cobas® 6500
urine analyzer series

Host Interface Manual

Version 12

Table of Contents

1 Preface 4
1.1 Manual information 4
1.1.1 Revision history 4
1.1.2 Editor's note 6
1.1.3 Copyrights 6
1.1.4 Brands 6
1.1.5 Contact addresses 6
1.2 Using this manual 6
1.3 Conventions used in this manual 6
1.3.1 Symbols 6
1.3.2 Abbreviations 7
1.4 Safety classification 7
2 Introduction 8
2.1 Overview 8
2.1.1 Purpose and scope 8
2.1.2 Audience 8
2.2 System overview 8
2.2.1 cobas u 601 urine analyzer 8
2.2.2 cobas u 701 microscopy analyzer 8
2.2.3 Topology 8
2.2.4 LIS communication (HOST protocols) 9
2.2.5 Log Files on cobas 6500 for host communication 10
3 Sample processing 10
3.1 Identifying samples on the instrument 10
3.1.1 Sample rack and barcode 10
3.1.2 Barcode and sample ID's 11
3.1.3 Samples missing a barcode 11
3.1.4 Controls missing a barcode 11
3.1.5 Sequence numbers 12
3.2 Querying orders to the host 12
3.3 Returning results to the host 12
3.3.1 Result and Raw data transmission u601 12

3.3.2 Result and Raw data transmission u701 and c6500 ... 13
3.3.3 Edited Result and Raw data transmission u701 and c6500 ... 15
3.4 Particle configuration ... 17
3.5 Image transmission u 701 and cobas 6500 ... 19
3.5.1 Microscope images ... 19
3.5.2 Map network drive ... 20
3.5.3 Image transfer configuration ... 21
3.6 Passing results automatically to the host ... 22
3.6.1 Automatic validation ... 22
3.6.2 Host controlled workflow ... 23
3.6.3 Host query from u 701 ... 24
3.7 Communication types ... 25
3.7.1 Communication and message types ... 25
3.7.2 Communication scenarios ... 25
3.7.3 Details of message types ... 26
4 Interface description ... 27
4.1 Host communication settings ... 27
4.1.1 Communication setup ... 27
4.1.2 Host communication check ... 27
4.2 Physical layer specifications ... 33
4.2.1 Electrical Characteristics ... 33
4.2.2 Mechanical Characteristics ... 34
5 ASTM Reference ... 35
5.1 ASTM protocol (LIS2 – A2) ... 35
5.1.1 Background ... 35
5.1.2 Communication Processing Layers ... 35
5.1.3 ASTM Lower Layer ... 35
5.1.4 ASTM syntax ... 35
5.2 ASTM text content (LIS2 – A2) ... 37
5.2.1 Record levels ... 37
5.2.2 Messages used in host communication ... 38
5.2.3 Record description ... 39
5.2.4 Message Header Record ... 40
5.2.5 Patient Information Record ... 42

5.2.6 Test Order Record 43
5.2.7 Result Record 45
5.2.8 Comment Record (following Result Record) 47
5.2.9 Request Information Record 48
5.2.10 Message Termination Record 49
5.2.11 Manufacturer Information Record 49
6 Appendices 54
6.1 Data Alarms 54
6.2 Test number and Test code of cobas u 601 55
6.3 Test number and Test code of cobas u 701 55
6.4 LIS and FortiGate Firewall 56
6.5 Communication examples 56
6.5.1 Host protocol version 8 56
6.5.2 Host protocol version 9 or higher 63

1 Preface

1.1 Manual information

1.1.1 Revision history

Manual version	Software version	Revision date	Remark
1	2.2.0	22-Jul-2015	First version
2	2.2.1	09-Feb-2016	Chapter Host Communication Check: WinMonitor removed
3	2.2.3	02-Dec-2016	Chapter 2.2.4 LIS communication: Software and Protocol Version information updated. Chapter 3.3.3 Edited Result and Raw data transmission u 701 and c 6500 added. Chapter 3.5.2: Screenshot replaced Chapter 5.2.5 Patient Information Record: Field 7.14 updated. Chapter 5.2.6 Test Order Record: Field 8.4.6 updated and notice added. Chapter 5.2.8 Comment Record: notice enhanced. Chapter 6.3 Test number and test code of u 701: Parameter “Others” added.
4	2.2.4	22-May-2017	Chapter 2.2.3 Topology picture revised Chapter 2.2.4 LIS communication: Software and Protocol Version information updated Chapter 3.3.1 Sequence numbers: Sequence number information added Chapter 3.6.2 Host controlled workflow added Chapters 5.2.4 to 5.2.11 Version 11 added in all tables Chapter 5.2.6 Test Order Record: Sequence number example added; Field 8.4.3 Sequence number information added Chapter 5.2.7 Result Record: Host controlled workflow notice added. Chapter 5.2.8 Comment Record: Host controlled workflow added. Chapter 5.2.9 Request Information Record: Field 11.3 Sequence number information added Chapter 6.4.2 Example 11 added
5	2.2.5	07-Sep-2017	Chapter 2.2.4 LIS communication revised
6	2.2.7	17-Jul-2018	Chapter 2.2.4 LIS communication revised Chapter 5.2.2 Messages used in host communication: Notice added
7	2.2.8 2.3.2	08-Mar-2019	Chapter 2.2.4 revised

Manual version	Software version	Revision date	Remark
8	2.3.4	04-Sep-2019	Chapter 2.2.4 revised
9	2.2.9 2.3.5	24-Mar-2020	Chapter 2.2.4 revised - new SW version & *Notice* added New Chapter 2.2.5 Log Files on cobas 6500 for host communication New Chapter 3.6.3 Host Query from u 701 Chapter 5.2.4 *Notice* added Chapter 5.2.5 Patient Information Record - revised
10	2.3.6	21-Sep-2020	Chapter 2.2.3 revised (u 601 and u 701 mentioned instead of cobas 6500) Whole Chapter 2.2.4 revised Chapter 2.2.5: Log files from Host Interface Test Tool added Chapter 3.6.3 revised Chapter 4.1.2: procedure for ASTM Host Simulator configuration revised, screenshots revised, link to Google Site “Host Interface Test Tools” added Chapter 5.2.4: Header records revised (examples updated and more examples added) Chapter 5.2.5 revised Chapter 5.2.6: chapter and table (Ref. 8.4.4.) revised Chapter 5.2.7: typo revised Chapter 5.2.8: typo revised Chapter 5.2.11: typo revised Chapter 6.4.1 and 6.4.2: All examples revised Whole document: “NOTICE” renamed to “TIP”
11	2.2.10 2.3.7	22-Jan-2021	Chapter 2.2.4 revised Chapter 3.1.1: new (Sample Rack and barcode) Chapter 3.5.2: revised Chapter 5.2.5 revised (Patient record) Chapter 5.2.6: Rack ID and table (Ref. 8.4.4.) revised Chapter 6.1: Order of Data Alarms added Chapter 6.4: new (LIS and FortiGate Firewall)
12	2.2.11 2.3.8	25-Jul-2022	Chapter 2.2.4 revised with software versions Chapter 3.1.1, 3.1.3, and 3.1.4: Examples edited Chapter 5.2.5 revised (Patient record)

1.1.2 Editor's note

Every effort has been made to ensure that all the information contained in this manual is correct at the time of printing. However, Roche Diagnostics International Ltd reserves the right to make any changes necessary without notice as part of ongoing product development. Any customer modification to the instrument will render the warranty or service agreement null and void.

1.1.3 Copyrights

© 2022, Roche Diagnostics International Ltd. All rights reserved. The contents of this document may not be reproduced in any form or communicated to any third party without the prior written consent of Roche. While every effort is made to ensure its correctness, Roche assumes no responsibility for errors or omissions which may appear in this document. Subject to change without notice.

1.1.4 Brands

COBAS, COBAS U, and LIFE NEEDS ANSWERS are trademarks of Roche.

1.1.5 Contact addresses

Manufacturer
Roche Diagnostics GmbH
Sandhofer Strasse 116
68305 Mannheim, Germany

Made in Hungary

www.roche.com

1.2 Using this manual

TIP: Keep this manual in a safe place to ensure that it is not damaged and remains available for use. This host interface description should be easily accessible at all times.

Related documents:

- LIS01-A2: Specification for Low-Level Protocol to Transfer Messages between Clinical Laboratory Instruments and Computer Systems.
- LIS2-A2: Specification for Transferring Information between Clinical Laboratory Instruments and Information Systems.

1.3 Conventions used in this manual

The following chapters describe the conventions used in this manual, such as safety symbols, safety classification and abbreviations. Do not proceed reading this manual before these chapters have been read and understood.

1.3.1 Symbols

Symbols are used to help quickly locate and interpret information in this manual. This section explains the formatting conventions used in this manual.

The following symbols are used:

Symbol	Description
	The tip symbol indicates additional information on correct use of the analyzer or useful tips
	Safety alert symbol

1.3.2 Abbreviations

The following abbreviations are used:

Abbreviation	Definition
ASTM	American Society for Testing and Material
c6500	cobas 6500 analyzer series
DNS	Domain Name Server
LIS	Laboratory Information System
u601	**cobas u** 601 urine analyzer
u701	**cobas u** 701 microscopy analyzer

1.4 Safety classification

Safety messages are classified according to ANSI Z535.6. The following classifications are used, according to the level of seriousness of the hazard: The safety alert symbol by itself (without a signal word) is used to promote awareness to hazards which are generic or to direct the reader to safety information provided elsewhere in the document. The following signal words are used for specific hazards:

WARNING indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

TIP Indicates a message not related to personal injury.

2 Introduction

2.1 Overview

2.1.1 Purpose and scope

This document details the host interface specifications for the cobas® 6500 analyzer series for **Software 2.2.0 or higher**. This interface regulates data transmissions between the cobas® 6500 analyzer series and the hospital and laboratory information system.

Therefore, this manual gives programmers a description of the basic operational features of the cobas® 6500 analyzer series, in order to enable them to connect to a host system, such as Laboratory Information Systems, Hospital Information Systems or Work Area Manager.

The main part of this document consists of a series of tables that show the information needed to successfully interface to the system. The basic concept of data transfer in this interface is the exchange of data and control frames between the host system and the analyzer.

2.1.2 Audience

This manual is written for:

- Developers of Hospital Information Systems / Laboratory Information Systems (HIS/LIS), who need to create programs that connect to the cobas® 6500 analyzer series.
- Authorized Roche Diagnostics personnel who need to configure or troubleshoot the host communications of the cobas® 6500 analyzer series. Depending on the type of host system and on the workflow in the laboratory, the cobas 6500 host interface offers a set of configurable features.

2.2 System overview

2.2.1 cobas u 601 urine analyzer

The **cobas u** 601 urine analyzer is a semi-automatic urinalysis system intended for in vitro qualitative or semi-quantitative determination of urine analytes, including specific gravity (SG), pH, leukocytes, nitrite, protein, glucose, ketones, urobilinogen, bilirubin, erythrocytes, and color.

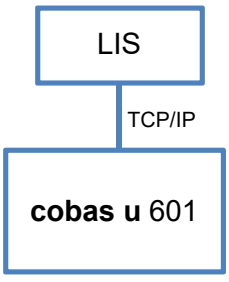
2.2.2 cobas u 701 microscopy analyzer

The **cobas u** 701 microscopy analyzer is intended for in vitro qualitative or semi-quantitative determination of urine analytes, including pathological casts, crystals, yeasts, mucus, sperm, bacteria, squamous epithetical cells, non-squamous epithetical cells, hyaline casts, erythrocytes, and leukocytes.

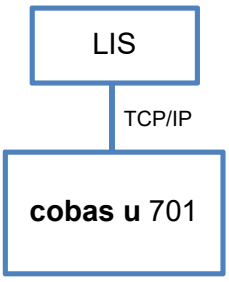
2.2.3 Topology

The LIS and analyzer communicate by ASTM over TCP/IP network connection.
To connect the analyzer with the host system, use a commercial LAN cable with RJ45 connectors on both sides.

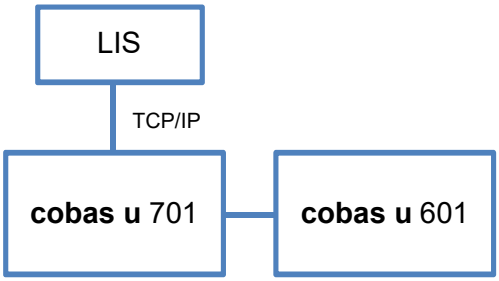
u601 standalone



u701 standalone



c6500 (u601 and u701 connected)



TIP: cobas 6500 host communication is done by the TCP/IP connection from the u701.

2.2.4 LIS communication (HOST protocols)

Two host protocols are supported depending on the software version.
For detailed protocol information, see version information in chapter 5.2.

Following information is essential **for driver developers**:

cobas 6500 protocol (means Version **8**) → for User Software Version < 2.2.0
cobas 6500_09 protocol (means Version **9**) → for User Software Version 2.2.0, 2.2.1, and 2.2.2
cobas 6500_09 protocol (means Version **10**) → for User Software Version 2.2.3
cobas 6500_09 protocol (means Version **11**) → for User Software Version > 2.2.4 and 2.3.x

- Check User Software version
- Choose name of protocol
- Choose version of protocol

User Software Version	Name of protocol	Version of protocol
< 2.2.0	cobas 6500	**8**
2.2.0 2.2.1 2.2.2	cobas 6500 cobas 6500_09	**8** **9**
2.2.3	cobas 6500 cobas 6500_09	**8, 9, and 10**
2.2.4 2.2.5 2.2.7 2.2.8 2.2.9 2.2.10 2.2.11 2.3.2 2.3.4 2.3.5 2.3.6 2.3.7 2.3.8	cobas 6500 cobas 6500_09	**8, 9, 10, and 11**

In the User Software, there are **only two** possible selections:
cobas 6500
cobas 6500_09

To select one of the available protocol versions in the User Software, choose Administration > System configuration > Host configuration. Only Supervisor and Service have the rights to choose a protocol.

TIP During driver installation and/or development, some LIS providers apply an unnecessary **check of the user software version** at the message header record. This creates communication problems right after the user software is upgraded and the user software version changes.
Do not implement this unnecessary user software version check.

TIP Personal computers and all information technology equipment that you connect to the device must meet the EN 60950, UL 60950/CSA C22.2 No. 60950 requirements for data processing equipment.

2.2.5 Log Files on cobas 6500 for host communication

The analyzers log the host communication. To check the driver implementation, save the log file.
To get the log files, the following actions have to be performed:

Log files from User Software:
- User Software > Monitoring > Perform maintenance > Create problem report
- Save on a USB memory device
- Open .zip file and look for **dev_lis.log**

Archive log files from Windows:
- Log on User Software with the Service login
- Access Windows
- Open Windows explorer and browse E:\UWA\logs\
- Look for **archive_dev_lis.log**

Log files from Host Interface Test Tool:
- In the Instrument selector, choose cobas 6500.
- Trace File > Convert Instrument Trace Files > Convert cobas 6500 Log File *dev_lis.log to Record File

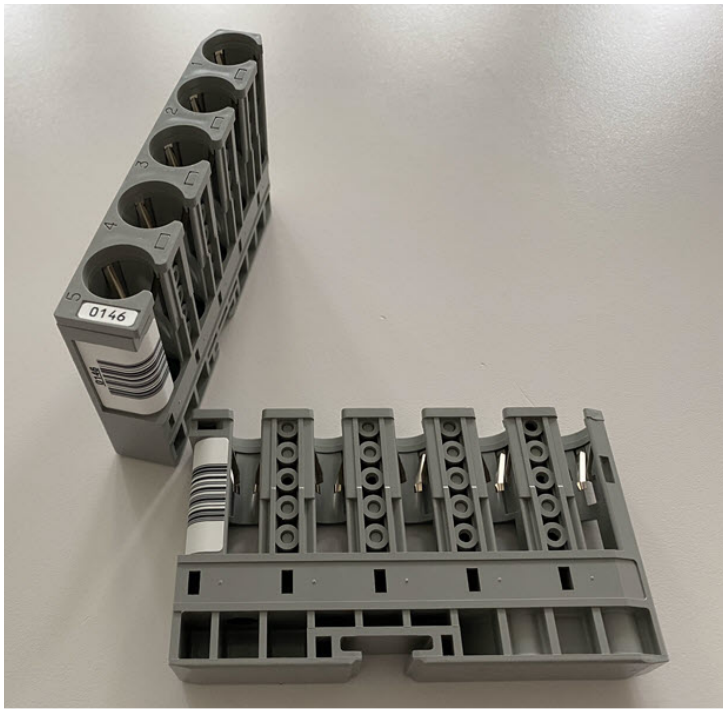
3 Sample processing

3.1 Identifying samples on the instrument

3.1.1 Sample rack and barcode

By default, the analyzer reads the barcodes on the sample racks (RD5 rack), and uses the number on the barcode as rack ID. The rack ID is also used as a part of the Sample ID if there are samples missing a barcode.

The sample racks have two labels.
Visual ID label on top of the rack. 4-digit number. i.e. [0146]
Barcode ID label at the side of the rack, Barcode ITF (Interleaved two of five)
5-digit for Rack ID, 1-digit for check digit. [5 0xxx X] → [5 0146 0]
The grey sample rack (RD5 rack) starts always with a 5, followed by the Visual ID and the Check Digit.
Common Rack ID ranges with Visual ID 0001 - 0200.



Example:
Visual RackID 0146
Barcode RackID (ITF) 5 0146 0
The host communication shows the 6-digit Rack ID.

3.1.2 Barcode and sample ID's

By default, the analyzer reads the barcodes on the sample tubes, and uses the number on the barcode as a sample ID. The sample ID uniquely identifies the sample in the databases and uniquely identifies the sample in messages to and from the host.

3.1.3 Samples missing a barcode

If a sample tube's barcode is missing or unreadable, the software generates a unique sample ID and there is no interaction with the host before the corrective action has been done.

TIP Sample results with generated sample ID's are not transferred automatically to the host. The operator has to change the unique sample ID to the sample barcode before it can be sent to the host.

Example of generated unique sample ID: 0146120210410112133
- 0146: Rack ID
- 1: Tube position
- 20210410: YYYYMMDD
- 112133: hhmmss

3.1.4 Controls missing a barcode

If a QC tube does not have a barcode, the software also generates a unique QC ID.

TIP QC results with generated QC ID are transferred automatically to the host.

Example of generated unique QC ID: Q001120210410104447
- Q001:Rack ID
- 1: Tube position
- 20210410: YYYYMMDD
- 104447: hhmmss

3.1.5 Sequence numbers

If it is not possible to use barcodes, the analyzer can give each sample a number. This number increases by 1 for each sample. The host must then know the sequence of samples, and respond with the test orders.

3.2 Querying orders to the host

Test selection inquiry sent from the analyzer to the host:

Q|1|^0203^500432^3

Test selection information sent from the host to the analyzer:

O|1|0203|500432^3^operator^SAMPLE|CM|R||||||N|||20120508115956||||||||||Q

TIP If the host does not answer within the defined timeout period, the analyzer will start the order and process the sample with the default test profile defined on the analyzer.

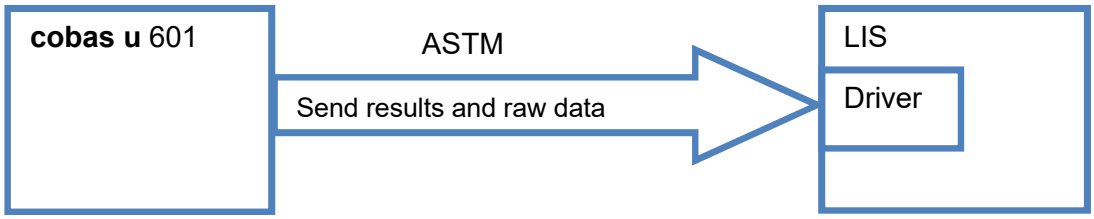
If you want to use a unidirectional communication (sending only result to the host), then set the **Timeout** in the **Host configuration** to **1** second.

3.3 Returning results to the host

3.3.1 Result and Raw data transmission u601

Enable raw data transmission of results on Administration > System Configuration > Host Configuration

Data flow



Order of action:
Analyzer sends results and raw data

Results and Raw data
Result Record (v8):

R|1|1^ERY|2+^25 /ul^25 /ul^^||International|||F||operator|||u601

→ Final result in ‘arbitrary units‘ **and** ‘conventional units’ **and** ‘SI units’

Result Record (v9 or higher):

R|1|1^ERY|25|/ul|International|||F||operator|||u601

→ Final result in ‘arbitrary units‘ or ‘conventional units’ or ‘SI units’

Raw Result Record (v8 and v9 or higher):
M|1|RR|u601|1^ERY|REM_ERY_560|26.0500|26.0500

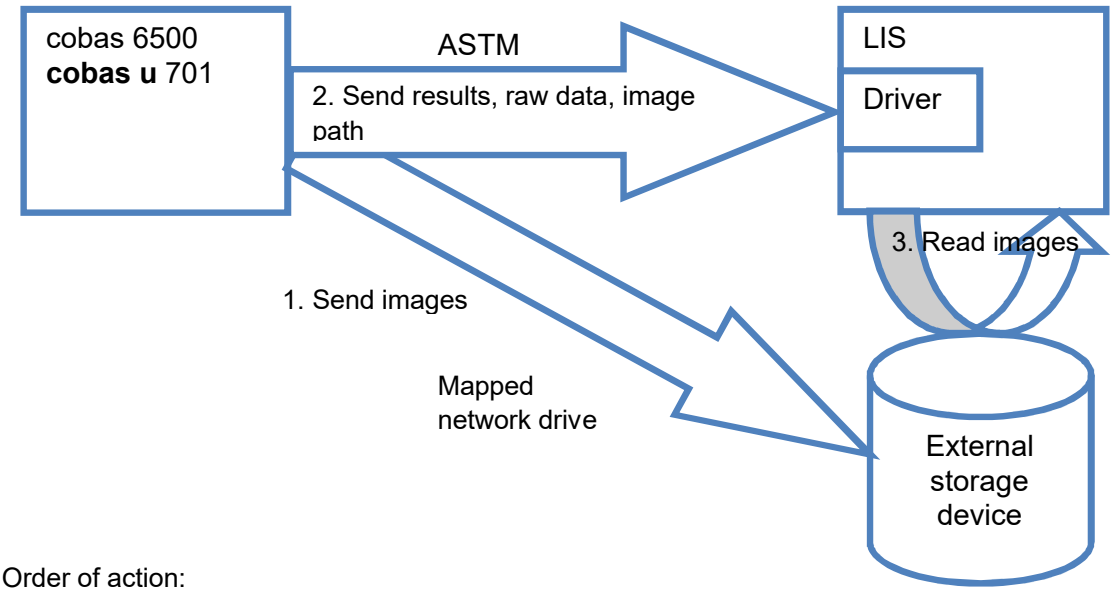
(26.0500 is the reflectance value)

3.3.2 Result and Raw data transmission u701 and c6500

Enable raw data transmission of results on Administration > System Configuration > Host Configuration

Subclasses must be defined first in the particle configuration by the operator before they can be used.

Data flow



Order of action:
1. Analyzer sends images
2. Analyzer sends results, raw data, image path
3. LIS reads images

TIP Be aware that sending images from the analyzer to the external storage device takes some time. Therefore, the LIS needs to wait for the image path record before it can read the images from the external storage device.

Results and Raw data without subclasses
CAUTION For all other tests than RBC and WBC, the final result is not the same as the concentration.

Result Record (v8):
R|1|1^RBC|^60.60 /HPF^266.64 /uL^60.60 /HPF^266.64 /uL||International|||F||operator|||u701

→ Final result in 'arbitrary units' **and** 'parts per high power field' [HPF] **and** 'parts per microliter' [uL]

→ Concentration value

Result Record (v9 or higher):
R|1|1^RBC|266.64|/uL|International|||F||operator|||u701

→ Final result in 'arbitrary units' **or** 'parts per high power field' [HPF] **or** 'parts per microliter' [uL]

Raw Result Record (v8 and v9 or higher):
M|1|RR|u701|1^RBC|10^20^12^12^12^25^25^25^25^25^25^25^25^25^12|606|40.40|266.64|60.60

→ Concentration value

TIP Only for RBC and WBC the Result Record field 4 [R Record] (data or measurement value) is equal to Raw Result Record [RR for u 701] field 9 (/ul value) or field 10 (/HPF value).

Results and Raw data with subclasses
CAUTION For all other tests than RBC and WBC, the final result is not the same as the concentration.

Result Record (v8):
R|1|1^RBC|^60.60 /HPF^266.64 /uL^60.60 /HPF^266.64 /uL||International|||F||operator|||u701

→ Final result in 'parts per high power field' [HPF] **and** 'parts per microliter' [uL]

→ Concentration value

Raw Result Record (v8):
M|1|RR|u701|1^RBC|5^10^10^10^10^20^20^20^20^20^20^20^20^20^2|454|30.27|199.76|45.40
M|2|RR|u701|1-1^dysm. EC|5^10^2^2^2^5^5^5^5^5^5^5^5^5^10|152|10.13|66.88|15.20

→ Concentration value

CAUTION With **host protocol version 8** the test code RBC within the Raw Result Record means in real RBC_X (Rest of the main class). The main class (summary of all subclasses) is only submitted with **host protocol version 9 and higher**.

Result Record (v9):
R|1|1^RBC|266.64|/uL|International|||F||operator|||u701
R|2|1-0^RBC_X|199.76|/uL|International|||F||operator|||u701
R|3|1-1^dysm. EC|66.88|/uL|International|||F||operator|||u701

→ Final result in 'parts per high power field' [HPF] **or** 'parts per microliter' [uL]

Raw Result Record (v9):
M|1|RR|u701|1^RBC|10^20^12^12^12^25^25^25^25^25^25^25^25^25^12|606|40.40|266.64|60.60
M|2|RR|u701|1-0^RBC_X|5^10^10^10^10^20^20^20^20^20^20^20^20^20^2|454|30.27|199.76|45.40
M|3|RR|u701|1-1^dysm. EC|5^10^2^2^2^5^5^5^5^5^5^5^5^5^10|152|10.13|66.88|15.20

→ Concentration value

TIP If there are subclasses defined the following rule is applied:

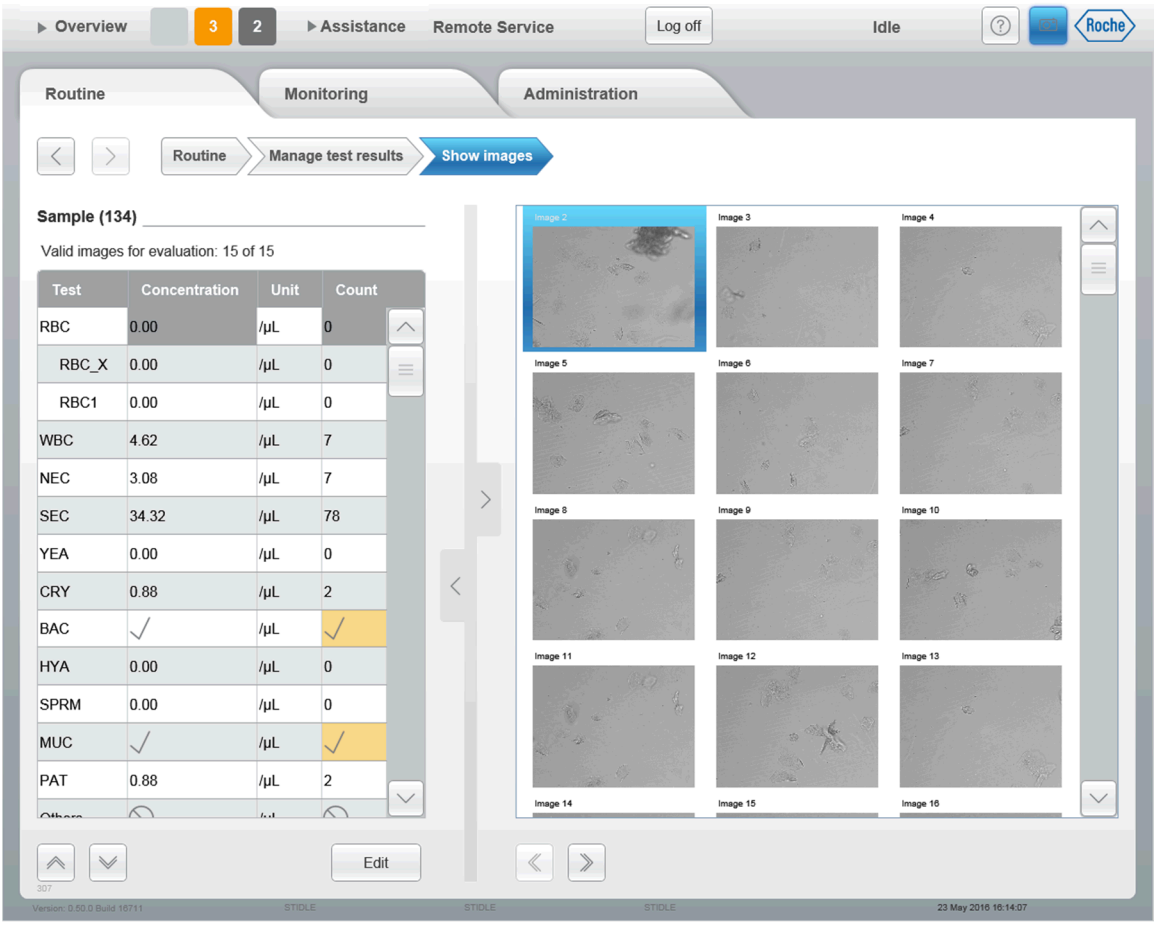
- If subclasses are reclassified then they are subtracted from the main class. Therefore RBC (v8) or RBC_X (v9 or higher) is only the rest of the main class (e.g. 266.64-66.88-0.00=199.76).
- To calculate the main class value, the rest of the main class and the subclasses have to be summed up (e.g. 199.76+66.88+0.00=266.64).

TIP The concentration for subclasses of semi-quantitative or qualitative parameters is only provided in the Raw Result Record of **cobas u** 701.

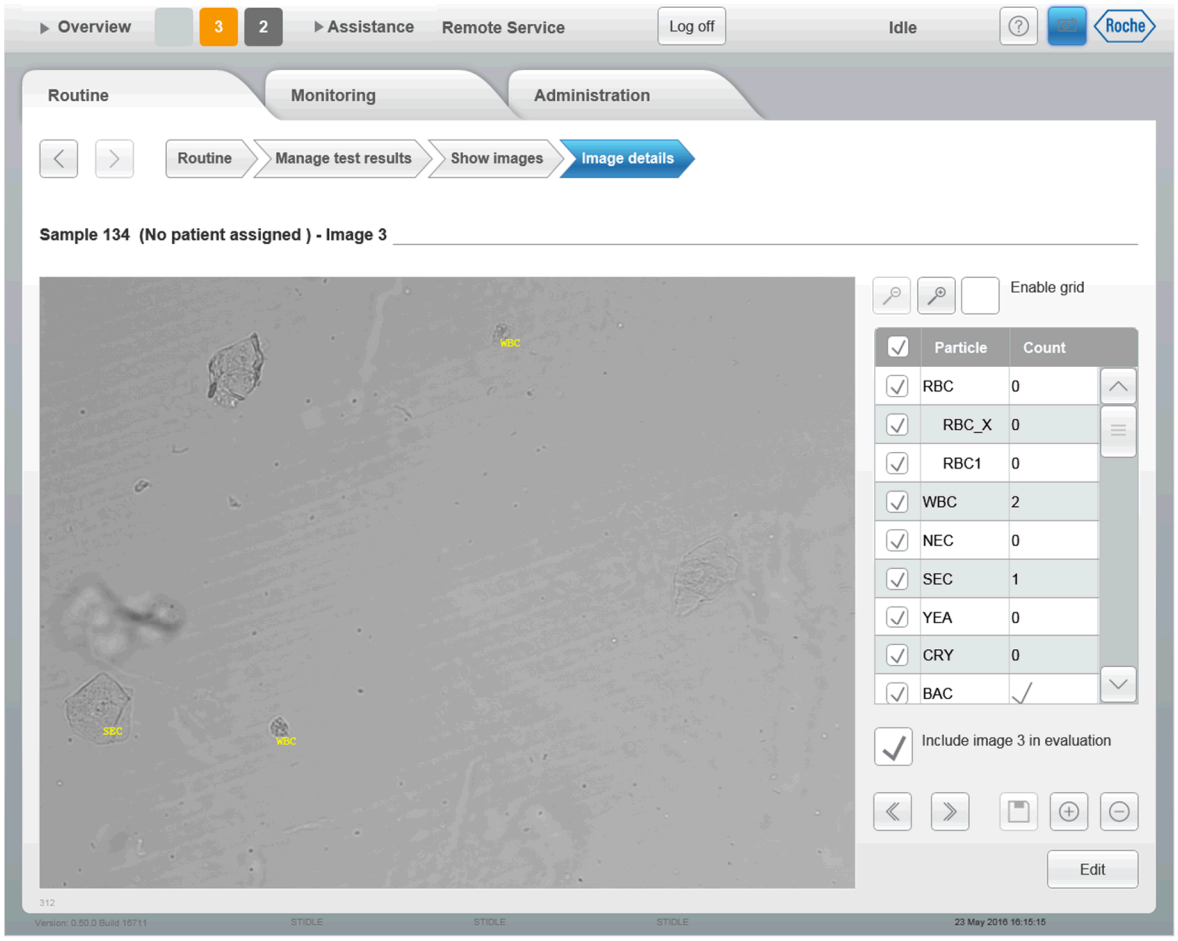
CAUTION If the LIS implements range table borders, they must be the same as on the instrument. Please be aware of the fact that the range table borders can be edited on **cobas u** 701 by a user with supervisor rights.

3.3.3 Edited Result and Raw data transmission u701 and c6500

CAUTION Editing the result (concentration or count) on the page “Routine->Manage test results->Show images” does not change the Raw data in the Raw Result Record. It only changes the result in the Result Record.

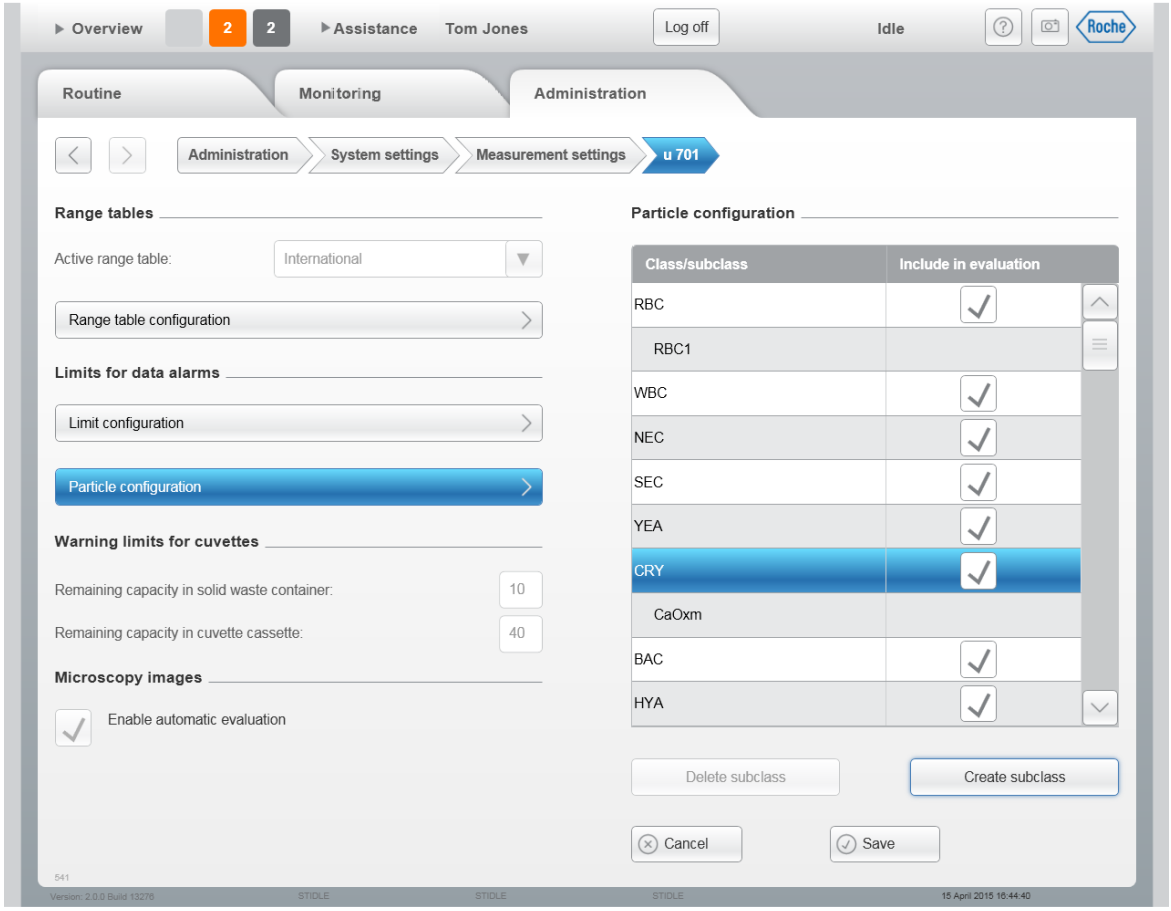


Changes made during reclassification on the page “Routine->Manage test results->Show images->Image details” are reflected in the Raw Result Record.

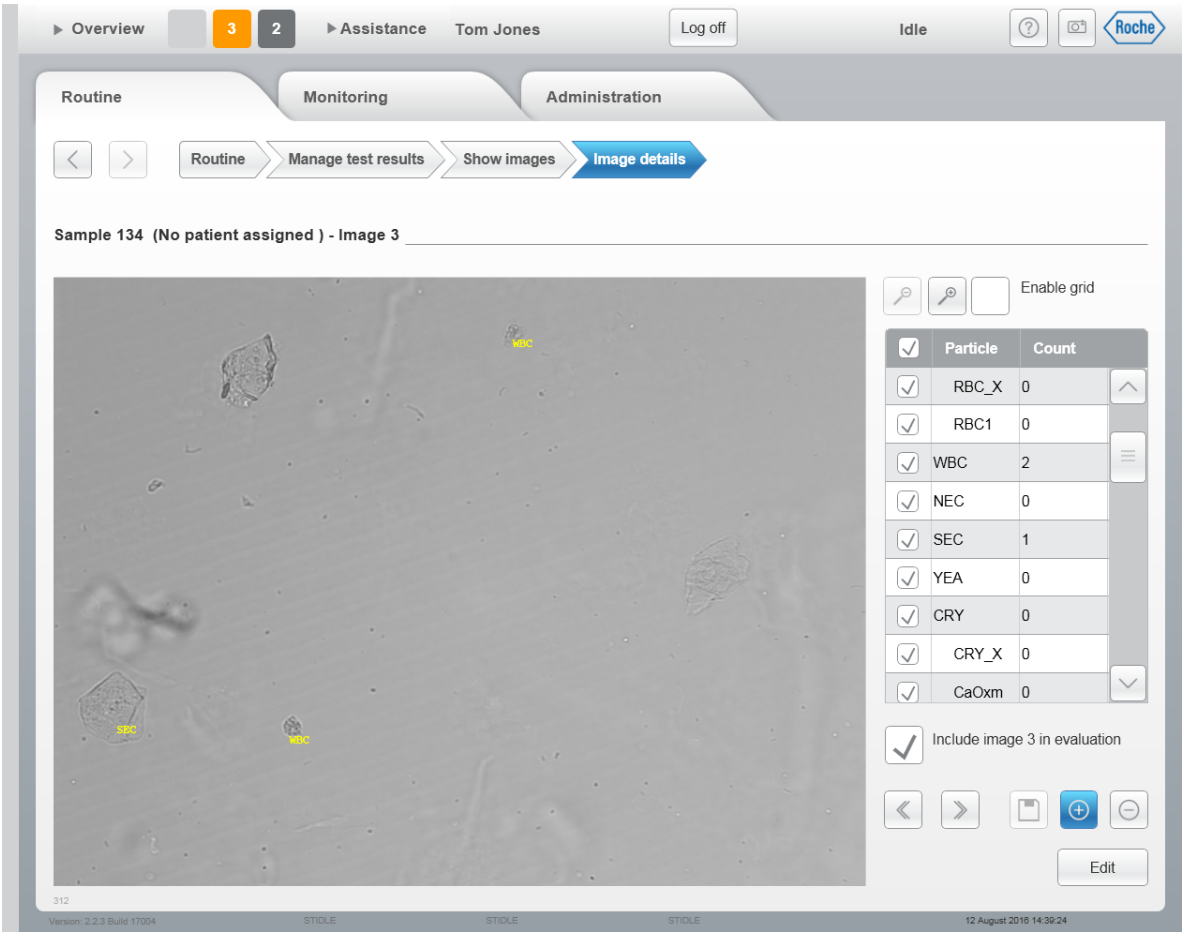


3.4 Particle configuration

Define subclasses on Administration > System Settings > Measurement settings > u 701 > Particle configuration.



The software automatically creates a default subclass _X (Rest of the main class).
Example: CRY = CRY_X + CaOxm


Overview
3
2
Assistance
Tom Jones
Log off
Idle
Roche
Routine
Monitoring
Administration
Routine
Manage test results
Show images
Image details
Sample 134 (No patient assigned) - Image 3
Enable grid
Particle
Count
RBC_X 0
RBC1 0
WBC 2
NEC 0
SEC 1
YEA 0
CRY 0
CRY_X 0
CaOxm 0
Include image 3 in evaluation
Edit
312
Version: 2.2.3 Build 17004
STIDLE
STIDLE
STIDLE
12 August 2016 14:39:24

3.5 Image transmission u 701 and cobas 6500

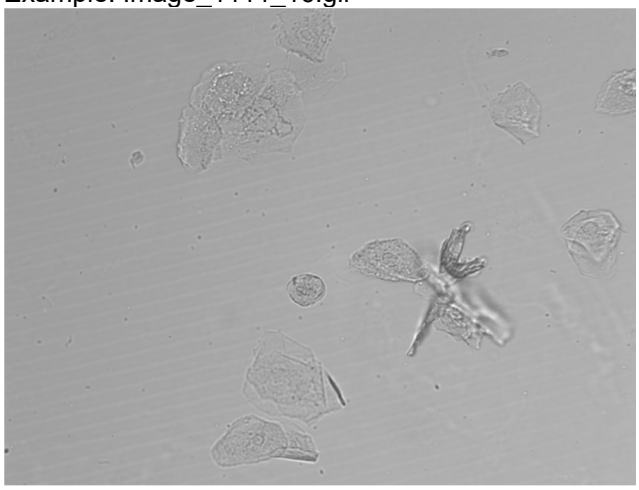
3.5.1 Microscope images

Images can be transferred with and without particle labels.
The images file names are like Image_SampleID_Index.*

- Image: Fix prefix
- SampleID: According barcode
- Index: 01-16; but only 15 images per sample are transferred as maximum.
- *Extension: *.gif or *.png

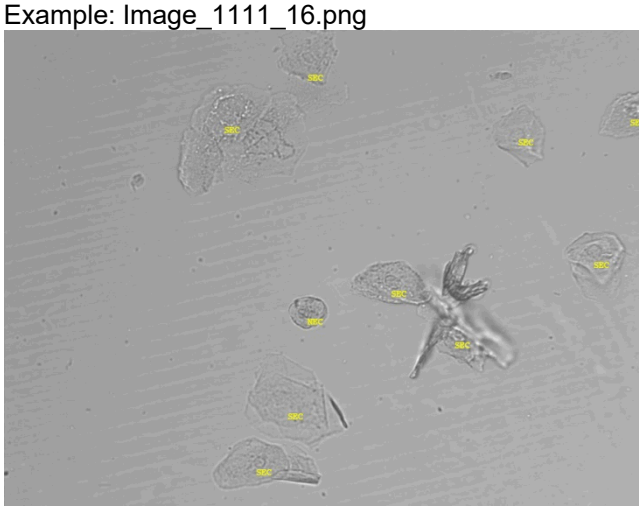
Images **without** particle labels are in ***.gif** format and have an average size of 700 kB.
Dimension: 1280 x 960 pixels

Example: Image_1111_16.gif



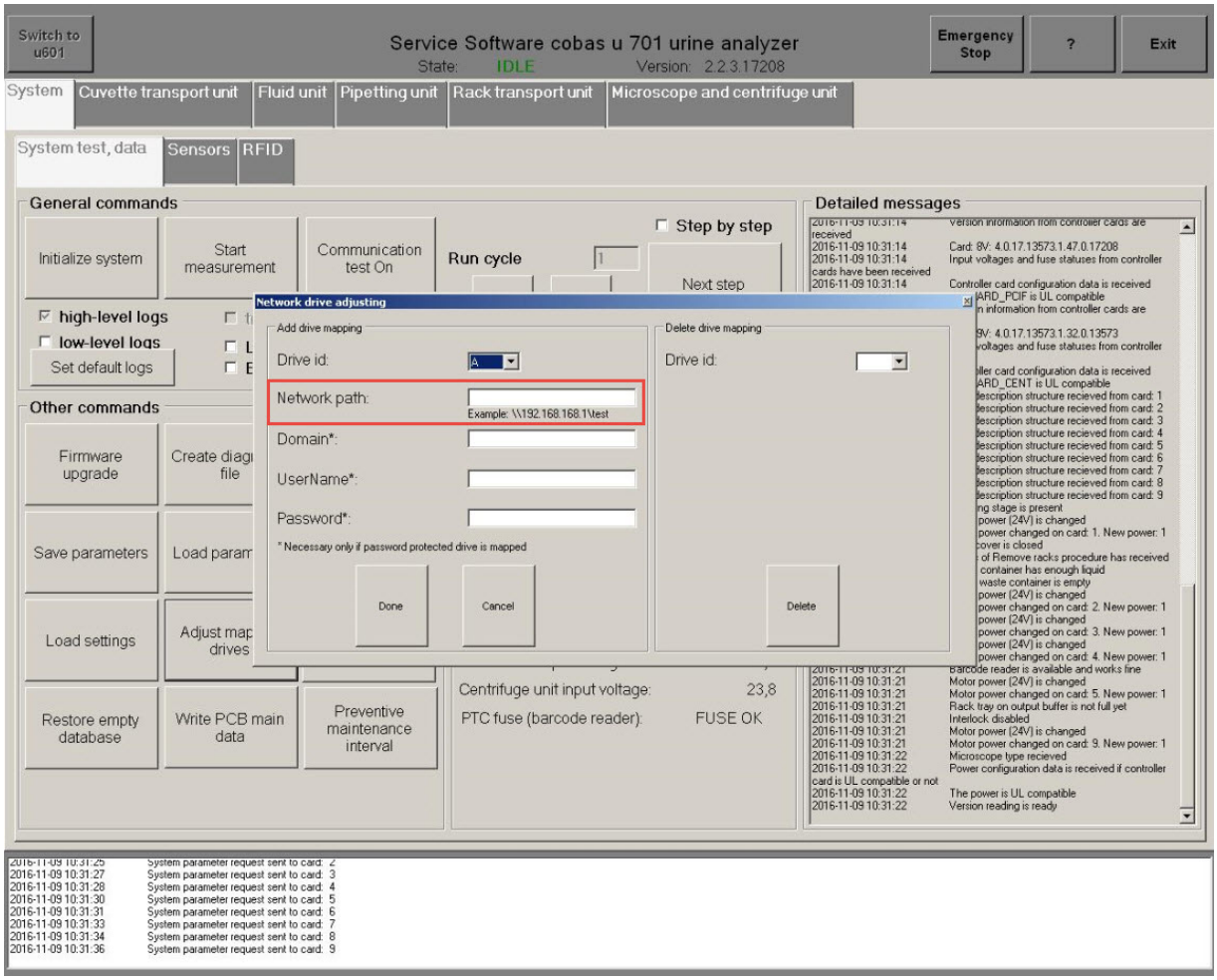
Images **with** particle labels are in ***.png** format and have an average size of 1000 kB.
Dimension: 1280 x 960 pixels

Example: Image_1111_16.png

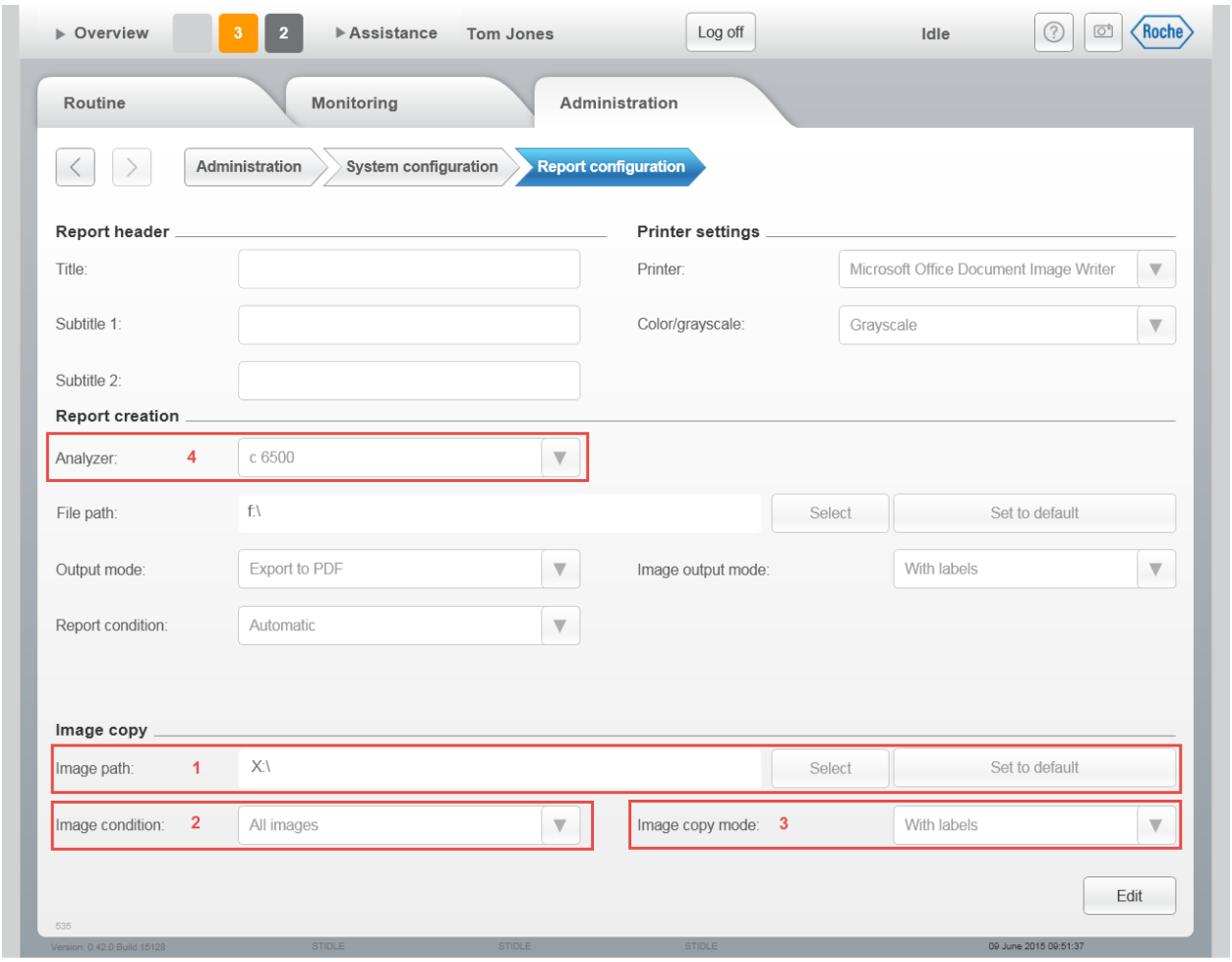


3.5.2 Map network drive

Mapping a network drive is needed for configuration of the User-Software.
The network drive is used as location, where the images will be transferred by the User- Software.
To map network drives, the Service Software must be used.
Folders with authentication can be used.
Refer also to the Installation Manual and to the Service Manual.



3.5.3 Image transfer configuration



- The User Software transfers the images to the mapped network drive which must be selected on “Image path” (see 1).
- The images are transferred when the “Image condition” is fulfilled (see 2).
  Either “No images”, only “Pathological images” or always “All images” are transferred.
  “Pathological images” are samples with the abnormal data alarm (A-flag). It does not matter which test parameter has the data alarm.
- The “Image copy mode” is either “Without labels” (*.gif files) or “With labels” (*.png files) or “Both” (see 3).
- The images are transferred to a folder for each sample. The folder naming depends on the chosen “Analyzer” report creation and the Regional settings.
  The “Analyzer” report creation is either “c 6500” or “u 701” (see 4).
  The Regional settings influence the time format.

The folder names are like Analyzer_ResultReport_SampleID_DateTime.

- Analyzer: According analyzer report creation
- ResultReport: Fix prefix
- SampleID: According barcode
- DateTime: According Regional settings

Examples:
u_701_ResultReport_5_11-24-201435048PM
cobas_6500_ResultReport_5_11-24-201435048PM
cobas_6500_ResultReport_1111_25-11-2014154336

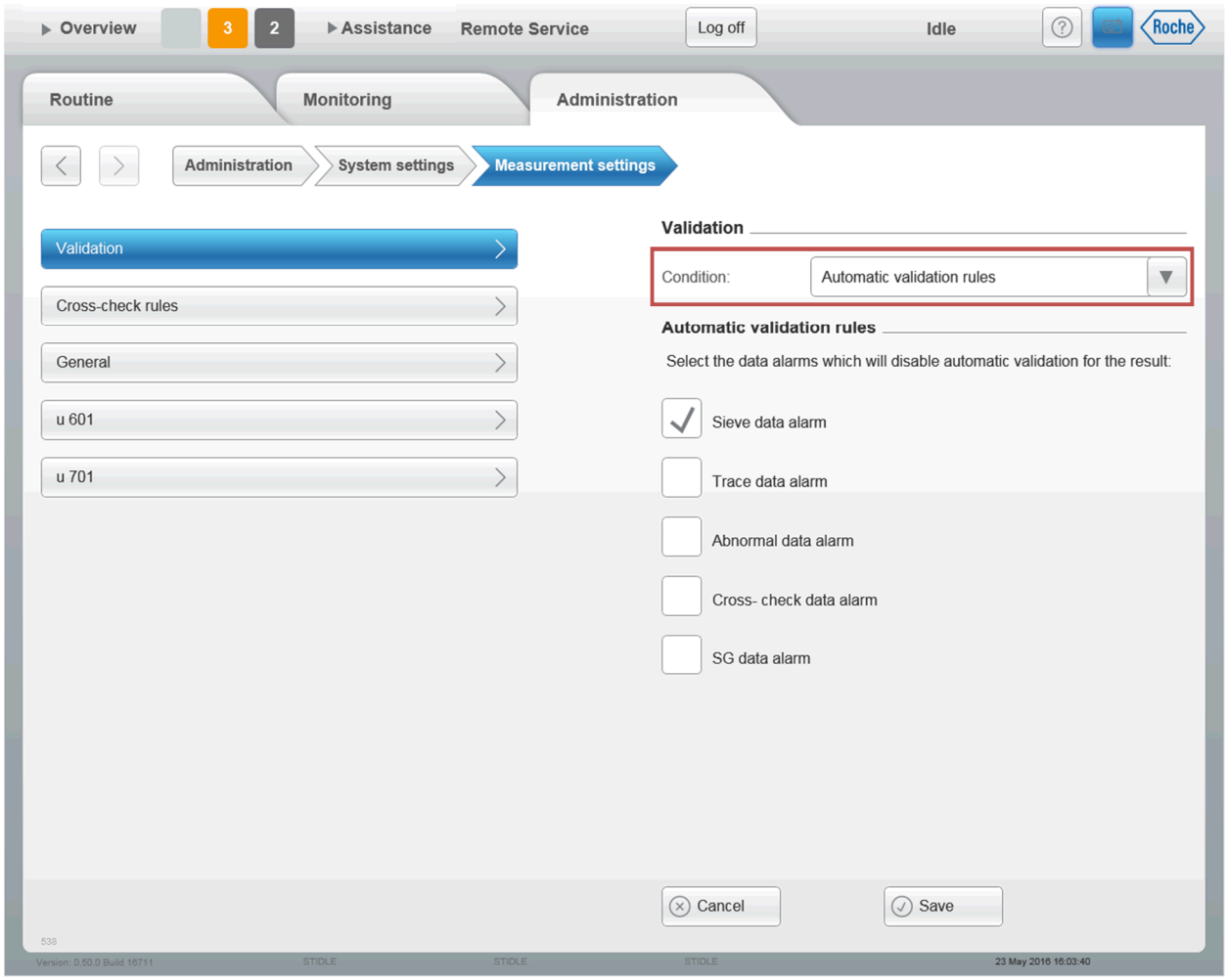
TIP In case of rerun the same sample ID, the date & time from the folder will be different but not the image file names.
If the sample ID contains special characters, they will be exchanged by "_".

3.6 Passing results automatically to the host

3.6.1 Automatic validation

In this mode, the analyzer automatically validates sample results, and then passes them immediately to the host, including any data alarm. Otherwise, the analyzer waits for an operator to release the results before passing them up to the host.

TIP There are some exceptions where automatic validation is not done. See Operator's manual.

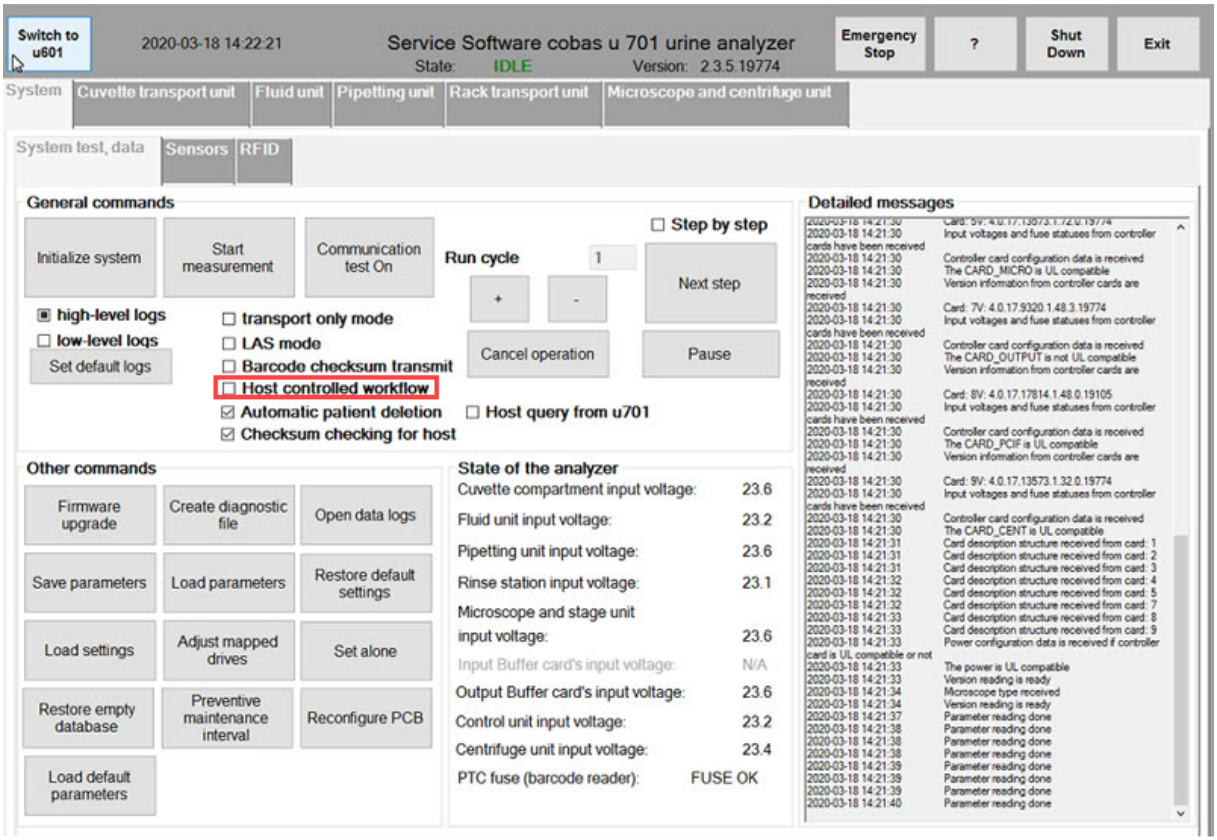


The validation condition triggers the transfer of results, raw data and images:

- Automatic validation all: If the result is technically ok (no error appeared) it will automatically set to validated and sent to the host.
- Automatic validation rules: If one of the checked data alarms (flags) is set, the user has to validate the result manually which contain this data alarm. All other results are handled like in “Automatic validation all”.
- Manual validation: All results must be validated by the user.

3.6.2 Host controlled workflow

In this mode the exceptions were automatic validation was not done are removed.
To enabling the host controlled workflow for the User-Software, tick the Host controlled workflow in the Service Software.



By enabling the host controlled workflow, the existing rules which would break automatic validation are removed:

- Results with D data alarm (sample dilution on **cobas u** 701)
- Results with U data alarm and at least 5 images are included for the **cobas u** 701 result evaluation (unreliable image found)
- Results with F data alarm (defocused image found)
- There is an existing order for the result (one analyzer result is in error state - the other analyzer is sent to the host on cobas 6500)
- Less than 5 images are included for the **cobas u** 701 result evaluation (empty result record and all images are sent to the host)

Empty Result Record:
R|1|1^RBC|||International|||F||Service||20170126094953|u701
C|1|I|Q^Cm^Uc^F1^F3|I[CR][ETX]5B

TIP The validation of the results must be done on the host. The validation condition setting on the analyzer is ignored. All results sent to the host cannot be changed afterwards on the analyzer when the host controlled workflow is enabled.

TIP Cross-check rules are in general not applied on the analyzer when the host controlled workflow is enabled.

3.6.3 Host query from u 701

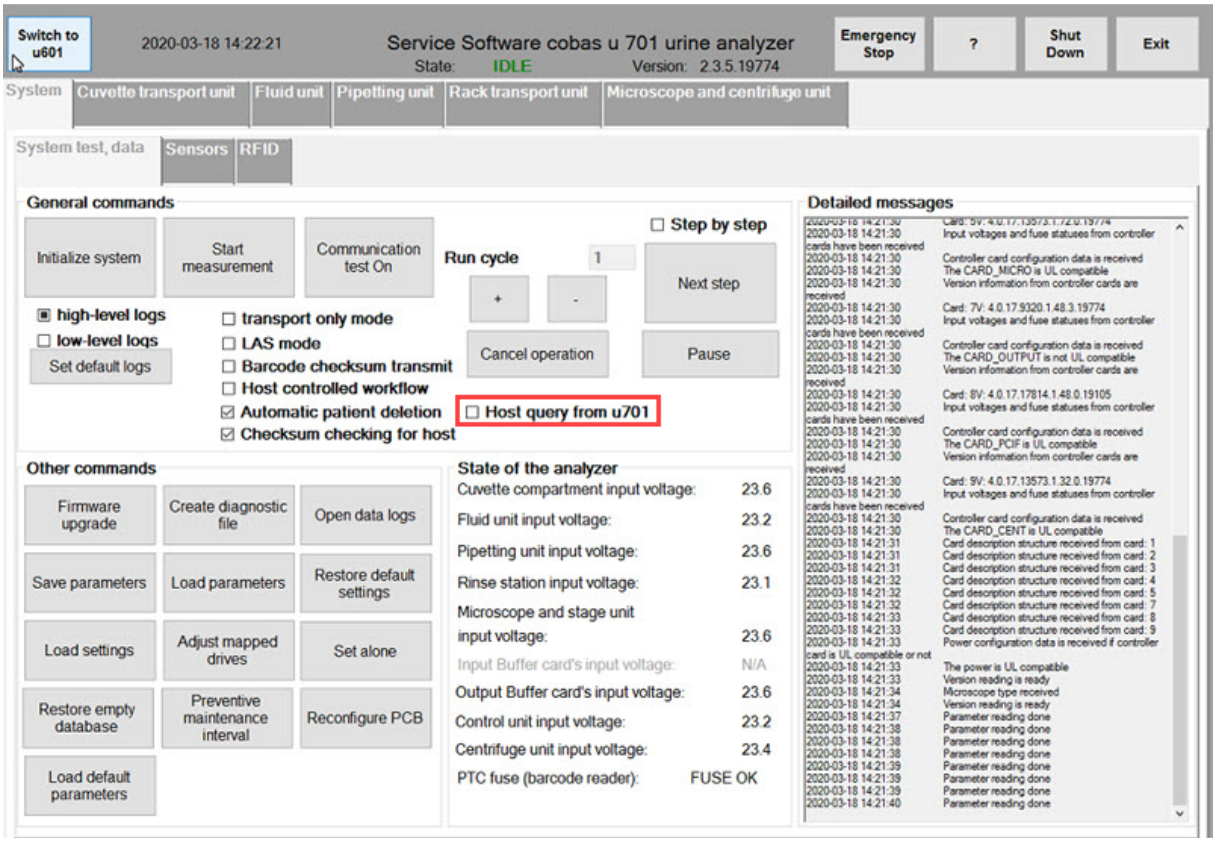
In this mode, it is possible to choose two query mode options for cobas 6500. To be able to select, go to Service Software.

Disable ☐ - only **cobas u** 601 queries

Enable ☑ - both instruments queries

TIP This option is only available for cobas 6500 running with user software v2.3.5 and higher.

TIP After user software installation to v2.3.5 or higher, the option is disabled by default.



3.7 Communication types

This section discusses the different types of communications between the host and the analyzer.

3.7.1 Communication and message types

Each record is introduced by field (number one) identifying the record type, and terminated by a carriage return. The following record types are defined.

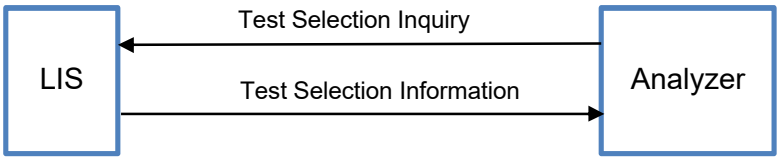
Supported records:

Record Type ID	Record Name	Description
H	Header Record	First record in every message.
P	Patient Information Record	Patient demographics can be sent from the host and will be sent back.
O	Test Order Record	Defines the attributes of a particular order.
R	Result Record	Contains measurement results.
C	Comment Record	Transmission of data alarms and result comment.
M	Manufacturer Information Record	Transmission of raw data, additional information for sample and control results.
Q	Request Information Record	Test selection inquiry.
L	Message Terminator Record	Last record in every message.

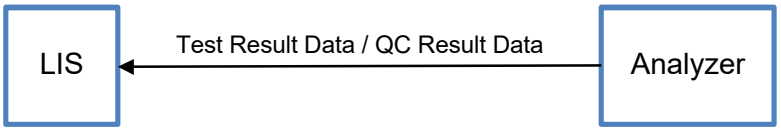
3.7.2 Communication scenarios

This section describes the types of communication scenarios that occur between the host and the analyzer.

The host sends a Test Selection Information in response to an analyzer Test Selection Inquiry.



The host can send a Test Results or QC Results independent of other communication.



3.7.3 Details of message types

Sending test selections

The query sent to the host contains always Sample ID, Rack ID and the Tube position on the rack.

Sending test results

For results to be sent to the host, they must first pass validation. Validation can be done manually or automatically. The manual validation is done by the user on the analyzer. Automatic validation is done if a result is technically ok.

Sending QC results

The measured quality control results are sent automatically from the analyzer to the host.

4 Interface description

4.1 Host communication settings

4.1.1 Communication setup

The host status on the analyzer is disabled by default. To establish the host communication, the host status must be set to enable. To configure the host settings and to enable the host communication, proceed the following procedure.

➢ To set user software's host connection settings.

a) Choose **Administration > System configuration > Host Communication**.

b) Choose **Edit**.

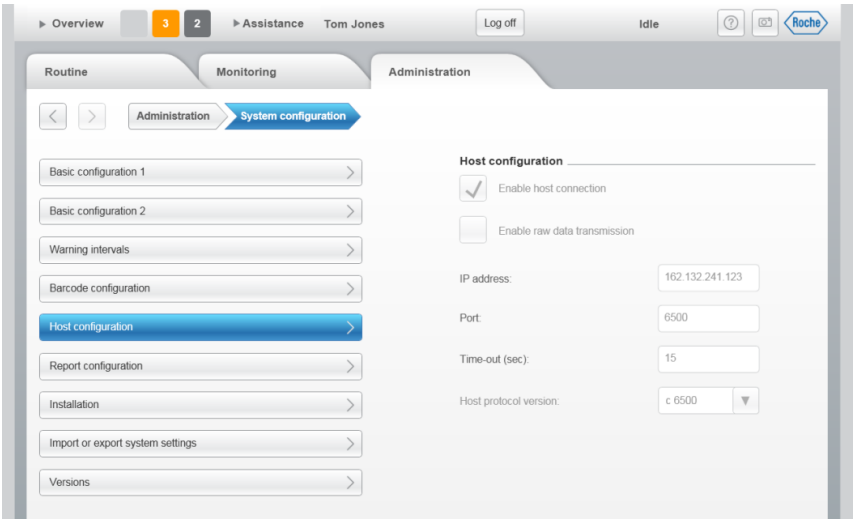
c) Select the **Enable host connection** check box.

d) Select the **Enable raw data transmission** check box, if required.

e) Enter the host's **IP address** and the **Port 6500**.

f) Select the **host protocol version**.

g) Choose **Save**.



4.1.2 Host communication check

In case of host communication problems as sending data from the analyzer to the host system (LIS) check host settings on the analyzer and the LIS, as well as the connection. The communication can be tested using a host simulator on the Roche service representative's notebook.

See also Google Site for HOST Interface Test Tools:
https://sites.google.com/a/roche.com/host-interface-test-tools/home

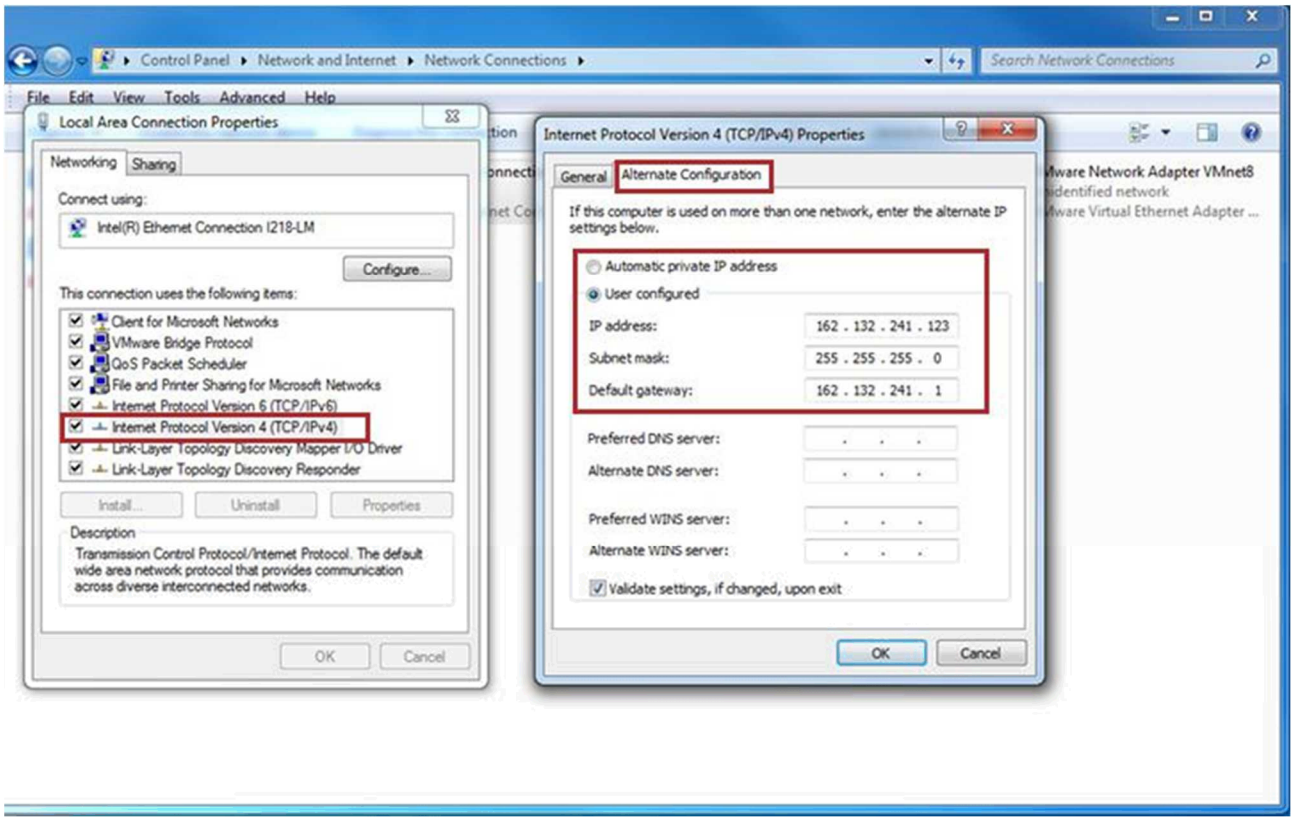
Before changing any settings or disconnecting the LAN cable from the analyzer, follow the procedures below.

➢ To connect the analyzer with the notebook

a) Disconnect the wireless connection on the notebook.
E.g. choose **Start > Control Panel > Network and Sharing Center**.

b) Disable the firewall on the notebook.
E.g. on the right side of the notebook's taskbar click **Show hidden icons**.
Right-click on **Symantec Endpoint Protection > disable Symantec Endpoint Protection**.

c) Connect the analyzer with the notebook, using the analyzer's connector labeled with **LAN** and a LAN cable.
TIP **LAN connectors are located** at the rear of the analyzer.



➢ To set notebook's network connection settings

a) Choose **Start > Control Panel > Network and Sharing Center**.

b) Choose **LAN-Verbindung, the LAN-Verbindung Status** dialog box opens.

c) Choose **Properties**, the **LAN-Verbindung Properties** dialog box opens.

d) Choose **Internet Protocol Version 4 (TCP/IPv4).**

e) Choose **Properties**, the **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box opens.

f) Choose the **Alternate Configuration** tab.

g) Select the **User configured** option.

h) Under **IP address** enter **162.132.241.123**.

i) Under **Subnet mask** enter **255.255.255.0**.

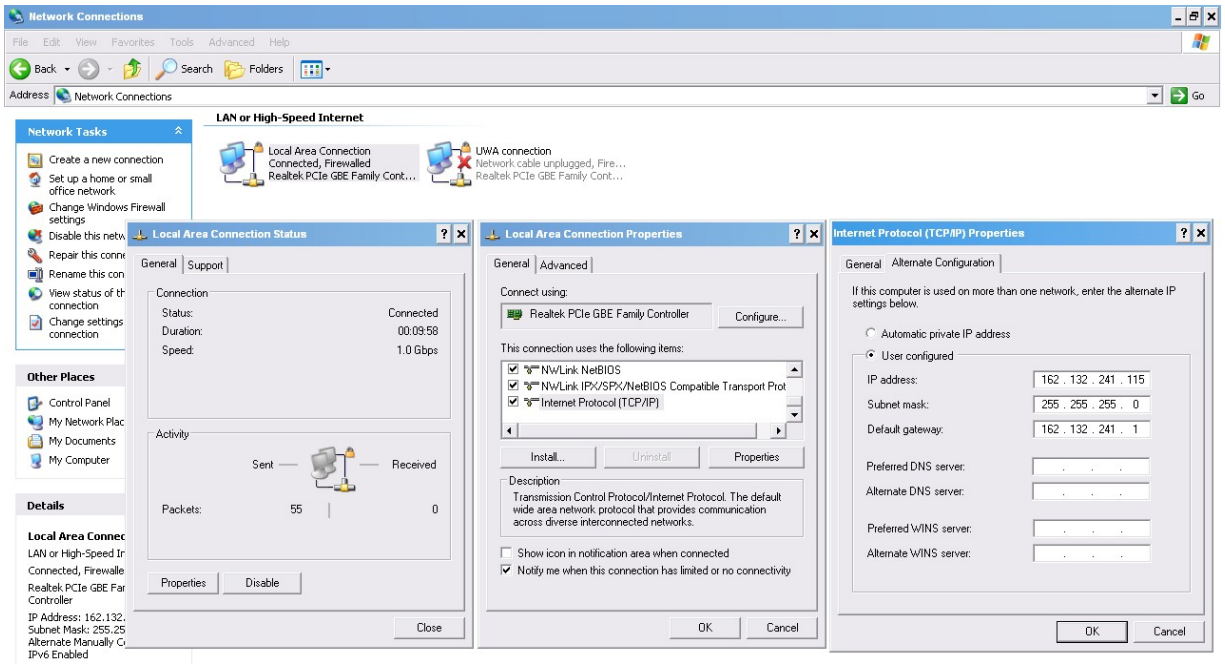
j) Under **Default Gateway** enter **162.132.241.1**.

k) Choose **OK**, the **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box closes.

l) Choose **Close**, the **LAN-Verbindung Properties** dialog box closes.

m) Choose **Close**, the **LAN-Verbindung Status** dialog box closes.

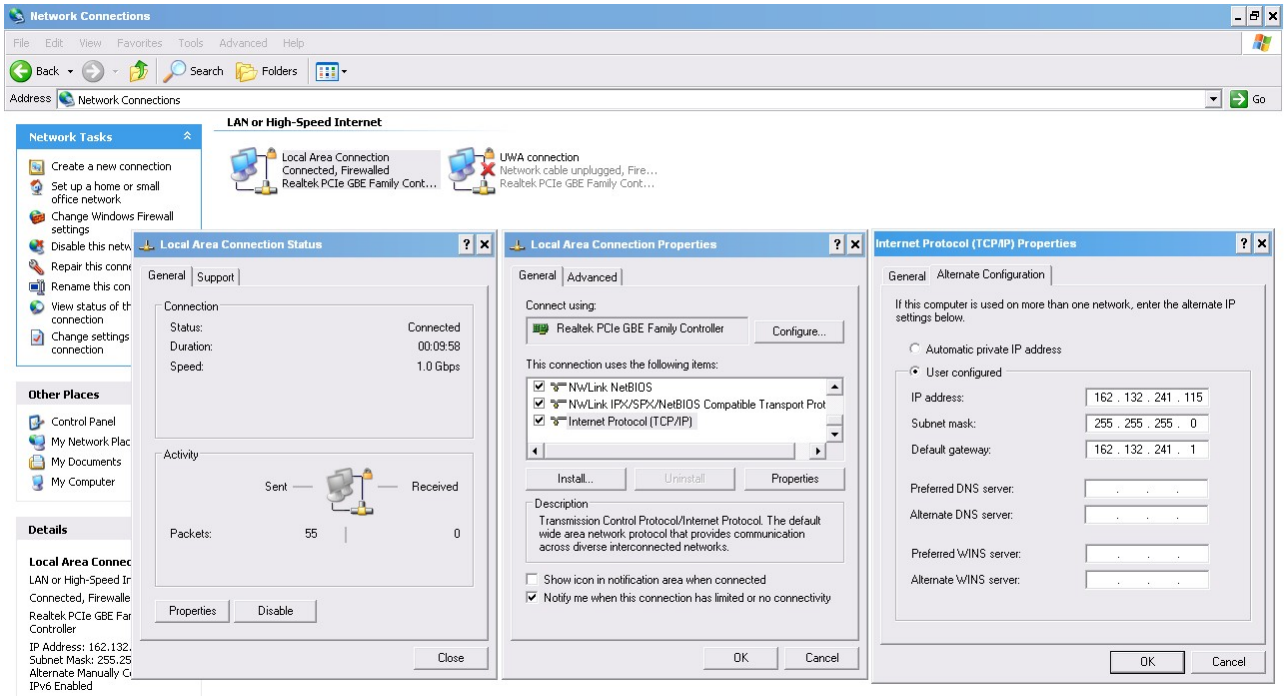
n) Close the **Network and Sharing Center** window.



TIP **The following procedure must be executed if advised by Roche Global Customer Support only**. It may misadjust the analyzer's network settings and operating system if the FSE is not experienced.

➢ To set analyzer's network connection settings.

a) Choose **Start > Settings > Control Panel > Network Connections**.
b) Double-click the **Local Area Connection** icon, the **Local Area Connection Status** dialog box opens.
c) Choose **Properties**, the **Local Area Connection Properties** dialog box opens.
d) Choose **Internet Protocol (TCP/IP).**
e) Choose **Properties**, the **Internet Protocol (TCP/IP) Properties** dialog box opens.
f) Select **Alternate Configuration**.
g) Select the **Use the following IP address** option.
h) Under **IP address**, enter **162.132.241.115**.
i) Under **Subnet mask**, enter **255.255.255.0**.
j) Under **Default Gateway** enter **162.132.241.1**.
k) Choose **OK**, the **Internet Protocol (TCP/IP) Properties** dialog box closes.
l) Choose **OK**, the **Local Area Connection Properties** dialog box closes.
m) Choose **OK**, the **Local Area Connection Status** dialog box closes.
n) Close the **Network Connections** window.



For configuring the ASTM Host Simulator use the following procedure.

➢ To set ASTM Host Simulator's connection settings

a) From the **Options** menu, choose **Common Settings**.

b) Choose the **Device/Trace** tab.

c) From the **Instrument** drop/down list, choose **cobas 6500**.

d) Choose **OK**.

e) From the **Options** menu, choose **Interface Settings**.

f) Choose the **Network Settings** tab.

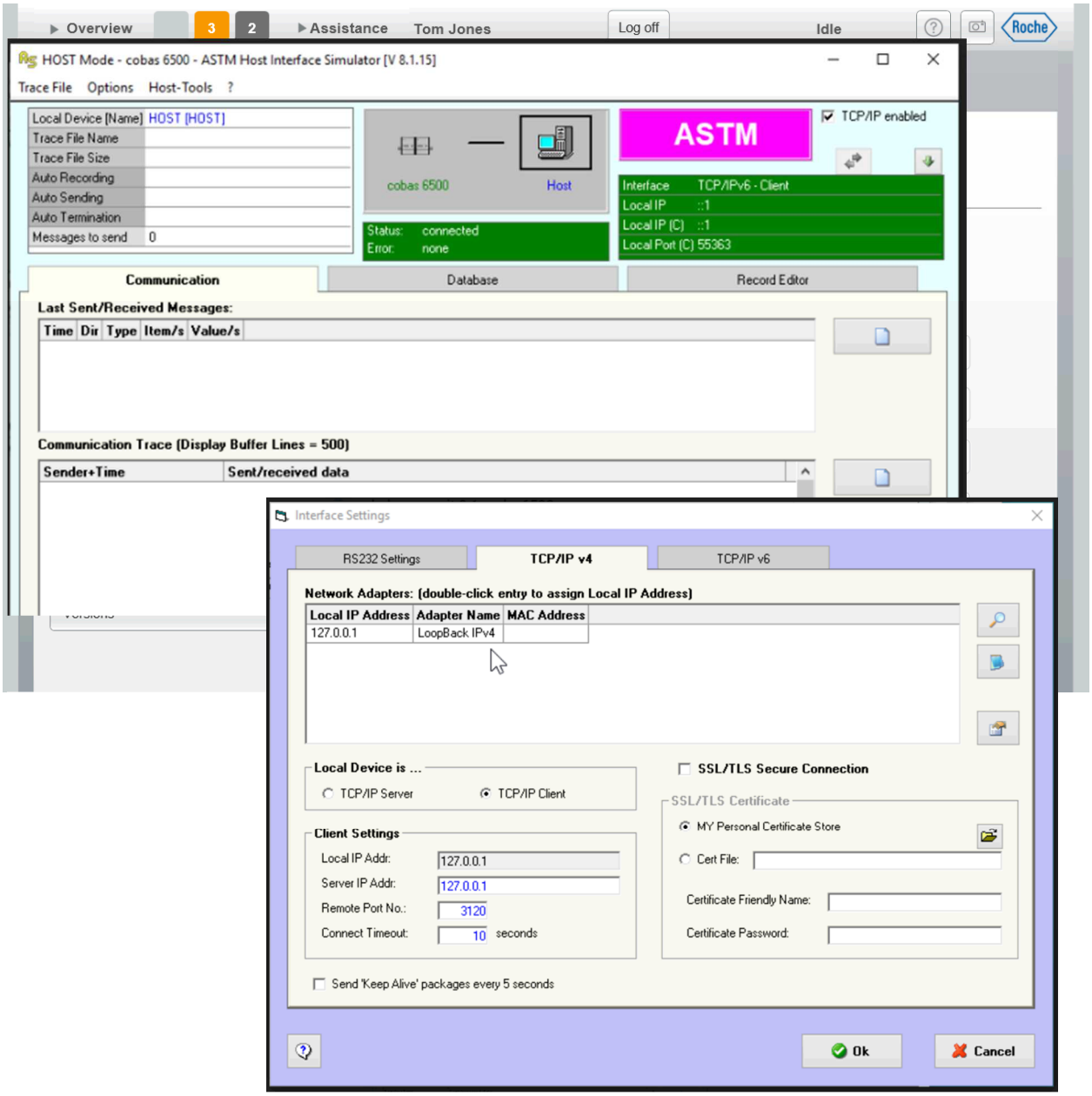
g) Under **Local Device is** ..., select the **TCP/IP Server** option.

h) Under **Server Settings > Local IP address**, enter **162.132.241.123**.

i) Under **Server Settings > Local Port No**, enter **6500**.

j) Choose **OK**

TIP A successful connection with the analyzer is indicated with a green bar and the message "Winsock Status: Connected" underneath the instrument connection icon. Otherwise check the analyzer's network connection settings, see procedure at the end of this chapter.



➢ To set user software's host connection settings on the analyzer.

a) Choose **Administration > System Configuration > Host Configuration**.

b) Choose **Edit**.

c) Select the **Enable host connection** check box.

d) Select the **Enable raw data transmission** check box, if necessary.

e) Under **IP address**, enter **162.132.241.123**.

f) Under **Port**, enter **6500**.

g) Under **Host protocol version**, choose **cobas 6500** or **cobas 6500_09**

h) Choose **Save**.

i) Restart the analyzer.

TIP Analyzer has to be connected with the Notebook.

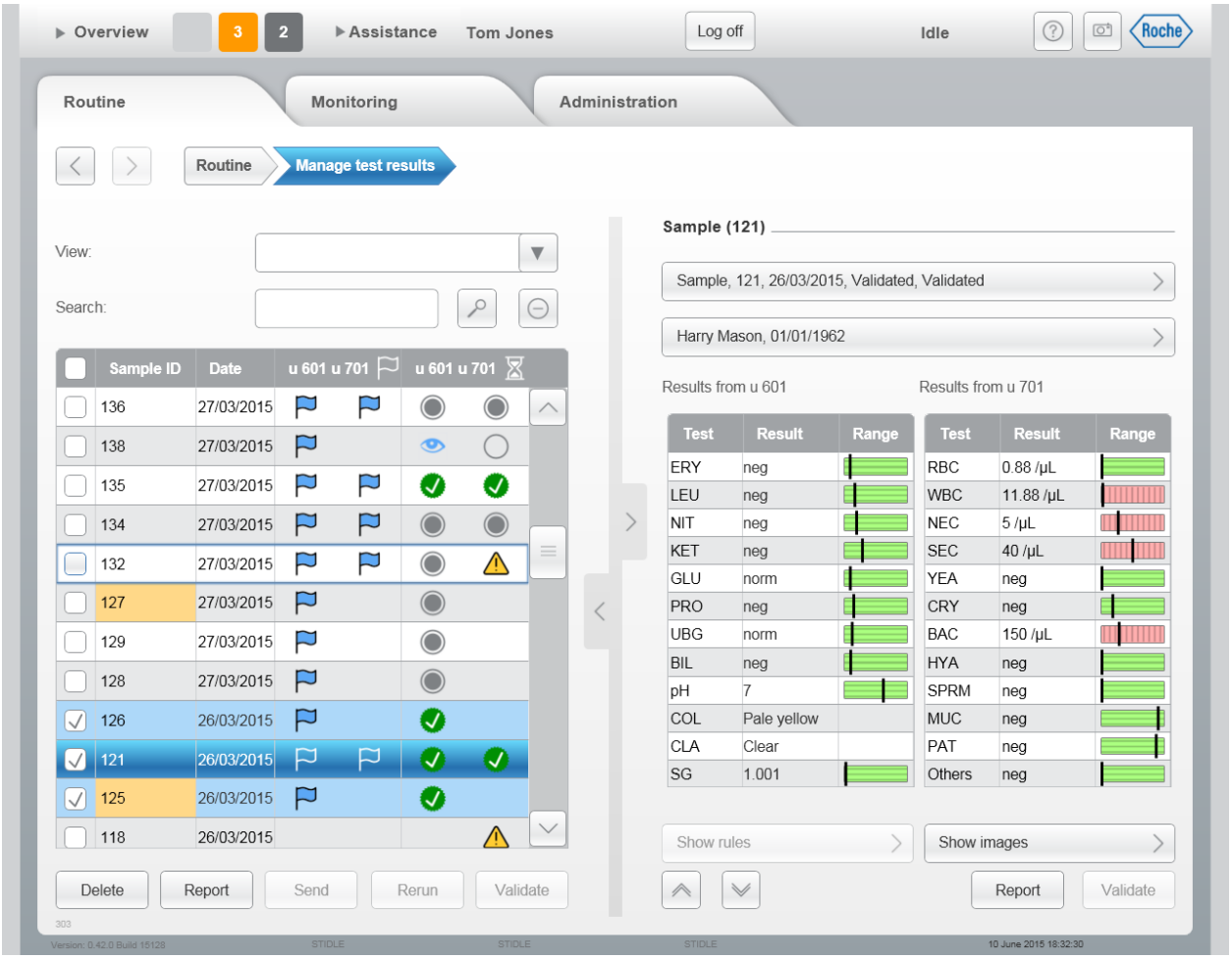
➢ To transmit data from the analyzer to the notebook

a) Choose **Routine > Manage test results**.

b) Select the check boxes of the results to be transmitted.

c) Choose **Send**.

TIP For receiving the results on the notebook, the appropriate host simulator must be started and configured according to the procedure above.



4.2 Physical layer specifications

4.2.1 Electrical Characteristics

The voltage and impedance levels for the sender and receiver circuits are as specified in the IEEE 802.3 standard.15.

Signal Levels

The signal levels conform to the IEEE 802.3 standard.15.

Character Structure

- The method of data transmission is TCP/IP. The order of the bits in a character is:
  (1) One start bit, corresponding to a binary 0;
  (2) The data bits of the character, least significant bit transmitted first;
  (3) Parity bit; and
  (4) Stop bit(s), corresponding to a binary 1.
- The time between the stop bit of one character and the start bit of the next character may be of any duration. The data interchange circuit is in the marking condition between characters.
- Even parity corresponds to a parity bit chosen in such a way that there are an even number of 1 bit in the sequence of data bits and parity bit. Odd parity corresponds to an odd number of 1 bit when formed in the same way.
- All devices must be capable of sending and receiving characters consisting of one start bit, eight data bits, no parity bit, and one stop bit.
- The default character structure consists of one start bit, eight data bits, no parity bit, and one stop bit. Eight-data-bit character sets are allowed but not specified by this standard. Other character structures can be used for specialized applications, for example, seven data bits, odd, even, mark or space parity, or two stop bits.
- The character bit sequencing, structure, and parity sense definitions conform to ANSI standards X3.15-1976 and X3.16-1976.12,13

Speed

The data transmission rate for instruments shall conform to IEEE 802.315 and operate at least 10MBit/second. A host system using TCP/IP must have the capability to conform to a minimum speed of 10 MBit/second.

Interface Connections

The conforming connection utilizes an eight-line connector (RJ45). The connector contact assignments conform to the ANSI EIA/TIA 568B standard16 (also called the AT&T specification) and are as follow:

Connector contact assignments:

No	Color
1	white / orange
2	orange
3	white / green
4	blue
5	white / blue
6	green
7	white / brown
8	brown

4.2.2 Mechanical Characteristics

Connector

The conforming connector associated with the instrument and computer is a commercial type RJ-45F style connector. The connector dimensions must correspond to those given in the ANSI EIA/TIA 568B standard16.

Cable

Category 5 cables as defined by ANSI EIA/TIA 568B16 are preferred for all connections. In general, no extension cables should be required to connect the instrument to the computer network. Detailed requirements of an interconnecting cable are undefined, but good engineering practice should be followed in selecting the cable and connectors. Low-capacitance cable and shielded connectors may be necessary to suppress electromagnetic interface (EMI). Appropriate connector-locking hardware should be used at the conforming connectors.

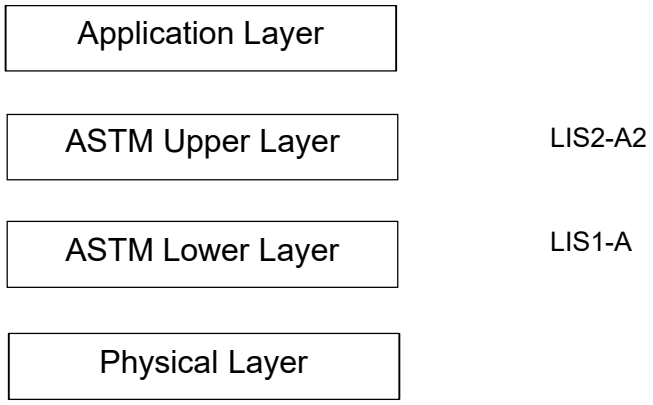
5 ASTM Reference

5.1 ASTM protocol (LIS2 – A2)

5.1.1 Background

The standards for communication between automatic analyzers and host computers are LIS1-A (Standard Specification for Low-Level Protocol to Transfer Messages between Clinical Laboratory Instruments and Computer Systems) and LIS2-A2 (Standard Specifications for Transferring Information Between Clinical Instruments and Computer Systems).

5.1.2 Communication Processing Layers



Details of the ASTM protocol can be found in

- **LIS1-A (ASTM E1381-02) Low Level Protocol**
  (NCCLS. Standard Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems. NCCLS document LIS1-A [ISBN 1-56238-489-9]. NCCLS, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania 19087-1898 USA, 2003.)
- **LIS2-A2 (ASTM E1394-97) High Level Protocol**
  (NCCLS. Specification for Transferring Information Between Clinical Laboratory Instruments and Information Systems; Approved Standard—Second Edition. NCCLS document LIS2-A2 [ISBN 1-56238-550-X]. NCCLS, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania 19087-1898 USA, 2004.)

5.1.3 ASTM Lower Layer

ASTM lower layer receives messages for a transmission request from the upper layer. These messages are then split into frames and sent to a communication medium to be transmitted to other parties. ASTM lower layer also constructs frames received from a communication medium to recreate messages to be transferred to the ASTM upper layer as reception messages.

5.1.4 ASTM syntax

The structure of the sentences to be transferred, according to ASTM Communication Regulation, is explained in this section. Between the analyzer and the host, various data such as Test Results are transferred back and forth. All of these data conform to this syntax.

Definitions

Message:

A message is constructed with an arrangement of several records (refer to the next item). It is the smallest unit of information transferred between a host and an analyzer. Messages begin with a ‘Message Header Record’ that indicates the beginning of a message and end with a ‘Message Termination Record’ that indicates the end of a message.

Record:
A record is constructed from several fields and expresses a single purpose (such as to specify test result data). A record may be repeated or used singularly in a message. Code that indicates the purpose of a record is noted in the first character of that record.

Field:
A field is the ASTM's smallest element to construct information. Attributes for a field (name, format, and meanings) are defined in units in a record.

Messages
Each message has a number of records. A message is a group of records that begins with a Header Record and ends with a Message Terminator Record. Each record has a number of fields. Each field is by default separated by the vertical bar | character (the actual definition of which character is used for field separation is done with the Header Record).
Following is a description of the records and the fields within each record:

Record Type ID	Record Name
H	Message Header Record
P	Patient Information Record
O	Test Order Record
R	Result Record
C	Comment Record
M	Manufacturer Information Record
L	Message Termination Record
Q	Request Information Record

Delimiters
For the purpose of providing examples, the following delimiters are used:

- Field delimiter = vertical bar (|) Latin-1(124)
- Repeat delimiter = backslash (\) Latin-1(96)
- Component delimiter = caret (^) Latin-1(94)
- Escape delimiter = ampersand (&) Latin-1(38)

Record Delimiter:
Carriage return (13) shall be the delimiter for the end of any of the defined record types.

Field Delimiter:
A single allowable character, excluding Latin-1(13) (carriage return), shall separate adjacent fields. The field delimiter is variable and defined in the message header. The same delimiter must be used in all records following a header and preceding a message terminator record.

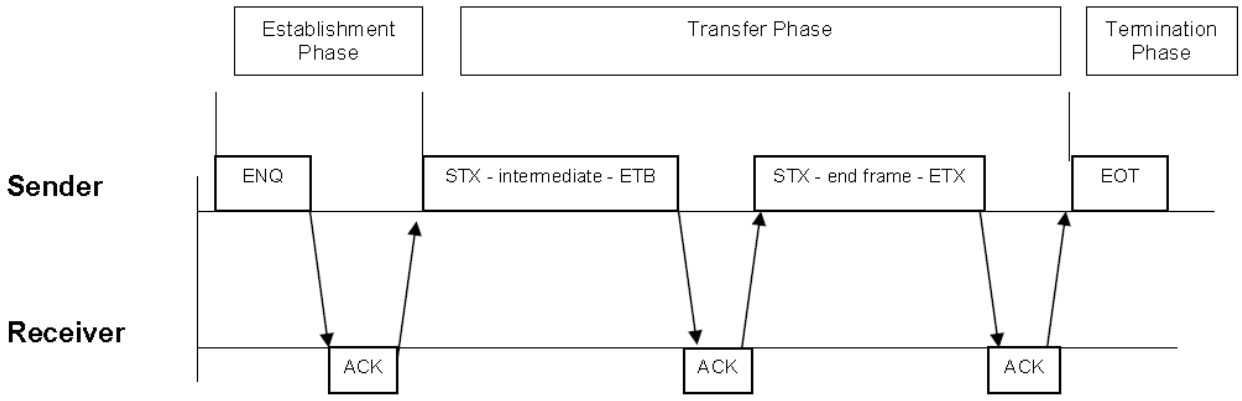
Repeat Delimiter:
A repeat delimiter is a single allowable character, excluding Latin-1(13) and the value for the field delimiter. The repeat delimiter must be defined in the message header and is used to separate variable numbers of descriptors for fields containing parts of equal members of the same set.

Component Delimiter:
A component delimiter is a single allowable character, excluding Latin-1(13) and the field and repeat delimiter values. The component delimiter is used to separate data elements of fields of a hierarchical or qualifier nature. For example, the street, city, state, zip, etc. of an address field would be separated by component delimiters.

Escape Delimiter:
An escape delimiter is a single allowable character, excluding Latin-1(13) and the field, repeat, and component delimiter values. The escape delimiter is used within text fields to signify special case operations. Applications of the escape delimiter are optional and may be used or ignored at the discretion of either the transmitter or the receiver. However, all applications are required to accept the escape delimiter and use it to correctly parse fields within the record.

Message Transmission Phases
To establish which system sends and which system receives information and to assure the actions of sender and receiver are well coordinated, there are three distinct phases in transferring information:

- Establishment Phase
- Transfer Phase
- Termination Phase



Within the transfer phase, all records of the corresponding message are grouped into longer frames to increase speed. The records are separated through a [CR] character. Therefore, to obtain pure ASTM records again, the receiver must concatenate all the frames and wait for a [EOT] character. Then, finally, he can process the frame and split it into different records using the [CR] as separator.

5.2 ASTM text content (LIS2 – A2)

5.2.1 Record levels

The following table shows the Standard Record types and levels specified by the protocol LIS2-A2.

Level	Record Name	Record Type ID
0	Message Header Record	H
1	Patient Information Record	P
2	Test Order Record	O
3	Result Record	R
1 … 3	Comment Record • Data alarms for a test parameter (C-I) • Comment for a result (C-G)	C
1 … 3	Manufacturer Information Record • Raw Result Record (M-RR) • Result Context Record (M-RC) • Image Path Record (M-IR)	M
0	Message Termination Record	L
1	Request Information Record	Q

5.2.2 Messages used in host communication

The following section shows detailed descriptions of each of message sent between the host and analyzer, and the ASTM records used in each.

Message	Communication direction
Test Selection Information	Host to analyzer
Test Selection Inquiry	Analyzer to host
Test Result Data	Analyzer to host
QC Result Data	Analyzer to host

Messages transmitted by the analyzer

Messages transmitted from the analyzer to the host are shown in the table below.
In the following charts:

- [ ] Square brackets indicate an optional segment. (0 - 1 times)
- { } Curly brackets indicate a segment or group of segments that may be repeated. (1 - n times.)

Message	Records	Reason
Test Selection Inquiry	H Q L	Inquiry is made for the requested sample just after a rack has passed the barcode reader.

Test Result Data u601
QC Result Data u601
	H
	[P]
	O
	{
	R
	[C-I]
	}
	{
	[M-RR]
	}
	M-RC
	[C-G]
	L
		Upload of the Test results or QC results at the point when the results for the sample have been calculated.

Test Result Data u701
QC Result Data u701
	H
	[P]
	O
	{
	R
	[C-I]
	}
	{
	[M-RR]
	}
	M-RC
	[M-IR]
	[C-G]
	L
		Upload of the Test results or QC results at the point when the results for the sample have been evaluated.

TIP During cobas 6500 measurement it is **not** specified which part of the result data (u 601 or u 701) is sent first to the host.

Messages transmitted by the host
The analyzer can receive the following message from a connected LIS.

Message	Records	Reason
Test Selection Information	H [P] O L	Test selection download for a sample as an answer to a test selection inquiry.

5.2.3 Record description

Each record of the ASTM message is divided into fields and subfields.

Field attributes
Types of attributes held by a field are explained below.

Attribute	Description
Field	The number of the field in the record.
Reference	The paragraph in the ASTM definitions that describes the field. See NCCLS. Specification for Transferring Information Between Clinical Laboratory Instruments and Information Systems: Approved Standard, Second Edition. NCCLS document LIS2-A2 [ISBN 1-56238-550-X]. NCCLS, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania 19087-1898 USA, 2004.
Value	This shows either: • The precise text to be sent. • The format of the field. The format of the field can take one of the following values: • *Character*: A single character. • *String*: A character string. • *Number*: A numeric value. Positive (+) or negative (-) is indicated before the numeric value. If it is not indicated, it is treated as positive (+). • *Date*: Always use the 4-digit Gregorian year. The format is YYYYMMDD (YYYY is the 4-digit Gregorian year, MM is the month, DD is the day). For example, September 5, 2009 is indicated 20090905. • *Time*: Military time. (24 hour) The format is HHMMSS (HH is the hour, MM is the minute, and SS is the second). • *DateTime*: A combination of Date and Time. The format is: YYYYMMDDHHMMSS. • *Complex*: A field in which multiple data components are combined, separated by a component delimiter. Each component may take one of the other formats.
Host	If sent from the host or LIS, this field is either: • R, required • O, optional

Analyzer	If sent from analyzer, this field is either: • R, required (in other words, always sent) • O, optional
Description	A description of the field, including use and permitted values. In the case of complex fields, this includes a description of individual components.
Version	The following host protocols are supported. • cobas 6500 protocol • cobas 6500_09 protocol Content of cobas 6500 protocol will be marked as “8”. Content of cobas 6500_09 protocol will be marked as “9” or “10” or “11”

Text encodings
All data shall be represented as eight-bit, single-byte, coded graphic character values as defined in ISO 8859-1:1987.1 The eight-bit values, within the range from 0 to 127 of ISO 8859-1:19871 correspond to the ASCII standard character set. Values from 0 to 31 are disallowed with the exception of 7 (BEL), 9 (Horizontal tab), 11 (Vertical tab), and 13 (CR), where 13 is reserved as a record terminator. Values from 32 to 126 and from 128 to 254 are allowed. Values 127 and 255 are also not allowed. It is the responsibility of the instrument vendor and information system vendor to understand the representation of any extended or alternate character set being used. As an example, the numeric value 13.5 would be sent as four-byte value characters 13.5 or Latin-1(49), Latin-1(51), Latin-1(46), and Latin-1(53).

Allowed Characters: 7, 9, 11, 12, 13, 32 to 126, 128 to 254
Disallowed Characters: 0 to 6, 8, 10, 14 to 31, 127, 255

Within text data fields, only the Latin-1 characters 32 to 126 and the undefined characters 128 to 254 are permitted as usable characters (excluding those used as delimiter characters in a particular transmission). Furthermore, all characters used as delimiters in a particular transmission are excluded from the permitted range. The sender is responsible for screening all text data fields to ensure that the text does not contain those delimiters. Unless otherwise stated, contents of data fields shall be case sensitive.

5.2.4 Message Header Record

This record contains information about the sender and other important general information.

u 601 standalone:
H|\^&|||AN_01^u601^2.2.9^9^SU0500997^|||||||P|LIS2-A2|20200324170303

u 701 standalone:
H|\^&|||^u701^2.2.7^8^^SV0500744|||||||P|LIS2-A2|20200331093025

cobas 6500 (u 601 and u 701 connected):
H|\^&|||c6500^Cobas6500^2.3.5^11^SU0501130^SV0500307|||||||P|LIS2-A2|20200420082750

If the analyzer name / system name is empty in the software:
H|\^&|||^Cobas6500^2.2.9^9^SU0500999^SV0500745|||||||P|LIS2-A2|20100603155801

TIP The given system name is visible in the cobas 6500 software in the global bar on the screen.
c6500 > Administration > System Configuration > Basic configuration 1 > System Name

Field	Ref.	Value	Host	An.	Description	Version
1	6.1	*H*	R	R	Record Type ID	8, 9, 10, 11
2	6.2	|\^&	R	R	Delimiter Definition Delimiter definitions. Fixed values: • | Field delimiter = vertical bar [ASCII 124] • \ Repeat Delimiter = backslash [ASCII 92] • ^ Component Delimiter = caret [ASCII 94] • & Escape character = ampersand [ASCII 38]	8, 9, 10, 11
3	6.3	*Not used*				8, 9, 10, 11
4	6.4	*Not used*				8, 9, 10, 11
5	6.5	*Complex*	-	R	Sender Name or ID ***Analyzer name*** ***^System configuration*** ***^User software version*** ***^Protocol version*** ***^Serial number u601*** ***^Serial number u701*** • Analyzer name is the system name given in the user software in Basic Configuration 1. If it is empty, then it is not sent. • System configuration is either a u 601 standalone, u 701 standalone or cobas 6500 connected mode (both analyzer connected to a system). • User software version is the user software version on the analyzer. • Protocol version of the c6500 host protocol.	8, 9, 10, 11
			O	-	No data or either caret needed if host would send it to the analyzer..	8, 9, 10, 11
6…11	6.6 – 6.11	*Not used*				8, 9, 10, 11
12	6.12	*P*	O	R	Processing ID Fixed value P, meaning production.	8, 9, 10, 11
13	6.13	*LIS2-A2*	O	R	Version No. Fixed string LIS2-A2	8, 9, 10, 11
14	6.14	*DateTime*	R	R	Date and Time of Message	8, 9, 10, 11

TIP During driver installation and/or development, some LIS providers apply an unnecessary check of the user software version at the message header record. This creates communication problems right after the user software is upgraded and the user software version changes.
Do not implement this unnecessary user software version check.

5.2.5 Patient Information Record

This record is used to transfer patient demographic data.

Empty patient data sent from the host to the analyzer is optional (v8):
P|1

Empty patient data sent from the analyzer to the host is requested (v8):
P|1

TIP Patients can be created manually but they will not be sent back to the host.
Only patients sent from the host to the analyzer will be sent back from the analyzer to the host.

Patient data sent from the host to the analyzer (v9 or higher):
P|1|13A930|302683||Doe^John||1891201|M|||||PhysicianID

Patient data sent from the analyzer to the host (v9 or higher):
P|1|13A930|302683||Doe^John||1891201|M|||||PhysicianID

The patient name field can be empty or just partly used **(not valid for SW 2.3.6, SW 2.3.7, and SW 2.3.8)**:
P|1|13A930|302683||||1891201|M|||||PhysicianID
P|1|13A930|302683||^||1891201|M|||||PhysicianID
P|1|13A930|302683||^John||1891201|M|||||PhysicianID
P|1|13A930|302683||Doe^||1891201|M|||||PhysicianID

If just one name is in the patient name field, the software uses it as last name **(not valid for SW 2.3.6, SW 2.3.7, and SW 2.3.8).**
P|1|13A930|302683||Doe||1891201|M|||||PhysicianID

TIP If no patient data is connected to the sample result then no patient record is sent back to the host.

Field	Ref.	Value	Host	An.	Description	Version
1	7.1	*P*	R	R	Record Type ID	8, 9, 10, 11
2	7.2	*1*	R	R	Sequence Number Fixed value 1.	8, 9, 10, 11
3	7.3	*String*	O	O	Practice-Assigned Patient ID Max length of 50 characters.	9, 10, 11
4	7.4	*String*	R	R	Laboratory-Assigned Patient ID Max length of 50 characters. If the host did not sent an ID then the analyzer cannot send it back. It cannot be defined in the User Software.	9, 10, 11
5	7.5	*Not used*				9, 10, 11
6	7.6	*Complex*	O	O	Patient Name ***Last Name^First Name*** Each component has a max. length of 22 characters. Should always contain the component delimiter ^ Fill in both fields (Last Name AND First Name) for SW version > 2.3.6	9, 10, 11
7	7.7	*Not used*				9, 10, 11
8	7.8	*Date*	O	O	Birthdate	9, 10, 11

9	7.9	*Character*	O	O	Patient Sex • M Male • F Female • U Unknown Any other value defaults to unknown, and is returned to the host as U.	9, 10, 11
10...13	7.10 – 7.13	*Not used*				9, 10, 11
14	7.14	*String*	R	O	Attending Physician ID Either name or code. Max length of 50 characters. Field to be sent even it is empty.	9
			O	O	Attending Physician ID Either name or code. Max length of 50 characters.	10, 11
15…35	7.15 – 7.35	*Not used*				9, 10, 11

TIP For User Software **2.3.5 all mandatory fields 1...14 must be sent** for the Patient Record, even the fields 10...14 that do not contain any data, field delimiters (vertical bars) must be sent.
This problem is fixed in Software version 2.3.6 onwards.

TIP **Fill in both fields (Last Name AND First Name) for SW version > 2.3.6**

Sending a patient record with less than 14 fields, leads to a host communication error "Wrong patient record!"

Example with physician ID:
P|1|13A930|302683||LastName^FirstName||1891201|M|||||PhysicianID

Example w/o physician ID:
P|1|13A930|302683||LastName^FirstName||1891201|M|||||
or
P|1|13A930|302683||LastName^FirstName||1891201|M

5.2.6 Test Order Record

This record holds information regarding the analysis request and sample information. It is sent to the analyzer within test selection message, and to the host within result message.

TIP The component delimiter ^ must be kept if field 4 has no data.

Order record sent from the host to the analyzer with sample identified by barcode (optional Rack ID and Tube positon):
O|1|00321068|^^^|CM|R|||||N|||20000202035009||||||||||Q

Order record sent from the host to the analyzer with sample identified by sequence number (requested Rack ID and Tube positon)
O|1|N1|500050^3^^|CM|R|||||N|||20000202035009||||||||||Q

TIP Rack ID and Position number are optional to be sent by the host when using barcodes as Sample ID. But they are requested to be sent when using sequence numbers as Sample ID on the host.

Order record sent from the host to the analyzer if no orders are available or sample is unknown to the host:
O|1|00321068|500050^3^^|||||||N|||20000202035009||||||||||Y

Order record sent from the analyzer to the host within the Test Result message:
O|1|00321068|713450^1^operator^SAMPLE|CM|R|||||N|||20120508132753||||||||||F

Order record sent from the analyzer to the host within the Test Result message with sequence number:
O|1|N1|500029^1^Service^SAMPLE|CM|R|||||N|||20170519114313||||||||||F

Order record sent from the analyzer to the host within the Test Result message with an error:
O|1|00321068|713450^3^operator^SAMPLE|CM|R|||||N|||20000202035009||||||||||X

TIP If there was no result because of an error during measurement, the order will be sent back to the host with an 'X' as Report type also after initialization without querying the host. It is the host's responsibility to cancel or rerun the order.

Order record sent from the analyzer to the host within the QC Result message:
O|1|004215/8/2012|500425^1^operator^CONTROL|C|R|||||Q|||20120508131539||||||||||F

TIP The host can send a STAT order to the instrument. Nevertheless, the analyzer cannot prioritize the STAT order. The prioritization is done manually by placing the STAT rack on the priority rack position. When the analyzer is querying the host for an order it could happen that the sample is in a STAT rack and the order on the host was defined for routine and vice versa. In that case, the analyzer is the master and shows the result according to the analyzer rack assignment.

Field	Ref.	Value	Host	An.	Description	Version
1	8.4.1	*O*	R	R	Record Type ID	8, 9, 10, 11
2	8.4.2	*Number*	R	R	Sequence Number	8, 9, 10, 11
3	8.4.3	*String*	R	R	Specimen ID (Sample ID) Either barcode or sequence number. Sequence numbers as Specimen ID contain a prefix: - Routine samples: Nxxx - STAT samples: Exxxx	8, 9, 10, 11
4	8.4.4	*Complex*	R R O O	R R O O	Rack ID (50xxxX) ^Tube Position (1...5) ^Operator ID ^Data Carrier Type (Sample or Control) Rack ID: - Routine rack (RD5): 50xxxX - QC rack ID: 10xxxX 0xxx = Rack ID X = check digit	8, 9, 10, 11
5	8.4.5	*String*	R	R	Universal Test ID (Test profile) • C u601 • P u601 reduced • M u701 • S u601 sieve to u701 • CM u601 & u701 • PM u601 reduced & u701	8, 9, 10, 11

6	8.4.6	*R*	O	R	Priority Fixed value R, meaning routine.	8, 9
			O	R	Priority • R Routine sample • S STAT sample	10, 11
7…11	8.4.7 – 8.4.11	*Not used*				8, 9, 10, 11
12	8.4.12	*Character*	-	R	Action Code • N New order • Q Quality control	8, 9, 10, 11
			R	-	Action Code • N New order • C Cancel order	8, 9, 10, 11
13…14	8.4.13 – 8.4.14	*Not used*				8, 9, 10, 11
15	8.4.15	*DateTime*	R	R	Date/Time Specimen Received	8, 9, 10, 11
16…25	8.4.16 – 8.4.25	*Not used*				8, 9, 10, 11
26	8.4.26	*Character*	-	R	Report Types • F Final result • X Order cannot be done	8, 9, 10, 11
			R	-	Report Types • Q Query response • Y Order not present	8, 9, 10, 11

5.2.7 Result Record

The analyzer uses the result record to upload the details of test results and QC result.

Result Record (u601)

A semi-quantitative test result (v8):

R|1|1^ERY|2+^25 /ul^25 /ul^^||International|||F||operator|||u601

A semi-quantitative test result (v9 or higher):

R|1|1^ERY|25|/ul|International|||F||operator|||u601

A semi-quantitative QC result (v8):

R|1|1^ERY|neg^neg^neg^^||International|||F||operator|||u601

A semi-quantitative QC result (v9 or higher):

R|1|1^ERY|neg||/ul|International|||F||operator|||u601

A result for SG without N data alarm (v8):

R|12|22^SG|1.000^1.000^1.000^^||International|||F||operator|||u601

A result for SG without N data alarm (v9 or higher):

R|12|22^SG|1.000||International|||F||operator|||u601

A result for SG with N data alarm (v8):

R|12|22^SG|-^-^-^^||International|||F||operator|||u601

A result for SG with N data alarm (v9 or higher):
R|12|22^SG|-||International|||F||operator|||u601

TIP In case of N data alarm, the SG result is reported as a dash sign ("-") instead of any values.

Result Record (u701)

TIP If the u 701 result has less than 5 images included into result evaluation, then the "Data or Measurement value" (9.4) and "Units" (9.5) fields are empty in the sent records. This happens only when the host controlled workflow is enabled.

Result Record without subclasses (u701)

A quantitative test result (v8):
R|1|1^RBC|^60.60 /HPF^266.64 /uL^60.60 /HPF^266.64 /uL||International|||F||operator|||u701

A quantitative test result (v9 or higher):
R|1|1^RBC|266.64|/uL|International|||F||operator|||u701

Result Record with subclasses (u701)

A quantitative test result (v8):
R|1|1^RBC|^60.60 /HPF^266.64 /uL^60.60 /HPF^266.64 /uL||International|||F||operator|||u701

TIP With **host protocol version 8** it is not possible to send results of subclasses. Subclass results are only submitted with **host protocol version 9 or higher**.

A quantitative test result (v9 or higher):
R|1|1^RBC|266.64|/uL|International|||F||operator|||u701
R|2|1-0^RBC_X|199.76|/uL|International|||F||operator|||u701
R|3|1-1^dysm. EC|66.88|/uL|International|||F||operator|||u701

TIP If the u 701 result has less than 5 images included into result evaluation, then the "Data or Measurement value" (9.4) and "Units" (9.5) fields are empty in the sent records. This happens only when the host controlled workflow is enabled.

Field	Ref.	Value	Host	An.	Description	Version
1	9.1	*R*		R	Record Type ID	8, 9, 10, 11
2	9.2	*Number*		R	Sequence Number	8, 9, 10, 11
3	9.3	*Complex*		R	Universal Test ID ***Test No^Test code***	8, 9, 10, 11
4	9.4	*Complex*		R	Data or Measurement Value u601 results including units: ***Arbitrary Result*** ***^Conventional Result*** ***^SI Result*** ***^empty*** ***^empty***	8

				R	Data or Measurement Value u701 results including units: ***Arbitrary Result*** ***^p/HPF Result*** ***^p/µl Result*** ***^p/HPF Concentration*** ***^p/µl Concentration***	8
		String		R	Data or Measurement Value u601 or u701 result according chosen measurement unit without units (Units are in field #5)	9, 10, 11
5	9.5	*Not used*				8
		String		R	Units	9, 10, 11
6	9.6	*String*		R	Reference Ranges	8, 9, 10, 11
7…8	9.7 – 9.8	*Not used*				8, 9, 10, 11
9	9.9	*F*		R	Result Status Fixed value F, meaning final result	8, 9, 10, 11
10	9.10	*Not used*				8, 9, 10, 11
11	9.11	*String*		R	Operator Identification	8, 9, 10, 11
12	9.12	*Not used*				8
13	9.13	*Not used*				8
		DateTime		R	Date/Time Test Completed	9, 10, 11
14	9.14	*String*		R	Instrument Identification • u601 • u701	8, 9, 10, 11

5.2.8 Comment Record (following Result Record)

Record to transfer comments regarding the measured result. This record is transmitted by the analyzer, either by adding a comment to a result, or by passing on data alarms to the host.

Data alarms for a test parameter:
C|1|I|A^M|I

TIP The Result Record is followed by a Comment Record which contains all data alarms (flags) that belong to the test parameter.
If no data alarms are triggered, then the record is not sent.
The X data alarm is not sent to the host with cross-check rules for subclasses when using **host protocol version 8**.

Comment for a result:
C|1|I|Comment|G

TIP The result comment is for the whole result and therefore only sent with the last test parameter result record.
If no result comment was entered, then the record is not sent.

Last test parameter result with data alarm and result comment:
R|12|22^SG|1.05||International|||F||operator|||u601
C|12|I|A|I
C|1|I|Comment|G

TIP The parameter data alarms (A, T, S, X, !, M, O) are not sent if the sample has less than 5 images included into result evaluation. This happens only when the host controlled workflow is enabled.

Field	Ref.	Value	Host	An.	Description	Version
1	10.1	*C*		R	Record Type ID	8, 9, 10, 11
2	10.2	*Number*		R	Sequence Number	8, 9, 10, 11
3	10.3	*I*		R	Comment Source Fixed value I, meaning clinical instrument system	8, 9, 10, 11
4	10.4	*Complex*		R	Comment Text **Each data alarm is separated by the delimiter ^** See appendix 6.1	8, 9, 10, 11
		String		R	Comment Text Free result comment. Max length of 280 characters.	9, 10, 11
5	10.5	*Character*		R	Comment Type • I Result data alarms (flags) from the analyzer	8, 9, 10, 11
				R	Comment Type • G Generic/free result comment	9, 10, 11

5.2.9 Request Information Record

This record is used to request information for new tests or tests previously ordered.

From analyzer to the host with sample identified by barcode
Q|1|^123456^05^1

From analyzer to the host with sample identified by sequence number
Q|1|^N1^05^1

TIP The analyzer is sending Sample ID, Rack ID and Tube position to the host.
Using barcodes, the Rack ID and Tube position is normally not send from the host to the analyzer. Using sequence numbers, the Rack ID and Tube position **must** be send from the host to the analyzer.

Field	Ref.	Value	Host	An.	Description	Version
1	11.1	*Q*		R	Record Type ID	8, 9, 10, 11
2	11.2	*1*		R	Sequence Number	8, 9, 10, 11
3	11.3	*Complex*		R	Starting Range ID Number ***empty*** ***^Specimen ID*** ***^Rack ID*** ***^Tube Position*** Sequence numbers as Specimen ID contain a prefix: - Routine samples: Nxxx STAT samples: Exxxx	8, 9, 10, 11

5.2.10 Message Termination Record

This is used as the final record in every message, to show that the message is completed.

Completed normally:
L|1|N

Field	Ref.	Value	Host	An.	Description	Version
1	12.1	*L*	R	R	Record Type ID	8, 9, 10, 11
2	12.2	*1*	R	R	Sequence Number Fixed value 1.	8, 9, 10, 11
3	12.3	*N*	O	R	Termination Code Fixed value N, meaning normal termination	8, 9, 10, 11

5.2.11 Manufacturer Information Record

Raw Result Record (u601)

This record is used to send raw data of measured u601 results.

Raw result:
M|1|RR|u601|1^ERY|REM_ERY_560|26.0500|26.0500

Raw result for test parameter SG without N data alarm:
M|17|RR|u601|22^SG||1.0001|

Raw result record for SG with N data alarm:
M|17|RR|u601|22^SG||-|

TIP In case of N data alarm the SG reflectance is reported as a dash sign (“-”) instead of any values.

Field	Ref.	Value	Host	An.	Description	Version
1	14	*M*		R	Record Type ID	8, 9, 10, 11
2	14	*Number*		R	Sequence Number	8, 9, 10, 11
3	14	*RR*		R	Record Type Sub ID Fixed value RR, meaning raw result.	8, 9, 10, 11
4	14	*u601*		R	Analyzer Identification Fixed value u601, meaning **cobas u** 601.	8, 9, 10, 11
5	14	*Complex*		R	Universal Test ID ***Test Number^Test Code*** See appendix 6.2 and 6.3	8, 9, 10, 11
6	14	*String*		R	LED frequency	8, 9, 10, 11
7	14	*String*		R	Reflectance in % without color compensation	8, 9, 10, 11
8	14	*String*		R	Reflectance in % corrected	8, 9, 10, 11

Raw Result Record (u701)

This record is used to send raw data of measured u701 results.

Raw result with counts of 15 images
M|1|RR|u701|1^RBC|7^9^8^12^10^7^9^8^12^10^7^9^8^12^10|138|9.20|60.72|13.8

Raw result with counts of 13 images
M|1|RR|u701|1^RBC|^0^0^0^0^0^0^^0^0^0^0^0^0^1|2|0.15|1.02|0.23

Raw result with subclasses (v8):
M|1|RR|u701|1^RBC|5^10^10^10^10^20^20^20^20^20^20^20^20^20^2|454|30.27|199.76|45.40
M|2|RR|u701|1-1^dysm. EC|5^10^2^2^2^5^5^5^5^5^5^5^5^5^10|152|10.13|66.88|15.20

CAUTION With **host protocol version 8** the test code RBC means in real RBC_X (Rest of the main class). The main class (summary of all subclasses) is only submitted with **host protocol version 9 or higher**.

Raw result with subclasses (v9):
M|1|RR|u701|1^RBC|10^20^12^12^12^25^25^25^25^25^25^25^25^25^12|606|40.40|266.64|60.60
M|2|RR|u701|1-0^RBC_X|5^10^10^10^10^20^20^20^20^20^20^20^20^20^2|454|30.27|199.76|45.40
M|3|RR|u701|1-1^dysm. EC|5^10^2^2^2^5^5^5^5^5^5^5^5^5^10|152|10.13|66.88|15.20

TIP If the sample has less than 5 images included into result evaluation, the Raw Result Records are not sent. This happens only when the host controlled workflow is enabled.

Field	Ref.	Value	Host	An.	Description	Version
1	14	*M*		R	Record Type ID	8, 9, 10, 11
2	14	*Number*		R	Sequence Number	8, 9, 10, 11
3	14	*RR*		R	Record Type Sub ID Fixed value RR, meaning raw result.	8, 9, 10, 11
4	14	*u701*		R	Analyzer Identification Fixed value u701, meaning **cobas u** 701.	8, 9, 10, 11
5	14	*Complex*		R	Universal Test ID ***Test Number^Test Code***	8, 9, 10, 11
6	14	*Complex*		R	Count of Images ***Count of Image 1*** ***^Count of Image 2*** ***^Count of Image 3*** ***^Count of Image 4*** ***^Count of Image 5*** ***^Count of Image 6*** ***^Count of Image 7*** ***^Count of Image 8*** ***^Count of Image 9*** ***^Count of Image 10*** ***^Count of Image 11*** ***^Count of Image 12*** ***^Count of Image 13*** ***^Count of Image 14*** ***^Count of Image 15***	8, 9, 10, 11
7	14	*Number*		R	Sum of Counts	8, 9, 10, 11

8	14	*String*		R	Sample average	8, 9, 10, 11
9	14	*String*		R	/µl concentration	8, 9, 10, 11
10	14	*String*		R	/HPF concentration	8, 9, 10, 11

Result Context Record (u601 normal measurement)

This record is used to send result context information that belongs to the measured u601 sample result.

Result context for a normal sample result:
M|1|RC|u601|00002|20110531|20110530|00001|20110531

Field	Ref.	Value	Host	An.	Description	Version
1	14	*M*		R	Record Type ID	8, 9, 10, 11
2	14	*Number*		R	Sequence Number	8, 9, 10, 11
3	14	*RC*		R	Record Type Sub ID Fixed value RC, meaning result context.	8, 9, 10, 11
4	14	*u601*		R	Analyzer Identification Fixed value u601, meaning **cobas u** 601.	8, 9, 10, 11
5	14	*String*		R	Calibration Strip Lot Number	8, 9, 10, 11
6	14	*Date*		R	Calibration Strip Expiration Date	8, 9, 10, 11
7	14	*Date*		R	Calibration Execution Date	8, 9, 10, 11
8	14	*String*		R	Test Strip Lot Number	8, 9, 10, 11
9	14	*String*		R	Test Strip Expiration Date	8, 9, 10, 11

Result Context Record (u701 normal measurement)

This record is used to send result context information which belongs to the measured u701 sample result.

Result context for a normal sample result:
M|1|RC|u701|00001|20110531|20110530||

Field	Ref.	Value	Host	An.	Description	Version
1	14	*M*		R	Record Type ID	8, 9, 10, 11
2	14	*Number*		R	Sequence Number	8, 9, 10, 11
3	14	*RC*		R	Record Type Sub ID Fixed value RC, meaning result context.	8, 9, 10, 11
4	14	*u701*		R	Analyzer Identification Fixed value u701, meaning **cobas u** 701.	8, 9, 10, 11
5	14	*String*		R	Test Cuvette Lot Number	8, 9, 10, 11
6	14	*Date*		R	Test Cuvette Expiration Date	8, 9, 10, 11
7	14	*Date*		R	Microscope check Execution Date	8, 9, 10, 11
8	14	Not used				8, 9, 10, 11
9	14	Not used				8, 9, 10, 11

Result Context Record (u601 control measurement)

This record is used to send result context information that belongs to the measured u601 QC result.

Result context for a QC result:
M|1|RC|u601|00001|20110531|20110530|00003|20111206|CONTLOW|00002|20110607|20110530|1

Field	Ref.	Value	Host	An.	Description	Version
1	14	*M*		R	Record Type ID	8, 9, 10, 11
2	14	*Number*		R	Sequence Number	8, 9, 10, 11
3	14	*RC*		R	Record Type Sub ID Fixed value RC, meaning result context.	8, 9, 10, 11
4	14	*u601*		R	Analyzer Identification Fixed value u601, meaning **cobas u** 601.	8, 9, 10, 11
5	14	*String*		R	Calibration Strip Lot Number	8, 9, 10, 11
6	14	*Date*		R	Calibration Strip Expiration Date	8, 9, 10, 11
7	14	*Date*		R	Calibration Execution Date	8, 9, 10, 11
8	14	*String*		R	Test Strip Lot Number	8, 9, 10, 11
9	14	*String*		R	Test Strip Expiration Date	8, 9, 10, 11
10	14	*String*		R	Control Name	8, 9, 10, 11
11	14	*String*		R	Control Lot Number	8, 9, 10, 11
12	14	*Date*		R	Control Expiration Date	8, 9, 10, 11
13	14	*Date*		R	Control Execution Date	8, 9, 10, 11
14	14	*Number*		R	Control Level	8, 9, 10, 11

Result Context Record (u701 control measurement)

This record is used to send result context information which belongs to the measured u701 QC result.

Result context for a QC result:
M|1|RC|u701|00003|20111206|20110605|||CONTLOW|00001|20110607|20110530|1

Field	Ref.	Value	Host	An.	Description	Version
1	14	*M*		R	Record Type ID	8, 9, 10, 11
2	14	*Number*		R	Sequence Number	8, 9, 10, 11
3	14	*RC*		R	Record Type Sub ID Fixed value RC, meaning result context.	8, 9, 10, 11
4	14	*String*		R	Analyzer Identification Fixed value u701, meaning **cobas u** 701.	8, 9, 10, 11
5	14	*String*		R	Test Cuvette Lot Number	8, 9, 10, 11
6	14	*Date*		R	Test Cuvette Expiration Date	8, 9, 10, 11
7	14	*Date*		R	Microscope check Execution Date	8, 9, 10, 11
8	14	Not used				8, 9, 10, 11
9	14	Not used				8, 9, 10, 11
10	14	*String*		R	Control Name	8, 9, 10, 11
11	14	*String*		R	Control Lot Number	8, 9, 10, 11
12	14	*Date*		R	Control Expiration Date	8, 9, 10, 11
13	14	*Date*		R	Control Execution Date	8, 9, 10, 11
14	14	*Number*		R	Control Level	8, 9, 10, 11

Image Path Record (u701)

This record is used to send the image path of u701 sediment images to the host.
The image path is divided into record fields to reduce data transmission. The image path must be set together with record field 5, 6 and 7 at the host.

TIP As the backslash is defined in the header record to be a repeat delimiter, be aware that you will have to escape the backslash character in the ASTM transmission.

Image path with both types of images (with and without label):
M|1|IR|u701|X:&R&images&R&cobas_6500_ResultReport_1111_27032015005518|Image_1111_01^Image_1111_02^Image_1111_03^Image_1111_04^Image_1111_05^Image_1111_06^Image_1111_07^Image_1111_08^Image_1111_09^Image_1111_10^Image_1111_11^Image_1111_12^Image_1111_13^Image_1111_14^Image_1111_16|gif^png|

Image path with labels and copy error:
M|1|IR|u701|X:&R&images&R&cobas_6500_ResultReport_1111_27032015005518|Image_1111_01^Image_1111_02^Image_1111_03^Image_1111_04^Image_1111_05^Image_1111_06^Image_1111_07^Image_1111_08^Image_1111_09^Image_1111_10^Image_1111_11^Image_1111_12^Image_1111_13^Image_1111_14^Image_1111_16|^png|E

Field	Ref.	Value	Host	An.	Description	Version
1	14	*M*		R	Record Type ID	9, 10, 11
2	14	*Number*		R	Sequence Number	9, 10, 11
3	14	*IR*		R	Record Type Sub ID Fixed value IR, meaning image path record..	9, 10, 11
4	14	*u701*		R	Analyzer Identification Fixed value u701, meaning **cobas u** 701.	9, 10, 11
5	14	*String*		R	Image path File path were images are exported.	9, 10, 11
6	14	*Complex*		R	Image names ***Name of Image 1*** ***^Name of Image 2*** ***^Name of Image 3*** ***^Name of Image 4*** ***^Name of Image 5*** ***^Name of Image 6*** ***^Name of Image 7*** ***^Name of Image 8*** ***^Name of Image 9*** ***^Name of Image 10*** ***^Name of Image 11*** ***^Name of Image 12*** ***^Name of Image 13*** ***^Name of Image 14*** ***^Name of Image 15***	9, 10, 11
7	14	*Complex*		R	Image extension ***Extension for images without particle labels*** ***^Extension for images with particle labels*** • gif Image without particle labels • png Image with particle labels	9, 10, 11
8	14	*Character*		R	Image error • E If the image copy failed or no connection, not enough space, folder not created.	9, 10, 11

6 Appendices

6.1 Data Alarms

The result data which is transmitted to the host system must be checked for data alarms.

WARNING Data alarms are in order to bring some of the values to the attention of the operator. Therefore it is important that these data alarms are displayed on the host system. If these data alarms are not displayed, this could mislead the operator to wrong conclusions and medical decisions!

u 601	u 701	Description
	!	The result was manually changed.
A	A	Abnormal result.
	Cm	Calibration. The microscope check results were no longer valid when the result was generated.
Cs		Calibration. The photometer calibration results were no longer valid when the result was generated.
Cp		Calibration. The measuring cell calibration results were no longer valid when the result was generated.
	D	Dilution. The result was generated with manually diluted or concentrated sample.
	F1	Defocused image found all particle counts are zero. Review the images and repeat measurement.
	F2	Defocused image found, focus position difference is too big. Review the images and repeat measurement.
	F3	Defocused image found, focus position is out of range. Review the images and repeat measurement.
	F4	Defocused image found, MUC count diversity is too big. Review the images and repeat measurement.
H		High temperature. The upper temperature limit has been exceeded.
K		The color ranges for COL parameter were changed.
L		Lysed erythrocytes were detected for concentrations ≤50 ERY/µL. (The software cannot reliably identify hemolyzed erythrocytes in concentrations >50 ERY/µL.
N		SG cannot be measured because the sample is too turbid. (If you work with auto validation and a LIS, the validated results of the other parameters are sent to the host as usual.)
	M	The result of the image was manually changed.
O	O	Parameter is out of range.
P		u 601 reduced test profile.
Q	Q	Invalid QC. QC failed or QC material has expired.
R		Test strip cassette onboard stability has expired.
S		Sieve result.
T	T	Trace result. Borderline or "soft positive" result.
	Uc	The software could not generate an automatic result for all 15 images and at least one of the images that did not yield a result is **crowded**. You need to validate the result manually.
	Ub	The software could not generate an automatic result for all 15 images and at least one of the images that did not yield a result contains **bubbles**. You need to validate the result manually.
X	X	A cross-check rule has been triggered.
#	#	A Roche Service representative did not cancel a service or troubleshooting function, and it can only be cancelled by a Roche Service representative. All results have this data alarm indication and the validity of these results cannot be guaranteed. (For example, expired materials may have been used). If you find this data alarm indication, contact your Roche Service representative immediately.

Data alarms appear in the following order:

cobas u 601: A, S, T, Q, X, H, R, Cs, Cp, #, O, P, L, N, K
cobas u 701: A, T, Q, X, H, !, Cm, #, M, Uc, Ub, D, F1, F2, F3, F4, O

6.2 Test number and Test code of cobas u 601

These test numbers and test codes belong only to the **cobas u** 601 results and raw results record.

Test number	Test code	Description
1	ERY	Erythrocytes
2	LEU	Leukocytes
3	NIT	Nitrite
4	KET	Ketones
5	GLU	Glucose
6	PRO	Protein
7	UBG	Urobilinogen
8	BIL	Bilirubin
9	COM	Compensation field
10	pH	pH-Value
20	COL	Color
21	CLA	Clarity
22	SG	Specific Gravity

6.3 Test number and Test code of cobas u 701

These test numbers and test codes belong only to the **cobas u** 701 results and raw results record.

Test number	Test code	Description
0	Others	Others
1	RBC	Red Blood Cells
3	WBC	White Blood Cells
5	NEC	Non Squamous Epithelial Cells
6	SEC	Squamous Epithelial Cells
7	YEA	Yeast
8	CRY	Crystals
14	BAC	Bacteria
15	HYA	Casts - Hyaline
19	SPRM	Spermatozoa
21	MUC	Mucus
26	PAT	Casts - Pathological

Subclasses
Sub-classes of u 701 results are sent:
The “Test number” is created by the system.
The “Test code” is defined by the operator.

e.g. Crystals – Calcium oxalate monohydrate:

Test number	Test code	Description
8-0	CRY_X	Rest of main class CRY
8-1	CaOxm	Calcium oxalate monohydrate

6.4 LIS and FortiGate Firewall

The FortiGate-Firewall is mandatory for all installation that are connected to a local network. The firewall needs to be installed between the analyzer and the laboratories network. It is necessary to configure the firewall, that the communication between analyzer and LIS is allowed.
Refer to Service Manual FortiGate 50E in PIM.web

A default rule for **cobas u** 601 / u 701 / 6500 has been defined in the FortiConfig Tool for LIS connection, which is called “**c6500 out**”.
Use this rule when configuring the FortiGate Firewall.

6.5 Communication examples

The examples show the sequence of the communications.

6.5.1 Host protocol version 8

Example 1: Upload Sample Results without raw and sediment data

```
[ENQ]
[ACK]
[STX]1H|\^&|||Instrument·Name^u701^2.2.9^9^SV0500774^|||||||P|LIS2-A2|20100603155801[CR][ETX]FB[CR][LF]
[ACK]
[STX]2P|1[CR][ETX]3F[CR][LF]
[ACK]
[STX]3O|1|0283|500432^1^Service^SAMPLE|C|R||||||N|||20120508125656||||||||||F[CR][ETX]AC[CR][LF]
[ACK]
[STX]4R|1|1^ERY|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]AF[CR][LF]
[ACK]
[STX]5R|2|2^LEU|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]A8[CR][LF]
[ACK]
[STX]6R|3|3^NIT|pos^pos^pos^0.11^0.11||International|||F||Service|||u601[CR][ETX]FC[CR][LF]
[ACK]
[STX]7C|3|I|A|I[CR][ETX]80[CR][LF]
[ACK]
[STX]0R|4|4^KET|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]A5[CR][LF]
[ACK]
[STX]1R|5|5^GLU|neg^norm^norm^^||International|||F||Service|||u601[CR][ETX]B0[CR][LF]
[ACK]
[STX]2R|6|6^PRO|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]B8[CR][LF]
[ACK]
[STX]3R|7|7^UBG|neg^norm^norm^^||International|||F||Service|||u601[CR][ETX]AC[CR][LF]
[ACK]
[STX]4R|8|8^BIL|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]A4[CR][LF]
[ACK]
```

[STX]5R|9|10^pH|7^7^7^7.03^7.03||International|||F||Service|||u601[CR][ETX]BB[CR][LF]
[ACK]
[STX]6C|9|I|A|I[CR][ETX]85[CR][LF]
[ACK]
[STX]7R|10|20^COL|Pale·Yellow^Pale·Yellow^Pale·Yellow^^||International|||F||Service|||u601[CR][ETX]52[CR][LF]
[ACK]
[STX]0R|11|21^CLA|Clear^Clear^Clear^^||International|||F||Service|||u601[CR][ETX]69[CR][LF]
[ACK]
[STX]1R|12|22^SG|1.044^1.044^1.044^1.044^1.044||International|||F||Service|||u601[CR][ETX]64[CR][LF]
[ACK]
[STX]1M|1|RC|u601|123456|20121201|20120507|29188300|20121101[CR][ETX]B6[CR][LF]
[ACK]
[STX]2L|1|N[CR][ETX]05[CR][LF]
[ACK]
[EOT]

Example 2: Upload Sample Results (u601 and u701) with raw data

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas6500^2.2.9^9^SU0500999^SV0500745|||||||P|LIS2-A2|20120508133241[CR][ETX]DC[CR][LF]
[ACK]
[STX]2P|1[CR][ETX]3F[CR][LF]
[ACK]
[STX]3O|1|1111|713450^1^Service^SAMPLE|CM|R||||||N|||20120508132753||||||||||F[CR][ETX]F2[CR][LF]
[ACK]
[STX]4R|1|1^ERY|3+^50·/ul^50·/ul^^||International|||F||Service|||u601[CR][ETX]31[CR][LF]
[ACK]
[STX]5C|1|I|A|I[CR][ETX]7C[CR][LF]
[ACK]
[STX]6R|2|2^LEU|1+^25·/ul^25·/ul^^||International|||F||Service|||u601[CR][ETX]37[CR][LF]
[ACK]
[STX]7C|2|I|S^T|I[CR][ETX]43[CR][LF]
[ACK]
[STX]0R|3|3^NIT|pos^pos^pos^^||International|||F||Service|||u601[CR][ETX]7A[CR][LF]
[ACK]
[STX]1C|3|I|A|I[CR][ETX]7A[CR][LF]
[ACK]
[STX]2R|4|4^KET|4+^150·mg/dl^15·mmol/l^^||International|||F||Service|||u601[CR][ETX]59[CR][LF]
[ACK]
[STX]3C|4|I|A|I[CR][ETX]7D[CR][LF]
[ACK]
[STX]4R|5|5^GLU|2+^100·mg/dl^6·mmol/l^^||International|||F||Service|||u601[CR][ETX]35[CR][LF]
[ACK]
[STX]5C|5|I|A|I[CR][ETX]80[CR][LF]
[ACK]
[STX]6R|6|6^PRO|2+^75·mg/dl^0.75·g/l^^||International|||F||Service|||u601[CR][ETX]1E[CR][LF]
[ACK]
[STX]7C|6|I|A|I[CR][ETX]83[CR][LF]
[ACK]
[STX]0R|7|7^UBG|4+^12·mg/dl^203·umol/l^^||International|||F||Service|||u601[CR][ETX]08[CR][LF]
[ACK]
[STX]1C|7|I|A|I[CR][ETX]7E[CR][LF]
[ACK]
[STX]2R|8|8^BIL|3+^6·mg/dl^100·umol/l^^||International|||F||Service|||u601[CR][ETX]D5[CR][LF]

[ACK]
[STX]3C|8|I|A|I[CR][ETX]81[CR][LF]
[ACK]
[STX]4R|9|10^pH|9^9^9^30.31^30.31||International|||F||Service|||u601[CR][ETX]1A[CR][LF]
[ACK]
[STX]5C|9|I|A|I[CR][ETX]84[CR][LF]
[ACK]
[STX]6R|10|20^COL|Pale·Yellow^Pale·Yellow^Pale·Yellow^^||International|||F||Service|||u601[CR][ETX]51[CR][LF]
[ACK]
[STX]7R|11|21^CLA|Clear^Clear^Clear^^||International|||F||Service|||u601[CR][ETX]70[CR][LF]
[ACK]
[STX]0R|12|22^SG|1.000^1.000^1.000^^||International|||F||Service|||u601[CR][ETX]3B[CR][LF]
[ACK]
[STX]1M|1|RR|u601|1^ERY|REM_ERY_560|72.3800|72.3800[CR][ETX]83[CR][LF]
[ACK]
[STX]2M|2|RR|u601|1^ERY|REM_ERY_615|65.9000|65.9000[CR][ETX]86[CR][LF]
[ACK]
[STX]3M|3|RR|u601|2^LEU|REM_LEU_560|67.5700|67.5700[CR][ETX]7E[CR][LF]
[ACK]
[STX]4M|4|RR|u601|3^NIT|REM_NIT_560|66.8000|66.8000[CR][ETX]81[CR][LF]
[ACK]
[STX]5M|5|RR|u601|4^KET|REM_KET_560|60.0300|60.0300[CR][ETX]2D[CR][LF]
[ACK]
[STX]6M|6|RR|u601|5^GLU|REM_GLU_560|75.0200|75.0200[CR][ETX]43[CR][LF]
[ACK]
[STX]7M|7|RR|u601|6^PRO|REM_PRO_615|69.2300|69.2300[CR][ETX]61[CR][LF]
[ACK]
[STX]0M|8|RR|u601|7^UBG|REM_UBG_560|71.0800|71.0800[CR][ETX]C7[CR][LF]
[ACK]
[STX]1M|9|RR|u601|8^BIL|REM_BIL_560|72.1600|72.1600[CR][ETX]BE[CR][LF]
[ACK]
[STX]2M|10|RR|u601|10^pH|REM_PH_560|73.1800|73.1800[CR][ETX]46[CR][LF]
[ACK]
[STX]3M|11|RR|u601|10^pH|REM_PH_615|30.3100|30.3100[CR][ETX]3D[CR][LF]
[ACK]
[STX]4M|12|RR|u601|9^COM|REM_COM_465|75.7700|[CR][ETX]64[CR][LF]
[ACK]
[STX]5M|13|RR|u601|9^COM|REM_COM_525|74.3600|[CR][ETX]5D[CR][LF]
[ACK]
[STX]6M|14|RR|u601|9^COM|REM_COM_560|69.2900|[CR][ETX]64[CR][LF]
[ACK]
[STX]7M|15|RR|u601|9^COM|REM_COM_615|72.0400|[CR][ETX]5A[CR][LF]
[ACK]
[STX]0M|16|RR|u601|21^CLA||0.0138|[CR][ETX]5E[CR][LF]
[ACK]
[STX]1M|17|RR|u601|22^SG||1.0001|[CR][ETX]5E[CR][LF]
[ACK]
[STX]2M|1|RC|u601|123456|20121201|20120507|0|00010101[CR][ETX]41[CR][LF]
[ACK]
[STX]3O|1|1111|713450^1^Service^SAMPLE|CM|R||||||N|||20120508132950||||||||||F[CR][ETX]F2[CR][LF]
[ACK]
[STX]4R|1|19^SPRM|neg^neg^neg^0.0·/HPF^0.0·/ul||International|||F||Service|||u701[CR][ETX]A5[CR][LF]
[ACK]
[STX]5R|2|1^RBC|neg^neg^neg^0.2·/HPF^0.9·/ul||International|||F||Service|||u701[CR][ETX]0E[CR][LF]
[ACK]

[STX]6R|3|3^WBC|neg^neg^neg^1.6·/HPF^7.0·/ul||International|||F||Service|||u701[CR][ETX]1A[CR][LF]
[ACK]
[STX]7R|4|5^NEC|neg^neg^neg^1.1·/HPF^4.8·/ul||International|||F||Service|||u701[CR][ETX]18[CR][LF]
[ACK]
[STX]0R|5|6^SEC|1+^3·/HPF^15·/ul^10.0·/HPF^44.0·/ul||International|||F||Service|||u701[CR][ETX]8F[CR][LF]
[ACK]
[STX]1C|5|I|S^T|I[CR][ETX]45[CR][LF]
[ACK]
[STX]2R|6|7^YEA|neg^neg^neg^0.0·/HPF^0.0·/ul||International|||F||Service|||u701[CR][ETX]1A[CR][LF]
[ACK]
[STX]3R|7|8^CRY|neg^neg^neg^0.0·/HPF^0.0·/ul||International|||F||Service|||u701[CR][ETX]31[CR][LF]
[ACK]
[STX]4R|9|15^HYA|neg^neg^neg^0.0·/HPF^0.0·/ul||International|||F||Service|||u701[CR][ETX]48[CR][LF]
[ACK]
[STX]5R|10|21^MUC|neg^neg^neg^17.8·/HPF^78.3·/ul||International|||F||Service|||u701[CR][ETX]CC[CR][LF]
[ACK]
[STX]6R|11|26^PAT|neg^neg^neg^0.1·/HPF^0.4·/ul||International|||F||Service|||u701[CR][ETX]7D[CR][LF]
[ACK]
[STX]7R|12|14^BAC|1+^20·/HPF^100·/ul^46.6·/HPF^205.0·/ul||International|||F||Service|||u701[CR][ETX]6D[CR][LF
]
[ACK]
[STX]0C|13|I|S^T|I[CR][ETX]71[CR][LF]
[ACK]
[STX]1M|1|RR|u701|1^RBC|0^0^0^0^0^0^0^0^0^0^1^1^0^0|2|0.13|0.88|0.20[CR][ETX]AF[CR][LF]
[ACK]
[STX]2M|2|RR|u701|3^WBC|0^3^0^1^2^1^0^0^0^1^2^3^3^0^0|16|1.07|7.04|1.60[CR][ETX]FF[CR][LF]
[ACK]
[STX]3M|3|RR|u701|5^NEC|1^1^1^0^0^1^0^1^1^0^0^2^2^1^0|11|0.73|4.84|1.10[CR][ETX]ED[CR][LF]
[ACK]
[STX]4M|4|RR|u701|6^SEC|2^6^2^8^11^7^9^6^9^8^11^4^4^4^9|100|6.67|44.00|10.00[CR][ETX]2B[CR][LF]
[ACK]
[STX]5M|5|RR|u701|7^YEA|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]A3[CR][LF]
[ACK]
[STX]6M|6|RR|u701|8^CRY|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]D8[CR][LF]
[ACK]
[STX]7M|7|RR|u701|8-1^Ca-Oxm|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]A8[CR][LF]
[ACK]
[STX]0M|7|RR|u701|14^BAC|33^32^33^31^35^32^22^32^27^31^35^37^37^27^22|466|31.07|205.04|46.60[CR][ETX]43[CR][L
F]
[ACK]
[STX]1M|8|RR|u701|15^HYA|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]DB[CR][LF]
[ACK]
[STX]2M|9|RR|u701|19^SPRM|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]41[CR][LF]
[ACK]
[STX]3M|10|RR|u701|21^MUC|10^4^10^10^12^11^17^7^9^10^12^14^14^21^17|178|11.87|78.32|17.80[CR][ETX]B8[CR][LF]
[ACK]
[STX]4M|11|RR|u701|26^PAT|0^0^0^0^0^1^0^0^0^0^0^0^0^0|1|0.07|0.44|0.10[CR][ETX]17[CR][LF]
[ACK]
[STX]5M|1|RC|u701|-1|20120508|20120105|-|20120505[CR][ETX]78[CR][LF]
[ACK]
[STX]6L|1|N[CR][ETX]05[CR][LF]
[ACK]
[EOT]

Example 3: Results during multiple measurements

When multiple measurements are switched on, the instrument measure all samples with the same multiple counts. In this case every sample has more results with one order. When one of the measurements is finished the result will be sent with the same order and the same barcode.
In the following example, the multiple measurement count is 3.

First measurement is finished.

```
[ENQ]
[ACK]
[STX]1H|\^&|||AN_01^u601^2.2.9^9^SU0500997^|||||||P|LIS2-A2|20120508130227[CR][ETX]F5[CR][LF]
[ACK]
[STX]2P|1[CR][ETX]3F[CR][LF]
[ACK]
[STX]3O|1|0241|500432^2^Service^SAMPLE|C|R||||||N|||20120508130100||||||||||F[CR][ETX]93[CR][LF]
[ACK]
[STX]4R|1|1^ERY|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]AF[CR][LF]
[ACK]

[STX]0M|1|RC|u601|123456|20121201|20120507|29188300|20121101[CR][ETX]B5[CR][LF]
[ACK]
[STX]1L|1|N[CR][ETX]04[CR][LF]
[ACK]
[EOT]
```

Second measurement is finished.

```
[ENQ]
[ACK]
[STX]1H|\^&|||AN_01^u601^2.2.9^9^SU0500997^|||||||P|LIS2-A2|20120508130248[CR][ETX]F8[CR][LF]
[ACK]
[STX]2P|1[CR][ETX]3F[CR][LF]
[ACK]
[STX]3O|1|0241|500432^2^Service^SAMPLE|C|R||||||N|||20120508130133||||||||||F[CR][ETX]99[CR][LF]
[ACK]
[STX]4R|1|1^ERY|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]AF[CR][LF]
[ACK]

 [STX]0M|1|RC|u601|123456|20121201|20120507|29188300|20121101[CR][ETX]B5[CR][LF]
[ACK]
[STX]1L|1|N[CR][ETX]04[CR][LF]
[ACK]
[EOT]
```

Third measurement is finished.

```
[ENQ]
[ACK]
[STX]1H|\^&|||AN_01^u601^2.2.9^9^SU0500997^|||||||P|LIS2-A2|20120508130309[CR][ETX]F6[CR][LF]
[ACK]
[STX]2P|1[CR][ETX]3F[CR][LF]
[ACK]
[STX]3O|1|0241|500432^2^Service^SAMPLE|C|R||||||N|||20120508130154||||||||||F[CR][ETX]9C[CR][LF]
[ACK]
[STX]4R|1|1^ERY|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]AF[CR][LF]
[ACK]
```

[STX]0M|1|RC|u601|123456|20121201|20120507|29188300|20121101[CR][ETX]B5[CR][LF]
[ACK]
[STX]1L|1|N[CR][ETX]04[CR][LF]
[ACK]
[EOT]

Example 4: Upload QC results with raw data

[ENQ]
[ACK]
[STX]1H|\^&|||AN_01^u601^2.2.9^9^SU0500997^|||||||P|LIS2-A2A2|20120508131705[CR][ETX]F7[CR][LF]
[ACK]
[STX]2P|1[CR][ETX]3F[CR][LF]
[ACK]
[STX]3O|1|004215/8/2012|500425^1^Service^CONTROL|C|R||||||Q|||20120508131539||||||||||F[CR][ETX]C7[CR][LF]
[ACK]
[STX]4R|1|1^ERY|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]AF[CR][LF]
[ACK]
[STX]5R|2|2^LEU|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]A8[CR][LF]
[ACK]
[STX]6R|3|3^NIT|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]B6[CR][LF]
[ACK]
[STX]7R|4|4^KET|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]AC[CR][LF]
[ACK]
[STX]0R|5|5^GLU|neg^norm^norm^^||International|||F||Service|||u601[CR][ETX]AF[CR][LF]
[ACK]
[STX]1R|6|6^PRO|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]B7[CR][LF]
[ACK]
[STX]2R|7|7^UBG|neg^norm^norm^^||International|||F||Service|||u601[CR][ETX]AB[CR][LF]
[ACK]
[STX]3R|8|8^BIL|neg^neg^neg^^||International|||F||Service|||u601[CR][ETX]A3[CR][LF]
[ACK]
[STX]4R|9|10^pH|7^7^7^^||International|||F||Service|||u601[CR][ETX]BE[CR][LF]
[ACK]
[STX]5C|9|I|A|I[CR][ETX]84[CR][LF]
[ACK]
[STX]6R|10|20^COL|Pale·Yellow^Pale·Yellow^Pale·Yellow^^||International|||F||Service|||u601[CR][ETX]51[CR][LF]
[ACK]
[STX]7R|11|21^CLA|Clear^Clear^Clear^^||International|||F||Service|||u601[CR][ETX]70[CR][LF]
[ACK]
[STX]0R|12|22^SG|1.045^1.045^1.045^^||International|||F||Service|||u601[CR][ETX]68[CR][LF]
[ACK]
[STX]1M|1|RR|u601|1^ERY|REM_ERY_560|72.6300|72.6300[CR][ETX]3D[CR][LF]
[ACK]
[STX]2M|2|RR|u601|1^ERY|REM_ERY_615|66.2800|66.2800[CR][ETX]44[CR][LF]
[ACK]
[STX]3M|3|RR|u601|2^LEU|REM_LEU_560|71.3600|71.3600[CR][ETX]2D[CR][LF]
[ACK]
[STX]4M|4|RR|u601|3^NIT|REM_NIT_560|62.1200|62.1200[CR][ETX]37[CR][LF]
[ACK]
[STX]5M|5|RR|u601|4^KET|REM_KET_560|62.7500|62.7500[CR][ETX]32[CR][LF]
[ACK]
[STX]6M|6|RR|u601|5^GLU|REM_GLU_560|74.8900|74.8900[CR][ETX]45[CR][LF]
[ACK]

[STX]7M|7|RR|u601|6^PRO|REM_PRO_615|70.2000|70.2000[CR][ETX]47[CR][LF]
[ACK]
[STX]0M|8|RR|u601|7^UBG|REM_UBG_560|70.9200|70.9200[CR][ETX]25[CR][LF]
[ACK]
[STX]1M|9|RR|u601|8^BIL|REM_BIL_560|72.2400|72.2400[CR][ETX]17[CR][LF]
[ACK]
[STX]2M|10|RR|u601|10^pH|REM_PH_560|28.7700|28.7700[CR][ETX]20[CR][LF]
[ACK]
[STX]3M|11|RR|u601|10^pH|REM_PH_615|34.4600|34.4600[CR][ETX]1C[CR][LF]
[ACK]
[STX]4M|12|RR|u601|9^COM|REM_COM_465|78.0500|[CR][ETX]5E[CR][LF]
[ACK]
[STX]5M|13|RR|u601|9^COM|REM_COM_525|76.1700|[CR][ETX]5E[CR][LF]
[ACK]
[STX]6M|14|RR|u601|9^COM|REM_COM_560|72.6800|[CR][ETX]61[CR][LF]
[ACK]
[STX]7M|15|RR|u601|9^COM|REM_COM_615|74.5100|[CR][ETX]5E[CR][LF]
[ACK]
[STX]0M|16|RR|u601|21^CLA||0.0137786177|[CR][ETX]5E[CR][LF]
[ACK]
[STX]1M|17|RR|u601|22^SG||1.04468279631784|[CR][ETX]5E[CR][LF]
[ACK]
[STX]2M|1|RC|u601|123456|20121201|20120507|29188300|20121101|Low_lot|11111|20120531|20120508|1[CR][ETX]47[CR]
[LF]
[ACK]
[STX]3L|1|N[CR][ETX]04[CR][LF]
[ACK]
[EOT]

Example 5: Download (Work list request)

The instrument is always the Master, which means the worklist is requested by the analyzer.

[ENQ]
[ACK]
[STX]1H|\^&|||AN_01^u601^2.2.9^9^SU0500997^|||||||P|LIS2-A2|20120508132059[CR][ETX]FA[CR][LF]
[ACK]
[STX]2Q|1|^0203^500432^3[CR][ETX]FC[CR][LF]
[ACK]
[STX]3L|1|N[CR][ETX]06[CR][LF]
[ACK]
[EOT]

After sending the request, the instrument is waiting for the answer from the Host:

[ENQ]
[ACK]
[STX]1H|\^&||||Host-01|||||||P|LIS2-A2|20120202143800[CR][ETX]20[CR][LF]
[ACK]
[STX]2O|1|0203|500432^3^Service^SAMPLE|CM|R||||||N|||20120508115956||||||||||Q[CR][ETX]B2[CR][LF]
[ACK]
[STX]3L|1|N[CR][ETX]06[CR][LF]
[ACK]
[EOT]

Where 0203 is the sample barcode (ID).

6.5.2 Host protocol version 9 or higher

Example 1: 601 result, without raw data transmission and N-flag

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas601^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|||||||P|LIS2-A2|20150616093200[CR][ETX]11[CR][LF]
[ACK]
[STX]2O|1|136|713450^5^Service^SAMPLE|CM|R||||||N|||20150327004636||||||||||F[CR][ETX]CB[CR][LF]
[ACK]
[STX]3R|1|1^ERY|neg||International|||F||Service||20150327004636|u601[CR][ETX]0D[CR][LF]
[ACK]
[STX]4R|2|2^LEU|25|/uL|International|||F||Service||20150327004636|u601[CR][ETX]23[CR][LF]
[ACK]
[STX]5C|2|I|A|I[CR][ETX]7D[CR][LF]
[ACK]
[STX]6R|3|3^NIT|neg||International|||F||Service||20150327004636|u601[CR][ETX]0F[CR][LF]
[ACK]
[STX]7R|4|4^KET|neg||International|||F||Service||20150327004636|u601[CR][ETX]0B[CR][LF]
[ACK]
[STX]0R|5|5^GLU|norm||International|||F||Service||20150327004636|u601[CR][ETX]8C[CR][LF]
[ACK]
[STX]1R|6|6^PRO|neg||International|||F||Service||20150327004636|u601[CR][ETX]16[CR][LF]
[ACK]
[STX]2R|7|7^UBG|norm||International|||F||Service||20150327004636|u601[CR][ETX]88[CR][LF]
[ACK]
[STX]3R|8|8^BIL|neg||International|||F||Service||20150327004636|u601[CR][ETX]02[CR][LF]
[ACK]
[STX]4R|9|10^pH|7||International|||F||Service||20150327004636|u601[CR][ETX]0B[CR][LF]
[ACK]
[STX]5R|10|20^COL|Pale·yellow||International|||F||Service||20150327004636|u601[CR][ETX]62[CR][LF]
[ACK]
[STX]6C|10|I|K|I[CR][ETX]B7[CR][LF]
[ACK]
[STX]7R|11|21^CLA|Turbid||International|||F||Service||20150327004636|u601[CR][ETX]84[CR][LF]
[ACK]
[STX]0C|11|I|A|I[CR][ETX]A8[CR][LF]
[ACK]
[STX]1R|12|22^SG|1.008||International|||F||Service||20150327004636|u601[CR][ETX]D7[CR][LF]
[ACK]
[STX]2M|1|RC|u601|7777|20151201|20130320|29188300|20121130[CR][ETX]5D[CR][LF]
[ACK]
[STX]3L|1|N[CR][ETX]06[CR][LF]
[ACK]

Example 2: 601 result with N-flag, without raw data transmission

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas601^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616093236[CR][ETX]1A[CR][LF]
[ACK]
[STX]2O|1|125|301237^1^Service^SAMPLE|C|R||||||N|||20150326235755||||||||||F[CR][ETX]7B[CR][LF]
[ACK]
[STX]3R|1|1^ERY|neg||International|||F||Service||20150326235755|u601[CR][ETX]14[CR][LF]
[ACK]
[STX]4R|2|2^LEU|25|/uL|International|||F||Service||20150326235755|u601[CR][ETX]2A[CR][LF]
[ACK]
[STX]5C|2|I|A|I[CR][ETX]7D[CR][LF]
[ACK]
[STX]6R|3|3^NIT|neg||International|||F||Service||20150326235755|u601[CR][ETX]16[CR][LF]
[ACK]
[STX]7R|4|4^KET|neg||International|||F||Service||20150326235755|u601[CR][ETX]12[CR][LF]
[ACK]
[STX]0R|5|5^GLU|norm||International|||F||Service||20150326235755|u601[CR][ETX]93[CR][LF]
[ACK]
[STX]1R|6|6^PRO|0.25|g/L|International|||F||Service||20150326235755|u601[CR][ETX]8A[CR][LF]
[ACK]
[STX]2C|6|I|A|I[CR][ETX]7E[CR][LF]
[ACK]
[STX]3R|7|7^UBG|norm||International|||F||Service||20150326235755|u601[CR][ETX]90[CR][LF]
[ACK]
[STX]4R|8|8^BIL|neg||International|||F||Service||20150326235755|u601[CR][ETX]0A[CR][LF]
[ACK]
[STX]5R|9|10^pH|6.5||International|||F||Service||20150326235755|u601[CR][ETX]75[CR][LF]
[ACK]
[STX]6R|10|20^COL|Pale·yellow||International|||F||Service||20150326235755|u601[CR][ETX]6A[CR][LF]
[ACK]
[STX]7C|10|I|K|I[CR][ETX]B8[CR][LF]
[ACK]
[STX]0R|11|21^CLA|Turbid||International|||F||Service||20150326235755|u601[CR][ETX]84[CR][LF]
[ACK]
[STX]1C|11|I|A|I[CR][ETX]A9[CR][LF]
[ACK]
[STX]2R|12|22^SG|-||International|||F||Service||20150326235755|u601[CR][ETX]15[CR][LF]
[ACK]
[STX]3C|12|I|N|I[CR][ETX]B9[CR][LF]
[ACK]
[STX]4M|1|RC|u601|7777|20151201|20130320|29188300|20121130[CR][ETX]5F[CR][LF]
[ACK]
[STX]5L|1|N[CR][ETX]08[CR][LF]
[ACK]
[EOT]

Example 3: 601 result with N-flag, with raw data transmission

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas601^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616093227[CR][ETX]1A[CR][LF]
[ACK]
[STX]2O|1|125|301237^1^Service^SAMPLE|C|R||||||N|||20150326235755||||||||||F[CR][ETX]7B[CR][LF]
[ACK]
[STX]3R|1|1^ERY|neg||International|||F||Service||20150326235755|u601[CR][ETX]14[CR][LF]
[ACK]
[STX]4R|2|2^LEU|25|/uL|International|||F||Service||20150326235755|u601[CR][ETX]2A[CR][LF]
[ACK]
[STX]5C|2|I|A|I[CR][ETX]7D[CR][LF]
[ACK]
[STX]6R|3|3^NIT|neg||International|||F||Service||20150326235755|u601[CR][ETX]16[CR][LF]
[ACK]
[STX]7R|4|4^KET|neg||International|||F||Service||20150326235755|u601[CR][ETX]12[CR][LF]
[ACK]
[STX]0R|5|5^GLU|norm||International|||F||Service||20150326235755|u601[CR][ETX]93[CR][LF]
[ACK]
[STX]1R|6|6^PRO|0.25|g/L|International|||F||Service||20150326235755|u601[CR][ETX]8A[CR][LF]
[ACK]
[STX]2C|6|I|A|I[CR][ETX]7E[CR][LF]
[ACK]
[STX]3R|7|7^UBG|norm||International|||F||Service||20150326235755|u601[CR][ETX]90[CR][LF]
[ACK]
[STX]4R|8|8^BIL|neg||International|||F||Service||20150326235755|u601[CR][ETX]0A[CR][LF]
[ACK]
[STX]5R|9|10^pH|6.5||International|||F||Service||20150326235755|u601[CR][ETX]75[CR][LF]
[ACK]
[STX]6R|10|20^COL|Pale·yellow||International|||F||Service||20150326235755|u601[CR][ETX]6A[CR][LF]
[ACK]
[STX]7C|10|I|K|I[CR][ETX]B8[CR][LF]
[ACK]
[STX]0R|11|21^CLA|Turbid||International|||F||Service||20150326235755|u601[CR][ETX]84[CR][LF]
[ACK]
[STX]1C|11|I|A|I[CR][ETX]A9[CR][LF]
[ACK]
[STX]2R|12|22^SG|-||International|||F||Service||20150326235755|u601[CR][ETX]15[CR][LF]
[ACK]
[STX]3C|12|I|N|I[CR][ETX]B9[CR][LF]
[ACK]
[STX]4M|1|RR|u601|1^ERY|REM_ERY_615|73.5096|73.5096[CR][ETX]5B[CR][LF]
[ACK]
[STX]5M|2|RR|u601|1^ERY|REM_ERY_560|67.4021|67.4021[CR][ETX]48[CR][LF]
[ACK]
[STX]6M|3|RR|u601|2^LEU|REM_LEU_560|57.1691|57.1691[CR][ETX]49[CR][LF]
[ACK]
[STX]7M|4|RR|u601|3^NIT|REM_NIT_560|65.4398|65.4398[CR][ETX]62[CR][LF]
[ACK]
[STX]0M|5|RR|u601|4^KET|REM_KET_560|56.0789|56.0789[CR][ETX]4F[CR][LF]
[ACK]
[STX]1M|6|RR|u601|5^GLU|REM_GLU_560|73.3669|73.3669[CR][ETX]58[CR][LF]
[ACK]
[STX]2M|7|RR|u601|6^PRO|REM_PRO_615|56.4587|56.4587[CR][ETX]70[CR][LF]
[ACK]

[STX]3M|8|RR|u601|7^UBG|REM_UBG_560|71.1567|71.1567[CR][ETX]3C[CR][LF]
[ACK]
[STX]4M|9|RR|u601|8^BIL|REM_BIL_560|72.2110|72.2110[CR][ETX]15[CR][LF]
[ACK]
[STX]5M|10|RR|u601|10^pH|REM_PH_615|48.9487|48.9487[CR][ETX]40[CR][LF]
[ACK]
[STX]6M|11|RR|u601|10^pH|REM_PH_560|43.3479|43.3479[CR][ETX]2D[CR][LF]
[ACK]
[STX]7M|12|RR|u601|9^COM|REM_COM_465|74.7436|[CR][ETX]0E[CR][LF]
[ACK]
[STX]0M|13|RR|u601|9^COM|REM_COM_525|73.0516|[CR][ETX]FC[CR][LF]
[ACK]
[STX]1M|14|RR|u601|9^COM|REM_COM_560|68.7292|68.7292[CR][ETX]79[CR][LF]
[ACK]
[STX]2M|15|RR|u601|9^COM|REM_COM_615|71.1831|[CR][ETX]FF[CR][LF]
[ACK]
[STX]3M|16|RR|u601|21^CLA||0.6027|[CR][ETX]C9[CR][LF]
[ACK]
[STX]4M|17|RR|u601|22^SG||-|[CR][ETX]96[CR][LF]
[ACK]
[STX]5M|1|RC|u601|7777|20151201|20130320|29188300|20121130[CR][ETX]60[CR][LF]
[ACK]
[STX]6L|1|N[CR][ETX]09[CR][LF]
[ACK]
[EOT]

Example 4: 701 result without raw data transmission

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas6500^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616084057[CR][ETX]1B[CR][LF]
[ACK]
[STX]2O|1|136|713450^5^Service^SAMPLE|CM|R||||||N|||20150327005518||||||||||F[CR][ETX]CB[CR][LF]
[ACK]
[STX]3R|1|1^RBC|<5.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]AA[CR][LF]
[ACK]
[STX]4R|2|3^WBC|11.22|/uL|International|||F||Service||20150327005518|u701[CR][ETX]A8[CR][LF]
[ACK]
[STX]5C|2|I|A|I[CR][ETX]7D[CR][LF]
[ACK]
[STX]6R|3|5^NEC|5|/uL|International|||F||Service||20150327005518|u701[CR][ETX]E8[CR][LF]
[ACK]
[STX]7C|3|I|A|I[CR][ETX]80[CR][LF]
[ACK]
[STX]0R|4|6^SEC|40|/uL|International|||F||Service||20150327005518|u701[CR][ETX]18[CR][LF]
[ACK]
[STX]1C|4|I|A|I[CR][ETX]7B[CR][LF]
[ACK]
[STX]2R|5|7^YEA|neg||International|||F||Service||20150327005518|u701[CR][ETX]06[CR][LF]
[ACK]
[STX]3R|6|8^CRY|neg||International|||F||Service||20150327005518|u701[CR][ETX]18[CR][LF]
[ACK]
[STX]4R|7|14^BAC|150|/uL|International|||F||Service||20150327005518|u701[CR][ETX]6B[CR][LF]
[ACK]
[STX]5C|7|I|A|I[CR][ETX]82[CR][LF]
[ACK]

[STX]6R|8|15^HYA|neg||International|||F||Service||20150327005518|u701[CR][ETX]3F[CR][LF]
[ACK]
[STX]7R|9|19^SPRM|neg||International|||F||Service||20150327005518|u701[CR][ETX]A5[CR][LF]
[ACK]
[STX]0R|10|21^MUC|neg||International|||F||Service||20150327005518|u701[CR][ETX]62[CR][LF]
[ACK]
[STX]1R|11|26^PAT|pos||International|||F||Service||20150327005518|u701[CR][ETX]81[CR][LF]
[ACK]
[STX]2C|11|I|A|I[CR][ETX]AA[CR][LF]
[ACK]
[STX]3R|12|0^Others|neg||International|||F||Service||20150327005518|u701[CR][ETX]C4[CR][LF]
[ACK]
[STX]4M|1|RC|u701|1234|20141231|20121211|-1|20150327[CR][ETX]18[CR][LF]
[ACK]
[STX]5M|1|IR|u701|f:&R&cobas_6500_ResultReport_136_27032015005518|Image_136_01^Image_136_02^Image_136_03^Image_136_04^Image_136_06^Image_136_07^Image_136_08^Image_136_09^Image_136_10^Image_136_11^Image_136_12^Image_136_13^Image_136_14^Image_136_15^Image_136_16|^png||[CR][ETX]D8[CR][LF]
[ACK]
[STX]6L|1|N[CR][ETX]09[CR][LF]
[ACK]
[EOT]

Example 5: Edited 701 result without raw data transmission

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas6500^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616084528[CR][ETX]1E[CR][LF]
[ACK]
[STX]2O|1|136|713450^5^Service^SAMPLE|CM|R||||||N|||20150327005518||||||||||F[CR][ETX]CB[CR][LF]
[ACK]
[STX]3R|1|1^RBC|<5.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]AA[CR][LF]
[ACK]
[STX]4C|1|I|M|I[CR][ETX]87[CR][LF]
[ACK]
[STX]5R|2|3^WBC|112.20|/uL|International|||F||Service||20150327005518|u701[CR][ETX]D9[CR][LF]
[ACK]
[STX]6C|2|I|A^!|I[CR][ETX]FD[CR][LF]
[ACK]
[STX]7R|3|5^NEC|5|/uL|International|||F||Service||20150327005518|u701[CR][ETX]E9[CR][LF]
[ACK]
[STX]0C|3|I|A|I[CR][ETX]79[CR][LF]
[ACK]
[STX]1R|4|6^SEC|40|/uL|International|||F||Service||20150327005518|u701[CR][ETX]19[CR][LF]
[ACK]
[STX]2C|4|I|A|I[CR][ETX]7C[CR][LF]
[ACK]
[STX]3R|5|7^YEA|neg||International|||F||Service||20150327005518|u701[CR][ETX]07[CR][LF]
[ACK]
[STX]4R|6|8^CRY|neg||International|||F||Service||20150327005518|u701[CR][ETX]19[CR][LF]
[ACK]
[STX]5R|7|14^BAC|150|/uL|International|||F||Service||20150327005518|u701[CR][ETX]6C[CR][LF]
[ACK]
[STX]6C|7|I|A|I[CR][ETX]83[CR][LF]
[ACK]
[STX]7R|8|15^HYA|neg||International|||F||Service||20150327005518|u701[CR][ETX]40[CR][LF]
[ACK]

[STX]0R|9|19^SPRM|neg||International|||F||Service||20150327005518|u701[CR][ETX]9E[CR][LF]
[ACK]
[STX]1R|10|21^MUC|neg||International|||F||Service||20150327005518|u701[CR][ETX]63[CR][LF]
[ACK]
[STX]2R|11|26^PAT|pos||International|||F||Service||20150327005518|u701[CR][ETX]82[CR][LF]
[ACK]
[STX]3C|11|I|A|I[CR][ETX]AB[CR][LF]
[ACK]
[STX]4R|12|0^Others|neg||International|||F||Service||20150327005518|u701[CR][ETX]C5[CR][LF]
[ACK]
[STX]5M|1|RC|u701|1234|20141231|20121211|-1|20150327[CR][ETX]19[CR][LF]
[ACK]
[STX]6M|1|IR|u701|f:&R&cobas_6500_ResultReport_136_27032015005518|Image_136_01^Image_136_02^Image_136_03^Image_136_04^Image_136_06^Image_136_07^Image_136_08^Image_136_09^Image_136_10^Image_136_11^Image_136_12^Image_136_13^Image_136_14^Image_136_15^Image_136_16|^png||[CR][ETX]D9[CR][LF]
[ACK]
[STX]7L|1|N[CR][ETX]0A[CR][LF]
[ACK]
[EOT]

Example 6: Edited 701 result with subclasses and raw data transmission

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas6500^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616093024[CR][ETX]15[CR][LF]
[ACK]
[STX]2O|1|136|713450^5^Service^SAMPLE|CM|R||||||N|||20150327005518||||||||||F[CR][ETX]CB[CR][LF]
[ACK]
[STX]3R|1|1^RBC|<5.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]AA[CR][LF]
[ACK]
[STX]4C|1|I|M|I[CR][ETX]87[CR][LF]
[ACK]
[STX]5R|2|1-0^RBC_X|<5.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]C1[CR][LF]
[ACK]
[STX]6C|2|I|M|I[CR][ETX]8A[CR][LF]
[ACK]
[STX]7R|3|1-2^RBC1|0.88|/uL|International|||F||Service||20150327005518|u701[CR][ETX]0F[CR][LF]
[ACK]
[STX]0R|4|1-3^RBC2|0.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]FB[CR][LF]
[ACK]
[STX]1R|5|3^WBC|112.20|/uL|International|||F||Service||20150327005518|u701[CR][ETX]D8[CR][LF]
[ACK]
[STX]2C|5|I|A^!|I[CR][ETX]FC[CR][LF]
[ACK]
[STX]3R|6|5^NEC|5|/uL|International|||F||Service||20150327005518|u701[CR][ETX]E8[CR][LF]
[ACK]
[STX]4C|6|I|A|I[CR][ETX]80[CR][LF]
[ACK]
[STX]5R|7|6^SEC|40|/uL|International|||F||Service||20150327005518|u701[CR][ETX]20[CR][LF]
[ACK]
[STX]6C|7|I|A|I[CR][ETX]83[CR][LF]
[ACK]
[STX]7R|8|7^YEA|neg||International|||F||Service||20150327005518|u701[CR][ETX]0E[CR][LF]
[ACK]
[STX]0R|9|8^CRY|neg||International|||F||Service||20150327005518|u701[CR][ETX]18[CR][LF]
[ACK]

[STX]1R|10|14^BAC|150|/uL|International|||F||Service||20150327005518|u701[CR][ETX]92[CR][LF]
[ACK]
[STX]2C|10|I|A|I[CR][ETX]A9[CR][LF]
[ACK]
[STX]3R|11|15^HYA|neg||International|||F||Service||20150327005518|u701[CR][ETX]66[CR][LF]
[ACK]
[STX]4R|12|19^SPRM|neg||International|||F||Service||20150327005518|u701[CR][ETX]CC[CR][LF]
[ACK]
[STX]5R|13|21^MUC|neg||International|||F||Service||20150327005518|u701[CR][ETX]6A[CR][LF]
[ACK]
[STX]6R|14|26^PAT|pos||International|||F||Service||20150327005518|u701[CR][ETX]89[CR][LF]
[ACK]
[STX]7C|14|I|A|I[CR][ETX]B2[CR][LF]
[ACK]
[STX]0R|15|0^Others|neg||International|||F||Service||20150327005518|u701[CR][ETX]C4[CR][LF]
[ACK]
[STX]1M|1|RR|u701|1^RBC|1^0^0^0^0^0^0^0^0^0^0^0^0^1|4|0.27|1.76|0.40[CR][ETX]B1[CR][LF]
[ACK]
[STX]2M|2|RR|u701|1-0^RBC_X|0^0^0^0^0^0^0^0^0^0^0^0^0^1|2|0.13|0.88|0.20[CR][ETX]BF[CR][LF]
[ACK]
[STX]3M|3|RR|u701|1-2^RBC1|1^0^0^0^0^0^0^0^0^0^0^0^0^0|2|0.13|0.88|0.20[CR][ETX]3D[CR][LF]
[ACK]
[STX]4M|4|RR|u701|1-3^RBC2|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]28[CR][LF]
[ACK]
[STX]5M|5|RR|u701|3^WBC|1^2^3^1^0^0^2^0^0^1^2^0^1^1^3|26|1.73|11.44|2.60[CR][ETX]35[CR][LF]
[ACK]
[STX]6M|6|RR|u701|5^NEC|1^0^1^1^1^1^0^0^0^1^0^1^1^0^2|10|0.67|4.40|1.00[CR][ETX]EE[CR][LF]
[ACK]
[STX]7M|7|RR|u701|6^SEC|7^1^6^7^6^4^1^1^9^7^11^2^7^8^4|81|5.40|35.64|8.10[CR][ETX]AA[CR][LF]
[ACK]
[STX]0M|8|RR|u701|7^YEA|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]A4[CR][LF]
[ACK]
[STX]1M|9|RR|u701|8^CRY|0^0^0^0^0^0^0^0^2^0^0^0^0^0|2|0.13|0.88|0.20[CR][ETX]D0[CR][LF]
[ACK]
[STX]2M|10|RR|u701|14^BAC|32^35^32^32^32^25^35^36^22^32^35^33^32^31^37|481|32.07|211.64|48.10[CR][ETX]66[CR][LF]
[ACK]
[STX]3M|11|RR|u701|15^HYA|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]03[CR][LF]
[ACK]
[STX]4M|12|RR|u701|19^SPRM|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]69[CR][LF]
[ACK]
[STX]5M|13|RR|u701|21^MUC|11^12^4^11^7^29^12^24^17^11^12^10^11^10^14|195|13.00|85.80|19.50[CR][ETX]DA[CR][LF]
[ACK]
[STX]6M|14|RR|u701|26^PAT|1^0^0^1^0^1^0^0^0^1^0^0^1^0^0|5|0.33|2.20|0.50[CR][ETX]27[CR][LF]
[ACK]
[STX]7M|15|RR|u701|0^Others|0^0^0^0^0^0^0^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]68[CR][LF]
[ACK]

Example 7: 701 result with excluded images

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas6500^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616093544[CR][ETX]1C[CR][LF]
[ACK]
[STX]2O|1|136|713450^5^Service^SAMPLE|CM|R||||||N|||20150327005518||||||||||F[CR][ETX]CB[CR][LF]
[ACK]
[STX]3R|1|1^RBC|<5.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]AA[CR][LF]
[ACK]
[STX]4R|2|1-0^RBC_X|<5.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]C0[CR][LF]
[ACK]
[STX]5R|3|1-2^RBC1|0.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]FD[CR][LF]
[ACK]
[STX]6R|4|1-3^RBC2|0.00|/uL|International|||F||Service||20150327005518|u701[CR][ETX]01[CR][LF]
[ACK]
[STX]7R|5|3^WBC|12.18|/uL|International|||F||Service||20150327005518|u701[CR][ETX]B4[CR][LF]
[ACK]
[STX]0C|5|I|A|I[CR][ETX]7B[CR][LF]
[ACK]
[STX]1R|6|5^NEC|5|/uL|International|||F||Service||20150327005518|u701[CR][ETX]E6[CR][LF]
[ACK]
[STX]2C|6|I|A|I[CR][ETX]7E[CR][LF]
[ACK]
[STX]3R|7|6^SEC|40|/uL|International|||F||Service||20150327005518|u701[CR][ETX]1E[CR][LF]
[ACK]
[STX]4C|7|I|A|I[CR][ETX]81[CR][LF]
[ACK]
[STX]5R|8|7^YEA|neg||International|||F||Service||20150327005518|u701[CR][ETX]0C[CR][LF]
[ACK]
[STX]6R|9|8^CRY|neg||International|||F||Service||20150327005518|u701[CR][ETX]1E[CR][LF]
[ACK]
[STX]7R|10|14^BAC|150|/uL|International|||F||Service||20150327005518|u701[CR][ETX]98[CR][LF]
[ACK]
[STX]0C|10|I|A|I[CR][ETX]A7[CR][LF]
[ACK]
[STX]1R|11|15^HYA|neg||International|||F||Service||20150327005518|u701[CR][ETX]64[CR][LF]
[ACK]
[STX]2R|12|19^SPRM|neg||International|||F||Service||20150327005518|u701[CR][ETX]CA[CR][LF]
[ACK]
[STX]3R|13|21^MUC|neg||International|||F||Service||20150327005518|u701[CR][ETX]68[CR][LF]
[ACK]
[STX]4R|14|26^PAT|pos||International|||F||Service||20150327005518|u701[CR][ETX]87[CR][LF]
[ACK]
[STX]5C|14|I|A|I[CR][ETX]B0[CR][LF]
[ACK]
[STX]6R|15|0^Others|neg||International|||F||Service||20150327005518|u701[CR][ETX]CA[CR][LF]
[ACK]
[STX]7M|1|RR|u701|1^RBC|^0^0^0^0^0^0^^0^0^0^0^0^0^1|2|0.15|1.02|0.23[CR][ETX]47[CR][LF]
[ACK]
[STX]0M|2|RR|u701|1-0^RBC_X|^0^0^0^0^0^0^^0^0^0^0^0^0^1|2|0.15|1.02|0.23[CR][ETX]55[CR][LF]
[ACK]
[STX]1M|3|RR|u701|1-2^RBC1|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]C2[CR][LF]
[ACK]
[STX]2M|4|RR|u701|1-3^RBC2|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]C6[CR][LF]
[ACK]

[STX]3M|5|RR|u701|3^WBC|^2^3^1^0^0^2^^0^1^2^0^1^1^3|24|1.85|12.18|2.77[CR][ETX]DD[CR][LF]
[ACK]
[STX]4M|6|RR|u701|5^NEC|^0^1^1^1^1^0^^0^1^0^1^1^0^2|9|0.69|4.57|1.04[CR][ETX]71[CR][LF]
[ACK]
[STX]5M|7|RR|u701|6^SEC|^1^6^7^6^4^1^^9^7^11^2^7^8^4|73|5.62|37.06|8.42[CR][ETX]48[CR][LF]
[ACK]
[STX]6M|8|RR|u701|7^YEA|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]4A[CR][LF]
[ACK]
[STX]7M|9|RR|u701|8^CRY|^0^0^0^0^0^0^^2^0^0^0^0^0^0|2|0.15|1.02|0.23[CR][ETX]6E[CR][LF]
[ACK]
[STX]0M|10|RR|u701|14^BAC|^35^32^32^32^25^35^^22^32^35^33^32^31^37|413|31.77|209.68|47.65[CR][ETX]AB[CR][LF]
[ACK]
[STX]1M|11|RR|u701|15^HYA|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]A1[CR][LF]
[ACK]
[STX]2M|12|RR|u701|19^SPRM|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]07[CR][LF]
[ACK]
[STX]3M|13|RR|u701|21^MUC|^12^4^11^7^29^12^^17^11^12^10^11^10^14|160|12.31|81.23|18.46[CR][ETX]08[CR][LF]
[ACK]
[STX]4M|14|RR|u701|26^PAT|^0^0^1^0^1^0^^0^1^0^0^1^0^0|4|0.31|2.03|0.46[CR][ETX]C7[CR][LF]
[ACK]
[STX]5M|15|RR|u701|0^Others|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]06[CR][LF]
[ACK]
[STX]6M|1|RC|u701|1234|20141231|20121211|-1|20150327[CR][ETX]1A[CR][LF]
[ACK]
[STX]7M|1|IR|u701|f:&R&cobas_6500_ResultReport_136_27032015005518|Image_136_01^Image_136_02^Image_136_03^Image_136_04^Image_136_06^Image_136_07^Image_136_08^Image_136_09^Image_136_10^Image_136_11^Image_136_12^Image_136_13^Image_136_14^Image_136_15^Image_136_16|^png|[CR][ETX]DA[CR][LF]
[ACK]
[STX]0L|1|N[CR][ETX]03[CR][LF]
[ACK]
[EOT]

Example 8: 601 result with assigned patient

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas6500^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616093618[CR][ETX]1E[CR][LF]
[ACK]
[STX]2P|1|007|007||Mason^Harry||19620101|M|||||[CR][ETX]52[CR][LF]
[ACK]
[STX]3O|1|136|713450^5^Service^SAMPLE|CM|R||||||N|||20150327004636||||||||||F[CR][ETX]CC[CR][LF]
[ACK]
[STX]4R|1|1^ERY|neg||International|||F||Service||20150327004636|u601[CR][ETX]0E[CR][LF]
…
[EOT]

Example 9: 701 result with unsuccessful image copy

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas6500^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616093804[CR][ETX]1B[CR][LF]
[ACK]
[STX]2P|1|007|007||Mason^Harry||19620101|M|||||[CR][ETX]52[CR][LF]
[ACK]
[STX]3O|1|136|713450^5^Service^SAMPLE|CM|R||||||N|||20150327005518||||||||||||F[CR][ETX]CC[CR][LF]
[ACK]
…
[ACK]
[STX]2M|1|IR|u701|f:&R&cobas_6500_ResultReport_136_27032015005518|Image_136_01^Image_136_02^Image_136_03^Image_136_04^Image_136_06^Image_136_07^Image_136_08^Image_136_09^Image_136_10^Image_136_11^Image_136_12^Image_136_13^Image_136_14^Image_136_15^Image_136_16|^png|E[CR][ETX]1A[CR][LF]
[ACK]
[STX]3L|1|N[CR][ETX]06[CR][LF]
[ACK]
[EOT]

Example 10: c 6500 result with raw data transmission, subclasses on u 701, excluded image and assigned patient

[ENQ]
[ACK]
[STX]1H|\^&|||^Cobas6500^2.2.9^9^Unknown^Unknown|||||||P|LIS2-A2|20150616100812[CR][ETX]0F[CR][LF]
[ACK]
[STX]2P|1|007|007||Mason^Harry||19620101|M|||||[CR][ETX]52[CR][LF]
[ACK]
[STX]3O|1|136|713450^5^Service^SAMPLE|CM|R||||||N|||20150327004636||||||||||||F[CR][ETX]CC[CR][LF]
[ACK]
[STX]4R|1|1^ERY|neg||International|||F||Service||20150327004636|u601[CR][ETX]0E[CR][LF]
[ACK]
[STX]5R|2|2^LEU|25|/uL|International|||F||Service||20150327004636|u601[CR][ETX]24[CR][LF]
[ACK]
[STX]6C|2|I|A|I[CR][ETX]7E[CR][LF]
[ACK]
[STX]7R|3|3^NIT|neg||International|||F||Service||20150327004636|u601[CR][ETX]10[CR][LF]
[ACK]
[STX]0R|4|4^KET|neg||International|||F||Service||20150327004636|u601[CR][ETX]04[CR][LF]
[ACK]
[STX]1R|5|5^GLU|norm||International|||F||Service||20150327004636|u601[CR][ETX]8D[CR][LF]
[ACK]
[STX]2R|6|6^PRO|neg||International|||F||Service||20150327004636|u601[CR][ETX]17[CR][LF]
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[STX]3R|7|7^UBG|norm||International|||F||Service||20150327004636|u601[CR][ETX]89[CR][LF]
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[STX]5R|9|10^pH|7||International|||F||Service||20150327004636|u601[CR][ETX]0C[CR][LF]
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[ACK]

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[STX]3M|1|RR|u601|1^ERY|REM_ERY_615|65.7400|65.7400[CR][ETX]4A[CR][LF]
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[STX]4M|2|RR|u601|1^ERY|REM_ERY_560|64.7014|64.7014[CR][ETX]4B[CR][LF]
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[STX]0M|1|RR|u701|1^RBC|^0^0^0^0^0^0^^0^0^0^0^0^0^1|2|0.15|1.02|0.23[CR][ETX]40[CR][LF]
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[STX]2M|3|RR|u701|1-2^RBC1|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]C3[CR][LF]
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[STX]5M|6|RR|u701|5^NEC|^0^1^1^1^1^0^^0^1^0^1^1^0^2|9|0.69|4.57|1.04[CR][ETX]72[CR][LF]
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[STX]6M|7|RR|u701|6^SEC|^1^6^7^6^4^1^^9^7^11^2^7^8^4|73|5.62|37.06|8.42[CR][ETX]49[CR][LF]
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[STX]7M|8|RR|u701|7^YEA|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]4B[CR][LF]
[ACK]
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[STX]1M|10|RR|u701|14^BAC|^35^32^32^32^25^35^^22^32^35^33^32^31^37|413|31.77|209.68|47.65[CR][ETX]AC[CR][LF]

[ACK]
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[STX]3M|12|RR|u701|19^SPRM|^0^0^0^0^0^0^^0^0^0^0^0^0^0|0|0.00|0.00|0.00[CR][ETX]08[CR][LF]
[ACK]
[STX]4M|13|RR|u701|21^MUC|^12^4^11^7^29^12^^17^11^12^10^11^10^14|160|12.31|81.23|18.46[CR][ETX]09[CR][LF]
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[STX]5M|14|RR|u701|26^PAT|^0^0^1^0^1^0^^0^1^0^0^1^0^0|4|0.31|2.03|0.46[CR][ETX]C8[CR][LF]
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[STX]7M|1|RC|u701|1234|20141231|20121211|-1|20150327[CR][ETX]1B[CR][LF]
[ACK]
[STX]0M|1|IR|u701|f:&R&cobas_6500_ResultReport_136_27032015005518|Image_136_01^Image_136_02^Image_136_03^Image_136_04^Image_136_06^Image_136_07^Image_136_08^Image_136_09^Image_136_10^Image_136_11^Image_136_12^Image_136_13^Image_136_14^Image_136_15^Image_136_16|^png|[CR][ETX]D3[CR][LF]
[ACK]
[STX]1L|1|N[CR][ETX]04[CR][LF]
[ACK]
[EOT]

Example 11: Empty u701 result with all images

[ENQ]
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[STX]5L|1|N[CR][ETX]08[CR][LF]
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[EOT]