cobas c 111

Host Interface Manual
Version 2.1
October 2012

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CONTENT:

1. Preface

1.1 Revision history

Version	Revision Date	Revision Information
1.0	October 2006	First released version
2.0	December 2007	Update to Software Version 2.x
2.0.1	November 2008	M.ICR record removed Flags added Ignored QC in 10.1.09 added, control information in 09.4.03, changed. 10.1.11 added operator SYS 10.1.13 added calculation time Various corrections and examples added. (M.CR) Changes in style and corporate identity
2.0.2	May 2010	Change of actual SW version
2.1	October 2012	Template changed, company name changed.

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Questions or comments regarding the contents of this Installation Manual can be directed to the address below or to your Roche representative.

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1.3 Manufacturer

Manufacturer

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Made in Switzerland

1.4 Intended use

The **cobas c** 111 instrument is a continuous random-access analyzer intended for the in-vitro determination of clinical chemistry and electrolyte parameters in serum, plasma, urine or whole blood (only HbA1c application).
It is important that the operators read this manual thoroughly before using the system.
Any disregard of the instructions in this or the Operator's Manual may result in a safety risk.

2. About this manual

This document details the specifications for the **cobas c** 111 host interface (HIF). This interface defines data transmission between the instrument and the Laboratory Information System (LIS) computer.

This document gives the reader a basic understanding of the system operation with a host computer and describes the following:

- Basic System Architecture
- Sample Processing
- Sample Types
- Rerun Modes
- Test Orders
- Operational Modes

2.1 Conventions used in this manual

The conventions used in this manual are as follows:
1., 2., 3., represents sequential steps in a procedure. You should follow these steps in order.

2.2 Symbol listing

Caution: Refer to accompanying documents.

These symbols are provided on the type plate of the instrument

Manufacturer of device

Electrical and electronic equipment marked with this symbol are covered by the European directive WEEE. The symbol denotes that the equipment must not be disposed of in the municipal waste system.
(WEEE = Directive 2002/96/EC of the European Parliament and the council of 27 January 2003 on waste electrical and electronic equipment.)

2.3 Abbreviations

The following abbreviations are used:

Acronyms	
UL	Underwriters Laboratories Inc.
IEC	International Electro technical Commission
CSA	Canadian Standard Association
EN	European Norm
ASTM	American Society for Testing and Materials
ASCII	American Standard Code for Information Interchange

3. Safety information

Before operating the **cobas c** 111, it is essential that you read and understand the safety information listed here.

3.1 Safety classifications

The safety precautions and important user notes are classified according to ANSI Z535 resp. ISO 3864 standards. You must familiarize yourself with following signs and their meanings:

Danger

- Indicates a direct danger that, if not avoided, may result in death or serious injury.

Warning

- Indicates a possibly hazardous situation that, if not avoided, may result in death or serious injury.

Caution

- Indicates a possibly hazardous situation that, if not avoided, may result in slight or minor injury or may result in damage to equipment.

- General warning symbol on the analyzer:
  The triangular warning symbol on the analyzer is a general reminder that users should read the safety information contained in this manual. Users must be able to identify specific hazards and take appropriate action to avoid them.

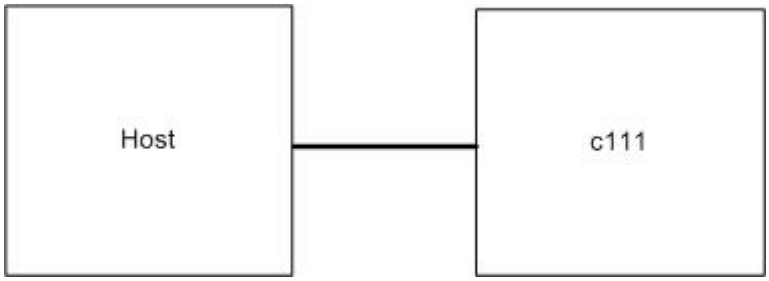
4. Overview

4.1 Introduction

This document is written for technicians who must configure the cobas c 111 interfaces in the environment of a lab. Depending on the type of host system and workflows in the laboratory, the cobas c 111 host interface offers a set of configurable features. The assigned reader should have basic knowledge of laboratory terms and workflows.

To understand all the details of the cobas c 111 host interface it is important to know the context of the LIS interface between the cobas c 111 and the host, e.g. a Laboratory Information System.

4.2



4.3 System Overview

Before discussing the host communication's working principle, it is important to understand the basic architecture of the system. This section provides an overview of the architecture and discusses some specialized items of interest pertaining to the analytical system.

- The Sample Area is the place where the sample tubes are kept for processing.
- The Pipetting Unit is responsible for collecting the reagent and sample fluids, filling them into the reaction cuvette and mixing of the various fluids.
- The LCD with a Touch Screen interface allows operator interaction with the system, such as entering orders, displaying results and changing configuration settings.

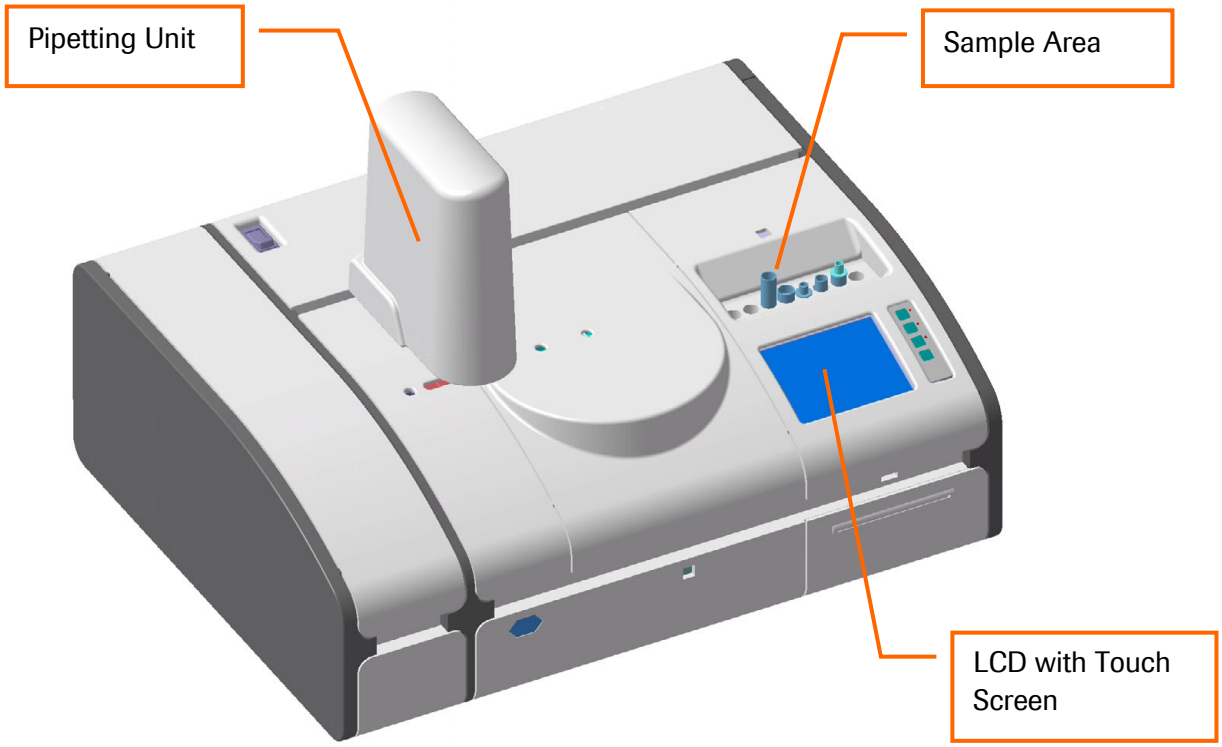


Figure 1: cobas c 111 instruments System Architecture

4.4 System Information

4.4.1 Sample Carriers

The **cobas c** 111 instrument has a direct sample reception area and does not use or support separate sample carriers such as racks.

4.4.2 Samples

The sample area can accommodate various types of sample tubes and cups. A sample must be identified prior to positioning at the sample area. Containers that are introduced without prior identification will be refused and will not be processed. During analysis, the analyzer retrieves the identification of a sample from its memory and matches it to the corresponding sample position, then analyzing it according to the test orders defined for that sample.

- Standardized material used for calibration
- Control material used for quality control
- Patient samples

4.4.3 Sample Type

The cobas c 111 system database does not support the definition of 'Sample Types', therefore a specific 'sample type parameter' is not available in this host interface protocol.

4.4.4 Repeat / Rerun

Repeating an order will just do the same basic processing again.

Rerunning an order means to repeat according to the settings given in the application configuration, such as predefined dilution factors.

Note: For easy reading only the term 'Rerun' instead of 'Repeat / Rerun' will be used in this document.

4.4.4.1 Manual Rerun

The operator can manually ask for a Rerun.

To do so, the operator has to display the result in question and ask for a Rerun. This action can also be initiated via the host. Once the sample is recognized by the system (i.e. already present or re-inserted by the operator) the measurement will be initiated.

4.4.4.2 Automatic Rerun

Automatic Rerun is not supported on **cobas c** 111 instruments.

4.4.5 Sample Number and ID modes

The analyzer can be operated in one of two modes for identifying samples:

- ID Mode, using barcoded samples
  settings: Utilities/Configuration/Workflow/Sample Barcode = on
- Sample Number Mode, each sample number is manually entered by the operator
  settings: Utilities/Configuration/Workflow/Sample Barcode = off

The most common mode used is ID Mode, which also allows processing of samples that have damaged, unreadable or missing barcode label.

The user can switch between ‚ID Mode' and ‚Sample Number Mode' during standby without clearing the database, but switching is strongly discouraged. Generally, once a mode is decided upon, it should not be changed. The sample identification item (Sample ID) however remains the same in both modes.

For all following described Sample ID Handling modes you can use ID Mode or Sample Number Mode

4.4.5.1 Order ID = Sample ID

Setting: Utilities/Configuration/Workflow/Sample ID handling -> Order ID = Sample ID

In this mode the Order ID is equal to the Sample ID. The sample number is given by the operator while placing the sample on the system.

4.4.5.2 Independent ID

Setting: Utilities/Configuration/Workflow/Sample ID handling -> Independent ID

In this mode the Sample ID and the Order ID are not connected to each other and could be different. Sample ID is given by the operator. Order ID can be given by the operator or the system increments automatically the Order ID.
Setting for automatic Order ID increment: Utilities/Configuration/Workflow/Auto Order ID -> On

4.4.5.3 Grouped Sample ID

Setting: Utilities/Configuration/Workflow/Sample ID handling -> Grouped Sample ID

In this mode the Sample ID and Order ID are identical. For a given patient, the sample ID is used all the time. A three digit number is appended and automatically increased with each new order.

This mode is used to provide a patient ID centric behavior for **cobas IT** 1000 interface connected systems. In this mode the Sample ID entered is extended on c111 (3 char unique extension per sample ID), to provide a unique sample ID for the system, when there is a need to handle samples with identical barcodes or manually entered IDs.
The total number of characters (including separator and number) is 23.

The extension is done whenever the system is configured in that particular mode. The extended ID is then processed by the system in the same manner as in other modes.

To complete the NPT ID Mode the host protocol will send the part of the sample ID which has been entered in the P-Record simulating a patient ID. The complete extended sample ID is still reported within the O-Record as sample ID field.

It is important to know that even by introducing this P-Record content the system will not maintain patient relevant data, neither will it consolidate data based on P-Queries or send multiple O-Records belonging to a specific P-Record.

4.4.6 Working Mode

The Working Mode defines the way you select tests when defining orders.

4.4.6.1 Manual

Settings: Utilities/Configuration/Workflow/Working Mode -> Manual

During order definition, the test selection screen is displayed, allowing you to select the tests or to make changes to the selection.
After measuring the sample the results are uploaded to the host system.

4.4.6.2 Host

Settings: Utilities/Configuration/Workflow/Working Mode -> Host

During order definition, the tests are automatically selected; the test selection screen is not displayed. After identifying the sample, you are asked to place the sample.

5. LIS Interface configuration

5.1 Connection settings / General Setup

The communication with a host computer is highly configurable and requires to be set according to the needs and capabilities of the laboratory equipment and the host interface computer.

A) The Host Interface is enabled under Utilities – Configuration – System – Host Server

B) The workflow with host computer is enabled in *Utilities – Workflow – Working Mode*.

- **Manual** The instrument is used as a stand-alone system. Orders are defined in 3 steps: 1 – defining order number; 2 – selecting tests; 3 – placing sample
- **Host** Orders are mostly downloaded from a host computer and results are uploaded to it. Orders are defined in 2 steps: 1 – defining order number; 2 – placing sample. (The test selection is downloaded via HIF automatically)

C) Various properties of the host connection and its behavior can be changed in *Utilities – Configuration – Host Settings*

The following items can be setup:

Configuration	Range / *Default	Remark
RS-232 Settings	- - -	See chapter 4.1
Communication	*OFF BATCH REALTIME	Type of host communication → Offline → Only manual upload is supported → **cobas c 111 instrument** sends results and queries in process
Checksum	OFF *ON	→ The checksum is ignored on arrival → The checksum is validated and required Note: A valid checksum is always sent by **cobas c** 111 instrument
Send Order Query	OFF ONCE *ALWAYS	Allows Real-Time Communications for orders → No queries are sent → A query is sent once the sample is seen for the first time → A query is sent every time the sample is seen on-board (used to inquire Rerun/Repeat orders)

		The analyzer will send inquiries for test and rerun orders **only** when this function is enabled. If disabled, test orders have to be made either manually by the operator at the analyzer or by download from the host.
Query Timeout	(10 - 300) *10 sec	Time before **cobas c 111 instrument** assumes that the host does not answer. This function allows the operator to set a timeout interval for 'Query' for Routine, STAT and Rerun Samples. The specified timeout interval determines how long the analyzer will wait for a response from the host. The range is 10-300 seconds, with a default of 10 seconds. Note: This function cannot be disabled.
Send Result Mode	 OFF *COMPLETE IMMEDIATE	Allows Real-Time Communications for results → No results are sent automatically → Send results only if all results are complete avail. → Send each result as soon as available Note: QC results will be sent immediately if not switched OFF, QC results can not be sent grouped by QC sample. Only when this function is enabled, the analyzer will send analytical result records to the host computer according to the description above. If disabled, result records have to be sent manually to the host computer or the host may send an inquiry to upload such results.
Raw-Data	 *OFF ON	 → Raw data records are not sent → Raw data records (M.RR) are added to result record (if raw data is still available)
Trace	 ON *OFF	 → A communication trace file is written → No communication trace file is written When this function is enabled, the content of the communication with the host can be stored at the analyzer. The Communication Trace report can be saved via media interface to a Memory Stick. This report can be used as an analysis tool if a problem occurs.
System ID	char[10] *c111	The instrument device identification Name used on reports and in communications for the **cobas** c 111 instrument system or the ID number used to identify the system in communications with the host.

Host ID	char[10] *host	The host device identification Name used on reports and in communications for the host system or the ID number used to identify the host in communications with the analyzer.

Note: Automatic result upload is only supported in Real-Time Communication mode.

5.2 RS-232 serial cable specifications

Figure2 and 3 shows the two possible wiring diagram of the connection cable between the analyzer and the host.
The plug for the RS232 host interface cable is the topmost RS232 connector on the right side of the analyzer (marked as "**Host**").
You can use the "industry standard "null modem cable or the second one that can be ordered from the Roche stock and is also used for other instruments i.e. cobas Amplicor.

5.2.1 Maximum cable length

The maximum cable length is 15 m

Figure2 : Host Interface Null modem Connection Cable

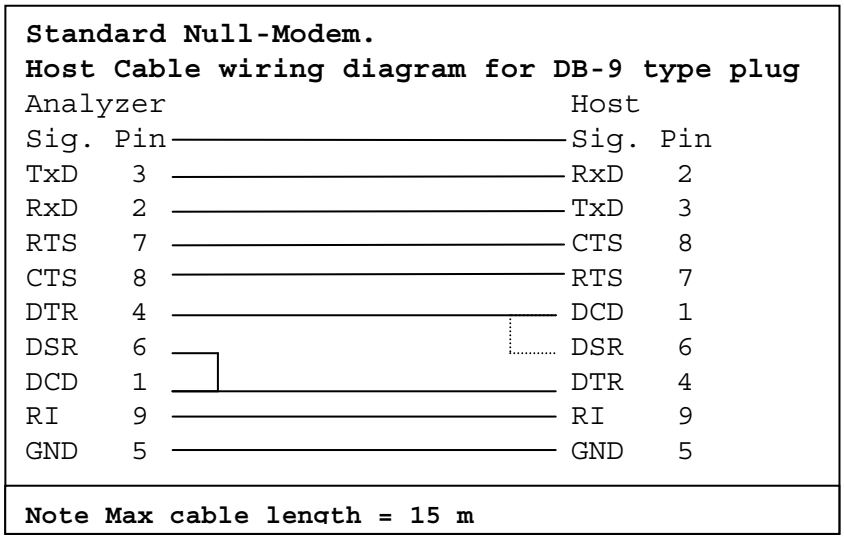


Figure3 : Host Interface Connection Cable GMMI 28053391001

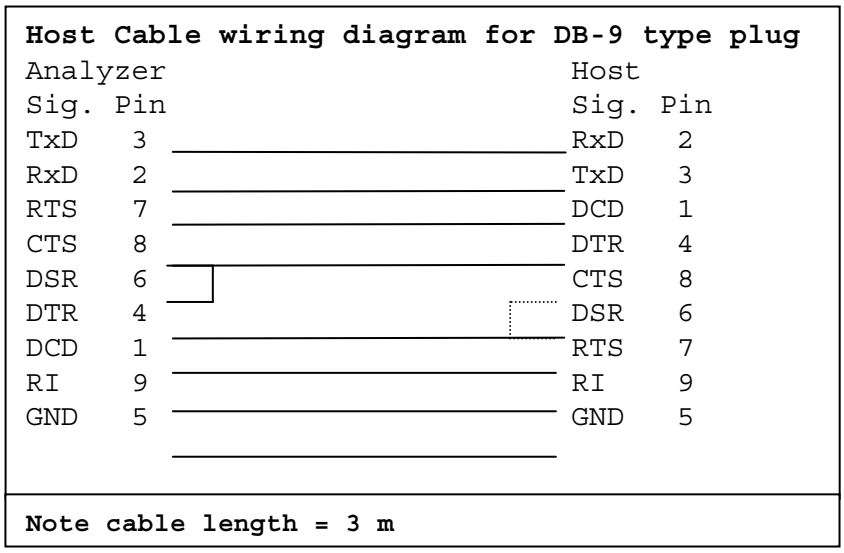
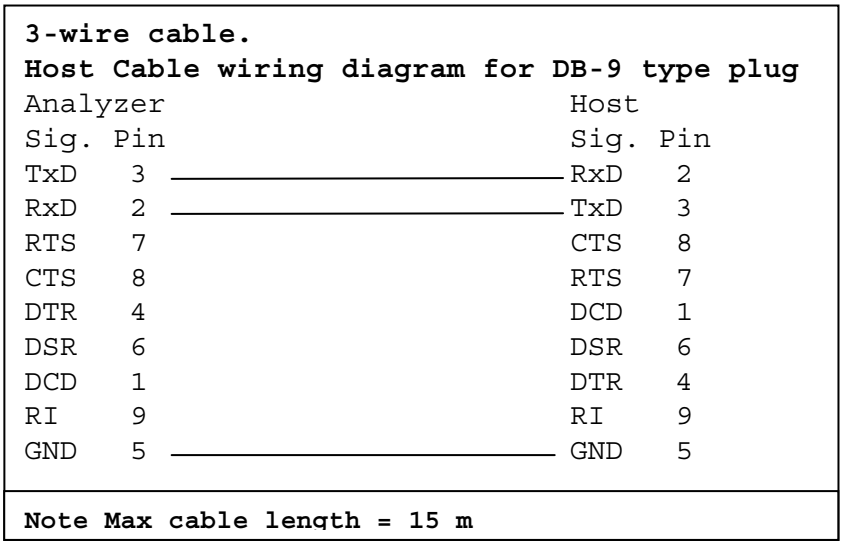


Figure 4 : Host Interface Connection 3-wire Cable



Use the mapping in Figure2 : Host Interface Null modem Connection Cable

Figure3 : Host Interface Connection Cable GMMI 28053391001

Figure 4 if you intend to work with the software handshake or without any handshake.

Cables with the above mentioned pin mappings work with most connecting equipment installed in commercially available computers. However, depending on your particular computer configuration, you may require a cable with a different pin mapping.
Check with the technical documentation of your computer equipment.

To obtain a suitable cable, contact your service representative.

6. Supported Work Flow

6.1 Communication *methods*

cobas c 111 instruments support real-time communication and batch communication for test ordering and analytical data upload.

6.1.1 Automated Real-Time Communication (REAL)

Real-time communication refers to a communication model where the reception of a sample on the system triggers an inquiry for test orders from **cobas c** 111 instrument to host. The host may now download the known orders for this specific sample order (also known as Host Query Mode).

The relationships between real-time communication functions and types of samples are shown in Table 1. The following are the details regarding communication procedures and communication functions.

Communication Functions	Patient Samples			Control Sample	Calibration Sample
	Routine	Stat	Rerun		
Test order inquiry (host query)	✓	✓	✓	×	×
Analytical data transmission (result upload)	✓	✓	✓	✓	✓
Rerun test order reception	✓	✓	× 1)	×	×
Rerun test order inquiry	✓	✓	× 1)	×	×
Rerun analytical data transmission	✓	✓	× 1)	×	×

(✓ = Possible; × = not possible) 1) Rerun of a rerun is not supported

Table 1: Real time Communication Functions

6.1.1.1 Sample Introduction

Samples (tubes and cups) are placed directly into one of the sample carrier slots of the **cobas c** 111 instrument. (Sample Area)

6.1.1.2 Sample Identification and Test Ordering

A sample is identified by the sample ID either read via barcode reader or the number given by the operator. On **cobas c** 111 instruments a sample is never referred to by a position.

The system looks for test orders for each sample, depending on configuration settings. Test orders can come from:

- The host prior to testing
- The host as a result of a 'Test order inquiry' initiated by the analyzer
- Manually programmed test orders on the analyzer by the operator

6.1.1.3 Sample Aspiration

The aspiration of sample will take place at the position in the Sample Area. Once all sample aspirations have been done, the sample can be removed without disturbing the performance of the system.

6.1.1.4 Rerun Initiation

Once a sample is processed, the measurements and result calculations are done according to the application definitions.
When all measurements for a sample are finished, the **cobas c** 111 instrument system is ready to upload the results (automatically after the last result is available in real-time mode). At this point the host may place additional test orders (also reruns) for this sample. Of course, if the sample has been already removed, it has to be reinserted into the Sample Area, before a rerun is possible.
If all measurements are finished and a sample is recognized back on the system, the **cobas c** 111 instrument will initiate a 'Rerun test order inquiry' for this sample, if the host has not already submitted such an order. The host may then either ask for rerun measurements or answer with no further test orders.

Results from Rerun measurements are submitted as 'Rerun analytical data transmission'.

6.1.2 Manually Triggered Communication (BATCH)

Manually triggered communication is shown in Table 2. Each of the communication functions is explained in detail below.

Communication Functions	Request Originator	Patient Sample			Control Sample	Calibration Sample
		Routine	Stat	Rerun		
Test order reception	Host	✓	✓	✓	×	×
Analytical data transmission	Host	✓	✓	✓	×	✓
	Analyzer	✓	✓	✓	✓	×
Photometric / ISE raw data transmission *)	Analyzer	✓	✓	✓	✓	×

(✓ = Possible; × = not possible)
*) the raw data transmission has to be enabled in the Instrument Configuration
Table 2: Batch Communication Function Table

6.1.2.1 Test Order Reception

A host can send Test Orders (TO) for patient sample(s) prior to introduction of the sample(s) onto the analyzer.

Key Information Used for Registration
In Batch Mode, the type of key information is the same as in real-time Mode. If the key information of a patient sample is the same as the one already known in the database, the patient sample is overwritten; otherwise, it is stored as a new sample.

The key information is the 'Sample Number'.

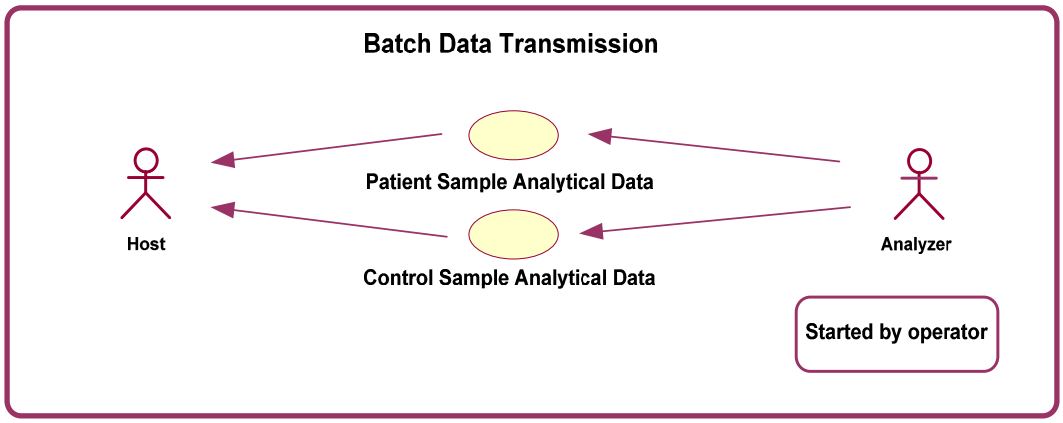
6.1.2.2 Number of Samples Possible for Registration

The system database holds a maximum of 300 samples, for both routine and stat records combined. Due to this restriction, an error occurs when the Test Orders received from a host exceed this limit. The Test Order is not stored if this limit is reached.

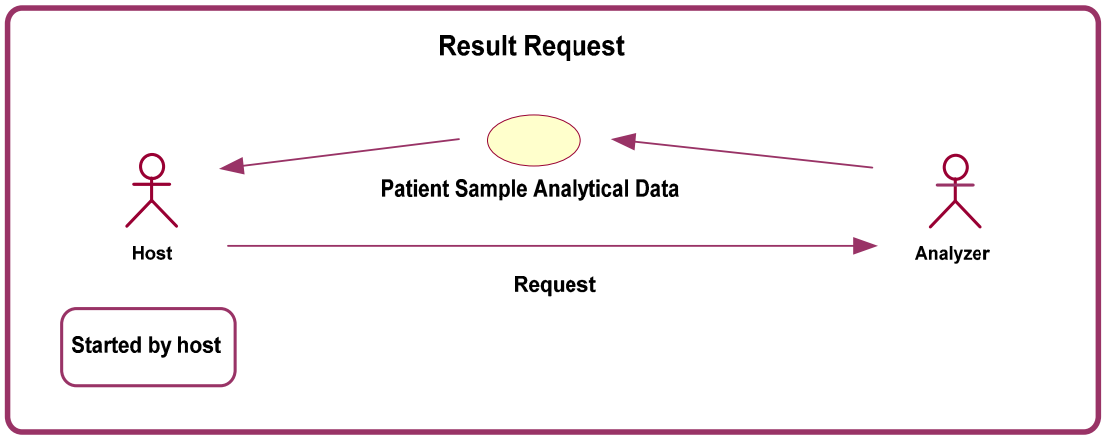
A requester pops up informing the user that he or she has to delete existing orders before new orders can be created.

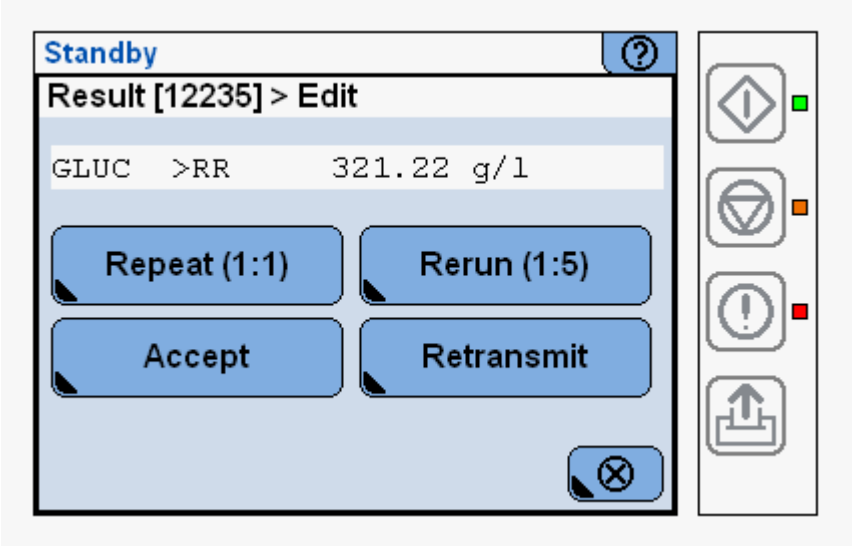
6.1.2.3 Analytical Data Transmission in Batch Mode

The operator can initiate a Batch Data Transmission of routine results and of control sample results from the “Workplace/Result Review/Edit” screen on the analyzer.



The host can also request results for a specific sample, but control sample results cannot be requested from the host.





6.1.2.4 Application & Test Order Codes

Each application (test) for **cobas c** 111 instruments is identified within Roche Diagnostics by an Application Code Number (ACN). This ACN is often referred to as “Test Number” that consists of a 3-digit number. For host orders, a mapping table is available to translate the laboratory-specific number space for applications into the **cobas c** 111 instrument ACN number space. This table is located on **cobas c** 111 instruments at “Configuration”. In order to adapt the translation table, you have to export the table to an external computer, change the table accordingly using an ASCII editor (e.g. Windows Notepad), and import that table into the instrument.
This laboratory-specific number space is referred to as Host Application Code (HAC). The HAC is used in communication with the Host whenever Patient and QC orders are communicated. For Calibration records and Inventory communication the original ACN is used.

6.2 Host Communication Settings

6.2.1 Definitions

Sample ID

Sample ID (also named Sample Number etc.) on **cobas c** 111 instruments are specified as strings of a maximum of 23 ASCII printable characters.

RS232C Settings

See description in chapter 4.1.

6.3 Physical Layer Specifications

6.3.1 Communication Options

Host communication options such as baud rate can be found on the *Utility / System / Host Communication Setting* screen.

Item	Specifications	Remarks
Communication Speed [bps]	1200 , 2400 , 4800 , *9600 19200, 38400, 57600, 115200	Baud rate
Handshake	OFF HW *SW	→ No handshake → RTS, CTS mode → Xon, Xoff mode
Parity Check	*OFF ON	→ Parity check disabled → Parity check enabled
Line Mode	*N_8_1 E_8_1 O_8_1 N_8_2 E_7_1 O_7_1 E_7_2 O_7_2	→ None Parity, 8 bit, 1 stop bit → Even Parity, 8 bit, 1 stop bit → Odd Parity, 8 bit, 1 stop bit → None Parity, 8 bit, 2 stop bits → Even Parity, 7 bit, 1 stop bit → Odd Parity, 7 bit, 1 stop bit → Even Parity, 7 bit, 2 stop bits → Odd Parity, 7 bit, 2 stop bits
Communication Port	1	
Electrical Signal	In accordance with EIA-232-D-1986	
Cable Length	Maximum 15m	

Table 3: Physical Level Specifications

6.4 Messages used in cobas c 111 instrument Communication

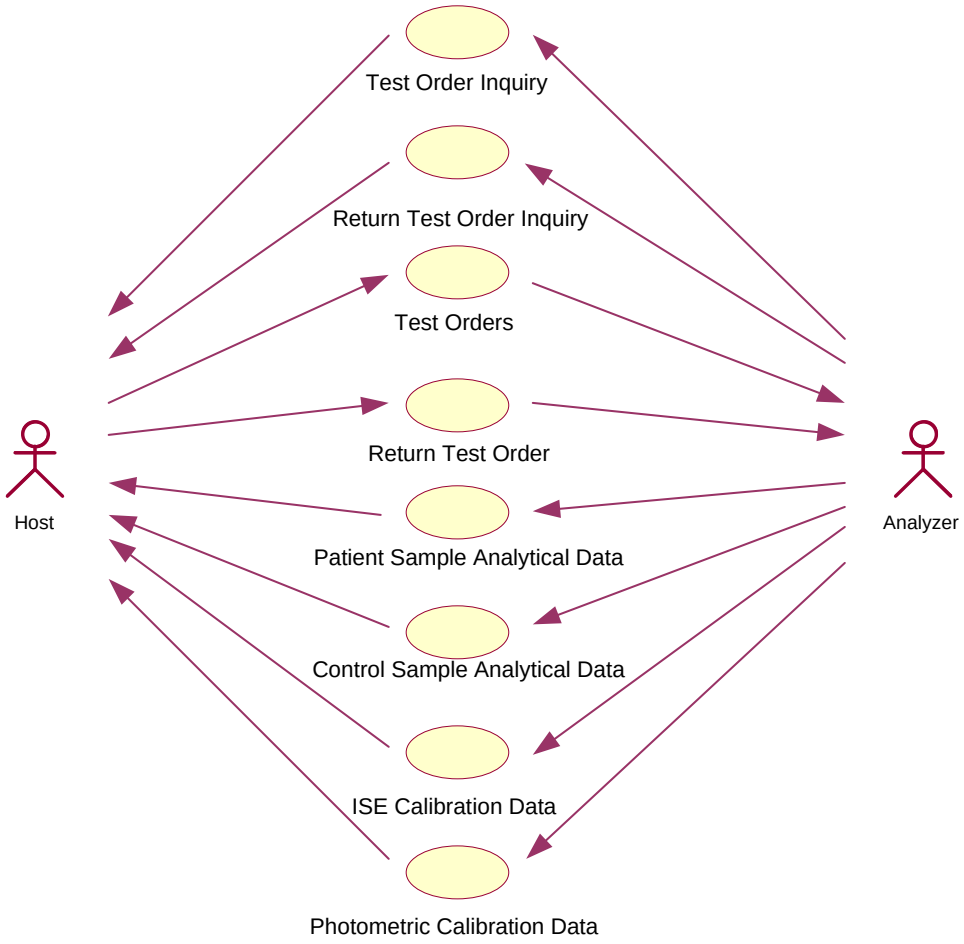
All messages are shown in Table 8.The following section shows detailed information for each of the messages and the included ASTM records.

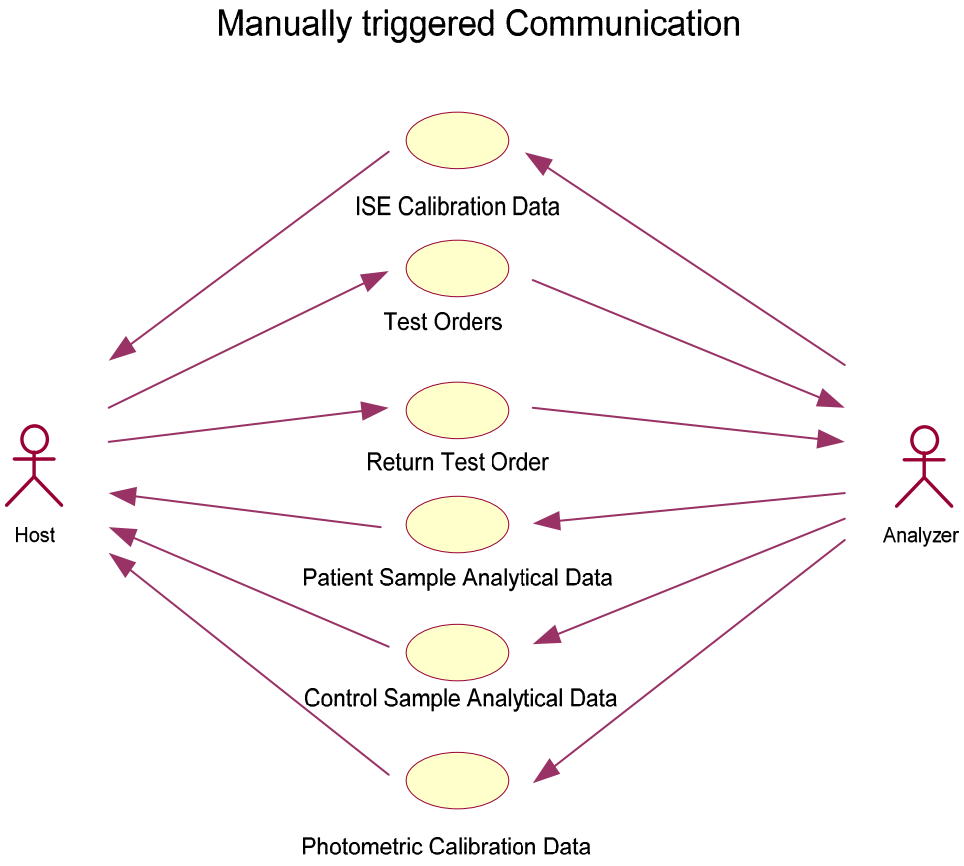
Communication Text	Communication Direction	Automated Communication	Manually triggered Communication
Test Order Inquiry	Analyzer → Host	✓	×
Rerun Test Order Inquiry	Analyzer → Host	✓	×
Test Orders	Host → Analyzer	✓	✓
Rerun Test Order	Host → Analyzer	✓	×
Patient Sample Analytical Data	Analyzer → Host	✓	✓
Control Sample Analytical Data	Analyzer → Host	✓	✓
Photometric Calibration Data	Analyzer → Host	✓	✓
ISE Calibration Data	Analyzer → Host	✓	✓
Photometric Raw Data according to Configuration	Analyzer → Host	Supported	Supported
Analytical Data Transmission Request	Host → Analyzer	×	✓
Factory used communication items:			
Reagent Disk Loading Inquiry	Host → Analyzer	✓	×
Reagent Disk Loading	Analyzer → Host	✓	×
Database Factory Reset Inquiry	Host → Analyzer	✓	×
Database Factory Reset	Analyzer → Host	✓	×

(✓ = Possible; × = not possible)

Table 4: Communication Text Table

Automated Communication




Manually triggered Communication
ISE Calibration Data
Test Orders
Return Test Order
Patient Sample Analytical Data
Control Sample Analytical Data
Photometric Calibration Data
Host
Analyzer

Messages transmitted: Analyzer → Host

Messages transmitted by the analyzer (messages received by the host) are indicated in the table below. The identifier is set in the Comment or 'Special Instruction' field in the Message Header Record with the reason for the messages.

Messages	Syntax / Records	Comment or Special Instructions	Reasons
Test Order Inquiry	H Q|n|^SID L	TSREQ^REAL	Inquiry is made for the ordered tests just after the identified sample has been introduced into the system. SID=SampleID, Test ID is always ALL
Patient / Control Sample Order List	H P|n O|1|^SID.. [C|1|..] L	RSUPL^REAL RSUPL^REPLY RSUPL^BATCH	Reports on the result at the point when the results for the sample have been accumulated. Reports on the result as a response for the inquiry from a host. Transmits results of the selected sample(s) by instruction at the analyzer.
Patient / Control Sample Analytical Data	H P|n O|1|^SID.. [C|1|..] {R [C|1|..]}$_n$ L n = 0~60	RSUPL^REAL RSUPL^REPLY RSUPL^BATCH	Reports on the result at the point when the results for the sample have been accumulated. Reports on the result as a response for the inquiry from a host. Transmits results of the selected sample(s) by instruction at the analyzer.
Photometric Raw Data	H P|n O|1|^SID.. [C|1|..] {R [C|1|..] [M-RR]}$_n$ L	RSUPL^BATCH RSUPL^REAL	Reports results including the absorbance of the photometric tests
Photometric Calibration Data	H M-CR L	PCUPL^REAL	The current calibration is reported immediately after becoming valid.
ISE Calibration Data	H M-ICR L	ICUPL^REAL	The current calibration is reported immediately after becoming valid.
Reagent Disk Loading	H M.EQU	INU^U05	Reports the current loading of a reagent disk including reagent lot numbers in response to

	$_{0}\{M.INV\}_{27}$ L		such an inquiry
Database factory reset response	H M.EQU M.ECD M.ECR L	EAR^U08	Reports the reception of the command or that the request has been ignored

Table 5: Messages Transmitted by the Analyzer

6.4.1 Messages received: Host → Analyzer

Messages transmitted by the host are shown in the table below (messages received by the analyzer).

Messages	Syntax / Records	Comment or Special Instructions	Reasons
Analytical Data Transmission Request Sample	H Q|n|^SID L	RSREQ ^ REAL	Makes inquiry for the results of a test. SID=SampleID, Test ID is assumed as ALL System replies with RSUPL.
Analytical Data Transmission Request Cal	H Q|n|||AppCode L	RSREQ ^ REAL	Makes inquiry for the results of a calibration Only one appCode allowed The system replies with PCUPL or ICUPL . Note: the system reports calibration results of the currently active calibration if still available – receive the real time uploads to avoid gaps in the reporting sequence.
Test Orders	H P|n O|1|SID… [C|1|..] L	TSDWN ^ REPLY TSDWN ^ BATCH	Orders test request for a sample as answer to a Test Selection Inquiry Orders test request for a sample by instruction at the host
Reagent Tray Loading Inquiry	H M.EQU M.INV L	INR^U06	Makes an inquiry for the reagent tray loading **cobas c** 111 instrument replies with INU
Database factory reset request	H M.EQU M.ECD L	EAC^U07	Factory command to reset the database to its default status (reloads the empty database stored on the system) **cobas c** 111 instrument replies with EAR This is for manufacturer's exclusive use and is only included here for completeness. There is no use of this feature for customers.

Table 6: Messages Transmitted by the Host

6.5 System behavior on communication errors

There will be an error message sent to the alarm monitor (incl. red LED at button), if a host system does not confirm a data communication within a defined amount of time. The unconfirmed communication records are not re-sent.

If a host receives data, but responds with a content error (e.g. checksum failed), the erroneous sequence will be repeated. After 3 failed attempts, the communication of this data block is aborted and an error message sent to the alarm monitor (incl. red LED at button).

Results must be sent manually. (after correcting communication problems with the host)

7. ASTM Protocol

7.1 General ASTM Protocol Information

7.1.1 Background

ASTM (American Society of Testing and Material) has a plan for communications between automatic analyzers and host computers for standards E1381-97 (Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems) and E1394-97 (Standard Specifications for Transferring Information Between Clinical Instruments and Computer Systems). The basic specifications of the standards are regulated on X12 of ANSI. These documents are now LIS1-A &LIS2-A2 and are controlled by CLSI.

The host communication interface installed in the **cobas c** 111 instrument systems meets the standards of ASTM.

7.1.2 Communication Processing Layers

The communication process between the system and the host is divided into three layers as shown below. This specification explains the processing and operation methods for the application layer.

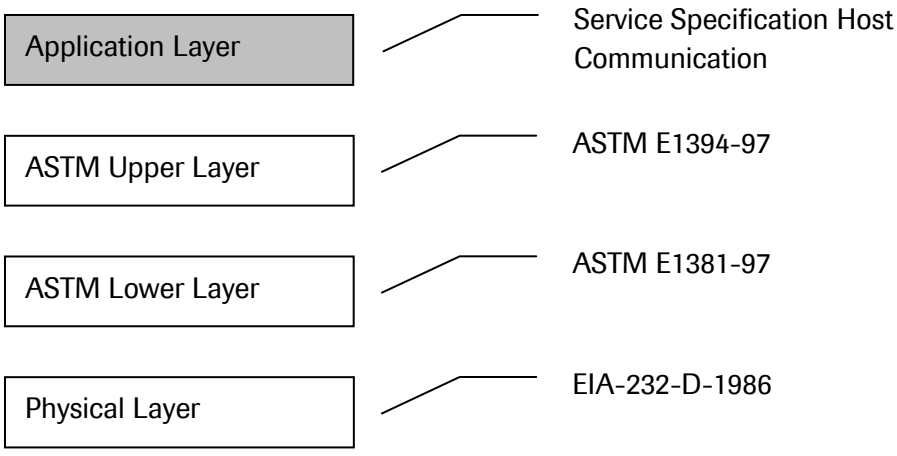


Figure 5: Host Communication Processing Layers

Details of the ASTM protocol can be found in the Annual Book of ASTM Standards.

- **ASTM E1381-97 Low Level Protocol**
  Specification for Low Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems
- **ASTM E1394-97 High Level Protocol**
  Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems.

7.1.3 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. Configuration and communication procedures for transmission and reception of frames are explained in the following chapters.

Item	Method	Explanation
Frame Configurations	For Middle Frame <STX> FN text <ETB> C1 C2 <CR><LF> For Last Frame <STX> FN text <ETX> C1 C2 <CR><LF>	Control character (characters enclosed in < >): <STX> is control character (HEX 02) <ETB> is control character (HEX 17) <CR> is control character (HEX 0D) <LF> is control character (HEX 0A) <ETX> is control character (HEX 03) FN: FN is a single ASCII number. FN indicates the sequence number for a frame (the frame number modulus 8). Frames of a single transmission phase are consecutively numbered beginning with 1, so FN runs from 1 to 7, then continues with 0, 1, and so on. Text: the data content of a frame (maximum 240 characters). Records are sub-divided into intermediate (middle) frames with 240 or fewer characters. Text is part of a split message. C1 and C2: When 1 byte resulting from adding each byte, FN to <ETB> for the middle frame and FN to <EXT> for the last frame, is expressed in hexadecimal, the upper character (16^1) is C1 and the lower character (16^0) is C2. Characters used are '0' to '9' or 'A' to 'F'.
Frame Character Configuration of Text	Characters other than <SOH><STX><ETX> <EOT><ENQ><ACK> <DLE><NAK><SYN> <ETB><CR><LF> <DC1><DC2><DC3> <DC4>	<SOH> is control character (HEX 01) <EOT> is control character (HEX 04) <ENQ> is control character (HEX 05) <ACK> is control character (HEX 06) <DLE> is control character (HEX 10) <NAK> is control character (HEX 15) <SYN> is control character (HEX 16) <DC1> ~ <DC4> are control characters (HEX 11 ~ 14)
Maximum Length of the Frame	247 characters	For one frame, maximum of 240 characters for text, 7 characters for frame control characters. Messages equal to or less than 240 characters are transmitted as one final frame. Messages greater than 240 characters are split into frames that have character lengths that fall within the 240-character limit. The only or final remaining frame becomes the last frame and is indicated by <ETX>. All others are intermediate (middle) frames and are indicated by <ETB>.

Table 7: ASTM Lower Layer Communication Methods

7.1.4 ASTM Syntax

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

This section deals with message coding rules as well as special characters, such as delimiters, used to develop messages provided by records and fields.

7.1.4.1 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 result reports or test requests). 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 as units in a record.

7.1.4.2 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:

ID	Record Types
H	Header Record
L	Message Termination Record
P	Patient Record
O	Test Order Record
R	Result Record
C	Comment Record
Q	Request Record
M-X	Manufacturer specific records

Note: The record type ID is not case sensitive; however, it is suggested to always use uppercase characters.

7.1.4.3 Delimiters

Delimiters are ASCII characters used to separate fields within a record and to separate components within fields. Below is a description of the delimiters and how they are commonly used:

Character	Name	Used as
|	vertical bar	Field delimiter
\	Backslash	Repeat delimiter
^	Caret	Component delimiter
&	ampersand	Escape delimiter
<CR>	carriage return	Record delimiter
<CR><LF>	carriage return, line feed	Record delimiter (alternate form - NOT USED)

7.1.4.3.1 Field Delimiter = Vertical Bar '|'

A Field delimiter is a character used to separate fields that are next to each other in a record. This is also a delimiter for the first Record ID (character that appears in the beginning of a record) and the next field. According to the 2nd character that appears in the Message Header Record (record that appears in the front of a message), a Field delimiter can be defined with an optional character within the Message Header Record; however, it is recommended that a vertical bar '|' (ASCII 124dec) is used.

7.1.4.3.2 Repeat Delimiter = Backslash '\'

When a field is constructed by the same data repeated several times, it is referred to as a Repeated Field. The delimiter between the repeated items for the Repeated Field is called the Repeat delimiter. Repeat delimiters can be defined with an optional character within the Message Header Record; however, it is recommended that a backslash '\' be used.

7.1.4.3.3 Component Delimiter = caret '^'

When a field is constructed by several elements, it is referred to as a Component Field. The delimiter between these elements is the Component delimiter. The Component delimiter can be defined with an optional character within the Message Header Record; however, it is recommended that a caret '^' be used.

7.1.4.3.4 Escape Character = Ampersand '&'

An Escape character is provided to indicate a delimiter for the fields that include general text. When this character occurs in a relevant field, the next character holds a special meaning (discussed below). An Escape character can be defined with an optional character within the Message Header Record; however, it is recommended that an ampersand '&' be used.

7.1.4.3.5 Expression of Special Characters with Escape Character

If you want to use any of the characters that are predefined as delimiters, within a text, you can use the following Escape sequence (starting with & and ending with &). When this sequence is detected in a field, the corresponding character is set as text character and the escape sequence is deleted.

Escape sequences other than these are skipped and treated as NULL value.

&F&	Indicates Field delimiter
&S&	Indicates Component delimiter
&R&	Indicates Repeat delimiter
&E&	Indicates Escape

7.1.4.3.6 Record Delimiter / End of Record Character

The ASCII CR character (HEX 0D) is always used to indicate the end of a record.

7.1.4.3.7 Null values

All fields are position dependent and are obtained by counting field delimiters by their position starting from the beginning of the record. This means if a field is null (no information available), the field delimiters must be included in the record. This ensures that the n^{th} field can be identified by counting n-1 delimiters. Trailing null fields do NOT need to be included. Delimiters are not needed after the last field containing data.

Null values may be sent for the following reasons:

- The value is not known.
- The sender knows the field is irrelevant to the receiving system.
- The value has not changed since the last transmission.

A field containing only a pair of double quotes “” is not a NULL field instead it should be treated by the receiving system as an instruction to delete any existing contents of that field.

Note: The receiving system may ignore any field it does not require. However, fields must always be transmitted in the order specified.

7.1.4.4 Message Transmission Phases

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

- Establishment Phase
- Transfer Phase
- Termination Phase

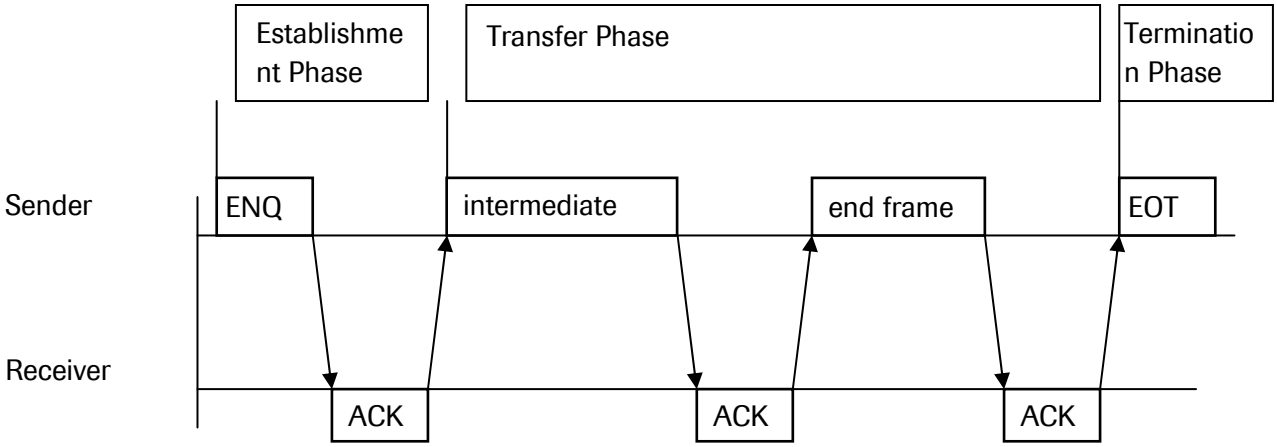


Figure 6: Message Transmission Phases

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. Finally he can process the frame and split it into different records using the [CR] as separator.

7.1.5 Checksum Calculation/ Message Frame

7.1.5.1.1 The Intermediate Frame

[STX]	FN	Text first char.	.....	Text last char.	ETB	CH	CL	[CR]	[LF]

7.1.5.1.2 The End Frame

[STX]	FN	Text first char.	.....	Text last char.	ETX	CH	CL	[CR]	[LF]

[STX] The ASCII code 2, indicating the beginning of a frame transmission.

FN The frame number modulus 8. Frames of a single Transmission Phase are consecutively numbered beginning with 1. So FN runs from 1 to 7, continues with 0, 1, and so on. Use ASCII codes for the digits '0' to '7' (48-55).

Text The data content of a frame (max. 240 characters).

Records are sub-divided into intermediate frames with 240 characters.

Maximum is indicated by [ETB]. The only or last remaining frame is indicated by [ETX]. Different records must be sent in different frames.

[ETB] The ASCII code 23 (17hex), indicating the end of the text block of an intermediate frame.

[ETX] The ASCII code 3, indicating the end of the text block of an end frame.

CH, CL Represents the high nibble (= most significant 4 bit) respectively, the low nibble (=least significant 4 bit) of the 8-bit checksum. CH and CL are represented as two digits of hex numbers. The checksum is the modulus 8 of the sum of ASCII values of the frame characters starting with and including 'FN' and completing with [ETX] respectively [ETB].

Example for Checksum Calculation

```
[STX]1Test[ETX]
```

Character	Value (hex)	Sum
[STX]	02h	00h
'1'	31h	31h
'T'	+54h	85h
'e'	+65h	EAh
's'	+73h	15Dh
't'	+74h	1D1h
[ETX]	+03h	1D4h
	= 1D4h	
	Mod 100h	
	= **D4**h	

to be sent:

```
[STX]1Test[ETX]D4[CR][LF]
```

7.2 Communication Text Content

7.2.1 Record Levels

The following table shows the Standard Record types and levels (see ASTM E 1394-97 Section 5, 'Information Requirements in Clinical Testing')

Level	Record Name	Identifier
0	Message Header Record	H
0	Message Termination Record	L
1	Patient Information Record	P
2	Test Orders	O
3	Result Record	R
1...3	Comment Record	C
1...3	Manufacturer Information Record	M
1	Request Information Record	Q

Table 8: Standard Record Types and Levels

The Manufacturer Specific Records are specific for the **cobas c** 111 instrument and must be received by the host

Level	Record Name	Identifier
1	Photometry Calibration Result	M.CR
1	ISE Calibration Result	M.ICR
3	Photometric Raw Data	M.RR
1	Reagent Disk Loading	INR^U06 INU^U05
1	Database Factory Reset (Command)	EAC^U07 EAR^U08

Table 9: Manufacturer Defined Record Types and Levels

7.2.2 Record Description

7.2.2.1 Field Attributes

Types of attributes held by a field are explained below.

No.	Attribute	Description
1	Field Name	Name of the relevant field. Fields printed with *underlined-italic font* are mandatory fields.
2	Reference	Position of the field. Order in which the relevant fields appear in a record.
3	Format	The format for a field is one of the following: ST: String: A character string TX: Text: A group of character strings that can be printed at the terminal. It is an optional character string; however, a special escape sequence is defined for a display at the terminal. NM: Numeric: A numeric value. Positive (+) or negative (-) is indicated before the numeric value. If it is not indicated, it is treated as positive (+). If a decimal point is not included, the numeric value is treated as an integer. There are no restrictions for placing '0' in the front and for '0s' placed at the end of numbers with decimal points. For certain fields where the resolution with a decimal number cannot be achieved a scientific format is used i.e. (1.234E03) DT: Date. Always use the 4-digit Christian year. The format is YYYYMMDD (YYYY is the 4-digit Christian year, MM is the month, DD is the day). For example, September 5, 1998 is indicated 19980905. TM: Time: 24h format (corresponds with the U.S. Military time) The format is HHMMSS (HH is the hour, MM is the minute, and SS is the second). TS: Time Stamp. A combination of DT and TM. The format is: YYYYMMDDHHMMSS. CM: Combination. A field in which multiple data are combined by a component delimiter.
4	Comments (Data Content)	Contains field contents and any relevant field comments. Note: A field with the message 'Field does not contain data' in the column means that even though it is provided by ASTM, it may be ignored when received.

Table 10: Field Attributes

7.2.2.2 Message Header Record (H)

This record must always be the first record in a transmission. This record contains information about the sender and receiver, instruments, and computer system whose records are being exchanged. It also identifies the delimiter characters. The minimum information that must be sent in a Header record is: H|\^&{RT}

The H corresponds to the record type, H=Header. The | (vertical bar) is used as the field delimiter. The \ (backslash) is the repeat delimiter. The ^ (caret) is the component delimiter. The & (ampersand) is the Escape delimiter. {RT} is the record delimiter i.e. <CR>.

The entire header record consists of the following fields:

```
H|\^&|||c111^Roche^c111^0.5.4.0509^1^1005|||||host|RSUPL^BATCH|P|1|200
51021152259{RT}
```

Field Name	Reference	Format	Comments (Data Content) **H|7.1.**
Record Type ID (H)	07.1.01	ST	→ 'H'
Delimiter Definition	07.1.02	ST	The first character is the field delimiter, the second is the repeat delimiter, the third is the component, and the fourth is the escape character i.e. |\^&
Message Control ID	07.1.03		Not used / ignored by **cobas c** 111 instrument
Access Password	07.1.04		Not used / ignored by **cobas c** 111 instrument .
Sender Name or ID: Name ^Manufacturer ^Instrument Type ^SW Version ^Protocol Vers. ^Serial Number	07.1.05	CM	Name of the machine transmitting this message. **cobas c** 111 instrument **receives data:** These fields will be logged but not used to confirm the proper sender. cobas c 111 instrument transmits data: <Name > The analyzer name given[1]. ^<Manufacturer> → *"Roche"* ^<Instrument Type> → "c111*"* ^<SW Version > → Instrument e.g. *1.2.3.1234* ^<Protocol Vers.> → Comm. Protocol *1* ^<Serial number> → Instrument e.g. *1235*
Others	07.1.06 … 07.1.09		Not used / ignored by **cobas c** 111 instrument
Receiver ID: Name	07.1.10	ST	Name of the machine receiving this message. **cobas c** 111 instrument **transmits data:** The host name given[2]. **cobas c** 111 instrument **receives data:** This field will be logged but not used to confirm the proper receiver (myself).

[1] The name of the analyzer which has been setup in Utilities. See also Definitions – System. Characters that can be used are printable ascii as defined in the appendix.
[2] The name of the host computer which has been setup in Utilities. See also Definitions – System. Characters that can be used are printable ascii as defined in the appendix.

Field Name	Reference	Format	Comments (Data Content) **H|7.1.**
Comment or Special Instructions	07.1.11	CM	A *comment* regarding the message is entered here. cobas c 111 instrument transmits data: To indicate the classification of the transmitted message from the analyzer one of the defined messages (see above) is transmitted. The first component element indicates the purpose for the message, e.g. TSREQ: Test request inquiry RSUPL: Result report … The second component element indicates the cause of the message. REAL: Message automatically generated BATCH: Message generated due to operator command REPLY: Response to an inquiry from a host Or in case of HL7 based Manufacturer spec. recs.: INU^U05: Automated equipment inventory update (MSR) … cobas c 111 instrument receives data: To indicate classification of the transmitted message from the host, one of the defined messages (see above) shall be sent by the host.
Processing ID	07.1.12	ST	Indicates the processing method for the messages. Currently 'P' is used.
Version No.	07.1.13	NM	Enter version number of the communication program. Currently '1' is used.
Date and Time of Message	07.1.14	TS	Format: YYYYMMDDHHMMSS.

EndOfRecord

7.2.2.3 Message Termination Record (L)

This record occurs at the end of a message to indicate the end of a message.

`L|1|N{RT}`

Field Name	Reference	Format	Comments (Data Content) **L|13.1.**
Record Type ID (L)	13.1.01	ST	→ 'L'
Sequence Number	13.1.02	NM	→ '1'
Termination Code	13.1.03	ST	Input the value shown below. N Normal termination E Unspecified System error

EndOfRecord

7.2.2.4 Patient Information Record (P)

This record is used to transfer patient information to the analyzer (test order messages) or to the host (result messages).

Note: On the **cobas c** 111 instrument there is no patient information stored or maintained in the database, this record is therefore ignored when sent to a **cobas c** 111 instrument and filled with a default patient information record when originating from the **cobas c** 111 instrument in e.g. transmission of result records.

In c111 SW V 2 the Laboratory ID field carries the manually entered sampleID part if in NPT Mode (see chapter 2.5.3).

`P|1||[SampleIDpart]`

Field Name	Reference	Format	Comments (Data Content) **P|8.1.**
Record Type ID (P)	08.1.01	ST	→ 'P'
Sequence Number	08.1.02	NM	Sequence number of the Patient Information Record in the message. Always '1'.
Practice Patient ID	08.1.03	ST	Not used / ignored by c111
Laboratory Pat. ID	08.1.04	ST	Unique processing number assigned to the patient by the laboratory, **analyzer → host** c111 receives data: The field and record is ignored c111 transmits data: Only in NPT Mode the field carries the un-extended sampleID part (i.e. the part entered by the user either manually or by barcode. If not in NPT mode the field is left empty.
Rest of List	08.1.05 … up to … 08.1.35		Not used / ignored by **cobas c** 111 instrument

EndOfRecord

7.2.2.5 Test Order Record (O)

This record holds information regarding analysis order and sample information to the analyzer (within test order message) and to the host (within result message).

```
O|1||Sample1|^^^111\^^^121\^^^211\^^^212\^^^221|R||||||N|||||||||||||
O\Q

Response when the host does not have tests to be requested for this
patient
O|1|Sample1|||R||||||A|||||||||||||Z
```

Field Name	Reference	Format	Comments (Data Content) **O|9.4.**
Record Type ID (O)	09.4.01	ST	→ 'O'
Sequence Number	09.4.02	NM	Indicates the sequence number of the Test Order Record at the current layer. This record is in the layer following the Patient Information Record and is reset to 1 for each occurrence of a new Patient Information Record. It is numbered consecutively; 1, 2, etc., for each occurrence of this record.
Specimen ID* Sample ID ^Rack ID / Carrier ID ^Position on Rack/Carrier	09.4.03	CM	Identification for samples host → analyzer. cobas c 111 instrument *receives data:* The identification of a sample i.e. a barcode or an assigned number. The max. Length is 23 characters. Only the SampleID element is handled (the positional indicators are ignored, as the position is recognized by the system itself and a sample cannot be entered without having been identified before) **Samples:** The identification **Controls**: empty → see action code field 09.4.12 **cobas c** 111 instrument ***transmits data:*** → empty – field 09.4.04 will be used instead

Field Name	Reference	Format	Comments (Data Content) O|9.4.
Instrument Specimen ID: Sample ID / Sequence ^Rack ID / Carrier ID ^Position on Rack/Carrier ^Tray ID / Location ID ^Rack/Carrier type ^Tube/Cont. type	09.4.04	CM	Identification for samples analyzer → host. **cobas c** 111 instrument ***receives data:*** → Field is ignored (09.4.03 is read) cobas c 111 instrument *transmits data:* The sample identification known by the instrument Format <Sample ID>^^<Position ID> Element Max Length Format Sample ID 23 ST Position ID 1 NM Elements & Description Sample ID Samples: Instrument's sample-order identification, e.g. either the barcode, a sequence # (returned unchanged or a new ID if is entered on instrument) Controls: '1000 + Control Code (ACN/BCN)' is used. e.g. PNU: Control No. = 300, is sent as "1300" See also action code field 09.4.12 Position ID Values 1 to 8. Counting from the sample area left to right positions first sample is 1 Position on the sample area if the sample is still on-board, otherwise empty.

Field Name	Reference	Format	Comments (Data Content) O|9.4.
Universal Test ID: ^^^Test ID ^Treatment Type (and value) ^Pre-Treatment Type (and value) ^Result Evaluation Type (and value)	09.4.05	CM repeat	Repeat Field (example: ^^^2^1\^^^100\^^^744^1) Specifies Test Orders. **Format** ^^^<HostCode>^<Dilution> The first three elements for this format are empty. Currently Universal Test IDs are not supported. This format is used repeatedly with delimiters when ordering several tests. Maximum of 60 tests can be specified. Element — Max Length — Format Test ID = Host Code Number[Ω] — 5 — NM Treatment — 3 — ST Element Description Test ID, Profile ID (Host Application Code): This is a key field for orders. When transmitting results, this field is left empty, i.e. the relevant Test ID is part of the Result Record. The analyzer identifies the test order with 3-digit numbers. Range : 1-999 NOTE: the Host Application Code is translated from and into the cobas c 111 instrument ACN space using a configurable table. Treatment: General: Specifies treatment to be done on instrument: (A)utodilution, (D)ilution and factor, (C)oncentration and factor, etc., e.g. A, D100, etc. (Roche specific field). **Note**: concentration of samples is not supported on c111. **cobas c** 111 instrument ***receives data:*** Any Value but NULL → dilution / concentration is done according to the value entered in the application protocol If NULL - pipetting and testing is done using the standard analysis parameters. Pre-Treatment & Result Evaluation: Not supported on **cobas c** 111 instrument
Priority	09.4.06	ST	Indicates the priority order of the Patient Samples. Ignored for Control Samples. Values are one of the following: Field Value — Description R — Indicates routine analysis of the patient samples [Ψ] S — Indicates Stat analysis of the patient samples

[Ω] The record should be sent with this field left blank when the host has no Test Selections. See example on page 36.
[Ψ] The record should be sent with R when the host has no Test Selections. See example on page 36.

Field Name	Reference	Format	Comments (Data Content) O|9.4.
Others	09.4.07 … 09.4.11		Not used / ignored by **cobas c** 111 instrument
Action Code [3]	09.4.12	ST	Indicates type of information for the report. cobas c 111 instrument *receives data:* A : Add tests to an existing order NOTE: If the sample does not exist it creates a new sample Needed if no tests for sample (see example page 43) C : Cancel i.e., delete a previously downloaded order NOTE: the sample involved will **not** be deleted if the last test order is cancelled! Q : Quality control order, the specimen ID in field 09.4.3 is ignored cobas c 111 instrument *transmits data:* N : New order (Instrument dependent: If not explicitly implemented it behaves like A) Q : Quality control result data
Others	09.4.13 .. 09.4.22		Not used / ignored by **cobas c** 111 instrument
Date/Time Results Reported or Last Modified	09.4.23	TS	Indicates the date and time the result was obtained. This field is not specified by a host. Format: YYYYMMDDHHMMSS. **cobas c** 111 instrument **receives data:** → Field is ignored **cobas c** 111 instrument **transmits data:** →contains the timestamp of 'Now' i.e. Results Reported TS
Instrument Charge to Computer System	09.4.24		Not used / ignored by **cobas c** 111 instrument
Instrument Section ID	09.4.25		Not used / ignored by **cobas c** 111 instrument
Report Types[4]	09.4.26	ST Repeat	Indicates type of communications. O : Order record X : Results cannot be done / request cancelled Z : No record of this patient/sample (in response to an instrument query) if the host does not have test order(s) for a query. See also footnotes for fields 09.4.05 and 09.4.06. F : Final results Q : Query response - a repeat delimiter and the code Q will follow (e.g. O\Q) - indicates that this order record and all associated information are being sent in response to a query.

[3] Indicates a required field or field component.

Field Name	Reference	Format	Comments (Data Content) O|9.4.
Rest of List	09.4.27 .. 09.4.31		Not used / ignored by **cobas c** 111 instrument

EndOfRecord

7.2.2.6 Comment Record (following the Order Record)

Record to transfer comments regarding the patient's demographic data. This record is transmitted by the host (within test selection message) and the analyzer (within result message).

cobas c *111 instrument does not transmit Comment records. It can receive such records, however most of the content is ignored.*

Field Name	Reference	Format	Comments (Data Content) C|11.1.
Record Type ID	11.1.01	ST	'C'.
Sequence Number	11.1.02	NM	Indicates the sequence number of the Test Request Record in the current layer. Since this record is in the layer following the Test Request Record, it is reset to '1' each time a new Test Request Record is presented and then numbered consecutively; 1, 2, etc.
Comment Source	11.1.03	ST	Indicates the source of the comment. If issued by the host it is 'L'. cobas c 111 instrument receives data: → The record is ignored if not set to L
Comment Text	11.1.04	CM	Format <Comment-1> Only one comment regarding the sample can be specified. From Host to Analyzer Element — Max Length — Format Comment-1 — 30 — ST cobas c 111 instrument receives data: → For **cobas c** 111 instrumenst only Comment-1 is used as and replaces any contents of the sample comment field. Comment-2 to n is ignored and allowed here for compatibility reasons.
Comment Type	11.1.05	ST	Always G for generic/free text comment cobas c 111 instrument receives data: → The record is ignored if not set to G

EndOfRecord

[4] Indicates a field or field component required in ID and Sample No. modes.

7.2.2.7 Result Record

Record to transmit analytical data.

`R|1|^^^111|1480.00|mmol/l||||F||UnitTest{RT}`

Field Name	Reference	Format	Comments (Data Content) **R|10.1.**
Record Type ID	10.1.01	ST	'R'
Sequence Number	10.1.02	NM	Indicates sequence numbers for the Test Request Record in the current layer. Since this record is the layer that follows the Test Request Record, it resets to 1 for each occurrence of a new Test Request Record. It is numbered consecutively; 1, 2, etc., for each occurrence of this record.
Universal Test ID: ^^^Test ID ^Treatment type (and value) ^Pre-Treatment type (and value) ^Result evaluation type (and value)	10.1.03	CM	*Example*: ^^^103^D The first three elements for this format are empty. Currently Universal Test IDs are not supported. Element — Max Length — Format <Test ID> Host Code Number[Ω] — 5 — NM ^Treatment — 3 — ST Element Description Test ID, Profile ID (Host Code Number): This is a key field for orders. When transmitting results, this field is left empty, i.e. the relevant Test ID is part of the Result Record. The analyzer identifies the test with 3-digit numbers. Range: 1-999 NOTE: the Host Application Code is translated from and into the cobas c 111 instrument ACN space using a configurable table. Treatment: General: Specifies treatment to be done on instrument: (A)utodilution, (D)ilution and factor, (C)oncentration and factor, etc., e.g. A, D100, etc. (Roche specific field) **cobas c** 111 instrument : Dilution or Concentration depending on the treatment done according to the value entered in the application protocol D / C / <empty> <empty> - pipetting and testing is done using the standard analysis parameters. Pre-Treatment & Result Evaluation: Not supported on **cobas c** 111 instrument

[Ω] The record should be sent with this field left blank when the host has no Test Selections. See example on page 80.

Field Name	Reference	Format	Comments (Data Content) R|10.1.
Data or Measurement Value	10.1.04	ST	When "result status" = 'X' (i.e. No Value) → no data is set in this field. Element Description Quantitative results: The value corresponds to the measured concentration: e.g., 1.97, 123.4, etc. In case a result is above / below a limit (measurement range), the characters '<' or '>' are added in front of the result (limit) e.g., <0.05, >10.0, etc. Qualitative results: **ARE NOT AVAILABLE ON cobas c** 111 instrument
Units	10.1.05	CM	*Example*: mg/dL Format; <UnitString> Indicates units of the analytical data.
Reference Ranges	10.1.06	NM	**Format:** LowerLimit/UpperLimit/OtherRange Relates to field 10.1.07: L or H: Below/Above reference range (Reference Range), < or >: Low/High scale of assay (test range) For QC samples: target value/ranges for Lower limit/Upper limit see **example1** page 50 The system submits the values entered in the application protocol, if no value is specified the corresponding field is left empty.
Result Abnormal Flags	10.1.07	ST	Field Value Description L : Less than reference range H : Higher than reference range see example page 50 < : Below absolute low scale of assay (test range) > : Above absolute high scale of assay (test range) ex. page 50 N : Normal A : Abnormal → Technical problems Roche instruments provide more instrument specific flags than those defined above by ASTM. The detailed flag information is transmitted to the Host using an additional Comment Record.
Nature of Abnormality Testing	10.1.08		Not used / ignored by **cobas c** 111 instrument

Field Name	Reference	Format	Comments (Data Content) **R|10.1.**
Result Status	10.1.09	ST	Indicates the number of the test conducted for the analytical data. Field Value Description F : Final Result: Used to indicate initial transmission of result (Validated Result) C: Correction of previously transmitted result (i.e., the result of a test-re-run is transmitted) X : Test cannot be completed: Used to indicate an error during processing (e.g. the result has been blocked by instrument) R: Repeat: Used to indicate previously transmitted result (i.e. indicates re-transmission of already sent result) I: QC result is ignored
Date of Change in Instrument Normative Values Units	10.1.10		Not used / ignored by **cobas c** 111 instrument
Operator Identification	10.1.11	ST	Identifies the operator. **cobas c** 111 instrument **receives data:** → Field is ignored **cobas c** 111 instrument **transmits data:** → Field contains the ID of the operator who released the result or SYS if the results was automatically accepted.
Date time test started	10.1.12	TS	Not used / ignored by cobas c 111 instrument
Date Time test completed		TS	Date and time the test result was calculated is designated by YYYYMMDDHHMMSS.
Instrument ID	10.1.14	ST	Not used / ignored by cobas c 111 instrument

EndOfRecord

Field 10.1.6 examples

Example1:
4R|1|^^^687|48.4|U/L|**20.0\30.0**|N||C||admin

Field 10.1.7 examples

Example 1: QC flag Higher than reference range (H)
4R|1|^^^687|49.2|U/L|20.0\30.0|**H**||F||admin

Example 2: QC flag Under test range (<)

4R|1|^^^687|-0.1|U/L||**<**||F||admin

7.2.2.8 Comment Record (following the result record)

Record to transfer comments regarding the analytical data. This record is transmitted by the analyzer only; it is not transmitted by the host (i.e. ignored when a **cobas c** 111 instrument receives such a record).

`C|1|I|43|I{RT}`

Field Name	Reference	Format	Comments (Data Content) **C|11.1.**
Record Type ID	11.1.01	ST	'C'
Sequence Number	11.1.02	NM	Indicates the sequence number of the Comment Record in the current layer. Since this record is in the layer following the Test Request Record, it is reset to '1' each time a new Test Request Record is presented and then numbered consecutively; 1, 2, etc.
Comment Source	11.1.03	ST	Indicates the source of the Comment. Currently, this record is issued only from the analyzer, so 'I' is always used.
Comment Text: Flag Code ^Flag Comment	11.1.04	NM repeated	A comment record is added following a flagged result. All activated flags are transmitted. Repeat delimiters are used if more than one flag is activated.
Comment Type	11.1.05	ST	Character limiting the comment format. This record is issued only from the analyzer, so 'I' is always used.

EndOfRecord

7.2.2.9 Request Information Record

Record to request information from the other device. It is sent by the analyzer (within test order request message) and the host (within result request message)

```
Q|1|^Sample1||ALL|||||||O
```

Note:
Up to SW v 2.0 the sequence number was missing. Corrected in SW v 2.0 and above

Field Name	Reference	Format	Comments (Data Content) **Q|12.1.**
Record Type ID	12.1.01	ST	'Q'.
Sequence Number	12.1.02	NM	Indicates the sequence numbers for the Test Request Record in the current layer. Since this record is the layer that follows the Test Request Record, it resets to '1' each time a new Test Request Record is presented, and then it is numbered consecutively; 1, 2, etc.
Starting Range ID Number	12.1.03	CM	Format: ^<Sample ID> Element Max Length Format Sample ID 23 ST Element Description Sample ID The sample ID is found on a barcode attached to the test tube. It is read by a barcode reader in the analyzer. Total valid character number is 23 It can be a manually entered number on the analyzer if barcode reading is not enabled. cobas c 111 instrument receives data: The SampleID 'ALL' i.e. report on all known samples is not supported by **cobas c** 111 instrument . For 'C' requests (12.1.13) this field is ignored
Ending Range ID Number	12.1.04		Not used / ignored by **cobas c** 111 instrument
Universal Test ID	12.1.05	NM	cobas c 111 instrument receives data: For 'C' = calibration requests the application code number (ACN) For other requests the implementation assumes 'ALL' i.e. all available results for the sample will be reported
Others	12.1.06 … 12.1.12		Not used / ignored **cobas c** 111 instrument
Request Information Status Codes	12.1.13	ST	Field Value Description F The final patient sample result. A Rejects the previous request and accepts the new request. Information can only be requested through the Request Record one at a time. To use this code, it is necessary to reject a current request for information before requesting the next. O Request for Test Request only (no results). Inquiry is sent to a host from the analyzer using this code. C Request a calibration result

EndOfRecord

7.2.2.10 Photometric Calibration Result Record (M.CR)

Record used to transfer results of **cobas c** 111 instrument photometric calibration measurement.

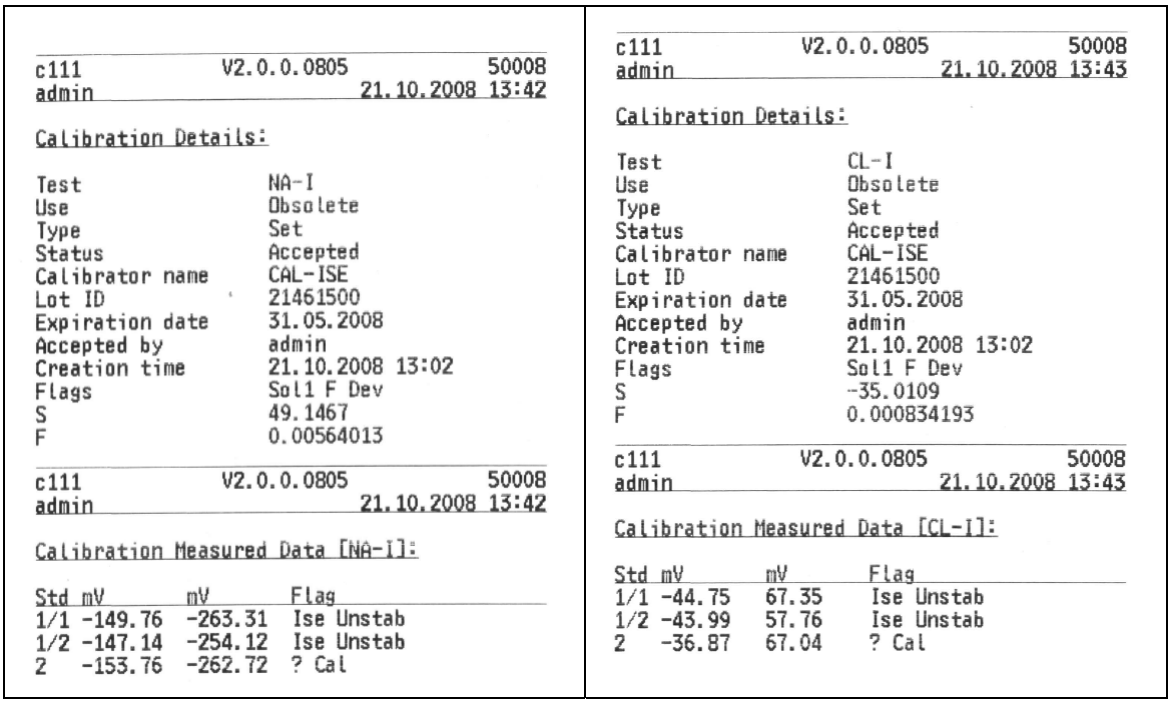
```
2M|1|CR^BM^c111^1|211^Ap211|Rea1.1|mmol/l|BS^Rea1||N^R|2|2005122108345
9|A^$SYS$||1.650000E-01^-3.909952E-
05|SD^^^St1.1|2110^0.0825^0.055^0.11^0^0\0^0.165^0.11 ^0.22^0^0{RT}
```

Field Name	Reference	Format	Comments (Data Content) **M.CR**
Record Type ID	M.CR.01	ST	'M'
Sequence Number	M.CR.02	NM	This record appears as the next layer of the Message Header Record. For one record, the field value is '1'; for specifying several, sequence numbers starting from 1 are assigned.
Record type sub-ID ^BMtag ^Instrument ^Version#	M.CR.03	CM	CR^BM^c111^1 Roche specific record identifier
test number	M.CR.04	CM	Application Code (ACN - as given in masterset) cobas c 111 instrument transmits data: ACN^ShortName (5 chars)
test lot numb.	M.CR.05	ST	Reagent lot no. ISE: Electrode lot no.
Units	M.CR.06	ST	*Example*: mg/dL Indicates units of the analytical data. **Format:** <UnitString > StdUnits
Test Container Description	M.CR.07	CM	Format: |BS^GLUC^1| **cobas c** 111 instrument **transmits data:** only one field for a bottle set carrier type => "BS" (indicates a Bottle Set) ^ShortName ^ExpirationFlag (1 = 'Expired Bottleset ', otherwise empty) **ISE**: carrier type => "EL" (indicates an Electrode) **Example Page 55**
Test Package Number	M.CR.08	CM repeat	Format: |313^R1^1234567\313^SR^2345678| **cobas c** 111 instrument **transmits data:** only one field for a bottle set BCN (Bottle Code Number) ^BottleTypeText ^SerialNbr (7 digits) - repeat field for all bottles **ISE:** BCN is empty, BottleTypeText is "NA", "K", "CL" or "REF", SerialNbr is the electrode serial number. Example Page 55
Calibration method N^M, N^R,	M.CR.09	CM	N - quantitative L - qualitative (not currently supported by **cobas c** 111 instrument) I - **ISE** calibration mode M - master (Lot Master Calibration) R - recalibration (Bottle set Calibration)
Replication number	M.CR.10		Number of Replicates actually done i.e. 1 or 2 If option "Use Old" is used, calibrations are copies of an old calibration results and do not have an order result. Therefore such calibrations do not have replicates and the number of replicates is 0. (See Operator manual v 2.0 page B-58)
date/time calibration completed	M.CR.11	TS	date/time when result is ready

Field Name	Reference	Format	Comments (Data Content) M.CR
result states	M.CR.12	CM	A – Accepted (with or without flags) cobas c 111 instrument transmits data: A^<operator> the user who accepted the cal will be submitted O – Calculated no flags F – Calculated with flags X – cannot be measured (less than calculated)
Result characteristics	M.CR.13		Not used / ignored by **cobas c** 111 instrument
Curve Parameters	M.CR.14	CM	list of test number specific (application) curve parameters, e.g., A, B, C, D for LogitLog4 NOTE: the parameter transmitted is the original internal data. For linear models the factor is usually displayed as 1/parameter curve parameter[0]^ curve parameter[1]^ curve parameter[2]^ curve parameter[3]^ curve parameter[4] **cobas c** 111 instrument **transmits data:** Scientific notation i.e. 1.3454E2 ISE: slope^solution factor Example Page 55
Calibrators Container Description	M.CR.15	CM	field components: carrier type^^^calibrator lot number **cobas c** 111 instrument **transmits data:** only one field for a calibrator (set) carrier type = “SD” calib. lot nr (8 chars)
Calibrator Result text {^ … } {\…}	M.CR.16	CM \CM ..	effective signal (only one value per single measurements, n values for replicates); this field component is repeated for each calibrator level Nbr of replicates is in M.CR.10 cobas c 111 instrument transmits data: Repeated from STD1 to max. STD6 for as many as there are. Format <Targetvalue> (Conc) ^<Rate – dAbs or dAbs/Min> ^<Replicate1 – dAbs or dAbs/Min> (Rate) ^<Replicate2 – dAbs or dAbs/Min> (Rate) ^<Data Alarm> i.e. highest priority flag of a STD measurement ^<Prozone Value> (Antigen Excess Rate) **ISE**: In case of an ISE calibration, the Prozone Value contains the ISE Standard Signal (as opposed to Sample Signal in Rate) **Example Page 55**

EndOfRecord

Examples : Left Sodium *Right : Chloride*



c111 V2.0.0.0805 50008
admin 21.10.2008 13:42

Calibration Details:

Test	NA-I
Use	Obsolete
Type	Set
Status	Accepted
Calibrator name	CAL-ISE
Lot ID	21461500
Expiration date	31.05.2008
Accepted by	admin
Creation time	21.10.2008 13:02
Flags	Sol1 F Dev
S	49.1467
F	0.00564013

c111 V2.0.0.0805 50008
admin 21.10.2008 13:42

Calibration Measured Data [NA-I]:

Std	mV	mV	Flag
1/1	-149.76	-263.31	Ise Unstab
1/2	-147.14	-254.12	Ise Unstab
2	-153.76	-262.72	? Cal

c111 V2.0.0.0805 50008
admin 21.10.2008 13:43

Calibration Details:

Test	CL-I
Use	Obsolete
Type	Set
Status	Accepted
Calibrator name	CAL-ISE
Lot ID	21461500
Expiration date	31.05.2008
Accepted by	admin
Creation time	21.10.2008 13:02
Flags	Sol1 F Dev
S	-35.0109
F	0.000834193

c111 V2.0.0.0805 50008
admin 21.10.2008 13:43

Calibration Measured Data [CL-I]:

Std	mV	mV	Flag
1/1	-44.75	67.35	Ise Unstab
1/2	-43.99	57.76	Ise Unstab
2	-36.87	67.04	? Cal

Corresponding HIF outputs below.

Example Sodium

2M|1|CR^BM^c111^1|989^NA-I|GSS_ONLY|mmol/L|EL^NA|^NA^0\^REF^0|I^R|1|200
81021130649|A^admin||4.914673E+01^5.640128E-03|SD^^^21461500|150^-149.76^-
149.76^^18^-263.31\150^-147.14^-147.14^^18^-254.12\110^-153.76^-153.76^^110^-
262.72

Example Chloride

2M|1|CR^BM^c111^1|991^CL-I|GSS_ONLY|mmol/L|EL^CL|^CL^0\^REF^0|I^R|1|2008
1021130650|A^admin||-3.501088E+01^8.341931E-04|SD^^^21461500|115^-44.75^-
44.75^^18^67.35\115^-43.99^-43.99^^18^57.76\72^-36.87^-36.87^^110^67.04

7.2.2.11 Photometric Absorbance Data Record (M.RR)

Record used to transfer raw absorbance data of photometric tests.

Only the analyzer can send this record.

For transfer of raw results (more values - array - for one measurement); this record is sent in addition to the Result Record depending on the configuration settings (see Instrument Configuration record)

```
M|5|RR^BM^c111^1|10|10\0\87\109\131\153\200\225\250\275\300\325\350\37
5\400\425\450\475\500\525\550\575\600\625\650\675\700\725\750\775\800\
825\850\875\900\925\950\975\1000\1025|0.055000{RT}
```

Field Name	Reference	Format	Comments (Data Content) **M.RR**
Record Type ID	M.RR.01	ST	'M'
Sequence number	M.RR.02	NM	The field value is '1' for one record. To specify several records, sequence numbers starting from 1 are assigned.
Record type sub-ID ^BMtag ^Instrument ^Version#	M.RR.03	CM	Roche specific record identifier RR^BM^c111^1
Starting value	M.RR.04	NM	cobas c 111 instrument transmits data: → Empty cuvette signal. For bi-chromatic measurements: the difference between the main wavelength and sub-wavelength absorbance data of the system calibration ('water and air control) Only one point is reported A measuring point in [Abs] is multiplied with 10000 to be transmitted. i.e. 1.2 Abs → 12000 transmitted
Value list	M.RR.05	NM repeat	Repeat field. cobas c 111 instrument transmits data: → AN_{CUV}(Lm, Lr, n) or mono AN_{CUV}(Lm,n) [uAbs] For bi-chromatic measurements: the difference between the difference between the main wavelength and the sub-wavelength absorbance data All measured points are reported. A measuring point in [Abs] is multiplied with 10000 to be transmitted. i.e. 1.2 Abs → 12000 transmitted
Effective signal	M.RR.06	NM	effective signal (only one value per single measurement) The signal is sent in dAbs or dAbs/Min (depends on reaction model)

EndOfRecord

7.3 Manufacturer Specific Records (MSR)

Newly introduced functions will use the MSRs specified in [7] – the use of specific fields for **cobas c** 111 instruments is outlined below.
The collection of Manufacturer Specific Records bases on the standards, specified below:

1. Health Level 7, version 2.4 (HL7v2.4), chapter 13.
2. NCCLS standards AUTO3 "Laboratory Automation: Communications with Automated Clinical Laboratory Systems, Instruments, Devices, and Information Systems".

Please refer to these documents for any additional details.

Data flows and messages

- The data flows based on concepts and definitions from the NCCLS standards AUTO3.
- The messages are described in detail in the HL7v2.4 and NCCLS-AUTO3 standards.
- The message and event identifiers send with the MSH-9 segment-field "Message type" of HL7 should be sent with the field 7.1.11 "Comment or Special Instructions" of Header.

7.3.1 Reagent Disk Loading

Request or send information from and to the other device. It is sent by the host as inquiry or by the analyzer as response to an inquiry. Uses the INR / INU commands.

7.3.1.1 Automated equipment inventory request (INR - event U06)

General: This message is used to request information about inventory items from one application to another (e.g., Laboratory Automation System to automated equipment). The equipment specified in the EQU segment should respond with the information about inventory item requested in the INV segment (or all items).

cobas c 111 instrument: The message will trigger an upload of the reagent disk status. For specific queries only the field 5 of the INV segment "Container Carrier Identifier" is accepted.

INR^U06	Inventory Request Message
H	Message Header
M|1|EQU	Equipment Detail
M|1|INV	Inventory Detail (query for reagent disk only)
L	

7.3.1.2 Automated equipment inventory update (INU - event U05)

This message is used to send information about inventory items from one application to another (e.g., automated Equipment to a Laboratory Automation System).

INU^U05	**Inventory Update Message**
H	Message Header
M|1|EQU	Equipment Detail
0{ M|1|INV }27	Inventory Detail 0 to 27 segments
L	

7.3.2 Database Factory Reset

Request the database initialization to factory default from the other device. It is sent by the host.

The system can only be reset in 'Standby' mode.

Once such a command is received it will be confirmed an EAR and will then change to the 'error' state immediately – a restart is required to make the reset active - the database is replaced with the factory provided during startup only.

7.3.2.1 Automated equipment command (EAC - event U07)

General: This message is used to send equipment commands from one application to another (e.g., automated Equipment to a Laboratory Automation System).

cobas c 111 instrument: The message will trigger the initialization of the database at the next system startup. See segment description for specifics.

EAC^U07	**Equipment Command Message**
H	Message Header
M|1|EQU	Equipment Detail
M|1|ECD	Equipment Command Detail – see segment information
L	

7.3.2.2 Automated equipment response (EAR - event U08)

This message is used to send equipment responses to previously issued commands from one application to another (e.g., automated Equipment to a Laboratory Automation System).

EAR^U08	**Equipment Command Message**
H	Message Header
M|1|EQU	Equipment Detail
M|1|ECD	Equipment Command Detail – reply command reference number as received
M|1|ECR	Equipment Command Response OK or UN if the command cannot be accepted See segment information for details
L	

7.4 MSR Segment Definitions used with cobas c 111 instrument

The table definition of fields of the MSRs below and the description of the fields base directly on the HL7v2.4 – chapter 13

Column description for:
“Data Type” The data types as outlined in the previous section

Column description for:
“Opt In” optionally for incoming messages = “Processed on Instrument”
“Opt Out” optionally for outgoing messages = “Transmitted to Host”

R	Required / mandatory key information (unique processing key required to identify the information).
C	Conditional information, that is, information which is required in certain circumstances
O	Optional information, supported by Roche universal ASTM driver, processed on instrument if applicable, transmitted if available on instrument.
—	Not processed / not required

7.4.1 Equipment detail segment (EQU)

The equipment detail segment contains the data necessary to identify and maintain the equipment that is being used throughout the Laboratory Automation System.

#	Field Name	Data Type	Opt In	Opt Out	Re-peat	Description
1	Record Type ID	Char	R	R		M : Manufacturer Record Instrument transmits upper case characters and receives upper or lower case.
2	Sequence Number	Pos_int	R	R		1 : Sequence number is always one (1).
3	Record type sub ID	Text ^text ^text ^text	R — — —	R O O O		**cobas c** 111 instrument **receives data:** → field is ignored cobas c 111 instrument transmits data: Format: |EQU^RO^c111^1| EQU ^RO (Roche specific record identifier) ^Instrument abbreviation *(*c111*)* ^Version# of protocol implementation *(1)*
4	Equipment Instance Identifier	EI	R	R		|c111| **cobas c** 111 instrument **receives data:** → field is ignored cobas c 111 instrument transmits data: <entity identifier (ST)> **cobas c** 111 instrument
5	Event Date/Time	TS	R	R		**cobas c** 111 instrument **receives data:** → field is ignored **cobas c** 111 instrument **transmits data:** → YYYYMMDDHHMMSS
6	Equipment State	CE	C	C		Not used / ignored by **cobas c** 111 instrument
7	Local/Remote Control State	CE	O	O		Not used / ignored by **cobas c** 111 instrument
8	Alert Level	CE	O	O		Not used / ignored by **cobas c** 111 instrument

EndOfRecord

7.4.1.1 Equipment instance identifier (EI)

```
Components: <entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^
            <universal ID type (ID)>
```

Definition: This field identifies the equipment. This is the identifier from an institution's master list of equipment. The <namespace ID> identifies the institution.

7.4.1.2 Event date/time (TS)

Definition: This field is the date/time when the event (e.g., state transition, issuing of command, finishing of command execution) occurred.

7.4.2 Inventory detail segment (INV)

The inventory detail segment is the data necessary to track the inventory of substances (e.g. reagent, tips, waste) on equipment.

#	Field Name	Data Type	Opt In	Opt Out	Re-peat	Description
1	Record Type ID	Char	R	R		M : Manufacturer Record Instrument transmits upper case characters and receives upper or lower case.
2	Sequence Number	Pos_int	R	R		1 : Sequence number is always one (1).
3	Record type sub ID	Text ^text ^text ^text	R — — —	R O O O		**cobas c** 111 instrument **receives data:** → field is ignored cobas c 111 instrument transmits data: Format: |INV^RO^c111^1| INV ^RO (Roche specific record identifier) ^Instrument abbreviation (c111) ^Version# of protocol implementation (*1*)
4	Substance Identifier	CE	—	R		Format: |2-123^R1-GLUC| or |4-123^SR-GLUC| **cobas c** 111 instrument **transmits data:** only the first 2 fields <identifier (ST)> BottleCode (ST5) ^<text (ST)> BottleCodeTx (ST) One element is composed of the reagent type (NM1) and the bottle code (NM3) i.e. n-nnn The textual version carries the Reagent type as ST2 followed by a dash and the material name Reagent type is defined as: 1 – No / 2 - R1 / 3 - R2 / 4 – SR (1 - No is used in case of auxiliary liquids such as Cleaner or Diluents)
5	Substance Status	CE	—	R	Y	Format: |OK | **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> is used according to the table below
6	Substance Type	CE	—	O		Format: |MR | **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> is used according to the table below
7	Inventory Container Identifier	NM	—	O		Format: |1234567| cobas c 111 instrument transmits data: <SerialNbr (NM7)>
8	Container Carrier Identifier	NM	—	O		Format: |5| cobas c 111 instrument receives data: Number of the reagent disk to be reported (1…8) or 0 to request the currently loaded. cobas c 111 instrument transmits data: <diskID (NM)> ID of the reagent disk reported.

#	Field Name	Data Type	Opt In	Opt Out	Re-peat	Description
9	Position on Carrier	NM	—	—		Format: |1234567| **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> SerialNbr (ST7)
10	Initial Quantity	NM	—	O		Format: |100| **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> Full = 100% (NM3)
11	Current Quantity	NM	—	—		Not used / ignored by **cobas c** 111 instrument
12	Available Quantity	NM	—	O		Format: |68| **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> ActualLeft (NM3) (e.g. 68%) or "n.a." for bottles where volume management is disabled
13	Consumption Quantity	NM	—	—		Not used / ignored by **cobas c** 111 instrument
14	Quantity Units	CE	—	O		Format: |%| **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> % (ST1) or "uL" for bottles where volume management is disabled
15	Expiration Date/Time	TS	—	O		Format: |200411| **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> <ExpiryDate> YYYYMM
16	First Used Date/Time	TS	—	O		Format: |20041105| **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> <1stUseDate> YYYYMMDD
17	On Board Stability Duration	TQ	—	—		Not used / ignored by **cobas c** 111 instrument
18	Test/Fluid Identifier(s)	CE	—	—	Y	Not used / ignored by **cobas c** 111 instrument
20	Manufacturer Lot Number	ST	—	O		Format: |1254abcd| **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> LotDescriptor (ST8)
21	Manufacturer Identifier	CE	—	—		Not used / ignored by **cobas c** 111 instrument
22	Supplier Identifier	CE	—	—		Not used / ignored by **cobas c** 111 instrument

EndOfRecord

7.4.2.1 Substance identifier (CE)

```
Components:  <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate
             identifier (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system
             (ST)>
```

Definition: Unique identifier for the substance that is in inventory. This is a manufacturer-specific identifier.

User-defined table – Manufacturer identifier

Value	Description
ALL	Used for query of all inventory items

7.4.2.2 Substance status (CE)

```
Components:  <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate
             identifier (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system
             (ST)>
```

Definition: The status of the inventoried item. The status indicates the current status of the substance. Refer *to HL7 table 0383 – Substance status* for suggested values.

Table 0383 - Substance status supported by **cobas c** 111 instrument

Value	Description
EW *	Expired Warning
NW *	Not Available Warning
OK *	OK Status

7.4.2.3 Substance type (CE)

```
Components:  <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate
             identifier (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system
             (ST)>
```

Definition: The type of substance. Refer to *HL7 table 0384 – Substance type* for suggested values.

Table 0384 - Substance type supported by **cobas c** 111 instrument

Value	Description
MR	Multiple Test Reagent (consumption cannot be tied to orders for single test)
DI	Diluent
LI	Measurable Liquid Item (e.g. Cleaner)

7.4.3 Equipment command segment (ECD)

The equipment command segment contains the information required to notify the receiving component what is to happen. **Currently Database Reset is the only command in use:**

NOTE: Due to the consequences when initiated it is not recommended to implement this command. (**manufacturing purposes**).
The description is only for completeness of documentation, no use in the laboratory environment.

#	Field Name	Data Type	Opt In	Opt Out	Re-peat	Description
1	Record Type ID	Char	R	R		M : Manufacturer Record Instrument transmits upper case characters and receives upper or lower case.
2	Sequence Number	Pos_int	R	R		1 : Sequence number is always one (1).
3	Record type sub ID	Text ^text ^text ^text	R — — —	R O O O		**cobas c** 111 instrument **receives data:** → field is ignored cobas c 111 instrument transmits data: Format: |ECD ^RO^c111^1| ECD ^RO (Roche specific record identifier) ^Instrument abbreviation (*c111*) ^Version# of protocol implementation (*1*)
4	Reference Command Number	NM	R	—		Format: |12345| **cobas c** 111 instrument **receives data:** numeric (NM5) See below
5	Remote Control Command	CE	R	—		Format: |IN | **cobas c** 111 instrument **receives data:** only the first field <identifier (ST)> is used and only “IN” is supported.
6	Response Required	ID	O	—		**cobas c** 111 instrument **receives data:** Execution is never synchronized, so N is assumed and the field is ignored
7	Requested Completion Time	TQ	O	—		Not used / ignored by **cobas c** 111 instrument
8	Parameters	ST	O	—	Y	Format: |C111-2509| **cobas c** 111 instrument **receives data:** only one field (ST9) Use ‘C111-2509’ a string field which has to match exactly – otherwise the request will be ignored.

EndOfRecord

7.4.3.1 Reference command number (NM)

Definition: This field contains the unique identifier for this particular command that should be used by the various components for future referral to this command. This number is generated by the originator of this command.

7.4.3.2 Response required (ID)

Definition: This field identifies the mode of synchronization that is to be used in relation to the execution of the command. “Y” (Yes) means that the response is required immediately after execution; “N” (No) response is not required at all. Refer to *HL7 Table 0136 – Yes/no indicator* for valid values.

7.4.3.3 Parameters (ST)

Definition: This field identifies the parameters of the command (if they are not included in separate segment[s]).

7.4.4 Equipment command response segment (ECR)

The equipment command response segment contains the receiving component's response to the previously received command.

#	Field Name	Data Type	Opt In	Opt Out	Re-peat	Description
1	Record Type ID	Char	R	R		M : Manufacturer Record Instrument transmits upper case characters and receives upper or lower case.
2	Sequence Number	Pos_int	R	R		1 : Sequence number is always one (1).
3	Record type sub ID	Text ^text ^text ^text	R — — —	R O O O		**cobas c** 111 instrument **receives data:** → field is ignored cobas c 111 instrument transmits data: Format: |ECR ^RO^ **c111** ^1| ECR ^RO (Roche specific record identifier) ^Instrument abbreviation (c111) ^Version# of protocol implementation (*1*)
4	Command Response	CE	—	R		Format: |OK| **cobas c** 111 instrument **transmits data:** only the first field <identifier (ST)> is used according to the table below only "OK" and "UN" is supported see parameters
5	Date/Time Completed	TS	—	—		Not used / ignored by **cobas c** 111 instrument
6	Command Response Parameters	ST	—	O	Y	Format: |C111 -2509| **cobas c** 111 instrument **transmits data:** only one field (ST9) Reports the same tag to confirm the reset or an empty field to indicate that the reset request was ignored 'C111 -2509' a string field which has to match exactly.

EndOfRecord

7.4.4.1 Command response (CE)

```
Components:  <identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate
             identifier (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system
             (ST)>
```

Definition: This field identifies the response of the previously issued command. Refer *to HL7 table 0387 – Command response* for valid values.

Table 0387 - Command response

Value	Description
OK *	Command completed successfully
UN *	Command cannot be completed for unknown reasons

7.4.4.2 Command response parameters (ST)

Definition: This field identifies any associated parameters that relate to the returned response command message.

EndOfRecord

7.5 Data types

Because ASTM E1394 does not support sub-components, every field that requires data type consisting of sub-components will be defined in the Roche Diagnostics ASTM 2.0 specification explicitly. In most cases it is sufficient to consider the 1st sub-component of component only.
List of data types used in the Roche Diagnsotics ASTM 2.0 MSRs based on the HL7v2.4 chapter 13 is presented below. For details refer to the chapter 2 of the current version of HL7 standard.

Data Type Category/ Data type	Data Type Name	Notes/Format
Alphanumeric		
ST	String	
FT	Formatted text	Roche ASTM does not require support for any specific formatting characters, i.e. FT=ST. Any format characters should be send using escape delimiters as defined in the ASTM E1394, e.g., &XA& could equal line feed.
Numerical		
CQ	Composite quantity with units	<quantity (NM)> ^ <units (CE)>
NM	Numeric	
SN	Structured numeric	<comparator> ^ <num1 (NM)> ^ <separator/suffix> ^ <num2 (NM)>
NA	Numeric Array	<value1 (NM)> ^ <value2 (NM)> ^ <value3 (NM)> ^ …
Identifier		
ID	Coded values for HL7 tables	
IS	Coded value for user-defined tables	
EI	Entity identifier	<entity identifier (ST)> ^ <namespace ID (IS)> ^ <universal ID (ST)> ^ <universal ID type (ID)>
Date/Time		
TS	Time stamp	YYYY[MM[DD[HHMM[SS[.S[S[S[S]]]]]]]][+/-ZZZZ] ^ <degree of precision>
Code Values		
CE	Coded element	<identifier (ST)> ^ <text (ST)> ^ <name of coding system (IS)> ^ <alternate identifier (ST)> ^ <alternate text (ST)> ^ <name of alternate coding system (IS)> Roche ASTM requires that only the 1st component will be implemented. Implementation of other components is optional. Of course in case of implementation of the 1st component only, the trailing component delimiters can be omitted.
Generic		
CM	Composite	<specimen source name or code (CE)> ^ <additives (TX)> ^ <freetext (TX)> ^ <body site (CE)> ^ <site modifier (CE)> ^ <collection method modifier code (CE)> ^ <specimen role (CE)>
Time Series:		
TQ	Timing/quantity	<quantity (CQ)> ^ <interval (*)> ^ <duration (*)> ^ <start date/time (TS)> ^ <end date/time (TS)> ^ <priority (ID)> ^ <condition (ST)> ^ <text (TX)> ^ <conjunction (ID)> ^ <order sequencing (*)>

8. Appendix A – Flags

8.1 Data Flags

Nr.	c111	Comment c111 Check
5	High Abs	Excessive Absorbance Description The absorbance value to be used for calculation and checks is > 2.0 Abs.
6	Ag Excess	Prozone Error Description The sample contains an excess antigen and a valid result cannot be calculated.
9	Ep Unstab	Reaction limit over Description The absorbance values near the endpoint show unacceptable fluctuation.
11	Non Linear <Kin Read	Linearity abnormal Description The first and last parts of the reaction curve have different slopes. Not enough kinetic readings. Insufficient absorbance readings were found in the linear part of the reaction to be able to calculate a rate. Not enough readings in kinetic range for calc mode Kinetic
26	>Test Rng	PANIC value over (upper) Technical Limit Description Value over the technical limit. The result is higher than the upper limit for the test.
27	<Test Rng	PANIC value over (lower) Technical Limit Description Value under the technical limit. The result is lower than the lowest limit for the test.
40	>RR	Outside of expected value (upper) Description For patient samples, the calculated concentration is greater than the upper limit of the expected value range. nnnnn is the actual value which was checked against

41	<RR	Outside of expected value (lower) Description For patient samples, the calculated concentration is less than the lower limit of the expected value range. nnnnn is the actual value which was checked against
46	CALC RANGE	Absorbance Maximum Over (nonLin curve) Description The absorbance of a sample is found equal or greater than the maximum theoretical concentration. The result field will be left blank on the report and Data Review screen. This blank result is transmitted, together with the alarm code ">" to the Host.
56	High Act Low Act	Kinetic unstable (subst. Hitachi Rate Prozone check) Description The Absorbance change during measurement exceeds the accepted limit, i.e. the reaction has taken off too fast. Possibility of substrate exhaustion. Or the absorbance change during the measurement is lower than the defined limit.
18	Ise Unstab	ISE Noise error Description The signal from the electrode(s) was not stable during the measurement.
19	Air Fluid Seg Fluid	ISE Voltage Level error Description The length of the fluid segment was too short. The end of the fluid segment was not detected. It takes too long for a sample segment to reach the electrodes.
91	Air Isecal Seg Isecal	Description The length of the calibrator segment was too short. The end of the calibrator segment was not detected. It takes too long for a calibrator segment to reach the electrodes.
68	No Fluid	Description The fluid sensors (1 or 2) could not detect any liquid.
90	No Isecal	Description Fluid sensor 2 could not detect a calibrator.

8.2 Calibration Flags

Nr.	c111	Comment c111 Check
12	>Reag Rng <Reag Rng	S1ABS abnormal Description During calibration the absorbance value of the lowest calibrator is below the lower defined range or above the upper defined range.
13	>Repl Dev	DUPLICATE error Description Greater than replicate deviation. Deviation between replicates exceed programmed limit. One or more replicates are erroneous.
14	Curv Dir	STANDARD error Description Curve direction. The direction of the calibration curve is incorrect / not as expected.
16	Calc Error	Calibration error (Calib Flag) Description Calculation error. Slope or nonlinear standard curve cannot be calculated due to a calibration error.
17	>Std Dev	SD limit error Description Greater than standard deviation. A point in the calibration fell outside the defined limits.
20	Out of Rng	Slope abnormal Description Slope out of range. The slope for the specified electrolyte cartridge is outside of the acceptable/ programmed range.
22	Sol1 F Dev	Internal Standard concentration abnormal Description The concentration of the Calibrator on the ISE unit was not within the expected range.
80	Non Mono	Monotony of curve Description Curve not monotonic.

Nr.	c111	Comment c111 Check
		No calibration curve could be calculated because the rates of the calibrators were non-monotonic.
84	Out of Rng	Description Curve out of range. The calibration curve is outside of the acceptable/ programmed range.

8.3 QC-Flags

Nr.	c111	Comment c111 Check
29	>R 2(2s) <R 2(2s)	2-2SA (Syst.Error 1 -2 Results) Description: Two sequential control measurements are above 2SD or below -2SD, both on the same side.
35	R 1(3s)	1-3SD (QC error 1**)** Description: One control value is above 3SD or below -3SD.
36	R 1(2.5s)	1-2.5SD (QC error 2) Description: One control value is above 2.5 SD or below -2.5 SD.

8.4 Derived Flags

Nr.	c111	Comment c111 Check
43	Cal Error	Calibration Failure Data (Sample Flag) Description No calibration data or previous calibration data used. CAL ERROR appears on each control and patient sample for the affected test until the problem is resolved. Caused by an alarm that occurred during calibration because the calibration could not provide a usable result.
110	? Cal	Description A result where its calibration is flagged The calibration was in question and has been flagged, however the calibration could be used to calculate the result (compare with CAL ERROR where the calibration did not provide a usable result)
111	? QC	Description A result where the quality control measurement is flagged The last QC measurement before this measurement was flagged. The dependency is derived from the time sequence.
112	Cal Due	Description A result where the calibration is due but not yet executed (Regular mode only). The user decided to delay the calibration measurement

8.5 Treatment Flags

Nr.	c111	Comment c111 Check
120	>	Description A rerun result with the same running parameters (repeated)
121	V	Description A rerun result with diluted sample

8.6 Flag Priority List

The list defines the display priority in ascending order

- The Flags of the Treatment Group are displayed in parallel with the result flag
- The Flags of the Derived Group are represented separately in the detail and printout

No.	Flag-Name	NG-Ref	Check name
5	High Abs	>Abs	Check: High Absorbance (Excessive Absorbance)
68	No Fluid	Samp.B	ISE Controller Flag: NO FLUID
90	No Isecal	ISE.S	ISE Controller Flag: NO STD
19	Air Fluid	ISE.E	ISE Controller Flag: SEG FLUID ISE Controller Flag: AIR FLUID
91	Air Isecal	--	ISE Controller Flag: SEG STD ISE Controller Flag: AIR STD
18	Ise Unstab	ISE.N	ISE Controller Flag: ISE UNSTAB
12	Reag Rng	S1A.E	Check: Reagent Range
9	Ep Unstab	>React	Check: Endpoint Unstable
56	High Act	>Kin	Check: High Activity / Low Activity
14	Curv Dir	Std.E	Check: Curve Direction
11	Non Linear	>Lin	Check: Kinetic Readings Check: Non Linear
13	>Repl Dev	Dup.E	Check: Duplicate Standard
16	Calc Error	Cal.E	Check: Calculation Error
80	Non Mono	Mono.E	Check: Curve Non Monotonic
20	Out of Rng	Slop.E	Check: Slope Out of Range (ISE)
84	Out of Rng	Sig.E	Check: Curve Out Of Range
17	>Std Dev	SD.E	Check: Standard Curve Deviation
22	Sol1 F Dev	IStd.E	Relativer Check des Solution-1 Faktors
6	Ag Excess	>Proz	Check: Antigen Excess
26	>Test Rng	>Test	Check: Test Range (Teil 1) Check: Test Range (Teil 2)
27	<Test Rng	<Test	Check: Test Range (Teil 1) Check: Test Range (Teil 2)
40	>RR	>Ref	Check: Reference Range
41	<RR	<Ref	Check: Reference Range
43	Cal Error	Cal.E	Check: Calculation Error (Sample Flag)
46	Calc Error	Samp.?	Result calculation out of range (Not used)
29	R 2(2s)	S2-2Sa	QC Check: R2 (2s)
35	R 1(3s)	Q3SD	QC Check: R1(3s)
36	R 1(2.5s)	Q2.5SD	QC Check: R1 (2.5s)
110	? Cal	--	Derived-Flag:Flagged Calibration
111	? QC	--	Derived-Flag:Flagged Quality Control
112	Cal Due	--	Derived-Flag:Flagged Calibration Due
120	>	>	Treatment-Flag:Repeat
121	V	v	Treatment-Flag:Rerun Diluted
122	^	^	Treatment-Flag:Rerun Concentrated (Not used)

9. Appendix B – Communication Examples

In this section, some examples of communication on ASTM Upper Layer are shown.

This example text contains some non-realistic cases for standard clinical chemistry analysis to show variable examples of communication.

In this section, the analyzer is shown as ‘c111’, External system is shown as ‘host’.

9.1 Order Query - Realtime / Analyzer to Host

```
c111    08:41:04,761 [ENQ]
HOST    08:41:04,761 [ACK]
c111    08:41:04,870 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
                     44|||||host|TSREQ^REAL|P|1|20071210084106[CR][E
                     TB]D6[CR][LF]
HOST    08:41:04,870 [ACK]
c111    08:41:04,917 [STX]2Q|1|^4456||ALL||||||||O[CR][ETB]01[CR][LF
                     ]
HOST    08:41:04,917 [ACK]
c111    08:41:04,948 [STX]3L|1|N[CR][ETX]06[CR][LF]
HOST    08:41:04,948 [ACK]
c111    08:41:04,964 [EOT]
```

9.2 Order Query Response- Realtime / Host to Analyzer

```
HOST    08:41:06,979 [ENQ]
c111    08:41:06,995 [ACK]
HOST    08:41:07,073 [STX]1H|\^&|||ASTM-Host^V·6.61|||||c111|TSDWN^R
                     EPLY|P|1|20071210084105[CR][ETX]04[CR][LF]
c111    08:41:07,104 [ACK]
HOST    08:41:07,120 [STX]2P|1[CR][ETX]3F[CR][LF]
c111    08:41:07,135 [ACK]
HOST    08:41:07,198 [STX]3O|1|4456||^^^444^\^^^555|R||||||A||||||||
                     ||||||O\Q[CR][ETX]6A[CR][LF]
c111    08:41:07,229 [ACK]
HOST    08:41:07,260 [STX]4C|1|L|Default·TS^^^^|G[CR][ETX]3F[CR][LF]
c111    08:41:07,291 [ACK]
HOST    08:41:07,307 [STX]5L|1|N[CR][ETX]08[CR][LF]
c111    08:41:07,323 [ACK]
HOST    08:41:07,323 [EOT]
```

9.3 Order Query Host → Analyzer

```
HOST   08:38:07,040 [ENQ]
c111   08:38:07,055 [ACK]
HOST   08:38:07,134 [STX]1H|\^&|||ASTM_SIM|||||c111|RSREQ^REAL|P|1|
            20050613010333[CR][ETX]73[CR][LF]
c111   08:38:07,165 [ACK]
HOST   08:38:07,212 [STX]2Q|1|^83720||ALL||||||||O[CR][ETX]1E[CR][L
            F]
c111   08:38:07,227 [ACK]
HOST   08:38:07,243 [STX]3L|1|N[CR][ETX]06[CR][LF]
```

c111 08:38:07,274 [ACK]
HOST 08:38:07,274 [EOT]

9.4 Order Query Reply Analyzer → Host

c111 08:38:07,384 [ENQ]
HOST 08:38:07,399 [ACK]
c111 08:38:07,508 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
44|||||host|ORUPL^REPLY|P|1|20071210083808[CR][
ETB]49[CR][LF]
HOST 08:38:07,508 [ACK]
c111 08:38:07,540 [STX]2P|1|||[CR][ETB]4B[CR][LF]
HOST 08:38:07,540 [ACK]
c111 08:38:07,712 [STX]3O|1||83720|^^^685\^^^687\^^^706\^^^798\^^
^57\^^^652\^^^767\^^^678\^^^781\^^^418\^^^989\^
^^990\^^^991|R||||||N||||||||||20071210083808|
||O\Q[CR][ETB]08[CR][LF]
HOST 08:38:07,712 [ACK]
c111 08:38:07,758 [STX]4L|1|N[CR][ETX]07[CR][LF]
HOST 08:38:07,758 [ACK]
c111 08:38:07,774 [EOT]

9.5 Result Query Host → Analyzer

HOST 08:57:35,471 [ENQ]
c111 08:57:35,502 [ACK]
HOST 08:57:35,565 [STX]1H|\^&|||ASTM_SIM|||||c111|RSREQ^REAL|P|1|
20050613010402[CR][ETX]70[CR][LF]
c111 08:57:35,596 [ACK]
HOST 08:57:35,627 [STX]2Q|1|^83720||ALL|||||||F[CR][ETX]15[CR][L
F]
c111 08:57:35,643 [ACK]
HOST 08:57:35,659 [STX]3L|1|N[CR][ETX]06[CR][LF]
c111 08:57:35,674 [ACK]
HOST 08:57:35,690 [EOT]

9.6 Result Query Reply Analyzer → Host

c111 08:57:35,815 [ENQ]
HOST 08:57:35,815 [ACK]
c111 08:57:35,924 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
44|||||host|RSUPL^REPLY|P|1|20071210085737[CR][
ETB]50[CR][LF]
HOST 08:57:35,924 [ACK]
c111 08:57:35,955 [STX]2P|1|||[CR][ETB]4B[CR][LF]
HOST 08:57:35,971 [ACK]
c111 08:57:36,049 [STX]3O|1||83720||R||||||N||||||||||2007121008
5737|||F\Q[CR][ETB]55[CR][LF]
HOST 08:57:36,049 [ACK]
c111 08:57:36,112 [STX]4R|1|^^^685|16.69|U/L||N||F||SYS[CR][ETB
]1F[CR][LF]
HOST 08:57:36,112 [ACK]
c111 08:57:36,159 [STX]5C|1|I|||I[CR][ETB]4F[CR][LF]
HOST 08:57:36,159 [ACK]
c111 08:57:36,393 [STX]6M|1|RR^BM^c111^1|-4|-4\-4\9\10\8\9\157\15
9\159\157\157\157\158\156\157\157\8912\8879\886
1\8850\8842\8837\8824\8814\8808\8800\8787\8779\
8773\8766\8764\8757\8746\8738\8726\8724\8717\87
11\8704\8701|0.002674[CR][ETB]D3[CR][LF]
HOST 08:57:36,393 [ACK]
c111 08:57:36,455 [STX]7R|2|^^^687|13.20|U/L||N||F||SYS[CR][ETB
]15[CR][LF]
HOST 08:57:36,455 [ACK]
c111 08:57:36,502 [STX]0C|2|I|||I[CR][ETB]4B[CR][LF]
HOST 08:57:36,502 [ACK]
c111 08:57:36,737 [STX]1M|1|RR^BM^c111^1|-11|-11\-14\6\3\14\13\15
0\151\149\150\149\151\149\150\151\148\8931\8892
\8875\8866\8860\8850\8842\8837\8828\8820\8813\8
803\8798\8793\8791\8786\8778\8769\8769\8763\875
8\8751\8748\8742|0.002299[CR][ETB]85[CR][LF]
HOST 08:57:36,752 [ACK]
c111 08:57:36,799 [STX]2R|3|^^^706|9.32|mg/dL||N||F||SYS[CR][ET
B]C4[CR][LF]
HOST 08:57:36,815 [ACK]
c111 08:57:36,846 [STX]3C|3|I|||I[CR][ETB]4F[CR][LF]
HOST 08:57:36,846 [ACK]
c111 08:57:37,065 [STX]4M|1|RR^BM^c111^1|36|36\34\-2\-2\-1\-2\3\3
\3\2\2\2\3\3\3\2216\2196\2183\2175\2170\2162\
2159\2157\2159\2153\2154\2151\2152\2149\2150\21
48\2149\2148\2146\2147\2145\2144\2142\2141|0.21
9326[CR][ETB]30[CR][LF]
HOST 08:57:37,080 [ACK]
c111 08:57:37,143 [STX]5R|4|^^^798|234.74|mg/dL||N||F||SYS[CR][
ETB]39[CR][LF]
HOST 08:57:37,143 [ACK]
c111 08:57:37,174 [STX]6C|4|I|||I[CR][ETB]53[CR][LF]

HOST 08:57:37,190 [ACK]
c111 08:57:37,440 [STX]7M|1|RR^BM^c111^1|79|79\78\675\676\672\672
\1641\3096\3222\3244\3251\3260\3273\3274\3280\3
282\3281\3286\3285\3286\3286\3284\3289\3286\328
6\3288\3284\3283\3283\3282\3281\3277\3281\3282\
3282\3281\3279\3277\3278\3276|0.260749[CR][ETB]
D2[CR][LF]
HOST 08:57:37,440 [ACK]
c111 08:57:37,502 [STX]0R|5|^^^57|44.57|U/L||N||F||SYS[CR][ETB]
E6[CR][LF]
HOST 08:57:37,502 [ACK]
c111 08:57:37,549 [STX]1C|5|I|||[CR][ETB]4F[CR][LF]
HOST 08:57:37,549 [ACK]
c111 08:57:37,814 [STX]2M|1|RR^BM^c111^1|152|152\151\1454\1393\13
73\1364\1500\1487\1480\1476\1472\1472\1469\1470
\1466\1466\1575\1581\1581\1587\1594\1602\1613\1
621\1628\1641\1649\1660\1669\1683\1692\1705\171
6\1724\1737\1749\1758\1771\1778\1794|0.003268[C
R][ETB]F1[CR][LF]
HOST 08:57:37,814 [ACK]
c111 08:57:37,877 [STX]3R|6|^^^652|58.83|umol/L||N||F||SYS[CR][
ETB]87[CR][LF]
HOST 08:57:37,877 [ACK]
c111 08:57:37,924 [STX]4C|6|I|||[CR][ETB]53[CR][LF]
HOST 08:57:37,924 [ACK]
c111 08:57:38,096 [STX]5M|1|RR^BM^c111^1|46|46\47\1\4\3\2\8\7\8\8
\9\8\7\9\9\8\18\22\30\40\52\64\73\80\85\90\94\9
7\99\100\102\106\108\105\110\111\109\112\113\11
3|0.008700[CR][ETB]45[CR][LF]
HOST 08:57:38,096 [ACK]
c111 08:57:38,174 [STX]6R|7|^^^767|95.41|mg/dL||N||F||SYS[CR][E
TB]08[CR][LF]
HOST 08:57:38,174 [ACK]
c111 08:57:38,205 [STX]7C|7|I|||[CR][ETB]57[CR][LF]
HOST 08:57:38,205 [ACK]
c111 08:57:38,455 [STX]0M|1|RR^BM^c111^1|24|24\23\633\618\606\599
\596\593\588\587\583\586\586\584\585\584\1302\2
087\2185\2197\2195\2194\2196\2195\2194\2192\219
0\2192\2190\2192\2195\2191\2192\2191\2192\2192\
2193\2194\2193\2191|0.160888[CR][ETB]BA[CR][LF]
HOST 08:57:38,455 [ACK]
c111 08:57:38,517 [STX]1R|8|^^^678|67.55|g/L||N||F||SYS[CR][ETB
]38[CR][LF]
HOST 08:57:38,517 [ACK]
c111 08:57:38,564 [STX]2C|8|I|||[CR][ETB]53[CR][LF]
HOST 08:57:38,564 [ACK]
c111 08:57:38,752 [STX]3M|1|RR^BM^c111^1|47|47\50\0\0\0\-1\4\4\3\
5\4\2\5\3\6\3\88\243\313\359\390\416\433\446\45
8\468\476\485\492\496\504\510\512\517\519\520\5
27\528\531\534|0.047284[CR][ETB]03[CR][LF]

HOST 08:57:38,767 [ACK]
c111 08:57:38,830 [STX]4R|9|^^^781|124.29|mg/dL||N||F||SYS[CR][
ETB]33[CR][LF]
HOST 08:57:38,845 [ACK]
c111 08:57:38,877 [STX]5C|9|I|||[CR][ETB]57[CR][LF]
HOST 08:57:38,877 [ACK]
c111 08:57:39,142 [STX]6M|1|RR^BM^c111^1|74|74\74\207\211\212\211
\263\620\881\989\1032\1046\1052\1060\1060\1063\
1065\1063\1067\1066\1065\1068\1066\1069\1067\10
69\1068\1068\1066\1067\1068\1068\1065\1068\1068
\1068\1067\1067\1065\1066|0.085380[CR][ETB]64[C
R][LF]
HOST 08:57:39,142 [ACK]
c111 08:57:39,205 [STX]7R|10|^^^418|34.63|mg/dL||N||F||SYS[CR][
ETB]29[CR][LF]
HOST 08:57:39,205 [ACK]
c111 08:57:39,252 [STX]0C|10|I|||[CR][ETB]7A[CR][LF]
HOST 08:57:39,252 [ACK]
c111 08:57:39,533 [STX]1M|1|RR^BM^c111^1|22|22\26\12905\12891\128
91\12885\13034\12914\12758\12598\12444\12299\12
160\12029\11918\11803\11699\11598\11512\11425\1
1344\11269\11200\11134\11081\11021\10968\10920\
10876\10830\10798\10764\10731\10697\10668\10639
\10617\1059[ETB]95[CR][LF]
HOST 08:57:39,533 [ACK]
c111 08:57:39,580 [STX]21\10574\10551|0.048558[CR][ETB]54[CR][LF]
HOST 08:57:39,580 [ACK]
c111 08:57:39,658 [STX]3R|11|^^^989|137.8|mmol/L|136.0\145.0|N||F
||SYS[CR][ETB]FF[CR][LF]
HOST 08:57:39,658 [ACK]
c111 08:57:39,705 [STX]4C|11|I|||[CR][ETB]7F[CR][LF]
HOST 08:57:39,705 [ACK]
c111 08:57:39,767 [STX]5R|12|^^^990|4.26|mmol/L|3.50\5.10|N||F||$
SYS$[CR][ETB]5D[CR][LF]
HOST 08:57:39,783 [ACK]
c111 08:57:39,814 [STX]6C|12|I|||[CR][ETB]82[CR][LF]
HOST 08:57:39,814 [ACK]
c111 08:57:39,892 [STX]7R|13|^^^991|104.2|mmol/L|98.0\107.0|N||F|
|SYS[CR][ETB]C7[CR][LF]
HOST 08:57:39,892 [ACK]
c111 08:57:39,939 [STX]0C|13|I|||[CR][ETB]7D[CR][LF]
HOST 08:57:39,939 [ACK]
c111 08:57:39,986 [STX]1L|1|N[CR][ETX]04[CR][LF]
HOST 08:57:39,986 [ACK]
c111 08:57:40,001 [EOT]

9.7 Result Query Host → Analyzer (unknown sample)

HOST 09:00:36,899 [ENQ]
c111 09:00:36,915 [ACK]
HOST 09:00:36,977 [STX]1H|\^&|||ASTM_SIM|||||c111|RSREQ^REAL|P|1|

```
                20050613010333[CR][ETX]73[CR][LF]
c111   09:00:37,009 [ACK]
HOST   09:00:37,040 [STX]2Q|1|^dummy||ALL|||||||O[CR][ETX]46[CR][L
                F]
c111   09:00:37,056 [ACK]
HOST   09:00:37,071 [STX]3L|1|N[CR][ETX]06[CR][LF]
c111   09:00:37,102 [ACK]
HOST   09:00:37,102 [EOT]
```

9.8 Abort Query Analyzer → Host (unknown sample)

c111 09:00:37,118 [ENQ]
HOST 09:00:37,134 [ACK]
c111 09:00:37,243 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
44|||||host|RSREQ^REPLY|P|1|20071210090038[CR][
ETB]3D[CR][LF]
HOST 09:00:37,243 [ACK]
c111 09:00:37,290 [STX]2Q|1|dummy|||||||||A[CR][ETB]15[CR][LF]
HOST 09:00:37,290 [ACK]
c111 09:00:37,321 [STX]3L|1|N[CR][ETX]06[CR][LF]
HOST 09:00:37,337 [ACK]
c111 09:00:37,352 [EOT]

9.9 Result Upload Analyzer → Host

c111 09:13:57,438 [ENQ]
HOST 09:13:57,438 [ACK]
c111 09:13:57,548 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
44|||||host|RSUPL^BATCH|P|1|20071210091358[CR][
ETB]22[CR][LF]
HOST 09:13:57,548 [ACK]
c111 09:13:57,579 [STX]2P|1|||[CR][ETB]4B[CR][LF]
HOST 09:13:57,579 [ACK]
c111 09:13:57,673 [STX]3O|1||TEST^^3||R||||||N||||||||||20071210
091358|||F[CR][ETB]CF[CR][LF]
HOST 09:13:57,673 [ACK]
c111 09:13:57,752 [STX]4R|1|^^^989|151.1|mmol/L|136.0\145.0|H||F|
|admin[CR][ETB]80[CR][LF]
HOST 09:13:57,752 [ACK]
c111 09:13:57,783 [STX]5C|1|I|40^>RR|I[CR][ETB]C7[CR][LF]
HOST 09:13:57,783 [ACK]
c111 09:13:57,861 [STX]6R|2|^^^990|6.62|mmol/L|3.50\5.10|H||F||ad
min[CR][ETB]EB[CR][LF]
HOST 09:13:57,861 [ACK]
c111 09:13:57,908 [STX]7C|2|I|40^>RR|I[CR][ETB]CA[CR][LF]
HOST 09:13:57,908 [ACK]
c111 09:13:57,987 [STX]0R|3|^^^991|118.5|mmol/L|98.0\107.0|H||F||
admin[CR][ETB]53[CR][LF]
HOST 09:13:57,987 [ACK]
c111 09:13:58,018 [STX]1C|3|I|40^>RR|I[CR][ETB]C5[CR][LF]
HOST 09:13:58,034 [ACK]
c111 09:13:58,065 [STX]2L|1|N[CR][ETX]05[CR][LF]
HOST 09:13:58,065 [ACK]
c111 09:13:58,081 [EOT]

9.10 Result Upload Retransmit with Abs Rawdata Analyzer → Host

c111 09:16:45,190 [ENQ]
HOST 09:16:45,190 [ACK]
c111 09:16:45,299 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
44|||||host|RSUPL^BATCH|P|1|20071210091645[CR][
ETB]21[CR][LF]
HOST 09:16:45,299 [ACK]
c111 09:16:45,331 [STX]2P|1|||[CR][ETB]4B[CR][LF]
HOST 09:16:45,331 [ACK]
c111 09:16:45,425 [STX]3O|1||83712^^4||R||||||N||||||||||2007121
0091645|||F[CR][ETB]94[CR][LF]
HOST 09:16:45,425 [ACK]
c111 09:16:45,487 [STX]4R|1|^^^798|113.01|mg/dL||N||F||SYS[CR][
ETB]27[CR][LF]
HOST 09:16:45,487 [ACK]
c111 09:16:45,534 [STX]5C|1|I|||I[CR][ETB]4F[CR][LF]
HOST 09:16:45,534 [ACK]
c111 09:16:45,784 [STX]6M|1|RR^BM^c111^1|73|73\73\672\667\670\667
\1142\1802\1869\1885\1895\1900\1908\1911\1913\1
918\1919\1922\1925\1923\1921\1922\1922\1928\192
2\1922\1922\1923\1922\1923\1923\1921\1923\1918\
1916\1920\1918\1919\1921\1919|0.125061[CR][ETB]
A2[CR][LF]
HOST 09:16:45,784 [ACK]
c111 09:16:45,847 [STX]7R|2|^^^57|106.88|U/L||N||F||SYS[CR][ETB
]1D[CR][LF]
HOST 09:16:45,863 [ACK]
c111 09:16:45,894 [STX]0C|2|I|||I[CR][ETB]4B[CR][LF]
HOST 09:16:45,894 [ACK]
c111 09:16:46,160 [STX]1M|1|RR^BM^c111^1|144|144\145\1457\1399\13
80\1363\1517\1502\1495\1487\1486\1480\1483\1480
\1481\1478\1593\1607\1618\1636\1654\1675\1695\1
719\1742\1762\1787\1813\1836\1860\1885\1906\192
8\1954\1978\2002\2027\2050\2075\2097|0.007730[C
R][ETB]F7[CR][LF]
HOST 09:16:46,160 [ACK]
c111 09:16:46,223 [STX]2R|3|^^^767|101.67|mg/dL||N||F||SYS[CR][
ETB]2C[CR][LF]
HOST 09:16:46,223 [ACK]
c111 09:16:46,270 [STX]3C|3|I|||I[CR][ETB]4F[CR][LF]
HOST 09:16:46,270 [ACK]
c111 09:16:46,520 [STX]4M|1|RR^BM^c111^1|27|27\25\635\622\609\601
\605\603\598\597\594\595\591\593\593\589\1315\2
184\2296\2306\2304\2306\2303\2302\2304\2302\230
7\2302\2301\2300\2302\2302\2301\2301\2302\2303\
2303\2303\2306\2305|0.171377[CR][ETB]1A[CR][LF]
HOST 09:16:46,520 [ACK]
c111 09:16:46,583 [STX]5R|4|^^^781|116.83|mg/dL||N||F||SYS[CR][

```
                ETB]30[CR][LF]
HOST   09:16:46,583 [ACK]
c111   09:16:46,629 [STX]6C|4|I|||I[CR][ETB]53[CR][LF]
HOST   09:16:46,629 [ACK]
c111   09:16:46,880 [STX]7M|1|RR^BM^c111^1|72|72\70\208\210\213\210
                \251\556\803\918\964\983\994\996\1000\1003\1003
                \1006\1008\1007\1013\1010\1009\1012\1011\1015\1
                011\1012\1013\1012\1013\1012\1014\1014\1014\101
                1\1011\1017\1012\1015|0.080260[CR][ETB]E9[CR][L
                F]
HOST   09:16:46,880 [ACK]
c111   09:16:46,942 [STX]0R|5|^^^418|32.49|mg/dL||N||F||$SYS$[CR][E
                TB]F8[CR][LF]
HOST   09:16:46,942 [ACK]
c111   09:16:46,989 [STX]1C|5|I|||I[CR][ETB]4F[CR][LF]
HOST   09:16:46,989 [ACK]
c111   09:16:47,255 [STX]2M|1|RR^BM^c111^1|20|20\21\12891\12878\128
                66\12858\13013\12903\12756\12605\12461\12326\12
                194\12077\11963\11859\11757\11665\11580\11503\1
                1430\11364\11299\11243\11186\11137\11088\11045\
                11004\10963\10925\10889\10860\10828\10802\10774
                \10752\1073[ETB]83[CR][LF]
HOST   09:16:47,271 [ACK]
c111   09:16:47,318 [STX]31\10711\10689|0.045600[CR][ETB]4B[CR][LF]
HOST   09:16:47,318 [ACK]
c111   09:16:47,349 [STX]4L|1|N[CR][ETX]07[CR][LF]
HOST   09:16:47,349 [ACK]
c111   09:16:47,365 [EOT]
```

9.11 Add Order Request - Host → Analyzer

```
HOST   09:19:22,270 [ENQ]
c111   09:19:22,302 [ACK]
HOST   09:19:22,364 [STX]1H|\^&|||ASTM_SIM|||||c111|TSDWN^BATCH|P|1
                |20050720003527[CR][ETX]BA[CR][LF]
c111   09:19:22,380 [ACK]
HOST   09:19:22,474 [STX]2O|1|109ASZabqjz||^^^687\^^^767\^^^706\^^^
                001\^^^1111|R||||||A||||||||||20050523163300||
                |O[CR][ETX]4B[CR][LF]
c111   09:19:22,505 [ACK]
HOST   09:19:22,521 [STX]3L|1|N[CR][ETX]06[CR][LF]
c111   09:19:22,552 [ACK]
HOST   09:19:22,552 [EOT]
```

9.12 Delete Order Request - Host → Analyzer

```
HOST   09:20:07,465 [ENQ]
c111   09:20:07,496 [ACK]
HOST   09:20:07,559 [STX]1H|\^&|||ASTM_SIM|||||c111|TSDWN^BATCH|P|1
                |20050615222346[CR][ETX]BF[CR][LF]
c111   09:20:07,575 [ACK]
HOST   09:20:07,669 [STX]2O|1|109ASZabqjz||^^^687\^^^001\^^^1111\^^
```

^706\^^^767|R|||||C|||||||||||20050523163300||
|O[CR][ETX]4D[CR][LF]
c111 09:20:07,700 [ACK]
HOST 09:20:07,715 [STX]3L|1|N[CR][ETX]06[CR][LF]
c111 09:20:07,747 [ACK]
HOST 09:20:07,747 [EOT]

9.13 Abs- Calibration Upload - Analyzer → Host

Host Request PCUPL (Photometer Calibration Data Request)

```
HOST   09:21:29,184 [ENQ]
c111   09:21:29,200 [ACK]
HOST   09:21:29,262 [STX]1H|\^&|||ASTM_SIM|||||c111|RSREQ^REAL|P|1|
            20050613010402[CR][ETX]70[CR][LF]
c111   09:21:29,294 [ACK]
HOST   09:21:29,309 [STX]2Q|1|||706|||||||C[CR][ETX]74[CR][LF]
c111   09:21:29,341 [ACK]
HOST   09:21:29,372 [STX]3L|1|N[CR][ETX]06[CR][LF]
c111   09:21:29,388 [ACK]
HOST   09:21:29,403 [EOT]
```

Analyzer Reply PCUPL^REPLY (Calibration Data)

```
c111   09:21:29,419 [ENQ]
HOST   09:21:29,435 [ACK]
c111   09:21:29,544 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
            44|||||host|PCUPL^REPLY|P|1|20071210092129[CR][
            ETB]37[CR][LF]
HOST   09:21:29,544 [ACK]
c111   09:21:29,794 [STX]2M|1|CR^BM^c111^1|706^CA|67710801|mmol/L|B
            S^CA^1|706^R1^903\706^SR^1043|N^R|2|20060912134
            230|A^admin||4.763721E-02^7.384927E-02|SD^^^172
            72500|2.6^0.239645^0.239345^0.239945^0^0\0^0.04
            76372^0.0478372^0.0474372^0^0[CR][ETB]54[CR][LF
            ]
HOST   09:21:29,794 [ACK]
c111   09:21:29,826 [STX]3L|1|N[CR][ETX]06[CR][LF]
HOST   09:21:29,826 [ACK]
c111   09:21:29,841 [EOT]
```

9.14 Reagent Disk Loading - Host ←→ Analyzer

Host Request INR (Inventory Request Reagent-Disk)

```
HOST   09:27:28,503 [ENQ]
c111   09:27:28,519 [ACK]
HOST   09:27:28,581 [STX]1H|\^&|||ASTM_SIM|||||c111|INR^U06|P|1|200
            50613010402[CR][ETX]63[CR][LF]
c111   09:27:28,612 [ACK]
HOST   09:27:28,628 [STX]2M|1|EQU|c111[CR][ETX]15[CR][LF]
c111   09:27:28,659 [ACK]
HOST   09:27:28,675 [STX]3M|1|INV|||||0[CR][ETX]42[CR][LF]
c111   09:27:28,706 [ACK]
HOST   09:27:28,721 [STX]4L|1|N[CR][ETX]07[CR][LF]
c111   09:27:28,737 [ACK]
HOST   09:27:28,753 [EOT]
```

Analyzer Response INU (reply of the inventory)

```
c111   09:27:28,784 [ENQ]
HOST   09:27:28,784 [ACK]
c111   09:27:28,893 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
            44|||||host|INU^U05|P|1|20071210092728[CR][ETB]
            D2[CR][LF]
HOST   09:27:28,909 [ACK]
c111   09:27:28,971 [STX]2M|1|EQU^RO^c111^1|c111|20071210092728|||[
            CR][ETB]C4[CR][LF]
HOST   09:27:28,971 [ACK]
c111   09:27:29,080 [STX]3M|1|INV^RO^c111^1|2-685^R1-ALTL|EW|MR|109
            7|1|3|100||59||Tests|200608|19700101|||67543551
            [CR][ETB]82[CR][LF]
HOST   09:27:29,080 [ACK]
c111   09:27:29,205 [STX]4M|2|INV^RO^c111^1|4-685^SR-ALTL|EW|MR|706
            |1|4|100||59||Tests|200608|19700101|||67543551[
            CR][ETB]75[CR][LF]
HOST   09:27:29,205 [ACK]
c111   09:27:29,314 [STX]5M|3|INV^RO^c111^1|2-652^R1-CREP2|EW|MR|48
            7|1|7|100||67||Tests|200610|19700101|||67601951
            [CR][ETB]7C[CR][LF]
HOST   09:27:29,314 [ACK]
c111   09:27:29,439 [STX]6M|4|INV^RO^c111^1|4-652^SR-CREP2|EW|MR|56
            4|1|8|100||67||Tests|200610|19700101|||67601951
            [CR][ETB]9F[CR][LF]
HOST   09:27:29,439 [ACK]
c111   09:27:29,564 [STX]7M|5|INV^RO^c111^1|2-057^R1-CKL|EW|MR|554|
            1|2|100||67||Tests|200610|19700101|||67505951[C
            R][ETB]F6[CR][LF]
HOST   09:27:29,564 [ACK]
c111   09:27:29,689 [STX]0M|6|INV^RO^c111^1|4-057^SR-CKL|EW|MR|497|
```

1|1|100||67||Tests|200610|19700101|||67505951[C
R][ETB]19[CR][LF]
HOST 09:27:29,689 [ACK]
c111 09:27:29,798 [STX]1M|7|INV^RO^c111^1|4-678^SR-TP2|EW|MR|437|
1|6|100||70||Tests|200610|19700101|||67506151[C
R][ETB]12[CR][LF]
HOST 09:27:29,813 [ACK]
c111 09:27:29,923 [STX]2M|8|INV^RO^c111^1|2-678^R1-TP2|EW|MR|643|
1|5|100||70||Tests|200610|19700101|||67506151[C
R][ETB]EE[CR][LF]
HOST 09:27:29,938 [ACK]
c111 09:27:30,047 [STX]3M|9|INV^RO^c111^1|4-767^SR-GLUC2|EW|MR|72
8|1|9|100||68||Tests|200610|19700101|||67502351
[CR][ETB]A7[CR][LF]
HOST 09:27:30,047 [ACK]
c111 09:27:30,172 [STX]4M|10|INV^RO^c111^1|2-798^R1-CHOL2|EW|MR|8
06|1|0|100||58||Tests|200608|19700101|||6750275
1[CR][ETB]A9[CR][LF]
HOST 09:27:30,172 [ACK]
c111 09:27:30,281 [STX]5M|11|INV^RO^c111^1|2-767^R1-GLUC2|EW|MR|1
91|1|10|100||68||Tests|200610|19700101|||675023
51[CR][ETB]D0[CR][LF]
HOST 09:27:30,297 [ACK]
c111 09:27:30,406 [STX]6M|12|INV^RO^c111^1|2-418^R1-UREAL|EW|MR|1
84|1|11|100||70||Tests|200610|19700101|||675064
51[CR][ETB]E8[CR][LF]
HOST 09:27:30,406 [ACK]
c111 09:27:30,531 [STX]7M|13|INV^RO^c111^1|2-781^R1-TRIGL|EW|MR|2
26|1|12|50||20||Tests|200609|19700101|||6750835
1[CR][ETB]CC[CR][LF]
HOST 09:27:30,531 [ACK]
c111 09:27:30,656 [STX]0M|14|INV^RO^c111^1|2-687^R1-ASTL|EW|MR|32
3|1|13|100||60||Tests|200610|19700101|||6750185
1[CR][ETB]A2[CR][LF]
HOST 09:27:30,656 [ACK]
c111 09:27:30,781 [STX]1M|15|INV^RO^c111^1|4-687^SR-ASTL|EW|MR|88
6|1|14|100||59||Tests|200610|19700101|||6750185
1[CR][ETB]DF[CR][LF]
HOST 09:27:30,781 [ACK]
c111 09:27:30,905 [STX]2M|16|INV^RO^c111^1|2-706^R1-CA|EW|MR|903|
1|15|100||64||Tests|200608|19700101|||67710801[
CR][ETB]FC[CR][LF]
HOST 09:27:30,905 [ACK]
c111 09:27:31,015 [STX]3M|17|INV^RO^c111^1|4-706^SR-CA|EW|MR|1043
|1|16|100||64||Tests|200608|19700101|||67710801
[CR][ETB]4F[CR][LF]
HOST 09:27:31,015 [ACK]
c111 09:27:31,139 [STX]4M|18|INV^RO^c111^1|1-953^SD-PYP|EW|DI|474
|1|17|100||96||%|200706|19700101|||67569351[CR]
[ETB]A1[CR][LF]

HOST 09:27:31,139 [ACK]
c111 09:27:31,249 [STX]5M|19|INV^RO^c111^1|1-951^SD-NACL|EW|DI|25
222|1|20|100||100||%|200612|19700101|||19952005
[CR][ETB]31[CR][LF]
HOST 09:27:31,249 [ACK]
c111 09:27:31,280 [STX]6L|1|N[CR][ETX]09[CR][LF]
HOST 09:27:31,295 [ACK]
c111 09:27:31,311 [EOT]

9.15 Database Init Command - Host ←→ Analyzer

Host Request EAC (Init database during next power cycle)

```
HOST   09:32:21,184 [ENQ]
c111   09:32:21,200 [ACK]
HOST   09:32:21,262 [STX]1H|\^&|||ASTM_SIM|||||c111|EAC^U07|P|1|200
            50613010402[CR][ETX]44[CR][LF]
c111   09:32:21,293 [ACK]
HOST   09:32:21,309 [STX]2M|1|EQU|c111[CR][ETX]15[CR][LF]
c111   09:32:21,340 [ACK]
HOST   09:32:21,371 [STX]3M|1|ECD|12345|IN|N||C111-2509[CR][ETX]A8[
            CR][LF]
c111   09:32:21,403 [ACK]
HOST   09:32:21,418 [STX]4L|1|N[CR][ETX]07[CR][LF]
c111   09:32:21,449 [ACK]
HOST   09:32:21,449 [EOT]
```

Analyzer Response EAR (the command was accepted or not)

```
c111   09:32:21,465 [ENQ]
HOST   09:32:21,465 [ACK]
c111   09:32:21,574 [STX]1H|\^&|||c111^Roche^c111^2.0.0.0710^1^3334
            44|||||host|EAR^U08|P|1|20071210093221[CR][ETB]
            B6[CR][LF]
HOST   09:32:21,590 [ACK]
c111   09:32:21,653 [STX]2M|1|EQU^RO^c111^1|c111|20071210093221|||[
            CR][ETB]B9[CR][LF]
HOST   09:32:21,653 [ACK]
c111   09:32:21,715 [STX]3M|1|ECD^RO^c111^1|12345|IN|||C111-2509[CR
            ][ETB]50[CR][LF]
HOST   09:32:21,715 [ACK]
c111   09:32:21,778 [STX]4M|1|ECR^RO^c111^1|UN||C111-2509|||[CR][ETB
            ]6C[CR][LF]
HOST   09:32:21,778 [ACK]
c111   09:32:21,809 [STX]5L|1|N[CR][ETX]08[CR][LF]
HOST   09:32:21,809 [ACK]
c111   09:32:21,840 [EOT]
```

OK indicates that the command was accepted, otherwise **UN** is reported (as in the example above).

10. Appendix C – ASTM Simulator.

Short description : Refer to Grips

11. Appendix D – ASCII Table

Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec	Char Hex Dec
NUL 00 0	DLE 10 16	Space 20 32	0 30 48	@ 40 64	P 50 80	` 60 96	p 70 112
SOH 01 1	DC1 11 17	! 21 33	1 31 49	A 41 65	Q 51 81	a 61 97	q 71 113
STX 02 2	DC2 12 18	" 22 34	2 32 50	B 42 66	R 52 82	b 62 98	r 72 114
ETX 03 3	DC3 13 19	# 23 35	3 33 51	C 43 67	S 53 83	c 63 99	s 73 115
EOT 04 4	DC4 14 20	$ 24 36	4 34 52	D 44 68	T 54 84	d 64 100	t 74 116
ENQ 05 5	NAK 15 21	% 25 37	5 35 53	E 45 69	U 55 85	e 65 101	u 75 117
ACK 06 6	SYN 16 22	& 26 38	6 36 54	F 46 70	V 56 86	f 66 102	v 76 118
BEL 07 7	ETB 17 23	' 27 39	7 37 55	G 47 71	W 57 87	g 67 103	w 77 119
BS 08 8	CAN 18 24	(28 40	8 38 56	H 48 72	X 58 88	h 68 104	x 78 120
HT 09 9	EM 19 25	) 29 41	9 39 57	I 49 73	Y 59 89	i 69 105	y 79 121
LF 0A 10	SUB 1A 26	* 2A 42	: 3A 58	J 4A 74	Z 5A 90	j 6A 106	z 7A 122
VT 0B 11	ESC 1B 27	+ 2B 43	; 3B 59	K 4B 75	[5B 91	k 6B 107	{ 7B 123
FF 0C 12	FS 1C 28	, 2C 44	< 3C 60	L 4C 76	\ 5C 92	l 6C 108	| 7C 124
CR 0D 13	GS 1D 29	- 2D 45	= 3D 61	M 4D 77	] 5D 93	m 6D 109	} 7D 125
SO 0E 14	RS 1E 30	. 2E 46	> 3E 62	N 4E 78	^ 5E 94	n 6E 110	~ 7E 126
SI 0F 15	US 1F 31	/ 2F 47	? 3F 63	O 4F 79	_ 5F 95	o 6F 111	DEL 7F 127