LABONLINE
HOST Connection
Specifications

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			3.7.5 Added handling of comment "TU – Tube Status Update"

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1 Introduction

This manual is a reference for programming external computer systems to communicate with the LabOnline System.

The manual is based on two reference standards issued by the American Society for Testing and Materials (ASTM). The standards cover a low-level protocol and an high-level protocol.

- low-level protocol
    "Standard Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems", Designation: E1381-95
- high-level protocol
    "Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems", Designation: E 1394 - 97

LabOnline can be connected to external systems through:
- Serial line connection - RS232
- Network connection – using TCP/IP as the transport protocol
- File Exchange by shared folders

2 ASTM Low level protocol

2.1   Serial line connection specifications

2.1.1   Data Link layer

The data link layer uses a character-oriented, simple stop-and-wait protocol to transfer information between LabOnline and host computer system. Information can only flow in one direction at a time.

The section describes:
- link connection and link release (determine which system sends and which system receives information)
- delimiting and synchronism (the framing of the data and recognition of frames)
- sequential control (maintains the sequential order of information across the connection)
- error detection (detects transmission errors)
- error recovery (tries to recover detected error)

There are three phases in transferring information between LabOnline and host computer system:
1. Establishment phase (Link connection)
2. Transfer phase (Data transmission)
3. Termination phase (Link release)

2.1.2   Establishment Phase

The establishment phase determines the direction of the information flow and prepares the receiver to accept information.
The establishment phase is initiated by sending <ENQ> from the sender.

If a valid replay (<ACK>, <NAK> OR <ENQ>) is not received within the 15 seconds the sender enters the termination phase. The sender returns to the establishment phase after waiting 30 seconds.
If after 3 attempts the sender is unable to establish communication with the receiver, the operator is informed via a red light on the bottom side of LabOnline and an error message is posted to the error log file.

If after sending <ENQ> the sender receives <NAK>, it must wait ten seconds before sending another <ENQ>.

When sending <ENQ> the sender receives <ACK> it pass to the transfer phase.

When both systems simultaneously send <ENQ> they are in contention. In this case LabOnline has first priority to transmit information. The Host must immediately stop trying to transmit and prepare to receive. LabOnline wait at least one second before re-sending another <ENQ>, the Host replies with <ACK> or <NAK> depending on its readiness to receive. In case of contention if after the first <ENQ> LabOnline does not send another <ENQ> the Host must wait at least twenty seconds before trying to initiate the communication by sending another <ENQ>, because after 20 seconds a time-out occurs and the the Host regards the link as being in a neutral state.

2.1.3   Transfer Phase

During the transfer phase, the sender transmits messages to the receiver until all messages are sent. Messages are sent in frames which contain a maximum of 247 characters.
Special control characters identify the frame type, the beginning and end of a frame, and provide for error detection. The following table lists the special control characters.

Special Contro Characters

Command	Function
<STX>	Start of text transmission control character
[FN]	Frame number "0"-"7" (first in H record is "1")
"text"	Data content message
<ETB>	End of transmission block transmission control character
<ETX>	End of text transmission control character
[C1]	Most significant hex character of the checksum 0 - 9 & A - F
[C2]	Least significant hex character of the checksum 0 - 9 & A - F
<CR>	Carriage return character
<LF>	Line feed character.

Frames
Every frame has seven control characters. Two type of frames are used:
- End frames: a message with 240 characters or less is sent in a single end frame,

[STX][F#][Message][ETX][CS1][CS2][CR][LF]
- Intermediate frames: messages that are longer than 240 characters are broken into pieces that are 240 characters or less in length and sent in multiple or intermediate frames with the last part of the message sent in an end frame [STX][F#][Message][ETB][CS1][CS2][CR][LF]

After a frame is sent, the sender stops transmitting and waits for an acknowledgment [ACK] from the receiver. The receiver responds to every frame, when it is ready to receive another frame it sends one of the following replies:
- Message Acknowledged [ACK]
- Message Not Acknowledged [NAK]
- End of Transmission [EOT]

Each of the replies is discussed below.
A reply of [ACK] acknowledges that the last frame was received successfully and that the receiver is ready for another frame. The sender must increment the frame number and transmit another frame or terminate the message transfer.
A reply of [NAK] means that the last frame was not received successfully and that the receiver is ready to receive the frame again. The sender may re-transmit the frame or proceed to the termination phase.
The receiver [NAK] a frame for the following reasons:
- Improperly framed transmission received after [STX]. Certain situations cause a time-out condition to occur if insufficient information is received to properly process the frame. Under
- these conditions, ASI instruments return to idle state without transmitting a [NAK] or any other characters.
- Invalid frame number or frame number out of sequence.
- Restricted character received in message text.
- Invalid checksum received.
A reply of [EOT] acknowledges that the last frame was received successfully and that the receiver is ready for another frame, but the receiver is requesting that the sender stop transmitting. The sender must send a reply within the time-out period.

Error Handling The receiver checks every frame for defects. The receiver sends a [NAK] reply if it receives a defective frame. When the sender receives a [NAK], it re-transmits the last frame using the same frame number.
A frame is rejected by the receiver for several reasons, including:
- Character structure errors are detected in parity, baud rate, etc., or transmission is improperly framed.
- The frame checksum from the sender does not match the checksum on the receiving end.
- The frame number is incorrect. The number must be the same as the last one rejected or one number higher than the last one accepted by the receiver.

When the sender receives anything other than an [ACK] or an [EOT], it updates a re-transmit counter by one and re-sends the frame. A frame can be re-transmitted a maximum of six times. After that, the sender must abort the message and proceed to the termination phase.

If an [EOT] is encountered by the ASI instruments during the processing of a frame, the receiver return to idle state assuming that the sender terminated transmission prematurely. The sender must re-establish the connection in order to continue.

NOTE1: If the [ACK] is corrupted during transmission, the sender of data retransmits the last frame, since any character received other than an [EOT] or [ACK] is treated as a [NAK]. However, since the [ACK] was already transmitted for that frame, the receiver [NAK] duplicates frames to avoid any possibility of infinite loops. This leads to Termination Phase after six attempts.

NOTE2: The sender sets a timer when transmitting the last character of a frame. If a reply is not received within 15 seconds, a time-out occurs and the sender proceeds to the termination phase. The receiver sets a timer when first entering the transfer phase or when replying to a frame. If no reply is received within 30 seconds, a time-out occurs and the receiver regards the link as being in a neutral state. A time out also occurs if an incomplete frame is received and the timer expires.

NOTE3: The checksum permits the receiver to detect a frame error. The checksum is calculated by adding the binary values of each character to the checksum (modulo 256). The characters <STX>, the checksum, <CR> and <LF> are not included in the calculation.
<STX><Frame number>TEXT<ETX><Checksum><CR><LF>
Checksum is expressed as 2 digits (hex)
Example: <STX>7L|1|N<ETX>0A<CR><LF>

Character	ASCII value (decimal)
7	55
L	76
|	124
1	49
|	124
N	78
<ETX>	3
Sum =	509
509 MOD 256	253 (dec) (FD Hex)

2.1.4 Termination Phase

The termination phase returns the data link to the neutral state. The sender notifies the receiver that all messages have been sent. The sender transmits the <EOT> transmission control character to the receiver and then the data link is regarded by both devices to be in a neutral state. Which means that any character except <ENQ> will be ignored.

2.1.5 Restricted Characters

The data link protocol is designed for sending character based message text. Therefore there are restrictions on which characters may appear in the message text.

The table below shows the control characters that are not allowed in the message text:

Control characte	Name	Dec. code	Hex. code
SOH	Start of header	1	01
STX	Start of text	2	02
ETX	End of text	3	03
EOT	End of transmission	4	04
ENQ	Inquiry	5	05
ACK	Acknowledgement	6	06
DLE	Data link escape	16	10
NAK	Negative acknowledgement	21	15
SYN	Synchronous idle	22	16
ETB	End of transmission block	23	17
LF	Line feed	10	0A
DC1	Device control 1	17	11
DC2	Device control 2	18	12
DC3	Device control 3	19	13
DC4	Device control 4	20	14

2.1.6 Physical connections

LabOnline can use the same com port to send and receive data or two different serial ports one to receive and other to send data. Of course using two different lines, to receive and send information by two serial ports, contentions are avoid and the speed of the communication is significantly increased.

2.2 Network TCP/IP connection specifications

Network connection using TCP/IP as transport protocol follows same rules as the RS232 connection. LabOnline can act both as Server as well as Client socket.

LabOnline can use the same socket port to send and receive data or two different socket ports one to receive and another to send data. Of course using two different lines, to receive and send information by two separate sockets, contentions are avoid and the speed of the communication is significantly increased.

2.3 File Exchange connection specifications

Using this connection two shared folders are used by Host system and LabOnline to exchange files. One folder is used by the host system to write request files (DownLoad files) and LabOnline is responsible for ensuring that these files are correctly read, interpreted and erased. The other folder is used by LabOnline to write the result files (Upload files) and the host system is responsible for ensuring that these files are correctly read, interpreted and erased.

The data flow of this connection is the following:
as soon as data are available on the Host system, a DownLoad file can be created containing all information needed for programming. Different download session are saved in download files with different name and same extension.

To avoid read/write conflicts the Host creates a file with the same name and extension 'ok' as soon as the data file has been completed and closed. LabOnline will look for the 'ok' file before attempting to read data file. When Labonline finds a file with extension 'ok' then it will open and process the corresponding data file. At the end of this operation it will erase both files. After writing the 'ok' file the host shall avoid to append any data to the corresponding data file, intending that any new data to download will generate a new data file with different name and same extension.

Similarly, as soon as data are available on the LabOnline system, an UpLoad file will be created, containing all information needed for results uploading. To avoid read/write conflicts LabOnline creates a file with the same name and default extension 'ok' as soon as the data file has been completed and closed. The host will look for the 'ok' file before attempting to read data file. When Host system finds a file with extension 'ok' then it will open and process corresponding data file. At the end of this operation it will erase both files. After writing the 'ok' file LabOnline shall avoid to append any data to the corresponding data file, intending that any new data to upload will generate a new data file with different name and same extension.

The format of the DownLoad/UpLoad file follows the ASTM High-Level Protocol described in the following section.

3 ASTM High-Level Protocol

3.1 Overview

This high-level standard specifies the structure of messages exchanged between the LabOnline and Host system i.e. the individual records and the fields contained in the records.

3.2 Reference Standard

The message structures exchanged between LabOnline and Host system are implemented according to the following high-level communication protocol standard:
"Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems", Designation: E 1394-97.

3.3 Message Structure

3.3.1 Record Types

Messages consist of various record types which are listed in the table below:

Record type	Name
H	Header record
P	Patient record
O	Order record
R	Result record

C	Comment record
L	Message terminator record

3.4   DownLoad – Message from Host to LabOnline

To send information to LabOnline, Host should be able to download them as soon as they are available: no query host is supported.
The structure of the message is composed of the following sequence of records. Only comment records and result records are optional.

H	Header
P	Patient 1
<C>	Comment (related to the Patient 1)
O	Order 1
<C>	Comment (related to the Order 1)
O	Order 2
<C>	Comment (related to the Order 2)
<R>	Result 1 (information about the previous result of the first test of the specimen)
.	.
<R>	Result n (information about the previous result of the last test of the specimen)
.	
P	Patient 2 (all the structure repeats)
.	.
P	Patient n
.	.
L	Message Terminator Record

3.5   Upload – Message from LaOnline to Host

LabOnline will send information to Host as soon as they are available.
The structure of the message is composed of the following sequence of records. Only comment records and result records are optional.

H	Header
P	Patient 1
<C>	Comment (related to Patient 1)
O	Order 1
<C>	Comment (related to the Order 1)
O	Order 2
<C>	Comment (related to the Order 2)
<R>	Result 1 (information about the result of the first test of the specimen)
<C>	Comment (related to the Result 1)
.	.

<R>	Result n (information about the result of the last test of the specimen)
.	
P	Patient 2 (all the structure repeats)
.	.
P	Patient n
.	.
L	Message Terminator Record

3.5.1 Delimiters

Delimiters are used to separate the record into fields and components.
The following delimiters are used in LABONLINE

Delimiter	Name	Dec. code	Hex. code
"|"	Field delimiter	124	7C
"\\"	Repeat field delimiter	92	5C
"^"	Component field delimiter	94	5E
"&"	Escape delimiter	38	26

3.5.2 Date and Times

Dates are always represented as: YYYYMMDD
Times are always represented as: HHMMSS
Dates and times together are represented as: YYYYMMDDHHMMSS

3.5.3 Values

Decimal values are transmitted with a period as decimal separator, e.g. 7.243

3.5.4 Field rules

• The field identification.
  In each segment type, fields are identified by a number. This identification corresponds to the ASTM definitions.

• The field delimiters.
  A character defined as delimiter separates each field from the next one. If no more fields are required to the end of a record, next delimiters can be omitted.

• The field size
  All field sizes given in the document are maximum sizes. Each field contains only significant information, without any left or right filling characters.

• Not used fields
  when a field, in following specifications, is marked as *not used* it is intended that it can be present in the transmitting record but his contents has no relevance.

3.6 Record Definition - Host to LabOnline

LabOnline supports Message Header, Patient Information, Test Order, Result, Comment and Terminator records.

NOTE1: The column Option of the below tables is marked as "M" for mandatory fields, "O" for optional fields and blank for not used.

3.6.1 Message Header Record - Host to LabOnline

The header contains general information and identifies the sender. The header record is always the first record in a transmission.

F	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type ID	H		M	1
2	Delimiter Definition	|\^&	"|" : Field "\\" : Repeat "^" : Component "&" : Escape	M	4
3	Message Control ID	-	Not Used.	-	-
4	Access Password	-	Not Used.	-	-
5	Sender Name or ID	HOST^1.0.0	Sender Name^Sender Version	O	-
6	Sender Street Address	-	Not Used.	-	-
7	Not defined	-	Not Used.	-	-
8	Sender Telephone Number	-	Not Used.	-	-
9	Characteristics of Sender	-	Not Used.	-	-
10	Receiver ID	-	Not Used.	-	-
11	Comment or Special Instructions	-	Not Used.	-	-
12	Processing ID	P	(P)roduction: Treat message as an active message to be completed according to standard processing. If the field is blank, this is the default.	M	1
13	Version No.	E 1394-97	Version level of the specification	O	-
14	Date and Time of Message	20091116104731	Date and time of the transmitted message: YYYYMMDDhhmmss	M	14

Example:

H|\^&||| HOST^1.0.0||||||||P|E 1394-97|20091116104731

3.6.2 Patient Record - Host to LabOnline

The patient record contains general information about the patient.

F	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type ID	P		M	1
2	Sequence Number	1 to 65535	Sequence Number.	M	-
3	Practice Assigned Patiend ID	12120001	Request Number: This is the univocal request key, returned unchanged during transmission to Host.	M	35
4	Laboratory Assigned Patient ID	117118112	Patient ID: This is the univocal patient key, Returned unchanged during transmission to Host.	M	50
5	Patient ID No. 3	-	Not Used.	-	-
6	Patient Name	White^Anna	Surname^Name.	O	50^50
7	Mother's Maiden Name	Black	Mother's Maiden Name.	O	50
8	Birthdate	19601218	Birthdate, in the format: YYYYMMDD.	O	8
9	Patient Sex	F	Following values are admitted: M : Male F : Female I : Indeterminate (used for Animals) Blank – Unknown.	O	1
10	Patient Race	C	Patient Race.	O	10
11	Patient Address	-	Not Used.	-	-
12	Reserved Field	-	Not Used.	-	-
13	Patient Telephone Number	^+3902 566318	Not Used^Ward Phone Number.	O	^20
14	Attending Physician ID.	0782	Physician Code.	O	35
15	Special Field 1- Patient Age (optional field)	55^years	Age^Units: (Years, Days, Months).	O	-
16	Special Field 2- Patient Type	0	Following values are admitted: 0 : Internal Patient 1 : External Patient.	O	1
17	Patient Height	-	Not Used.	-	-
18	Patient Weight	-	Not Used.	-	-
19	Diagnosis	Week^N ^25\Diagnosis^ S^Diabetes\Diuresis^N^ 348	Patient Clinical Data (use of repetitions delimiter if necessary). Each data is structured as following: - Clinical Data Code - Clinical Data Type ➢ N (Number)	O^O^O	16^1^1 024

			➤ S (Free Text) ➤ C (Coded Text) ➤ D (DateTime) - Clinical Data Value.		
20	Medication	-	Not Used.	**-**	-
21	Diet	-	Not Used.	**-**	-
22	Practice Field #1	-	Not Used.	**-**	-
23	Practice Field #2	-	Not Used.	**-**	-
24	Admission Date	-	Not Used.	**-**	-
25	Admission Status	-	Not Used.	**-**	-
26	Location	CHIR	Requester, or patient location	O	20
27	Nature of Diagnostic Code	-	Not Used.	**-**	-
28	Diagnostic Code	-	Not Used.	**-**	-
29	Patient Religion	-	Not Used.	**-**	-
30	Maritial Status	-	Not Used.	**-**	-
31	Isolation Status	-	Not Used.	**-**	-
32	Language	-	Not Used.	**-**	-
33	Hospital Service	-	Not Used.	**-**	-
34	Hospital Istitution	-	Not Used.	**-**	-
35	Dosage Category	-	Not Used.	**-**	-

Example:

P|1|1212000|117118112||White^Anna|Black|19601218|F|C|||^+3902566318|0782|55^Years|0|||Week^N^25\Diagnosis^S^Diabetes\Diuresis^N^348|||||||CHIR

3.6.3   Order Record - Host to LabOnline

The order record contains information about the tests on a single specimen.

F	Name – E 1394-97	Values	Comments	Option	Length
1	Record Type ID	O		M	1
2	Sequence Number	1 to 65535	Sequence number.	M	-
3	Specimen ID	1212000 01	Sample ID: This is the univocal Sample Barcode Identifier.	M	35
4	Instrument Specimen ID	-	Not used.	**-**	-
5	Universal Test ID	^^^N A^NA	^^^Test Code^Analysis Code: Used to uniquely identify test and material to be done on the Sample. Use of repetitions is admitted in case of multiple tests for the same sample.	^^^M ^O	^^^20 ^8
6	Priority	S or R	Following values are admitted: S : Stat	M	1

			R : Routine.		
7	Requested/ Ordered data and time	199810 231057 15	Request Date and time, in the format: YYYYMMDDhhnnss.	M	14
8	Specimen Collection Date and Time	199810 231057 15	Sample Draw date and time, in the format: YYYYMMDDhhnnss.	O	14
9	Collection End Time	-	Not Used.	-	-
10	Collection Volume	-	Not Used.	-	-
11	Collector ID.	-	Not Used.	-	-
12	Action Code	N	Following values are admitted: C : Cancel a test order A : Add a test to a known specimen N : Create a new test order R : Request a Rerun for a test.	M	1
13	Danger Code	-	Not Used.	-	-
14	Relevant Clinical Information	-	Not Used.	-	-
15	Date/Time Specimen Received	-	Not Used.	-	-
16	Specimen Descriptor	SERUM	Sample Material Code.	O	20
17	Ordering Physician	-	Not Used.	-	-
18	Physician's Telephone Number	-	Not Used.	-	-
19	User Field No. 1	CHIM	Optional field, which is returned back unchanged to the host along with the result.	O	20
20	User Field No. 2	AXM	Optional field, which is returned back unchanged to the host along with the result.	O	1024
21	Laboratory Field No. 1	Lab1	Requesting Laboratory: In a multi-laboratory environment, indicates the laboratory which entered the request into the system.	O	20
22	Laboratory Field No. 2	121200	Primary tube code: This field is optionally used to transmit the Primary Tube Code in case the Sample ID contains an Aliquot Code.	O	35
23	Date/Time Result Reported or Last Modified	-	Not Used.	-	-
24	Instrument Charge to Computer System	-	Not Used.	-	-
25	Instrument Section ID.	-	Not Used.	-	-
26	Report Types	O	(O)rder – Normal request from Host.	O	1

27	Reserved Field	-	Not Used.	-	-
28	Location of Ward of Specimen Collection	-	Not Used.	-	-
29	Nosocomial Infection Flag	-	Not Used.	-	-
30	Specimen Service	-	Not Used.	-	-
31	Specimen Institution	Lab2	Production Lab: In a multi-laboratory environment, indicates the laboratory expected to process the sample.	O	20

Example (Host to LabOnline):

O|1|12120001||^^^NA^NA\^^^CL^CL\^^^K^K|R|20161023105715|20161023103124||
||N||||SERUM|||CHIM|AXM|Lab1|121200||||O|||||Lab2

3.6.4 Result Record - Host to LabOnline

The host sends a result record to LabOnline only to communicate previous result for the request.

F	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type	R		M	1
2	Sequence Number	1 to 65535	Sequence number.	M	-
3	Universal Test ID.	^^^NA^NA	^^^Test Code^Analysis Code: Used to uniquely identify test and material which has the previous result.	^^^M^O	^^^20^8
4	Measurement Value	7.273	Can be a Numeric Value or a Coded Value or a Free Text, according to the result type.	M	20
5	Units	-	Not Used.	-	-
6	Reference Ranges	-	Not Used.	-	-
7	Result Abnormal Flags	-	Not Used.	-	-
8	Nature of Abnormality Testing	-	Not Used.	-	-
9	Result Status	-	Not Used.	-	-
10	Date of Change in Instrument Normative Values or Units	-	Not Used.	-	-
11	Operator Identification	-	Not Used.	-	-

12	Date/Time Test Started	-	Not Used.	-	-
13	Date/Time Test Completed	201009 261034	Host previous result date and time, in the format: YYYYMMDDhhnnss	M	14
14	Instrument Identification	-	Not Used.	-	-

Example:

R|1|^^^NA^NA|7.273||||||||||20091116104722

3.6.5   Comment Record - Host to LabOnline

Comment records may be inserted anywhere except after the message header or terminator record. Each comment record shall apply to the first non-comment record preceding it.

F	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type ID	C		M	1
2	Sequence Number	1	Sequence number.	M	-
3	Comment Source	L	Always L indicating Laboratory Computer System.	M	1
4	Comment Text	SC^Sample centrifuged	Comment code^Comment text. See the Legend (*) for the possible Comment Code values and their meaning.	M	2^255
5	Comment Type	G	Fixed value	M	1

(*) Legend
PC = Patient Comment
RC = Request Comment
SC = Sample Comment
TC = Test Comment

The above comment codes must be followed by a free comment text related to the patient, request, sample and test respectively.

Example:

C|1|L|SC^Sample centrifuged|G
C|1|L|TC^Test reflex|G

In the last example the test comment is related to the test id specified in the preceding order record.

3.6.6 Message Terminator Record - Host to LabOnline

This will be always the last record in a message.

Field	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type ID	L		M	1
2	Sequence Number	1	Always 1	M	1
3	Termination Code	N	Always "N" - Normal termination	M	1

Example:

L|1|N

3.7 Record Definition - LabOnline to Host

LabOnline transmits Message Header, Patient Information, Test Order, Comment, Result and Terminator records to the receiving Host System.

NOTE1: The column **Option** of the below tables is marked as "M" for mandatory fields, "O" for optional fields and blank for not used.

3.7.1 Message Header Record - LabOnline to Host

The header contains general information and identifies the sender. The header record is always the first record in a transmission.

F	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type ID	H		M	1
2	Delimiter Definition	|\^&	"|" : Field "\" : Repeat "^" : Component "&" : Escape	M	4
3	Message Control ID	-	Not Used.	-	-
4	Access Password	-	Not Used.	-	-
5	Sender Name or ID	LabOnline^1.0.0	Sender Name^Sender Version	O	-
6	Sender Street Address	-	Not Used.	-	-
7	Not defined	-	Not Used.	-	-
8	Sender Telephone Number	-	Not Used.	-	-
9	Characteristics of Sender	-	Not Used.	-	-
10	Receiver ID	-	Not Used.	-	-

11	Comment or Special Instructions	-	Not Used.	**-**	-
12	Processing ID	P	(P)roduction: Treat message as an active message to be completed according to standard processing. If the field is blank, this is the default.	M	1
13	Version No.	E 1394-97	Version level of the specification	O	-
14	Date and Time of Message	20091116104731	Date and time of the transmitted message: YYYYMMDDhhmmss	M	14

Example:

H|\^&|||LabOnline^1.0.0|||||||P|E 1394-97|20091116104731

3.7.2 Patient Record – LabOnline to Host

The patient record contains general information about the patient.

F	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type ID	P		M	1
2	Sequence Number	1 to 65535	Sequence Number.	M	-
3	Practice Assigned Patiend ID	12120001	Request Number: This is the univocal request key, returned unchanged during transmission to Host.	M	35
4	Laboratory Assigned Patient ID	117118112	Patient ID: This is the univocal patient key, Returned unchanged during transmission to Host. QC: In case of QC transmission, this field will be populated with following information: QC Lot Date + "-" + QC Level QC Lot Date Format: YYYMMDD.	M	50
5	Patient ID No. 3	-	Not Used.	**-**	-
6	Patient Name		Surname^Name.	O	50^50

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7	Mother's Maiden Name	Black	Mother's Maiden Name.	O	50
8	Birthdate	19601218	Birthdate, in the format: YYYYMMDD.	O	8
9	Patient Sex	F	Following values are admitted: M : Male F : Female I : Indeterminate (used for Animals) Blank – Unknown.	O	1
10	Patient Race	C	Patient Race.	O	10
11	Patient Address	-	Not Used.	-	-
12	Reserved Field	-	Not Used.	-	-
13	Patient Telephone Number	^+3902566318	Not Used^Ward Phone Number.	O	-^20
14	Attending Physician ID.	0782	Physician Code.	O	35
15	Special Field 1- Patient Age	-	Not Used.	-	-
16	Special Field 2- Patient Type	0	Following values are admitted: 0 : Internal Patient 1 : External Patient.	O	1
17	Patient Height	-	Not Used.	-	-
18	Patient Weight	-	Not Used.	-	-
19	Diagnosis	-	Not Used.	-	-
20	Medication	-	Not Used.	-	-
21	Diet	-	Not Used.	-	-
22	Practice Field #1	-	Not Used.	-	-
23	Practice Field #2	-	Not Used.	-	-
24	Admission Date	-	Not Used.	-	-
25	Admission Status	-	Not Used.	-	-
26	Location	CHIR	Requester, or patient location	O	20
27	Nature of Diagnostic Code	-	Not Used.	-	-
28	Diagnostic Code	-	Not Used.	-	-
29	Patient Religion	-	Not Used.	-	-
30	Maritial Status	-	Not Used.	-	-
31	Isolation Status	-	Not Used.	-	-
32	Language	-	Not Used.	-	-
33	Hospital Service	-	Not Used.	-	-
34	Hospital Istitution	-	Not Used.	-	-
35	Dosage Category	-	Not Used.	-	-

Example:

P|1|1212000|117118112||White^Anna|Black|19601218|F|C|||^+3902566318|0782||0|||
|||||||CHIR

3.7.3 Order Record - LabOnline to Host

The order record contains information about the tests on a single specimen ID.

F	Name – E 1394-97	Values	Comments	Option	Length
1	Record Type ID	O		M	1
2	Sequence Number	1 to 65535	Sequence number.	M	-
3	Specimen ID	25140008	Sample ID: This is the univocal Sample Barcode Identifier. QC: QC Code.	M	35
4	Instrument Specimen ID	^1001^3	Not Used^Rack Id^Position No Rack Id: Rack Id where the sample has been loaded on the instrument Position No: Position of the sample on the rack	O	^5^3
5	Universal Test ID	^^^*****	Fixed value: ^^^*****	^^^M	^^^5
6	Priority	S or R	Following values are admitted: S : Stat R : Routine.	M	1
7	Requested/ Ordered data and time	19981023105715	Request Date and time, in the format: YYYYMMDDhhnnss.	M	14
8	Specimen Collection Date and Time	19981023105715	Sample Draw date and time, in the format: YYYYMMDDhhnnss.	O	14
9	Collection End Time	-	Not Used.	-	-
10	Collection Volume	-	Not Used.	-	-
11	Collector ID.	-	Not Used.	-	-
12	Action Code		Empty for patient. Q: for quality control – Used to identify a Quality Control Sample	O	1
13	Danger Code	-	Not Used.	-	-
14	Relevant Clinical Information	-	Not Used.	-	-
15	Date/Time Specimen Received	-	Not Used.	-	-

16	Specimen Descriptor	SERUM	Sample Material Code	O	20
17	Ordering Physician	-	Not Used.	-	-
18	Physician's Telephone Number	-	Not Used.	-	-
19	User Field No. 1	CHIM	It is sent to the host as it has been received from it.	O	20
20	User Field No. 2	ARCH	It is sent to the host as it has been received from it.	O	1024
21	Laboratory Field No. 1	Lab1	Requesting Laboratory: In a multi-laboratory environment, indicates the laboratory which entered the request into the system.	O	20
22	Laboratory Field No. 2	251400	Primary tube code: This field is optionally used to transmit the Primary Tube Code in case the Sample ID contains an Aliquot Code.	O	35
23	Date/Time Result Reported or Last Modified	-	Not Used.	-	-
24	Instrument Charge to Computer System	-	Not Used.	-	-
25	Instrument Section ID.	-	Not Used.	-	-
26	Report Types	F	(F)inal Result.	O	1
27	Reserved Field	-	Not Used.	-	-
28	Location of Ward of Specimen Collection	-	Not Used.	-	-
29	Nosocomial Infection Flag	-	Not Used.	-	-
30	Specimen Service	-	Not Used.	-	-
31	Specimen Institution	Lab2	Production Lab: In a multi-laboratory environment, indicates the laboratory expected to process the sample.	O	20

Example:

O|1|25140008|^1003^3|^^^*****|R||20161023105715|20161023103519|||||||SERU

M|||CHIM|ARCH|Lab1|251400||||F|||||Lab2

3.7.4   Result Record - LabOnline to Host

The result record contains information about a single parameter, its value can be an input (keyed-in value), default, measured, calculated or estimated.

F	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type	R		M	1
2	Sequence Number	1 to 65535	Sequence number.	M	-
3	Universal Test ID.	*Primary Result* ^^^HCV^HCV^1:10^^ABC1234^32458^^NM *Secondary Result* ^^^HCV.I^HCV.I^1:10^^ABC1234^32458^^CE *RLU Result* ^^^HCV.R^HCV.R^1:10^^ABC1234^32458^^NM	^^^Test Code (*) ^Analysis Code ^Dilution ^Not Used ^Reagent Lot ^Reagent Serial Nr. ^Control Lot Nr. ^Result Type ^Result GUID ^Control GUID1 ^Control GUID2 ^Control GUID3 ^Control GUID4 ^Control GUID5 ^AWOSID ^Batch Id (*) Test Code can contain following suffixes: - ".I" : Interpretative Secondary Result - ".N" : Numeric Secondary Result - ".R" : Raw (RLU) Result.	^^^M ^O ^O ^ ^O ^O ^O ^O ^O ^O ^O ^O ^O ^O ^O ^O	^^^20 ^8 ^10 ^1 ^15 ^5 ^20 ^2 ^50 ^51 ^51 ^51 ^51 ^51 ^100 ^20
4	Measurement Value	7.273	Numeric Value or Coded Value or Free Text depending on result type. For numeric value point is used as decimal separator. (See note at the end of	M	1024

			document for description of graphics results).		
5	Units	mmol/L	Measurement unit, empty for Interpreted results.	O	20
6	Reference Ranges	10 – 120	Normal reference value interval.	O	-
7	Result Abnormal Flags	0	0: Normal result 1: Result out of normal values 2: Result out of attention values 3: Result out of panic values +10 Delta-check +1000 Device alarm.	O	5
8	Nature of Abnormality Testing	H	Instrument Result Flag.	O	50
9	Result Status	F or R	"F" indicating a final result. "R" indicating a rerun.	M	1
10	Date of Change in Instrument Normative Values or Units	-	Not Used.	-	-
11	Operator Identification	Val.Autom.^Admin^FSE	Code of the operator that validated result on LabOnline ^ Code of the operator that validated result on the analyser ^ Code of the operator logged into the system when the result was produced	M^O^O	12^20^20
12	Date/Time Test Starter	201009261006	Sample Check-in or date/time of test creation on worklist		14
13	Date/Time Test Completed	201009261034^201009261033	LabOnline validation result DateTime ^Analyzer Result DateTime	O	14^14
14	Instrument Identification	Architect^^iSR123\ A1234^12^ Location^6^4^	Analyzer code ^ ^SerialNumber	M ^O ^O	12 ^12 ^50

		12	^Rack barcode	^O	^15
			^Tube position	^O	^5
			^Rack location	^O	^10
			^Bay number	^O	^10
			^Process Path ID	^O	^10
			^Processing Lane ID	^O	^10
		After QPL executed: QPL^Architect^ iSR123^A1234^1 2^ Location^6^4^ 12	*After QPL executed:* QPL ^Analyzer code ^SerialNumber ^Rack barcode ^Tube position ^Rack location ^Bay number ^Process Path ID ^Processing Lane ID		
		After ManualEdit: Edit^Architect	*After Manual Edit:* Edit ^Analyzer Code ^SerialNumber ^Rack barcode ^Tube position ^Rack location ^Bay number ^Process Path ID ^Processing Lane ID		

Example:

Primary Result Example
R|1|^^^BENZ^BENZ^1:10^^ABC1234^32458^^NM|7.273|mmol/l|0 - 5|1|H|F||
Val.Autom.^Admin^FSE|20161026100615|20161026103413^20161026102311|Architect^
^C168976^Z0011^3

Secondary (Interpretated) Result Example
R|1|^^^BENZ.I^BENZ.I^1:10^^ABC1234^32458^^CE|Positive|||||F||
Val.Autom.^Admin^FSE|20161026100615|20161026103413^20161026102311|Architect^
^C168976^Z0011^3

Raw (RLU) Result Example
R|1|^^^BENZ.R^BENZ.R^1:10^^ABC1234^32458^^NM|3256|RLU||||F||
Val.Autom.^Admin^FSE|20161026100615|20161026103413^20161026102311|Architect^
^C168976^Z0011^3

3.7.5   Comment Record - LabOnline to Host

Comment records may be inserted anywhere except after the message header or terminator record. Each comment record shall apply to the first non-comment record preceding it.

F	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type ID	C		M	1
2	Sequence Number	1	Sequence Number.	M	-
3	Comment Source	I	Always I indicating Clinical Instrument System	M	1
4	Comment Text	CK^APS^20100 925102955	Comment code^Comment text1^...^Comment textN. See the Legend (*) for the possible Comment Code values and their meaning.	M	2^255 ... ^255
5	Comment Type	G	Fixed value	M	1

(*) Legend
The following comment codes do not need of a structured comment text.
PC = Patient Comment
RC = Request Comment
SC = Sample Comment
TC = Test Comment
Example:
C|1|I|SC^Sample contaminated|G

The following comment codes will have a structured comment text components as described below.
CK = Sample Check-In
    C|1|I|CK^DeviceCode^Check-In date and time (YYYYMMDDHH24MISS)|G
    This notification is sent to inform the Host that LabOnline has received a check-in event for the sample id specified in the order record preceding the above comment record. It contains the device code where the check in has been done, date and time of the event.
Example:
C|1|I|CK^APS^20100925102955|G

SE = Sample Seen
    C|1|I|SE^DeviceCode^Sample seen date and time (YYYYMMDDHH24MISS)|G
    This notification is sent to inform the Host that LabOnline has received a sample seen message for the sample id specified in the order record preceding the above comment record. It contains the device code that has generated the event, date and time of the event

Example:
C|1|I|SE^APS^20100925102955|G

CL = Forced Test Closing
   C|1|I|CL|G
   This notification is sent to inform the Host that in LabOnline a test has been closed
   without any value. The test id is specified in the preceding order record.
Example:
C|1|I|CL|G

TA = Added test
   C|1|I|TA|G
   This notification is sent to inform the Host the a test has been added in Labonline.
   The test id is specified in the preceding order record.
Example:
C|1|I|TA|G

SS = Sample storage
   *C|1|I|SS^Refrigerator^Rack^Position^DeviceCode^Sample storage date and time
   (YYYYMMDDHH24MISS)|G*
   This notification is sent to inform the Host that a sample has been stored in the
   storage module. The sample id is specified in the preceding order record. It contains
   the refrigerator, rack and position where the sample has been strored; the device
   code where the storing has been done; date and time of the event.
Example:
C|1|I|SS^1^5^35^APS^20100925104523|G

HQ = Host-Query
   C|1|I|HQ^DeviceCode^Host-query date and time (YYYYMMDDHH24MISS)|G
   This notification is sent to inform the Host that LabOnline has received a query host.
   The sample id is specified in the order record preceding the above comment record.
   It contains the device code where the host-query has been done, date and time of
   the event.
Example:
C|1|I|HQ^CI8000_1^20100925103115|G

AL = Aliquoting
   *C|1|I|AL^Aliquot type^Aliquot volume^Rack^Position^DeviceCode^Aliquoting date
   and time (YYYYMMDDHH24MISS)|G*
   This notification is sent to inform the Host that LabOnline has received aliquot
   information. The sample id of the aliquot is sent in the order record preceding the
   above comment record. It contains the aliquot type; the aliquot volume; rack and
   position where the aliquote has been placed; the device code where the aliquot has
   been done; date and time of the event.
Example:
C|1|I|AL^SERUM^500^56^25^fe500^20100925083115|G

PT = Primary tube
   *C|1|I| PT^Aliquots number^Rack^Position^DeviceCode^Date and time
   (YYYYMMDDHH24MISS)|G*
   This notification is sent to inform the Host that LabOnline has received information
   about the primary tube. The sample id of the primary tube id is sent in the order

record preceding the above comment record. It contains how many aliquots has been done from the primary tube; rack and position where the primary tube has been placed; the device code from who the information was received; date and time of the event.

Example:
C|1|I|PT^1^23^62^fe500^20100925083115|G

SU = Sample Status Update
C|1|I|SU^Sample_Status^DeviceCode^Rack_Barcode^
Sample_Position^Rack_Position^Bay_Number^Date_Time(YYYYMMDDHH24MISS)|G
This notification is sent to inform the Host that LabOnline has received a Status Update about the tube. The sample id of the primary tube id is sent in the order record preceding the above comment record.
Sample_Status can be valued with following values:
- I = Identified (Sample barcode successfully scanned)
- O = In Process (All tests on sample have been scheduled for processing)
- R = Process Completed (All processing complete on sample and it can be unloaded from analyser)
- L = Left Equipment (Sample has been unloaded from analyser)

The other information will be uploaded if available from the analyser which raised the notification, otherwise they'll be empty.

Example:
C|1|I|SC^SU|I^C160001^A1235^2^13^1^20160614113245|G

TU = Test Status Update
C|1|I|TU^Test_Status^DeviceCode^Test^Analysis^LIS_TestCode^
        Rack_Barcode^Sample_Position^Rack_Position^Bay_Number^
Date_Time(YYYYMMDDDHH24MISS)|G
This notification is sent to inform the Host that LabOnline has received a Status Update about a Test of the tube. The sample id of the primary tube id is sent in the order record preceding the above comment record.
Test_Status can be valued with following values:
- I = Initiated (Test run has initiated on analyser)
- E = Exception (Test run has an exception)
- P = Pending QC (The test run has completed but the result is pending the completion of a release control)
- C = Pending Collation (The test run has completed but is being held for transmission until all other results for this sample)

The other information will be uploaded if available from the analyser which raised the notification, otherwise they'll be empty.

Example:
C|1|I|SC^TU|P^C160001^GLU^GLU^^A1235^2^13^1^20160614113245|G

3.7.6   Message Terminator Record - LabOnline to Host

This will be always the last record in a message.

Field	Name - E 1394-97	Values	Comments	Option	Length
1	Record Type ID	L		M	1
2	Sequence Number	1	1	M	1
3	Termination Code	N	"N" - Normal termination	M	1

Sample: L|1|N

3.8   Note – Format of Graphics (curve) Data

3.8.1 Note1

LabOnline can export graphical data such as electrophoresis curves. The data is sent in the 4th field of the result record: Measurement Value.
The format used is the following:

[GRAPHICS]97:1;167:1;234:1;303:1;312:1;473:1;474:1;FL;256:275:;190:209:;367:380:;@x:y;x:y; ... x:y;

The field begins with the text string "[GRAPHICS]", identifying the result as containing graphics data.

This is followed immediately by on optional section containing the values for the minimum points in the curve. The format is:

x:y;x:y; …. x:y; [last character in the field is a semicolon (";")].

In the above example the are seven minimum points, but this number can vary.

The minimums may be followed by another (optional) section containing data on the bands or spikes of the curve. If present, the beginning of this section is indicated by the token "FL;". The data contains the x coordinates of the bands (start:finish) , plus the name assigned to each band, if present. The format is:

   x1:x2:<name>; x1;x2;<name>; … x1;x2;<name>; [last character in the field is a semicolon (";")]

In the example above, names are not present so there is nothing following the second colon. As with the minimums, fields are separated with the semicolon (";") character.

The beginning of the section containing the x, y coordinates of the curve is indicated by the "@" symbol. The number of points in the curve is not fixed and depends solely on the data received from the instrument. The format is:

   x:y;x:y; … x:y; [last character in the field is a semicolon (";")].