Roche Diagnostics

cobas u 411

Host Interface Manual

Version **1.0**

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VERSION HISTORY

Version	Date	Software version	Modifications
1.0	March 2007	3.0	First Release

1 Purpose

This document describes the behavior of the **cobas u** 411 analyzer data interchange interface when interacting with a *Laboratory Information System (LIS)* also called Host system.

1.1 Audience

This document is written for technicians who must configure the **cobas u** 411 LIS Interface in the environment of a laboratory. Depending on the type of host system and on the work flows in the laboratory the **cobas u** 411 LIS interface offers a set of configurable features.

1.2 References

Referenced documents:

[1] Roche Diagnostics ASTM+ Interface Specification Version 2.0
[2] E 1394-91 Standard Specification for Transferring Information between Clinical Instruments and Computer Systems, A*merican Society for* T*esting and* M*aterials* (ASTM)

1.3 Used Syntax and Abbreviations

Used Syntax

<SpecimenID>	Meaning any string (not containing delimiters), representing a value of the ASTM field “SpecimenID”.
char	Single character. Content specified by standard.
text	String. Variable length.
pos_int	Positive integer (0 to 65535)
d_t	Date and time format as specified by ASTM 6.6.2 (YYYYMMDDHHMMSS)
date	Date format as specified by ASTM 6.6.2 (YYYYMMDD)

Terms

ASTM	American Society for Testing and Materials
LIS	Laboratory Information System

1.4 Further Help

In case of questions please contact your **local Roche Diagnostics Service Department**.

Or alternatively the Global Systems Support:

E-Mail Address: mannheim.gssnpt@roche.com

Clarify Queue: GSSNPT-MA

2 Introduction

This document describes the behavior of the **cobas u** 411 Host Interface to a host system, when connected to a Laboratory Information System via null modem cable (RS 232).

2.1 Overview of the cobas u 411 analyzer

The **cobas u** 411 analyzer is a semi-automatic urinalysis system intended for in vitro qualitative or semi-quantitative determination of urine analyses, including specific gravity (SG), pH, leukocytes, nitrite, protein, glucose, ketones, urobilinogen, bilirubin and erythrocytes and color.

3 Interface (RS-232)

The **cobas u** 411 uses a serial asynchronus interface (RS 232) to connect to the Host Computer. The COM2 Port is dedicated to this communication.

4 Host-Protocols

The **cobas u** 411 supports the following protocols:

- ASTM plus
- ASTM Urisys 2400

5 Transmitted Data

5.1 Upload (cobas u 411 -> Host)

The Following data can be transmitted:

ASTM plus

Strip results

- Sample ID / sequence number
- Date and time of calculation
- Strip results
- Units
- Flags
- Color and clarity of sample
- Sediment results
- Compensated raw data R_F, Color compensation (optional)
- Instrument ID
- User ID
- Software-Version
- Range table (Int/Jap)
- Lot number of test strip and calibration strip

Control results

- Name and lot ID

- Control results for three levels
- Date and time of control calculation
- Units
- Flags
- Color
- Compensated raw data R_F, Color compensation (optional)
- Instrument ID
- User ID
- Software-Version
- Range table (Int/Jap)
- Lot number of test strip and calibration strip

ASTM Urisys 2400

Strip results

- Sample ID / sequence number
- Date and time of calculation
- Strip results
- Units
- Flags
- Color and clarity of sample
- Compensated raw data R_F, Color compensation (optional)
- Instrument ID
- User ID
- Software Version
- Range table (Int/Jap)

Control results

- Name and lot ID
- Control results for three levels
- Date and time of control calculation
- Units
- Flags
- Color
- Compensated raw data R_F, Color compensation (optional)
- Instrument ID
- User ID
- Software Version
- Range table (Int/Jap)

5.2 Download (Host -> cobas u 411)

The following data can be transmitted from Host to the **cobas u** 411 using ASTM plus only:

- list of sample IDs

The download will be initiated on the **cobas u** 411 by clicking the <Download> button.

The ASTM Urisys 2400 **does not** support this mode.

5.3 Arbitrary Units

ASTM plus

Arbitrary units are sent to the host in combination with other units (Conventional or SI).
With the controls, the preset arbitrary values (default) are transmitted.

ASTM Urisys 2400

Arbitrary units are sent to the host only when they are selected alone and NOT in combination with other units (Conventional or SI).
With the controls, the preset arbitrary values (default) are transmitted.

6 Behavior after a transmission failure

If a data transmission is not confirmed by the host, an entry will be made in the alarm monitor (red alarm LED is activated). The failed transmission will not be repeated.

If the host has received data, but report it back as faulty (example wrong checksum), the incorrect sequence will be repeated. After three failed attempts the transmission will be aborted and an entry in the alarm monitor will be set (red alarm LED is activated).

7 Sample ID

The **cobas u** 411 supports a sample ID with a maximum of 13 characters.

8 Configuration setup

8.1 Host interface behavior

The Host interface behavior can be influenced by the following configuration setups (User Interface):

Configuration	Default preset
Host (On/Off)	Off
Protocol (ASTM plus, ASTM Urisys 2400)	ASTM plus
Raw Data to Host (Off, On, Upload only) Setup in Service	Off
Checksum (On/Off)	On

The automatic Result transmission is active when the Host suport is switched On.

8.2 Host Communication

The following configuration setups can be made in the User Interface for the Host communication:

Configuration	Default Preset
Baudrate (1200, 2400, 4800, 9600, 19200, 38400, 57600)	9600
Databits (7, 8)	8
Stopbits (1, 2)	1
Flow Control (None, Xon-Xoff, RTS-CTS)	None
Parity (None, Odd, Even)	None

9 Description of the supported Protocols

9.1 ASTM plus protocol

9.1.1 Outlining of the ASTM communication protocol

The following concepts are essential for the comprehention of the ASTM Communication protocol.

- Record
- Frame
- Message

9.1.1.1 Records

A Record ist the smallest logical group of information. Following records are supported:

Identification	Name	Description
H	Header Record	First record of the transmission. **Mandatory**
O	Order Record	General Sample information i.e. Sample ID, Sequence No. etc.
P	Patient Information Record	General Patient information i.e. Patient-ID, Name etc. The **cobas u** 411 does not hold any Patient data Only an empty record will be sent
R	Result Record	Measurement data
C	Comment Record	Comment, with **cobas u** 411 this record will be used to transmit Sample Flags and Sample Result Flags
M	Manufacturer Record	**cobas u** 411 uses the manufacturer record for the transmission of the raw data, the patient and control additional information, and the sediment data
Q	Request Information Record (Query)	Worklist request
L	Termination Record	Last record of the transmission. **Mandatory**

In chapter 9.1.3 (Record-Descriptions) you will find the records detailed description

9.1.1.2 Frames

A frame is a defined data structure that encapsulates a data block to be transported (transmitted). According to the ASTM protocol, a frame may contain one or more records.
Our implementation, however, always contains only one record.

A frame has the following structure:

ASCII-character STX (Hex 02)
Frame No.

Data according to individual record description (see Point 9.1.3)

ASCII- character ETX (Hex 03)
Checksum
ASCII- character CR (Hex 0D)
ASCII- character LF (Hex 0A)

The Frame No. Always starts at 1. The Frame No. will be incremented by one for each record. If the frame reaches No. 7, the following Frame receives Number 0 (NULL !!!) .

9.1.1.3 Messages

Messages are collections of several records packed in frames into a logical unit.
A message starts with the Header Record (H) and finishes with the Termination Record (L).

9.1.2 Communication startup

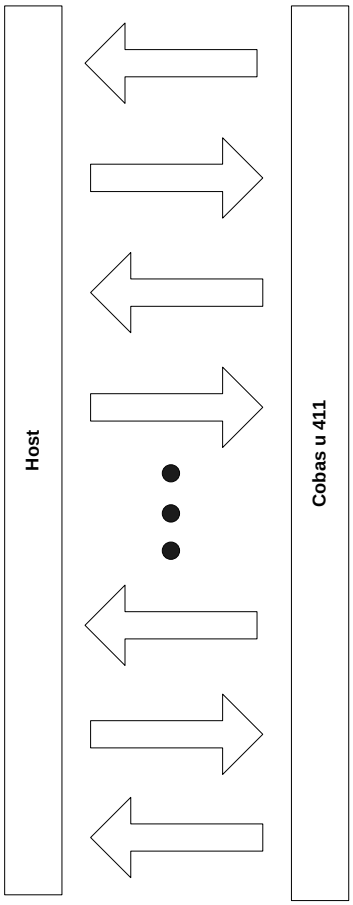
Only the **cobas u** 411 can start a commmunication. The **cobas u** 411 is master.

Exception: After successful handling of the worklist request sequence, the Master function temporarily belongs to the host for the duration of the worklist transmission. See 0

A communication sequence will be initiated by sending the ASCII ENQ character (Hex 05)
The Host (Slave) confirms its receiving readiness by sending back the ACK character (HEX 06)
Or signals a negative readiness with the character NAK (Hex 15).

When the readiness is confirmed by the Host, the transmission will be sent frame by frame.
The host has to confirm a frame reception with ACK. The host can trigger a resending of the last sent frame with NAK.

The communication phase will be ended by sending the ASCII character EOT (Hex 04)



9.1.3 Record descriptions

In the following sections the meanings of the fields in individual records will be explained in the form of tables.
For a better comprehension, compare the following explanations with the examples in chapter 9.1.4 (Examples).

9.1.3.1 Message Header Record

Every message starts with *Message Header Record*. This record is **mandatory.**

No.	Field	Content	Comment
1	record type ID	H	needed by ASTM, always “H”
2	delimiter definition	|\^&	needed by ASTM, defines the delimiter for the sub fields
3	message control ID		not used in **cobas u** 411
4	access password		not used in **cobas u** 411
5	sender name or ID	cobas u 411^serial no.^software version^range boundary setting	first sub field contains “ **cobas u** 411”, second sub field contains serial number (10 digits, e.g. 0000000001), third sub field contains the software version, and the fourth sub field contains the range boundary setting (Int/Jap)
6	Sender street address		not used in **cobas u** 411
7	reserved field		
8	Sender telephone number		
9	Characteristics of sender		
10	receiver ID		
11	comment of special instructions		
12	processing ID	P	always P (production)
13	version no.		not used in **cobas u** 411
14	date and time of message	date	date and time in the format “YYYYMMDDhhmmss (e.g. 20040101154716)

Example:
[STX]1H|\^&|||cobas·u·411^1^3.0.3.0606^Int||||||P||20070225103511[CR][ETX]9C[CR][LF]

9.1.3.2 Patient Information Record

Although **cobas u** 411 does not save any patient data, the patient information record is a mandatory requirement of the ASTM standard. For this reason the **cobas u** 411 simply transmits an empty record.

No.	Field	Content	Comment
1	record type ID	P	needed by ASTM, always “P”
2	sequence no.	1	needed by ASTM, we only send one order per transmission, so this value is always 1

Example:

[STX]2P|1[CR][ETX]3F[CR][LF]

9.1.3.3 Order Record

In the *Order Record* general sample information such as Sampe ID, sequence Number, etc will be transmitted.

No.	Field	Content	Comment
1	record type ID	O	needed by ASTM, always “O”
2	sequence no.	1	needed by ASTM, we only send on order per transmission, so this value is always 1
3	Specimen ID	sample ID	the ID of the sample, numerical or alphanumerical value (e.g. 112)
4	instrument specimen ID	sample no^ rack ID^ position no.^ operator ID^ data carrier type	**cobas u** 411 supports only sample no and data carrier type (“SAMPLE” for patient samples, “CONTROL” for control samples. For order download the sample no is not needed and is ignored.
5	universal test ID		not used in **cobas u** 411
6	Priority	R	always “R” (routine sample, **cobas u** 411 does not support emergency samples)
7	request/ordered date and time		Not used in **cobas u** 411
8	specimen collection date and time		
9	collection end time		
10	collection volume (in ml)		
11	collector ID		
12	action code	X or X\Q	always X, in case of control samples “\Q” is added
13	danger code		used in **cobas u** 411 not
14	relevant clinical information		
15	date/time specimen received		date and time in the format “YYYYMMDDhhmmss (e.g. 20000202035009)
16	Specimen description		Not used in **cobas u** 411
17	ordering physician		
18	physician’s telephone number		
19	user field no. 1		
20	user field no. 2		
21	laboratory field no. 1		
22	laboratory field no. 2		
23	Date/time results reported or last modified		
24	Instrument change to computer system		
25	Instrument section ID		
26	report types		
27	Reserved field		
28	location or ward of specimen collection		
29	nosocomial flag		
30	specimen service		
31	specimen institution		

Example:
[STX]2O|8|0000000001|1^^^^SAMPLE||R||||||X|||20040124104711[CR][ETX]42[CR][LF]

9.1.3.4 Result Record

In *Result Record* the measurement data will be transmitted. Each test needs a separate *Result Record*.

No.	Field	Content	Comment
1	record type ID	R	needed by ASTM, always “R”
2	sequence no.	1 – 100	needed by ASTM, **cobas u** 411 saves up to 100 results (color, clarity and sediment parameters included)
3	universal test ID	test no.^	test no list (e.g. 1) see 10.2
		test code	test code (e.g. “SG”) see 10.2
4	data or measurement value	result value^ arbitrary value	result value: numerical value (e.g. 1.030) or alphanumerical value (e.g. „neg.”) arbitrary value: additional, this subfield is only used if arbitrary values are used in combination with others (Conventional or SI); arbitrary values for color and clarity don’t exist
5	Unit	unit	alphanumerical value (e.g. “mg/dl”), only if result can be represented by several units
6	reference ranges		not used in **cobas u** 411
7	result abnormal flag		this field is not supported, abnormal flags are stored in the comment record
8	nature of abnormality testing		
9	result status		not used in **cobas u** 411
10	date of change in instrument normative values or units		
11	Operator identification	user ID	user ID of operator who performed the test
12	date/time test started		not used in **cobas u** 411
13	date/time test completed		
14	Instrument identification		

Example:

[STX]4R|1|1^SG|1.020||||||service[CR][ETX]AA[CR][LF]

9.1.3.5 Comment Record

With **cobas u** 411 the *omment Record* will be used to transmit Sample Flags and Sample Result Flags. When the result of a sample or control has a *Sample result flag*. A *Comment Record* will be attached to all the corresponding *Result Records* of the sample.

No.	Field	Content	Comment
1	record type ID	C	needed by ASTM, always “C”
2	sequence no.	1	needed by ASTM, use the same sequence no. as the prior result record
3	comment source	I	needed by ASTM, always “I”
4	comment text	Sample Flags / Sample Result Flags	**cobas u** 411 uses the comment record only for transmitting flags, each flag is separated with the ^ delimiter.
5	comment type	I	needed by ASTM, always “I”

Example:

[STX]0C|4|I|*^S|I[CR][ETX]14[CR][LF]

9.1.3.6 Manufacturer Record (Raw Result Record - RR)

cobas u 411 uses the *Raw Result Record* for transmission of the raw data. The *Raw Result Record* can be used for patient or control results as well.

No.	Field	Content	Comment
1	record type ID	M	needed by ASTM, always “M”
2	sequence no.	1 – 100	running number
3	record type sub-ID	RR	Always “RR” (raw result)
4	universal test ID	test no.^	test no list (e.g. 1) see 10.2
		test code	test code (e.g. “SG”) see 10.2
5	test frequency	frequency	LED frequency (e.g. “green”) blue (~470 nm) green (~555 nm) orange (~620 nm)
6	raw result value	reflectance	floating number in the format ##.## (e.g. 88.06)

Example:

[STX]1M|1|RR|11^COM|blue|72.60[CR][ETX]13[CR][LF]

9.1.3.7 Manufacturer Record (Result Context Record - RC)

cobas u 411 uses the *Result Context Record* for the transmission of additional information for patients or controls.

Patient samples:

- Calibration strip - Lot number
- Calibration strip - expiry date

- Test strip - Lot number
- Test strip - expiry date

Control :

- Calibration strip - Lot number
- Calibration strip - expiry date
- Test strip - Lot number
- Test strip - expiry date
- Name of control
- Lot number of control
- expiry date of control

No.	Field	Content	Comment
1	record type ID	M	needed by ASTM, always “M”
2	Sequence no.	1	running number
3	record type sub-ID	RC	always “RC” (result context)
4	calibration strip lot number	e.g. 4567	numerical or alphanumerical value
5	calibration strip expiration date	e.g. 20061231	date and time in the format “YYYYMMDD”, e.g. “20061231”
6	test strip lot number	e.g. 1234	numerical or alphanumerical value
7	test strip expiration date	e.g. 20061231	date and time in the format “YYYYMMDD”, e.g. “20061231”
8	control name	e.g. CONTROL-LOW	patient sample: always empty control sample: control name
9	control lot number	e.g. 7890	patient sample: always empty control sample: control lot no
10	control expiration date	e.g. 20061231	patient sample: always empty control sample: control expiration date date and time in the format “YYYYMMDD”, e.g. “20061231”

Example Patient sample:

[STX]4M|1|RC|CalibStrip02|20091111|Teststrip01|20081111|||[CR][ETX]52[CR][LF]

Example control:

[STX]2M|1|RC|CalibStrip02|20091111|Teststrip01|20081111|Control·1|12122235|20070607[CR][ETX]AA[CR][LF]

9.1.3.8 Request Information Record (request for worklist download)

Using the *Request Information Records* the worklist can be requested from the host.

No.	Field	Content	Comment
1	record type ID	Q	needed by ASTM, always “Q”
2	sequence no.	1	always 1
3	record type sub-ID	^ALL	ask for all orders

Example:

[STX]2Q|1|^ALL[CR][ETX]F3[CR][LF]]

9.1.3.9 Termination Record

Every Message will be closed with a *Termination Record.* This Record is **mandatory.**

No.	Field	Content	Comment
1	record type ID	L	needed by ASTM, always “L”
2	sequence no.	1	always 1
3	termination code	N	N for normal end of message

Example:

[STX]3L|1|N[CR][ETX]06[CR][LF]

9.1.4 Examples

9.1.4.1 Example1: Upload Sample Results (without raw and Sediment data)

u 411 10:33:52,279 [ENQ]
Host 10:33:52,279 [ACK]
u 411 10:33:52,326 [STX]1H|\^&|||cobas·u·411^1^3.0.3.0606^Int
|||||||P||20070225103511[CR][ETX]9C[CR][LF]
Host 10:33:52,388 [ACK]
u 411 10:33:52,435 [STX]2P|1[CR][ETX]3F[CR][LF]
Host 10:33:52,451 [ACK]
u 411 10:33:52,482 [STX]3O|1|0000000001|1^^^^SAMPLE||R||||||X|||2
0070225092523[CR][ETX]48[CR][LF]
Host 10:33:52,545 [ACK]
u 411 10:33:52,592 [STX]4R|1|1^SG|1.020|||||||service[CR][ETX]AA[
CR][LF]
Host 10:33:52,623 [ACK]
u 411 10:33:52,654 [STX]5R|2|2^pH|6|||||||service[CR][ETX]10[CR][
LF]
Host 10:33:52,685 [ACK]
u 411 10:33:52,732 [STX]6R|3|3^LEU|neg|||||||service[CR][ETX]45[C
R][LF]
Host 10:33:52,763 [ACK]
u 411 10:33:52,795 [STX]7R|4|4^NIT|pos|||||||service[CR][ETX]65[C
R][LF]
Host 10:33:52,826 [ACK]
u 411 10:33:52,873 [STX]0C|4|I|*^S|I[CR][ETX]14[CR][LF]
Host 10:33:52,888 [ACK]
u 411 10:33:52,920 [STX]1R|5|5^PRO|neg|||||||service[CR][ETX]4F[C
R][LF]
Host 10:33:52,967 [ACK]
u 411 10:33:52,998 [STX]2R|6|6^GLU|norm|||||||service[CR][ETX]CB[
CR][LF]
Host 10:33:53,029 [ACK]
u 411 10:33:53,076 [STX]3R|7|7^KET|neg|||||||service[CR][ETX]48[C
R][LF]
Host 10:33:53,107 [ACK]
u 411 10:33:53,138 [STX]4R|8|8^UBG|norm|||||||service[CR][ETX]C7[
CR][LF]
Host 10:33:53,185 [ACK]
u 411 10:33:53,232 [STX]5R|9|9^BIL|neg|||||||service[CR][ETX]41[C
R][LF]
Host 10:33:53,263 [ACK]
u 411 10:33:53,295 [STX]6R|10|10^ERY|neg|||||||service[CR][ETX]AB
[CR][LF]

Host 10:33:53,326 [ACK]
u 411 10:33:53,373 [STX]7R|11|11^COL|||||||service[CR][ETX]62[CR][LF]
Host 10:33:53,404 [ACK]
u 411 10:33:53,451 [STX]0R|12|12^CLA|||||||service[CR][ETX]4F[CR][LF]
Host 10:33:53,482 [ACK]
u 411 10:33:53,513 [STX]1M|1|RC|CalibStrip02|20091111|Teststrip01|20081111||||[CR][ETX]4F[CR][LF]
Host 10:33:53,576 [ACK]
u 411 10:33:53,623 [STX]2L|1|N[CR][ETX]05[CR][LF]
Host 10:33:53,623 [ACK]
u 411 10:33:53,670 [EOT]

9.1.4.2 Example 2: Upload Sample Results (without raw data, with sediment data)

411 10:48:55,033 [ENQ]
Host 10:48:55,033 [ACK]
u 411 10:48:55,080 [STX]1H|\^&|||cobas·u·411^1^3.0.3.0606^Int|||||||P||20070225105014[CR][ETX]9C[CR][LF]
Host 10:48:55,158 [ACK]
u 411 10:48:55,189 [STX]2P|1[CR][ETX]3F[CR][LF]
Host 10:48:55,205 [ACK]
u 411 10:48:55,236 [STX]3O|1|0000000001|1^^^^SAMPLE||R||||||X|||20070225092523[CR][ETX]48[CR][LF]
Host 10:48:55,299 [ACK]
u 411 10:48:55,346 [STX]4R|1|1^SG|1.020|||||||service[CR][ETX]AA[CR][LF]
Host 10:48:55,377 [ACK]
u 411 10:48:55,408 [STX]5R|2|2^pH|6|||||||service[CR][ETX]10[CR][LF]
Host 10:48:55,439 [ACK]
u 411 10:48:55,486 [STX]6R|3|3^LEU|neg|||||||service[CR][ETX]45[CR][LF]
Host 10:48:55,517 [ACK]
u 411 10:48:55,549 [STX]7R|4|4^NIT|pos|||||||service[CR][ETX]65[CR][LF]
Host 10:48:55,580 [ACK]
u 411 10:48:55,627 [STX]0C|4|I|*^S|I[CR][ETX]14[CR][LF]
Host 10:48:55,642 [ACK]
u 411 10:48:55,689 [STX]1R|5|5^PRO|neg|||||||service[CR][ETX]4F[CR][LF]
Host 10:48:55,721 [ACK]
u 411 10:48:55,767 [STX]2R|6|6^GLU|norm|||||||service[CR][ETX]CB[CR][LF]
Host 10:48:55,799 [ACK]
u 411 10:48:55,846 [STX]3R|7|7^KET|neg|||||||service[CR][ETX]48[CR][LF]
Host 10:48:55,877 [ACK]
u 411 10:48:55,908 [STX]4R|8|8^UBG|norm|||||||service[CR][ETX]C7[CR][LF]
Host 10:48:55,955 [ACK]
u 411 10:48:55,986 [STX]5R|9|9^BIL|neg|||||||service[CR][ETX]41[CR][LF]
Host 10:48:56,033 [ACK]
u 411 10:48:56,064 [STX]6R|10|10^ERY|neg|||||||service[CR][ETX]AB[CR][LF]
Host 10:48:56,096 [ACK]

u 411 10:48:56,142 [STX]7R|11|11^COL|||||||service[CR][ETX]62[CR][LF]
Host 10:48:56,174 [ACK]
u 411 10:48:56,205 [STX]0R|12|12^CLA|||||||service[CR][ETX]4F[CR][LF]
Host 10:48:56,252 [ACK]
u 411 10:48:56,283 [STX]1R|13|51^Sediparam1|11-20|||||||service[CR][ETX]3C[CR][LF]
Host 10:48:56,330 [ACK]
u 411 10:48:56,377 [STX]2R|14|52^Sediparam2|1-5|||||||service[CR][ETX]E2[CR][LF]
Host 10:48:56,424 [ACK]
u 411 10:48:56,455 [STX]3R|15|53^Sediparam3|3|||||||service[CR][ETX]86[CR][LF]
Host 10:48:56,502 [ACK]
u 411 10:48:56,533 [STX]4M|1|RC|CalibStrip02|20091111|Teststrip01|20081111||||[CR][ETX]52[CR][LF]
Host 10:48:56,596 [ACK]
u 411 10:48:56,627 [STX]5L|1|N[CR][ETX]08[CR][LF]
Host 10:48:56,642 [ACK]
u 411 10:48:56,674 [EOT]

9.1.4.3 Example 3: Upload Sample Results (with raw data, without sediment data)

u 411 10:56:22,121 [ENQ]
Host 10:56:22,121 [ACK]
u 411 10:56:22,168 [STX]1H|\^&|||cobas·u·411^1^3.0.3.0606^Int|||||||P||20070225105741[CR][ETX]A3[CR][LF]
Host 10:56:22,230 [ACK]
u 411 10:56:22,277 [STX]2P|1[CR][ETX]3F[CR][LF]
Host 10:56:22,277 [ACK]
u 411 10:56:22,324 [STX]3O|1|0000000002|2^^^^SAMPLE||R||||||X|||20070225092541[CR][ETX]4A[CR][LF]
Host 10:56:22,387 [ACK]
u 411 10:56:22,418 [STX]4R|1|1^SG|1.020|||||||service[CR][ETX]AA[CR][LF]
Host 10:56:22,465 [ACK]
u 411 10:56:22,496 [STX]5R|2|2^pH|6|||||||service[CR][ETX]10[CR][LF]
Host 10:56:22,527 [ACK]
u 411 10:56:22,559 [STX]6R|3|3^LEU|neg|||||||service[CR][ETX]45[CR][LF]
Host 10:56:22,605 [ACK]
u 411 10:56:22,637 [STX]7R|4|4^NIT|pos|||||||service[CR][ETX]65[CR][LF]
Host 10:56:22,668 [ACK]
u 411 10:56:22,699 [STX]0C|4|I|*^S|I[CR][ETX]14[CR][LF]
Host 10:56:22,715 [ACK]
u 411 10:56:22,762 [STX]1R|5|5^PRO|neg|||||||service[CR][ETX]4F[CR][LF]
Host 10:56:22,793 [ACK]
u 411 10:56:22,840 [STX]2R|6|6^GLU|norm|||||||service[CR][ETX]CB[CR][LF]
Host 10:56:22,871 [ACK]
u 411 10:56:22,918 [STX]3R|7|7^KET|neg|||||||service[CR][ETX]48[CR][LF]
Host 10:56:22,949 [ACK]
u 411 10:56:22,980 [STX]4R|8|8^UBG|norm|||||||service[CR][ETX]C7[CR][LF]

Host 10:56:23,027 [ACK]
u 411 10:56:23,059 [STX]5R|9|9^BIL|neg||||||service[CR][ETX]41[C
R][LF]
Host 10:56:23,105 [ACK]
u 411 10:56:23,137 [STX]6R|10|10^ERY|neg||||||service[CR][ETX]AB
[CR][LF]
Host 10:56:23,168 [ACK]
u 411 10:56:23,215 [STX]7R|11|11^COL|||||||service[CR][ETX]62[CR
][LF]
Host 10:56:23,246 [ACK]
u 411 10:56:23,277 [STX]0R|12|12^CLA|||||||service[CR][ETX]4F[CR
][LF]
Host 10:56:23,324 [ACK]
u 411 10:56:23,355 [STX]1M|1|RR|11^COM|blue|72.60[CR][ETX]13[CR][
LF]
Host 10:56:23,387 [ACK]
u 411 10:56:23,418 [STX]2M|2|RR|11^COM|green|74.62[CR][ETX]82[CR]
[LF]
Host 10:56:23,465 [ACK]
u 411 10:56:23,496 [STX]3M|3|RR|11^COM|orange|74.92[CR][ETX]F2[CR
][LF]
Host 10:56:23,527 [ACK]
u 411 10:56:23,559 [STX]4M|4|RR|10^ERY|green|67.35[CR][ETX]98[CR]
[LF]
Host 10:56:23,590 [ACK]
u 411 10:56:23,637 [STX]5M|5|RR|10^ERY|orange|67.97[CR][ETX]0D[CR
][LF]
Host 10:56:23,668 [ACK]
u 411 10:56:23,699 [STX]6M|6|RR|3^LEU|green|74.61[CR][ETX]61[CR][
LF]
Host 10:56:23,730 [ACK]
u 411 10:56:23,777 [STX]7M|7|RR|4^NIT|green|68.10[CR][ETX]66[CR][
LF]
Host 10:56:23,809 [ACK]
u 411 10:56:23,840 [STX]0M|8|RR|7^KET|green|58.99[CR][ETX]6C[CR][
LF]
Host 10:56:23,871 [ACK]
u 411 10:56:23,918 [STX]1M|9|RR|6^GLU|green|73.52[CR][ETX]63[CR][
LF]
Host 10:56:23,949 [ACK]
u 411 10:56:23,980 [STX]2M|10|RR|5^PRO|orange|71.56[CR][ETX]01[CR
][LF]
Host 10:56:24,012 [ACK]
u 411 10:56:24,059 [STX]3M|11|RR|8^UBG|green|70.50[CR][ETX]81[CR]
[LF]
Host 10:56:24,090 [ACK]
u 411 10:56:24,121 [STX]4M|12|RR|9^BIL|green|69.01[CR][ETX]81[CR]
[LF]
Host 10:56:24,152 [ACK]
u 411 10:56:24,199 [STX]5M|13|RR|2^pH|green|49.08[CR][ETX]62[CR][
LF]
Host 10:56:24,230 [ACK]
u 411 10:56:24,262 [STX]6M|14|RR|2^pH|orange|64.19[CR][ETX]CE[CR]
[LF]
Host 10:56:24,293 [ACK]
u 411 10:56:24,340 [STX]7M|15|RR|1^SG|orange|35.47[CR][ETX]B0[CR]
[LF]
Host 10:56:24,371 [ACK]

u 411 10:56:24,402 [STX]0M|16|RC|CalibStrip02|20091111|Teststrip0
1|20081111||||[CR][ETX]84[CR][LF]
Host 10:56:24,465 [ACK]
u 411 10:56:24,512 [STX]1L|1|N[CR][ETX]04[CR][LF]
Host 10:56:24,512 [ACK]
u 411 10:56:24,559 [EOT]

9.1.4.4 Example 4: Upload Control Results

u 411 11:15:18,028 [ENQ]
Host 11:15:18,028 [ACK]
u 411 11:15:18,075 [STX]1H|\^&|||cobas·u·411^1^3.0.3.0606^Int
|||||||P||20070225111637[CR][ETX]A4[CR][LF]
Host 11:15:18,138 [ACK]
u 411 11:15:18,169 [STX]2P|1[CR][ETX]3F[CR][LF]
Host 11:15:18,185 [ACK]
u 411 11:15:18,232 [STX]3O|1||0^^^^CONTROL||R||||||X\Q|||20070225
110013[CR][ETX]63[CR][LF]
Host 11:15:18,278 [ACK]
u 411 11:15:18,310 [STX]4R|1|1^SG|1.025|||||||service[CR][ETX]AF[
CR][LF]
Host 11:15:18,357 [ACK]
u 411 11:15:18,388 [STX]5C|1|I|*|I[CR][ETX]65[CR][LF]
Host 11:15:18,403 [ACK]
u 411 11:15:18,435 [STX]6R|2|2^pH|6|||||||service[CR][ETX]11[CR][
LF]
Host 11:15:18,466 [ACK]
u 411 11:15:18,513 [STX]7C|2|I|*|I[CR][ETX]68[CR][LF]
Host 11:15:18,528 [ACK]
u 411 11:15:18,560 [STX]0R|3|3^LEU|neg|||||||service[CR][ETX]3F[C
R][LF]
Host 11:15:18,591 [ACK]
u 411 11:15:18,622 [STX]1R|4|4^NIT|pos|||||||service[CR][ETX]5F[C
R][LF]
Host 11:15:18,669 [ACK]
u 411 11:15:18,700 [STX]2C|4|I|*|I[CR][ETX]65[CR][LF]
Host 11:15:18,716 [ACK]
u 411 11:15:18,747 [STX]3R|5|5^PRO|neg|||||||service[CR][ETX]51[C
R][LF]
Host 11:15:18,778 [ACK]
u 411 11:15:18,825 [STX]4R|6|6^GLU|norm|||||||service[CR][ETX]CD[
CR][LF]
Host 11:15:18,857 [ACK]
u 411 11:15:18,903 [STX]5R|7|7^KET|neg|||||||service[CR][ETX]4A[C
R][LF]
Host 11:15:18,935 [ACK]
u 411 11:15:18,982 [STX]6R|8|8^UBG|norm|||||||service[CR][ETX]C9[
CR][LF]
Host 11:15:19,013 [ACK]
u 411 11:15:19,060 [STX]7R|9|9^BIL|neg|||||||service[CR][ETX]43[C
R][LF]
Host 11:15:19,091 [ACK]
u 411 11:15:19,122 [STX]0R|10|10^ERY|neg|||||||service[CR][ETX]A5
[CR][LF]
Host 11:15:19,169 [ACK]
u 411 11:15:19,200 [STX]1R|11|11^COL|||||||service[CR][ETX]5C[CR
][LF]
Host 11:15:19,247 [ACK]
u 411 11:15:19,278 [STX]2M|1|RC|CalibStrip02|20091111|Teststrip01

|20081111|Control·1|12122235|20070607[CR][ETX]
AA[CR][LF]
Host 11:15:19,372 [ACK]
u 411 11:15:19,403 [STX]3L|1|N[CR][ETX]06[CR][LF]
Host 11:15:19,419 [ACK]
u 411 11:15:19,450 [EOT]

9.1.4.5 Example5: Download (Worklist-request from cobas u 411)

cobas u 411 always master, i.e. the Worklist will be requested by pressing the „Download“ button on **cobas u** 411:

u 411 [ENQ]
Host [ACK]
u 411 [STX]1H|\^&|||cobas u 411^1^3.0.3.0606^Int||||||P||20070225090758[CR][ETX]AE[CR][LF]
Host [ACK]
u 411 [STX]2Q|1|^ALL[CR][ETX]F3[CR][LF]
Host [ACK]
u 411 [STX]3L|1|N[CR][ETX]06[CR][LF]
Host [ACK]
u 411 [EOT]

After sending the request, the **cobas u** 411 waits fort he answer from the host:

HOST [ENQ]
u 411 [ACK]
HOST [STX]1H|\^&|||6146000-00-15|||||||P|[CR][ETX]0A[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000001|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D2[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000002|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D3[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000003|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D4[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000004|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D5[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000005|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D6[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000006|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D7[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000007|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D8[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000008|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D9[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000009|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]DA[CR][LF]
u 411 [ACK]
HOST [STX]2O|8|0000000000010|1^^^^SAMPLE||R|||||X|||20040124104711[CR]
[ETX]D2[CR][LF]
u 411 [ACK]

HOST [STX]3L|1|N[ETX]F9[CR][LF]
U 411 [ACK]
HOST [EOT]

Sample ID's = 0000000000001-0000000000010

9.2 Protocols ASTM Urisys 2400

9.2.1 Outlining of the ASTM Urisys 2400 Communication protocol

The ASTM Urisys 2400-Protocol is also implemented according to the ASTM standard.
The following concepts are essential for the comprehention of the ASTM Communication protocol:

- Record
- Frame
- Message

9.2.1.1 Records

A Record ist the smallest logical group of information. Following records are supported by ASTM Urisys 2400-Protocol:

Identification	Name	Description
H	Header Record	First record of the transmission. **Mandatory**
O	Order Record	General Sample information i.e. Sample ID, Sequence No. etc.
P	Patient Information Record	General Patient information i.e. Patient-ID, Name etc. The **cobas u** 411 does not hold any Patienten data Only an empty record will be sent
R	Result Record	Measurement data
C	Comment Record	Comment, with **cobas u** 411 this record will be used to transmit Sample Flags and Sample Result Flags.
M	Manufacturer Record	**cobas u** 411 uses the manufacturer record for the transmission of the raw data, the patient and control additional information, andf the sediment data
L	Termination Record	Last record of the transmission. **Mandatory**

In chapter 9.2.3 (Record-Descriptions) werden die einzelnen Records detailliert beschrieben.

9.2.1.2 Frames

A frame is a defined data structure that encapsulates a data block to be transported (transmitted). According to the ASTM protocol, a frame may contain one or more records.
Our implementation, however, always contains only one record.

A frame has the following structure:

ASCII-character STX (Hex 02)
Frame No.

Data according to individual record
description (9.1.3)

ASCII-CharacterETX (Hex 03) oder
ASCII-CharacterETB (Hex 14)
Checksumme
ASCII-CharacterCR (Hex 0D)
ASCII-CharacterLF (Hex 0A)

The Frame No. Always starts at 1. The Frame No. will be incremented by one for each record. If the frame reaches No. 7, the following Frame receives Number 0 (NULL !!!) .

Most ASTM implementations encapsulate one Record in one Frame:

[STX] + Frame No. + Informationen (Record) + [ETX] + Checksumme + [CR] + [LF]

The ASTM Urisys 2400-Protocols is a special implementation of ASTM. All recards will be packed in one Frame. According to ASTM-Standard the total length of the data in one frame should not exceed 240 Bytes, otherwise the Frame must me split into sub-Frames or partial Frames. Such a sub-Frame is terminated with an [ETB] character:

[STX] + Frame No. + Information 1 + **[ETB]** + Checksum + [CR] + [LF]
[STX] + Frame No. + Information 2 + **[ETB]** + Checksum + [CR] + [LF]
[STX] + Frame No. + Information 3 + **[ETX]** + Checksum + [CR] + [LF] (Msg-End, therefore [ETX])

9.2.1.3 Messages

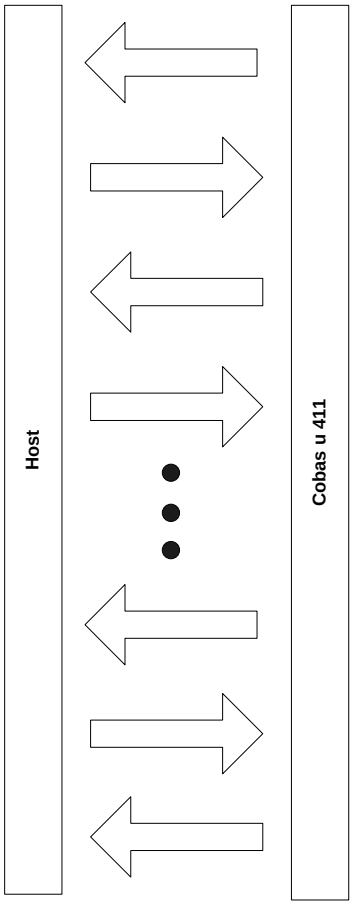
Messages are collections of several Records, packed into Frames as a logical unit. A message starts with an Header Record (H) and ends with the Termination Record (L).

9.2.2 Communication startup

Only the **cobas u** 411 can open a communication. This means that **cobas u** 411 is the Master. A communication will be initiated by sending the ENQ ASCII-character initialisiert(Hex 05). The Host (Slave) confirms its readiness by sending the ACK ASCII-character (Hex 06), or signals a negative readiness by sending durch Versenden NAK ASCII- character (Hex 15).

When the readiness is confirmed by the Host, the transmission will be sent frame by frame.
The host has to confirm a frame reception with ACK. The host can trigger a resending of the last sent frame with NAK.

The communication phase will be ended by sending the ASCII character EOT (Hex 04)



9.2.3 Record descriptions

In the following sections the meanings of the fields in individual records will be explained in the form of tables.

For a better comprehension, compare the following explanations with the examples in chapter 9.1.4 (Examples).

9.2.3.1 Message Header Record

Every message starts with *Message Header Record*. This record is **mandatory.**

No.	Field	Content	Comment
1	record type ID	H	needed by ASTM, always “H”
2	delimiter definition	|\^&	needed by ASTM, defines the delimiter for the sub fields
3	message control ID		not used in **cobas u** 411
4	access password		not used in **cobas u** 411
5	sender name or ID	serial no	serial number (10 digits, e.g. 0000000001)
6	Sender street address		not used in **cobas u** 411
7	reserved field		
8	Sender telephone number		
9	Characteristics of sender		
10	receiver ID		
11	comment of special instructinos		
12	processing ID	P	always P (production)
13	version no.	software version	e.g. 2.0.0.0504
14	date and time of message		not used in **cobas u** 411

Example:

H|\^&|||1||||||P|3.0.2.0605[CR]

9.2.3.2 Patient Information Record

Although **cobas u** 411 does not save any patient data, the patient information record is a mandatory requirement of the ASTM standard. For this reason the **cobas u** 411 simply transmits an empty record.

No.	Field	Content	Comment
1	record type ID	P	needed by ASTM, always “P”
2	Sequence no.	1	needed by ASTM, we only send one order per transmission, so this value is always 1

Example:

P|1[CR]

9.2.3.3 Order Record

In the *Order Record* general sample information such as Sampe ID, sequence Number, etc will be transmitted.

No.	Field	Content	Comment
1	record type ID	O	needed by ASTM, always “O”
2	sequence no.	1	needed by ASTM, we only send on order per transmission, so this value

			is always 1
3	Specimen ID	sample ID	the ID of the sample, numerical or alphanumerical value (e.g. 112)
4	instrument specimen ID	sample no^ rack ID^ position no.^ operator ID^ data carrier type	**cobas u** 411 supports only sample no and data carrier type (“SAMPLE” for patient samples, “CONTROL” for control samples. For order download the sample no is not needed and is ignored.
5	universal test ID		not used in **cobas u** 411
6	Priority	R	always “R” (routine sample, **cobas u** 411 does not support emergency samples)
7	request/ordered date and time		
8	specimen collection date and time		not used in **cobas u** 411
9	collection end time		
10	collection volume (in ml)		
11	collector ID		
12	action code	X or X\Q	always X, in case of control samples “\Q” is added
13	danger code		not used in **cobas u** 411
14	relevant clinical information		not used in **cobas u** 411
15	date/time specimen received		date and time in the format “YYYYMMDDhhmmss (e.g. 20000202035009)
16	Specimen description		
17	ordering physician		
18	physician’s telephone number		
19	user field no. 1		
20	User field no. 2		
21	laboratory field no. 1		
22	laboratory field no. 2		
23	Date/time results reported or last modified		
24	Instrument change to computer system		not used in **cobas u** 411
25	Instrument section ID		
26	report types		
27	Reserved field		
28	location or ward of specimen collection		
29	nosocomial flag		
30	specimen service		
31	specimen institution		

Example:

O|1|0000000000001|1^^^service^SAMPLE||R||||||X|||20040609182730[CR]

9.2.3.4 Result Record

In *Result Record* the measurement data will be transmitted. Each test needs a separate *Result Record*

No.	Field	Content	Comment
1	record type ID	R	needed by ASTM, always “R”
2	sequence no.	1 – 12	needed by ASTM, **cobas u** 411 saves always 12 results (color and clarity included)
3	universal test ID	^ ^ ^ test no.	test no list (fixation): 1: SG 2: pH 3: LEU 4: NIT 5: PRO 6: GLU 7: KET 8: UBG 9: BIL 10: ERY 11: COL 12: CLA
4	data or measurement value	result value	numerical value (e.g. 1.030) or alphanumerical value (e.g. „neg.”) IMPORTANT: to be compatible with the original URISYS 2400 analyzer, the following conversions are done in the driver: pos → POS pos. → POS neg → NEG neg. → NEG norm → NORM norm. → NORM
5	Unit	unit	alphanumerical value (e.g. “mg/dL”), only if result can be represented by several units IMPORTANT: all “l” letters, which stand for “liter”, are converted to capital letters (e. g. ml → mL)!
6	reference ranges		not used in **cobas u** 411
7	result abnormal flag		flag “R”: Test Strip Error
8	nature of abnormality testing		not used in **cobas u** 411
9	result status		not used in **cobas u** 411
10	date of change in instrument normative values or units		not used in **cobas u** 411
11	Operator identification	user ID	user ID of operator who performed the test
12	date/time test started		not used in **cobas u** 411
13	date/time test completed		not used in **cobas u** 411
14	Instrument identification		not used in **cobas u** 411

Example:
R|1|^^^1|1.020|||||[CR]

9.2.3.5 Comment Record

With **cobas u** 411 the *omment Record* will be used to transmit Sample Flags and Sample Result Flags. When the result of a sample or control has a *Sample result flag*. A *Comment Record* will be attached to all the corresponding *Result Records* of the sample. If not flags occurred, an empty record will be transmitted

No.	Field	Content	Comment
1	record type ID	C	Needed by ASTM, always “C”
2	sequence no.	1	needed by ASTM, use the same sequence no. as the prior result record
3	comment source	I	Needed by ASTM, always “I”
4	comment text	Sample Result Flags	**cobas u** 411 uses the comment record only for transmitting flags, each flag is separated with the ^ delimiter.
5	comment type	I	needed by ASTM, always “I”

Example:

C|1|I|||[CR] or
C|10|I|*^S|I[CR]

9.2.3.6 Manufacturer Record (Raw Result Record - RR)

The **cobas u** 411 uses the *Raw Result Record* to transmit the raw data. The *Raw Result Record* may be also used for patient and control results.

No.	Field	Content	Comment
1	record type ID	M	needed by ASTM, always “M”
2	sequence no.	1 – 16	running number
3	record type sub-ID	RR	Always “RR” (raw result)
4	raw result value	Reflectance	floating number in the format ##.## (e.g. 88.06) fix order for raw result value: 1: COM blue 2: COM green 3: COM orange 4: ERY green 5: ERY orange 6: LEU green 7: NIT green 8: KET green 9: GLU green 10: PRO orange 11: UBG green 12: BIL green 13: pH green 14: pH orange 15: SG orange 16: not used, always 0

Example:

M|1|RR|69.12|[CR]

9.2.3.7 Manufacturer Record (Result Context Record - RC)

cobas u 411 uses the *Result Context Record* for transmission of the control names and Controllot Numbers.

No.	Field	Content	Comment
1	record type ID	M	needed by ASTM, always “M”
2	Sequence no.	1	running number
3	record type sub-ID	RC	Always “RC” (result context)
4	Test strip cassette lot number		Always empty
5	date/time test strip cassette set		Always empty
6	control name	e.g. CONTROL-LOW	Control name
7	control identifier	e.g. 001	Control lot no

Example:

M|1|RC|||ControlName1|ControlLotNo1|[CR]

9.2.3.8 Termination Record

Every Message will be closed with a *Termination Record.* This Record is **mandatory.**

No.	Field	Content	Comment
1	record type ID	L	needed by ASTM, always “L”
2	sequence no.	1	always 1
3	termination code		Empty if normal end of message

Example:

L|1|[CR]

9.2.4 Examples

9.2.4.1 Example 1: Upload Sample Results (without Raw data)

u 411 17:24:06,095 [ENQ]
Host 17:24:06,095 [ACK]
u 411 17:24:06,141 [STX]1H|\^&|||1|||||||P|3.0.2.0605[CR]P|1[CR]O
|1|0000000000001|1^^^service^SAMPLE||R|||||X|
||20040609182730[CR]R|1|^^^1|1.020|||||[CR]C|1
|I|||I[CR]R|2|^^^2|6|||||[CR]C|2|I|||I[CR]R|3|^^
^3|NEG|||||[CR]C|3|I|||I[CR]R|4|^^^4|NEG|||||[C
R]C|4|I|||I[CR]R|5|^^^5|NEG|||||[CR]C|5|I|||I[CR
]R|6|^^^6[ETB]B1[CR][LF]
Host 17:24:06,188 [ACK]
u 411 17:24:06,220 [STX]2|NORM|||||[CR]C|6|I|||I[CR]R|7|^^^7|NEG||
||||[CR]C|7|I|||I[CR]R|8|^^^8|NORM|||||[CR]C|8|I
|||I[CR]R|9|^^^9|NEG|||||[CR]C|9|I|||I[CR]R|10|^
^^10|10|/uL||||[CR]C|10|II|*^S|I[CR]R|11|^^^11|
yellow|||||[CR]C|11|I|||I[CR]R|12|^^^12||||||X[

CR]C|12|I||I[CR]L|1|[CR][ETX]6C[CR][LF]
Host 17:24:06,251 [ACK]
u 411 17:24:06,282 [EOT]

9.2.4.2 Example 2: Upload Sample Results (with Raw data)

u 411 14:51:47,012 [ENQ]
Host 14:51:47,055 [ACK]
u 411 14:51:47,084 [STX]1H|\^&|||1|||||||P|3.0.2.0605[CR]P|1[CR]O
|1|0000000000001|1^^^service^SAMPLE||R||||||X|
||20040609182730[CR]R|1|^^^1|1.020|||||[CR]C|1
|I||I[CR]R|2|^^^2|6|||||[CR]C|2|I||I[CR]R|3|^^
^3|NEG|||||[CR]C|3|I||I[CR]R|4|^^^4|NEG|||||[C
R]C|4|I||I[CR]R|5|^^^5|NEG|||||[CR]C|5|I||I[CR
]R|6|^^^6[ETB]B1[CR][LF]
Host 14:51:47,128 [ACK]
u 411 14:51:47,157 [STX]2|NORM|||||[CR]C|6|I||I[CR]R|7|^^^7|NEG||
|||[CR]C|7|I||I[CR]R|8|^^^8|NORM|||||[CR]C|8|I
||I[CR]R|9|^^^9|NEG|||||[CR]C|9|I||I[CR]R|10|^
^^10|10|/uL|||||[CR]C|10|I|*^S|I[CR]R|11|^^^11|
yellow|||||[CR]C|11|I||I[CR]R|12|^^^12||||||X[
CR]C|12|I||I[CR]M|1|RR|69.12|[CR]M|2|RR|71.39|
[CR]M|3|RR|71.25|[CR][ETB]5D[CR][LF]
Host 14:51:47,201 [ACK]
u 411 14:51:47,230 [STX]3M|4|RR|56.11|[CR]M|5|RR|60.90|[CR]M|6|RR
|75.36|[CR]M|7|RR|70.29|[CR]M|8|RR|58.75|[CR]M
|9|RR|70.13|[CR]M|10|RR|68.01|[CR]M|11|RR|62.3
1|[CR]M|12|RR|70.46|[CR]M|13|RR|45.12|[CR]M|14
|RR|63.59|[CR]M|15|RR|29.24|[CR]M|16|RR|0|[CR]
L|1|[CR][ETX]F0[CR][LF]
Host 14:51:47,273 [ACK]
u 411 14:51:47,288 [EOT]

9.2.4.3 Examples 4: Upload Control Results

u 411 13:27:40,425 [ENQ]
Host 13:27:40,425 [ACK]
u 411 13:27:40,456 [STX]1H|\^&|||1|||||||P|3.0.2.0605[CR]P|1[CR]O
|1||0^^^^CONTROL||R||||||X\Q|||20040609165502[
CR]R|1|^^^1|1.020|||||[CR]C|1|I||I[CR]R|2|^^^2
|6|||||[CR]C|2|I||I[CR]R|3|^^^3|NEG|||||[CR]C|
3|I||I[CR]R|4|^^^4|POS|||||[CR]C|4|I||I[CR]R|5
|^^^5|NEG|||||[CR]C|5|I||I[CR]R|6|^^^6|NORM|||
|||[CR]C|6|I|[ETB]D7[CR][LF]
Host 13:27:40,519 [ACK]
u 411 13:27:40,550 [STX]2|I[CR]R|7|^^^7|NEG|||||[CR]C|7|I||I[CR]R
|8|^^^8|NORM|||||[CR]C|8|I||I[CR]R|9|^^^9|NEG|
|||||[CR]C|9|I||I[CR]R|10|^^^10|10|/uL|||||[CR]C
|10|I||I[CR]R|11|^^^11|yellow|||||[CR]C|11|I||
I[CR]M|1|RC|||ControlName1|ControlLotNo1|[CR]L
|1|[CR][ETX]93[CR][LF]
Host 13:27:40,581 [ACK]
u 411 13:27:40,612 [EOT]

10 Appendices

10.1 Appendix 1: ASCII-Table

Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	00	Null	32	20	Space	64	40	@	96	60	`
1	01	Start of heading	33	21	!	65	41	A	97	61	a
2	02	Start of text	34	22	"	66	42	B	98	62	b
3	03	End of text	35	23	#	67	43	C	99	63	c
4	04	End of transmit	36	24	$	68	44	D	100	64	d
5	05	Enquiry	37	25	%	69	45	E	101	65	e
6	06	Acknowledge	38	26	&	70	46	F	102	66	f
7	07	Audible bell	39	27	'	71	47	G	103	67	g
8	08	Backspace	40	28	(	72	48	H	104	68	h
9	09	Horizontal tab	41	29	)	73	49	I	105	69	i
10	0A	Line feed	42	2A	*	74	4A	J	106	6A	j
11	0B	Vertical tab	43	2B	+	75	4B	K	107	6B	k
12	0C	Form feed	44	2C	,	76	4C	L	108	6C	l
13	0D	Carriage return	45	2D	-	77	4D	M	109	6D	m
14	0E	Shift out	46	2E	.	78	4E	N	110	6E	n
15	0F	Shift in	47	2F	/	79	4F	O	111	6F	o
16	10	Data link escape	48	30	0	80	50	P	112	70	p
17	11	Device control 1	49	31	1	81	51	Q	113	71	q
18	12	Device control 2	50	32	2	82	52	R	114	72	r
19	13	Device control 3	51	33	3	83	53	S	115	73	s
20	14	Device control 4	52	34	4	84	54	T	116	74	t
21	15	Neg. acknowledge	53	35	5	85	55	U	117	75	u
22	16	Synchronous idle	54	36	6	86	56	V	118	76	v
23	17	End trans. block	55	37	7	87	57	W	119	77	w
24	18	Cancel	56	38	8	88	58	X	120	78	x
25	19	End of medium	57	39	9	89	59	Y	121	79	y
26	1A	Substitution	58	3A	:	90	5A	Z	122	7A	z
27	1B	Escape	59	3B	;	91	5B	[	123	7B	{
28	1C	File separator	60	3C	<	92	5C	\	124	7C	|
29	1D	Group separator	61	3D	=	93	5D	]	125	7D	}
30	1E	Record separator	62	3E	>	94	5E	^	126	7E	~
31	1F	Unit separator	63	3F	?	95	5F	_	127	7F	□

10.2 Appendix 2: Definition of Test Codes and Test Numbers (for ASTM plus Protocol ONLY)

Parameter	Test Code	Test Number
Specific Gravity	SG	1
pH	pH	2
Leukocytes	LEU	3
Nitrite	NIT	4
Protein	PRO	5
Glucose	GLU	6
Ketones	KET	7
Urobilinogen	UBG	8
Bilirubin	BIL	9
Erythrocytes	ERY	10
Compensation	COM	11
Color	COL	12
Clarity	CLA	13
…	…	…
…	…	…
Sediment Parameter 1	Name 1. Sediment Parameter	51
Sediment Parameter 2	Name 2. Sediment Parameter	52
Sediment Parameter 3	Name 3. Sediment Parameter	53
Sediment Parameter 4	Name 4. Sediment Parameter	54
Sediment Parameter 5	Name 5. Sediment Parameter	55
Sediment Parameter 6	Name 6. Sediment Parameter	56
Sediment Parameter 7	Name 7. Sediment Parameter	57
Sediment Parameter 8	Name 8. Sediment Parameter	58
Sediment Parameter 9	Name 9. Sediment Parameter	59
Sediment Parameter 10	Name 10. Sediment Parameter	60
Sediment Parameter 11	Name 11. Sediment Parameter	61
Sediment Parameter 12	Name 12. Sediment Parameter	62
Sediment Parameter 13	Name 13. Sediment Parameter	63
Sediment Parameter 14	Name 14. Sediment Parameter	64
Sediment Parameter 15	Name 15. Sediment Parameter	65
Sediment Parameter 16	Name 16. Sediment Parameter	66
Sediment Parameter 17	Name 17. Sediment Parameter	67
Sediment Parameter 18	Name 18. Sediment Parameter	68
Sediment Parameter 19	Name 19. Sediment Parameter	69
Sediment Parameter 20	Name 20. Sediment Parameter	70
Sediment Parameter 21	Name 21. Sediment Parameter	71
Sediment Parameter 22	Name 22. Sediment Parameter	72
Sediment Parameter 23	Name 23. Sediment Parameter	73
Sediment Parameter 24	Name 24. Sediment Parameter	74
Sediment Parameter 25	Name 25. Sediment Parameter	75
Sediment Parameter 26	Name 26. Sediment Parameter	76
Sediment Parameter 27	Name 27. Sediment Parameter	77
Sediment Parameter 28	Name 28. Sediment Parameter	78
Sediment Parameter 29	Name 29. Sediment Parameter	79
Sediment Parameter 30	Name 30. Sediment Parameter	80
…	…	…
Sediment Parameter 50	Name 50. Sediment Parameter	100