LIS-Communication Protocol Description

LIS-Protocol SortPro

Version: 3.2
Date: 2019-06-13
Created by: Karsten Wittmann
Verified by: Julian Drube

Address: Rugenranzel 4, 25373 Ellerhoop
Phone: +49 (0)4120 70679 27
Internet: http://www.asplabauto.com
eMail: info@asplabauto.com
Filename: SortPro interface description (en) v3.2.docx

Revision history

Version	Date	Author	Remarks
2.0	2015-03-09	J. Schluensen	Newly created and released
2.1	2015-08-10	J. Schluensen	Added Communication sample for mode A
2.2	2016-04-21	J. Schluensen	Added software version information and known errors (ch. 1.1) Added color codes 98 and 99 (ch. 3.2) Changed transmission behavior of Result Rec. (ch. 3.4)
2.3	2018-02-23	J. Drube	Updated the Query Record description in UserField#1 (duplicate tube handling)
3.0	2018-11-05	K. Wittmann	Draft – see changes in “1.4 Differences against interface protocol version 2.x”
3.01	2018-11-27	K. Wittmann	Additional comment for version in header record, added Testnames (8.4.5) and ordering physician (8.4.17) to order record
3.02	2018-12-03	K. Wittmann	Additional subfield 11.3 query record: centrifuge status. Changed order of subfields in 11.3 query record. Additional tube codes for query record
3.1	2019-02-21	K. Wittmann	Additional field SN in M Record, updated communication example
3.2	2019-06-12	K. Wittmann	New paragraph “Error Handling”; additional info for c1 in query record; additional subfields in 11.3 query record; Frame number always 1, image file transfer through ftp and rsync, path for image files changed

Table of Contents

1 Introduction

1.1 Software version of the SortPro

This document refers to ASP SortPro II (instruments from 2019 and newer) with control software version 1.0. The interface for SortPro I (instruments from 2018 and older) is described in Interface description v2.x.

1.2 Operational Background

The SortPro family of instruments is intended to sort identify and register medical sample tubes. To do this it uses barcode information, material type and information provided by the Laboratory Information System (LIS).

SortPro can sort offline without a LIS connecting and it can sort online connected to an LIS. SortPro can combine the sorting information from LIS with own sort logic and it can sort completely independent from LIS information, but can inform LIS about tube details and the sorting target for each tube. Whenever an online connection is necessary the instrument will try to connect via Ethernet to a server once the sorting process is started. The machine is always the client. It will send a query containing barcode and material type (optional) as well as the sort rule number for each tube to the LIS which replies with an order record containing the barcode and test methods or the target bin number. Additionally the instrument can be configured to send a result record which tells the LIS that the tube was sorted into the corresponding bin. No information is sent for tubes with invalid barcode information (missing, unreadable or multiple different barcode). The communication is synchronous for query and order records, therefore the record order for each tube is always query -> order. The result records is sent as soon as the tube is sorted into the target bin and may be asynchronous. I.e. one tube is sent to the very last bin and the next tube is sent to the first bin. Then the result record of the second tube may occur before the result record from the first tube.

There are two levels for the communication protocol. The low-level protocol provides the electrical specification as well as error handling and flow control. It is implemented according to the CLSI standard LIS01-A02. The high-level protocol provides the data format for messages to be exchanged. It is implemented according to the CLSI standard LIS02-A02 with little adaptions that are necessary to support tube sorting.

In the past it was observed that LIS did not recognize when SortPro was rebooted. In these cases some implementation did not allow to reconnect the sorter as the former connection was still present at the LIS side. In order to overcome this, SortPro will send a heartbeat periodically. LIS can remove the connection if the heartbeat is missing for more than the defined period.

SortPro II is capturing images of all tubes. With TubeID installed these images can be transferred to LIS. It is the LIS task to collect the images. They are accessible via FTP.

1.3 Reference Documentation

The SortPro communication protocol is implemented according to the following standards:

CLSI standard LIS01-A02: ***Specification for Low-Level Protocol to Transfer Messages between Clinical Laboratory Instruments and Computer Systems; Approved Standard—Second Edition; ISBN Number: 1-56238-665-4***

CLSI standard LIS02-A02: ***Specification for Transferring Information between Clinical Instruments and Computer Systems; Approved Standard—Second Edition; ISBN Number: 1-56238-550-X***

1.4 Differences against interface protocol version 2.x

With the protocol version for SortPro II some changes and additions have been specified:

SortPro terminates the result record now also with <ETX>.

Different sorting modes have been eliminated.

Preceding ^characters in various fields (e.g. Starting Range ID in query record, universal test id in order record) removed.

Sendername/ID in the header: Component number is removed, SW version is transmitted as plain text, version of protocol was added and is transmitted as plain text.

Starting range ID no in query record: sortrule as plain text, additional tube code and cap type, STAT information and cap color as text.

User field #2 in query record contains unique sample ID (unique to this device).

Specimen ID in order record contains the unique sample ID

Instrument specimen ID in order record only contains the barcode of the sample, the other information sent with the query record for this field are omitted.

Priority in order record is now coded ‘S’ or ‘R’. It should be the value sent in the query record. SortPro can yet not react to this field.

The Universal Test ID in the result record has been changed to Specimen ID and contains the unique sample ID from the query record User field #2.

Data field in the result record only contains the barcode and the sort target.

There is defined a manufacturer information record that informs LIS on status changes and error on SortPro.

There is an additional FTP server on SortPro to provide image files for every tube processed.

2 Low-Level Protocol

2.1 Physical Layer

The physical layer is also specified in the ***CLSI standard LIS01-A02 Chapter 7***.

The data between SortPro and LIS is transferred via Ethernet standard. The SortPro has an 8P8C (RJ-45) jack and needs to be connected with at least a Cat5 cable.

2.2 Data Link Layer

2.2.1 Overview

The low-level protocol is also specified in the ***CLSI standard LIS01-A02 Chapter 8.***

The Data Link Layer provides procedures for link connection and link release, delimiting and synchronism, sequential control, error detection and error recovery.

The LIS (=server) offers a socket for a connection, while the instrument can be configured to access a certain socket at a certain IP-Address as a client.

Once this link is opened either the client or the server can start a message transfer which consists of three phases: Establishment Phase, Transfer Phase and Termination Phase.

2.2.2 Establishment Phase

The device that wants to send data starts by sending ***<ENQ>***. It may only do so when the link is in a neutral state, i.e. no communication process is active. Now the sender will ignore anything but ***<ACK>***, ***<NAK>*** or ***<ENQ>***.

The receiver will ignore anything that is sent after the ***<ENQ>***. It will answer with one of the following:

Character	Meaning
<ACK>	Ready for transmission
<NAK>	**Not** ready for transmission

If both devices are simultaneously trying to send an ***<ENQ>***, then the server stops its attempt, while the instrument will repeat its attempt to establish a communication.

2.2.3 Transfer Phase

During the Transfer Phase the sender will send a message in the following format:

<STX>	FN	Text	***<ETX>***	C1	C2	***<CR>***	***<LF>***

Block	Meaning
<STX>	Start of Text control character (ASCII)
FN	Frame number, single digit, range 0..7
Text	Data content of message
<ETX>	End of Text control character (ASCII)
C1	Most significant checksum character
C2	Least significant checksum character

<CR>	Carriage Return character (ASCII)
<LF>	Line Feed character (ASCII)

Once the frame was transmitted there are two possible answers:

Character	Meaning
<ACK>	Frame was correctly received
<NAK>	Frame was not received properly, resend

In case the receiver responds ***<NAK>*** then the instrument will resend the frame.

2.2.3.1 Frame number

The frame number permits the receiver to distinguish between new and retransmitted frames. It ranges from 0 to 7 and will increment for each new frame. It will roll over from 7 to 0 after 8 frames. Frame numbers are only increased for message with several frames and start with 1 again for the next message. Information in this protocol require only one frame per message, therefore FN is always 1.

2.2.3.2 Checksum

The checksum is calculated by adding up the binary values of all characters **after *<STX>*** until ***<ETX>*** (including ***<ETX>***) and processing the sum with a modulo 256 operation. The resulting eight bit value is converted into the ASCII codes for its hexadecimal interpretation.

Example: The checksum is 122 which equals to 7A hexadecimal. C1 = '7', C2 = 'A'

2.2.4 Termination Phase

Once the data is transferred completely, the sender will transmit ***<EOT>*** to indicate the data link is in a neutral state. The receiver will not send an acknowledgment but will also regard the data link in a neutral state.

2.2.5 Heartbeat

If no record is to be sent by SortPro for more than 10 seconds then SortPro will send a heartbeat to inform LIS that it is still available. LIS should close the connection if no heartbeat or other records has been sent for 10 seconds.

Heartbeat: SortPro sends ***<ENQ>***, LIS responds with **<ACK>**, SortPro finishes transmission with **<EOT>**. No records are sent.

3 High-Level Protocol

The high level protocol complies with **CLSI standard LIS02-A02**. There is only one exception: When a Result Record is sent from the SortPro, it will not be accompanied with the Patient Record and the Order Record.

As the SortPro only works in query-mode and has only very little data to transmit and receive, the 'Text' part of chapter 2.2.3 will always look like this:

<Header-Record><CR><Query/Result-Record><CR><Termination-Record>

The SortPro will never send more than one Query or Result record in one Transmission. The LIS may add a Patient Record to the Order Record but this will be ignored by the instrument.

Fields that are not used at the end of a record are omitted.

Manufacturer information records are sent in the same fashion as Query and Result records:

<Header-Record><CR><Manufacturer information-Record><CR><Termination-Record>

3.1 Header Record

The Header Record contains information about the sender and is transmitted as the first record in each transmission. Both LIS and the instrument send this record. It contains the following data:

LIS02-A2 (ASTM) ref.	Field Name	Value	Remark
6.1	Record Type ID	'H'	Always 'H' for Header
6.2	Delimiter Definition	|\^&	Definition of Delimiters used in the message
6.3	Message Control ID		Not used by SortPro
6.4	Access Password		Not used by SortPro
6.5	Sender Name/ID	NAME^SW^VER	Name and Version of the sorter **NAME**: name of sorter **SW**: SW Version as text e.g. '1.00' VER: Protocol version as text e.g. 2.3, 3.0[1]
6.6	Sender Str. Addr.		Not used by SortPro
6.7	Reserved Field		Not used by SortPro
6.8	Sender Tel-no.		Not used by SortPro
6.9	Characteristics of Sender		Not used by SortPro
6.10	Receiver ID	'HOST'	Name of the Receiver
6.11	Comment or special instructions		Not used by SortPro

[1] This field allows the LIS dynamically to decide how to decode the information sent by the sorter. SortPro does not create and decode messages based on information sent in this field by LIS. LIS should only check the major version to avoid difficulties with newer versions which will be downward compatible but may send a higher minor number than LIS may have implemented.

6.12	Processing ID	'P'	Defines if record shall be processed
6.13	Version number		Not used by SortPro
6.14	Date and Time		Not used by SortPro

Example of Header Record:

H|\^&|||ASP^1.00^3.03|||||HOST||P

3.2 Query Record

The Query Record is a request from the instrument for test orders. It will only be sent from the instrument to the LIS, not vice versa. It contains the following data:

LIS02-A2 (ASTM) ref.	Field Name	Value	Remark
11.1	Record Type ID	'Q'	Always 'Q' for Query
11.2	Sequence number	'1'	Always 1 because each session contains just 1 Query
11.3	Starting Range ID no.	BARCODE^SORTRULE^p^ zz^ xx^c1^c2^CCOLOR ^c3^c4	Contains Barcode, Sorting rule and sample related data. **BARCODE**: Barcode of the sample **SORTRULE**: Name of Sortrule for this tube. **P:**'S' for STAT/Priority tube. 'R' routine tube. **ZZ**: Material code (00 if no CapID installed, 98 for multiple match, 99 for no match). **XX:** Tube code (00 if no TubeID installed, 98 for multiple match, 99 for no match). **c1:** Cap type: '0' unknown, 'H' hemogard, 'R' rubber cap, 'h' hemogard with coding cap (Sarstedt), 's' hemogard with snap in ring (GBO) **c2:** Centrifuge status: '0' unknown, 'C' centrifuged, 'N' not centrifuged **CCOLOR:** Cap color as text c3: Additional cap info: '0' unknown, see also below.

			c4: reserved: '0'
11.4	Ending range ID no.		Not used by SortPro
11.5	Universal Test ID	'ALL'	All tests are queried every time
11.6	Nature of Request Time Limits		Not used by SortPro
11.7	Beginning Request Results Date and Time		Not used by SortPro
11.8	Ending Request Results Date and Time		Not used by SortPro
11.9	Req. Ph. Name		Not used by SortPro
11.10	Req. Ph. Phone No.		Not used by SortPro
11.11	User Field #1	Integer | Empty	The number of times this tube has been processed if duplicate tube handling is activated on the sorter.
11.12	User Field #2	Integer	Tube identifier: unique number for every tube.
11.13	Request Info Status Codes	'O'	Requesting only test orders

Example of Query Record:

Q|1|1234567890^Rule 1^R^03^10^H^N^green^0^0||ALL|||||||1|4711|O

Barcode:	1234567890
Sorting Rule	Rule 1
Priority	R – Routine
Material code	03
Tube code	10 – BD 13x75 mm
Cap Type	H – Hemogard
Centrifuge status	N – not centrifuged
Cap color	green
Add. Cap info	0 – no info
Reserved	0

Duplicate	1 – first time
Tube identifier	4711

List of defined tube codes:

Tube Code	**Description (length without cap)**
00	Unknown, no Tube detection available
98	Multi match, tube detection ambiguous
99	Unknown, no match found
10	BD 13 x 75 mm (Beckton Dickinson)
11	BD 13 x 100 mm
12	BD 16 x 100 mm
13	BD 16 x 100 mm conical tube
20	GBO 13 x 75 mm (Greiner Bio One)
21	GBO 13 x 100 mm
22	GBO 16 x 100 mm
23	GBO 16 x 100 mm conical tube
30	Sarstedt 15 x 92 mm, 16 x 92 mm
31	Sarstedt 11 x 92 mm
32	Sarstedt 13 x 90 mm
33	Sarstedt 13 x 75 mm
34	Sarstedt 15 x 75 mm
35	Sarstedt 13 x 65 mm
36	Sarstedt 11 x 66 mm
37	Sarstedt 15 x 102 mm (urine tube)
40	Kabe 15 x 92 mm, 16 x 92 mm
41	Kabe 11,5 x 92 mm
42	Kabe 13 x 90 mm
43	Kabe 11,5 x 82 mm
44	Kabe 13 x 75 mm
45	Kabe 15 x 75 mm
46	Kabe 11,5 x 66 mm , 13 x 66 mm
47	Kabe 15 x 58 mm

Further tube codes will be defined when they are needed for specific installations.

c3: Additional cap info for Sarstedt tubes: color of coding cap

0	default
1	Pink
2	Blue
3	Yellow
4	Green
5	Grey

c3: Additional cap info for GBO tubes: color of top ring or ID snap ring

0	default
1	Black
2	Yellow
3	White
4	reserved
5	Orange
6	Green
7	Pink
8	Blue
9	Gray

3.3 Order Record

The Order Record contains test methods for the sample requested by the instrument. It will only be sent from the LIS to the instrument, not vice versa. It contains the following data:

LIS02-A2 (ASTM) ref.	Field Name	Value	Remark
8.4.1	Record Type ID	'O'	Always 'O' for Order
8.4.2	Sequence number	'1'	Always 1 because each session contains just 1 Order
8.4.3	Specimen ID	Integer	Tube identifier that is sent in query record User Field #2
8.4.4	Instrument Specimen ID	BARCODE	**BARCODE**: Barcode of the sample.
8.4.5	Universal Test ID	TEST^TESTNAME	This field contains the test IDs. Multiple Test IDs are separated by '\'. LIS can also only send 'Y' to accept a sample and 'X' to reject it. LIS can send bin numbers 01 to nn (nn is number of target bins) and 00 for default bin. Use nn+1 to sort tube to right instrument outlet (e.g. for connected external automation).Default sort rule on SortPro can use these for sorting into respective bins. ^TESTNAME is an optional subfield and contains the descriptive name for a given test. It can be omitted if not used.
8.4.6	Priority	p	Priority p is 'S' or 'R'. However, instrument can't prioritize samples.
8.4.7	Ordered Date and Time		Ignored by SortPro
8.4.8	Collection Date and Time		Ignored by SortPro
8.4.9	Collection End Time		Ignored by SortPro
8.4.10	Collection Volume		Ignored by SortPro
8.4.11	Collector ID		Ignored by SortPro
8.4.12	Action Code		Ignored by SortPro
8.4.13	Danger Code		Ignored by SortPro
8.4.14	Relevant Clinical Information		Ignored by SortPro

8.4.15	Date/Time Specimen Received		Ignored by SortPro
8.4.16	Specimen Descriptor		Ignored by SortPro
8.4.17	Ordering Physician	NAME	If field is not empty it then contains Name of the ordering physician. If field is used, all fields before need to be send (as empty fields). Currently not used by sortpro, reserved for future use.
8.4.18	Physician Phone-No.		Ignored by SortPro
8.4.19	User Field #1		Ignored by SortPro
8.4.20	User Field #2		Ignored by SortPro
8.4.21	Lab Field #1		Ignored by SortPro
8.4.22	Lab Field #2		Ignored by SortPro
8.4.23	Date/Time Results Reported		Ignored by SortPro
8.4.24	Instrument charge to Information System		Ignored by SortPro
8.4.25	Instrument sect. ID		Ignored by SortPro
8.4.26	Report Types		Ignored by SortPro
8.4.27	Reserved Field		Ignored by SortPro
8.4.28	Location of Collect.		Ignored by SortPro
8.4.29	Nosocomial Infection Flag		Ignored by SortPro
8.4.30	Specimen Service		Ignored by SortPro
8.4.31	Specimen Institution		Ignored by SortPro

Example:

LIS sends bin designator, no sender: **O|1|4711|1234567890|04|R** (Sample target Bin 04)

LIS sends bin designator and sender: **O|1|4711|1234567890|04|R||||||||||Dr.Dolittle**

LIS sends test methods (HBA1C, CBC): **O|1|4711|1234567890|HBA1C\CBC|R**

LIS sends test methods (HBA1C, CBC) and descriptive names for display:
O|1|4711|1234567890|HBA1C^hba1c\CBC^haemogram|R

LIS accepts tube, no target: **O|1|4711|1234567890|Y|R**

3.4 Result Record

When activated, the instrument will inform the LIS that a sample was sorted into a certain bin. To do this, it uses the Result Record. The result record will be transmitted once the ejector for the target bin is actuated. The Result Record will only be sent from the instrument to the LIS, not vice versa. It contains the following data:

LIS02-A2 (ASTM) ref.	Field Name	Value	Remark
9.1	Record Type ID	'R'	Always 'R' for Result
9.2	Sequence number	'1'	Always 1 because each session contains just 1 Result
9.3	Specimen ID	Integer	Tube identifier that is sent in Query record User Field #2
9.4	Data or Measurement Value	BARCODE^TARGET	Contains Barcode and target number. **BARCODE**: Barcode of the sample **TARGET:** Sorting target number as Integer
9.5	Units		
9.6	Reference Ranges		
9.7	Result Abnormal Flags		
9.8	Nature of Abnormality Testing		
9.9	Result Status	'F' or 'C'	'F' is sent when the bin is announced the first time, 'C' is sent when the announcement is changed
9.10	Date of Change		
9.11	Operator ID		
9.12	Date/Time Test started		
9.13	Date/Time Test Completed		
9.14	Instrument ID		

Example:

Sample target is sent: **R|1|4711|1234567890^4|||||F**

Sample target is corrected: **R|1|4711|1234567890^5|||||C**

3.5 Manufacturer Information Record

The Manufacturer Information Record is used to inform the counterpart on certain general status changes that are not related a specific sample. It can be added to any record sequence that is transmitted or can be sent on its own. It can be send by both parties. SortPro will send a manufacturer information record whenever a status described in the record has changed.

Content of manufacturer information record sent by SortPro to LIS:

LIS02-A2 (ASTM) ref.	Field Name	Value	Remark
9.1	Record Type ID	'M'	Always 'M' for manufacturer information record
9.2	Sequence number	'1'	Always 1
n/a	Serial number	SERIALNUMBER	Serial number of SortPro
n/a	Instrument status	Integer	Status of the instrument
n/a	Hopper status	Integer	'0' if no tubes in hopper, '1' if tubes are in hopper
n/a	Error number	Integer	Error or warning number, '0' if no error.
n/a	Error text	TEXT	Empty or text describing the error cause.

Instrument statuses defined:

Status code	Description
0	Sorter stopped
1	Sorter running
2	Sorter interrupted (e.g. target bin removed)
3	Sorter in Standby (ready for autostart when tubes loaded into hopper)

Error and Warning codes and messages

Error code	Description
0	No error or error acknowledged by user
TBD	

Example: **M|1|299|0|1|0|**

Content of manufacturer information record sent by LIS to SortPro:

LIS02-A2 (ASTM) ref.	Field Name	Value	Remark
9.1	Record Type ID	'M'	Always 'M' for manufacturer information record
9.2	Sequence number	'1'	Always 1
n/a	TBD	TBD	TBD

3.6 Termination Record

The Termination Record is the last Record sent in a message. It contains the following data:

LIS02-A2 (ASTM) ref.	Field Name	Value	Remark
12.1	Record Type ID	'L'	Always 'L' for Last
12.2	Sequence number	'1'	Always 1 because each session contains just 1 Termination
12.3	Termination Code	'N'	Normal Termination

Example: **L|1|N**

4 Error Handling

When SortPro received NAK instead of ACK it will resend the last record. It will do so 3 times for the same record before it gives up and displays an error message.

Timeout waiting for reply from LIS:

There is a timeout period on SortPro which is configurable. If SortPro did not receive a reply after timeout then it will close the connection and try to open it again. It will then continue communication.

If the order record did not show until timeout then the respective tube will be sorted into the default bin.

Result record handling: A result record – if feature is turned on – will be sent when the tube is being ejected from the sorting belt. It will be sent for every tube, even when it is sorted to the default bin. Sending of the result record will be repeated until it is acknowledged by LIS (e.g. connection interrupted, timeout waiting for LIS). Unsent result records will be saved permanently in case instrument is powered down, sending will be resumed after power up of the instrument. Query records for further tubes may be sent before the result record has been sent or was received by LIS.

5 Sample Image Transmission

If TubeID is installed at SortPro then images of all tubes are available for download through FTP and RSYNC. Images are stored in JPEG format. There are two type of images available: 1. Cropped picture of tube (ca. 15 KB) 2. Full picture with 3 views on the sample in HD resolution (ca. 500 KB)

Images of samples are available for at least one day. They get deleted periodically to make room for new images.

Path to image files: /data/by-id/

Filenames for images:

Cropped pictures: <Tube identifier>.jpg

Full pictures: f_<Tube identifier>.jpg

Pictures that cannot be evaluated: e_<Tube identifier>.jpg

<Tube identifier> is the number sent by SortPro with the Query record in User Field #2.

SortPro provides an FTP server. Images can be collected by the LIS through the SFTP protocol. Default user for file collect is: username: lis Password: lis. Port number is 2222.

Files can only be copied, no other sftp operations are allowed.

Rsync can also be used for file transfer:
rsync -Lrvu -e 'ssh -p 2222' lis@SORTER-ADDRESS:data/by-id/ DESTINATION_DIR

6 Communication Sample

11:25:23	[ASP]	// trying to connect to LIS (127.0.0.1 , 5701)
11:25:23	[ASP]	// LIS connection established
11:25:33	[ASP->LIS]	<ENQ> // heart beat
11:25:33	[LIS->ASP]	<ACK>
11:25:33	[ASP->LIS]	<EOT>
11:25:43	[ASP->LIS]	<ENQ> // heart beat
11:25:43	[LIS->ASP]	<ACK>
11:25:43	[ASP->LIS]	<EOT>
11:25:45	[ASP->LIS]	<ENQ>
11:25:45	[LIS->ASP]	<ACK>
11:25:45	[ASP->LIS]	<STX>1H|\^&|||ASP4711^1.0^3.1|||||||P<CR>M|1|299|1|1|0|<CR><ETX>11<CR><LN> // manufacturer record, sorter start
11:25:45	[LIS->ASP]	<ACK>
11:25:45	[ASP->LIS]	<EOT>
11:25:45	[ASP->LIS]	<ENQ>
11:25:45	[LIS->ASP]	<ACK>

11:25:45 [ASP->LIS] <STX>1H|\^&|||ASP4711^1.0^3.1|||||||P<CR>Q|1|128786792^Rule1^R^78^12^H^0^0^0^SST||ALL||||||1|184|O<CR>L|1|N<CR><ETX>59<CR><LN> // query record

11:25:45 [LIS->ASP] <ACK>

11:25:45 [ASP->LIS] <EOT>

11:25:45 [LIS->ASP] <ENQ>

11:25:45 [ASP->LIS] <ACK>

11:25:45 [LIS->ASP] <STX>1H|\^&|||LIS^2.0rc2^3.1|||||ASP4711||P<CR>O|1|184|128786792|02^two|R<CR>L|1|N<CR><ETX>23<CR><LN> // order record

11:25:45 [ASP->LIS] <ACK>

11:25:45 [LIS->ASP] <EOT>

11:25:45 [ASP->LIS] <ENQ>

11:25:45 [LIS->ASP] <ACK>

11:25:45 [ASP->LIS] <STX>1H|\^&|||ASP4711^1.0^3.1|||||LIS||P<CR>R|1|184|128786792^2|||||F<CR>L|1|N<CR><ETX>08<CR><LN> // result record

11:25:45 [LIS->ASP] <ACK>

11:25:45 [ASP->LIS] <EOT>

11:25:46 [ASP->LIS] <ENQ>

11:25:46 [LIS->ASP] <ACK>

11:25:46 [ASP->LIS] <STX>1H|\^&|||ASP4711^1.0^3.1|||||LIS||P<CR>Q|1|128232980^Rule1^R^23^33^H^0^0^0^yellow||ALL||||||1|185|O<CR>L|1|N<CR><ETX>37<CR><LN> // query record

11:25:46 [LIS->ASP] <ACK>

11:25:46 [ASP->LIS] <EOT>

11:25:46 [LIS->ASP] <ENQ>

11:25:46 [ASP->LIS] <ACK>

11:25:46 [LIS->ASP] <STX>1H|\^&|||LIS^2.0rc2^3.1|||||ASP4711||P<CR>O|1|185|128232980|10^default|R<CR>L|1|N<CR><ETX>a0<CR><LN> // order record

11:25:46 [ASP->LIS] <ACK>

11:25:46 [LIS->ASP] <EOT>

11:25:46 [ASP->LIS] <ENQ>

11:25:46 [LIS->ASP] <ACK>

11:25:46 [ASP->LIS] <STX>1H|\^&|||ASP4711^1.0^3.1|||||LIS||P<CR>R|1|185|128232980^10|||||F<CR>L|1|N<CR><ETX>2B<CR><LN> // result record

11:25:46 [LIS->ASP] <ACK>

11:25:46 [ASP->LIS] <EOT>

11:25:48 [ASP->LIS] <ENQ>

11:25:48 [LIS->ASP] <ACK>

11:25:48 [ASP->LIS] <STX>1H|\^&|||ASP4711^1.0^3.1|||||LIS||P<CR>Q|1|128206462^Rule1^R^20^34^H^0^0^0^purple||ALL||||||1|186|O<CR>L|1|N<CR><ETX>EC<CR><LN> // query record

11:25:48 [LIS->ASP] <ACK>

11:25:48 [ASP->LIS] <EOT>

11:25:48 [LIS->ASP] <ENQ>

11:25:48 [ASP->LIS] <ACK>

11:25:48 [LIS->ASP] <STX>1H|\^&|||LIS^2.0rc2^3.1|||||ASP4711||P<CR>O|1|186|128206462|02^two|R<CR>L|1|N<CR><ETX>14<CR><LN> // order record

11:25:48 [ASP->LIS] <ACK>

11:25:48 [LIS->ASP] <EOT>

11:25:48 [ASP->LIS] <ENQ>

11:25:48 [LIS->ASP] <ACK>

11:25:48 [ASP->LIS] <STX>1H|\^&|||ASP4711^1.0^3.1|||||LIS||P<CR>R|1|186|128206462^2|||||F<CR>L|1|N<CR><ETX>FB<CR><LN> // result record

11:25:48 [LIS->ASP] <ACK>

11:25:48 [ASP->LIS] <EOT>

11:25:49 [ASP->LIS] <ENQ>

11:25:49 [LIS->ASP] <ACK>

11:25:49 [ASP->LIS] <STX>1H|\^&|||ASP4711^1.0^3.1|||||||P<CR>M|1|299|0|1|0|<CR><ETX>17<CR><LN> // manufacturer record, sorter stopped

11:25:49 [LIS->ASP] <ACK>

11:25:49 [ASP->LIS] <EOT>

11:25:59 [ASP->LIS] <ENQ> // heart beat

11:25:59 [LIS->ASP] <ACK>

11:25:59 [ASP->LIS] <EOT>