HORIBA
Medical

ABX Micros ES 60 / Micros Care ST
Hematology Analyzer

Output Formats

Ref: RAA043DEN

Output Formats

CE IVD

HORIBA ABX SAS
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Contents

1. Foreword

1.1. Revisions

Internal Reference	Software Version	Document Date Issued
RAA043CEN	2.2.x	June 2013
RAA043DEN	2.4.X	June 2016

1.2. What's New?

Here is the list of major updates in this document release:

The RDW-SD parameter has been added for ASTM and ABX formats:

- Data Presentation (ASTM Format)
- Data Presentation (HL7 Format)

The HL7 format is available:

- HL7 Format

2. Introduction

The ASTM format is recommended by HORIBA Medical for every new connection development. The ABX Format is currently supported to be compliant with existing connections.

Different protocols can be used on HORIBA Medical instrument. A connection between a computer (host) and a HORIBA Medical instrument can be performed when the protocol, the format description and the connection mode have been properly setup.

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). For 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).
Communications packet	All framing required for transmission of data. This framing includes: <STX>[frame number][DATA] [<ETB> or <ETX>][C1][C2] <LF>
Component Field	One of several related pieces of information within a field.
Field	A specific location within a record for a piece of information, indicated by a field delimiter and position.
Frame	A complete communications 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.
<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 communications packet. If the data is longer than 240 characters, then it must be split in two (or more) parts and sent in two (or more) communications packets. The intermediate packet uses the <ETB> character, and the ending packet uses the <ETX> character. No single communications 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).
Session	A total unit of communication activity used in this standard to indicate the events starting with the establishment phase and ending with the termination phase.
Test	A determination of a single analyte or a combination of values from other determinations or observations from which a variable or gradable result is derived.

3. Connection

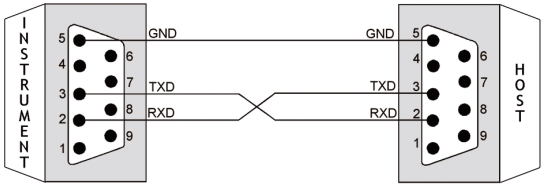
3.1. Serial Connection (RS232)

3.1.1. RS232 Connection Overview

All communications are expected to use the RS232 communication protocol, based on the Electronics Industries Association (EIA) standard RS232-C. As part of the conformance to this standard, the ABX Micros ES 60 / Micros Care ST Data Management System is configured as Data Terminal Equipment (DTE).

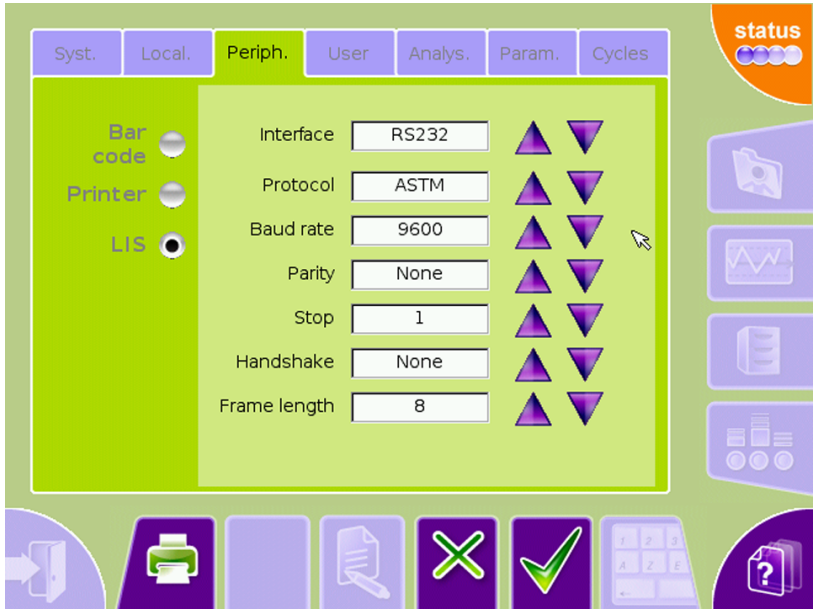
The ABX Micros ES 60 / Micros Care ST Data Management System is connected to the LIS via a DB-9 connector on the octopus cable plugged into the computer workstation on the ABX Micros ES 60 / Micros Care ST.

Pin (DB9) data management	LIS port configuration	LIS cable must provide
3	RXD	TXD
2	TXD	RXD
5	Ground	Ground



3.1.2. Instrument Connection

Access: ***Maintenance menu*** > ***Serv. (tab)*** > ***Settings (button)*** > ***Periph. (tab)*** > ***LIS***



The host and instrument communication port must be set up with:

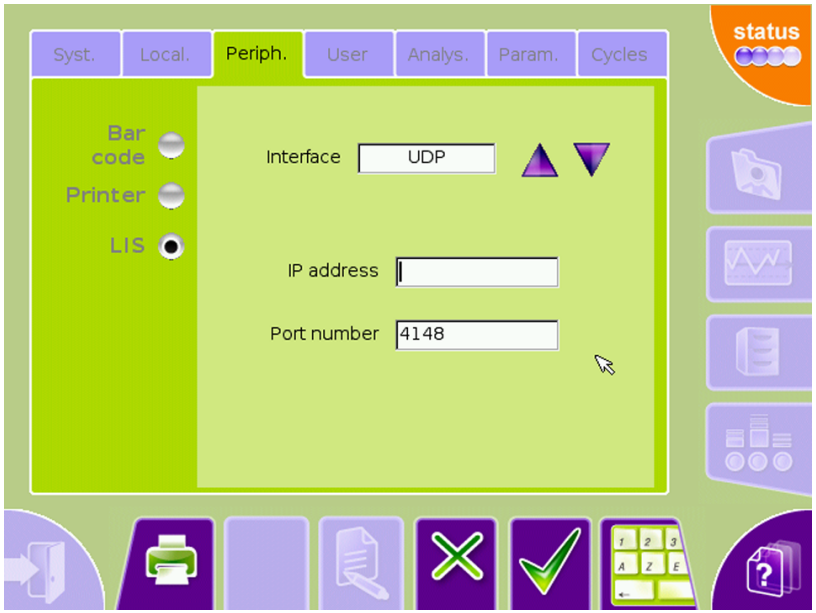
- the baud speed value
- the parity value
- the bit stop value
- the handshake value
- the frame size value

3.2. Ethernet Connection

3.2.1. UDP Mode

*Access: **Maintenance menu** > **Serv. (tab)** > **Settings (button)** > **Periph. (tab)** > **LIS***

The protocol is based on the ASTM standard.



The host socket must be set up with:

- The instrument IP address or DNS address. Go to ***Maintenance menu*** > ***Serv. (tab)*** > ***Settings (button)*** > ***Syst. (tab)*** > ***Network***.
- The port number where the instrument is awaiting connection.

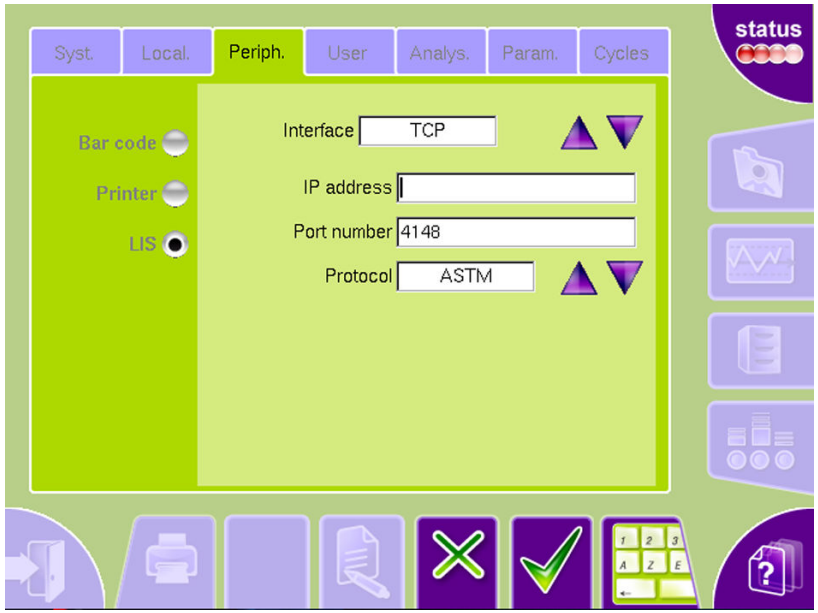
The instrument socket must be set up with:

- The host IP address or DNS address.
- The port number where the host is awaiting connection.

3.2.2. TCP Mode

*Access: **Maintenance menu** > **Serv. (tab)** > **Settings (button)** > **Periph. (tab)** > **LIS***

The protocol is based on the ASTM standard.

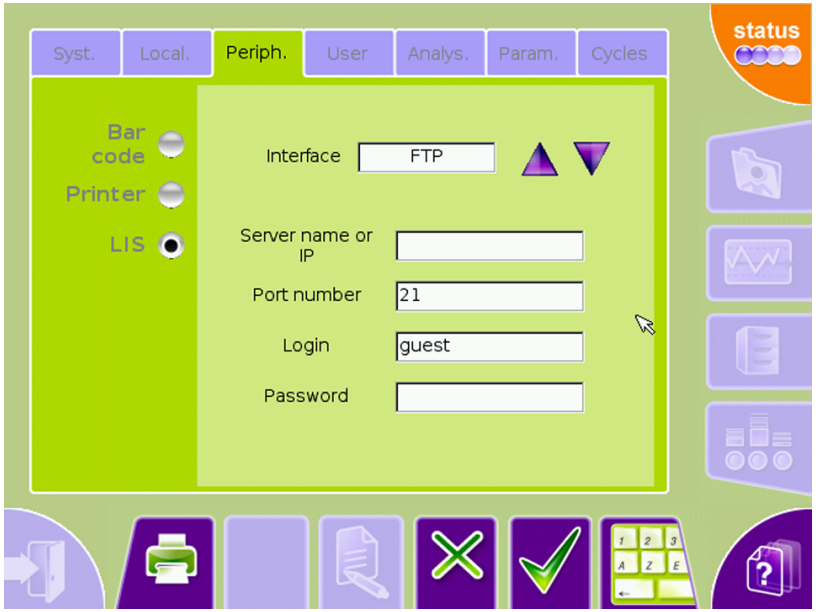


The instrument socket must be set up with:

- The host IP address or DNS address.
- The port number where the host is awaiting connection.

3.2.3. FTP Mode

*Access: **Maintenance menu** > **Serv. (tab)** > **Settings (button)** > **Periph. (tab)** > **LIS***



The instrument starts the connection with the FTP server right before it sends one file result, then it is disconnected.

Each file sent has a specific name "*ModuleSerialNumber_YYYYMMDDhhmmss.astm*", where *ModuleSerialNumber* is the instrument serial number, and *YYYYMMDDhhmmss* is the date and time of the analysis result.

Each line of the transmitted file is a "record" according to the ASTM format. A record has no checksum.

The host options must be set up with:

- The user login and password.
- The port number where the instrument is awaiting connection.
- The location where data is stored.

The instrument options must be set up with:

- The host IP address or DNS address.
- The port number where the host is awaiting connection.
- The user login and password.

4. ASTM Format

The HORIBA Medical analyzers format corresponds to the ASTM specifications E-1381 & E-1394:

- E-1381: Standard specification for low level protocol to transfer messages between clinical and laboratory instruments and computer systems.
- E-1394: Standard specification for transferring information between clinical and laboratory instruments and computer systems.

4.1. Connection Specifications (ASTM E-1381)

4.1.1. Hardware and Software Characteristics

The default format for emitted character is 1 bit start, 8 data bits, No parity, 1 bit stop.

The default communication speed is 38400 bauds.

Hardware settings of the interface:

- RS232 connection via a DB9 connector
- Ethernet connection via an RJ45 cable

4.1.2. Output Data Characteristics

- Characters: ASCII
- Maximum message length: 247 characters
- Xon/Xoff protocol

4.1.3. Communication Protocol

Standard control characters

Control String	Hexadecimal value
<ENQ>	$05
<ACK>	$06
<NAK>	$15
<STX>	$02
<ETX>	$03
<CR>	$0D
<LF>	$0A
<EOT>	$04

Typical discussion between the instrument and the host

Instrument	<>	Host
<ENQ>	>	
	<	<ACK>
<STX>1...Data...<CR><ETX>xx <CR><LF>	>	
	<	<ACK>
<STX>2...Data...<CR><ETX>xx <CR><LF>	>	
	<	<ACK>
<EOT>	>	

Discussion with conflict between the instrument and the host

- Number of transmission if negative answer (NACK): 6
- Timeout if no response: 15 s (Automatic disconnection max. time)
- Retry timeout: None
- Special timing: None
- Description of other specific treatments: None

Defect packet during discussion between instrument and host

Instrument	<>	Host
<ENQ>	>	
	<	<ACK>
<STX>1...Data...<CR><ETX>xx<CR><LF>	>	
	<	<NAK>
<STX>1...Data...<CR><ETX>xx<CR><LF>	>	
	<	<ACK>
<STX>2...Data...<CR><ETX>xx<CR><LF>	>	
	<	<ACK>
<EOT>	>	

4.1.4. ASTM Data Frame Format

A sequential number located after the <STX> character is inserted into each data frame. The frame number is set to 1 when the transfer phase is initialized and is incremented by 1 for each frame up to 7 and then returns to 0.

The frame number allows the receiver to distinguish new and re-transmitted frames. In case of re-transmitted frame (after a <NAK> response from the host), the frame number is not incremented: <STX>1...Data...<CR><ETX>xx<CR><LF>.

Frame format

ASTM field	Definition	Transmitted data	# of bytes	Comments
0	STX	$02	1	
1	Frame number	1 to 7, 0, ...	1	Frame number is set to 1, incremented by 1 for each frame up to 7, and then returns to 0
2	Data message		240 max.	Header, Patient, Order, Result and Comment messages
3	End of data message			
ETX if end frame		1		
4	Checksum		2	
5	CRLF	$0D $0A	2	

Frame checksum

According to ASTM E-1381, the frame checksum (<STX>1...Data...<CR><ETX>xx<CR><LF>) is defined as modulo 256 of ASCII values sum between <STX> not included and <ETX> included characters: 1...Data...<CR><ETX>.

4.2. Records General Format Specifications (ASTM E-1394)

Data frames encapsulate records defined by the ASTM E-1394 norm, records themselves encapsulate ASTM fields.

Record ID	ASTM Definition
H	Header
P	Patient
O	Order
R	Result
C	Comment
L	Terminator record

4.2.1. Structure of Records

Structure of records for order transmission

- H (Header)
- P (Patient)
- C (Patient Comments) optional
- .. O (Order)
- .. C (Order Comments) optional
- L (Terminator)

The transmission of an order without patient record is not allowed, but patient record can be empty. Example: <STX>2P|1<CR><ETX>BB<CR><LF>

Instrument patient file modification by host

- H (Header)
- P (Patient)
- C (Patient Comments) optional
- L (Terminator)

Structure of records for result transmission

- H (Header)
- P (Patient)
- C (Patient Comments) optional
- .. O (Order)
- .. C (Order Comments) optional
- .. C (Run Alarms) optional
- ... . R (Result)
- ... . C (Flag Result) optional
- ... . R (Result)
- ... . C (Flag Result) optional
- .....
- .....
- ... . R (Result)
- ... . C (Flag Result) optional
- L (Terminator)

4.2.2. Description of Records

Only fields described with their specified length are used by HORIBA Medical instruments.

The length of a field can be less than the maximum value but must not be more.

Only “Sample ID” and “Test” fields from the order record are mandatory, all other fields are optional.

Delimiters must be used even if a field is empty.

Delimiters inside records are separated by “|” (ASCII $7C).

Delimiters inside fields are separated by “^” (ASCII $5E).

Header record

ASTM field	Definition	Transmitted data	Field max. length
7.1.1	Record Type	H	1
7.1.2	Delimiters definition	idem standard: ■ \ Repeat delimiter ■ ^ Component delimiter ■ & Escape delimiter	4
7.1.3	Message Control ID		

ASTM field	Definition	Transmitted data	Field max. length
7.1.4	Access Password		
7.1.5	Sender Name	SAT	3
7.1.6	Sender Address		
7.1.7	Reserved		
7.1.8	Sender Telephone Nb		
7.1.9	Characteristics of Sender		
7.1.10	Receiver ID		
7.1.11	Comments or Special Instructions		
7.1.12	Processing ID	P: Production message Q: Quality control message	1
7.1.13	ASTM Version Nb	E 1394-97	9
7.1.14	Date and Time of message	YYYYMMDDHHMMSS	14

Patient record

ASTM field	Definition	Transmitted data	Field max. length
8.1.1	Record Type	P	1
8.1.2	Sequence Nb	1, 2, ...	2
8.1.3	Practice Assigned Patient ID		
8.1.4	Laboratory Assigned Patient ID	Patient Id	16
8.1.5	Patient ID No 3		
8.1.6	Patient Name	Name^First name	40
8.1.7	Mother's Maiden Name		
8.1.8	Birth date	YYYYMMDD	8
8.1.9	Patient Sex	M = Male F = Female	1
8.1.10	Patient Race-Ethnic Origin		
8.1.11	Patient Address		
8.1.12	Reserved		
8.1.13	Patient Telephone Nb		
8.1.14	Attending Physician ID	Text	20
8.1.15	Special Field 1		
8.1.16	Special Field 2		
8.1.17	Patient Height		
8.1.18	Patient Weight		
8.1.19	Patient's Known or Suspected Diagnosis		
8.1.20	Patient Active Medication		
8.1.21	Patient's Diet		
8.1.22	Practice Field 1		
8.1.23	Practice Field 2		
8.1.24	Admission and Discharge Dates		
8.1.25	Admission Status		
8.1.26	Location		
8.1.27	Nature of Alternative Diagnostic Code and Classifiers		
8.1.28	Nature of Alternative Diagnostic Code and Classifiers		
8.1.29	Patient Religion		
8.1.30	Martial status		
8.1.31	Isolation Status		
8.1.32	Language		
8.1.33	Hospital Service		
8.1.34	Hospital Institution	Text	32
8.1.35	Dosage Category		

Order record

ASTM field	Definition	Transmitted data	Field max. length
9.4.1	Record Type	O	1
9.4.2	Sequence Nb	1, 2, ...	2
9.4.3	Sample ID	Sample ID	16
9.4.4	Instrument Specimen ID		
9.4.5	Universal Test ID	^^^LMG	13
9.4.6	Priority		40
9.4.7	Requested/Ordered Date and Time		
9.4.8	Specimen Collection Date and Time	YYYYMMDDHHMMSS	14
9.4.9	Collection End Time	YYYYMMDDHHMMSS	14
9.4.10	Collection Volume		
9.4.11	Collector ID		
9.4.12	Action Code		
9.4.13	Danger Code		
9.4.14	Relevant Clinical Information		
9.4.15	Date/Time Specimen Received		
9.4.16	Specimen Descriptor		
9.4.17	Ordering Physician		
9.4.18	Physician Tel Nb		
9.4.19	User Field 1		
9.4.20	User Field 2		
9.4.21	Laboratory Field 1		
9.4.22	Laboratory Field 2		
9.4.23	Date and Time Results reported or last modified		
9.4.24	Instrument Charge to Computer System		
9.4.25	Instrument Section ID		
9.4.26	Report Types	F: final result	1
9.4.27	Reserved		
9.4.28	Location or Ward of Specimen Collection		
9.4.29	Nosocomial Infection Flag		
9.4.30	Specimen Service		
9.4.31	Specimen institution		

Result record

ASTM field	Definition	Transmitted data	Field max. length
10.1.1	Record Type	R	1
10.1.2	Sequence Nb	1, 2, ...	2
10.1.3	Universal Test ID	^^^parameter name in english^LOINC code	15
10.1.4	Data or Measurement Value	Test result (Data Presentation) or --.--	5
10.1.5	Unit or Set of units	1 = Standard 2 = International 3 = mmol 4 = japanese	1
10.1.6	Reference Range		
10.1.7	Result Abnormal Flag	Analytical flag L,H	1
10.1.8	Nature of Abnormality Testing		
10.1.9	Result Status	W: suspicion N: rejected result F: final result (without flag) X: Parameter exceeding the capacity	1
10.1.10	Date of Change in Normative Values or Units		
10.1.11	Operator Identification		
10.1.12	Date/Time Test Starting		
10.1.13	Date/Time Test Completed	YYYYMMDDHHMMSS	14

Comment record

ASTM field	Definition	Transmitted data	Field max. length
11.1.1	Record Type	C	1
11.1.2	Sequence Nb	1, 2, ...	2
11.1.3	Comment Source	I clinical instrument system	1
11.1.4	Comment Text	Text	100
11.1.5	Comment Type	G:Free text I: Instrument flag comment	1

The comment record is used to transmit:

- The analysis alarms. Refer to Analytical Alarms.
- The WBC, RBC, PLT histograms with thresholds. Refer to Histograms and Thresholds.

Terminal record

ASTM field	Definition	Transmitted data	Field max. length
13.1.1	Record type	L	1
13.1.2	Sequence number	1	1
13.1.3	Termination code	N: Normal	1

4.3. Special characteristics for HORIBA Medical data

4.3.1. Data Presentation

These data correspond to the 10.1.5 field.

Parameters	CBC Code	Standard	SI (international)	mmol/L	Japan
White Blood Cell	**WBC**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^2/mm^3$
Red Blood Cell	**RBC**	$10^6/mm^3$	$10^{12}/L$	$10^{12}/L$	$10^4/mm^3$
Hemoglobin	**HGB**	g/dL	g/L	mmol/L	g/dL
Hematocrit	**HCT**	%	L/L	L/L	%
Mean Corpuscular Volume	**MCV**	μm^3	fL	fL	μm^3
Mean Corpuscular Hemoglobin	**MCH**	pg	pg	fmol	pg
Mean Corpuscular Hemoglobin Concentration	**MCHC**	g/dL	g/L	mmol/L	g/dL
Red Distribution Width	**RDW**	%	%	%	%
Red Distribution Width Standard Deviation	**RDW-SD ***	μm^3	fL	fL	μm^3
Platelets	**PLT**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^4/mm^3$
Platelet Distribution Width	**PDW ***	%	%	%	%
Plateletcrit	**THT ***	%	$10^{-2}L/L$	$10^{-2}L/L$	%
Mean Platelet Volume	**MPV**	μm^3	fL	fL	μm^3

Parameters	LMG Parameters	Standard	SI (international)	mmol/L	Japan
Lymphocytes #	**LYM#**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^2/mm^3$
Lymphocytes %	**LYM%**	%	%	%	%
Monocytes #	**MON#**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^2/mm^3$
Monocytes %	**MON%**	%	%	%	%
Granulocytes #	**GRA#**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^2/mm^3$
Granulocytes %	**GRA%**	%	%	%	%

* PDW, PCT and RDW-SD have not been established as indications for use in United States for this instrument. Their use should be restricted to Research Use Only (RUO). Not for use in diagnostic procedure.

4.3.2. Alarms and Pathologies

4.3.2.1. Suspicion and Reject

When a result is suspected of being abnormal or false, it is not reliable and the instrument returns a flag in field 10.1.9.

Refer to Description of Records.

4.3.2.2. Normal and Panic ranges

Flags when result exceeds normal or panic ranges are transmitted through field 10.1.7, they should be compared, to obtain a full result information, to the ranges set by the user.

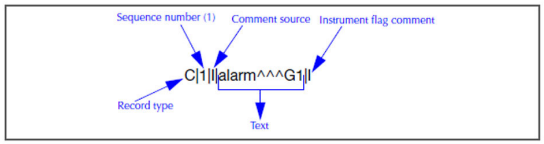
Refer to Description of Records.

4.3.2.3. Analytical Alarms

The analysis alarms are transmitted to a comment record. It follows the order record.

Parameters	Transmitted data
WBC or LMG	L1 M2 G1 G2 G3
PLT	SCL SCH MIC

An analytical alarm record is structured as follow:



4.4. Histograms and Thresholds

The WBC, RBC and PLT histograms and thresholds are transmitted on three comment records.

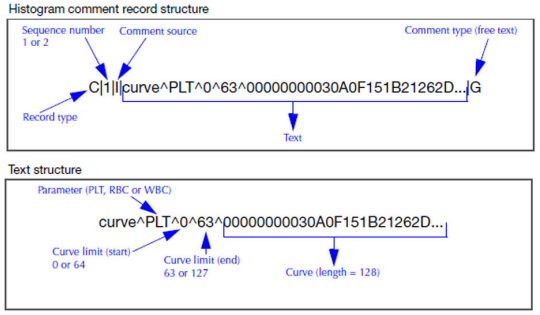
4.4.1. Histograms

The first two comment records contain half the histogram:

- The first comment record contains the histogram from point 0 to 63
- The second comment record contains the histogram from point 64 to 127

These comment records follow the result record for WBC, RBC and PLT.

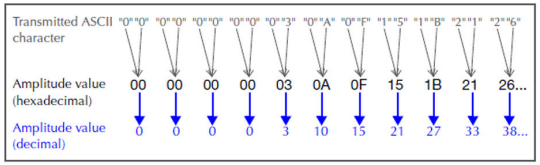
A histogram comment record is structured as follows:



The curve is a sequence of hexadecimal values representing each point of the curve (amplitude value).

Each hexadecimal value is transmitted in ASCII (2 characters per point). Example: for the hexadecimal amplitude value "15", the ASCII characters "1" and "5" are transmitted.

The example below shows the amplitude value (hexadecimal) corresponding to the transmitted values (ASCII).



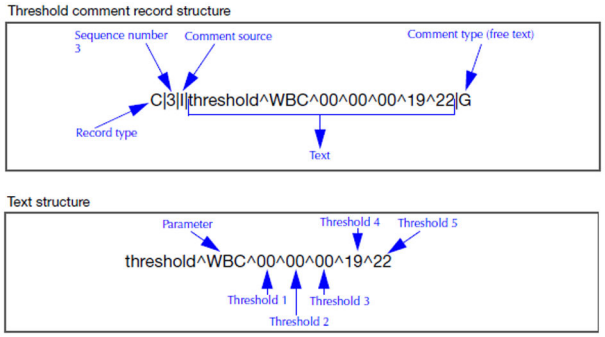
4.4.2. Thresholds

The first two comment records contain half the histogram:

The third comment record contains the threshold (for WBC and PLT only).

This comment record follows the comment records for the WBC and PLT histograms.

A threshold comment record is structured as follows:



The thresholds are the same as those displayed on the instrument:

- One for PLT
- One for WBC

4.5. Example of Result Sent by the Instrument

<ENQ>

<ACK>

<STX>1H|\^&|||SAT||||||P|E 1394-97|20160521173647<CR><ETX>8D<CR><LF>

<ACK>

<STX>2P|1|||||||U|||||||||||||||||||||||<CR><ETX>90<CR><LF>

<ACK>

<STX>3O|1|47||^^^LMG|||160419163833|160419163833|||||||||||||||F|||||<CR><ETX>D0<CR><LF>

<ACK>

<STX>4C|1|I|alarm^^|I<CR><ETX>03<CR><LF>

<ACK>

<STX>5R|1|^^^MPV^776-5|4.2|1||||N|||labtech||20160419163833|<CR><ETX>3A<CR><LF>

<ACK>
<STX>6R|2|^^^PLT^777-3|16|1||||N||labtech||20160419163833|<CR><ETX>0B<CR><LF>
<ACK>
<STX>7R|3|^^^HCT^4544-3|0.2|1||||F||labtech||20160419163833|<CR><ETX>49<CR><LF>
<ACK>
<STX>0R|4|^^^HGB^717-9|7.4|1||||W||labtech||20160419163833|<CR><ETX>23<CR><LF>
<ACK>
<STX>1R|5|^^^MCH^785-6|--.--|1||||X||labtech||20160419163833|<CR><ETX>78<CR><LF>
<ACK>
<STX>2R|6|^^^MCHC^786-4|--.--|1||||X||labtech||20160419163833|<CR><ETX>BC<CR><LF>
<ACK>
<STX>3R|7|^^^MCV^787-2|54|1||||F||labtech||20160419163833|<CR><ETX>FD<CR><LF>
<ACK>
<STX>4R|8|^^^RBC^789-9|0.03|1||||W||labtech||20160419163833|<CR><ETX>62<CR><LF>
<ACK>
<STX>5R|9|^^^RDW^788-0|4.0|1||||F||labtech||20160419163833|<CR><ETX>30<CR><LF>
<ACK>
<STX>6R|10|^^^GRA#^20482-6|--.--|1||||X||labtech||20160419163833|<CR><ETX>2A<CR><LF>
<ACK>
<STX>7R|11|^^^GRA%^14773-6|--.--|1||||X||labtech||20160419163833|<CR><ETX>34<CR><LF>
<ACK>
<STX>0R|12|^^^LYM#^731-0|--.--|1||||X||labtech||20160419163833|<CR><ETX>D3<CR><LF>
<ACK>
<STX>1R|13|^^^LYM%^736-9|--.--|1||||X||labtech||20160419163833|<CR><ETX>E5<CR><LF>
<ACK>
<STX>2R|14|^^^MON#^742-7|--.--|1||||X||labtech||20160419163833|<CR><ETX>D8<CR><LF>
<ACK>
<STX>3R|15|^^^MON%^744-3|--.--|1||||X||labtech||20160419163833|<CR><ETX>DA<CR><LF>
<ACK>
<STX>4R|16|^^^WBC^804-5|0.0|1||||N||labtech||20160419163833|<CR><ETX>4A<CR><LF>
<ACK>
<STX>5L|1|N<CR><ETX>08<CR><LF>
<ACK>
<EOT>

5. ABX Format

The ABX format supports unidirectional or bidirectional connections.

The ABX Micros ES 60 / Micros Care ST instruments use only unidirectional mode.

The ABX format can have a different number of fields according to the transmitted items set up by the user (results, curves, flags, etc.) or to the type of cycle.

Fields sequence is not fixed.

The result identifier is different according to the type of result: patient result ("RESULT"), QC result (QC-RES-M), etc.

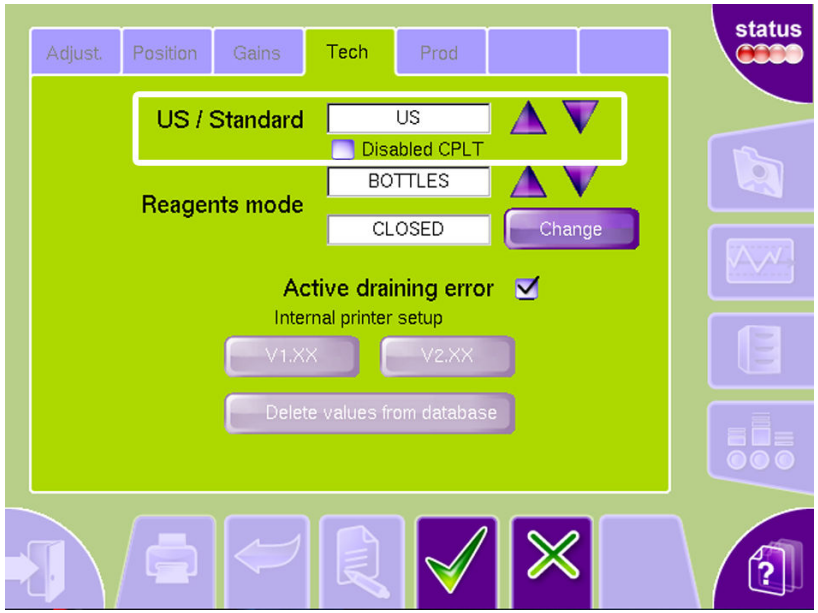
5.1. Protocol Configuration

5.1.1. To Configure the ABX Protocol

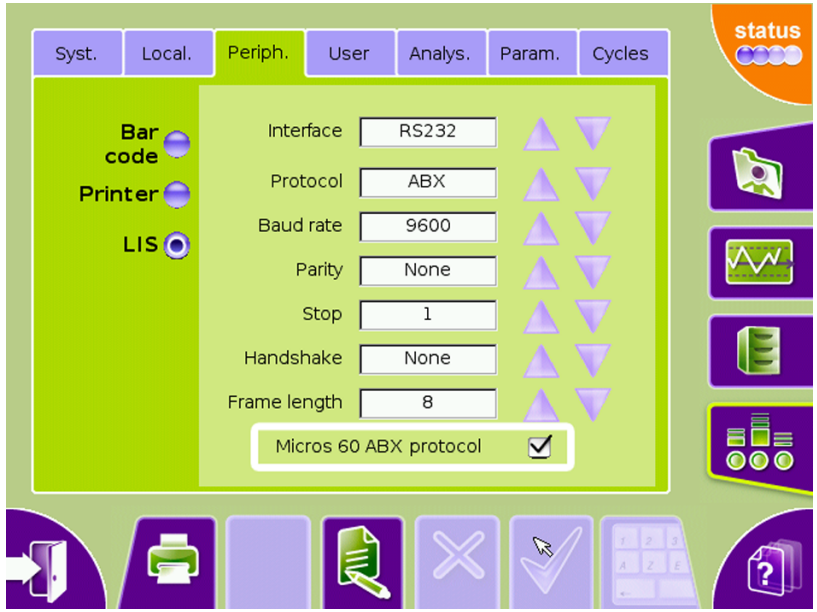
From software version 2.1.x , the LIS configuration connection with the ABX format could be the same as for an ABX Micros 60 by activating the compatibility mode.

Therefore, an ABX Micros 60could be replaced by an A 2.1.x without any modification of the LIS.

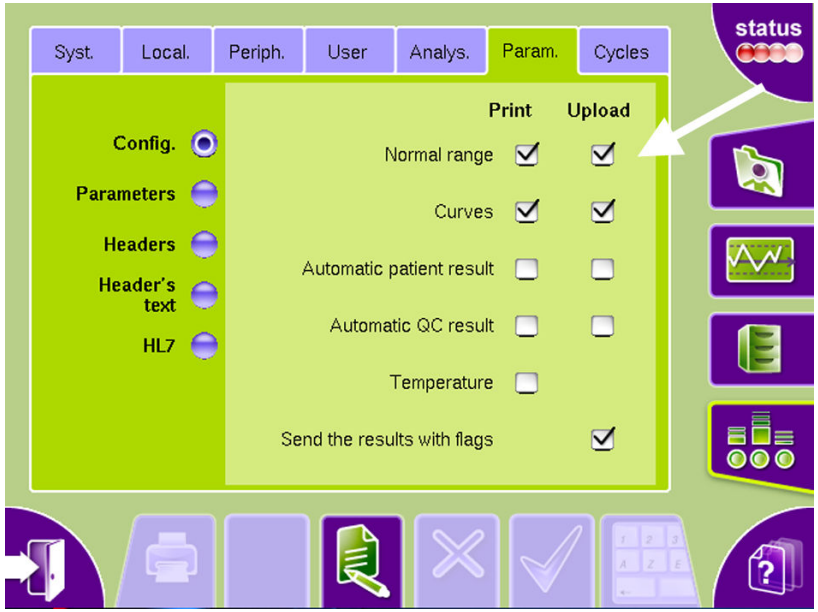
1. Go to ***Maintenance menu*** > ***Adjustement*** > ***Tech.***.
2. Select the US mode.



3. Go to ***Maintenance menu*** > ***Serv. (tab)*** > ***Settings (button)*** > ***Periph. (tab)*** > ***LIS*** and select the **Micros 60 ABX protocol** check box.



4. If necessary, go to ***Maintenance menu*** > ***Serv. (tab)*** > ***Settings (button)*** > ***Param. (tab)*** and select the **Normal range** check box to activate the normal ranges transmission to the LIS.



If the compatibility mode is activated:

- The content of the "0xFF", "u", "s" and "v" field is the same as for an ABX Micros 60. Refer to Identifier list (Instrument to Host).
- The analysis date is send to the LIS with the format selected in the ***Local*** tab. For example, if the format "YYYY/MM/DD" is selected, the date is sent to the LIS with the format "YY/MM/DD" (length limitation in the specifications of the ABX format).
- The empty field "Q" on all data frames is added.

5.1.2. Message Structure

Unidirectional mode

Instrument	<>	Host	Comment
<STX> + RESULT + <ETX>	>		

Lines structure

Header:

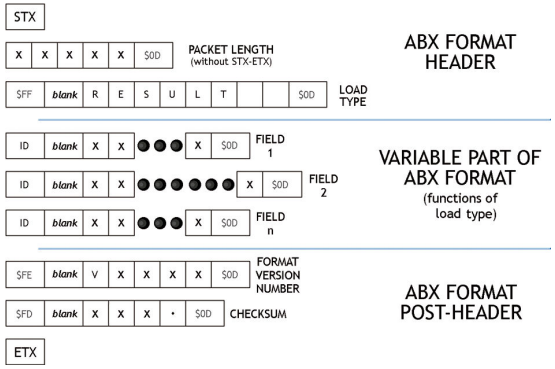
- STX
- Size + carriage return (Size: 5 bytes representing the total amount of the data except STX and ETX)
- Identifier followed by a load type + carriage return (Load: 8 character string preceded by a blank indicating the type of data)

Variable part:

- Identifier followed by the Information associated to the load type + carriage return (Identifier: 1 byte moving about $21 to $FF, it describes the information type which follows this indicator, always followed by a blank character $20)
- Remainder of the other Identifiers and Information associated to the load type +carriage returns.
- Other load type blocs + associated Information

Post-header:

- Identifier followed by checksum + carriage return (shecksum: Sum modulo 65536 of all characters except ETX, STX and all information about checksum (identifier - space - checksum - carriage return) in the hexadecimal format on 4 bytes, preceded by a blank character $20).
- ETX



Standard control characters

Control String	Hexadecimal value
<ENQ>	$05
<ACK>	$06
<NAK>	$15
<STX>	$02
<ETX>	$03
<CR>	$0D
<LF>	$0A
<EOT>	$04
<SOH>	$01

5.2. Data Transmitted by the Analyzer to the Host

5.2.1. Packet Type

The information described in the packet type allows the specification of the global message content: hematological routine results or statistic results.

Data packet string (8 characters)	Use
RESULT	Hematological result transmission on a routine mode
QC-RES-M	Result transmission of a median level control blood
REASSESS	Result transmission of a control blood in ABX Micros 60 compatibility
RESNOR-H	High limits for QC or patient result
RESNOR-L	Low limits for QC or patient result

5.2.2. Identifier list (Instrument to Host)

ABX Micros 60 compatibility mode disable

Identifier	Correspondence	Example	Length	Format
$70 p	Analyzer number	1	2+2+1	Integers
$71 q	Analysis date and time	31/12/99 13h15mn31s	2+19+1	String(19)
$73 s	Analyzer sequence number	Always empty		
$74 t	Sampling mode	M: manual (open tube) R: rack (close tube)	2+1+1	String(1)
$75 u	Id # or sample id.	1450302154275-42	2+16+1	String(16)
$76 v	Id.: patient name and first name	SMITH Ronald	2+30+1	String(30)
$80 ç	Analysis type	A: CBC D: LMG	2+1+1	String(1)

ABX Micros 60 compatibility mode enable

Identifier	Correspondence	Example	Length	Format
$70 p	Analyzer number	1	2+2+1	Integers
$71 q	Analysis date and time	User configuration	2+19+1	String(19)
$73 s	Analyzer sequence number	QC = 8888 Patient result = SID		
$74 t	Sampling mode	M: manual (open tube) R: rack (close tube)	2+1+1	String(1)
$75 u	Id # or sample id.	QC = 8888 Patient result = SID	2+16+1	String(16)
$76 v	Sample ID	Sample ID	2+30+1	String(30)
$80 ç	Analysis type	A: CBC D: LMG	2+1+1	String(1)
$51 Q	Empty	Empty string	2+28+1	String(28)
$7F	Species	Dog	2+16+1	String(16)

5.2.2.1. Numerical Results Fields

From software version 2.1.x , the instrument sends the patients results to the LIS only in standard units, whatever the units system that is configured in the instrument is Standard, mmol/L, International, Japanese.

If one parameter cannot be calculated by the analyzer, the field is replaced with --.--.

Parameter status: Following the numerical field, a first digit gives the counting rejection status or the suspicion, a second one gives the parameter value status according to high and low normal ranges, to high and low extreme values and to the overloading capacities.

Identifier first digit

First digit (letter)	Correspondence
$52 R	Parameter rejected for a counting default
$42 B	Incorrect balance between the counting methods
$53 S	Suspicious parameter value
$20 blank	No anomaly observed

Identifier second digit

Second digit (letter)	Correspondence
$42 B (french) or $4C L (other languages)	Parameter < to the lower extreme value
l$62 b (french) or $6C l (other languages)	Parameter < to the low normal value
$20 blank	Parameter normal value
$68 h	Parameter > to the high normal value
$48 H	Parameter > to the high extreme value
$43 C	Platelet concentrate
$4F O	Parameter exceeding the capacity

Example: 5.5 millions RBC with a counting error in the standard units:

- $32 $20 $30 $35 $2E $35 $30 $52 $68 $0D or
- «2 05.50Rh» + carriage return

CBC numerical result fields list

Identifier	Correspondence	Example	Length
$21 !	WBC	7.4	2+String(7)+1
$32 2	RBC	4.64	2+String(7)+1
$33 3	HGB	14.17	2+String(7)+1
$34 4	HCT	43.95	2+String(7)+1
$35 5	MCV	94.68	2+String(7)+1
$36 6	MCH	30.53	2+String(7)+1
$37 7	MCHC	32.24	2+String(7)+1
$38 8	RDW-CV	12.98	2+String(7)+1
$39 9	RDW-SD	40	2+String(7)+1
$40 @	PLT	401	2+String(7)+1
$41 A	MPV	7.94	2+String(7)+1
$42 B	THT	0.318	2+String(7)+1
$43 C	PDW	13.5	2+String(7)+1

LMG numerical result fields list

Identifier	Correspondence	Example	Length
$21 !	WBC	7.4	2+String(7)+1
$22 "	Lymphocytes (#)	2.03	2+String(7)+1
$23 #	Lymphocytes (%)	27.4	2+String(7)+1
$24 $	Monocytes (#)	0.7	2+String(7)+1
$25 %	Monocytes (%)	9.4	2+String(7)+1
$26 &	Granulocytes (#)	4.67	2+String(7)+1
$27 '	Granulocytes (%)	63.2	2+String(7)+1
$32 2	RBC	4.64	2+String(7)+1
$33 3	HGB	14.17	2+String(7)+1
$34 4	HCT	43.95	2+String(7)+1
$35 5	MCV	94.68	2+String(7)+1

Identifier	Correspondence	Example	Length
$36 6	MCH	30.53	2+String(7)+1
$37 7	MCHC	32.24	2+String(7)+1
$38 8	RDW-CV	12.98	2+String(7)+1
$39 9	RDW-SD	40	2+String(7)+1
$40 @	PLT	401	2+String(7)+1
$41 A	MPV	7.94	2+String(7)+1
$42 B	THT	0.318	2+String(7)+1
$43 C	PDW	13.5	2+String(7)+1

5.2.2.2. Flag Fields

Flags are transmitted in a comprehensive mode (same presentation than on the screen, that is to say dependant from the language).

They are replaced with blanks when the flag is not detected.

In the following tables, identifiers formats are separated by blanks only for a better comprehension.

Identifier list

Identifier	Parameters	Format	Length
$50 P	WBC or LMG	L1 M1 M2 G1 G2 G3	2+12+1
$53 S	PLT	Pc Sc Mc	2+6+1

For $FB and $FF, the strings having less than 8 characters are completed on the right side by blanks.

5.2.2.3. Other Identifiers

For $FB and $FF, the strings having less than 8 characters are completed on the right side by blanks.

Identifier	Correspondence	Format	Length
$FB û	Analyzer name MICROS60	Character string	2+8+1
$FD ý	16 bits checksum value	4 hexadecimal bytes	2+4+1
$FE Þ	Version N° of Identifier list	String of characters: Vx.xx	2+5+1

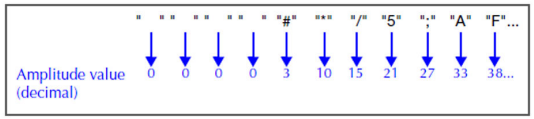
5.3. Histograms and Thresholds

5.3.1. Histograms

Histograms are transmitted on 128 channels, preceded by a blank. They are automatically re-scaled to a 223 maximum amplitude value. The zero amplitude value is $20, the maximum amplitude value is $FF.

The curve is transmitted by a sequence of points corresponding to the amplitude, each point of the curve is transmitted in ASCII format (one byte).

The example below shows the amplitude value corresponding to the transmitted values.



5.3.2. Separation Thresholds

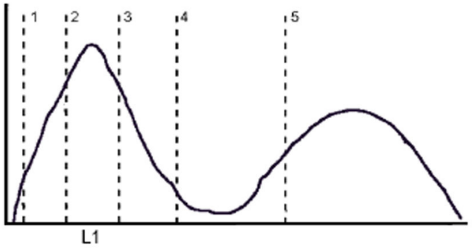
It is the channel number (decimal value) enclosing areas on the histograms. Each threshold is transmitted on 3 bytes preceded by a blank.

WBC thresholds

Separation thresholds 1-2-3 allow the L1 flag determination. For the analyzers in LMG mode, the 4-5 thresholds allow the separation of the 3 populations Lymphocytes, Monocytes and Granulocytes.

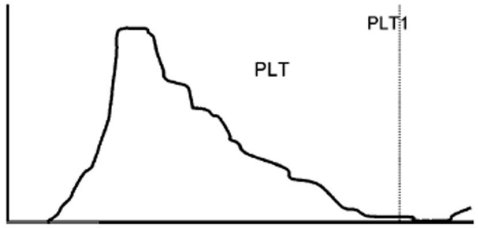
Example 1: output format of the WBC curve thresholds for an LMG sampling. In this example, the analyzer does not send the calculation thresholds of the L1 flag.

«] 000 000 000 040 060» + carriage return.



PLT thresholds

Threshold 1 is the number of the last channel used to calculate the PLT number.



Identifier	Parameters	Format	Length
$57 W	WBC	Amplitude of each channel	2+128+1
$58 X	RBC	Amplitude of each channel	2+128+1
$59 Y	PLT	Amplitude of each channel	2+128+1
$5D]	WBC thresholds	5 thresholds	1+20+1
$5F _	PLT thresholds	1 threshold	1+4+1

5.4. Example of Result Sent by the Instrument

ÿ RESULT
p 08
q 16/04/19 16h43mn51s
u 50
s
v
t M
€ D
! 011.1
2 05.88

3 012.5S

4 048.10

500 082

6 021.30

7 026.00

8 013.90

9 --.--

@ 00292

A 009.1

B --.--

C --.--

000.7

3.40%

' 095.9

000.0 $ 000.3 & 010.8 W $'()+**)+,---0479>@BCHNRSUUUUUXWXUQNJF@><9955230/--+++..
000013557:;=?DECEGIHKLOMNPSSQQSXZZZYZXUSSTROKGEEEÿ

X $#" !!!!"#$+1@Uv"´ÔîïÿéáÐ½ª¤•…ymdbZZQQKMJGDBA:<;654.1/,+)*&'%%#$$###"!"""!!!!!! !!! ! !
&

Y !$()-/38:=?ACEHHIJMMNLJJJIIIHHEGEDBA>=<9987664311...,,,++)(((''&&&&$$$
$####"""""""""!!!!!! ! !!!!!!!!""!!!!!!!!!!!"""###$

S PcScMc

_ 105

P L1M1M2G1G2G3

] 000 000 000 025 036

û MICROS60

þ V2.8

ý 993C

[ETX]

6. HL7 Format

HL7 content is enclosed by special characters to form a block.

The block format is < SB> HL7 Message < EB> < CR>.

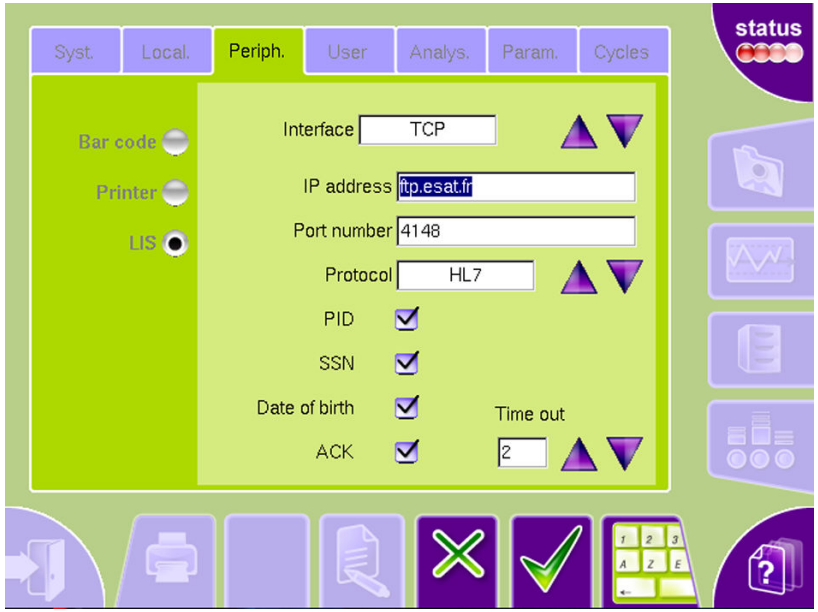
The characters below shall surround the HL7 TCP message:

Element	Description	Value	Comment
<SB>	Start Block character (1 byte)	<0x0B> / <VT>	Vertical Tab
HL7 Message	This is the HL7 data content of the block	The data can contain any single-byte values greater than 0x1F and the ASCII carriage return character <CR>	
<EB>	End Block character (1 byte)	<0x1C> / <FS>	File Separator
<CR>	Carriage Return (1 byte)	<0x0D> / <CR>	Carriage Return

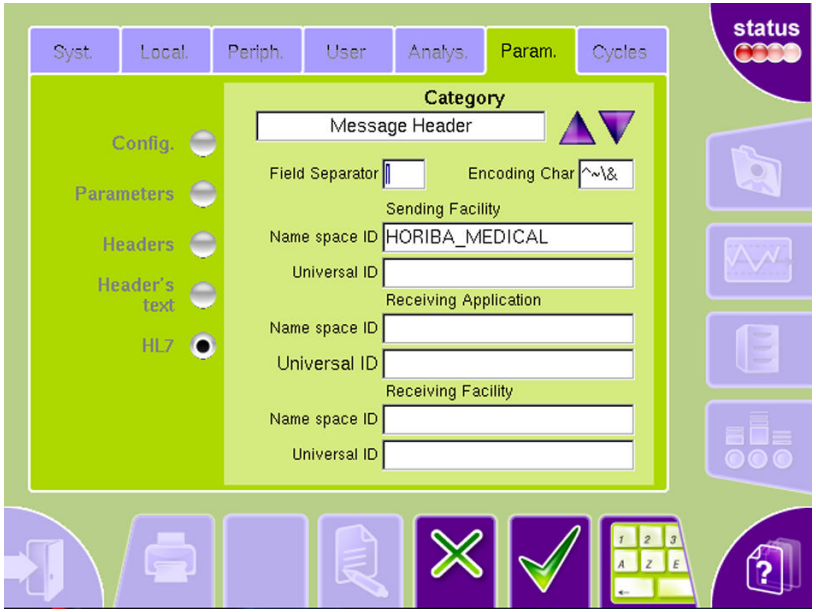
6.1. Protocol Configuration

6.1.1. To Configure the HL7 Protocol

1. Go to ***Maintenance menu*** > ***Serv. (tab)*** > ***Settings (button)*** > ***Periph. (tab)*** > ***LIS*** and press **Edit**.
2. Select the **TCP** interface and the **HL7** protocol.
3. Edit your configuration.
   Refer to PID - Patient Identification Segment.



4. Go to ***Maintenance menu*** > ***Serv. (tab)*** > ***Settings (button)*** > ***Param. (tab)*** > ***HL7*** and press **Edit**.
5. Configure the **Message Header** and **Ordering Facility** categories.
   Refer to MSH - Message Header Segment.



6. Press **Validate**.

6.1.2. Message Structure

Messages

A message is the atomic unit of data transferred between systems. It is composed of a group of segments in a defined sequence. Each message has a message type that defines its purpose.

Segments and segment groups

A segment is a logical grouping of data fields. Segments of a message may be required or optional. They may appear only once in a message or they may be allowed to repeat. Each segment has a name.

Each segment is identified by a unique three-character code known as the Segment ID. Two or more segments may be organized as a logical unit called a segment group. A segment group may be required or optional and might or might not repeat.

Each message is defined in special notation that lists the segment IDs in the order they would appear in the message.

- Braces { . . . }, indicate one or more repetitions of the enclosed group of segments. The group may contain only a single segment.
  Brackets [. . .], show that the enclosed group of segments is optional.

If a group of segments is optional and may repeat it should be enclosed in brackets and braces [{...}].

Fields

A field is a string of characters.

HL7 does not take into account how systems store data within an application.

When fields are transmitted, they are sent as character strings.

Whether the field is required, optional, or conditional in a segment, this information is provided in the column labeled OPT.

The designations are:

Designation	Description
R	Required
RE	Required but may be Empty: The field or data type component description must stipulate when the field or data type component may be empty.
O	Optional
C	Conditional on the triggered event or on some other field(s). The field definitions following the segment attribute table should specify the algorithm that defines the conditionality for this field.
X	Not used with this triggered event
B	Left in for backward compatibility with previous versions of HL7. The field definitions following the segment attribute table should denote the optionality of the field for prior versions.
W	Withdrawn

Final structure ABX Micros ES 60 / Micros Care ST

Segment	Meaning	Usage	Card
MSH	Message Header	R	[1..1]
MSA	Message Acknowledgment	R	[1..1]
[{ ERR }]	Error	O	[0..X]

6.1.3. Data Presentation

Parameters	CBC Code	Standard Conventional	SI (international)	mmol/L	Japan
White Blood Cell	**WBC**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^2/mm^3$
Red Blood Cell	**RBC**	$10^6/mm^3$	$10^{12}/L$	$10^{12}/L$	$10^4/mm^3$
Hemoglobin	**HGB**	g/dL	g/L	mmol/L	g/dL
Hematocrit	**HCT**	%	L/L	L/L	%
Mean Corpuscular Volume	**MCV**	μm^3	fL	fL	μm^3
Mean Corpuscular Hemoglobin	**MCH**	pg	pg	fmol	pg
Mean Corpuscular Hemoglobin Concentration	**MCHC**	g/dL	g/L	mmol/L	g/dL
Red Distribution Width	**RDW-CV**	%	%	%	%
Red Distribution Width Standard Deviation	**RDW-SD ***	μm^3	fL	fL	μm^3
Platelets	**PLT**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^4/mm^3$
Platelet Distribution Width	**PDW ***	%	%	%	%
Plateletcrit	**PCT ***	%	$10^{-2}L/L$	$10^{-2}L/L$	%
Mean Platelet Volume	**MPV**	μm^3	fL	fL	μm^3

Parameters	LMG Parameters DIFF Code	Standard	SI (international)	mmol/L	Japan
Lymphocytes #	**LYM#**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^2/mm^3$
Lymphocytes %	**LYM%**	%	%	%	%
Monocytes #	**MON#**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^2/mm^3$
Monocytes %	**MON%**	%	%	%	%
Granulocytes #	**GRA#**	$10^3/mm^3$	$10^9/L$	$10^9/L$	$10^2/mm^3$
Granulocytes %	**GRA%**	%	%	%	%

* PDW, PCT and RDW-SD have not been established as indications for use in United States for this instrument. Their use should be restricted to Research Use Only (RUO). Not for use in diagnostic procedure.

6.2. OUL Message Segments

6.2.1. Interaction Diagram

ABX Micros ES 60 / Micros Care ST only uses one kind of IHE consortium transaction: LAB-23.

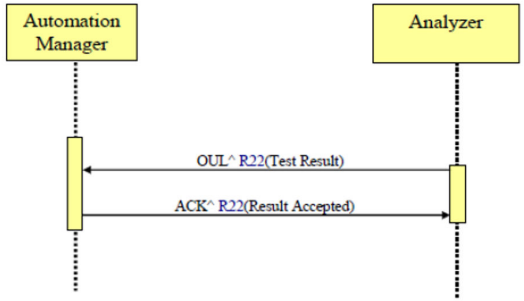
This transaction uses two message types:

- OUL^R22^OUL_R22
- ACK

The OUL message is used by the analyzer to send test results to the automation manager.

If acknowledgment is required, the timeout can be defined, default value is 2 seconds (step 1 second, Min 1 - Max 120). This timeout starts at the end of message OUL transmission.

Acknowledgment with error warns the user and is traced in the alarm log. Automatic retransmission is not possible.



6.2.2. MSH - Message Header Segment

The MSH segment defines the intent, source, destination, and some specifics of the syntax of a message.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
0	3		R		Segment ID	MSH	
1	1	ST	R		Field Separator	| (Pipe)	X
2	4	ST	R		Encoding characters	^~\&	X
						^: sub field delimiter	
						~: repeat sub field delimiter	
						\: ESCAPE sequence	
						&: sub filed component delimiter	

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
3	43	HD	R	361	Sending Application	Micros_ES60^2.4.0^ ^	
	20	IS	R	300		NameSpace ID: Micros_ES60	
	20	ST	C			Universal ID: 2.4.0 (Software version)	
	1	ID	C	301		Universal ID type: empty	
4	43	HD	R	362	Sending Facility	HORIBA_MEDICAL	
	20	IS	R	300		NameSpace ID : HORIBA_MEDICAL	X
	20	ST	C			Universal ID : empty	X
	1	ID	C	301		Universal ID type : empty	
5	43	HD	R	361	Receiving Application	^^	
	20	IS	R	300		NameSpace ID: empty	X
	20	ST	C			Universal IS: empty	X
	1	ID	C	301		Universal IS type: empty	
6	43	HD	R	362	Receiving Facility	^^	
	20	IS	R	300		NameSpace ID: empty	X
	20	ST	C			Universal IS: empty	X
	1	ID	C	301		Universal IS type: empty	
7	14	TS	R		Date/Time of message	Date Time HL7 Message is created Format = YYYYMMDDhhmmss	
8		ST	X		Security		
9	14	MSG	R		Message Type	OUL^R22^OUL_R22	
10	17	ST	R		Message Control ID	MSH.7 + ms Format = YYYYMMDDhhmmss	

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
11	1	PT	R		Processing ID	P (Production) D (Debugging) Default setting depending on user profile: ■ Tech: D ■ Others: P	
12	3	VID	R		Version ID	Default HL7 version= "2.5"	X (read only)
13		NM	O		Sequence number		
14		ST	O		Continuation Pointer		
15	2	ID	O	155	Accept Acknowledgment Type		
16	2	ID	O	155	Application Acknowledgement Type		
17	3	ID	O	399	Country Code		
18	5..15	ID	O	211	Character Set	UNICODE UTF-8	
19		CWE	O		Principal language of message		
20	3..13	ID	O	356	Alternate character set handling scheme		
21		EI	O		Message Profile Identifier		

6.2.3. PID - Patient Identification Segment

The PID segment is used by all applications as the primary means of communicating patient identification information. This segment contains permanent patient identifying and demographic information.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
0	3		R		Segment ID	PID	
1	1..4	SI	O	Set ID - PID	1 (Only one PID by message)		
2			B	Patient ID	See PID-3		
3	PID: 20 SSN: 20	CX	R	203	Patient Identifier List	PID; PID value^^^^PI^ SSN: Social Security Number^^^^SS^	X (mandatory or not)
4			B		Alternate Patient ID - PID		
5		XPN	R	200	Patient Name	LastName^FirstName	
6		XPN	O		Mother's maiden name		
7		TS	O		Date/Time of Birth	Date of Birth Format = YYYYMMDD	
8		CWE	O	1	Administrative Sex		
9			X		Patient Alias		
10		CWE	RE	5	Race		
11		XAD	RE		Patient Address		
12			X		Country Code		
13		XTN	O		Phone Number - Home		
14		XTN	O		Phone Number - Business		
15		CWE	O	296	Primary Language		
16		CWE	O	2	Marital Status		
17		CWE	O	6	Religion		
18		CX	RE	61	Patient Account Number		
19			B		SSN Number Patient		
20			X		Driver License Number Patient		

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
21		CX	O	61	Mother's Identifier		
22		CWE	O	189	Ethnic Group		
23		ST	O		Birth Place		
24	1..1	ID	O	136	Multiple Birth Indicator		
25		NM	O		Birth Order		
26		CWE	O	171	Citizenship		
27		CWE	O	172	Veterans Military Status		
28			X		Nationality		
29		DTM	O		Patient Death Date and Time		
30	1..1	ID	O	136	Patient Death Indicator		
31	1..1	ID	RE	136	Identity Unknown Indicator		
32		CWE	RE	445	Identity Reliability Code		
33		DTM	O		Last Update Date/Time		
34		HD	O		Last Update facility		
35		CWE	C	446	Species Code		
36		CWE	C	447	Breed Code		
37		ST	O		Strain		
38		CWE	O	429	Production Class Code		
39		CWE	O	171	Tribal Citizenship		

6.2.4. SPM - Specimen Segment

The intent of this segment is to describe the characteristics of a specimen.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE
0	3		R		Segment ID	SPM
1	1..4	SI	O		Set ID - SPM	Always «1» (Only one sample by message)
2	16	EIP	O		Specimen ID	Sample ID
3		EIP	O		Specimen Parent IDs	
4		CWE	R	48	Specimen Type	'WB'
5		CWE	O	541	Specimen Type Modifier	
6		CWE	O	371	Specimen Additives	
7		CWE	O	488	Specimen Collection Method	
8		CWE	O	542	Specimen Source SIte	
9		CWE	O	542	Specimen Source Site Modifier	
10		CWE	O	543	Specimen Collection Site	
11		CWE	O	369	Specimen Role	
12		CQ	O		Specimen Collection Amount	
13		NM	C		Grouped Specimen Count	
14		ST	O		Specimen Description	
15		CWE	O	376	Specimen Handling Code	
16		CWE	O	489	Specimen Risk Code	
17		DR	O		Specimen Collection Date/Time	
18		DTM	O		Specimen Received Date/Time	
19		DTM	O		Specimen Expiration Date/Time	
20	1..1	ID	O	136	Specimen availability	
21		CWE	O	490	Specimen Reject Reason	
22		CWE	O	491	Specimen Quality	
23		CWE	O	492	Specimen Appropriateness	
24		CWE	O	493	Specimen Condition	
25		CQ	O		Specimen Current Quantity	
26		NM	O		Number of Specimen Containers	
27		CWE	O	9999	Container Type	

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE
28		CWE	O	544	Container Condition	
29		CWE	O	494	Specimen Child Role	

6.2.5. OBR - Observation Request Segment

In the reporting of clinical data, the OBR serves as the report header. It identifies the observation set represented by the following atomic observations. It includes the relevant ordering information when that applies. It contains many of the attributes that usually apply to all of the included observations.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE
0	3		R		Segment ID	OBR
1	1..4	SI	O		Set ID - OBR	Always = 1 (Only 1 patient results per ile)
2		EI	RE		Placer Oreder Number	See SPM-2 for SID
3		EI	O		Filler Order Number	
4		CWE	R	9999	Universal Service Identifier	^CBC
5			X		Priority	
6			X		Requested Date/Time	
7		DTM	O		Observation Date/Time #	Analysis Date Time (Date Time Results analyzed) Format = YYYYMMDDHHMMSS
8		DTM	O		Observation End Date/Time #	
9		CQ	X		Collection Volume	
10		XCN	O		Collector Identifier	
11	1..1	ID	O	65	Specimen Action Code	
12		CWE	X	9999	Danger Code	
13		ST	X		Relevant Clinical Information	
14			X		Specimen Received Date/Time	
15			X		Specimen Source	See SPM-4
16	60	XCN	R		Ordering Provider	ID^LastName^FirstName
	15	ST			ID number	
	50	ST			Family Name	
	30	ST			Given Name	
17		XTN	O		Order Callback Phone Number	
18		ST	X		Placer Field 1	
19		ST	X		Placer Field 2	
20		ST	X		Filler Field 1	
21		ST	X		Filler Field 2	See ORC-21 and 22
22		DTM	C		Results Rpt/Status Chng Date/ Time	(Date Time results reported = user validation)
23		MOC	X		Charge to practice	
24	2..3	ID	C	74	Diagnostic Serv Sect ID	
25	1..1	ID	R	123	Results Status	Always = «F» for Final
26		PRL	X		Parent Result	
27			X		Quantity/Timing	
28		XCN	O		Result Copies To	
29		EIP	X		Parent	
30	4..4	ID	X	124	Transportation Mode	
31		CWE	O	9999	Reason for Study	
32		NDL	O		Principal Results Interpreter	
33		NDL	O		Assistant Results Interpreter	
34		NDL	O		Technician	
35		NDL	O		Transcriptionist	
36		DTM	O		Scheduled Date / Time	

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE
37		NM	O		Number of Sample Container	
38		CWE	O	9999	Transport Logistics of Collected Sample	
39		CWE	O	9999	Collector Comment	
40		CWE	X	9999	Transport Arrangement Responsibility	
41		ID	X	224	Transport Arranged	
42		ID	X	225	Escort Required	
43		CWE	X	999	Planned Patient Transport Comment	
44		CNE	O	88	Procedure Code	
45		CNE	O	340	Procedure Code Modifier	
46		CWE	O	144	Placer Supplemental Service Information	
47		CWE	O	411	Filler Supplemental Service Information	
48		CWE	X	476	Medically Necessary Duplicate Procedure Reason	
49		CWE	O	507	Result Handling	

6.2.6. ORC - Common Order Segment

The Common Order segment (ORC) is used to transmit fields that are common to all orders.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
0	3		R		Segment ID	ORC	
1	2..2	ID	R	119	Order Control	Default = "SC" Status changed (Status defined in ORC-5)	
2		EI	C		Placer Order Number	See SPM-2 for SID	
3		EI	C		Filler Order Number		
4		EI	RE		Placer Group Number		
5	2..2	C	C	38	Order Status	Default = "CM" Order is completed	
6	1..1	C	O	121	Response Flag		
7		W	B		Quantity/Timing		
8		EIP	X		Parent		
9		DTM	R		Date/Time of Transaction		
10		XCN	RE		Entered By		
11		XCN	RE		Verified By		
12		XCN	O		Ordering Provider	See OBR-16	
13		PL	O		Enterer's Location		
14		XTN	O		Call Back Phone Number		
15		DTM	O		Order Effective Date/Time		
16		CWE	RE	9999	Order Control Code Reason		
17		CWE	RE	9999	Entering Organization		
18		CWE	O	9999	Entering Device		
19		XCN	O		Action By		
20		CWE	X	339	Advanced Beneficiary Notice Code		
21	69	XON	RE		Ordering Facility Name	LabName^^^^^^^^^^^ID	
	30	ST			Organization Name	LabName	X
	30	ST			Organization Identifier	ID	X
22	133	XAD	O		Ordering Facility Address	Address^^City^State^ZIP^^^^^^^^^	
	30				Street Address	Address	X

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
	30	ST			City	City	X
	30	ST			State Or Province	State	X
	30	ST			Zip or Postal Code	Zip	X
23		XTN	O		Ordering Facility Phone Number		
24		XAD	O		Ordering Provider Address		
25		CWE	X	9999	Order Status Modifier		
26		CWE	X	552	Advanced Beneficiary Notice Override Reason		
27		DTM	C		Filler's Expected Availability Date/Time		
28		CWE	O	177	Confidentiality Code		
29		CWE	O	482	Order Type		
30		CNE	O	483	Enterer Authorization Mode		

6.2.7. NTE - Notes and Comments Segment

The NTE segment is defined here for inclusion in messages defined in other chapters. It is commonly used for sending notes and comments. NTE segment can be linked to an OBR or an OBX segment.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE
0	3		R		Segment ID	NTE
1	4	SI	R		Set ID - NTE	0-3
2		ID	RE	0105	Source of Comment	Default to "L" 'L' : Ancillary (filler) department is source of comment
3	65536	FT	RE		Comment	OBR segment: For each alarm, repetition of the block {Alarm family^Alarm} Example for WBC: WBC^L1~WBC^M2~WBC^G1~WBC^G2~W BC^G3 Example for PLT: PLT^MIC~PLT^SCH Example for Analyzer: ANALYZER^QCI~ANALYZER^STI~ANALYZER^ T OBX segment: One flag max for each parameter. Flags equivalence: REJECT for Reject (*) SUSPECT for Suspicion (!) COUNT for Count($) OVERRUN for Overrun (D)
4		CWE	RE		Comment Type	

6.2.8. OBX - Obervation Result Segment

The OBX segment is used to transmit a single observation or observation fragment. It represents the smallest indivisible unit of a report.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE
0	3		R		Sement ID	OBX
1	1..4	SI	R		Set ID - OBX	1-16 (+3 if RUO active)
2	2..3	ID	C	125	Value Type	NM = Numeric Results
3		CWE	R	999 0396	Observation Identifier	LOINC Code^Test Name^LN Test Name: English name. LN' for Logical Observation Identifier Names and Codes (LOINC).
4		ST	C		Observation Sub-ID	

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE
5		Varies	C		Observation Value	Test Result
6		CWE	C	9999	Units	Test Units (Current analyzer units) Escape characters used in unit with exponent like: mm3 => mm\S\3 (\S\ replace ^)
7		ST	RE		References Range	Test Reference Ranges Format: Low - High
8		CWE	RE		Abnormal Flags	Flags transmitted like in ASTM on ABX Micros ES 60 / Micros Care ST L = Under normal low limit H = Over normal high limit
9		NM	X		Probability	
10	1..2	ID	X	80	Nature of Abnormal Test	
11	1..1	ID	R	85	Observation Result Status	Always = "F" for Final
12		DTM	X		Effective Date of Reference Range	
13		ST	C		User Defined Access Checks	
14		DTM	RE		Date/Time of the Observation	
15		CWE	C	9999	Producer's ID	
16	5..12	XCN	RE		Responsible Oberver	^Login name^
17		CWE	C	9999	Observation Method	
18		EI	X		Equipment Instance Identifier	404ESCA00014 (Analyzer Serial Number)
19		DTM	X		Date/Tme of the Analysis	Analysis Date Time (Date Time Results analyzed)

6.2.9. MSA - Message Acknowledgement Segment

The MSA segment contains information sent while acknowledging another message.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE
0	3		R		Segment ID	MSA
1	2	ID	R	0008	Acknowledgment Code	AA: Positive Ack AE: Application Error AR: Application Reject
2	20	ST	R		Message Control ID	Echo of OUL - MSH-10
3	80	ST	X		Text Message	See ERR-8
4		NM	O		Expected Sequence Number	
5		ID	X		Observation Value Delayed Acknowledgment Type	
6		CE	X		Error Condition	

6.2.10. ERR - Error Segment

The ERR segment is used to add error comments to acknowledgment messages.

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
0	3		R		Segment ID	ERR	
1			X		Error Code and Location		
2		ERL	O		Error Location		

SEQ	LEN	DT	OPT	TBL#	Element name	MES IHE	Settings
3		CWE	R	0357	HL7 Error Code	0 Success: Message accepted	
						100 Error: Segment sequence error	
						101 Error: Required field missing	
						102 Error: Data type error	
						103 Error: Table value not found	
						104 Error: Value too long	
						200 Rejection: Unsupported message type	
						201 Rejection: Unsupported event code	
						202 Rejection: Unsupported processing id	
						203 Rejection: Unsupported version ID	
						204 Rejection: Unknown key identifier	
						205 Rejection: Duplicate key identifier	
						206 Rejection: Application record locked	
						207 Rejection: Application internal error	
4	1..1	ID	R	516	Severity	E Error	
						F Fatal Error	
						I Information	
						W Warning	
5		CWE	X	533	Application Error Code		
6		ST	X		Application Error Parameter		
7		TX	X		Diagnostic Information		
8		TX	X		User Message	Message for user information	
9		CWE	X	517	Inform Person Indicator		
10		CWE	X	518	Override Type		
11		CWE	X	519	Override Reason Code		
12		XTN	X		Help Desk Contact Point		

6.3. Example of HL7 Data Frame

<VT>

MSH|^~\&|Micros_ES_60^2.4.0^|HORIBA_MEDICAL^^|^^|^^|20160602140920||
OUL^R22^OUL_R22|20160602140920512|P|2.5|||||UNICODE UTF-8|||<CR>

PID|1||||^|||||||||||||||||||||||||||||||||<CR>

SPM|1|41||WB|||||||||||||||||||||||<CR>

OBR|1|||^CBC|||20160527103758|||||||||^^|||||20160602140919|||F|||||||||||||||||||<CR>

ORC|SC||||CM|||||||||||||^^^^^^^^^|^^^^^^^^^^^^^^|||||||<CR>

NTE|1|L|WBC^G1~WBC^G2~WBC^G3|<CR>

NTE|2|L|PLT^MIC~PLT^SCH~PLT^SCL~PLT^CPLT|<CR>

NTE|3|L|ANALYZER^STi~ANALYZER^Rex~ANALYZER^T°~ANALYZER^OPEN~ANALYZER^QCi|<CR>

OBX|1|NM|776-5^MPV^LN||10,8|fl|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|REJECT|<CR>

OBX|2|NM|X-PDW^PDW^LN||15,5|%|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|REJECT|<CR>

OBX|3|NM|777-3^PLT^LN||128|10\S\9/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|REJECT|<CR>

OBX|4|NM|X-PCT^PCT^LN||0,139|10\S\-2l/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|REJECT|<CR>

OBX|5|NM|4544-3^HCT^LN||0,445|l/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

OBX|6|NM|717-9^HGB^LN||9,31|mmol/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

OBX|7|NM|785-6^MCH^LN||1,85|fmol|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

OBX|8|NM|786-4^MCHC^LN||20,93|mmol/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

OBX|9|NM|787-2^MCV^LN||88|fl|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

OBX|10|NM|789-9^RBC^LN||5,04|10\S\12/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

OBX|11|NM|788-0^RDW-CV^LN||13,5|%|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

OBX|12|NM|21000-5^RDW-SD^LN||43|fl|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

OBX|13|NM|20482-6^GRA#^LN||3,60|10\S\9/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|COUNT|<CR>

OBX|14|NM|14773-6^GRA%^LN||88,3|%|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|COUNT|<CR>

OBX|15|NM|731-0^LYM#^LN||0,00|10\S\9/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|COUNT|<CR>

OBX|16|NM|736-9^LYM%^LN||2,0|%|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|COUNT|<CR>

OBX|17|NM|742-7^MON#^LN||0,30|10\S\9/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|COUNT|<CR>

OBX|18|NM|744-3^MON%^LN||9,7|%|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|COUNT|<CR>

OBX|19|NM|804-5^WBC^LN||3,9|10\S\9/l|0-999||||F|||||^scientist||311ESCA00189|20160527103758<CR>

NTE|1|L|COUNT|<CR>

<FS><CR>