MEQNET Link

ASTM Reference v2.0

By Normand Info

Contents

Introduction

Purpose

These instructions provide the necessary information to interface a Normand-Info system with a Laboratory Information System (LIS) using the ASTM protocol.

This document is based on the following ASTM standard protocols:

- ASTM E1394-97 (high level protocol)
- ASTM E1381-95 (low level protocol)

Overview

The ASTM driver feature allows an external LIS to communicate with one or more system(s) through one LIS serial line or one network interface using TCP/IP protocol. This document is intended as a guide to LIS vendors developing interfaces which communicate with Normand-Info systems.

It describes the version 1.0 of the ASTM host protocol.

Definitions

Below is a list of terms used in this document and their definition as used by Normand Info.

Term	Definition
<ACK>	*Acknowledgment (ASCII Decimal 6).*
[C1]	*The most significant character of Checksum.*
[C2]	*The least significant character of Checksum.*
[DATA]	*The data contents of the record.*
<ENQ>	*Inquire (ASCII Decimal 5).*
<ETB>	*End of Transmission Block (ASCII Decimal 23). To use only when a single record is too large to fit into one frame.*
<ETX>	*End of Text (ASCII Decimal 3). Required at the end of each record.*
[FRAME NUMBER]	*Single digit frame number "0" to "7". Starts with "1".*
<LF>	*Line Feed (ASCII Decimal 10).*
<NAK>	*Negative Acknowledgment (ASCII Decimal 21).*
<STX>	*Start of Frame (ASCII Decimal 2).*
COMMUNICATION PACKETS	*All framing required to transmit data. This framing includes: <STX>[frame number][DATA] [<ETB> or <ETX>][C1][C2] < LF>. Data part cannot be greater than 240 characters*
COMPONENT FIELD	*One of several related pieces of information within a field.*
DOWNLOAD	*The transmission of data from the LIS to the ASTM driver.*
FIELD	*A specific location within a record for a piece of information, indicated by a field delimiter and position.*
FRAME	*A complete communication packet.*
LIS	*Laboratory Information System.*
MESSAGE	*A collection of related information; a group of records that begins with a "Header" record and ends with a "Terminator" record. A single record could theoretically constitute a message, but within this context, a message always contains multiple records. Please refer to the Message Layer section and the descriptions of each type of records further down in this document.*
RECEIVER	*The device responding to the sender. The receiver in this document is either the ASTM driver or the LIS.*
<EOT>	*End of Transmission (ASCII decimal 4).*
<CR>	*Carriage Return (ASCII decimal 13).*
RECORD	*In reference to the low level protocol, a record is the message data (shown as [DATA]) as described within the communication packet. If the data is longer than 240 characters, then it must be split into two (or more) parts and sent in two (or more) communication packets. The intermediate packet uses the <ETB> character, and the ending packet uses the <ETX> character. No single communication packet contains more than one record.* *In reference to the message layer, a record can be one of the following codes: H (header), P*

	(patient), O (order), R (result), L (terminator), C (comment). Please refer to the Message Layer section further down in this document.
REPEAT FIELD	*An additional field of the same type as the previous and separated by a repeat delimiter.*
SENDER	*The device which is to send a message and which initiates the transmission process, here between the LIS and the ASTM driver. The sender in this document is either the ASTM driver or the LIS.*
SESSION	*An activity starting with the Setup phase and ending with the Termination phase. Please refer to the Frame Layer Protocol section further down in this document.*
TEST	*A single analysis or a combination of analysis or observations from which a variable or gradable result are derived.*
UPLOAD	*The transmission of data from the ASTM driver to the LIS.*

Frame Layer Protocol

The transmission mode between the ASTM driver and the LIS is bidirectional.

The recommended Low Level Protocol to use to transfer messages is based on an ACK/WAIT protocol. The low level protocol transfers messages as specified by the ASTM E1381-95 standard.

Setup Phase

During the protocol setup phase, the communication link between the ASTM driver and the LIS is set up.

Receiver State	*Sender*		*Receiver*
Receiver Ready	*<ENQ>*	->	
		<-	*<ACK>*
Receiver Not Ready	*<ENQ>*	->	
		<-	*<NAK>*

After an <ENQ> is sent, the state of the sender must change in order to receive data.

If both the ASTM driver and the LIS send an <ENQ> simultaneously, the ASTM driver takes priority.

Transfer Phase

During the protocol transfer phase, data is sent back and forth between the ASTM driver and the LIS. The ASTM driver uses data transfer conventions outlined in the ASTM E1381-95 standard for the data layer protocol. Any conventions that are not supported are noted and addressed. Please refer to the Message Layer section further down in this document.

Termination Phase

During the protocol termination phase, a sequence of characters or conditions causes communication between the ASTM driver and the LIS to cease, either normally or abnormally.

Transport Layer Sequence

The following tables illustrate a transport layer sequence:

Session Description	*Sender*		*Receiver*
Normal Session:	*<ENQ>*	->	
		<-	*<ACK>*
<STX> [F1] [DATA] <ETX> [C1] [C2] <CR> <LF>		->	
		<-	*<ACK>*
	<EOT>	->	
			No Response Expected

Session Description	Sender		Receiver
Failure Session (NAK):	*<ENQ>*	*->*	
		<-	*<NAK>*
(Delay 10 seconds)			
(Repeat up to 6 times)	*<ENQ>*	*->*	
		<-	*<ACK>*
(Before 6 <NAK>s) *<STX> [F1] [DATA] <ETX> [C1] [C2] <CR> <LF>*		*->*	
		<-	*<ACK>*
	<EOT>	*->*	
			No Response Expected

Session Description	Sender		Receiver
Failure Session (Max <NAK>s):	*<ENQ>*	*->*	
		<-	*<NAK>*
(Delay 10 seconds)	*<ENQ>*	*->*	
(Repeat up to 6 times)		*<-*	*<NAK>*
	<EOT>	*->*	
(After 6 <NAK>s)			*No Response Expected*

Session Description	Sender		Receiver
Failure Session (No Response):	*<ENQ>*	*->*	
			No Response
(Time-out after 15 seconds)	*<EOT>*	*->*	
			No Response Expected

Session Description	Sender		Receiver
Failure Session (Multiple <NAK>s):	*<ENQ>*	*->*	
		<-	*<ACK>*
<STX> [F1] [DATA] <ETX> [C1] [C2] <CR> <LF>		*->*	
		<-	*<NAK>*
(Delay 10 seconds)			
(Repeat up to 6 times) *<STX> [F1] [DATA] <ETX> [C1] [C2] <CR> <LF>*		*->*	
		<-	*<NAK>*
(Before 6 <NAK>s) *<STX> [F1] [DATA] <ETX> [C1] [C2] <CR> <LF>*		*->*	
		<-	*<ACK>*
	<EOT>	*->*	
			No Response Expected

Session Description	Sender		Receiver
Failure Session (Max <NAK>s):	*<ENQ>*	*->*	

		<-	*<ACK>*
<STX> [F1] [DATA] <ETX> [C1] [C2] <CR> <LF>		->	
			<NAK>
(Delay 10 seconds)			
(Repeat up to 6 times) *<STX> [F1] [DATA] <ETX> [C1] [C2] <CR> <LF>*		->	
		<-	*<NAK>*
(After 6 <NAK>s)	*<EOT>*	->	
			No Response Expected

Sending multiple frames

If a Message is greater than 240 characters, it will be divided into several frames where each frame will be up to 240 characters.

For example if the message (Msg) contains 489 characters, it will be divided as follows:

Msg: Data1+Data2+Data3

Where:

- Data1 are the characters 1 to 240 of Msg
- Data2 are the characters 241 to 480 of Msg
- Data3 are the characters 481 to 489 of Msg

The message will be sent as follow:

Session Description	***Sender***		***Receiver***
Normal session with Msg split	*<ENQ>*	->	
		<-	*<ACK>*
<STX> [F1] [DATA1] <ETB> [C1] [C2] <CR> <LF>		->	
		<-	*<ACK>*
<STX> [F2] [DATA2] <ETB> [C1] [C2] <CR> <LF>		->	
		<-	*<ACK>*
<STX> [F3] [DATA3] <ETX> [C1] [C2] <CR> <LF>		->	
		<-	*<ACK>*
	<EOT>	->	
			No Response Expected

Example:

<ENQ>		->	
		<-	*<ACK>*
<STX>1H|\^&<CR><ETX>E5<CR><LF>		->	
		<-	*<ACK>*
<STX>2P|1||PATIENTID||LAST^FIRST|||U<CR><ETX>B4<CR><LF>		->	
		<-	*<ACK>*
<STX>3O|1|7||\^\^\^06D|\^\^\^05D|\^\^\^03E|\^\^\^01A|\^\^\^01B|\^\^\^04A|\^\^\^02A|\^\^\^09D| *\^\^\^48A|\^\^\^43D|\^\^\^07D|\^\^\^08D|\^\^\^35A|\^\^\^30A|\^\^\^31A|\^\^\^11A|\^\^\^12A|\^\^\^33A|* *\^\^\^32A|\^\^\^10A|\^\^\^60A|\^\^\^36A|\^\^\^44A|\^\^\^42B|\^\^\^83D|\^\^\^41A|\^\^\^55A|\^\^\^08E|* *\^\^\^46B|\^\^\^71B|\^\^\^98A|\^\^\^67C|\^\^\^69C|\^<ETB>B5<CR><LF>*		->	
		<-	*<ACK>*
<STX>4^68C|\^\^\^95A|\^\^\^72C|\^\^\^70C|\^\^\^94B|\^\^\^94M|\^\^\^56A|			

^^^A53|R||200310240034||||N||||S|||1^1.00<CR><ETX>AC<CR><LF>	->	
	<-	*<ACK>*
<STX>5L|1|N<CR><ETX>08<CR><LF>	->	
	<-	*<ACK>*
<EOT>	->	

Physical Layer

Serial Interface

All communications are expected to use the RS232 communication protocol, based upon the Electronics Industries Association (EIA) standard RS232-C. As part of the conformance to this standard, the ASTM driver is configured as Data Terminal Equipment (DTE).

The ASTM driver is cabled to the LIS via a DB-9 connector on the back of the computer or a DB-25 connector on the octopus cable plugged into the back of the ASTM driver. The DB-9 Connector provides RXD at pin 2, TXD at pin 3, and signal ground at pin 5. The DB-25 Connector provides RXD at pin 2, TXD at pin 3, and ground signal at pin 7.

No other connections are used for the ASTM E1381-95 protocol. The following table shows the pin assignments for both the ASTM driver and the LIS.

Pin (DB9)	*Pin (DB25)*	*The ASTM driver Host port configuration*	*LIS cable must provide*
2	*3*	*RXD*	*TXD*
3	*2*	*TXD*	*RXD*
5	*7*	*Ground*	*Ground*

The cable must be compliant with:

- IEC 228 / IEC 332-1
- VDE 0295
- NF C 32-013 / NF C 32-070 C2

And its length should not exceed 10m.

The operator defines the baud rate, choosing 1200, 2400, 4800, 9600, 19200 (recommended) or 38400 baud. The number of data bits per character, parity bit, and number of stop bits are as defined in ASTM standard E1381-95.

The flow of information from the ASTM driver to the LIS can be controlled through a Xon Xoff protocol.

Network Interface

In the ASTM driver, the implementation of network-based communication is based on the Windows socket standard.

The socket client establishes a permanent session to the socket server. If, for any reason, the connection aborts, the ASTM driver attempts to re-establish the connection.

The data transmitted between the client and the server takes the form of ASTM high level packets. The control characters are the same as those used for the Serial Interface (please see the Frame Layer protocol chapter).

Message Layer

This document references the ASTM standard E1394-97, and the recommended support of the ASTM protocol. This section intends to provide a complete understanding of the particular records and fields as supported by the ASTM driver.

The low level protocol communications are separate from the message level. It is recommended that the ACK / WAIT specified in the Frame Layer Protocol section are used with this ASTM standard.

Message Content

Below is a list of the limitations and general considerations regarding message content.

Term	Definition		
Allowed Characters	*ASCII 7 (BEL), 9 (HT), 11 (VT), 12 (FF), 13 (CR), 32-126, 128-254 are allowed. However, the message data (shown as [DATA]) sent to the ASTM driver must be restricted to ASCII 32-126 for proper operation of the ASTM driver. Specific fields may further restrict allowed characters.*		
Maximum Field Length	*No maximum field length is imposed within the message-receiving mechanism. However, the message parsing performed by the ASTM driver /LIS interface software enforces certain restrictions. Please refer to the record tables further down in this document for specific field restrictions.* *Default maximum field length is 128 bytes.*		
Delimiters	*Any of the allowable characters, as specified in ASTM E1394-97, may be used as delimiters. Unless otherwise documented, the following characters should be used:*		
	Field delimiter	=	*vertical bar (|)*
	Repeat delimiter	=	*backslash (\)*
	Component delimiter	=	*caret (^)*
	Escape delimiter	=	*ampersand (&)*
Record Codes	*The following codes are required in relation to the ASTM standard:*		
	Header Record	*H*	
	Patient Record	*P*	
	Test Order Record	*O*	
	Result Record	*R*	
	Comment Record	*C*	
	Manufacturer Record	*M*	
	Request Information Record	*Q*	
	Final Record	*L*	
Fields with Null Values	*Nulls are sent when data do not need to be updated. A null value does not conflict with existing data in most cases. Erroneous data is the responsibility of the sender.*		

Record Field Contents

This section lists the following records and the fields they contain:

- Message Header Record
- Patient Information Record
- Test Order Record
- Result Record
- Comment Record
- Request Information Record
- Message Terminator Record

Following each record is a list of the requirements and general considerations regarding the contents of one or more fields of the record.

The following types of fields are allowed:

- A Alpha Characters
- N Numeric (from 0 to 9 plus the '.' Which is the decimal delimiter)
- AN Alphanumeric
- D Date YYYYMMDD
- T Time HHMMSS
- DT Date Time YYYYMMDDHHMMSS

Message Header Record

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	*Record Identifier*	*H*		*1*	*	*
2	Delimiters:					
	Field	|		*1*	*	*
	Repeat	\		*1*	*	*
	Component	^		*1*	*	*
	Escape	&		*1*	*	*
3	*Message Control ID*	|			*Ignored*	*No*
4	*Access Password*	|			*Ignored*	*Yes*
5	*Sender Name*	|	*[Info]*	*AN/40*	*Ignored*	*Yes*
	Device ID	^	*2*	*2*	*Yes*	*Yes*
6	*Sender Street Address*	|			*Ignored*	*No*

7	*Reserved Field*	|			*Ignored*	*No*
8	*Sender Telephone Number*	|			*Ignored*	*No*
9	*Characteristics of Sender*	|			*Ignored*	*No*
10	*Receiver ID*	|			*Ignored*	*Yes*
11	*Comment or Special Instructions*	|			*Ignored*	*No*
12	*Processing ID*	|	*P*	*A/1*	*Yes, always P or Q. No info is interpreted as "P". Any other case=> reject.*	*Yes, always P or Q*
13	*Version Number*	|	*E1394-97*	*AN*	*Ignored*	*Yes, always E1394-97*
14	*Date and Time of Message*	|	*20091119161505SS*	*DT/14*	*Ignored*	*Yes, current*
	End of Record	<CR>		*1*	*	*

* Required

- Sender Name: By default, the ASTM driver sends the keyword "NIVLINK". *This may be changed* in the driver configuration.
- Processing ID: The ASTM driver sends P (for production) or Q (for QC).
  Example:

  ```
  H|\^&|||NIVLINK|||||P|E1394-97
  ```

- Password: Can be set up as an option.

Patient Information Record

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	*Record Identifier*	*P*		*1*	*	*
2	*Sequence Number*	|	*1*	*3*	*	*
3	*Practice Assigned Patient ID*	|			*Yes***	*Yes***
4	*Laboratory Assigned Patient ID****	|	*098765678*	*AN/25*	*	*Yes*
5	*Patient ID #3*	|			*Ignored*	*No*
6	Patient Name:					
	Last Name	|	*Smith*	*AN/20*	*Yes*	*Yes*
	First Name	^	*Tom*	*AN/20*	*Yes*	*Yes*
	Middle Name	^	*F*	*AN/1*	*Yes*	*Yes*
	Suffix	^			*Ignored*	*No*
	Title	^			*Ignored*	*No*
7	*Mother's Maiden Name*	|			*Yes*	*Yes*
8	Birth date:					
	Birth date	|	*19631124*	*D/8*	*Yes*	*Yes*
	Age	^	*48*	*N/3*	*Yes*	*Yes*
	Age Unit	^	*Y*	*A/1*	*Yes*	*Yes*

9	*Patient Sex*	|	*M*	*A/1*	*Yes*	*Yes*
10	*Patient Race*	|			*Yes*	*Yes*
11	*Patient Address*	|			*Yes*	*Yes*
12	*Reserved Field*	|			*Ignored*	*No*
13	*Patient Telephone*	|			*Yes*	*Yes*
14	Attending Physician:			*(128 max for the 3 fields)*		
	Doctor Code	|	*XYZ*	*AN*	*Yes*	*Yes*
	Doctor last name	^	*Jones*	*AN*	*Yes*	*Yes*
	Doctor first name	^	*Alan*	*AN*	*Yes*	*Yes*
15	*Special Field 1*	|			*Ignored*	*No*
16	*Special Field 2*	|			*Ignored*	*No*
17	Patient Height:					
	Patient Height	|		*N*	*Yes*	*Yes*
	Patient Height Unit	^		*AN*	*Yes*	*Yes*
18	Patient Weight:					
	Patient Weight	|		*N*	*Yes*	*Yes*
	Patient Weight unit	^		*AN*	*Yes*	*Yes*
19	*Patient Diagnosis*	|			*Yes*	*Yes*
20	*Patient Medications*	|			*Yes*	*Yes*
21	*Patient Diet*	|			*Yes*	*Yes*
22	*Practice Field #1*	|			*Yes***	*Yes***
23	*Practice Field #2*	|			*Yes***	*Yes***
24	*Admission and Discharge Dates*	|			*Ignored*	*No*
25	*Admission Status*	|			*Yes*	*Yes*
26	*Location*	|	*Recovery*	*AN/10*	*Yes*	*Yes*
27	*Nature of Alt. Diag. Code & Class.*	|			*Ignored*	*No*
28	*Alt. Diag. Code & Class.*	|			*Ignored*	*No*
29	*Patient Religion*	|			*Ignored*	*No*
30	*Marital Status*	|			*Ignored*	*No*
31	*Isolation Status*	|		*AN*	*Yes*	*Yes*
32	*Language*	|			*Ignored*	*No*
33	*Hospital Service*	|			*Ignored*	*No*
34	*Hospital Institution*	|			*Ignored*	*No*
35	*Dosage Category*	|			*Ignored*	*No*
	End of Record	*<CR>*		*1*	*	*

* Required

**Deposit fields. These fields will be received by the ASTM driver, and shall be returned to the LIS system, with no change.

- Age Unit: The following codes are supported by the ASTM driver:
  - Y Years
  - M Months

- D Days
- W Weeks
- H Hours

- Sex Field The following codes are supported by the ASTM driver:
  - M Male
  - F Female
  - U Unknown
  - All other values will be treated as “Unknown”

***Unknown patient (tubes run at the instrument without orders) are uploaded as Unknown_PXXX

Test Order Record

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	Record Identifier	O		1	*	*
2	Sequence Number	|	1	3	*	*
3	Specimen ID:					
	Sample ID***	|	SPEC1234	AN	*	*
	Rack Number	^	3	N	Ignored	Yes
	Position Number	^	7	N	Ignored	Yes
	Ctrl Lot Number	^	H5767	AN	Ignored	No
	Nbr of replicates	^	1	N	Ignored	No
	Ctrl Name	^	LEVEL1	AN	Ignored	No
4	Instrument Specimen ID	|			Ignored	No
5	Universal Test ID:					
	Identifier	|			Ignored	No
	Name	^			Ignored	No
	Type	^			Ignored	No
	Local Code: Test	^	NA	AN/12	*	Yes
	Replicate	^	1	N	yes	yes
6	Priority	|	R	A/1	Yes	Yes
7	Requested Date and Time	|			Ignored	No
8	Collection Date and Time	|	20010212125400	DT/14	Yes	Yes
9	Collection End Time	|			Ignored	No
10	Collection Volume	|			yes	yes
11	Collector ID	|			yes	yes
12	Action Code	|	Q	A/1	Yes	Yes, Q if Control
13	Danger Code	|			yes	yes
14	TP Result	|			yes	yes
15	Date/Time Specimen Rcv’d	|	20091119161505SS	DT/14	yes	yes
16	Specimen Descriptor:					

	Specimen Type	|	*S*	*A/8*	*	*Yes*
	Specimen Descriptor	^			*yes*	*yes*
17	*Ordering Physician*	|			*Ignored*	*No*
18	*Physician's Phone Number*	|			*Ignored*	*No*
19	*User Field #1*	|			*Yes***	*Yes***
20	*User Field #2*	|			*Yes***	*Yes***
21	*Laboratory Field #1*	|			*Yes***	*Yes***
22	*Laboratory Field #2*	|			*Yes***	*Yes***
23	*Date/Time Results Reported/Mod.*	|			*Ignored*	*No*
24	*Inst. Charge to Computer System*	|			*Ignored*	*No*
25	*Inst. Section ID*	|			*Ignored*	*No*
26	*Report Types*	|			*yes*	*yes*
27	*Reserved Field*	|			*Ignored*	*No*
28	*Loc. Specimen Collection*	|			*Ignored*	*No*
29	*Nosocomial Infection Flag*	|			*Ignored*	*No*
30	*Specimen Service*	|			*yes*	*yes*
31	*Specimen Institution*	|			*yes*	*yes*
33	*End of Record*	*<CR>*		*1*	*	*

* Required

**Deposit fields. These fields will be received by the ASTM driver, and shall be returned to the LIS system, with no change.

- Specimen ID: Alphanumeric characters are accepted (0-9, A-Z). Spaces and punctuation are not allowed. Please refer to the Host specification document for each instrument connected for other limitations.
- Universal Test ID: The first 3 components of this field are ignored by the ASTM driver, and should be left blank by the LIS. The fourth component is required, as it contains the test code, and should be the last specified component.
- Priority:
  - When uploaded from the ASTM driver, the test priority codes are as follows:
    - S Stat
    - R Routine
  - When received from Host, the ASTM driver interpretation of the code is:
    - S or A Stat
    - R, C or P Routine
- Specimen Descriptor: Refer to the appendix 1 for possible specimen types.
- Collection Volume: The ASTM driver supports unit as the second component. Ex: 12^mL
  mL is the default volume unit.
- Action code:
  - When received from host, the ASTM driver supports the following codes:
    - A (add) Update action to the order for a patient
    - N (new) New order for a patient
    - C (cancel) Cancel the order for a patient

        - Q (Q/C) New order for a quality control.
        - Default interpretation in any other case is considered as “other” undefined action, for a patient.
    - When uploading results to the host, the following codes are:
        - A (add) Update action to the order for a patient
        - N (new) New order for a patient
        - C (cancel) Cancel the order for a patient
        - Q (Q/C) New order for a quality control.
- Report types:
    - When received from host, the ASTM driver supports the following codes:
        - Q or O New order asked to be performed
        - Y or Z No order (as response fro HQ)
        - Other codes are not supported.
    - When uploading results to the host, the following codes are:
        - X Demography or order rejection
        - Request for Order or Reflex

* SampleId could be empty at upload in case of unmatched tubes and if the pass-through mode is activated

Note: Reagent information management: Some reagent information related to an order record can be uploaded. They are defined as manufacturer records, the same way it is described at chapter “Reagent Information in Result or Manufacturer Record”.

Result Record

The ASTM driver can accept Result records from the Host. If received, this result will be considered as the last known result by the LIS.

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	Record Identifier	R		1	*	*
2	Sequence Number	|	1	3	*	*
3	Universal Test ID:					
	Identifier	|			Ignored	No
	Name	^			Ignored	No
	Type	^			Ignored	No
	Local Code	^	GLU	AN	*	*
	Replicate	^		N	Ignored	Yes
	Reagent lot**	^	856623\485965\748598	AN	Ignored	Yes
	Reagent sub-lot**	\	856623	AN		
	Reagent serial**	^	256\452\632	AN	Ignored	Yes
	Reagent sub-serial**	\	256	AN		
	Data type	^	GRAPH	AN	Ignored	Yes, only “GRAPH” value interpreted (see 6.4.1)
4	Data or Measurement Value:					
	Value field1	|	105.6	AN	Yes (*)	Yes
	Value field2	^			No	Yes

5	*Units*	|	*Ng/mL*	*AN*	*Yes*	*Yes*
6	*Reference Ranges*	|	*3.5 to 4.5*	*AN*	*Yes*	*Yes*
7	*Result Abnormal Flags*	|	*<*	*AN/2*	*Yes*	*Yes*
8	*Nature of Abnormality Testing*	|			*No*	*No*
9	*Result Status*	|	*R*	*A/1*	*Yes*	*Yes*
10	*Date of Change*	|			*No*	*No*
11	*Operator Identification*	|	*SYSADM*	*AN*	*Yes*	*Yes*
12	*Date/Time Test Started*	|			*No*	*No*
13	*Date/Time Test Completed*	|			*Yes*	*Yes*
14	*Instrument Identification*	|	*1*	*AN*	*No*	*Yes*
15	*End of Record*	*<CR>*		*1*	*No*	*

* Required

** See Reagent Information in Result or Manufacturer Record

- Universal Test ID: For considerations regarding this field, please see the Test Order Record descriptions in this document.
- Result Status: This field should be empty if it is a regular result upload or:
  - Cancel, InstrumentError or UserCancel : X
  - Pending : I
  - Final : F
  - Correction : C
  - Preliminary : P
  - Recall : R
  - Wrong : W
- Instrument Identification: This field contains the reference to the instrument which returned the result (deviceId configured for that instrument in the client application)
- Operator Identification: This field contains the name of the client application user who validated the result.

  Note: Instrument result properties, such as the result abnormal flags, are forwarded to the LIS only if they have been transmitted by the instrument.

Graph information

Warning, the graph information specification has to be reviewed

Some graph information can be uploaded to a LIS system into the Result record.

Test data type

A graph result has to be noticed into the « data type » subfield of the Universal Test ID. The keyword “GRAPH” will be used in this case.

Graph format, encoding, and data

The user can define the output data type with the 2 following information:

- Encoding method (Base64, BINHEX, …)
- Format: Codec information (native, png, URI, …)

The type has to be set into the Measurement Value field1: [Encoding:Format]

The data will follow into the Measurement Value field2.

Manufacturer Record

The ASTM driver can provide additional result information:

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	Record Identifier	M		1	*	*
2	Sequence Number	|	1	3	*	*
3	Manufacturer record type	|	RC_Extension	AN	Ignored	*(fixed value)
4	Rack	|		AN	Ignored	Yes
5	Position	|		AN	Ignored	Yes
6	Ordac	|	0/1	N/1	Ignored	Yes
7	Reserved field 1	|		AN	Ignored	No
8	Reserved field 2	|		AN	Ignored	No
9	Reserved field 3	|		AN	Ignored	No
10	Reserved field 4	|		AN	Ignored	No
11	Reserved field 5	|		AN	Ignored	No
12	Reserved field 6	|		AN	Ignored	No
13	End of Record	<CR>		1	No	*

Comment Record

Comment associated to the Patient is sent right after the P record (if it exists).

Order comments (Technical comment and Interpretation) are sent (if they exist) right after the Order Record. Order comments can also be hematology comments linked to the run, or rule comments added by upload rules.

Result comment (hematology comment linked to a result), or rule comment added by parameter rules.

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	Record Identifier	C		1	*	*
2	Sequence Number	|	1	3	Yes	*
3	Comment Source	|	P	1	No	Yes
4	Comment Text	|	CEX; PEX	AN	Yes	Yes
5	Comment Type	|			No	Yes
6	End of Record	<CR>		1	*	*

* Required

- Comment Source: This field contains the source of the comment:
  - P: practice
  - L: computer system
  - I: clinical instrument system
- Comment Type: This field can contain the type of the comment:
  - G: generic/free text comment
  - I: instrument flag(s) comment

Request Information Record

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	Record Identifier	Q		1	No	*
2	Sequence Number	|	1	3	No	*
3	Starting Range ID Number:					
	Patient ID Number	|			No	No
	Specimen ID Number	^	Samp45	AN	No	Yes
4	Ending Range ID Number	|			No	No
5	Universal Test ID	|			No	No
6	Nature of Request Time Limits	|			No	No
7	Beg. Request Results Date/Time	|			No	No
8	Ending Request Results Date/Time	|			No	No
9	Requesting Physician Name	|			No	No
10	Requesting Physician Telephone Number	|			No	No
11	User Field No. 1	|			No	No
12	User Field No. 2	|			No	No
13	Request Info. Status Codes	|	O	A/1	No	Yes, always O
14	End of Record	<CR>		1	No	*

* Required

Message Terminator Record

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	Record Identifier	L		1	*	*
2	Sequence Number	|	1	3	*	*
3	Termination Code	|			Ignored	No
4	End of Record	<CR>		1	*	*

* Required

Reagent Information in Result or Manufacturer Record

The ASTM driver provides 2 ways to manage the reagent information.

Result Record

As described before, the reagent information can be defined into the Universal Test ID of the result record.

Reagent information: The reagent information can give multiple lot & serial information.

Example:

```
R|1|^^^CL^^856623\485965\748598^256\452\632^^0| …
```

Manufacturer Record

The reagent information can also be defined as a manufacturer record of “Consumable”, contextual to the result record:

#	Description	Delimiter	Example	Type / Max. Length	The ASTM driver Receive	The ASTM driver Send
1	Record Identifier	M		1	*	*
2	Sequence Number	|	1	3	*	*
3	Manufacturer record type	|	RC_Consumable	AN	Ignored	*(fixed value)
4	Name	|		AN	Ignored	Yes
5	Lot Number	|		AN	Ignored	Yes
6	Serial number	|		AN	Ignored	Yes
7	Expiration Date Time	|	20101119161505SS	DT/14	Ignored	Yes
8	Setup Date Time	|	20101119161505SS	DT/14	Ignored	Yes
9	Type	|		AN	Ignored	Yes
10	Sub Type	|		AN	Ignored	Yes
11	End of Record	<CR>		1	No	*

Multiple reagent information for a single result will produce multiple Manufacturer records.

Manufacturer record comments and flags

The reagent information could contain comment or flag information. In this case, some contextual comment records can be sent. Refer to chapter “Comment Record”

Appendix 1

Specimen types

Specimen code	Description
ABS	Abscess
AMN	Amniotic fluid
ASP	Aspirate
BPH	Basophils
BIFL	Bile fluid
BLDA	Blood arterial
BBL	Blood bag
BLDC	Blood capillary
BPU	Blood product unit
BLDV	Blood venous
BON	Bone
BRTH	Breath (use EXHLD)
BRO	Bronchial
BRN	Burn
CALC	Calculus (=Stone)
CDM	Cardiac muscle
CNL	Cannula
CTP	Catheter tip
CSF	Cerebral spinal fluid
CVM	Cervical mucus
CVX	Cervix
COL	Colostrum
BLDCO	Cord blood
CNJT	Conjunctiva
CUR	Curettage
CYST	Cyst
DIAF	Dialysis fluid
DOSE	Dose med or substance
DRN	Drain
DUFL	Duodenal fluid
EAR	Ear

EARW	*Ear wax (cerumen)*
ELT	*Electrode*
ENDC	*Endocardium*
ENDM	*Endometrium*
EOS	*Eosinophils*
RBC	*Erythrocytes*
EYE	*Eye*
EXG	*Exhaled gas (=breath)*
FIB	*Fibroblasts*
FLT	*Filter*
FIST	*Fistula*
FLU	*Body fluid, unsp*
GAS	*Gas*
GAST	*Gastric fluid/contents*
GEN	*Genital*
GENC	*Genital cervix*
GENL	*Genital lochia*
GENV	*Genital vaginal*
HAR	*Hair*
IHG	*Inhaled Gas*
IT	*Intubation tube*
ISLT	*Isolate*
LAM	*Lamella*
WBC	*Leukocytes*
LN	*Line*
LNA	*Line arterial*
LNV	*Line venous*
LIQ	*Liquid NOS*
LYM	*Lymphocytes*
MAC	*Macrophages*
MAR	*Marrow*
MEC	*Meconium*
MBLD	*Menstrual blood*
MLK	*Milk*
MILK	*Breast milk*
NAIL	*Nail*
NOS	*Nose (nasal passage)*
ORH	*Other*
PAFL	*Pancreatic fluid*
PAT	*Patient*
PRT	*Peritoneal fluid /ascites*
PLC	*Placenta*
PLAS	*Plasma*
PLB	*Plasma bag*

PLR	*Pleural fluid (thoracentesis fld)*
PMN	*Polymorphonuclear neutrophils*
PPP	*Platelet poor plasma*
PRP	*Platelet rich plasma*
PUS	*Pus*
RT	*Route of medicine*
SAL	*Saliva*
SMN	*Seminal fluid*
SER	*Serum*
SKN	*Skin*
SKM	*Skeletal muscle*
SPRM	*Spermatozoa*
SPT	*Sputum*
SPTC	*Sputum - coughed*
SPTT	*Sputum - tracheal aspirate*
STON	*Stone (use CALC)*
STL	*Stool = Fecal*
SWT	*Sweat*
SNV	*Synovial fluid (Joint fluid)*
TEAR	*Tears*
THRT	*Throat*
THRB	*Thrombocyte (platelet)*
TISS	*Tissue*
TISG	*Tissue gall bladder*
TLGI	*Tissue large intestine*
TLNG	*Tissue lung*
TISPL	*Tissue placenta*
TSMI	*Tissue small intestine*
TISU	*Tissue ulcer*
TUB	*Tube NOS*
ULC	*Ulcer*
UMB	*Umbilical blood*
UMED	*Unknown medicine*
URTH	*Urethra*
UR	*Urine*
URC	*Urine clean catch*
URT	*Urine catheter*
URNS	*Urine sediment*
USUB	*Unknown substance*
VITF	*Vitreous Fluid*
VOM	*Vomitus*
BLD	*Whole blood*
BDY	*Whole body*
WAT	*Water*

WICK	*Wick*
WND	*Wound*
WNDA	*Wound abscess*
WNDE	*Wound exudate*
WNDD	*Wound drainage*
XXX	*To be specified in another part of the message*

Custom Specimen types

Specimen code	*Description*
BLD-ANM	*Anemied Blood*
BLD-HEM	*Hemolysis Blood*

Deprecated Specimen types

Some specimen type codes were previously used and still supported by the driver.

These codes should be avoided for new uses.

Specimen code	*Description*
S	*Serum*
U	*Urin*
F	*Cerebro-Spinal*
P	*Plasma*
T	*Timed-Urine*
Other	*Other*
NoSample	*No Sample*
Blood	*Blood*
Amniotic	*Amniotic*
Saliva	*Saliva*
Urethral	*Urethral*
Cervical	*Cervical*
Synovial	*Synovial*
Ratio	*Ratio*

This document and Appendix 1 revisions

Revision	*Date*	*Author*	*Action*	*Comment*
Rev. a	*24/11//2010*	*S.Bethune*	*Creation*	
Rev. b	*25/02/2011*	*S.Bethune*	*Modification*	*6.1. Message Header Record: field 13 ignored for VLink receive* *Remove Appendix 2*
Rev. c	*07/03/2011*	*F.Role*	*Modification*	*Minor misspelling corrections, presentation update*
Rev. d	*2011/09/07*	*F. Role*	*Modification*	*Minor correction (upload flags such as <, >>, … section has been removed)*
Rev. e	*2012/01/19*	*F. Role*	*Modification*	*Minor correction (reagent management: added ^ in result record field 3 before GRAPH; moved | in patient record for*

				doctor code field 14; removed examples; added a reagent management chapter)
Rev. f		*F.Role*	*Modification*	*Minor correction about Manufacturer messages*
Rev. g	*2012/06/06*	*FROLE*	*Modification*	*Sample ID could be empty at upload - Patient Id could be Unknown_PXXX when unknown*

Appendix 2

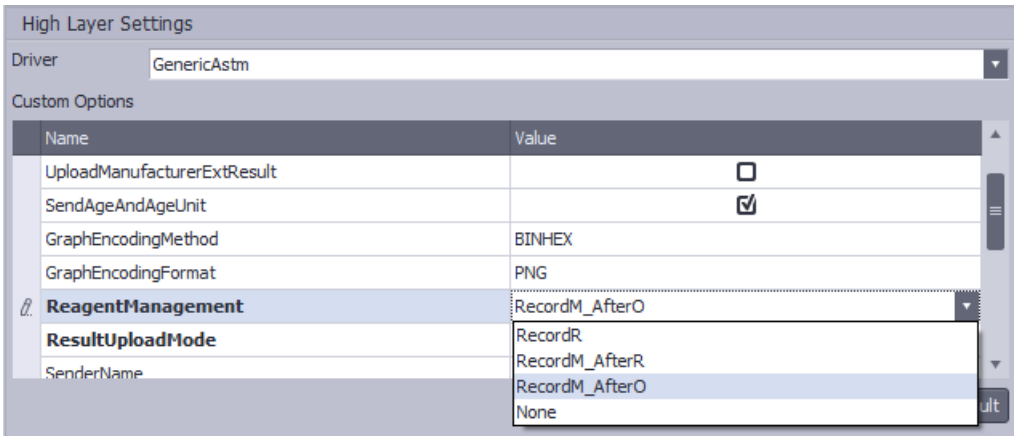
MEQNET Link Reagent Information Management

By default, the reagent information is uploaded to the Host in a Manufacturer Record next to the Order Record.

It is also possible to upload the reagent information in the Result Record.

To configure the upload of Reagent information, open MEQNET Link, Settings menu, LIS Settings, Select your LIS, select the Protocol Settings tab, and look for a High Layer Custom option named ReagentManagement.

Its default value is RecordM_AfterO (reagent in Manufacturer Record after Order) but can be changed to RecordR (reagent in Result Record).



See chapter Reagent Information in Result or Manufacturer Record for more information.

MEQNET Link Sample types

MEQNET Link uses the following sample types:

Name	*Sample type*
Urine	*UR*
Whole blood	*BLD*
Anemied Blood	*BLD-ANM*
Hemolysis Blood	*BLD-HEM*

MEQNET Link Analyte codes and units

MEQNET Link uses the following Analytes codes and Units:

Analyte Name	*Analyte Code*	*Sample Type*	*Units mg**	*Units SI**
HbA1C	*HbA1C*	*BLD/HEMOLYSIS/ANEMIA*	*mmol/mol*	*mmol/mol*
HbA1C%	*HbA1C%*	*BLD/HEMOLYSIS/ANEMIA*	*Count%*	*Count%*
HbA1C Chromatogram	*HbA1CChromatogram*	*BLD/HEMOLYSIS/ANEMIA*		
HbF%	*HbF%*	*BLD/HEMOLYSIS/ANEMIA*	*Count%*	*Count%*
Sharp A0 %	*#A0 %*	*BLD/HEMOLYSIS/ANEMIA*	*Count%*	*Count%*
Sharp A0 Area	*#A0 Area*	*BLD/HEMOLYSIS/ANEMIA*	*Count*	*Count*
Sharp A0 Sec	*#A0 Sec*	*BLD/HEMOLYSIS/ANEMIA*	*sec*	*sec*

Analyte Name	Analyte Code	Sample Type	Units mg*	Units SI*
A0 %	A0 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
A0 Area	A0 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
A0 Sec	A0 sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
C %	C %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
C Area	C Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
C Sec	C Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
F %	F %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
F Area	F Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
F Sec	F sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#1 %	HbA1ab#1 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#1 Area	HbA1ab#1 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#1 Sec	HbA1ab#1 sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#10 %	HbA1ab#10 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#10 Area	HbA1ab#10 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#10 Sec	HbA1ab#10 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#11 %	HbA1ab#11 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#11 Area	HbA1ab#11 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#11 Sec	HbA1ab#11 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#12 %	HbA1ab#12 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#12 Area	HbA1ab#12 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#12 Sec	HbA1ab#12 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#13 %	HbA1ab#13 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#13 Area	HbA1ab#13 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#13 Sec	HbA1ab#13 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#14 %	HbA1ab#14 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#14 Area	HbA1ab#14 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#14 Sec	HbA1ab#14 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#15 %	HbA1ab#15 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#15 Area	HbA1ab#15 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#15 Sec	HbA1ab#15 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#16 %	HbA1ab#16 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#16 Area	HbA1ab#16 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#16 Sec	HbA1ab#16 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#17 %	HbA1ab#17 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#17 Area	HbA1ab#17 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#17 Sec	HbA1ab#17 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#18 %	HbA1ab#18 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#18 Area	HbA1ab#18 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#18 Sec	HbA1ab#18 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#19 %	HbA1ab#19 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#19 Area	HbA1ab#19 area	BLD/HEMOLYSIS/ANEMIA	count	count

Analyte Name	Analyte Code	Sample Type	Units mg*	Units SI*
PeakHbA1ab#19 Sec	HbA1ab#19 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#2 %	HbA1ab#2 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#2 Area	HbA1ab#2 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#2 Sec	HbA1ab#2 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#20 %	HbA1ab#20 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#20 Area	HbA1ab#20 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#20 Sec	HbA1ab#20 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#3 %	HbA1ab#3 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#3 Area	HbA1ab#3 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#3 Sec	HbA1ab#3 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#4 %	HbA1ab#4 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#4 Area	HbA1ab#4 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#4 Sec	HbA1ab#4 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#5 %	HbA1ab#5 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#5 Area	HbA1ab#5 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#5 Sec	HbA1ab#5 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#6 %	HbA1ab#6 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#6 Area	HbA1ab#6 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#6 Sec	HbA1ab#6 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#7 %	HbA1ab#7 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#7 Area	HbA1ab#7 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#7 Sec	HbA1ab#7 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#8 %	HbA1ab#8 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#8 Area	HbA1ab#8 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#8 Sec	HbA1ab#8 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
PeakHbA1ab#9 %	HbA1ab#9 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
PeakHbA1ab#9 Area	HbA1ab#9 area	BLD/HEMOLYSIS/ANEMIA	count	count
PeakHbA1ab#9 Sec	HbA1ab#9 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
LA1c %	LA1c %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
LA1c Area	LA1c Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
LA1c Sec	LA1c sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#1 %	Peak#1 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#1 Area	Peak#1 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#1 Sec	Peak#1 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#10 %	Peak#10 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#10 Area	Peak#10 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#10 Sec	Peak#10 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#11 %	Peak#11 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#11 Area	Peak#11 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#11 Sec	Peak#11 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#12 %	Peak#12 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%

Analyte Name	Analyte Code	Sample Type	Units mg*	Units SI*
Peak#12 Area	Peak#12 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#12 Sec	Peak#12 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#13 %	Peak#13 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#13 Area	Peak#13 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#13 Sec	Peak#13 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#14 %	Peak#14 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#14 Area	Peak#14 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#14 Sec	Peak#14 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#15 %	Peak#15 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#15 Area	Peak#15 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#15 Sec	Peak#15 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#16 %	Peak#16 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#16 Area	Peak#16 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#16 Sec	Peak#16 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#17 %	Peak#17 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#17 Area	Peak#17 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#17 Sec	Peak#17 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#18 %	Peak#18 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#18 Area	Peak#18 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#18 Sec	Peak#18 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#19 %	Peak#19 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#19 Area	Peak#19 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#19 Sec	Peak#19 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#2 %	Peak#2 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#2 Area	Peak#2 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#2 Sec	Peak#2 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#20 %	Peak#20 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#20 Area	Peak#20 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#20 Sec	Peak#20 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#3 %	Peak#3 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#3 Area	Peak#3 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#3 Sec	Peak#3 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#4 %	Peak#4 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#4 Area	Peak#4 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#4 Sec	Peak#4 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#5 %	Peak#5 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#5 Area	Peak#5 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#5 Sec	Peak#5 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#6 %	Peak#6 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#6 Area	Peak#6 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#6 Sec	Peak#6 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec

Analyte Name	Analyte Code	Sample Type	Units mg*	Units SI*
Peak#7 %	Peak#7 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#7 Area	Peak#7 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#7 Sec	Peak#7 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#8 %	Peak#8 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#8 Area	Peak#8 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#8 Sec	Peak#8 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Peak#9 %	Peak#9 %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
Peak#9 Area	Peak#9 Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
Peak#9 Sec	Peak#9 Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
S %	S %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
S Area	S Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
S Sec	S Sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
SA1c %	SA1c %	BLD/HEMOLYSIS/ANEMIA	Count%	Count%
SA1c Area	SA1c Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
SA1c Sec	SA1c sec	BLD/HEMOLYSIS/ANEMIA	sec	sec
Total Area	Total Area	BLD/HEMOLYSIS/ANEMIA	Count	Count
A/C	A/C	URINE	mmol/L	mmol/L
ALB	ALB	URINE	mg/dL	mg/dL
Bilirubin	BIL	URINE	mg/dL	µmol/L
Blood	BLD	URINE	mg/dL	mg/L
Color	COLOR	URINE	Type	Type
Creatinine	CRE	URINE	mg/dL	g/L
Glucose	GLU	URINE	mg/dL	mmol/L
Ketones	KET	URINE	mg/dL	mmol/L
Leukocytes	LEU	URINE	Count/µL	Count/µL
LPR	LPR	URINE	mmol/L	mmol/L
Nitrite	NIT	URINE	ACnc	ACnc
Protein/Creatinine	P/C	URINE	mg/gCr	mg/g
pH	PH	URINE	LsCnc	LsCnc
Protein	PRO	URINE	mg/dL	g/L
Specific gravity	S.G.	URINE	rden	rden
Turbidity	TURB	URINE	ACnc	ACnc
Urobilinogen	URO	URINE	mg/dL	µmol/L

* *The system of units (mg or SI) is defined when installing the MEQNET Link application, and cannot be changed.*

Examples

MEQNET Link Host Query

```
H|\^&|||NIVLINK|||||||P|E 1394-97|20110302104140
Q|1|^H01|||||||||O
```

```
L|1|N
```

MEQNET Link AX4030 results upload

```
H|\^&|||NIVLINK|||||||P|E 1394-97|20110225110553
P|1||PID001||Scheinder^Mark||19900207|M
O|1|U01||^^^NO1\^^^CRE\^^^P/C|R|||||||||UR|||1&S&1.00
M|1|RC_Consumable|Feeder 1|||||Reagent
M|2|RC_Consumable|Feeder 2|||||Reagent
R|1|^^^GLU|2.8^+-|||||||||20100512174000
R|2|^^^PRO|-|||||||||20100512174000
R|3|^^^URO|Normal|||||||||20100512174000
R|4|^^^BIL|-|||||||||20100512174000
R|5|^^^CRE||||||X||||20100512174000
C|1||ResultQuantitative^OVER|I
R|6|^^^PH|5.5|LsCnc||||||||20100512174000
R|7|^^^BLD|0.3^+-|||||||||20100512174000
R|8|^^^KET|1^1+|||||||||20100512174000
C|1||Abnormal parameter|I
R|9|^^^NIT|1+|||||||||20100512174000
C|1||Abnormal parameter|I
R|10|^^^LEU|Neg.|||||||||20100512174000
R|11|^^^P/C|Normal|||||||||20100512174000
C|1||ResultQuantitative^<80|I
R|12|^^^TURB|1+|||||||||20100512174000
R|13|^^^S.G.||||||X||||20100512174000
C|1||ResultQuantitative^OVER\Abnormal parameter|I
R|14|^^^COLOR|Colorless|||||||||20100512174000
L|1|N
```

MEQNET Link HA8180 results upload

```
H|\^&|||NIVLINK|||||||P|E 1394-97|20110301135516
P|1||Unknown_P2|||||U
O|1|H04||^^^HbA1c|R|||||||||BLD
M|1|RC_Consumable|Eluent A|0A1101||20110301000000|20110301135513|Reagent
M|2|RC_Consumable|Hemorisys|0B1121||20111201000000||Reagent
M|3|RC_Consumable|Calibrator|-------||||Reagent
M|4|RC_Consumable|Eluent CV|0B1402||20120201000000||Reagent
M|5|RC_Consumable|Eluent B|0B1112||20110401000000||Reagent
M|6|RC_Consumable|SSS|SSS|SSS|20110316000000|20110316135336|Column
R|1|^^^HbA1C%|5|Count%|4.000000 to 5.900000|||||||20101010101000
R|2|^^^HbA1CChromatogram^^^^GRAPH|[BINHEX:Bitmap.Binary.PNG]^89504E470D0A1A0A000000 (…)
    00049454E44AE426082|Blob
R|3|^^^HbA1C|42|mmol/mol|20.210000 to 40.980000
R|4|^^^HbF%|1|Count%|0.200000 to 1.000000
R|5|^^^Total Area|41196|Count
R|6|^^^HbA1ab#1 area|412|count
R|7|^^^HbA1ab#1 sec|5|sec
```

```
R|8|^^^HbA1ab#1 %|1|Count%
R|9|^^^HbA1ab#2 area|478|count
R|10|^^^HbA1ab#2 Sec|6|sec
R|11|^^^HbA1ab#2 %|1.2|Count%
R|12|^^^F Area|161|Count
R|13|^^^F sec|10|sec
R|14|^^^F %|0.4|Count%
R|15|^^^LA1c Area|622|Count
R|16|^^^LA1c sec|13|sec
R|17|^^^LA1c %|1.5|Count%
R|18|^^^SA1c Area|3469|Count
R|19|^^^SA1c sec|21|sec
R|20|^^^SA1c %|8.4|Count%
R|21|^^^A0 Area|36054|Count
R|22|^^^A0 sec|37|sec
R|23|^^^A0 %|87.6|Count%
L|1|N
```

MEQNET Link HA8180 results upload for Variant

What we have received from HA8180 instrument:

```
H|$^&|||HA-8180V^00000000^V01.11    ||||||||201106131318
P|1
O|1|----------variantD^0007^00|0007|^^^HbA1c|R||||||||||||||00000040^00000000^0^V^------
    ^-------^------^-------^------^-------^------^-------^-------^-------
R|1|^^^ValueHbA1c|--.-|%||||F|||201106131317
R|2|^^^ValueIFCC|---|mmol/mol||||F
R|3|^^^ValueHbF|--.-|%||||F
R|4|^^^AreaTotal|31390|count||||F
R|5|^^^Peak|5^439^2.8|sec^count^%||||F
R|6|^^^Peak|6^423^2.7|sec^count^%||||F
R|7|^^^Peak|10^213^0.7|sec^count^%||||F
R|8|^^^Peak|13^354^2.3|sec^count^%||||F
R|9|^^^Peak|21^1002^6.4|sec^count^%||||F
R|10|^^^Peak|28^192^0.6|sec^count^%||||F
R|11|^^^Peak|37^13317^42.4|sec^count^%||||F
R|12|^^^Peak|39^15450^49.2|sec^count^%||||F
R|13|^^^TimeBottom||sec||ERR.||F
R|14|^^^TimeBase||sec||ERR.||F
R|15|^^^TimeSA1c|17^32|sec||||F
R|16|^^^TimeHbF|8^11|sec||||F
R|17|^^^TimeHbS||sec||||F
R|18|^^^TimeHbC||sec||||F
R|19|^^^TimeGain|32|sec||||F
R|20|^^^ValueGain|11^415|mOD||||F
R|21|^^^ADCount1|0000^
    (…)
    0000^0000|count||||F
```

```
L|1|N
```

What we transmit to the LIS:

```
H|\^&|||NIVLINK|||||||P|E 1394-97|20120119104802
P|1||Unknown_P1|||||U
O|1|variantD||^^^HbA1c|R|||||||||BLD
C|1|I|Measurement Number^0007|I
C|2|I|Abnormal peak (D) detected^Abnormal peak (D) detected|I
C|3|I|Variant|I
M|1|RC_Consumable|Column HA8180-A||||20120119103403|Column
M|2|RC_Consumable|Calibrator|-------|||20120119103403|Reagent
M|3|RC_Consumable|Eluent CV|------|||20120119103403|Reagent
M|4|RC_Consumable|Eluent A|------|||20120119103403|Reagent
M|5|RC_Consumable|Eluent B|------|||20120119103403|Reagent
M|6|RC_Consumable|Hemorisys|------|||20120119103403|Reagent
R|1|^^^HbA1C%||||||X||Manufacturer||20110613131700|HA8180-A
C|1|I|ResultQuantitative^--.-|I
R|2|^^^HbA1CChromatogram^^^^GRAPH|[BINHEX:Bitmap.Binary.PNG]^89504E470D0A1A0A00
    (…)
    4AE426082|Blob|||||||20110613131700|HA8180-A
R|3|^^^HbA1C||||||X||Manufacturer||20110613131700|HA8180-A
C|1|I|ResultQuantitative^---|I
R|4|^^^HbF%||||||X||Manufacturer||20110613131700|HA8180-A
C|1|I|ResultQuantitative^--.-|I
R|5|^^^Total Area|31390|Count||||||Manufacturer||20110613131700|HA8180-A
R|6|^^^Peak#1 Area|439|Count||||||Manufacturer||20110613131700|HA8180-A
R|7|^^^Peak#1 Sec|5|sec||||||Manufacturer||20110613131700|HA8180-A
R|8|^^^Peak#1 %|2.8|Count%||||||Manufacturer||20110613131700|HA8180-A
R|9|^^^Peak#2 Area|423|Count||||||Manufacturer||20110613131700|HA8180-A
R|10|^^^Peak#2 Sec|6|sec||||||Manufacturer||20110613131700|HA8180-A
R|11|^^^Peak#2 %|2.7|Count%||||||Manufacturer||20110613131700|HA8180-A
R|12|^^^Peak#3 Area|213|Count||||||Manufacturer||20110613131700|HA8180-A
R|13|^^^Peak#3 Sec|10|sec||||||Manufacturer||20110613131700|HA8180-A
R|14|^^^Peak#3 %|0.7|Count%||||||Manufacturer||20110613131700|HA8180-A
R|15|^^^Peak#4 Area|354|Count||||||Manufacturer||20110613131700|HA8180-A
R|16|^^^Peak#4 Sec|13|sec||||||Manufacturer||20110613131700|HA8180-A
R|17|^^^Peak#4 %|2.3|Count%||||||Manufacturer||20110613131700|HA8180-A
R|18|^^^Peak#5 Area|1002|Count||||||Manufacturer||20110613131700|HA8180-A
R|19|^^^Peak#5 Sec|21|sec||||||Manufacturer||20110613131700|HA8180-A
R|20|^^^Peak#5 %|6.4|Count%||||||Manufacturer||20110613131700|HA8180-A
R|21|^^^Peak#6 Area|192|Count||||||Manufacturer||20110613131700|HA8180-A
R|22|^^^Peak#6 Sec|28|sec||||||Manufacturer||20110613131700|HA8180-A
R|23|^^^Peak#6 %|0.6|Count%||||||Manufacturer||20110613131700|HA8180-A
R|24|^^^Peak#7 Area|13317|Count||||||Manufacturer||20110613131700|HA8180-A
R|25|^^^Peak#7 Sec|37|sec||||||Manufacturer||20110613131700|HA8180-A
R|26|^^^Peak#7 %|42.4|Count%||||||Manufacturer||20110613131700|HA8180-A
R|27|^^^Peak#8 Area|15450|Count||||||Manufacturer||20110613131700|HA8180-A
R|28|^^^Peak#8 Sec|39|sec||||||Manufacturer||20110613131700|HA8180-A
```

```
R|29|^^^Peak#8 %|49.2|Count%|||||Manufacturer||20110613131700|HA8180-A
L|1|N
```

Appendix 2 revisions

Date	Version	Author	Comment
2011-03-04	0.1a	F. ROLE	Creation
2012-01-19	0.1b	F. ROLE	Modification (added section that describe Reagent management; added example for variant)
2012-06-06	2	FROLE	Release 2.0

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