



LIS Interface Gallery - Indiko

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MANUFACTURER

Thermo Fisher Scientific Oy
Ratastie 2, FI-01620 Vantaa, FINLAND
Tel. +358 10 329 200
www.thermofisher.com

CONTACT INFORMATION

Postal address: Thermo Fisher Scientific Oy
Ratastie 2, P.O. Box 100, FI-01621 Vantaa, FINLAND

SERVICE INFORMATION

Contact the local service provider in your country or region.

Notices

When the system is delivered to you, it meets the pertinent electromagnetic compatibility (EMC) and safety standards as described below.

Standards

Table 1. Conformity with the following international standards and regulations for Indiko analyzers

Standard	Title
<ul style="list-style-type: none"> • EN ISO 13485 	Medical devices - Quality management systems - Requirements for regulatory purposes.
<ul style="list-style-type: none"> • EN ISO 14971 	Medical devices - Application of risk management to medical devices.
<ul style="list-style-type: none"> • EN 61010-1 • IEC 61010-1 • UL 61010-1 • CAN/CSA-C22.2 No. 61010-1 	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.
<ul style="list-style-type: none"> • EN 61010-2-010 • IEC 61010-2-010 • CAN/CSA-C22.2 No. 61010-2-010 	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-010: Particular requirements for laboratory equipment for the heating of material.
<ul style="list-style-type: none"> • EN 61010-2-081+A1 • IEC 61010-2-081+A1 • CAN/CSA-C22.2 No. 61010.2.081 	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-081: Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes.
<ul style="list-style-type: none"> • EN 61010-2-101 • IEC 61010-2-101 • CAN/CSA-C22.2 No. 61010.2.101 	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-101: Particular requirements for in vitro diagnostic (IVD) medical equipment.
<ul style="list-style-type: none"> • EN 61326-1 	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements.

Standard	Title
<ul style="list-style-type: none"> EN 61326-2-6 	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-6: Particular requirements - <i>In vitro</i> diagnostic (IVD) medical equipment.
<ul style="list-style-type: none"> FCC CFR 47 Part 15 	Subpart B, Class B. EMC Requirements for US.
<ul style="list-style-type: none"> EN 62304 IEC 62304 	Medical device software - Software life-cycle processes.
<ul style="list-style-type: none"> EN 50581 	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.
<ul style="list-style-type: none"> CLSI LIS01-A2 (2nd edition) 	Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems; Approved Standard.
<ul style="list-style-type: none"> CLSI LIS02-A2 (2nd edition) 	Specification for Transferring Information Between Clinical Laboratory Instruments and Information Systems; Approved Standard.

Table 2. Conformity with the following international standards and regulations for Gallery analyzers

Standard	Title
<ul style="list-style-type: none"> EN ISO 12100 	Safety of machinery – General principles for design – Risk assessment and risk reduction.
<ul style="list-style-type: none"> EN 61010-1 IEC 61010-1 UL 61010-1 CAN/CSA-C22.2 No. 61010-1 	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.
<ul style="list-style-type: none"> EN 61010-2-010 IEC 61010-2-010 CAN/CSA-C22.2 No. 61010-2-010 	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-010: Particular requirements for laboratory equipment for the heating of material.
<ul style="list-style-type: none"> EN 61010-2-081+A1 IEC 61010-2-081+A1 CAN/CSA-C22.2 No. 61010.2.081 	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-081: Particular requirements for automatic and semi-automatic laboratory equipment for analysis and other purposes.
<ul style="list-style-type: none"> EN 61326-1 	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements.

Standard	Title
• EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments.
• EN 61000-6-3	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments.
• FCC CFR 47 Part 15	Subpart B, Class B. EMC Requirements for US.
• EN 50581	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.
• CLSI LIS01-A2 (2 nd edition)	Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems; Approved Standard.
• CLSI LIS02-A2 (2 nd edition)	Specification for Transferring Information Between Clinical Laboratory Instruments and Information Systems; Approved Standard.

CE



The CE mark attached on Indiko (clinical chemistry analyzer, type 863) indicates the conformity with the IVD (in vitro diagnostic medical devices) regulation 2017/746/EU and RoHS directive (Restriction of the use of certain hazardous substances in electrical and electronic equipment) 2011/65/EU.

The CE mark attached on Gallery (chemistry analyzer, type 861) indicates the conformity with the EMC (electromagnetic compatibility) directive 2004/108/EC and Machinery Directive 2006/42/EC and RoHS directive (Restriction of the use of certain hazardous substances in electrical and electronic equipment) 2011/65/EU.

Changes that you make to your system may void compliance with one or more of these EMC and safety standards. Changes to your system include replacing a part or adding components, options, or peripherals not specifically authorized and qualified by Thermo Fisher Scientific. To ensure continued compliance with EMC and safety standards, replacement parts and additional components, options, and peripherals must be ordered from Thermo Fisher Scientific or one of its authorized representatives.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WEEE Compliance

This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol:



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Preface

LIS Interface contains instructions on how to integrate the analyzer into the laboratory information system (LIS). This manual describes the communication between the analyzer and the host.

Table 3. Product code

Product	Code
Thermo Scientific Indiko	9863 0000

Intended use/Intended purpose

Thermo Scientific Indiko Clinical Chemistry Analyzers are fully automated random access analyzers for routine and special chemistries, including specific proteins, therapeutic drugs, drugs of abuse.

Indiko Clinical Chemistry Analyzer(s) are intended to be used in diagnosis of disease or other conditions, including a determination of the state of health, in order to cure, mitigate, treat or prevent a disease. Indiko, and all of the reagents included in this test system are for in vitro diagnostic use only.

Thermo Scientific Gallery is a discrete, automated chemistry analyzer. In addition to photometric measurement, the analyzer supports electrochemical measurement (ECM) technique.

Gallery is specifically designed e.g. for food, beverages, water, environmental and different bioprocess applications. Thermo Scientific Gallery is offered with various system applications. Furthermore, the analyzer supports user definable application setup.

Gallery Plus *Beermaster* model is dedicated for beer and wort quality control and analysis.

Intended audience

This manual is addressed to the personnel responsible for integrating the analyzer into the laboratory information system (LIS). The personnel must be trained in and should have a knowledge of handling the analyzer.

Note It is recommended to follow good laboratory practices (GLP).

Product documentation

The product documentation consists of the following manuals:

- Operation Manual contains instructions on how to operate the analyzer during normal operation once it has been installed. The manual can be used to find out what needs to be done before running analyses and how to run analyses. The manual also contains daily maintenance task descriptions and a troubleshooting guide.
- Reference Manual contains operational and analysis principle descriptions and lists test parameters per test.
- Installation Manual contains instructions on how to install the analyzer. The manual describes procedures for mechanical and electrical installation. The chapters are organized in the chronological order in which the analyzer should be installed.
- Service Manual contains instructions on how to service and maintain the analyzer. The manual also describes procedures for adjusting the analyzer and information about the analyzer parts. The manual also lists spare parts and accessories. Service Manual is provided only to the trained service engineers.
- The LIS Interface manual contains instructions on how to integrate the analyzer into the Laboratory Information System (LIS). The manual describes the communication between the analyzer and the host, using the RS-232 or TCP/IP interface.

Document revision history

Document version and date	Document code	Software version	History
A/December 2010	N12027	2.0	Document created.
A/July 2011	N12027	3.0	Additional information added about CLSI LIS2-A message structure.
A/February 2012	N12027	4.0	Examples about communication between analyzer and host computer updated.
A/January 2013	N12027	4.1	Information about PC configuration and checksum calculation updated.
A/June 2013	N12027	5.0	Birth date and reference ranges support added. Error flags updated.
A/October 2013	N12027	5.1	Support for quality control sending added. Examples about communication between analyzer and host computer updated.
A/July 2014	N12027	5.2	Additional information added about CLSI LIS2-A message structure.
A/June 2015	N12027	5.3	Updated CLSI LIS2-A message structure and contact information. Updated contact information.
A/October 2016	N12027	6.0	Updated CLSI LIS2-A message structure.
B/March 2018	N12027	6.0	Added instructions to enable Windows firewall.

Document version and date	Document code	Software version	History
A/October 2018	N12027	7.0	Updated CLSI LIS2-A message structure. Added firewall configuration instructions.
B/August 2019	N12027	7.0	Added information about ASTM configuration parameter "Result sending criteria". Updated information about PC configuration.
C/31 January 2022	N12027	7.0/8.0/ 8.0.1	Verified the conformity with the IVD (in vitro diagnostic medical devices) regulation 2017/746/EU. Added chapter Setting up LIS connection for new installations, and Appendices LIS configuration checklist and Instructions for software developers how to develop the LIS interface. Added comment text "46 - Wash not performed" (Gallery Plus Enzyme Master TDS only).

The original language of these instructions is English.

Document symbols and conventions

Symbols in manual

This manual uses notes that point out important information related to the correct and safe operation of the analyzer. Therefore, comply fully with all notices.

Note The note icon informs the operator of relevant facts and conditions.

CAUTION The caution icon indicates important information or warnings related to the concept discussed in the text. It might indicate the presence of a hazard which could result in the corruption of software or damage to equipment or property.

Document conventions

- Important abbreviations and terms in this manual are spelled out in Glossary.
- The last command of the user interface menu path is presented in bold, for example: Select F2 > Samples > **New**.
- Menu names in the user interface are shown in bold, for example: Select the correct test from the **Test name** drop-down menu in the Results view.
- Parameter names are shown in italics, for example: The test can be taken into or out of use with the *In use* parameter.
- Parameter values are indicated with quotation marks, for example: The values of the *In use* parameter are "Yes" and "No".
- The statuses and messages are shown in Courier font, for example `NO valid calibration`.

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Setting up LIS connection for new installations

Configuring the LIS into use should be done together with the LIS provider representative (recommended), Laboratory IT personnel and with your local support organization.

LIS connection must be enabled in the analyzer software on the **F5 > 7 Configuration > Analyzer > LIS connection in use > Yes**. After enabling the LIS connection, the software restarts automatically and the LIS configuration parameters are available for configuration. For more information see the Appendix [LIS configuration checklist](#) on page 43 and Appendix [Instructions for software developers how to develop the LIS interface](#) on page 45.

Troubleshooting LIS related issues

Check first the configuration has been correctly set up. For more information see the Appendix A. If you require further assistance to resolve LIS related issues, please provide the relevant log files to system.support.fi@thermofisher.com and wait for instructions.

The log files can be extracted in two ways:

- Use the **Error reporter tool**, which is located on the desktop of the workstation. For more information about the Error reporter tool, see the *Operation manual*.
- Provide the LIS communication debug file **lsdebug.txt** located in **c:\arc\tmp** folder on the workstation. Make sure that the correct time stamp of the issue is recorded in the log file.

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Hardware interface

The analyzer LIS hardware interface works through a serial communication channel or an ethernet interface. The ethernet connector and the connector for serial communication are at the back of the analyzer workstation. An ethernet cable is used for the TCP/IP connection. The connector for the serial communication channel is a 9-pin male D-connector.

Note Do not use network cable connection for the internet or other LAN connections.

Figure 1. Connections



- 1 - Serial connection
- 2 - Ethernet connection

Table 4. The signals needed at the analyzer end of cable

Pin	Description
Pin 2	Receive Data
Pin 3	Transmit Data
Pin 5	Ground

Note Configure the cable according to the documentation of LIS system in use.

Table 5. Example of cabling between analyzer and LIS

Analyzer	PC (RS-232)
Pin 2 RxD	Pin 3 TxD
Pin 3 TxD	Pin 2 RxD
Pin 5 Gnd	Pin 5 Gnd

2 Hardware interface

Hardware interface

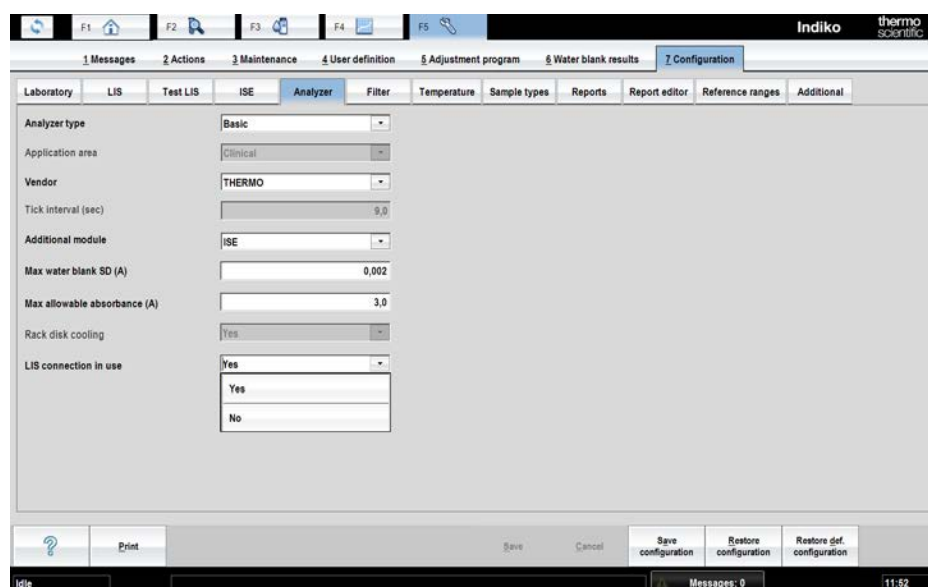
Note This example describes the minimum cable connections needed. Some computer systems may require some additional signals connected locally within connector. For more information about requirements, refer to the LIS documentation (Standards CLSI LIS01-A2 and CLSI LIS2-A 2).

Configuring ASTM software

To configure ASTM software:

1. Before configuration, take LIS into use.
 - a) Select F5 > Configuration > **Analyzer**.
 - b) Select **Yes** from the **LIS connection in use** drop-down menu.

Figure 2. Selecting LIS connection in use



2. Select F5 > Configuration > **LIS** to configure parameters shown in [Configuration modifications](#) on page 5. The ASTM software has additional configurations comparing to the analyzer online software. The configuration file is saved into the database.

Note The ASTM software supports sending results on ready sample or ready request basis. The sending of results on ready request basis loads the interface heavily. It is recommended to send results by ready sample. The selection can be done through the analyzer configuration function.

Table 6. Configuring parameters

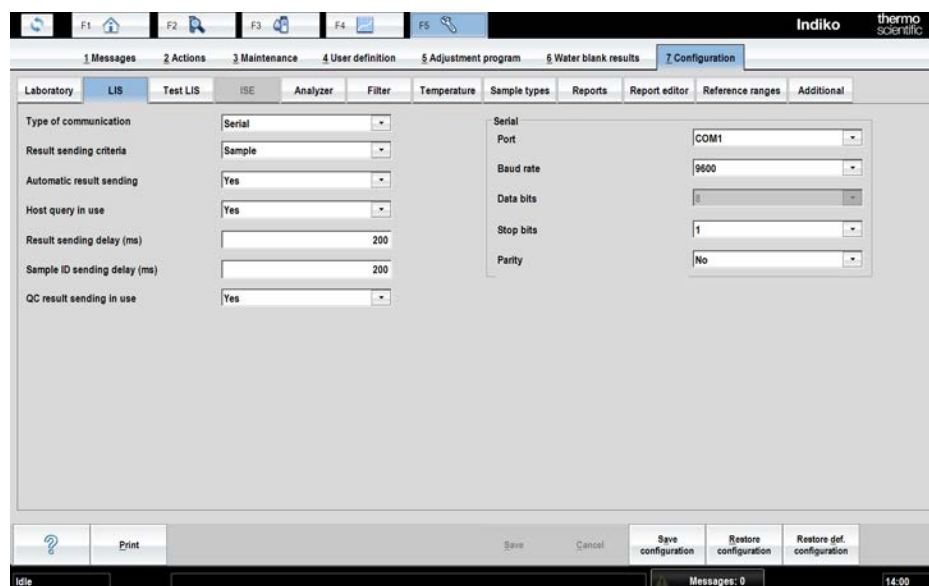
Parameter	Value to be used	Description
Type of communication	TCP/IP, Serial	Select a connection type
Result sending criteria	Request, Sample	Define whether the sample results are sent according to the request or sample.

3 Configuring ASTM software

Configuring ASTM software

Parameter	Value to be used	Description
		<p>If the Result sending criteria is "Request", each result is sent in a separate frame. If the Result sending criteria is "Sample" all results are sent in a same frame.</p> <p>See example 2a. Result sending when Result sending criteria is "Request" on page 29 and 2b. Result sending when Result sending criteria is "Sample" on page 30</p>
Automatic result sending	Yes	If the value is set to "Yes", new sample results and QC results (if defined) are automatically sent to the laboratory computer.
Host query in use	Yes	If the value is set to "Yes", the analyzer software sends a query for sample information and requests when new sample is introduced into the analyzer.
Multiple host query	Yes/No	If the value is set to "Yes", the analyzer sends the host query every time the barcode of the sample is read. If the value is set to "No", the analyzer sends the host query only for new samples.
Sample ID sending delay (ms)	0	If the value is not set to "0", the analyzer uses the delay between successive sending of new sample IDs. The sending delay can be used to ease the burden on laboratory computer, for example, when a full rack is introduced. The value is expressed in milliseconds.
Result sending delay (ms)	0	If the value is not set to "0", the analyzer uses the delay between successive sending of new sample results. The sending delay can be used to ease the burden on laboratory computer. The value is expressed in milliseconds.
QC result sending in use	Yes	If the value is set to "Yes", QC results are sent to the laboratory computer. The program also supports requests for archived QC results.

Figure 3. LIS Configuration



- [Configuring serial connection](#)
- [Configuring TCP/IP connection](#)
- [Configuring test online names](#)

Configuring serial connection

If the **Type of communication** is set to **Serial**, configure parameters for serial interface.

Table 7. Serial interface parameters

Parameter	Values	Description
Serial port	COM1, COM3, COM4, COM5, COM6	Select the serial port.
Baud rate	2400, 4800, 9600, 19200	Select the baud rate between 2400 and 19200.
Data bits	8	The number of data bits is set to 8.
Stop bits	1, 2	The number of stop bits can be set to 1 or 2.
Parity	Even, Odd, No, Space, mark	Select the type of parity checking. If the value is set to "No", the parity checking is not performed.

Configuring TCP/IP connection

For safe network connection, activate the firewall as instructed in [Enabling Windows 7 firewall](#) on page 35.

Socket Communication

Analyzer's socket communication is based on Windows Sockets which uses TCP/IP connection oriented sockets. A connection is needed between two parts, which are able to communicate, before information transmission can occur. After the communication, the connection can be terminated. The connection remains open until the session is closed, a request to clear the daily files is initiated or an error is occurred.

Analyzer can act as a client or a server in a socket communication. If the analyzer is run as a client, the analyzer tries to establish a connection to a given port at the given IP address. If the analyzer is run as a server, the analyzer creates a listening socket for a given port at given IP address and accepts client connection requests.

Communication requires a server at one end and a client at another end. Furthermore, the analyzer server mode can serve only one connection at a time and any attempt to create more connections may lead to malfunction. When the Windows firewall is in use, allow the `ARCASTM.exe` process to pass the firewall. It is allowed to disable the firewall only for testing purposes.

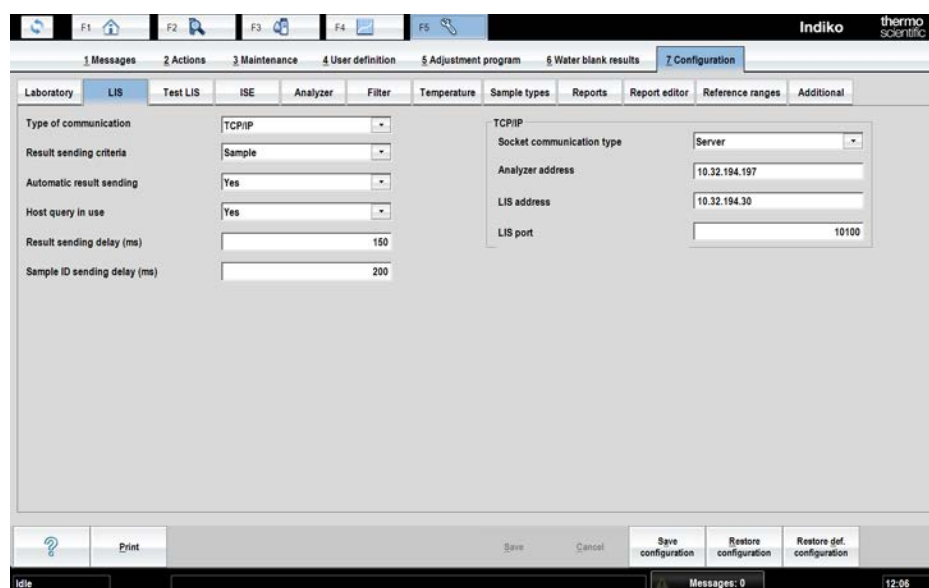
Communication protocol

Analyzer uses the ASTM protocol in socket communication. The serial channel is replaced with the socket communication. All interactions and message structures are similar when using a serial channel.

Configuration

Configure a new network card to use the specific TCP/IP address that is reserved for the communication. Configure the new card using **Network Connections** in **Windows Control Panel**.

Figure 4. LIS configuration



Furthermore, define the connection parameters for socket communication. Select **TCP/IP** from the **Type of communication** drop-down menu and configure parameters shown in [TCP/IP connection parameters](#) on page 9. For successful communication, both ends must use same port number and matching IP addresses.

Table 8. TCP/IP connection parameters

Parameter	Values	Description
Socket communication type	Server, Client	Analyzer software can be socket server or socket client
Analyzer address		IP address configured to a new network card
LIS address		IP address for LIS system
LIS port	10100	A communication port which is opened to ASTM communication

Connection management

Analyzer tries to connect when possible. In client mode, the analyzer tries to create a connection once in every 20 milliseconds. In server mode, the analyzer waits for a connection. After the connection has been established, the analyzer does not disconnect until the application is closed, a request to clear the daily files is initiated or an unrecoverable error condition is occurred in communication.

Furthermore, clearing daily files and changing the LIS connection communication parameters disconnects the analyzer, but the connection is restored after the operation has been performed. The analyzer waits for a few seconds before accepting any new data through the LIS connection. This ensures that the analyzer is internally stable before starting a new session. Error messages are not shown when the connection is terminated due to the clearing of daily files. If a

3 Configuring ASTM software

Configuring test online names

communication error occurs, analyzer disconnects and one of the following error messages is shown:

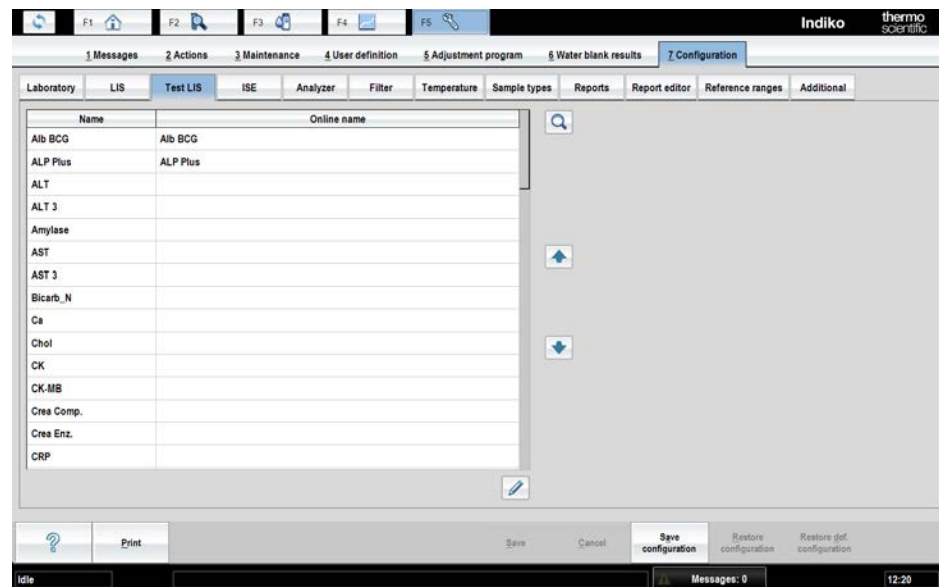
- 4403 write error (LIMS)
- 4404 Read error (LIMS)
- 4406 Communication time-out (LIMS)
- 4407 Transmit error (LIMS)

Error messages indicate the problems in communication. Analyzer tries to restore the connection immediately after it is disconnected. A flashing yellow signal on workstation screen indicates a communication trial is going on, but it does not indicate a successful communication.

Configuring test online names

Each test must have a test online name defined, if results or requests need to be transferred into the LIS system through the ASTM protocol. The test online name must match with the LIS test name, otherwise an error message is shown. The test online name must be unique for each test. If the online name is invalid, a comment message is sent to the LIS server.

Figure 5. Configuring test online names



ASTM protocol

The ASTM laboratory information management system interface is based on the following standards:

- CLSI LIS1-A: Standard Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems
- CLSI LIS2-A: Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems

- [Features](#)
- [CLSI LIS2-A message structure](#)

Features

The physical transmission layer is implemented according to CLSI LIS1-A. The connection can be established through the serial communication channel or the ethernet interface. The logical layer contains selected portions of CLSI LIS2-A. The detailed record structure is described in [CLSI LIS2-A message structure](#) on page 12.

Main features:

- automatic request for sample information when new sample is introduced to the analyzer (configurable ON/OFF)
- automatic sending of results either on ready sample or ready request basis (configurable reporting basis and ON/OFF)
- automatic sending of quality control results (configurable ON/OFF)
- response to sample information requests from the laboratory computer
- response to sample information received from the laboratory computer
- response to quality control information requested from the laboratory computer
- error situation management

Signal	Pin
RxD (received data)	2
TxD (transmitted data)	3
GND (ground)	5

Default communication parameters:

4 ASTM protocol

CLSI LIS2-A message structure

- 9600 baud
- 8 bit
- 1 start bit
- 1 stop bit
- no parity

No hardware or software flow control is used.

CLSI LIS2-A message structure

Following sections describe the ASTM records used by the analyzer.

The tables include:

- field name
- field number
- information about the field usage by the host
- information about the field usage by the analyzer
- description about the field usage

Optional fields have the usage information in brackets (X). The host can send data filled in all the fields, but only the marked fields are processed. The maximum length of the record is 247 characters without control characters and checksum. The ASTM software uses windows 1252 character encoding that supports characters 128-255 in ASCII table.

Header record (level 0)

The checksum is initialized to zero with the <STX> character. The first character used in computing the checksum is the frame number. Each character in the message text is added to the checksum (modulo 256). The computation for the checksum does not include <STX>, the checksum characters, or the trailing <CR> and <LF>.

Field name	No.	Host	Analyzer	Description
Record type ID	1	X	X	Always H. Starts every message. Do not use delimiter between the first and the second field
Delimiter definition	2	X	X	Field, repeat, component and escape delimiters
Message control ID	3	-		
Access password	4	-		
Sender name or ID	5	-	X	Analyzer type [1]
		-	X	Analyzer ID
		-	X	Database version

Field name	No.	Host	Analyzer	Description
Sender street address	6	-	-	
Reserved field	7	-	-	
Sender telephone number	8	-	-	
Characteristics of sender	9	-	-	
Receiver ID	10	-	-	
Comment or special instructions	11	-	-	
Processing ID	12	X	X	P (production)
		X	X	T (training)
		X	X	D (debugging)
		X	X	Q (QC)
Version No. Date and time of message	13	-	-	
Date and time of message	14	-	(X)	Form YYYYMMDDHHMMSS. Only in debug mode.

Message terminator record (level 0)

Field name	No.	Host	Analyzer	Description
Record type ID	1	X	X	Always L. Ends every message.
Sequence number	2	X	X	Always 1. One terminator per message.
Termination code	3	(X)	(X)	N or missing (normal termination)
		X	X	T (sender aborted)
		X	X	R (receiver requested abort)
		X	X	E (unknown error)
		-	X	Q (error in last request for information)
		-	X	I (no information available from last query)
		-	X	F (last request for information processed)

4 ASTM protocol

Patient information record (level 1)

Patient information record (level 1)

If patient information is used, the patient ID field is required.

Field name	No.	Host	Analyzer	Description
Record type ID	1	X	X	Always P.
Sequence number	2	X	X	Running number within Message. Starts with 1.
Practice assigned patient ID	3	(X)	(X)	If no code is given, this gets the value of Patient name.
<div style="border: 1px solid black; background-color: #e6f2ff; padding: 5px;"> <p>Note This is mandatory information, if patient information is transferred to the analyzer.</p> </div>				
Laboratory assigned patient ID	4	-	-	
Patient ID No. 3	5	-	-	
Patient name	6	(X)	(X)	Last name. Only one text field. Type the whole name. Optional if no patient relates to sample.
		-	-	First name
		-	-	Middle name or initials
Mothers maiden name	7	-	-	
Date of birth	8	(X)	(X)	Form YYYYMMDD.
Patient sex	9	(X)	(X)	Used as a reference range name. The field is case-sensitive.
Patient race-ethnic origin	10	-	-	
Patient address	11	-	-	
Reserved field	12	-	-	
Patient telephone number	13	-	-	
Attending physician ID	14	-	-	
Special field 1	15	-	-	
Special field 2	16	-	-	
Patient height	17	-	-	
Patient weight	18	-	-	

Field name	No.	Host	Analyzer	Description
Patient's known or suspected diagnosis	19	-	-	
Patient active medications	20	-	-	
Patient's diet	21	-	-	
Practice field 1	22	-	-	
Practice field 2	23	-	-	
Admission or discharge dates	24	-	-	
Admission status	25	-	-	
Sender	26	(X)	(X)	Ordering doctor
Native of alternative diagnostic code and classifiers	27	-	-	
Alternative diagnostic code and classification	28	-	-	
Patient religion	29	-	-	
Marital status	30	-	-	
Isolation status	31	-	-	
Language	32	-	-	
Hospital service	33	-	-	
Hospital institution	34	-	-	
Dosage category	35	-	-	

Test order record (level 2)

Field name	No.	Host	Analyzer	Description
Record type ID	1	X	X	Always O.
Sequence number	2	X	X	Running number within Patient information. Starts with 1.
Sample ID	3	X	X	SampleID or ControlID/ManualDilution/Rack/Position

4 ASTM protocol

ASTM protocol

Field name	No.	Host	Analyzer	Description
				Manual dilution is optional. If manual dilution information is not used, the value is set "0".
Analyzer Sample ID	4	-	-	
Universal test ID	5	-	-	Universal test ID
		-	-	Universal test name
		-	-	Universal test ID type
		X	X	Manufacturer defined test code
		-	X	Auto-dilution factor
		Multiple tests can be ordered separated by repeat delimiter		
Priority	6	(X)	(X)	S (stat)
		(X)	(X)	A (asap)
		(X)	(X)	R (routine)
		-	-	C (callback)
		-	-	P (preoperative)
		Optional, if there is no sample or sample is calibrator or control.		
Requested/ordered date and time	7	-	-	
Sample collection date and time	8	(X)	(X)	Form YYYYMMDDHHMMSS
Collection end time	9	-	-	
Collection volume	10	-	-	
Collector ID	11	-	-	
Action code	12	X	-	A (add test requests to existing sample)
		X	-	N (new test requests + new sample)
		-	X	P (pending sample)
		-	-	L (reserved)
		-	X	X (sample or test in process)
		-	X	Q (QC sample)
		-	X	C (comment)

Field name	No.	Host	Analyzer	Description
				Multiple action codes can be typed separated by repeat delimiter. For example X\Q.
Danger code	13	-	-	
Relevant clinical information	14	(X)	(X)	Sample information field
Date/time sample received	15	-	-	
Sample descriptor (type and source)	16	X	X	Type
		-	-	Source
				Type coding: 1 - serum 2- Plasma 3- Urine, 4 - CSF, 5 - Oral fluid, 6 - Whole blood, 7 - Hemol. Blood, 8 - Other Note: Control results do not contain sample type information.
Ordering physician	17	-	-	
Physicians telephone number	18	-	-	
User field No.1	19	-	-	
User field No.2	20	-	-	
Laboratory field No.1	21	-	(X)	Control lot ID
		-	(X)	Concentration
		-	(X)	Control lot standard deviation
Laboratory field No.2	22	-	-	
Date/time results reported or last modified	23	-	-	
Instrument charge to computer system	24	-	-	
Instrument section ID	25	(X)	(X)	Optional if no sample, Indiko always 1
Report types	26	X	-	O (order)
		-	-	P (preliminary results)
		-	-	C (correction to previously transmitted results)
		-	X	F (final results)
		X	X	X (requests cancelled)

4 ASTM protocol

Result record (level 3)

Field name	No.	Host	Analyzer	Description
		X	X	I (in analyzer pending)
		-	X	Y (no order for test (response to query))
		-	X	Z (no record of this patient (response to query))
		X	X	Q (response to query (info))
Multiple report types can be typed separated by repeat delimiter. For example YVZ.				
Reserved field	27	-	-	
Location or ward of sample collection	28	-	-	
Nosocomial infection flag	29	-	-	
Sample service	30	-	-	
Sample institution	31	-	-	

Note If even one test is requested as STAT, the priority of test order record is set to stat (S) when results are reported by samples. When results are reported by requests, the right test priority is always seen.

Result record (level 3)

Field name	No.	Host	Analyzer	Description
Record type ID	1	-	X	Always R.
Sequence number	2	-	X	Running number within Test order. Starts with 1.
Universal test ID	3	-	-	Universal test ID
		-	-	universal test name
		-	-	universal test ID type
		-	X	manufacturer defined test code
		-	X	dilution factor used in calculation
Data or measurement value	4	-	(X)	If the result status is X (cancelled) or result is UNSTABLE, no result is given. The range of result will be [99999.9 ... 0.00000] and [-0.00000 ... -99999.9]. If the actual result exceeds the values, the nearest value is shown.

Field name	No.	Host	Analyzer	Description
Units	5	-	(X)	Text field. All special characters (e.g. μ) are not supported. Unsupported characters are replaced with "?" character.
Reference ranges	6			Components:
		-	X	Low limit
		-	X	High limit
		-	-	Description
Result abnormal flags	7	-	X	L/N/H (below lower limit/normal/above higher limit)
Nature of abnormality testing	8	-	-	
Result status	9	-	-	C (correction)
		-	X	P (preliminary)
		-	X	F (final)
		-	X	X (cancelled)
		-	X	I (pending)
		-	-	S (partial)
		-	-	M (MIC level)
		-	X	R (reported)
		-	-	N (contains necessary information to run a new order)
		-	X	Q (response to query)
		-	-	V (verified)
		-	-	S (result from pretreated sample)
Multiple status flags can be given separated by repeat delimiter. For example F\Q.				
Date of change in analyzer normative values or units	10	-	-	
Operator identification	11	-	X	User login name if User levels have been set on. When a result is manually accepted, current user's login name is sent with the result. If the result is automatically accepted the text is "Automatic".

4 ASTM protocol

Comment record (level 4) used with result record

Field name	No.	Host	Analyzer	Description
Date/time test started	12	-	-	
Date/time test completed	13	-	(X)	Form YYYYMMDDHHMMSS. No value if test is not completed.
Analyzer identification	14	-	X	Analyzer ID is defined in the configuration parameter AnalyzerName.

Comment record (level 4) used with result record

Field name	No.	Host	Analyzer	Description
Record type ID	1	-	X	Always C. Used to transfer analyzer flags after Result record.
Sequence Number	2	-	X	Always 1, because of the use.
Comment source	3	-	-	P (practice)
		-	-	L (computer system)
		-	X	I (clinical analyzer system)
Comment text	4	-	X	Error condition identified with a number and a text in English. When the text in a comment record differs from the text in the Measurement Errors chapter in Operation Manual, the Operation Manual text is shown in parentheses.

Field name	No.	Host	Analyzer	Description
				2 - Addl. meas. error
				3 - Instrument abs. limit (Abs. high)
				4 - Init abs. low
				5 - Init abs. high
				6 - Bichr. net abs.
				7 - Linearity
				8 - Point(s) out of curve
				9 - Reaction direction
				10 - Blank init abs. low
				11 - Blank init abs. high
				12 - Blank resp. low
				13 - Blank resp. high
				14 - Unstable
				15 - Unstable cal.
				16 - Liquid movement
				18 - Dil. limit low
				19 - Dil. limit high
				20 - Test limit low
				21 - Test limit high
				22 - Crit. limit low
				23 - Crit. limit high
				24 - Antigen limit low
				25 - Antigen limit high
				27 - QC (Batch incomplite)
				28 - Calc. error
				30 - Outside of cal.
				31 - Square limit low (Coeff. of det. limit)
				32 - Factor limit low (Slope limit min)
				33 - Factor limit high (Slope limit max)
				34 - Bias limit low
				35 - Bias limit high
				38 - Reference range low
				39 - Reference range high
				46 - Wash not performed
Multiple flags can be given separated with repeat delimiter.				
Comment type	5	-	(X)	G (result approval comment)
		-	-	T (test name comment)
		-	-	P (positive test comment)
		-	-	N (negative test comment)
		-	X	I (analyzer flag(s) comment)

4 ASTM protocol

Comment record (level 3) used with transmission error conditions

Comment record (level 3) used with transmission error conditions

Field name	No.	Host	Analyzer	Description	
Record type ID	1	-	X	Always C. Used to transfer analyzer flags after Result record.	
Sequence Number	2	-	X	Always 1, because of the use.	
Comment source	3	-	-	P (practice)	
		-	-	L (computer system)	
		-	X	I (clinical analyzer system)	
Comment text	4	-	X	Error condition identified by 'E' followed by a number	
				E3 - wrong initializing character in record	
				E4 - wrong termination code or request code in record	
				E5 - records found in wrong order	
				E104 - invalid sample plate position, sample position already reserved in analyzer by another sample or calibrator or control. The new sample was wrongly positioned by LIS. Use position 0^0 for any sample when the position is defined at a later moment with sample insertion into the analyzer.	
				E105 - problems with analysis request, request could not be created	
				E201 sample rack position is reserved	
				E210 - problems with updating patient information	
				E211 - patient information could not be found	
				E220 - sample already exists	
E221 - problems with sample information					
E222 - Invalid test online name					
Comment type	5	-	X	G (generic/free text document)	
			-	-	T (test name comment)
			-	-	P (positive test comment)
			-	-	N (negative test comment)

Field name	No.	Host	Analyzer	Description
		-	-	I (analyzer flag(s) comment)

Request information record (level 1)

Field name	No.	Host	Analyzer	Description
Record type ID	1	X	X	Always Q. Analyzer requests external test results or orders new samples. Host requests sample and/or control results and monitors that results are in analyzer's database.
Sequence number	2	X	X	Always 1. Only one request can be outstanding at a time.
Starting range ID number	3	- (X)	- (X)	Patient ID or ALL Sample ID or ALL
		(X)	(X)	Rack
		(X)	(X)	Position
		Patient ID and sample ID are text fields, so field is not used as range. Multiple patients or samples can be requested separated by repeat delimiter.		
Ending range ID number	4	-	-	
Universal test ID	5	-	-	Universal test ID
		-	-	Universal test name
		-	-	Universal test ID type
		(X)	(X)	Manufacturer defined test code or ALL
		-	-	Auto-dilution factor
		Multiple tests can be requested separated by repeat delimiter.		
Nature of request time limits	6	-	-	S (sample collect date)
		(X)	(X)	R (result test date)
		According to standard R is taken as default, so it is optional.		
Beginning request results date and time	7	(X)	(X)	Form YYYYMMDDHHMMSS

4 ASTM protocol

ASTM protocol

Field name	No.	Host	Analyzer	Description
Ending request results date and time	8	(X)	(X)	Form YYYYMMDDHHMMSS
Requesting physician name	9	-	-	
Requesting physician telephone number	10	-	-	
User field No.1	11	-	-	
User field No.2	12	-	-	
Request information status codes	13	-	-	C (correction)
		(X)	(X)	P (preliminary)
		(X)	(X)	F (final)
		(X)	(X)	X (cancelled)
		(X)	(X)	I (pending)
		-	-	S (unfinalized results)
		-	-	M (MIC level)
		(X)	(X)	R (previously transmitted)
		-	-	A (cancel last request criteria)
		(X)	(X)	N (requesting new or edited results only)
		(X)	(X)	O (requesting test orders only (no results))
		-	-	D (requesting demographics only)

Note: not repeated.

Field lengths

Field	Length in characters
Analyzer type	1
Analyzer ID	20
Date and time of message	14
Practice assigned test ID	20
Patient name	24
Sample ID / Control ID	20
Manufacturer defined test code	30
Sample collection date and time	20
Relevant clinical information	80
Data or measurement value	9
Units	10
Date/time test completed	14
Beginning request results date and time	14
Ending request results date and time	14

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Examples: communication between analyzer and host computer

Examples show transmissions between the analyzer and the host computer, when the analyzer is configured to use automatic sample ID Sending and automatic result Sending. The control characters are presented between '<>'. For example <enq> means an ASCII character ENQ which hexadecimal value is 05. Examples give only an overview, the actual communication may vary.

Before starting the communication, it is possible to turn on the debugging of communication by selecting F5 > **Actions**. Click **Change debug status** and select the debug level. The file `1sdebug.txt` in the folder `C:\ARC\tmp` includes the LIS communication messages sent between the analyzer and LIS.

6 Examples: communication between analyzer and host computer

Examples: communication between analyzer and host computer

1. New sample introduced to the analyzer

Send: <ENQ>
Read: <ACK>
Send: <STX>1H|\^&t||1^Analyzer_1^|||||P||20101118101825<CR><ETX>A1
Read: <ACK>
Send: <STX>2Q|1|SampleID_03^^|\^^^ALL^|||||O<CR><ETX>FF
Read: <ACK>
Send: <STX>3L|1|N<CR><ETX>06
Read: <ACK>
Send: <EOT>

Read: <ENQ>
Send: <ACK>
Read: <STX>1H|\^&t||1^LIS host^1.0|||||P<CR><ETX>0D
Send: <ACK>
Read: <STX>2P|1|PatientID_03|||Patient Name_3|||U|||||Doctor Name|<CR><ETX>60
Send: <ACK>
Read: <STX>3O|1|SampleID_03||^ISE_test|S||20101102100000|||||Test information field||3|||||O<CR><ETX>2E
Send: <ACK>
Read: <STX>4L|1|F<CR><ETX>FF
Send: <ACK>
Read: <EOT>

Send: <ENQ>
Read: <ACK>
Send: <STX>1H|\^&t||1^Analyzer_1^|||||P||20101118104132<CR><ETX>9B
Read: <ACK>
Send: <STX>2P|1|PatientID_03|||Patient Name_3|||||Doctor Name|||||<CR><ETX>F5
Read: <ACK>
Send: <STX>3O|1|SampleID_03^0.0^3^1||^ISE_test^0|R||20101102100000|||||X||Test information field||3|||||1|F<CR><ETX>21
Read: <ACK>
Send: <STX>4R|1|^ISE_test^5|0.00830|μmol/l|||||20101118104459|Analyzer_1<CR><ETX>D6
Read: <ACK>
Send: <STX>5L|1|N<CR><ETX>08
Read: <ACK>
Send: <EOT>

2a. Result sending when Result sending criteria is "Request"

```

send: <ENQ>
read: <ACK>
send: <STX>1H|\^&|||1^Analyzer 1^7.0|||||P||20190801133529<CR><ETX>EA
read: <ACK>
send: <STX>3O|1|SampleID_07^0.0^5^1||^Test_1^0.0|S|||||X||||3|||||||1|F<CR><ETX>2D
read: <ACK>
send: <STX>4R|1|^Test_1^0.0|2.4|mmol/l||N||F\R||<root user>||20190801124608|Analyzer 1<CR><ETX>ED
read: <ACK>
send: <STX>5L|1|N<CR><ETX>08
read: <ACK>
send: <EOT>

```

```

send: <ENQ>
read: <ACK>
send: <STX>1H|\^&|||1^Analyzer 1^7.0|||||P||20190801133530<CR><ETX>E2
read: <ACK>
send: <STX>2P|1
read: <ACK>
send: <STX>3O|1|SampleID_07^0.0^5^1||^Photo_reflex_test^0.0|S|||||X||||3|||||||1|F<CR><ETX>0B
read: <ACK>
send: <STX>4R|1|^Photo_reflex_test^0.0|3.205|mmol/l||N||F\R||<root user>||20190801124606|Analyzer 1<CR><ETX>2D
read: <ACK>
send: <STX>5L|1|N<CR><ETX>08
read: <ACK>
send: <EOT>

```

```

send: <ENQ>
read: <ACK>
send: <STX>1H|\^&|||1^Analyzer 1^7.0|||||P||20190801133531<CR><ETX>E3
read: <ACK>
send: <STX>2P|1
read: <ACK>
send: <STX>3O|1|SampleID_07^0.0^5^1||^Photometric_test^0.0|S|||||X||||3|||||||1|F<CR><ETX>AA
read: <ACK>
send: <STX>4R|1|^Photometric_test^0.0|0.06|mmol/l||N||F\R||<root user>||20190801124607|Analyzer 1<CR><ETX>99
read: <ACK>
send: <STX>5L|1|N<CR><ETX>08
read: <ACK>
send: <EOT>

```

6 Examples: communication between analyzer and host computer

Examples: communication between analyzer and host computer

2b. Result sending when Result sending criteria is "Sample"

```
send: <ENQ>
read: <ACK>
send: <STX>1H|^&|||1^Analyzer 1^7.0|||||P||20190801124640<CR><EXT>E4
read: <ACK>
send: <STX>2P|1|PatientID_07|||Patient Name_7|||U|||||||||||||<CR><EXT>67
read: <ACK>
send: <STX>3O|1|SampleID_07^0.0^5^1||^Test_1^0.0|R||||X|||3|||||||1|F<CR><EXT>2C
read: <ACK>
send: <STX>4R|1|^Test_1^0.0|2.4|mmol/l||N||F||<root user>||20190801124608|Analyzer 1<CR><EXT>3F
read: <ACK>
send: <STX>5O|2|SampleID_07^0.0^5^1||^Photo_reflex_test^0.0|R||||X|||3|||||||1|F<CR><EXT>0D
read: <ACK>
send: <STX>6R|1|^Photo_reflex_test^0.0|3.205|mmol/l||N||F||<root user>||20190801124606|Analyzer 1<CR><EXT>81
read: <ACK>
send: <STX>7O|3|SampleID_07^0.0^5^1||^Photometric_test^0.0|R||||X|||3|||||||1|F<CR><EXT>AF
read: <ACK>
send: <STX>0R|1|^Photometric_test^0.0|0.06|mmol/l||N||F||<root user>||20190801124607|Analyzer 1<CR><EXT>E7
read: <ACK>
send: <STX>1L|1|N<CR><EXT>04
read: <ACK>
send: <EOT>
```

3. Invalid test request

Read: <ENQ>
 Send: <ACK>
 Read: <STX>1H|^&|60^ASTM_Tester^5.0|||||P||<CR><ETX>C5
 Send: <ACK>
 Read: <STX>2P|1|PatientID_06||Patient Name_6|||||||||||||Doctor Name||||||<CR><ETX>D7
 Send: <ACK>
 Read: <STX>3O|1|SampleID_06||^Invalid_test|S||20101102100000|||A||Test information field||1|||||1|Q\O<CR><ETX>78
 Send: <ACK>
 Read: <STX>4L|1|F<CR><ETX>FF
 Send: <ACK>
 Read: <EOT>

 Send: <ENQ>
 Read: <ACK>
 Send: <STX>1H|^&|1^Analyzer_1^|||||P||20101118141519<CR><ETX>A5
 Read: <ACK>
 Send: <STX>2P|1|PatientID_06||Patient Name_6|||||||||||||Doctor Name||||||<CR><ETX><CR><ETX>F1
 Read: <ACK>
 Send: <STX>3O|1|SampleID_06||^0|S|||||C||Test information field||3|||||1|X<CR><ETX>8D
 Read: <ACK>
 Send: <STX>4C|1|I|E105|G<CR><ETX>21
 Read: <ACK>
 Send: <STX>5L|1|Q<CR><ETX>0B
 Read: <ACK>
 Send: <EOT>

6 Examples: communication between analyzer and host computer

Examples: communication between analyzer and host computer

4. Measurement error in result

```
Send: ENQ
Read: <ACK>
Send: <STX>1H|\^&t||1^Analyzer_1^||||P||20101118151136<CR><ETX>A1
Read: <ACK>
Send: <STX>2Q|1|SampleID_20^^|^^^ALL^||||O<CR><ETX>FE
Read: <ACK>
Send: <STX>3L|1|N<CR><ETX>06
Read: <ACK>
Send: EOT

Read: <ENQ>
Send: ACK
read: <STX>1H|\^&t||||P<CR><ETX>0D
Send: ACK
read: <STX>2P|1|PatientID_20||Patient Name_20||20010101|M|||||||||||<CR><ETX>0B
Send: ACK
read: <STX>3O|1|SampleID_20^0.0^0^0|^^^Photometric_test|R|||||||2|||||||O<CR><ETX>31
Send: ACK
read: <STX>4L|1|F<CR><ETX>FF
Send: ACK
Read: <EOT>

Send: ENQ
Read: <ACK>
Send: <STX>1H|\^&t||1^Analyzer_1^||||P||20101118151301<CR><ETX>9B
Read: <ACK>
Send: <STX>2P|1|PatientID_20||Patient Name_20|||||||||||||||||<CR><ETX>19
Read: <ACK>
Send: <STX>3O|1|SampleID_20^0.0^4^1|^^^Photometric_test^0|R||||X||||2|||||||1|F<CR><ETX>44
Read: <ACK>
Send: <STX>4R|1|^^^Photometric_test^0|0.92129|nmol/l|||||20101118151221|Analyzer_1<CR><ETX>38
Read: <ACK>
Send: <STX>5C|1|I|20 AE meas error|I<CR><ETX>55
Read: <ACK>
Send: <STX>6L|1|N<CR><ETX>09
Read: <ACK>
Send: EOT
```

5. Result with user comment

Send: ENQ
 Read: <ACK>
 Send: <STX>1H|\^&t||1^Analyzer_1^|||||P||20110706101620<CR><ETX>9E
 Read: <ACK>
 Send: <STX>2P|1|PatientID_001||Patient Name_1||||||||||||||||||<CR><ETX>17
 Read: <ACK>
 Send: <STX>3O|1|SampleID_001^0.0^3^1||^Photometric_test^0.0|R||||X|||3||||||1|F<CR><ETX>D4
 Read: <ACK>
 Send: <STX>4R|1|^Photometric_test^0.0|0.80496|nmol/l||||||20110706101439|Analyzer_1<CR><ETX>A6
 Read: <ACK>
 Send: <STX>5C|1|I|21 Test limit high|I<CR><ETX>5F
 Read: <ACK>
 Send: <STX>6C|2|I|The result is commented|G<CR><ETX>FA
 Read: <ACK>
 Send: <STX>7L|1|N<CR><ETX>04
 Read: <ACK>
 Send: EOT

6. Sending control results

Send: ENQ
 Read: <ACK>
 Send: <STX>1H|\^&t||60^1^5.0|||||Q||20010502130025<CR><ETX>94
 Read: <ACK>
 Send: <STX>2P|1||||||||||||||||||<CR><ETX>BF
 Read: <ACK>
 Send: <STX>3O|1|Control_1||^Ca^0.0|R||||Q|||1||||||1|<CR><ETX>C4
 Read: <ACK>
 Send: <STX>4R|1|^Ca^0.0|2.3|mmol/l|^N|F||||20010502130024|0<CR><ETX>D4
 Read: <ACK>
 Send: <STX>5L|1|N<CR><ETX>08
 Read: <ACK>
 Send: EOT

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Windows 7 firewall activation and rule configuration

❖ Introduction

A firewall is a software or hardware that checks information coming from the Internet or a network, and then either blocks it or allows it to pass through to your computer, depending on your firewall settings. A firewall can help prevent hackers or malicious software from gaining access to your computer through a network or the Internet. A firewall can also help stop your computer from sending malicious software to other computers.

Note If the analyzer workstation is Windows 10 system, then the firewall is already configured and ready for use.

Note Installing any third party antivirus software to the workstation PC is not allowed.

❖ References

<https://support.microsoft.com/en-us/help/4028544/windows-turn-windows-firewall-on-or-off>

[https://technet.microsoft.com/en-us/library/cc753558\(v=ws.11\).aspx](https://technet.microsoft.com/en-us/library/cc753558(v=ws.11).aspx)

- [Enabling Windows 7 firewall](#)

Enabling Windows 7 firewall

1. Click **Start** and in the **Search for Programs and Files** text box, type **firewall**.
2. In the search results, click **Windows Firewall**.
3. If the Windows Firewall is disabled, the Windows Firewall state will be off. If it is off, click **Change settings** or **Turn Windows Firewall on or off** in the left column.
4. In the Firewall Settings window, select **On** and click **OK**.

Configuring Network Profiles

The Windows firewall uses three different profiles:

- **Domain Profile:** Used when your computer is connected to a domain.
- **Private:** Used when connected to a private network, such as a work or home network.

7 Windows 7 firewall activation and rule configuration

Remove all rules

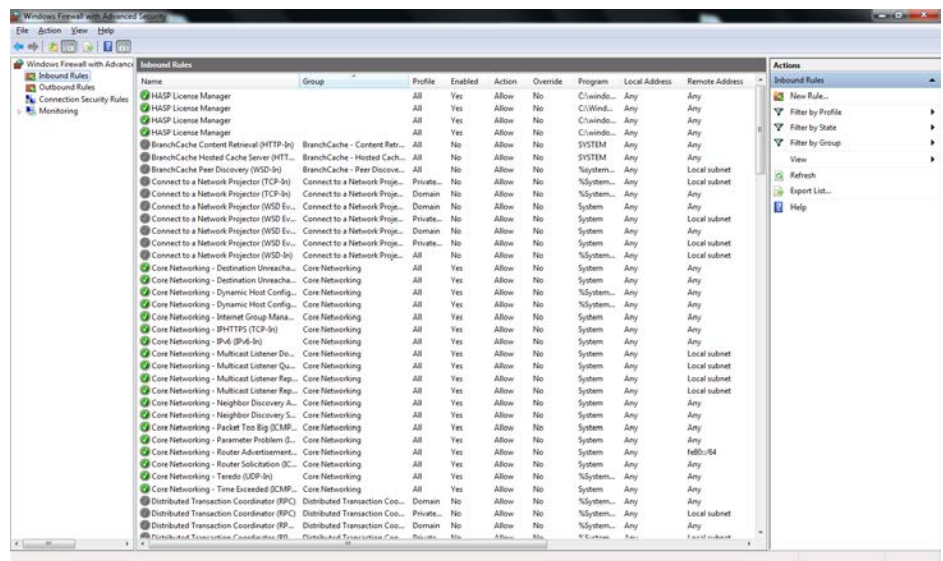
- **Public:** Used when connected to a public network, such as a public Wi-Fi access point or a direct connection to the Internet.

Windows asks whether a network is public or private when you first connect to it.

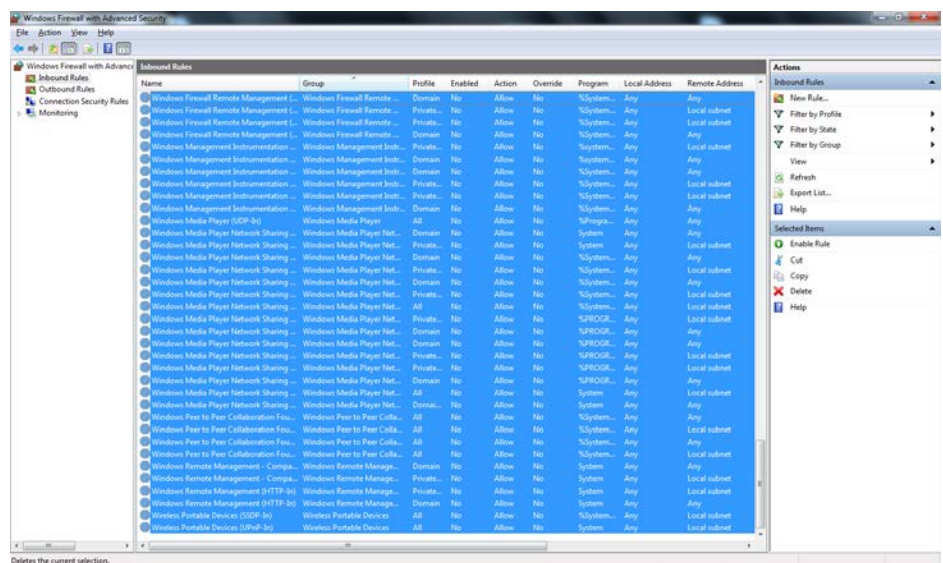
Remove all rules

The system has predefined inbound rules by default. You must delete these rules before you can create new ones.

1. In the **Windows Firewall with Advanced Security** window, select **Inbound rules**.



2. Select all rules.

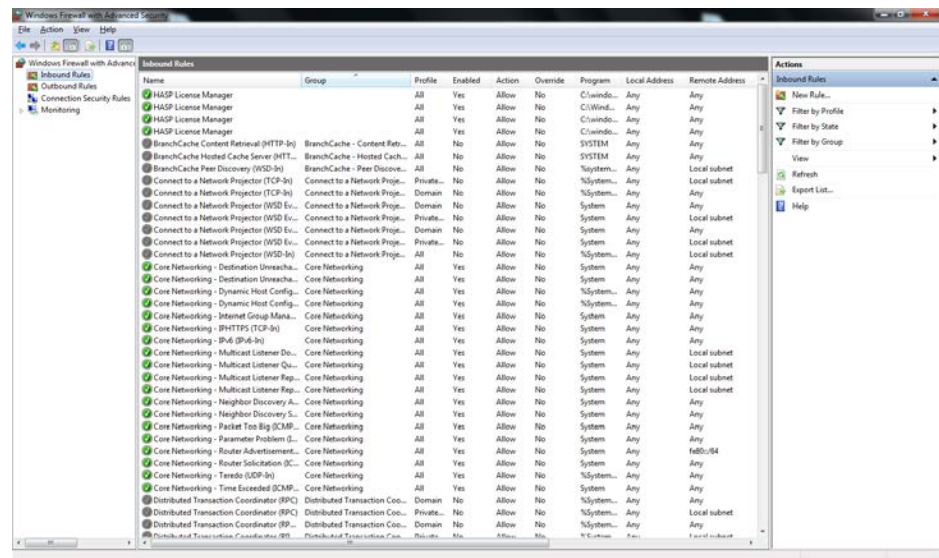


3. Click **Delete**.

Creating a Rule

To create a rule, select the **Inbound Rules** or **Outbound Rules** category at the left side of the window and click the **New rule** link at the right side.

Note The rules described will only allow the network connection to be used for communication with the LIS.



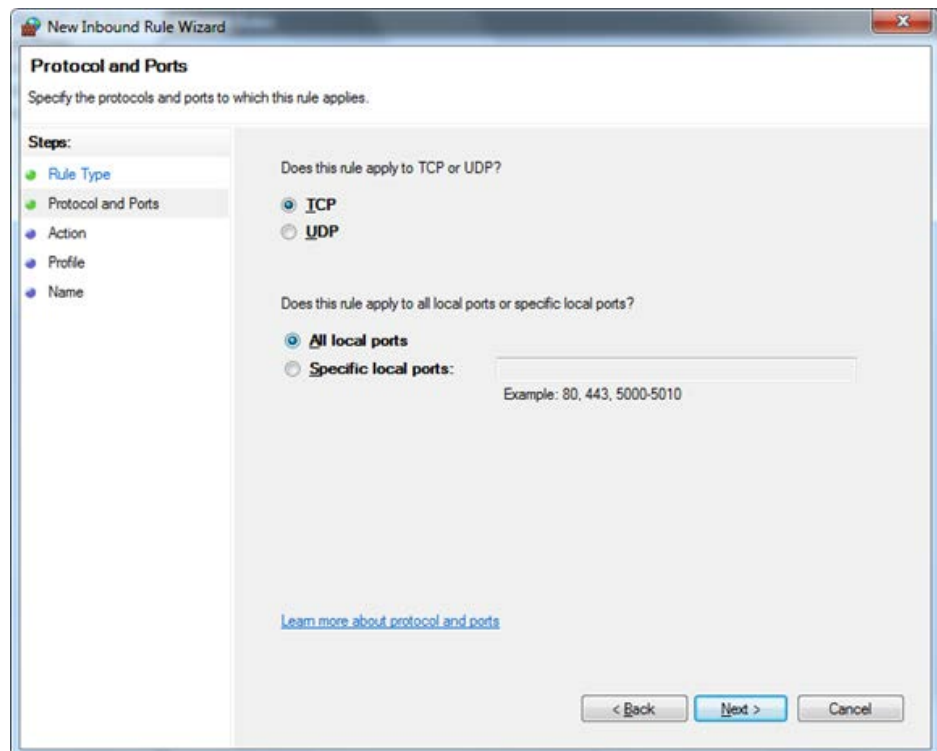
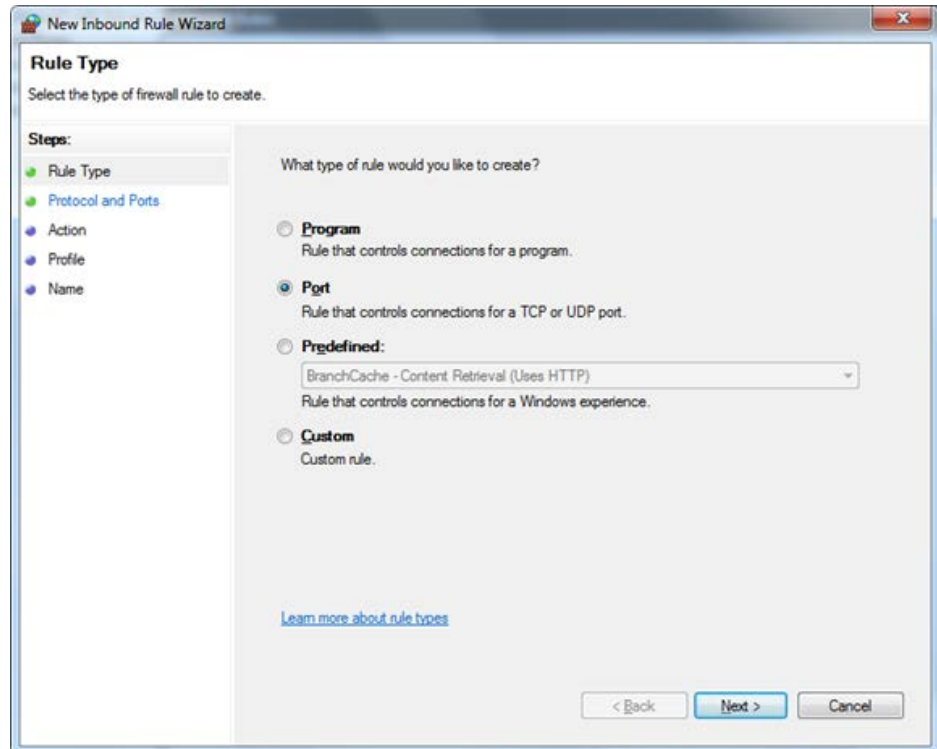
The Windows firewall offers four types of rules:

- **Program** – Block or allow a program.
- **Port** – Block or allow a port, port range, or protocol.
- **Predefined** – Use a predefined firewall rule included with Windows.
- **Custom** – Specify a combination of program, port, and IP address to block or allow.

7 Windows 7 firewall activation and rule configuration

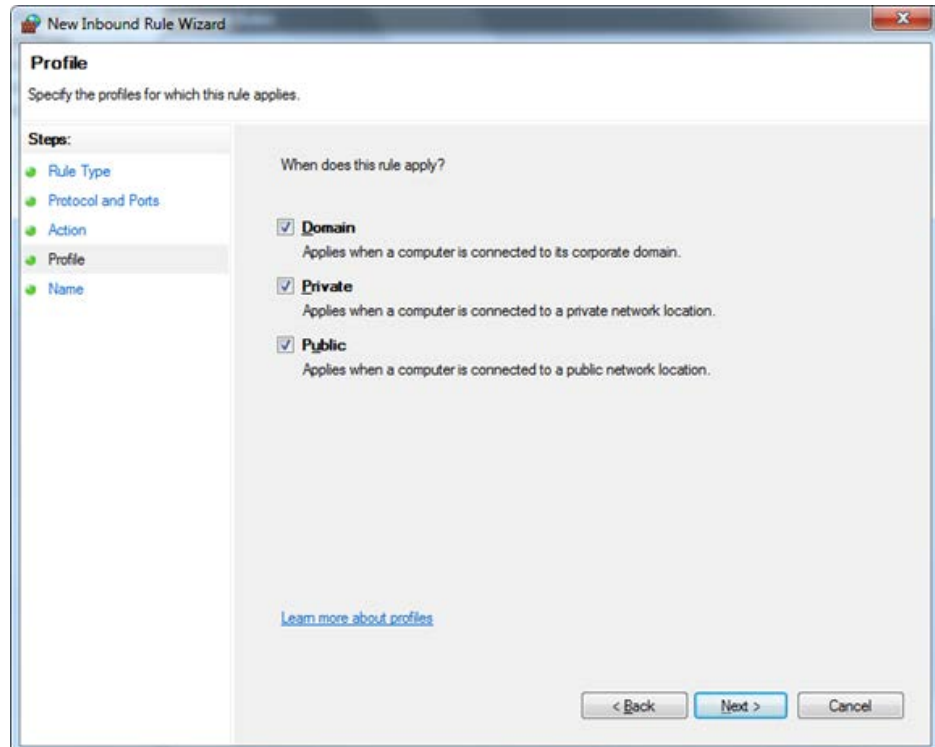
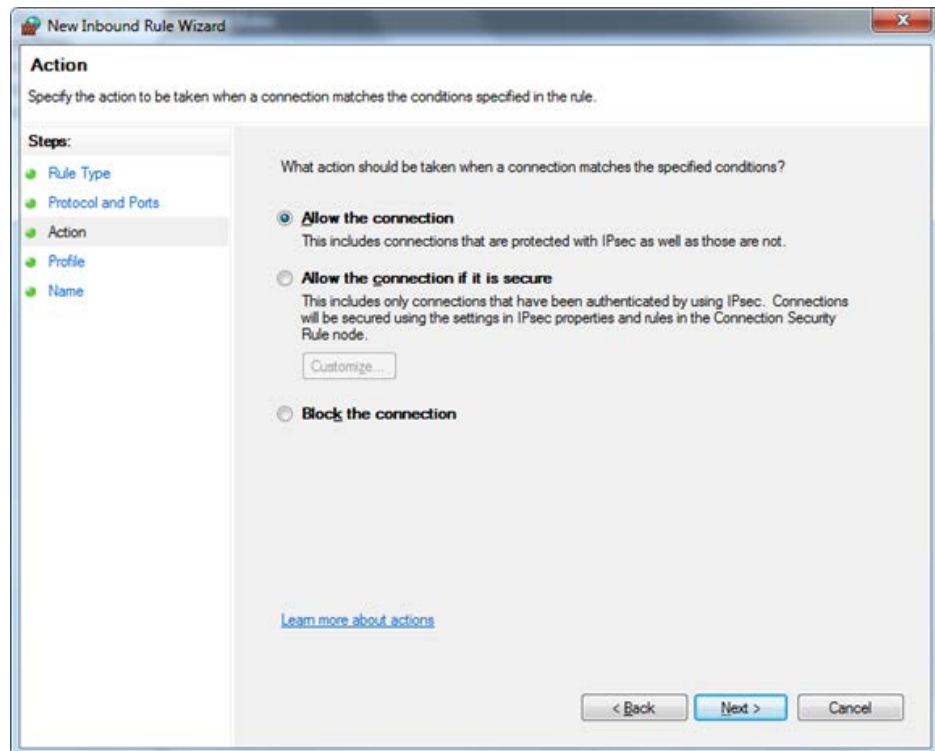
Example Rule: Allow ASTM connection to use TCP/IP

Example Rule: Allow ASTM connection to use TCP/IP



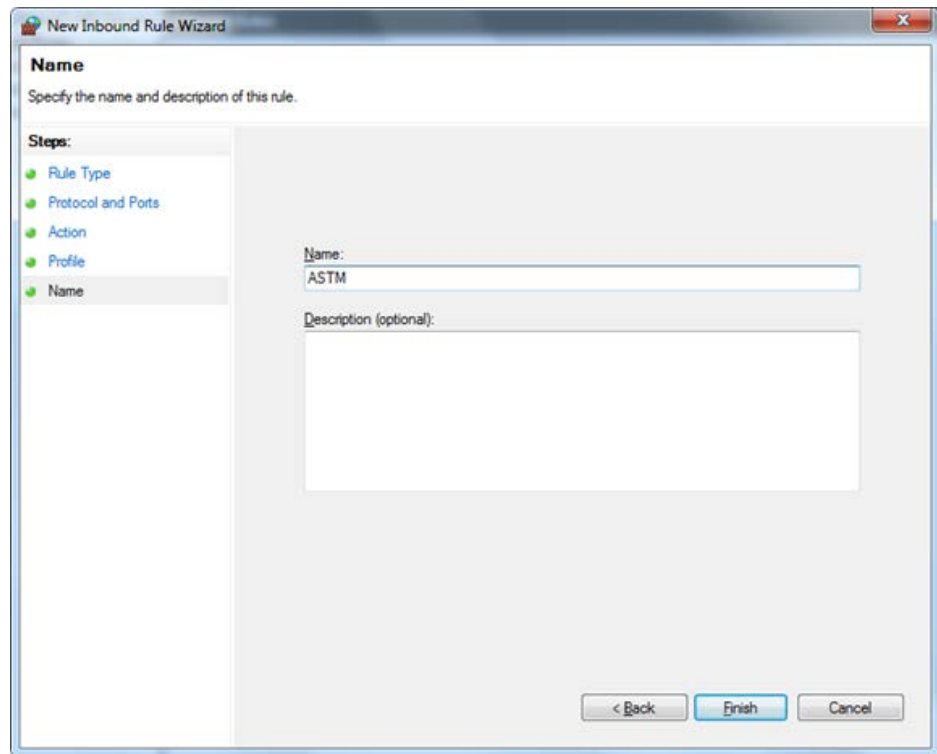
7 Windows 7 firewall activation and rule configuration

Windows 7 firewall activation and rule configuration



7 Windows 7 firewall activation and rule configuration

Windows 7 firewall activation and rule configuration



The image shows a screenshot of the 'New Inbound Rule Wizard' dialog box in Windows 7. The window title is 'New Inbound Rule Wizard'. The main heading is 'Name', and the instruction is 'Specify the name and description of this rule.' On the left side, there is a 'Steps:' list with five items: 'Rule Type', 'Protocol and Ports', 'Action', 'Profile', and 'Name'. The 'Name' step is currently selected and highlighted. The main area of the dialog contains a 'Name:' label followed by a text input field containing the text 'ASTM'. Below this is a 'Description (optional):' label followed by a larger, empty text area. At the bottom right of the dialog, there are three buttons: '< Back', 'Finish', and 'Cancel'.

Required firewall rules

Following inbound firewall rules are needed for safe network connection. All other programs and protocols should be disabled.

Name	Group	Profile	Enabled	Action	Override	Program	Local Address	Remote Address	Protocol	Local Port	Remote Port	Allowed Users	Allowed Computers
allow ping		All	Yes	Allow	No	Any	Any	Any	ICMPv4	Any	Any	Any	Any
ASTM		Private, Public	Yes	Allow	No	C:\arc\bin\arcastm.exe	Any	Any	TCP	Any	Any	Any	Any
ASTM		Private, Public	Yes	Allow	No	C:\arc\bin\arcastm.exe	Any	Any	UDP	Any	Any	Any	Any
Core Networking - Destination Unreachable Fragmentation Needed (ICMPv4-In)	Core Networking	All	Yes	Allow	No	System	Any	Any	ICMPv4	Any	Any	Any	Any
Core Networking - Dynamic Host Configuration Protocol (DHCP-In)	Core Networking	All	Yes	Allow	No	%SystemRoot%\system32\svchost.exe	Any	Any	UDP	68	67	Any	Any

LIS configuration checklist

When LIS interface is configured into use following information is required.

- What is physical interface to the LIS? The options are TCP/IP (ethernet cable) or Serial port (RS232) connection.
 - If connection is Serial, the Serial port configuration must be defined (Correct port, speed, baud, Stop bits, parity).
 - Serial cable type is a 9-pin male D-connector
 - USB-to-Serial converter can be used if needed
 - If connection is TCP/IP, TCP/IP configuration must be defined.
 - TCP/IP addresses and port number for analyzer and LIS is needed (default port 10100 is typically open)
 - Use normal RJ45 connector and cable
 - If the analyzer workstation is Windows 7, firewall settings must be defined according to Chapter 7 [Windows 7 firewall activation and rule configuration](#) on page 35.
 - If the analyzer workstation is Windows 10 system, then the firewall is already configured and ready for use.
 - Windows Defender virus scanning is enabled in both Windows 7 and Windows 10 systems.
- Test name mapping in the configuration
 - Each test whose results are to be sent to LIS must have an online name defined.
 - Must be defined on the **F3 > 4 Test definition > Info** window
 - **The online name must match with name defined in the LIS**
 - If the online name doesn't match, error message "Invalid test online name" is given in the analyzer user interface.
- LIS configuration parameters according to customer's wishes
 - Enable/disable automatic sending
 - Does the customer use host query (LIS is queried for request(s) when the sample barcode is read)? This is typically in use when samples are barcoded.
 - How results are to be sent to the LIS? The analyzer can send result immediately after every result or it can wait until all requests for the sample are measured and then send them all after the last measurement is completed.
 - Does customer want to send QC results to the LIS?

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Instructions for software developers how to develop the LIS interface

Recommended tools and documents for LIS interface development:

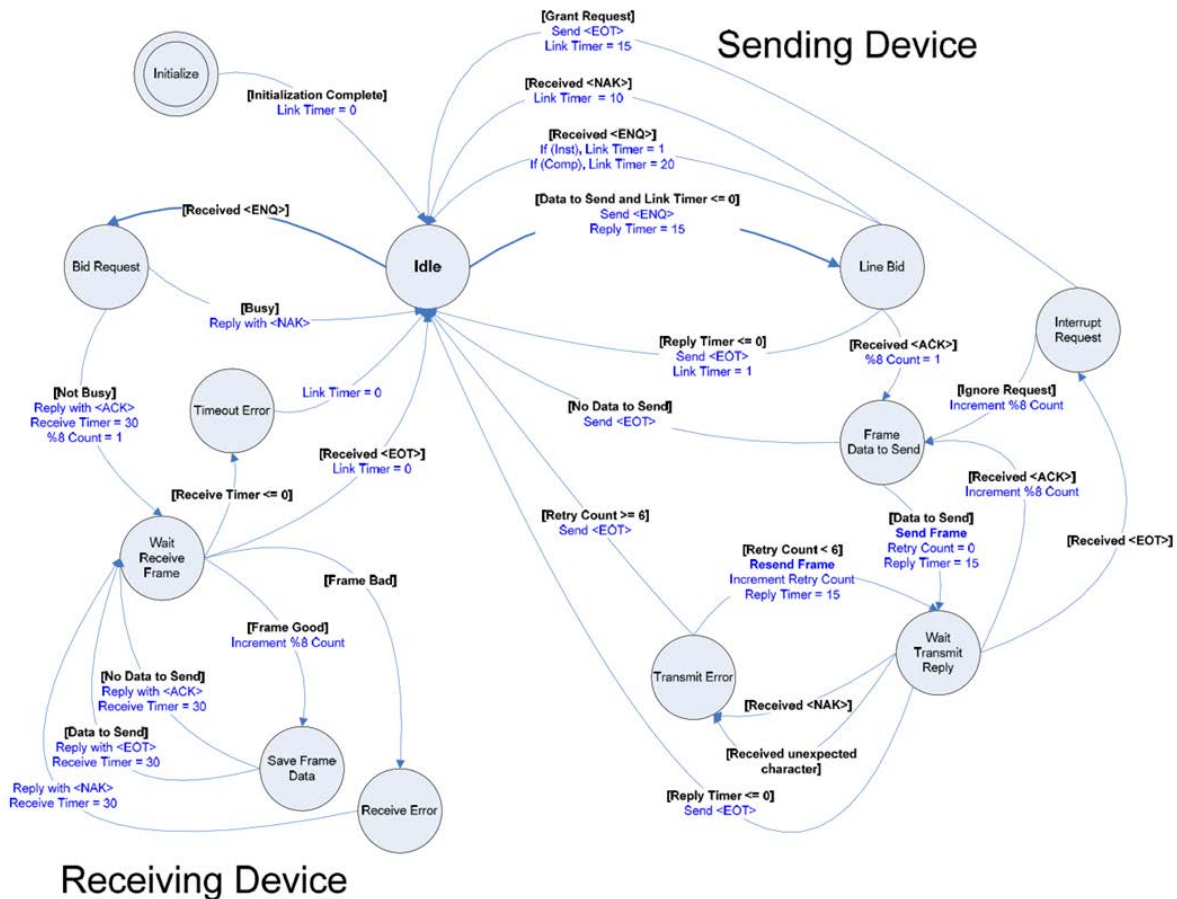
1. Network protocol analyzer or an application able to capture packets from a network connection. For example **Wireshark** or similar software.
2. **Analyzer Marketing Simulator** software
3. **N12027 Gallery-Indiko LIS Interface** manual
4. CLSI standards
 - CLSI LIS01-A2, <https://clsi.org/standards/products/automation-and-informatics/documents/lis01/>
 - CLSI LIS02-A2, <https://clsi.org/standards/products/automation-and-informatics/documents/lis02/>

Note It is recommended to read the LIS interface manual and CLSI standards carefully. LIS interface follows standards CLSI LIS01-A2 and CLSI LIS02-A2.

ASTM connectivity state flow chart can be found from the figure below for further guidance.

Figure 6. State diagram

Reference: CLSI. *Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Copmputer Systems; Approved Standard - Second Edition*. CLSI document LIS01-A2. Wayne, PA: Clinical and Laboratory Standards Institute; 2008.



Analyzer marketing simulator package is available as a supporting tool, which can be used to develop the LIS interface. The LIS interface in the simulator is identical to the real analyzer software. It may be useful to utilize the marketing simulator when developing the LIS interface to the analyzer software.

How to test the LIS interface with the Simulator or with the real analyzer:

The LIS connection has been enabled on the Configuration (**F5 > 7 Configuration > Analyzer > LIS connection in use > Yes**) and the online names have been defined (**F3 > 4 Test definition > Info**). Enable the Host query option and enable the Automatic sending.

1. Create a new sample in analyzer user interface (**F2 > 1 Samples > New**). When the sample is saved, the analyzer or the simulator sends a host query to the LIS.
2. Analyze requests with real the real analyzer or with the simulator, accept results and analyzer or simulator will send the results to the LIS.
3. Analyzer records all messages into LIS debug file. The file is located in **c:\arc\tmp** folder. Filename is **lsdebug.txt**.

Glossary

A

ASTM American Society for Testing and Materials

C

CLSI Clinical and Laboratory Standards Institute

G

GLP Good Laboratory Practices

GND Ground

I

ID Identification

L

LAN Local Area Network

LIS Laboratory Information System

Q

QC Quality Control

R

RxD Received Data

S

STAT Statim; immediately

T

TxD Transmitted Data