CUBE 30 TOUCH

PROTOCOL SPECIFICATIONS

Rev.0 February 2022

Data Communication Specifications
Using EVX1.1
Using ASTM E1394-97, E1381-95

FOR IN VITRO DIAGNOSTIC USE ONLY

DIESSE
DIAGNOSTICS EVOLUTION

Revision list

Revisions	Description of changes
0.00 of February 2022	First Version

Index

1. Introduction

1.1 Hardware Data

The Communication between the CUBE 30 touch and an external PC may be done in two possible ways:

a) Using a **USB Connection**:

Connect a standard A-B USB cable between the computer's USB port (type-A rectangular connector) and the CUBE 30 touch's USB port (type-B rectangular connector). The driver (STM32 SW; download from www.diesse.it) for MS Windows will need to be installed to establish communication with the CUBE 30 touch through a virtual COM port on USB.

On the Cube 30 touch, in the Service menu, the "HOST BY USBD" parameter must be set to ON.

b) Using a serial **RS232 COM port** on the PC.

Connect a straight standard serial cable between the PC's RS232 COM port and the instrument's RS232 (9-pin) serial connector.

On the Cube 30 touch, in the Service menu, the "HOST BY USBD" parameter must be set to OFF.

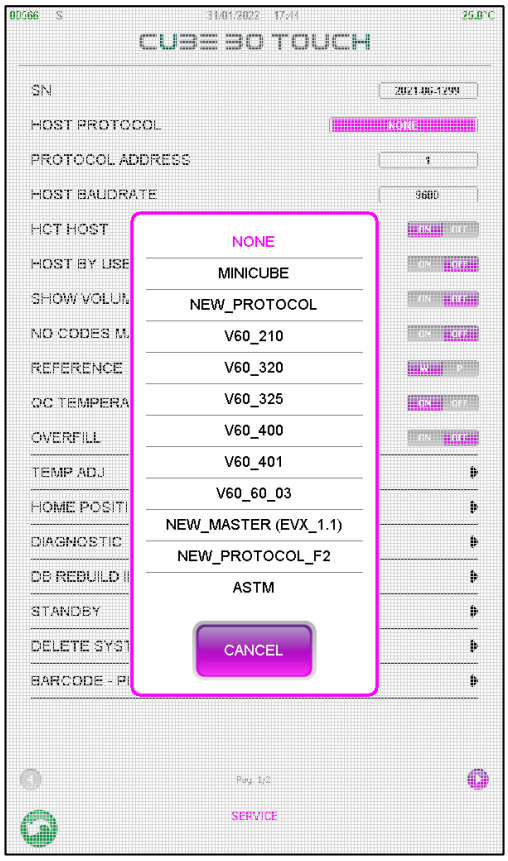
The electrical levels of the signals are of the standard RS232C type.

- The default transmission speed is 9600 bit/s
- the data format is the 8-bit
- 1 stop bit and no parity bits
- The DB9 Female "RS232C" connector reflects the following pin-out:

PIN	SIGNAL
3	Rx of data from Host
2	Tx of data towards Host
5	GND

1.2 Protocol selection

To set a host protocol select the 'host protocol' item in the service menu then select the desired protocol.



EVX 1.1 and ASTM host protocol are two-way protocol; the others are unidirectional protocol.

HCT HOST 

The “HCT HOST” parameter (in the Service menu) must be set to ON if you want to activate the reception of the hematocrit value with ASTM protocol set.

2. EVX 1.1 specifications protocol

2.1 HEXADECIMAL ASCII (HEX-ASCII) REPRESENTATION

In the protocol described below a great deal of the parameters and data are represented in Hexadecimal ASCII (HEX-ASCII) format, in other words:
a byte with a value of 0x7A is represented by two ASCII characters: '7' (0x37) and 'A' (0x41), the first represents the most significant nibble and the second, the least significant.
Examples:

Original Byte	Representation HEX-ASCII	
Hexadecimal value	H characters	L characters
0x45	'4' (0x34)	'5' (0x35)
0xC8	'C' (0x43)	'8' (0x38)
0x6F	'6' (0x36)	'F' (0x46)
0x10	'1' (0x31)	'0' (0x30)

As can be seen, this type of representation means that two ASCII characters are necessary for representing the value of one byte.

General remarks: Delay in replying

To allow the machine time to activate the reception mode it is necessary to enter a delay of 1 second on the reply.

2.2 Command 0x50: message requesting tubes to be processed

This message is sent by the CUBE 30 Touch to the Host Computer. It contains a list of the barcodes of the samples inserted in a rack. The Host Computer must reply to this message with a similar message containing the barcodes only, from among those received by the CUBE 30 Touch, of the samples analysed by the CUBE 30 Touch itself (therefore the codes that have already been accepted by the Host and with the VES to be carried out) and eventually also the codes not still accepted from the Host (therefore unknown).

The management of the samples to be processed due to being accepted by the Host and also that of the samples to be processed due to being "unknown" by the Host, are

based on an attribute (the terminator of the barcode) contained in Host's reply message (see point 4.2.3 Reply message with 0x50 control data).

Example 1 (WITHOUT the management of "unknown" data):

The CUBE 30 Touch sends 10 barcodes to the Host, and the Host only sends back 4 of the 10 barcodes received, that is, only the ones that have to be analysed by CUBE 30 Touch itself (the other 6 samples will not be processed by the instrument).

Example 2 (WITH the management of "unknown" data):

The CUBE 30 Touch sends 10 barcodes to the Host, and the Host sends back 4 barcodes with the VES "to be analysed" attribute + 2 barcodes with the attribute "barcode unknown". The instrument processes the 6 samples and at the end of the analysis sends the results of the 4 barcodes with the VES "to be analysed" attribute, while the other 2 "unknown" barcodes remain in the database under pending samples.

2.2.1 Request: CUBE 30 Touch sends the following frame:

STX (0x3E)	H-BLK (0x30)	L-BLK (0x30)	**H-LEN**	**L-LEN**	H-ADD (0x30)	L-ADD (0x31)	H-COM (0x35)	L-COM (0x30)	**Data-1**	...	**Data-n**	ETX (0x0D)	**H-CHK**	**L-CHK**

The hexadecimal values indicated in brackets are constant values for this message. The fields in bold print which are the variable ones, are described below:

H-LEN / L-LEN: length of the data field, from Data-1 to Data-n inclusive, represented in HEX-ASCII. Maximum Value 'F' (0x46) / 'F' (0x46). This is the effective number of bytes contained in the Data field. In fact, the maximum number of bytes contained in the Data field is 255.

Data-1 . Data-n: Data field. The data field for the message code 0x50 consists of the following:

H-NUM / L-NUM (2 bytes HEX-ASCII)	**BarCode-1** (ASCII string max. 15 characters)	**Terminator** of the string Barcode-1 (0x10)	**BarCode-2** (ASCII string max. 15 characters)	**Term.** of the string Barcode-2 (0x10)	.....	**BarCode-n** (ASCII string max. 15 characters)	**Term.** of the string Barcode-n (0x10)

H-NUM / L-NUM: Number of barcodes contained in the message, represented in HEX-ASCII.

BARCODE-n: ASCII string with a variable length, maximum of 15 characters allowed. This is the barcode, as it is read by the CUBE 30 Touch barcode reader.

Terminator: Each string of the barcodes is terminated with the byte 0x10. This is because the length of the string is variable.

The number of Barcodes contained in the data field is limited by the fact that the data field itself may contain up to a maximum of 255 bytes, nevertheless the barcodes are never cut off, but are always complete with terminator.

H-CHK / L-CHK: CheckSum of the message, represented in HEX-ASCII. The Checksum is calculated by carrying out the OR-exclusive of all the sent bytes from STX to ETX inclusive. The resulting hexadecimal value is then converted into HEX-ASCII and the two characters that represent it are sent.

ATTENTION: for debugging purposes it is possible to disable the checksum control, replacing the H-COM bytes with the value of 0x44 instead of 0x35. In this case the two bytes of the checksum are still sent but their value will be insignificant. The Host computer must also manage any possible cases in which the checksum is disabled.

2.2.2 Reply from the host computer

Upon receiving the message, the Host computer has to first send an ACK message to acknowledge correct receipt and interpretation of the message; meaning that all the fields have the correct values and the checksum is correct, or a NACK message to indicate that the message contains one or more errors: inexact checksum, incorrect length of the data field, etc...

ACK Message

ACK	H-ADD	L-ADD	ETX
(0x06)	(0x30)	(0x31)	(0x0D)

Timeout on ACK Message: 2 Sec.

NACK Message

NACK (0x15)	H-ADD (0x30)	L-ADD (0x31)	**H-ERR**	**L-ERR**	ETX (0x0D)

where: **H-ERR / L-ERR** are the HEX-ASCII representation of the error code defined according to the following table:

Error code	H-ERR Value	L-ERR Value	Meaning
0x00	0x30	0x30	General Error
0x04	0x30	0x34	Checksum Error
0x05	0x30	0x35	Field Error value H-LEN / L-LEN
0x06	0x30	0x36	Data field Length Error

2.2.3 Reply Message with 0x50 Control Data

After having sent the ACK message, the Host computer must send the real reply to the 0x50 message. This reply will be identical to the message send by the Ves-Matic CUBE 30 Touch, with the difference that the barcodes sent will be only those that have to be processed by the CUBE 30 Touch and another difference of the terminator 0x11 for the "unknown" codes (that is not yet accepted by the Host computer and thus equally to be processed) Therefore, the H-LEN / L-LEN and H-NUM / L-NUM fields may be different.

If none of the barcodes have to be processed, the data field will only contain the H-NUM / L-NUM (0x30 / 0x30 value) field and H-LEN /L-LEN will be equal to 0x30 / 0x32.

The data field for the message cod. 0x50 is composed as follows:

H-NUM / L-NUM (2 bytes HEX-ASCII)	**BarCode-1** (String ASCII max 15 characters)	**Terminator** of the string Barcode-1 (0x10/0x11)	**BarCode-2** (String ASCII max 15 characters)	**Terminator** of the string Barcode-2 (0x10/0x11)	.....	**BarCode-n** (String ASCII max 15 characters)	**Terminator** of the string Barcode-n (0x10/0x11)

H-NUM / L-NUM: Number of bar codes contained in the message, represented in HEX-ASCII.

BARCODE-n: ASCII string of variable length, maximum 15 characters allowed. This is the bar code as it is read by the bar code reader of the CUBE 30 Touch.

Terminator: Every string of the bar code is terminated by a 0x10 byte of a 0x11 byte (for "unknown" codes). This to allow the management of the variable length of the codes as well the management of "unknown codes". The number of bar codes contained in the data field is limited by the fact that the data field itself can contain a maximum of 255 bytes, in any case the bar codes are never truncated, but always complete with terminator. If the string of the bar code terminates with a 0x10 byte; this means that the sample has to be processed by the CUBE 30 Touch, at the end of the exam the result will be printed and stored in the Historic Database. If the string of the bar code terminates with a 0x11 byte, this means the code of the sample is unknown; in this case the CUBE 30 Touch will process the sample but at the end of the exam the result will not be printed and it will be stored in the Database of the Pendings.

Timeout on Message with Data: 5 Seconds.

2.2.4 Error on reply message with data

If the CUBE 30 Touch detects an error in the receipt of the message it will repeat the transaction from the beginning and resend the request message indicated in paragraph 2.2.1

2.3 Command 0x51: Message for sending Results

This message is sent by the CUBE30TOUCH to the host computer. The message contains the results of the analyses carried out on one or more tubes. The host computer must reply to this message only with a message of the ACK or NACK kind to notify the successful receipt of the results or the presence of errors message.

N.B.: the samples with the attribute "unknown code" that have been analysed by the instrument are not automatically sent at the end of the analysis process, instead these can only be sent manually by the operator by pressing the "Send to Host" key on the Database of Pending Samples menu.

2.3.1 Command: CUBE 30 Touch sends the following frame:

STX (0x3E)	H-BLK (0x30)	L-BLK (0x30)	**H-LEN**	**L-LEN**	H-ADD (0x30)	L-ADD (0x31)	H-COM (0x35)	L-COM (0x31)	**Data-1**	**...**	**Data-n**	ETX (0x0D)	**H-CHK**	**L-CHK**

The hexadecimal values indicated in brackets are constant values for this message. The fields in bold print are the variable ones and are described below:

H-LEN / L-LEN:

Length of the data field, from Data-1 to Data-n inclusive, represented in HEX-ASCII. Maximum value 'F' (0x46) / 'F' (0x46). This is the effective number of bytes contained in the data field. The maximum number of bytes contained in the 'Data' field is in fact 255.

Data-1 .. Data-n:

Data field. The data field for the message code 0x51 consists of the following:

H-PRO / L-PRO (2 bytes HEX-ASCII)	**Record Tube-1**	.....	**Record Tube-n**

H-PRO / L-PRO: Number of Record Tube contained in the message, represented in HEX-ASCII.

The Record Tube number contained in the data field is limited by the fact that the data field itself is able to contain up to a maximum of 255 bytes, in any case the Record Tubes are never cut off.

Record Tubes:

BarCode (ASCII string max 15 characters)	**Terminator** of the string Barcode (0x10)	**DATA ANALYSES** ASCII string 6 characters	**TIME ANALYSES** ASCII string 4 characters	**VES** ASCII string 4 characters	**H-FLAGS**	**L-FLAGS**	**RACK ID** ASCII string 4 characters	**POSITION** ASCII string 2 characters

BARCODE: ASCII string with variable lengths, maximum of 15 characters allowed. This is the barcode just as it is read by the CUBE 30 touch Barcode Reader.

TERMINATOR: the string of barcodes terminates with the 0x10 byte. This is because the length of this string is variable.

DATA ANALYSES : string of 6 characters without terminator, "**DDMMYY**" where:

- "DD" = day of the month, from "01" to "31" ASCII.
- "MM" = Month of the year, from "01" to "12" ASCII.

- “YY” = Year of the century, from “00” to “99” ASCII.

TIME ANALYSES : string of 4 characters without terminator, “hhmm” where:

- “hh” = hour of the day, from “00” to “23” ASCII.
- “mm” = Minutes, from “00” to “59” ASCII.

VES: Value of the VES measured, ASCII string without terminator: from “ 0” (3 spaces + ‘0’) transmitted in the case of an error, to “ 140” (1 space + “140”). If the result is greater of 140 the string will be “>140”.

EXAMPLES, see following table:

VES value	String sent	Bytes of the String
1	“ 1”	0x20, 0x20, 0x20, 0x31
100	“ 100”	0x20, 0x31, 0x30, 0x30
>140	“>140”	0x3E, 0x31, 0x34, 0x30

H-FLAGS / L-FLAGS: Bitmap with 8-bit of the sample errors, represented in HEX-ASCII. The following table illustrates the errors:

Bit	Error	Description
0	Sample High	Blood column too high
1	Sample Low	Blood column too low
2	Sample Absent	Tube Empty
3	Reading Error	Generic reading error
4	QC PASS	Reserved for samples with control blood
5	QC FAIL	Reserved for samples with control blood
6-7	-	Reserved

EXAMPLES:

- In the case of a “Sample High” error the Bit 0 (least significant) will be set to one and all the others to zero, therefore the byte of the Flags will have a 0x01 hexadecimal value and its HEX-ASCII representation will be 0x30 / 0x31.
- In the case of a “Sample Absent” error the Bit 2 will be set to one and all the others to zero, therefore the byte of the Flags will have a 0x04 hexadecimal value and its HEX- ASCII representation will be 0x30 / 0x34.

Managing Errors in RESULTS:

If a Test Tube Record is sent with a VES value equal to 0 and an Error Flag enabled (Bit 3 set to 1), the result (VES=0) must be interpreted by the Host as a 'Reading Error of the sample'.

RACK ID: Not Used, always "0000"(string of 4 characters without terminator)

POSITION: string of 2 characters without terminator, identifies the position occupied by the sample into the instrument ("01".....”04").

H-CHK / L-CHK:

CheckSum of the message, represented in HEX-ASCII. The Checksum is calculated by carrying out the OR- exclusive of all the bytes sent from STX to ETX inclusive. The resulting hexadecimal value is then converted into HEX-ASCII and the two characters that represent it are sent.

ATTENTION: for debugging purposes it is possible to disable the checksum control, replacing the H-COM bytes with the value of 0x44 instead of 0x35. In this case the two bytes of the checksum are still sent but their value will be insignificant. The Host computer must also manage any possible cases in which the checksum is disabled.

2.3.2 Reply from the Host computer (optional)

On receiving the message, the Host computer may send an ACK reply to acknowledge correct receipt and interpretation of the message, meaning that all the fields have the correct values and the checksum is correct; or a NACK reply to indicate that the message contains one of more errors: inexact checksum, incorrect length of the data field, etc..

ACK Message

ACK (0x06)	H-ADD (0x30)	L-ADD (0x31)	ETX (0x0D)

Timeout on ACK Message: 1 Sec.

NACK Message

NACK (0x15)	H-ADD (0x30)	L-ADD (0x31)	**H-ERR**	**L-ERR**	ETX (0x0D)

where: H-ERR / L-ERR are the HEX-ASCII representation of the error code defined according to the following table:

Error code	H-ERR Value	L-ERR Value	Meaning
0x00	0x30	0x30	General Error
0x04	0x30	0x34	Checksum Error
0x05	0x30	0x35	Error field value H-LEN / L-LEN
0x06	0x30	0x36	Data field Length Error

2.4 Command 0x52: Message for sending QC (Quality Control) sample data

This message is sent by the CUBE 30 touch towards the host computer. The message contains the results of the analyses performed on one or more samples. The host computer must only reply to this message with an ACK or NACK type message to notify the successful receipt of the results or the presence of errors in the message.

2.4.1 Command: CUBE 30 touch sends the following frame:

STX (0x3E)	H-BLK (0x30)	L-BLK (0x30)	**H-LEN**	**L-LEN**	H-ADD (0x30)	L-ADD (0x31)	H-COM (0x35)	L-COM (0x32)	**Data-1**	**...**	**Data-n**	ETX (0x0D)	**H-CHK**	**L-CHK**

The hexadecimal values indicated in brackets are constant values for this message. The fields in bold print are the variable ones and are described below:

H-LEN / L-LEN:

Length of the data field, from Data-1 to Data-n inclusive, represented in HEX-ASCII. Maximum Value 'F' (0x46) / 'F' (0x46). This is the effective number of bytes contained in the data field. In fact, the maximum number of bytes contained in the DATA field is 255.

Data-1 .. Data-n:

Data field. The Data field for the message code 0x52 consists of the following:

QC data	QC Record Sample

QC data

Batch No. (ASCII string 6 characters)	**EXPIRY DATE** ASCII string 6 characters	**H-VALMIN**	**L-VALMIN**	**H-VALMAX**	**L-VALMAX**

BATCH No.: ASCII string of 6 characters. Identifies the production batch of the control blood

EXPIRY DATE: string of 6 characters without terminator, “DDMMYY” where:

- “DD” = day of the month, from “01” to “31” ASCII.
- “MM” = Month of the year, from “01” to “12” ASCII.
- “YY” = Year of the century, from “00” to “99” ASCII.

H-VALMIN / L-VALMIN: Value lower than the acceptability range for the control blood, represented in HEX-ASCII.

H-VALMAX / L-VALMAX: Value higher than the acceptability range for the control blood, represented in HEX-ASCII.

QC Record Sample:

BarCode (ASCII string max 15 characters)	**Terminator** of the Barcode string (0x10)	**DATA ANALYSES** ASCII string 6 characters	**TIME ANALYSES** String ASCII 4 characters	**VES** ASCII string 4 characters	**H-FLAGS**	**L-FLAGS**	**RACK ID** String ASCII 4 characters	**POSITION** String ASCII 2 characters

BARCODE: ASCII string with variable length, maximum of 15 characters allowed. This is the barcode just as it is read by the CUBE 30 touch Barcode Reader.

TERMINATOR: the string of barcodes terminates with the 0x10 byte. This is because the length of this string is variable.

DATA ANALYSES: string of 6 characters without terminator, “DDMMYY” where:

- “DD” = day of the month, from “01” to “31” ASCII.
- “MM” = Month of the year, from “01” to “12” ASCII.
- “YY” = Year of the century, from “00” to “99” ASCII.

TIME ANALYSES: string of 4 characters without terminator, “hhmm” where:

- “hh” = hour of the day, from “00” to “23” ASCII.
- “mm” = Minutes, from “00” to “59” ASCII.

VES: Value of the VES measured on the QC sample, ASCII string without terminator:

from “ 0” (3 spaces + ‘0’) transmitted in the case of an error, to “ 140” (1 space + “140”). If the result is higher than 140 the string will be “>140”

EXAMPLES, see following table:

VES value	String sent	Bytes of the String
1	“ 1”	0x20, 0x20, 0x20, 0x31
100	“ 100”	0x20, 0x31, 0x30, 0x30
>140	“>140”	0x3E, 0x31, 0x34, 0x30

H-FLAGS / L-FLAGS: Bitmap with 8-bit of the sample errors, represented in HEX-ASCII. The following table illustrates the errors:

Bit	Error	Description
0	Sample High	Blood column too high
1	Sample Low	Blood column too low
2	Sample Absent	Tube Empty
3	Abnormal	Error in acquisition of height
4	QC PASS	The VES of the QC measured is within the acceptability range
5	QC FAIL	The VES of the QC measured is outside the acceptability range
6-7	-	Reserved

EXAMPLES:

- In the case of a “Sample High” error the Bit 0 (least significant) will be set to one and all the others to zero, therefore the byte of the Flags will have a 0x01 hexadecimal value and its HEX-ASCII representation will be 0x30 / 0x31.
- In the case of a “QC Fail” error the Bit 5 will be set to one and all the others to zero, therefore the byte of the Flags will have a 0x20 hexadecimal value and its HEX-ASCII representation will be 0x32 / 0x30

RACK ID: string of 4 characters without terminator, identifies the classifier rack in which the sample has been repositioned.

POSITION: string of 2 characters without terminator, identifies the coordinates of the position in which the sample has been repositioned in the Classifier rack.

ATTENTION: for debugging purposes it is possible to disable the checksum control, replacing the H-COM bytes with the value of 0x44 instead of 0x35. In this case the two bytes of the checksum are still sent but their value will be insignificant. The Host computer must also manage any possible cases in which the checksum is disabled.

3. ASTM specifications protocol

3.1. Communication Protocol

3.1.1. Analysis Order Inquiry (Cube 30 Touch → Host Computer)

This protocol is used for Cube 30 Touch to inquire to the host computer an analysis order information to know which of the samples in a rack have to be processed for ESR test.

CUBE 30 TOUCH	DIRECTION	HOST COMPUTER
ENQ	→	
	←	ACK
H (Header Record)	→	
	←	ACK
Q (Request Record for single or multiple samples)	→	
	←	ACK
L (Message Terminator Record)	→	
	←	ACK
EOT	→	

Table 1 - Analysis Order Inquiry

3.1.2. Analysis Information (Host Computer → Cube 30 Touch)

This protocol is used for the host computer to respond an analysis information against the inquiry made by the Cube 30 Touch.

CUBE 30 TOUCH	DIRECTION	HOST COMPUTER	REMARKS
	←	ENQ	
ACK	→		
	←	H (Header Record)	
ACK	→		
	←	O (Test Order Record, one for each sample)	Repeat this sequence for each sample previously requested in the inquiry message
ACK	→		

	←	L (Message Terminator Record)	
ACK	→		
	←	EOT	

Table 2 - Analysis Information

3.1.3. Analysis Results or QC data (Cube 30 Touch →Host Computer)

This protocol is used for the Cube 30 Touch to transmit the analysis results or, in case of QC sample, the QC data to the Host Computer.

CUBE 30 TOUCH	DIRECTION	HOST COMPUTER
ENQ	→	
	←	ACK
H (Header Record)	→	
	←	ACK
O (Test Order Record)	→	
	←	ACK
R (Result Record)	→	
	←	ACK
EOT	→	

Table 3 - Analysis Results

3.2. Details of Record

3.2.1. Header Record

[Example of transmission]

- Cube 30 Touch → Host

  H|\^&|||CUBE30T^2.01.00^2021-06-1299^000|||||||E1394-97|

- Host → Cube 30 Touch

  H|\^&||||||||||E1394-97|

ASTM Field	Field Name	Cube 30 Touch→Host	Host→Cube 30 Touch	Max Size (Bytes)	Remarks
7.1.1	Record Type	H	H	1	Fixed
7.1.2	Delimiter Definition	|\^&	|\^&	4	Fixed
7.1.3	Message Control ID	Not Used	Not Used	-	

7.1.4	Access Password	Not Used	Not Used	-	
7.1.5	Sender name or ID	Analyzer Name^ Software Version^ Analyzer Serial No.^ Rack Type	Not Used	10 8 15 3	
7.1.6	Sender Street address	Not Used	Not Used	-	
7.1.7	Reserved Field	Not Used	Not Used	-	
7.1.8	Sender Telephone No.	Not Used	Not Used	-	
7.1.9	Sender Characteristics	Not Used	Not Used	-	
7.1.10	Receiver ID	Not Used	Not Used	-	
7.1.13	ASTM Version No.	E1394-97	E1394-97	8	Fixed
7.1.14	Date and Time of message	Not Used	Not Used	-	

Table 4 - Details of Header Record

Detailed explanation of the fields:
7.1.2 Delimiter definition: "|\^& is used as a fixed character string. No filed delimiter is required between 7.1.1 and 7.1.2.

7.1.5 Sender name or ID: Analyzer name CUBE30TOUCH
Software version is a character string of 7 chars. maximum.
Serial number is composed by the Year and Month of manufacturing and 4 characters incremental number.
Rack type identifies the version of the analyzer based on the type of rack it is built for:
"SY"= Sysmex
"BA" = Bayer
"BC" = Beckman Coulter
"ABX" = ABX.

3.2.2. Request Information Record

[Example of transmission]

- Cube 30 Touch → Host

  Q|1|0123456789ABCDE\024681012\135791113||^^^^ESR||20070912091200[CR]
  Q|1|123458282||^^^^ESR||20220119153819||||||

- Host → Cube 30 Touch

  Not Used

Field	Field Name	Cube 30 Touch→ Host	Host → Cube 30 Touch	Max Size (Bytes)	Remarks
12.1.1	Record Type	Q	Not Used	1	Fixed
12.1.2	Sequence No.	Sequence No.	Not Used	4	Sequence No. of records
12.1.3	Starting Range ID No.	First Sample ID\ Second Sample ID\ Third Sample ID\ ... Last Sample ID	Not Used	16 16 16 ... 15	List of samples IDs to be requested to the host computer
12.1.4	Ending Range ID No	Not Used	Not Used	-	
12.1.5	Universal Test ID	^^^^ESR	Not Used	7	Fixed
12.1.6	Nature of request results date and time	Not Used	Not Used	-	
12.1.7	Beginning Request results date and time	YYYYMMDD HHMMSS	Not Used	14	
12.1.8	Ending Request results date and time	Not Used	Not Used	-	
12.1.9	Requesting physician name	Not Used	Not Used	-	
12.1.10	Requesting physician Telephone No.	Not Used	Not Used	-	
12.1.11	User Field No. 1	Not Used	Not Used	-	
12.1.12	User Field No. 2	Not Used	Not Used	-	
12.1.13	Request information status code	Not Used	Not Used	-	
12.1.6	Nature of request results date and time	Not Used	Not Used	-	
12.1.7	Beginning Request	YYYYMMDD HHMMSS	Not Used	14	

	results date and time				
12.1.8	Ending Request results date and time	Not Used	Not Used	-	

Table 5 - Details of Request Information Record

Detailed explanation of the fields:

12.1.2 Sequence No.

The Sequence No. starts with 1 and indicates the sequence position in which the record appeared in the message. This number is reset to 1 when a higher-level record appears in the message.

12.1.3 Starting Range ID No.

List of samples IDs to be requested to the host computer, separated by the Repeat Delimiter'\'. Up to 12 samples IDs for each request. Up to 15 characters for each Sample ID.

12.1.7 Beginning Request results date and time

The date format is fixed with "YYYYMMDDHHMMSS".

Here "YYYY" is the Year, MM the month, DD the day, HH the hour of the 24-hour system (00-23), MM the minute (00-59), SS the second (00-59).

3.2.3. Test Order Record

[Example of transmission]

- Cube 30 Touch → Host
  O|1|0123456789||^^^^ESR^1H|||||||N|||||||||||||F[CR]
- Host → Cube 30 Touch
  O|1|0123456789ABCDE||^^^^ESR^1H||20070423113400|||||N|||||||||||||Q[CR]

ASTM Field	Field Name	Cube 30 Touch→Host	Host→Cube 30 Touch	Max Size (Bytes)	Remarks
9.4.1	Record Type	O	O	1	Fixed
9.4.2	Sequence No.	Sequence No.	Sequence No	4	Sequence No. of records
9.4.3	Specimen ID	Sample ID	Sample ID	15	Sample ID string
9.4.4	Instrument Specimen ID	Classifier Rack ID^ Sample Position coordinates	Not Used	4 2	Classifier rack ID string X-Y coordinates of sample position
9.4.5	Universal Test ID	^^^^ESR^ Time	^^^^ESR^ Time	8 2	Fixed Time: 1H or 2H for

					1 hour or 2 hours ESR tests
9.4.6	Priority	Not Used	Not Used	-	
9.4.7	Requested/ order date and time	Not Used	YYYYMMDD HHMMSS	14	
9.4.8	Specimen collection date and time	Not Used	Not Used	-	
9.4.9	Collection end time	Not Used	Not Used	-	
9.4.10	Collection volume	Not Used	Not Used	-	
9.4.11	Collector ID	Not Used	Not Used	-	
9.4.12	Action Code	N, Q	N (fixed)	1	N: Normal Sample Q: QC material
9.4.13	Danger code	Not Used	Not Used	-	
9.4.14	Relevant clinical information	Not Used	HTC	3	Value of hematocrit sent by the host to correct the ESR value
9.4.15	Date/time specimen received	Not Used	Not Used	-	
9.4.16	Specimen descriptor	Not Used	Not Used	-	
9.4.17	Ordering physician	Not Used	Not Used	-	
9.4.18	Physician's telephone No.	Not Used	Not Used	-	
9.4.19	User field No. 1	Not Used	Not Used	-	
9.4.20	User field No. 2	Not Used	Not Used	-	
9.4.21	Laboratory field No. 1	Not Used	HTC	3	Value of hematocrit sent by the host to correct the ESR value (if not set in field 9.4.14)
9.4.22	Laboratory field No. 2	Not Used	HTC	3	Value of hematocrit sent by the host to correct the ESR value (if not set in field 9.4.14 and 9.4.21)

9.4.23	Date/time results reported or last modified	Not Used	Not Used	-	
9.4.24	Instrument charge to computer system	Not Used	Not Used	-	
9.4.25	Instrument section ID	Not Used	Not Used	-	
9.4.26	Report Type	F	X, Y, Q	1	F: Final results X: Order cannot be done Y: No Test order Q: Response to inquiry
9.4.27	Reserved field	Not Used	Not Used	-	
9.4.28	Location of ward of specimen collected	Not Used	Not Used	-	
9.4.29	Nosocomial infection flag	Not Used	Not Used	-	
9.4.30	Material Service	Not Used	Not Used	-	
9.4.31	Material institution	Not Used	Not Used	-	

Table 6 - Table 6 – Details of Test Order Record

Detailed explanation of the fields:

9.4.2 Sequence No.

The Sequence No. starts with 1 and indicates the sequence position in which the record appeared in the message. This number is reset to 1 when a higher-level record appears in the message.

9.4.3 Specimen ID

Single sample ID, up to 15 characters. When the host computer sends this record as an answer to an inquiry message from the Cube 30 Touch, it will send one Test Order Record for each sample specified in the Request Information Record of the inquiry message.

9.4.4 Instrument Specimen ID

When the instrument sends a Result message to the host computer, it also sent back to the host the Test Order Record, with the Classifier rack identification number (4 characters), and sample's Position Coordinates inside the classifier rack (2 characters). They are separated by a "^" character.

9.4.7 Requested/order date and time
The date format is fixed with "YYYYMMDDHHMMSS".
Here "YYYY" is the Year, MM the month, DD the day, HH the hour of the 24-hour system (00-23), MM the minute (00-59), SS the second (00-59).

9.4.12 Action Code
The instrument will specify if the sample is a normal sample or a QC material sample when it send this record together with the result. The host always send the normal sample identifier.

9.4.14 Relevant Clinical Information
The host can send the Hematocrit Value of the sample to the instrument using this field or otherwise the fields 9.4.21 or 9.4.22 to have the ESR value corrected by the instrument as a function of the Hematocrit.

9.4.21 Laboratory Field 1
The host can send the Hematocrit Value of the sample to the instrument using this field or otherwise the fields 9.4.14 or 9.4.22 to have the ESR value corrected by the instrument as a function of the Hematocrit.

9.4.22 Laboratory Field 1
The host can send the Hematocrit Value of the sample to the instrument using this field or otherwise the fields 9.4.14 or 9.4.21 to have the ESR value corrected by the instrument as a function of the Hematocrit.
If the Instrument has been set to correct the ESR value using the Hematocrit value, it expects to receive the HCT value from the host in one of the three fields above. If the Hematocrit value is not available on the Host computer at the first Query time, the instrument will repeat the query at the end of the exam before to send the Result record.

9.4.26 Report type
The analyzer will send the F character when it sends the result of the test, or the X character if the test result is not available at the end of the analysis cycle. The Host uses this field to tell the analyzer if the sample has to be processed for ESR test (Q), or not (Y).

3.2.4. Result Record

[Example of transmission]

- Cube 30 Touch → Host
  H|\^&|||CUBE30T^2.01.00^2021-06-1299^000|||||||E1394-97|
- Host → Cube 30 Touch
  Not Used

ASTM Field	Field Name	Cube 30 Touch→Host	Host→Cube 30 Touch	Max Size (Bytes)	Remarks
10.1.1	Record Type	R	Not Used	1	Fixed
10.1.2	Sequence No.	Sequence No.	Not Used	4	Sequence No. of records
10.1.3	Universal Test ID	^^^^ESR^ Parameter	Not Used	8 2	Fixed Parameter: 1H, 2H, KI
10.1.4	Data or measurement value	Value	Not Used	4	
10.1.5	Units	Unit	Not Used	4	“mm/H” for ESR 1H and ESR 2H. Not Used for KI
10.1.6	Reference Range	Min ESR – Max ESR	Not Used	-	Only for QC samples
10.1.7	Result abnormal flags	L, H, N, A, W	Not Used	1	L: Low sample Volume H: High sample Volume N: Valid result A: Analysis error or hardware problem W: Low reliability
10.1.8	Nature of abnormality testing	Not Used	Not Used	-	
10.1.9	Result Status	Not Used	Not Used	-	
10.1.10	Date of change in instrument normative values	Not Used	Not Used	-	
10.1.11	Operator identification	Not Used	Not Used	-	
10.1.12	Date/time test started	Not Used	Not Used	-	
10.1.13	Date/time test completed	YYYYMMDD HHMMSS	Not Used	14	

10.1.14	Instrument identification	Not Used	Not Used	-	

Table 7 - Details of Result Record

Detailed explanation of the fields:

10.1.2 Sequence No.

The Sequence No. starts with 1 and indicates the sequence position in which the record appeared in the message. This number is reset to 1 when a higher-level record appears in the message.

10.1.3 Universal Test ID

If the ordered Test ID is ESR^1H (one-hour ESR), the parameter will be always "1H", and in the message there will be only one Result Record.

If the ordered Test ID is ESR^2H (two hours ESR) there will be 3 Result Records, whose content is defined in the following table.

Record	Universal Test ID	Data Value field meaning	Units field
First	^^^^ESR^1H	1 hour ESR result	mm/H
Second	^^^^ESR^2H	2 hours ESR result	mm/H
Third	^^^^ESR^KI	Calculated Katz Index	Not Used

Table 8 – ESR 2 hours Test Result Records

10.1.4 Data or measurement Value:

- 1 Hour ESR result or 2Hours ESR result: a value comprised between 1 and 140, or ">140" for higher values.
- Katz Index: a parameter calculated in 2-hour ESR Test using the results of 1-hour ESR and 2 hours ESR tests.
- Set = 0 in case of analysis error or hardware error.

10.1.5 Units:

For ESR results (1hour and 2 hour) units is "mm/H", for Katz Index the fields is not used.

10.1.6 Reference Range:

Used only for QC samples, the format is "LLLL-HHHH", where LLLL and HHHH are 4-character strings representing respectively the minimum and the maximum value of ESR, with leading zeroes: es. "0020-0080".

10.1.7 Result Abnormal flags

Abnormal flags of the analysis:

L: Low volume sample, less than 1,5mL

H: High volume sample, more than 4 mL

N: Valid result or QC check PASS

A: analysis error or hardware error or QC check FAIL
W: result flagged with low reliability mark

10.1.13 Date/Time test completed
The date format is fixed with “YYYYMMDDHHMMSS”.
Here “YYYY” is the Year, MM the month, DD the day, HH the hour of the 24-hour system (00-23), MM the minute (00-59), SS the second (00-59).

3.2.5. Message Terminator Record

[Example of transmission]

- Cube 30 Touch → Host
  L|1|N[CR]
  - Host → Cube 30 Touch
    L|1|N[CR]

ASTM Field	Field Name	Cube 30 Touch→Host	Host→Cube 30 Touch	Max Size (Bytes)	Remarks
13.1.1	Record Type	L	L	1	Fixed
13.1.2	Sequence No.	1	1	4	Always 1
13.1.3	Terminator Code	N	N	1	N: Normal Termination

Table 9 - Details of Message Terminator Record

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