STRECK

CUBE 30 Touch LIS Specifications

CONNECTION TO A HOST COMPUTER

Foreword: Hardware data

The Communication between the CUBE30TOUCH and an external PC may be done in two possible ways:

1- 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.

2- Using a serial RS232 COM 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 electric levels of the signals are all the standard RS232C type.

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

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

Foreword: 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.

Message for sending Results: Command 0x51

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.

Command: CUBE30TOUCH 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 Mini Cube 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.

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

Timeout on NACK Message: 1 Sec.

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

This message is sent by the Mini Cube 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.

Command: CUBE30TOUCH 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 Mini Cube 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.

History of the revisions

Rev 1.0 dated 02-2018: First drafting.