c513

Host Interface Manual

Version 2.0

Revision History

Version	Revision Date	Author/Editor	Description
0.1			The first release version
0.2	20 Jan 2015	S.Aoyagi	* Detail Changed for c513 * Added traceability information to each record
0.3	03 Feb 2015	S.Aoyagi	Revised according to comments from RD.
0.4	10 Feb 2015	S.Aoyagi	Revised according to comments from RD.(Telco 20150210)
0.5	06 Mar 2015	S.Aoyagi	Revised according to comments from RD.
0.6	23 Mar 2015	S.Aoyagi	Revised according to comments from RD.
1.0	09 Apr 2015	Y.Saito	Version change for JMS4
1.1	26 Jan 2016	S.Aoyagi	Details Changed : 2.2.5 NCCLS LIS2-A2 Syntax (6) Test Order Record (9) Request Information Record 2.3.4 NCCLS LIS1Lower Layer Communication Message Examples (1) Realtime TS inquiry and the response(normal)
2.0	27 Jan 2016	Y.Saito	Version change for LCP1

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1. Hardware Specifications for external system connection

1.1. Overview

An automatic analyzer performs data communication over the RS-232C of a control unit computer.

1.2. Interface Signal description Interface

The interface signals are listed in Table 1-1, the signal level and its meanings are described in Table 1-2.

Table 1-1 List of Interface Signals

Abbreviation	Signal Name	Signal direction Analyzer the other side
TXD	Trans Data	=>
RXD	Receive Data	<=
RTS	Request To Send	=>
CTS	Clear To Send	<=
DSR	Data Set Ready	<=
GND	GrouND	
DCD	Data Carrier Detect	<=
DTR	Data Terminal Ready	=>
RI	Ring Indicator(not used)	<=

Table 1-2 RS-232C Interface Signal level and description

Signal Level / Signal Name	Positive (Note 1)	Negative (Note 1)
TXD RXD	SPACE Start bit data “0” (Note 2)	MARK(no signal) Stop bit data “1”(Note 2)
RTS DTR	ON data “1”	OFF data “0”
CTS	ON data “1” data communication permission	OFF data “0” data communication inhibit
DCD	ON data “1” data communication permission	OFF data “0” data communication inhibit

(Note 1) Positive : Output +12V, Input +3V to +15V

Negative: Output -12V, Input -3V to -15V

(Note 2) data”0”, data”1” indicates the correspondence with binary number when each CPU read/write data or status.

1.3. RS-232C Communication connection method

1.3.1. Connecter Position

Use RS-232C port placed in interface panel of rack loading unit (SU) back side.

1.3.2. Connecting Cable and Cable length

DSUB-9(male) is used at analyzer side. Use the following at cable side.

HDEB-9S (manufactured by Hirose Electric Co.,Ltd) or a similar one. Cable length is maximum 15m.

1.3.3. Connection Specifications

(1) PIN Arrangement of Control Unit PC

Table 1-3. PIN Arrangement

Pin No.	Signal	Pin No.	Signal
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	(RI)
5	GND		

(2) Shield Processing

Use communication cable with shield. Connect shields with both connector shells of analyzer and host.

(3) Example of Connection

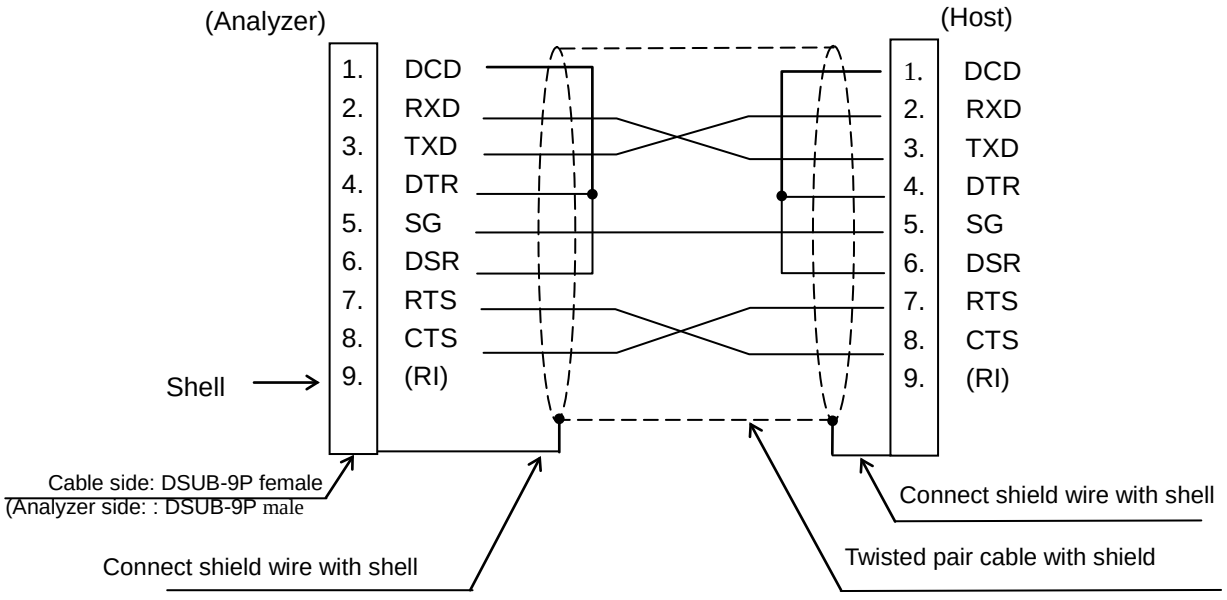


Figure 1-1, Example of Communication Connection for RS-232C (PIN arrangement of general PC)

2. Host Communication Specifications

2.1. Application Layer Interface Specifications

2.1.1. Overview

(1) Overview

This section describes about host communication specifications of cobas c513.

(2) Introduction

The communication interface specifications between this analyzer and the host consist of a three-layer structure as shown in the figure below. This section describes the specifications for the application layer.

For NCCLS LIS2 (upper/layer), see “2.2.Host Communication NCCLS LIS2 Upper/Low Layer Interface Specifications”.

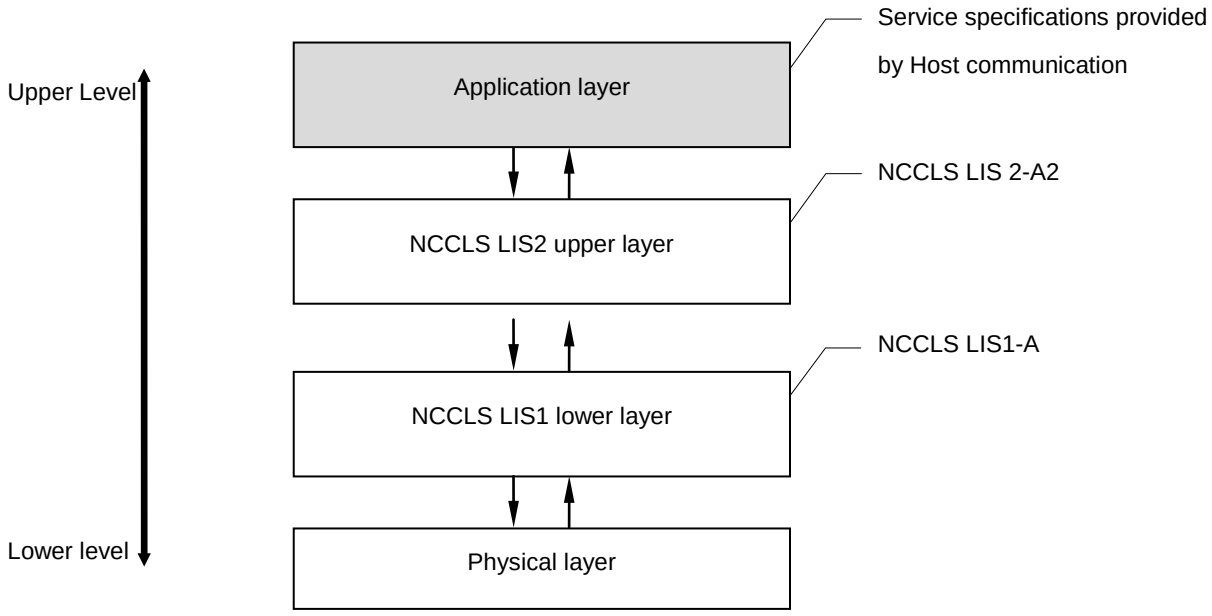


Figure 2-1 Host Communication Process Layers

(3) Analyzer configuration and host location

The analyzer consists of a control unit which sets the analytical conditions and displays and edits the analytical results, and an analytical unit which transfers the sample racks and mixes and analyzes the samples and reagents (see Figure 2-2). In this analyzer, the host is connected to the control unit over RS-232C and primarily sends and receives test selection information and measurement results data for routine / STAT samples.

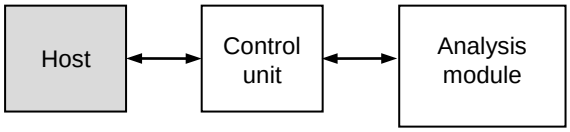


Figure 2-2 Analyzer Configuration and Host Location

(4) Analyzer management methods

(a) Sample ID

The samples that are handled are classified into standard solutions for creating calibration curve parameters (for calibration), routine samples, and STAT samples. The routine samples are managed loading onto a routine rack for routine analysis. STAT samples are managed loading onto a STAT rack interrupted between routine analysis. The samples assigned to each application rack are called routine samples, STAT samples and rerun samples, respectively.

The analyzer scans the barcode of the rack where the sample is placed, identifies the class of placed sample based on the rack number range, and performs analysis matching the respective conditions. Up to five samples can be placed on a single rack. The relationship among the sample classes handled by the analyzer, rack type and rack number are shown in Table 2-1. The analyzer scans the barcode label affixed to the rear on the rack side. This corresponds to the barcode IDs in Table 2-1. The rack number is the same as the label ID affixed to the rack top surface.

Table 2-1 Sample Classes and Rack numbers

Sample Class	Rack type	Barcode ID	Rack Numbers	Application	Automatic Rerun
Routine sample	Routine rack (gray)	50001 to 50999 60000 to 60999 70000 to 70999 80000 to 80999	00001 to 00999 01000 to 01999 02000 to 02999 03000 to 03999	For routine analysis of routine sample	o
STAT sample	STAT rack (red)	40001 to 40999	E0001 to E0999	For STAT sample analysis	o
Control sample	Control rack (white)	30001 to 30999	C0001 to C0999	For quality control	x
Standard solution	Calibrator rack (black)	20001 to 20999	S0001 to S0999	For calibration	x
Wash solution	Wash rack (green)	10001 to 10999	W0001 to W0999	For flow path wash operation (analysis not performed)	x

(o: Implemented, x: Not implemented)

Also, samples other than standard solution and wash solution are divided into a total of four types (called "sample types"), namely, "Whole Blood", "Hemolysate", "Serum/Plasma", "Urine". The control unit of the analyzer can set the analytical conditions specific to each type.

The wash rack is not used in host communication.

(b) Sample number mode and sample ID mode

The management method of the automatic analyzer varies depending on whether sample ID management is used. The sample type, sample ID, rack number-position number, management mode (sample number or sample ID) setting, and sample number and sample ID are important key information for accessing the sample database on the analyzer side. The characteristics of each mode are described below.

<Sample number mode>

For routine samples, sample numbers are assigned in order from the analysis start sample number that is set for each rack type (sample ID) in the control unit, and the patient information (test selection information and measurement results data) are managed based on the sample number, sample ID, and sample type.

For STAT samples, the rack number-position number where the sample is placed, sample number, and sample type are important key information for accessing the sample database.

<Sample ID mode>

The sample ID mode is set in the system settings, and the sample ID (barcode) affixed to the sample tube is scanned automatically. Patient information is managed based on the scanned sample ID and sample type. In contrast to sample number mode, this mode enables management without regard to the order that analysis is performed.

In the host connection, the management mode of the host must also match the management mode of the analyzer. The management mode can be switched when in standby. However, when the mode is switched, the host side must also be switched at the same time.

The next sections will describe realtime communication (section 2.1.2) where the information needed for analysis is transferred in synchronization with analyzer operation and batch communication (section 2.1.3) where patient information is sent and received based on instructions from the control unit or host.

2.1.2. Realtime Communication

The relationship of realtime communication functions with the sample class and sample ID is shown in Table 2-2. The communication sequence and their communication functions are described in detail below.

Table 2-2 Realtime Communication Functions

Communication function	Patient sample			Control sample	Standard solution
	Routine	STAT	Rerun		
Test selection information inquiry	o	o	o	x	x
Measurement results data send	o	o	o	o	o
Automatic rerun test selection information receive	o	o	(Note 1)	x	x
Automatic rerun test selection information inquiry	o	o	(Note 2)	x	x
Automatic rerun measurement results data send	o	o	(Note 3)	x	x

(o: Implemented, x: Not implemented)

Note 1: This information is accepted when there is a first-run result for the analysis results of the test item (set by [Application Parameters] - [Default Range]) required by automatic rerun and Automatic Rerun is specified (set in [Start Conditions]). If this information is not accepted, the received test selection information is registered as a batch.

Note 2: This is implemented when there is a first-run result for the analysis results of the test item required by automatic rerun and Automatic Rerun is specified.

Note 3: If it has any rerun measurement results data, then send.

(1) Communication sequence

Communication with the host is implemented in the order of "a" to "e" in Figure **2-3** based on the analysis sequence of the analyzer.

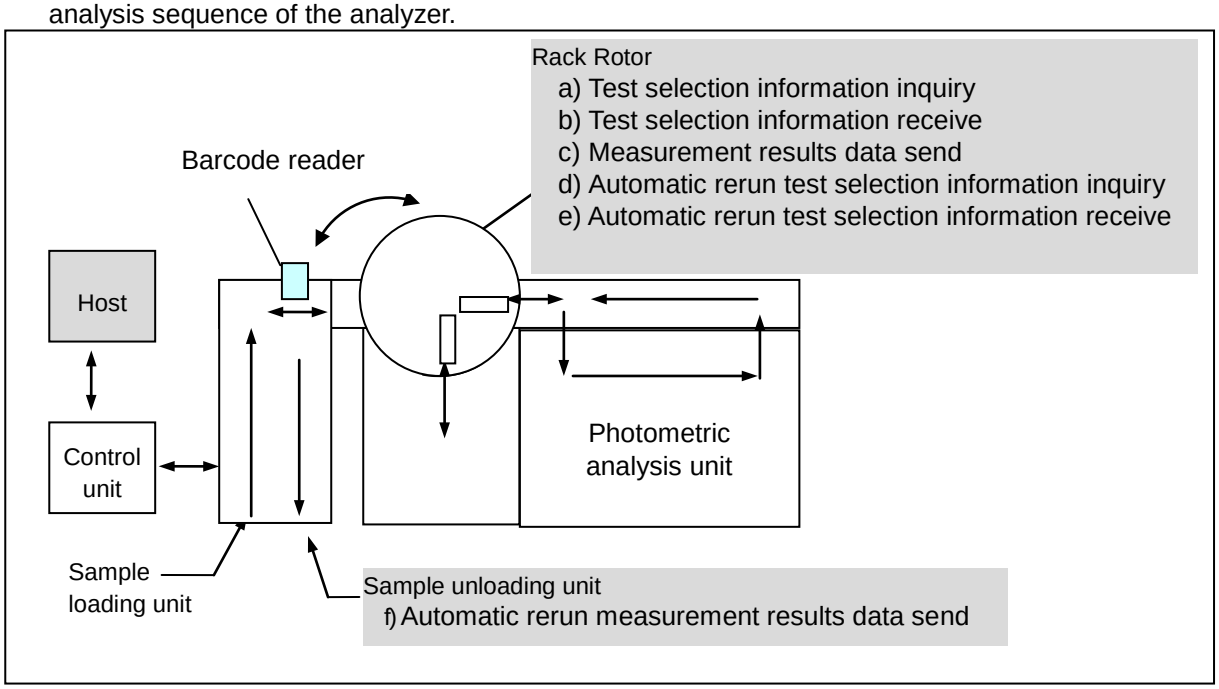


Figure 2-3 Analysis Flow and Communication Sequence

(a) Test Selection Information Inquiry

The racks where the samples (maximum of 5) are loaded are continuously inserted from the sample loading unit, and after the rack number and sample ID are scanned, test selection information inquiries are issued sequentially to the host based on the scanned information ("a" in the figure). During this operation, the inquiry text consists of one message per sample.

(b) Test selection information receive

The analyzer transfers the racks based on the test selection information received from the host.

The timeout period for responding to inquiries can be set in the control unit. Samples that could not receive a test selection information within the time period are designated as error samples, and the process moves to inquiry of the next sample. If the TS Timeout Interval is long, rack transfer will be slowed during this operation. Also, if the TS Timeout Interval is not set, the rack waits inside the rack rotor until the test selection information is received from the host, and so setting of a timeout period is recommended.

(c) Measurement Results Data Send

The photometric analysis unit ("analysis unit") conducts analysis based on the test selection information received from the control unit, and once analysis is completed, the analysis unit reports the measurement results to the control unit. The control units collects the analysis results from the analysis unit and sends the measurement results data sequentially to the host once all of the measurement results for a single sample are collected. Therefore, results are not sent to the host in the order that the samples were inserted.

The measurement results sent to the host can be selected from sending in sample units-or test units in the measurement results send screen.

In automatic rerun management, the racks are held inside the rack rotor until all of the measurement results are collected.

The control sample can be set for sending when the data for all tests is collected, for sending the results to the host in test units, or for not sending the results to the host. For this reason, in certain cases, the same control measurement results may be sent multiple times to the host in a single measurement. The measurement results for the standard solution are sent to the host in test units.

When the measurement results are sent, results with added alarms specified by the Review by Exception setting are not sent for routine samples, STAT samples, routine rerun samples, and STAT rerun samples.

(d) Automatic Rerun Test Selection Information Inquiry

The analyzer issues a rerun test inquiry to the host for samples where measurement results data was sent. For samples where rerun test inquiries were issued, the response timeout period is monitored in the same way as described in section (a).

(e) Automatic Rerun Test Selection Information receive

For samples where the measurement results data and automatic rerun test selection inquires were sent by the analyzer, the host can send automatic rerun test selection information. The time from when the analyzer sends the automatic rerun test selection information inquiry to the host until the automatic rerun test selection information of the sample is received can be set as a receive timeout. If the automatic rerun test selection information receive function is enabled, the host must send information without test reruns to the analyzer even for samples that do not have automatic rerun tests. If the TS Timeout Interval is long, analysis progress will be slowed during this time period. If the receive timeout period is not set, the rack waits inside the rack rotor until the test selection information is received from the host, and so setting of a receive timeout period is recommended.

If new tests were added to receive automatic rerun test selection information, rerun test and

additional test sampling are performed.

If a rerun test is sent from the host to a sample unloaded to the sample unloading unit, it is accepted as a batch request.

(f) Automatic Rerun Measurement Results Data Send

For samples which a rerun instruction have been received, the same analysis as the first run is performed, and when analysis is completed, the results are sent to the control unit. The control unit collects the rerun results from the analysis unit and sends the rerun measurement results to the host once the measurement results for a single sample are output. On Send to Host screen, unit of sending measurement results to the host computer can be selected from unit of samples or tests. When the test items for all of the samples on the rack are all rerun, the samples are transferred to the sample unloading unit, but the sample waits inside the rack loader if it includes a first run test item or additional request test item.

(2) Test selection information inquiry

(a) Inquiry Units

Test selection inquiries are performed in sample units. If "TS Inquire Always" is specified (see "2.1.5 Management Condition Settings (2)"), inquiries are conducted regardless of whether test selection information is included in the sample database, and if this option is not specified, inquiries are performed only for samples without test selection information.

(b) Process When Receive Timeout Error Occurs

No inquiry is made for the next sample until either the test selection information for the inquiry sample is received or a receive timeout error occurs. Therefore, analysis progress will be slowed during this time period. If a receive timeout occurs, once a cancel request is issued for inquiry of the sample where the timeout occurred, the process moves to inquiry of the next sample. For more information on the detailed specifications of the cancel request (cancellation of request tests), see "2.2.5 NCCLS LIS2-A2 Syntax (9) Request Information Record". The receive timeout period can be set by the control unit (see "2.1.5 Management Condition Settings (1)").

(c) Key Information for Inquiries

The key information for inquiries is shown in Table 2-3. If the key information in the received test selection information is different from the information at inquiry, the analyzer does not recognize it as test selection information on the requested sample, and instead stores it as batch request test selection information of another sample.

Table 2-3 Test Selection Inquiry Key Information

Key information	Description
Sample Priority	Identification as routine or STAT
Sample type	Identification of Whole Blood, Hemolysate, Serum/Plasma, Urine
Sample number	Analysis order number. Enabled for routine and STAT samples when not set to sample ID mode.
Sample ID	Scanned barcode information when using a barcode reader scanning device. When not using a scanning device, this is handled as a patient comment.
Rack ID	Rack number scanned by the analyzer. The range is different for routine racks and STAT racks.
Position number	Location where the sample is loaded on the rack.

The key information that is sent to the host at test selection information (TS) inquiry is shown in Table 2-3-1. Also, the key information used for comparison when receiving TS is shown in Table 2-3-2 and Table 2-3-3.

Table 2-3-1 Key Information Sent to Host at TS Inquiry

	Sample number mode				Sample ID mode			
	Routine		STAT		Routine		STAT	
	First run	Automatic rerun	First run	Automatic rerun	First run	Automatic rerun	First run	Automatic rerun
Sample number	o	o	o	o	0(Zero) fixed	0(Zero) fixed	0(Zero) fixed	0(Zero) fixed
Sample ID	o	o	o	o	o	o	o	o
Rack ID	o	o	o	o	o	o	o	o
Position number	o	o	o	o	o	o	o	o
Sample type	o	o	o	o	o	o	o	o
Sample Priority	o	o	o	o	o	o	o	o

o: Information that is sent from the automatic analyzer

Table 2-3-2 Key Information Used for Comparison when Receiving TS

	Sample number mode				Sample ID mode			
	Routine		STAT		Routine		STAT	
	First run Manual rerun	Automatic rerun	First run	Automatic rerun	First run Manual rerun	Automatic rerun	First run Manual rerun	Automatic rerun
Sample number	o	o	o	o	x	x	x	x
Sample ID	x	x	x	x	o	o	o	o
Rack ID	x	x	o	o	*2	x	*2	x
Position number	x	x	o	o	*2	x	*2	x
Sample type	o	o	o	o	*1	o	*1	o
Sample Priority	o	o	o	o	o	o	o	o

o: Information that is compared by automatic analyzer, x: Information ignored by automatic analyzer

*1 : Not handled as key information by the automatic analyzer for responses from the host to inquiries from the automatic analyzer made without sample type

*2 : Handled as key information by the automatic analyzer for responses from the host to inquiries from the automatic analyzer made without sample type

Table 2-3-3 Key Information Used for Comparison when Receiving TS of Barcode Read Error Sample

	Sample ID mode			
	Routine		STAT	
	First run Manual rerun	Automatic rerun	First run Manual rerun	Automatic rerun
Sample number	x	x	x	x
Sample ID	x	x	x	x
Rack number	o	o	o	o
Position number	o	o	o	o
Sample type	*1	o	*1	o
Sample Priority	o	o	o	o

o: Information that is compared by automatic analyzer, x: Information ignored by automatic analyzer

*1 : Not handled as key information by the automatic analyzer for responses from the host to inquiries from the automatic analyzer made without sample type

(d) Test Selection Information Used for Analysis

If the response to the inquiry cannot be accepted within the time period, an alarm is saved, and measurement is performed using the test selection information that was saved to the analyzer beforehand or using the default test selection information. The relationship between requests from the host and test selection information in the analyzer is shown in Table 2-4. This applies when "TS Inquire Always" is enabled in the communication conditions with the host. If "TS Inquire Always" is not enabled, an inquiry is not made to the host when there is test selection information.

Table 2-4 Relationship Between Requests from Host and Test Selection Information in Analyzer

Sample class	TS from host	Analyzer-side TS		Measurement
		Sample TS	Default TS	
Routine/STAT samples	o	o	o	Measurement based on TS combining TS from host and analyzer-side sample TS(Note 1)
	o	o	x	Measurement based on TS combining TS from host and analyzer-side sample TS(Note 1)
	o	x	o	Measurement based on TS from host
	o	x	x	Measurement based on TS from host
	x	o	o	Measurement based on analyzer-side sample TS
	x	o	x	Measurement based on analyzer-side sample TS
	x	x	o	Measurement based on analyzer-side default TS
	x	x	x	No measurement
Rerun sample	o	o	-	Measurement based on TS combining TS from host and analyzer-side sample TS(Note 1)
	o	x	-	Measurement based on TS from host
	x	o	-	Measurement based on analyzer-side sample TS
	x	x	-	No measurement

(o: Includes both test selection information and request, x: No test selection information or includes test selection information but no request, -: Disabled)

TS : Test selection information

Sample TS : Test selection information saved in the analyzer beforehand (Manual saved information or TS where batch communication was received)

TS from host: Test selection information received after an inquiry

Default TS : Test selection information that is set when there was no test selection information

*Note 1 : Are there for the same test different dilutions set at Analyzer and from host, then host overwrites dilution in analyzer.

(e) Test Item Masking

The analyzer includes an automatic masking function for aborting measurement of items if an error occurs in the reagent, calibration results, or other operation. Test items masked by this masking function are not analyzed even if an analysis request is issued from the host.

(f) Manual Rerun Management Method

Conducting analysis again on samples which incurred an analysis error is called manual rerun analysis, and these samples are called rerun samples. In sample number mode, this function is available only for routine samples, not for STAT samples. In sample ID mode, this function is available for both samples of routine and STAT. The differences between inquiries in sample number mode and sample ID mode are described below.

[1] Rerun Sample TS Inquiries in Sample No. mode

In sample number mode, rerun analysis can be conducted on routine racks. In the same way as first run analysis, the sample number is used as the key for issuing an inquiry of the test selection information to the host. A first run sample or rerun sample is identified based the number of times that analysis was conducted. If the sample number and sample type match, but analysis was already conducted one or more times, then the sample is a rerun sample. If analysis has not been conducted on the sample at all, it is a first run sample.

In sample number mode, rerun analysis cannot be conducted in STAT racks.

[2] Rerun sample TS inquiries in sample ID mode

In sample ID mode, rerun analysis can be conducted on routine racks and STAT racks. In the same way as first run analysis, the scanned barcode is used as the key for issuing an inquiry of the test selection information to the host. A first run sample or rerun sample is identified based the number of times that analysis was conducted. If the scanned sample ID and sample type match, but analysis was already conducted one or more times, then the sample is a rerun sample. If analysis has not been conducted on the sample at all, it is considered as a first run sample.

(g) Analysis of barcode read error samples in sample ID mode

The control unit includes a support function for measuring routine / STAT samples where a barcode read error has occurred or where a barcode label is not affixed. In the Barcode Read Error window, sample IDs (barcodes) where barcode read errors have occurred can be registered manually for the rack number-position number. During measurement, if a sample ID (barcode) that was entered manually was registered for a position where a read error occurred, an inquiry is issued to the host for the test selection information using the key information of the sample ID, rack number-position number, and sample type that were entered manually.

[TS Ask in Barcode Read Error function]

The following process is performed when "TS Ask in Barcode Read Error" is specified in the [System] - [Host Communication Settings] screen. If a barcode read error occurred at the analyzer side, an inquiry is issued using 22 asterisks (ASCII code 0x2A) "**********" as the sample ID. A sample ID corresponding to the rack number and position number is already provided at the host side and a response can be issued using this sample ID instead of "**********". If the sample ID "**********" is simply sent from the host side, this character string is recognized as a sample ID. In the same way as routine sample IDs, the same sample IDs are overwritten. If a correspondence is not obtained at the host side when using this function, either issue a sample ID that does not duplicate any other sample IDs, or wait for the timeout period that was set in the analyzer without issuing a response to the inquiry. If a timeout occurs, the error "111-2: Host TS receive error" occurs.

(h) Analysis of samples without types in sample ID mode

In the [System] - [Rack Assignment] screen, an inquiry is issued from the analyzer as a sample without types when the sample types of the samples loaded on a mixed rack are unknown. A type corresponding to the rack number-position number and the sample ID is already provided at the host side, and a response can be issued using this type.

If the host sends communication without the type, an error occurs, and no response is received.

In mixed racks, the types are mixed within the same rack.

(3) Measurement results data send

The analyzer sends the results sequentially to the host once all of the measurement results for a single sample are collected. The measurement results sent to the host can be selected from sending in sample units, test units in the measurement results send screen. Because the analysis time (response time) is variable by test item, the measurement results are sent independent of the sample loading order. The text of the measurement results data varies based on the sample class.

The types of measurement results data that are sent during realtime communication are shown in Table 2-5.

Table 2-5 Types of Measurement Results Data

Sample class		Types of measurement results data
Routine/STAT sample		Routine/STAT sample measurement results data
Standard solution	Photometric test	Photometric calibration results data
Control sample		Control sample measurement results data

(4) Automatic rerun test selection information receive

(a) Sample class

Automatic rerun is performed for routine samples and STAT samples only. It is not performed for other samples.

(b) Process when rerun determined

After the analyzer receives the automatic rerun test selection information from the host, the information is registered to the sample database. A check is performed for which rerun items are included for all samples on the analyzer.

(c) Acceptance key information

The key information accepted by the analyzer is identical to the information contained in Table 2-3 above. If any of the key information differs from the information when the measurement results data was sent, the information is not recognized as rerun information of the inquired sample and is saved as the batch information of a separate sample.

(d) Masking based on insufficient samples and other conditions

In addition to the automatic masking and manual masking that were described before, see "Table 2-21 Data Alarms" for details on how judgment is implemented in automatic rerun.

(5) Automatic rerun test selection inquiry

(a) Key information used in inquiries

This uses the same information as the key information used in the first run inquiry. During this operation, the inquiry text consists of one message per sample.

(b) Inquiry sample

For samples where a receive timeout occurred in "(4) Automatic rerun test selection information receive", once a cancel request is issued for inquiry of the sample, the process moves to inquiry of the next sample.

(c) Masking based on insufficient samples and other conditions

Details of how judgment is implemented for automatic rerun are based on the information in Table 2-21 Data Alarms. Automatic rerun test selection information inquiries are not made for samples where a data alarm which is “Samp.C” or “Samp.S” was added.

(d) Process when receive timeout error occurs

No inquiry is made for the next sample until either the test selection information for the inquiry sample is received or a receive timeout error occurs. Therefore, analysis progress will be slowed during this time period. If a receive timeout occurs, once a cancel request is issued for inquiry of the sample where the timeout occurred, the process moves to inquiry of the next sample. For more information on the detailed specifications of the cancel request (cancellation of request tests), see "2.2.5 (9) NCCLS LIS2 Syntax-".

(e) Test selection information used for analysis

If the response to the inquiry could not be received, the alarm is saved, and analysis is performed using the rerun test selection information determined by the analyzer. The default test selection information is not used in rerun measurement. The relationship between requests from the host and test selection information in the analyzer is shown in Table 2-6.

Table 2-6 Test Selection Information Used in Automatic Rerun

Sample class	TS from host	Analyzer-side TS		Rerun
		Analyzer judgment TS	Default TS	
Routine and STAT samples	o	o	-	Measurement based on TS combining TS from host and analyzer-side judgment TS
	o	x	-	Measurement based on TS from host
	x	o	-	Measurement based on analyzer judgment TS
	x	x	o	No measurement

(o: Includes both TS and request, x: No TS or includes TS but no request, - : Disabled)

TS: Test selection information

TS from host: TTS received at inquiry

Analyzer judgment TS: Rerun TS based on data alarm when performing first run measurement

Default TS: TS that is set when there has been no TS

(6) Automatic rerun measurement results data send

In the same way as first run analysis, the analyzer sends the results sequentially to the host once analysis is completed. The measurement results sent to the host can be selected from sending in sample units, or test units in the measurement results send screen.

(7) Realtime TS Flowchart

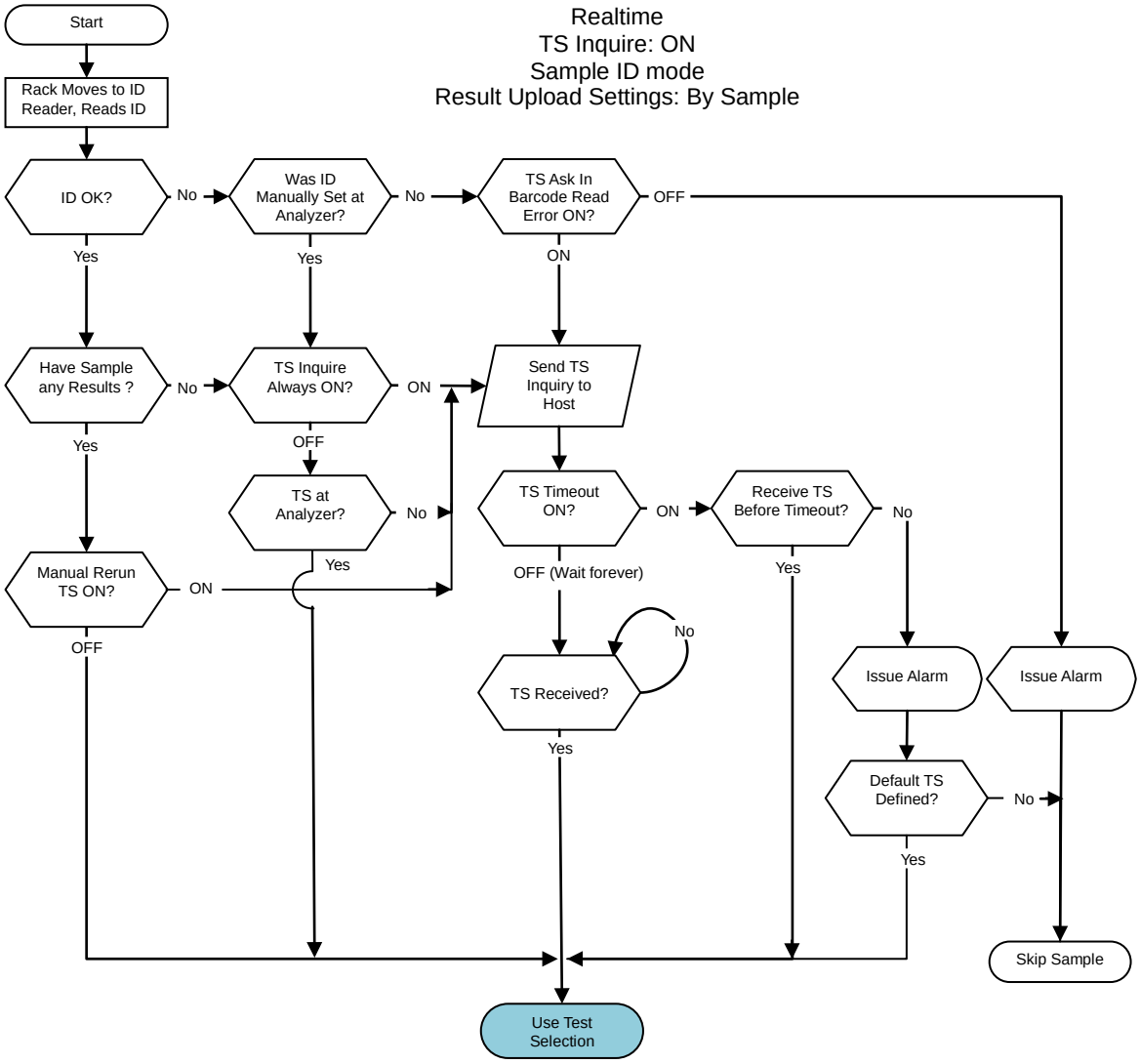


Figure 1: Realtime TS Flowchart

(8) Realtime Rerun TS Flowchart

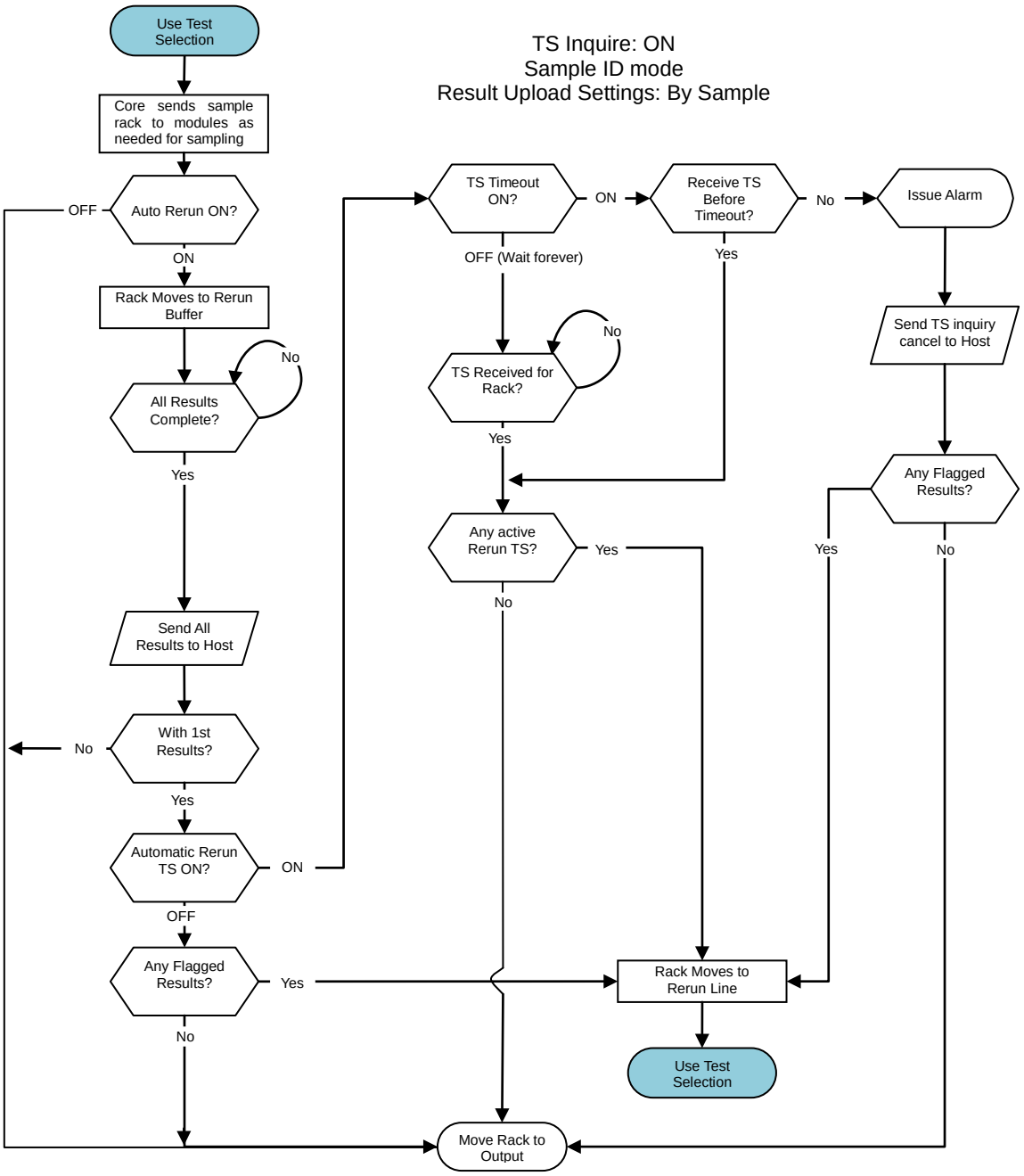


Figure 2: Realtime Rerun TS Flowchart

2.1.3. Batch Communication

The batch communication functions are listed in Table 2-7. The communication functions are described in detail below.

Table 2-7 Batch Communication Functions

Communication function	Request source	Routine/STAT sample			Standard solution	Control sample
		Routine	STAT	Rerun		
Test selection information receive	Host	o	o	o	x	x
Measurement results data send	Host	o	o	o	x	x
	Control unit	o	o	o	x	o
Reaction process data send	Control unit	o	o	o	x	o

(o: Implemented, x: Not implemented)

(1) Test selection information receive

The host can register the test selection information of the routine/STAT sample to the analyzer at any selected timing. However, if the analyzer receives the test selection information for the tests during analysis from the host, the host does not register it. Because the analyzer exchanges a large amount of information with the host, it is recommended that the test selection information be registered before analysis using this function for reducing the communication load during analysis.

(a) Key information used in registering

In the same way as realtime communication, the type of key information for registering to the database in the analyzer varies depending on the analyzer management mode. If the information is the same as the key information of the same registered routine/STAT sample, the sample is overwritten, and if the information is not found, it is registered as a new sample. Table 2-8 shows the key information registered to the database in the analyzer during batch communication

Table 2-8 Key Information Registered to Database in Analyzer

Analysis mode	Key information				
	Sample priority	Sample type	Sample number	Sample ID	Rack - Position
Sample number mode	Routine sample	o	o	x	x
	STAT sample	o	0(Zero) Fixed	x	o
Sample ID mode	Routine sample	o	x	o	x
	STAT sample	o	0(Zero) Fixed	o	x

(o: Information registered to database, x: Ignored information)

For the racks where patient samples are loaded, the range of the rack numbers is set for each sample type in the control unit. For STAT samples, an error occurs if the sample type from the host and the rack number-position number are outside the setting range made in the control unit.

(b) Number of samples that can be registered

The number of samples that can be registered in the system database is a total of 12,000 routine and STAT samples combined. Due to this restriction, an error occurs when the test selection information received from the host could not be registered.

(c) Number of request tests that can be registered

Regardless of batch/realtime communication, a maximum of 200 request tests per sample can be registered to the system database not including tests where results have already been produced (and do not have a rerun request). An error occurs if the number of request tests received from the host exceeds 200.

(2) Measurement results data send

Batch sending of measurement results data is possible by issuing a command from the system control unit or issuing a command from the host.

(a) Issuing command from control unit

Select this option from the [Data Review] screen. This performs batch sending of the measurement results data to the host for patient samples and control samples selected from the list.

During sending, you can specify whether the data sent to the host includes or excludes tests that were already sent before. And first run, rerun, or chosen can be specified for data types of measurement results to be sent.

(b) Request from host

This sends the measurement results data of patient samples requested from the host. Control samples cannot be requested.

First run or rerun can be specified for data types of measurement results to be sent.

The results to be sent for both (a) and (B) are determined based on the following rules. The results to be sent are filtered in order from [1] to [4]. [4] is a rule for (a) only.

[1] Measurement results are available.

[2] For routine/STAT samples, alarms specified in Review by Exception are not included.

[3] Use of results was specified (Note 1). Alternatively, only one result data for the same test remains.

[4] If a command is issued from the control unit, when "Send to Host = Unsent to Host Only" is specified, these are results that were not sent to the host.

Note 1: In the [Data Review] screen, use of the first run or rerun can be specified for the sample results. The one that is specified for use is the data that is sent. Results including alarms specified in Review By Exception cannot be used.

(3) Reaction process data send (photometric test)

This is performed based on commands from the analyzer screen. This can be performed by sending the reaction process displayed in graph form or by selecting or sending multiple choices from the patient list. The absorbance data to be sent is a value that is 10,000 times the absorbance of the two-wavelength difference.

2.1.4. Communication Text Details

The communication text is listed in Table 2-9. The details for each text are shown below. For details on the communication text formats, see "2.2 Host Communication NCCLS LIS2 Upper/Lower Interface Specifications".

Table 2-9 Communication Text

Communication text	Communication direction	Realtime communication	Batch communication
Test selection inquiry	Analyzer --> Host	o	x
Automatic rerun test selection inquiry	Analyzer --> Host	o	x
Test selection information	Host --> Analyzer	o	o
Automatic rerun test selection information	Host --> Analyzer	o	x
Patient sample measurement results data	Analyzer --> Host	o	o
Photometric calibration results data	Analyzer --> Host	o	x
Control sample measurement results data	Analyzer --> Host	o	o
Reaction process data (photometric)	Analyzer --> Host	x	o
Measurement results send request	Host --> Analyzer	x	o

(o: Yes, x: No)

(1) Test selection inquiry

Test selection inquiries are performed in sample units. The information contained in a single sample is shown in Table 2-10.

Table 2-10 Test Selection Inquiry Information for Single Sample

NO.	Item	Sample	Analyzer mode	Qt'y	Description
1	Identification details code	-	-	1	First run (<Kind> is R1) Rerun(This means manual rerun) (<Kind> is R2)
2	Sample type	-	-	1	1: Whole Blood, 2:Hemolysate, 3: Serum/Plasma,4:Urine, 0: No type
3	Sample number	Routine STAT	ID	1	Reserved
			S.No.	1	1 to 60,000
4	Rack No.	(Note 1)	-	1	The range varies depending on the sample class. (Note 1)
5	Position No.	-	-	1	1 to 5
6	ID No.	-	ID	1	Sample barcode
			S.No.	1	Patient comment (This means that S.ID is used as comment with the S.No mode.)

Measurement mode: ID; Sample ID mode, S. No.; Sample number mode

Note 1: See "2.1.1 (4) Analyzer management methods".

(2) Automatic rerun test selection inquiry

Automatic rerun test selection inquiries are performed in sample units. The information contained in a single sample is shown in Table 2-11. In the first run analysis, inquiries are not made for samples that include a sample probe clogging detection error data alarm.

Table 2-11 Automatic Rerun Test Selection Inquiry Information for Single Sample

NO.	Item	Sample	Analyzer mode	Qt'y	Description
1	Identification details code	-	-	1	Automatic rerun (<Kind> is R2)
2	Sample type	-	-	1	1: Whole Blood, 2:Hemolysate, 3: Serum/Plasma, 4:Urine
3	Sample number	Routine STAT	ID	1	Reserved
			S.No	1	1 to 60,000
4	Rack number		-	1	The range varies depending on the sample class. (See Table 2-1.)
5	Position number	-	-	1	1 to 5
6	ID number	-	ID	1	Sample barcode
			S.No	1	Patient comment

Measurement mode: ID; Sample ID mode, S. No.; Sample number mode

(3) Test selection information and automatic rerun test selection information

The analyzer accepts the test selection information of samples other than samples where an inquiry was made to the host as batch communication. Batch communication is accepted for any user-selected samples. The tests contained in the communication text are identical for realtime communication and batch communication. The test selection information contained in a single sample is shown in Table 2-12.

Table 2-12 Test Selection Information for Single Sample

NO.	Item	Sample	Measurement mode	Qt'y	Description
1	Sample Priority	-	-	1	Routine, STAT
2	Sample type	-	-	1	1: Whole Blood, 2: Hemolysate, 3: Serum/Plasma,4:Urine
3	Sample No. (Note 3)	Routine STAT	ID	1	Reserved
			S.NO.	1	1 to 60,000
4	Rack No.		-	1	The range varies depending on the sample class. (See Table 2-1.)
5	Position No.	-	-	1	1 to 5
6	ID No.	-	ID	1	Sample Barcode
			S.NO.	1	Sample Comment
7	Test item code	-	-	200	Send host codes set on [System]-[Communication Settings]-[Communication Settings](1 to 60000) - The request for HbA1c tests is a request for the %HbA1c test code. (Requests for Hb and HbA1c test codes are not allowed.). - Request calculated test using assigned host codes. - Maximum number of registrable test items: Photometric = 120, Calculated tests = 8. The maximum number of registered tests that can be accepted at one time is 200.
8	Request information(Note 4)	-	-	200	Request clear, Standard volume, Decrease, Increase Dilution ratio '3', '5', '10', '20', '50'
9	Sample comment(Note 1)	-	-		Total of up to 100 single-byte characters
10	Age Unit(Note 1)	-	-		Day, Month, Year
11	Age (Note 1)		-		0 to 200
12	Sex (Note 1)		-		Male or Female
13	Blood draw date (Note 1) (Note 2)	-	-		Year, Month, Day, Hour, Minute, Second

Measurement mode: ID; Sample ID mode, S. No.; Sample number mode

Note 1: If comment sending described in “2.1.5 Management Condition Settings” is not set, they are not sent.

Note 2: The year range is from 2001 to 2037. The setting for this information is essential.

Note 3: For test selection information sent to the STAT sample by batch communication, the sample number is fixed at 0. If this condition is not satisfied, a receive text error alarm is output.

Note 4: For tests that use simultaneous two-test measurement, set so that the request information is the same for the first-half test and the second-half test.
For example: If the first-half test is "Decrease", the second-half test is also "Decrease".
However, the test cord to appoint in request TS in c513 is %HbA1c. Therefore, for Whole Blood or a Hemolysate Sample, there is not used a simultaneous two-test measurement.

(4) Routine/STAT sample measurement results data

The tests contained in the communication text are identical for realtime communication and batch communication. The information contained in the patient sample measurement results data for a single sample is shown in Table 2-13.

Table 2-13 Measurement Results Data for Single Sample

NO.	Item	Sample	Analyzer mode	Qt'y	Description
1	Sample Priority	-	-	1	Routine, STAT
2	Identification details code	Routine, STAT	-	1	First run, Rerun
3	Sample type	-	-	1	1:Whole Blood, 2: Hemolysate, 3: Serum/Plasma, 4: Urine
4	Sample number	Routine, STAT	ID	1	Reserved
			S.No.	1	1 to 60000
5	Rack ID	-	-	1	The range varies depending on the sample class. (See Table 2-1.)
6	Position number	-	-	1	1 to 5
7	ID number	-	ID	1	Sample Barcode
		-	S.No.	1	Screen display comment
8	Test item code	-	-	200	Send host codes set on [System]-[Communication Settings]-[Communication Settings](1 to 60000) Maximum number of registrable test items: Photometric = 120, Calculated tests= 8 The maximum number of registered tests that can be accepted at one time is 200.
9	Request information	-	-	200	Standard quantity, Decrease, Increase Dilution ratio(Note 4) '3', '5', '10', '20', '50'
10	Measured value	-	-	100	Signed 6-byte character with decimal point(Note 2)
11	Units of measured values	-	-	100	8-byte character
12	First run/rerun for each result	-	-	100	First run, Rerun
13	Data alarms	-	-	100	See Table 2-21.
14	Measurement date (Note 3)	-	-	1	Year, Month, Day, Hour, Minute, Second
15	Operator ID (Note 5)	-	-	1	Operator ID at measurement
16	Sample comment (Note 1)	-	-	1	Total of up to 100 single-byte characters
17	Age Unit (Note 1)	-	-	1	Day, Month, Year
18	Age (Note 1)	-	-	1	0 to 200
19	Sex (Note 1)	-	-	1	Male or Female
20	Blood draw date (Note 1) (Note 3)	-	-	1	Year, Month, Day, Hour, Minute, Second
21	Pipetting date and time (Note 3)	-	-	1	Year, Month, Day, Hour, Minute, Second

Measurement mode: ID; Sample ID mode, S. No.; Sample number mode

Note 1: If comment sending described in “2.1.5 Management Condition Settings - Comments Upload” is not set, they are not sent,

Note 2: If qualitative determination is specified, it is expressed by dividing into six stages as shown in Table 2-14.

Note 3: The year range is from 2001 to 2037.

Note 4: Tests where measurement is not performed are not included in the measurement results data request information.

Note 5: In case of logoff mode, 2 single-byte characters are sent.

Table 2-14 Qualitative Determination Send Data

Item	Measured value range	Transmission data
Photometry	Measured value <= Qualitative determination concentration 1	-2
	Qualitative determination concentration 1 < Measured value <= Qualitative determination concentration 2	-1
	Qualitative determination concentration 2 < Measured value <= Qualitative determination concentration 3	0
	Qualitative determination concentration 3 < Measured value <= Qualitative determination concentration 4	1
	Qualitative determination concentration 4 < Measured value <= Qualitative determination concentration 5	2
	Qualitative determination concentration 5 < Measured value	3

(5) Photometric calibration results data

This data is sent during realtime communication only. Table 2-15 shows the information contained in the photometric calibration results data for a single test.

Table 2-15 Photometric Calibration Results Data for Single Test

NO.	Item	Sample	Measurement mode	Qt'y	Description
1	Sample Priority	-	-	1	Standard solution
2	Analysis module name	-	-	1	See O-6 in "(12) Photometric Calibration Result Record" in 2.2.5.
3	Test item code	-	-	1	Code to be sent depends on the host code ([System]-[Communication Settings]-[Communication Settings]) (1 to 60000)
4	Data alarm	-	-	1	See Table 2-21.
5	Measured value	-	-	24	See (12) Photometric Calibration Result Record" in 2.2.5.
6	SD value	-	-	1	Signed 6-byte character with decimal point
7	Operator ID (Note 1)	-	-	1	Operator ID at measurement

Note 1: In case of logoff mode, 2 single-byte characters are sent..

(6) Control sample measurement results data

The tests contained in the communication text are identical for realtime communication and batch communication. The information contained in the control sample measurement results data for a single sample is shown in Table 2-16.

Table 2-16 Control Sample Measurement Results Data for Single Sample

NO.	Item	Sample	Analyzer mode	Qt'y	Description
1	Sample Priority	-	-	1	Control sample
2	Identification details code	-	-	1	First run
3	Sample type	-	-	1	1: Whole Blood, 2: Hemolysate, 3: Serum/Plasma, 4: Urine
4	Control number	-	-	1	1 to 100
5	Sequence number	-	-	1	1 to 150
6	Rack ID	-	-	1	See Table 2-1.
7	Position number	-	-	1	1 to 5
8	Control name	-	-	1	Screen input characters
9	Test item code	-	-	200	(1 to 60000)
10	Request information	-	-	200	Standard quantity
11	Measured value	-	-	200	Signed 6-byte character with decimal point
12	Units of measured values	-	-	200	8-byte character
13	Data alarms	-	-	200	See Table 2-21.
14	Measurement date (Note 1)	-	-	1	In order of Year, Month, Day, Hour, Minute, Second
15	Operator ID (Note 2)	-	-	1	Operator ID at measurement
16	Pipetting date and time (Note 1)	-	-	1	In order of Year, Month, Day, Hour, Minute, Second

Note 1: The year range is from 2001 to 2037.

Note 2: In case of logoff mode, 2 single-byte characters are sent..

(7) Reaction process data

This function is available for batch communication only. The text configuration is not dependent on the sample class. The information contained in the reaction process data for a single test is shown in Table 2-17.

Table 2-17 Reaction Process Data for Single Test

NO.	Item	Sample	Analyzer mode	Qt'y	Description
1	Sample Priority	-	-	1	Routine, STAT, Quality control
2	Identification details code	Routine, STAT	-	1	First run, Rerun
		Control sample	-	1	Reserved
3	Sample type	-	-	1	1: Whole Blood, 2:Hemolysate, 3: Serum/Plasma, 4:Urine
4	Analysis module name	-	-	1	See [4] of "(11) Photometric Raw Data (Absorbance) Record: Reaction Process Record" in 2.2.5.
5	Sample number 1	Routine, STAT	S.No.	1	1 to 60,000
			ID	1	Reserved
		Control sample	-	1	1 to 100 (Control No.
6	Sample number 2	Routine, STAT	-	1	Reserved
				1	Reserved
		Control sample	-	1	1 to 150 (Sequence No.)
7	ID number	Routine, STAT	S.No.	1	Patient Comment
		-	ID	1	Sample Barcode
		Control sample	-	1	Control Name
8	Rack ID	-	-	1	See Table 2-1.
9	Position number	-	-	1	1 to 5
10	Cell number	-	-	1	1 to 221
11	Inner and outer circumference information	-	-	1	Reserved
12	Reaction time	-	-	1	3 to 10
13	Measurement date (Note 1)	-	-	1	In order of Year, Month, Day, Hour, Minute, Second
14	Test item code	-	-	1	1 to 60000
15	Measured value	-	-	1	6-byte character
16	Request information	-	-	1	Standard volume, Decrease, Increase, Dilution ratio '3', '5', '10', '20', '50'
17	Data alarms	-	-	1	See Table 2-21.
18	Cell blank absorption value	-	-	4	Two-wavelength difference absorption value data
19	Number of photometric points	-	-	34	1 to 34
20	Reaction process absorption value	-	-	34	Two-wavelength difference absorption value data
21	Operator ID (Note 1)	-	-	1	Operator ID at measurement
22	Pipetting date and time (Note 1)	-	-	1	In order of Year, Month, Day, Hour, Minute, Second

Note 1: The year range is from 2001 to 2037.

Note 2: In case of logoff mode, 2 single-byte characters are sent.

(8) Measurement results send request

This is used when the host requests measurement results data from the analyzer. The information contained in the measurement results send request for a single sample is shown in Table 2-18.

Table 2-18 Measurement Results Send Request for Single Sample

NO.	Item	Sample	Analyzer mode	Qt'y	Description
1	Sample Priority	-	-	1	First run, Rerun, Selected (Note 1)
2	Sample type	-	-	1	1: Whole Blood, 2: Hemolysate, 3: Serum/Plasma, 4: Urine
3	Sample number	Routine	ID	1	Reserved
4		STAT	S.No.	1	1 to 60,000
	Rack number	-	-	1	The range varies depending on the sample class. (See Table 2-1.)
5	Position number	-	-	1	1 to 5
6	ID number	-	ID	1	Sample barcode
			S.No.	1	Sample comment

Note 1: The measurement results that are sent from the analyzer are determined based on "(4) Routine/STAT sample measurement results data" regardless of whether it is first run or rerun.

2.1.5. Management Condition Settings

The various conditions for host management can be set in the control unit [System] screen - [Communication] window, and [Review by Exception] window-. For the hardware setting specifications, see "1. Hardware Specifications for External System Connection". This describes the specifications for the various condition settings for management. The condition settings for management are listed in Table 2-19. The detailed functions are described starting from the pages below.

Table 2-19 Condition Setting List for Management

Window Name	Item	Description
Communication Settings	System Name	Specifies the name used on reports and in communications for the c513 analyzer.
	System ID	Specifies the ID number used to identify the system in communications with the host.
	Host Name	Specifies the name used on reports and in communications for the host.
	Host ID	Specifies the ID number used to identify the host in communications with the host.
	Automatic Recovery of Session	Specifies whether communication is automatically restarted when the communication is interrupted.
	Communication Trace	Specifies whether communication trace is performed.
	RS232C Setting Speed Character	See “2.2.2 Physical Layer Specifications (Electrical Specification)”.
	*cobas link Setting Communication EIU Level	These options are used for cobas link. There are not relations with the HOST communication.
Text Settings	Conc. Of Chemistry Qualitative Tests Upload	With this mode enabled, the concentration of the chemistry qualitative test is sent to the host.
	Original Data Upload	In addition to the tests that are officially requested, the sets whether the supplemented test measurement results that are automatically filled in the calculated test and %HbA1c test items are also sent to the host computer.
	Comments Upload	Specifies whether comments for routine/STAT are sent.
	Time Stamp of Pipetting Samples Upload	Specifies whether pipetting date and time are sent.
	Rack ID Type	Specifies the definition of rack number.
	Host Code	Sets the test code for sending to host.
TS Inquiry Settings	TS Timeout Interval	Sets the response timeout period for the test selection information inquiry and automatic rerun TS.
	TS Inquire Always	Specifies whether an inquiry is made to the host regardless of whether the test selection information is contained in the analyzer.
	Automatic Rerun TS	Specifies whether an automatic rerun test selection information inquiry is performed.
	Manual Rerun TS	Specifies whether a manual rerun sample test selection information inquiry is performed.

	STAT TS	Specifies whether a STAT sample test selection information inquiry is performed.
	TS Priority Mode	During test inquiries from analyzers, this specifies whether other transmissions are sent from the analyzer until the test selection information from the host is received during an automatic rerun inquiry.
	TS Ask in Barcode Read Error	Specifies whether a barcode read error sample test selection information inquiry is performed.
Review By Exception settings	Review By Exception	Specifies whether the measurement results that include a data alarm that was set are sent to the host.
Result Upload Settings	Measurement Results Send Setting	Specifies the transmission method for the measurement results of routine samples, STAT samples, control samples, and calibration. This can be specified from sample units, test units, or do not send.

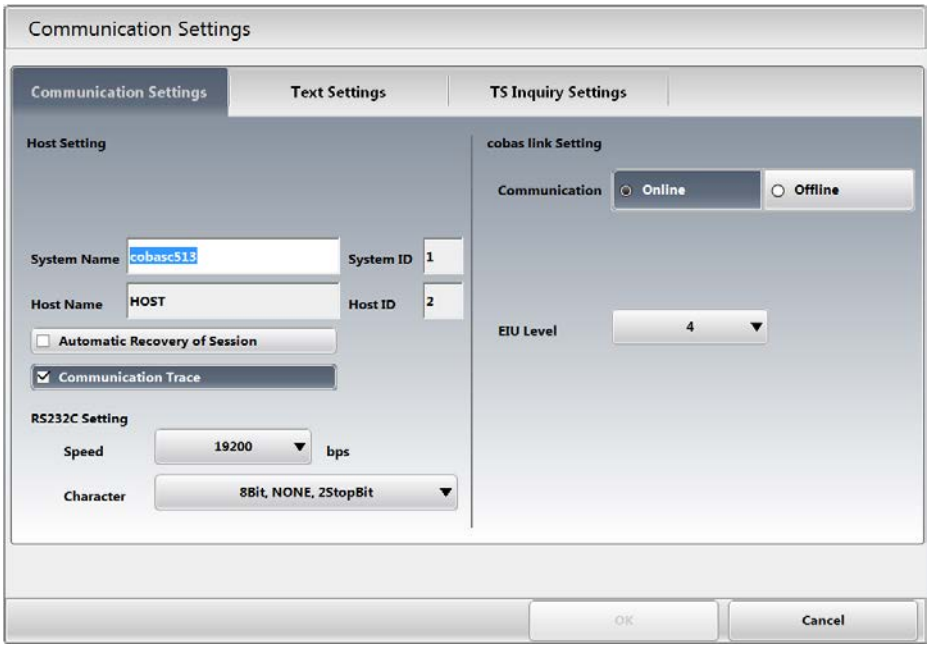


Figure 2-1-5-1: Communication Setting in Utility > System > Communication Setting screen

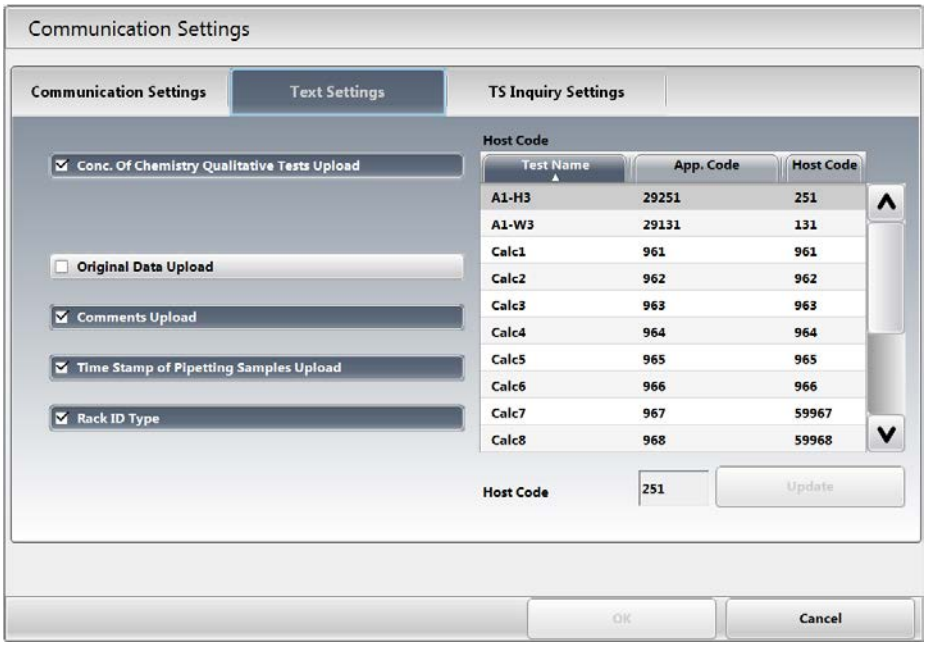


Figure 2-1-5-2: Text Setting in Utility > System > Communication Setting screen

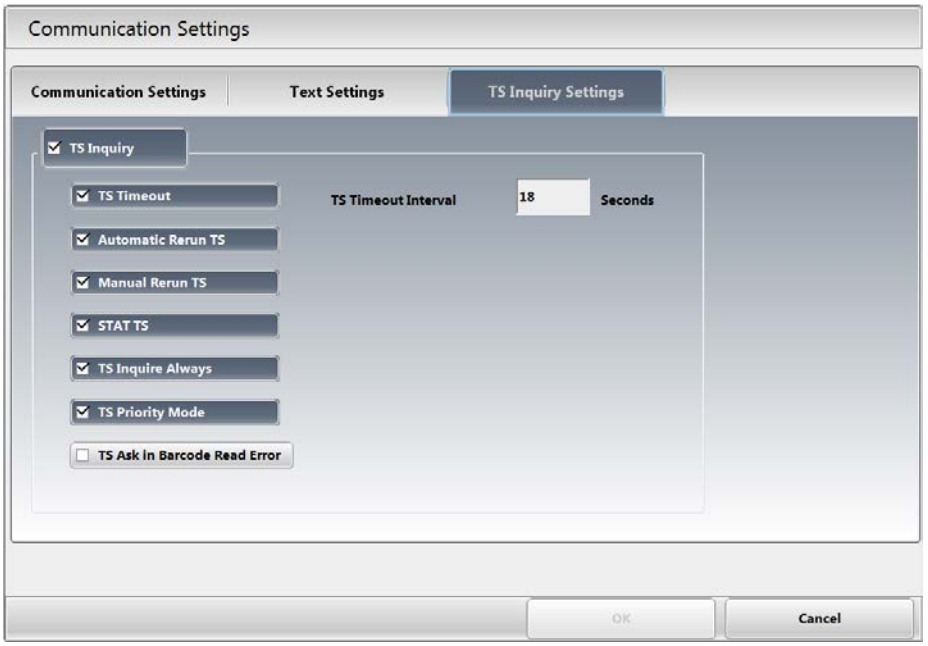


Figure 2-1-5-3: TS Inquiry Settings in Utility > System > Communication Setting screen

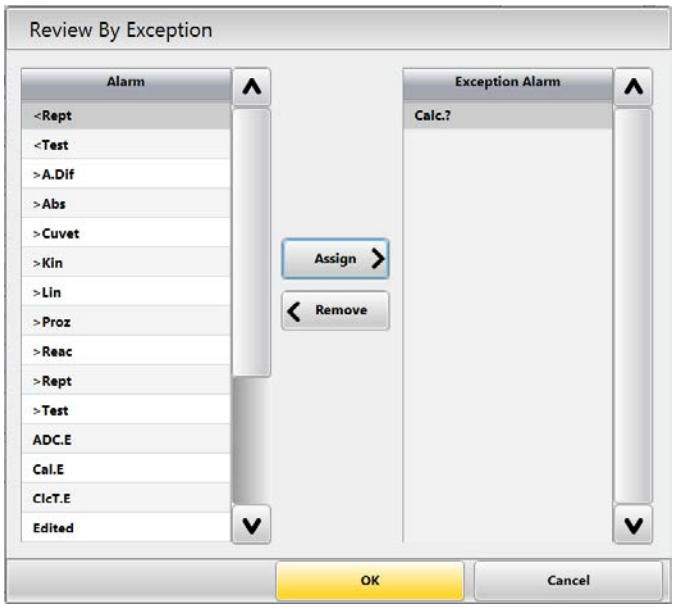


Figure 2-1-5-4: Utility > System > Review By Exception screen

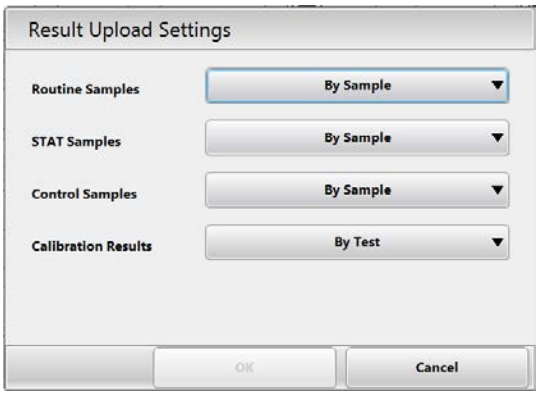


Figure 2-1-5-5: Utility > System > Result Upload Settings

(1) TS Timeout Interval

This function applies to test selection information inquiries and automatic rerun test selection information inquiries for test selection inquiries (routine samples, STAT samples, rerun samples) in realtime communication. The inquiry text consists of one message per sample and is sent in message units, and the response timeout period from the host for inquiries from the system is set for each message. If the timeout period is not set, the analyzer waits until the test selection information is received from the host, and so setting of a timeout period is recommended.

Default value is 18 seconds.

The range is different by setting of “TS Priority Mode”.

- TS Priority Mode is ON : 1 to 18
- TS Priority Mode is OFF : 10 to 9998

(2) TS Inquire Always

This function applies to test selection information inquiries for routine samples and STAT samples in realtime communication. It does not apply to test selection information inquiries and automatic rerun test selection information inquiries for rerun samples. If this function is specified, inquiries are conducted regardless of whether test selection information is included in the analyzer, and if this function is not specified, inquiries are performed only for samples without test selection information. The default test selection information is unrelated to whether registration was performed.

(3) Automatic Rerun TS

This function applies to Auto Rerun TS inquiry within the Realtime Communications. When this function is enabled in the Auto Rerun mode during analysis, an inquiry is made for the Auto Rerun selections. When this function is not enabled, no inquiry for the Auto Rerun Selection is made.

(4) Manual Rerun TS

This function applies to test selection information inquiries for Manual Rerun samples in realtime communication. If this function is specified, test selection inquiries for the Manual Rerun samples are performed, but if it is not specified, test selection inquires for Manual Rerun samples are not performed.

(5) STAT TS

This function applies to test selection information inquiries for STAT samples in realtime

communication. If this function is specified, test selection inquiries for the STAT samples are performed during analysis, but if it is not specified, test selection inquires for STAT samples are not performed. This function applies also to automatic rerun test selection information inquiries in realtime communication.

(6) Comments Upload

This function applies to all host communications. When this function is enabled, the host can register test selection information to the analyzer with the addition of patient comments. Patient comments stored in the analyzer can also be transmitted to the host along with analytical data and Reaction Monitor data. When this function is not enabled, no patient comments are accepted or sent.

(7) Communication Trace

This function applies to all host communications. 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 printed from the global Print screen. This report can be used as an analysis tool if a problem occurs.

How to store a host communication trace file

It is possible to get a host communication trace by the following procedure. (The analyzer must be in Standby mode. And Host communication on Start Screen must be turned off.)

- Touch the Print button.
- Select Utility tab.
- Select the Communication Trace in the list box.
- Select the radio button “Data Range” or “Detail”
- Touch Preview button.

After above procedure, touch History button, and backup the communication trace in the view on the media.

(8) TS Ask in Barcode Read Error

This function applies to test selection information inquiries for routine samples and STAT samples in ID mode. If this function is specified, and the analyzer cannot read a sample barcode, it will send the rack ID and position to the host as key information. The sample ID is sent as ‘***...’ [22 characters of ‘*’]. If the host has the table of the rack ID, position and Sample ID, the host can send the analyzer the correct Sample ID instead of ‘***...’.
(Only available if in Utility, Barcode Setting, Routine / STAT = Checked to enable the barcode reader.)

(9) Automatic Recovery of Session

This function specifies whether the communication session automatically restarts when the session is interrupted by communication error based on ASTM E1381-91 standard. However, even if this function is enabled, the communication messages itself errored communication and the communication messages sent from the host until restart process is completed are lost.
When the same alarm is occurred 5 times consecutively, no automatic recovery is performed.

(10) TS Priority Mode

This function applies to test selection inquiries and automatic rerun test selection information inquiries in realtime communication. After sending of test selection inquiries and automatic rerun test inquiries from the analyzer, all other communication is disabled until the analyzer receives the answer to the

inquiry from the host or the TS timeout period passes. If this mode is specified, the TS Timeout Interval can be specified from 1 to 18 seconds. The initial setting of the timeout period is 18 seconds.

(11) Host Codes

This function applies to all host communications. Converts test code that was saved to the analyzer into the host code according to the setting in [System]-[Communication Settings]-[Communication Settings].

(12) Review By Exception

In the control unit [System] screen - [Review by Exception] window, the items that are sent and not sent to the host based on the data alarm added to the measurement results can be specified. This function applies to the sending of results data for routine samples and STAT samples regardless of whether it is first run, rerun, or batch/realtime communication. This does not apply to the reaction processes, control samples, or standard solutions.

All measurement results including data alarms are sent to the host except those measurement results that include data alarms that were set to not be sent.

If no more measurement results data are available to be sent during sending in realtime, the sample information only is sent to the host for automatic rerun determination and other operations by the host.

(13) Measurement results send setting

This is applied to the sending of results for routine samples, STAT samples, rerun samples, control samples, and calibration in realtime communication. Sample units, test units, or do not send is specified for routine samples, STAT samples, rerun samples, or control samples, and test units or do not send is specified for calibration. If test units is specified, the measurement results are sent to the host for each test whenever results are output from the analysis unit during analysis. If sample units is specified, the measurement results are sent to the host as soon as all results for the sample are output. If do not send is specified, the measurement results are not sent to the host.

(14) Original Data Upload

This function applies to the sending of results. When this function is enabled, in addition to the tests that are officially requested, the supplemented test measurement results that is automatically filled in the test-to-test compensation, the calculated test and %HbA1c test are also sent to the host computer.

(15) Rack ID Type

This function applies to all host communications. The default is barcode ID. When this function is enabled, specify label ID. Specify one rack number for use of communication with host from barcode ID or label ID according to this setting (Table 2-20). Use label ID normally.

*Barcode ID is the number when barcode label on rack is scanned.

*Because label ID is the same number as screen display and the number affixed the rack, searching for racks is easy and it could be helpful for inquiry response.

Table 2-20 Rack Number Types and Correspondence

Sample Class	Rack Type	Barcode ID	Label ID
Routine sample	Routine rack (gray)	50001 to 50999	00001 to 00999

Sample Class	Rack Type	Barcode ID	Label ID
		60000 to 60999 70000 to 70999 80000 to 80999	01000 to 01999 02000 to 02999 03000 to 03999
STAT sample	STAT rack (red)	40001 to 40999	E0001 to E0999
Control sample	Control rack (white)	30001 to 30999	C0001 to C0999
Standard solution	Calibrator rack (black)	20001 to 20999	S0001 to S0999

2.1.6. Error Processing

This section describes the communication errors detected by the application layer. Also Errors detected by the ASTM upper layer level program are shown in 2.2.5 (15) Error processing ASTM upper layer. Errors detected by the ASTM lower layer level program are shown in 2.2.6 (5) Error processing for ASTM lower layer.

(1) Errors detected by application layer

When an error is detected, the alarm codes below are displayed in the Alarm screen shown in the operation screen of the analyzer.

Table 2-21 System Alarm List

Alarm Name	Alarm Code		Description	Processing (Note 1)
	Meijer	Sub		
TS receive error	111	2	No response to inquiry within a set time in the operation screen.	x
		3	No response to inquiry within 10 minutes. This alarm is to call your attention and the communication status is maintained as it is.	-
		5	The test code requested by the host is not registered in the analyzer.	x
		51	Errors in sample management database.	x
		52	Dilution ratio code is out of range.	x
		53	Errors in the following sample information value. Application code, Sample Type, Sample ID, Sample No., Rack No., Position	x
		54	Writing error to sample management database.	x
		55	Sample management database file is full. Sample information should be deleted.	x
		56	The number of test that is requested is too many. The number of test should be reconsidered.	x
		57	STAT rack No. is out of range.	x
		58	STAT rack position No. is out of range.	x
		59	STAT rack position assignment is already registered.	x
		60	Sample ID characters are abnormal.	x
		61	Tests have been double- requested.	x
		72	TS inquiry failure (Time out).	x
	990	Application code	HbA1c or Hb test was requested.	x

Alarm name	Alarm Code		Description	Processing (Note 1)
	Major	Sub		
Rerun TS receive error	112	2	No response to inquiry within a set time in the operation screen.	x
		3	No response to inquiry within 10 minutes. This alarm is to calls your attention and the communication status is maintained as it is.	-
		5	The test code requested by the host is not registered in the analyzer.	x
		51	Errors in sample management database.	x
		52	Dilution ratio code is out of range.	x
		53	Errors in the following sample information value. Application code, Sample Type, Sample ID, Sample No., Rack No., Position	x
		54	Writing error to sample management database.	x
		55	Sample management database file is full. Sample information should be deleted.	x
		56	The number of test that is requested is too many. The number of test should be reconsidered.	x
		60	Sample ID characters are abnormal.	x
		61	Tests have been double- requested.	x
	991	Application code	HbA1c or Hb test was requested.	x
Receive Text Error	340	101	Sample No. is out of range.	x
		102	Sample type is out of range.	x
		103	Rack No. is out of range.	x
		104	Rack position is out of range.	x
		105	Sub code of sample identification is out of range.	x
		106	Application code is out of range.	x
		108	Blood draw date is out of range.	x
		114	Age is out of range.	x
		115	Age unit is not a valid value.	x
		116	Sex is not a valid value.	x
		117	Type of sample cups is not a valid value,	x
		120	The number of TS exceeds the prescribed number.	x
		122	Dilution ratio is out of range.	x
Application code conversion error (send)	341	Application code	Application code is not converted during measurement result sending.	x
Application code conversion error (receive)	342	1	Application code is not converted during test selection receiving.	x

(Note 1)Explanation of Processing column

x: The communication text of the sample which caused an error is discarded.

-: It is processed according to sub code 2.

2.1.7. Data alarms

This describes the data alarms included in the measurement results.

The data alarms are listed in Table 2-22.

Table 2-22 Data Alarm List

Alarm code	Data alarm name	Output character string	Photometry				Automatic rerun	
			Routine	STAT	Ctrl	Std		
0	No alarm						No	
1	ADC error	ADC.E	o	o	o	o	Yes	
2	Cell blank error	>Cuvet	o	o	o	o	Yes	
3	Not enough samples	Samp.S	o	o	o	o	No	Measurement result becomes space. Automatic rerun test selection information inquiry is not performed.
4	Not enough reagent	Reag.S	o	o	o	o	No	Measurement result becomes space.
5	Absorption value exceeded	>Abs	o	o	o	o	Yes	
6	Prozone error	>Proz	o	o			Yes	
7	Reaction limit exceeded (all points)	>Reac	o	o	o	o	Yes	
8	Reaction limit exceeded (except for 1 point)	>Reac	o	o	o	o	Yes	
9	Reaction limit exceeded (except for 2 to 3 points)	>Reac	o	o	o	o	Yes	
10	Linearity error (9 or more points)	>Lin	o	o	o	o	Yes	
11	Linearity error (8 or fewer points)	>Lin	o	o	o	o	Yes	
12	Standard 1 absorbance abnormal	S1A.E				o	-	
13	Duplicate error	Dup.E				o	-	
14	Calibration curve preparation error	Std.E				o	-	
15	Sensitivity error	Sens.E				o	-	
16	Calibration error	Cal.E				o	-	
17	Calibration convergence error	SD.E				o	-	
18 to 25	Reserved						-	The data alarm for this number is not output.
26	Technical limit value exceeded (upper limit)	>Test	o	o			No	
27	Technical limit value exceeded (lower limit)	<Test	o	o			No	
28	Random error	R4SD			o		-	

Alarm code	Data alarm name	Output character string	Photometry				Automatic rerun	
			Routine	STAT	Ctrl	Std		
29	Systematic error 1	S2-2Sa			o		-	
30	Systematic error 2	S2-2Sw			o		-	
31	Systematic error 3	S4-1Sa			o		-	
32	Systematic error 4	S4-1Sw			o		-	
33	Systematic error 5	S10Xa			o		-	
34	Systematic error 6	S10Xw			o		-	
35	QC error 1	Q3SD			o		-	
36	QC error 2	Q2.5SD			o		-	
37	Calculated test error	ClcT.E	o	o	o		No	
38	Overflow	Over.E	o	o	o		No	Measurement result becomes space.
39	Calculation failure	Calc.?	o	o	o	o	No	Measurement result becomes space.
40	Reference interval exceeded (upper limit)	H	o	o	o		No	The data alarm for this number is not output.
41	Reference interval exceeded (lower limit)	L	o	o	o		No	The data alarm for this number is not output.
42	Edited data	Edited	o	o	o		No	This is included with the data for the test that was edited in the Data Review submenu. The data before editing is lost. Adding of the EDITED alarm can be specified in the screen.
43	Calibration failure data	Cal.E	o	o	o		No	
44	Repeat limit value exceeded (upper limit)	>Rept	o	o			Yes/No	Execution of automatic rerun can be set in the screen.
45	Repeat limit value exceeded (lower limit)	<Rept	o	o			Yes/No	Execution of automatic rerun can be set in the screen.
46 to 47	Reserved						-	The data alarm for this number is not output.
48	QC management range exceeded (upper limit)	QCH			o		-	
49	QC management range exceeded (lower limit)	QCL			o		-	
50 to 55	Reserved						-	The data alarm for this number is not output.
56	Prozone error 2	>Kin	o	o			Yes	
57	Reserved							The data alarm for this number is not output.
58	Reserved							The data alarm for this number is not output.
59	Mixing operation stopped	MIXSTP	o	o	o	o	Yes	
60	Low ultrasonic output	MIXLOW	o	o	o	o	Yes	

Alarm code	Data alarm name	Output character string	Photometry				Automatic rerun	
			Routine	STAT	Ctrl	Std		
61 to 71	Reserved						-	The data alarm for this number is not output.
72	Probe clogging detection	Samp.C	o	o	o	o	No	The data alarm for this number is not output. Automatic rerun test selection information inquiry is not performed.
73 to 100	Reserved						-	The data alarm for this number is not output.
101	Expired reagent flag	ReagEx	o	o	o		No	
102 to 112	Reserved						-	The data alarm for this number is not output.
113	Absorption difference error	>A.Dif	o	o	o	o	Yes	

The columns in the Data Alarms table are defined as shown below.

Alarm code : Alarm code that is output to the host
Data alarm name : Name of data alarm
Output character string : Character string that is output to the respective device
Printer : Character string that is output to printer connected to control unit
Screen : Character string that is output to control unit screen. However, this does not include previews of printing-related screens.
Photometry : Output conditions in photometric analysis. This is output when "o" is shown.
Routine : Routine sample measurement
STAT : STAT sample measurement
Ctrl : Control sample measurement
Std : Standard solution measurement
Automatic rerun : Indicates whether automatic rerun is performed

2.2. Host Communication NCCLS LIS2/LIS1 Upper/Lower Layer Interface Specifications

2.2.1. Overview

(1) Introduction

It prescribes the details according to the following standard in the NCCLS LIS2/LIS1 Upper/Lower Layer Interface Specifications.

(2) Background

NCCLS LIS1 and LIS2 (formerly ASTM (American Society of Testing and Material)) has a plan for communications between automatic analyzers and host computers for standards NCCLS LIS1-A (Standard Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems) and NCCLS LIS2-A2 (Specification for Transferring Information Between Clinical Laboratory Instruments and Information Systems; Approved Standard—Second Edition). The basic specifications of the standards are defined by ANSI standard X12, which standardises communications in different categories of industries.

The host communication interface installed in this analyzer meets the standards of NCCLS according to these trend..

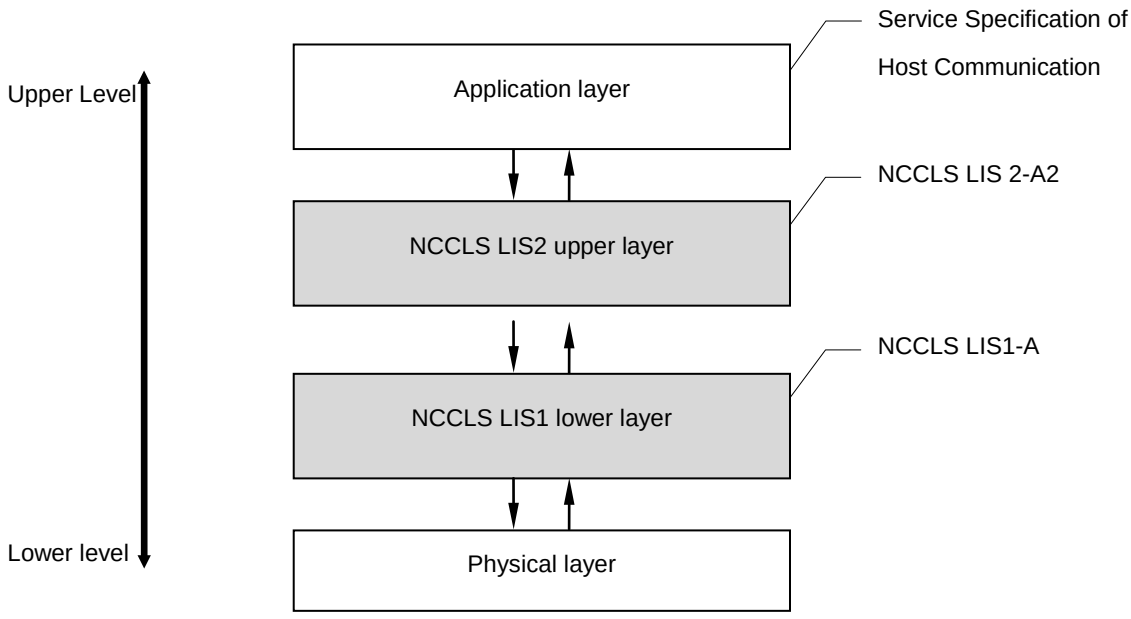


Figure 2-4. Host Communication Process Layers

2.2.2. Physical Layer Specifications (Electrical Specification)

Table2-23: Physical layer Specifications

Item	Specifications	Remarks
Communication Speed	115200 bps, 57600 bps, 38400 bps, 19200 bps, 9600 bps, 4800 bps	Specified on [System] screen - [Communication Settings] window
Character Configurations	Refer to diagram below	
Communication Port	1	
Electrical Signal	In accordance with EIA-232-D-1986	
Cable Length	Maximum 15m	

One character is made up of one start bit + data bit + parity bit + stop bit. Data bit, parity bit and stop bit are selected from the table below.

Table2-24: Character Configurations

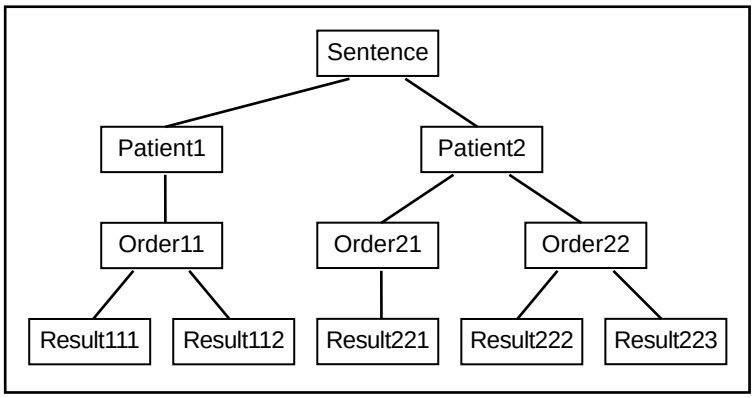
No.	Data Bit	Parity Bit	Stop Bit
1	7 bits	Even	2 bits
2	7 bits	Odd	2 bits
3	7 bits	Even	1 bit
4	7 bits	Odd	1 bit
5	8 bits	None	2 bits
6	8 bits	None	1 bit
7	8 bits	Even	1 bit
8	8 bits	Odd	1 bit

2.2.3. NCCLS LIS2-A2 Protocol Overview

The sentence to be exchanged between analyzer and host can include at once multiple orders of multiple patients, and their multiple results.

Generally, these information can be expressed by layered configurations. Concretely, (Sentence) which expresses information(Sentence) includes multiple (Patient), each samples include multiple test selections (Order), in addition, each orders include multiple test results(Result). (Figure 2-5)

Figure 2-5: Layer Configurations



NCCLS LIS2 maps these layer configurations into the first dimension called communicating. For examples, the above layer configurations are roughly expressed as follows.

Beginning of message - Patient 1 - Order 11 - Result 111 - Result 111 - Result 112 - Patient 2 - Order 21 - Result 221 - Order 22 - Result 222 - Result 223 - End of message

When finding results in the communication message, communication program tracks back messages received until that time and interprets that the result corresponds to the order information which most recently appeared, also interprets that it corresponds to the patient result which most recently appeared. As described above, the layer is recognized in the order of Patient, Order, Result in the communication message. In the above, the top number of sentence is called sequence number, which indicates “a sequence number of the information in the current layer”

Note: In the NCCLS standards, a term “patient record” is used. However, this analyzer manages not patient data but sample data. Patient data is managed by a host computer.

2.2.4. NCCLS LIS Communication Program Configuration

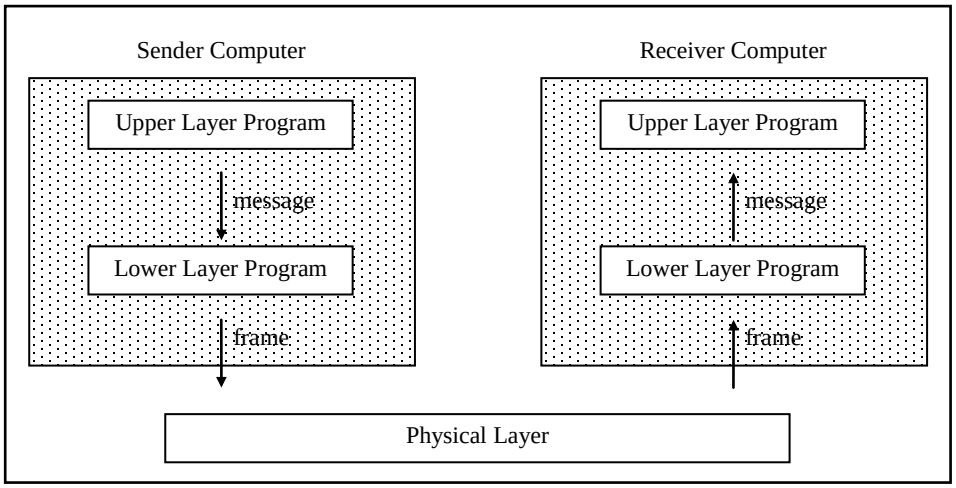
The communication program based on ASTM is divided into Upper Layer Program and Lower Layer Program.

The upper layer creates message and transmit to the lower layer, also receives message from the lower layer and interprets. Message expresses the sentence which has more than one meaning. It's writing method and syntax defined by NCCLS

The lower layer convert the message transferred from the upper layer to transmit into Physical Layer, also composes receiving message by using received data(frame) from Physical Layer.

Physical Layer indicates physical communication medium, which is the generic name for e.g. such as serial communication and Ethernet. Physical Layer has reliability and transfer rate peculiar to its medium. The message which is decomposed into the form to fit this medium feature by Physical Layer is received data.

NCCLS defines this decomposing method for serial communication.



Explained below are the syntax of messages to be sent/received by the upper layer program (NCCLS LIS2 syntax) and the scheme in which the lower layer program decomposes and composes messages (NCCLS LIS1 lower layer program).

2.2.5. NCCLS LIS2-A2 Syntax

This describes the structure of messages transferred using NCCLS LIS2. Test selection, measurement values, and other data are exchanged between the automatic analyzer and host, but all of this exchanged data follows the NCCLE LIS2 syntax.

(1) Definitions

(a) Message

A message is constructed with an arrangement of several records (refer to “(b) record”). 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.

(b) Record

A record is constructed from several fields (refer to “(c) Field”) 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.

(c) Field

A field is the NCCLS LIS2 smallest element to construct information. Attributes for a field (name, format, and meanings) are defined in units in a record.

(2) Coding Rules for the Messages

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

(a) End of Record Character

The ASCII Carriage Return character (0x0D) is always used to indicate the end of a record.

(b) 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 through the Message Header Record; however, it is recommended that a vertical bar ‘|’ be used.

(c) 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 through the Message Header Record; however, it is recommended that a backslash ‘\’ be used.

(d) 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 through the Message Header Record; however, it is recommended that a caret '^' be used.

(e) 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 through the Message Header Record; however, it is recommended that an ampersand '&' be used.

(f) Expression of Special Characters with Escape Character

The following Escape sequence (starting with & and ending with &) is defined. When this sequence is detected in a field, it is changed to a corresponding character.

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

Any escape sequence other than above are skipped and handled as a null value.

(g) Message Send Processing

The procedure for message send by the upper layer are described below.

(I) Records which are defined in the message are coded sequentially according to the following steps each.

- Input record ID into the initial character.
- Code record field according to the following steps.
  - Input field delimiter.
  - If there is no data, input nothing
  - If there is data but is Null value (data cleaning instruction), input "" (two double quotations).
  - If it is component field, the steps are as follows.
    i. If there are two or more component elements, separate them by delimiter..
    ii. If there is data but is Null value, input "" (two double quotations).
    iii. If there is no field, do not input even one character in the element.
    iv. If there is no field and it is the last element, no need to separate by delimiter.
    e.g. the following two elements indicate the same field.
    | A^B^^ | and | A^B |
  - In case of a repetitive field, the repetitive data items are delimited using a repetitive delimiter.
  - If none of the above cases are applicable, the field will be converted into a character string that matches data type, followed by entry of the character string.
- Step b) is repeated for all the data that exists. When there is no data for all the remaining items, it is not necessary to express all the nonexistent data with delimiters (though it does

not constitute a problem). For example, the two codes shown below indicate the same record.

A|B|||| and A|B

- Input Carriage Return (ASCII CODE 0x0d) to indicate the end of record.

(II) Repeat step (I) for the next record.

(h) Message Receive Processing

- Ignore all of the records, fields, component elements and unnecessary repeats which receiver side does not expect.
- If there is no expected record, interpret that all of the field values do not exist.
- If there is no expected field or component element, interpret that the value of its field or component element do not exist.
- If can't distinguish whether no existence or NULL value, interpret as NULL value.
- Interpret / process received data.

(3) Field attributes

The attributes of the fields comprising the records are defined in the definition table for the records (4) to (13). This explains how to read the record definition table.

No.	Attribute name	Description
1	Sequence (No.)	Field position. Order where the target field appears in the record.
2	Field name (Field)	Name of target field
3	Valid (V)	Indicates that this field is valid within the record. If "x" does not appear for Valid, the fields are defined in ASTM but can be omitted.
4	Repeat (R)	Indicates whether a field is repeated. (Blank): Does not repeat x: Repeat
5	Comments (Comments)	Field description
6	Type (DT)	Fields have one of the type names shown below. - ST: String: 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: Numerical value A "+" or "-" sign is added to the beginning, and if no sign is added, it is treated as "+". If no decimal point is included, the value is treated as an integer. The placement of "0" before numbers and "0" after numbers with a decimal point is allowed. -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: The format is HHMMSS (HH is the hour, MM is the minute, and SS is the second). - TS: Time Stamp: Time stamp, which is combined with DT and TM. The format is YYYYMMDDHHMMSS. - CM: Component: Field where multiple data items are joined by component separators.
7	Maximum length	Maximum number of valid characters excluding the escape character of the target field.

(4) Message Header Record

Analyzer ->Host: Routine/STAT TS Inquiry

H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150216143454

Host -> Analyzer: Routine/STAT TS information (Realtime)

H|\^&|||HOST^1|||||cobasc513|TSDWN^REPLY|P|1|20150216143455

Host -> Analyzer: Routine/STAT TS information (Batch)

H|\^&|||HOST^1|||||cobasc513|TSDWN^BATCH|P|1|20150216143455

Analyzer ->Host: Routine/STAT/Control sample measurement results data (Realtime)

H|\^&|||cobasc513^1|||||HOST|RSUPL^REAL|P|1|20150216143038

Analyzer ->Host: Photometric calibration results data (Realtime)

H|\^&|||cobasc513^1|||||HOST|PCUPL^REAL|P|1|20150218131753

Analyzer ->Host: Routine/STAT/Control sample measurement results data (Batch)

H|\^&|||cobasc513^1|||||HOST|RSUPL^BATCH|P|1|20150218105624

Analyzer ->Host: Routine/STAT/Control reaction process data

H|\^&|||cobasc513^1|||||HOST|ABUPL^BATCH|P|1|20150217124822

Host -> Analyzer: Routine/STAT measurement results request

H|\^&|||HOST^1|||||cobasc513|RSREQ^REAL|P|1|20150220090542

Analyzer ->Host: Reply of Routine/STAT measurement results request

H|\^&|||cobasc513^1|||||HOST|RSUPL^REPLY|P|1|20150220090544

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use 'H'
2	Delimiter Definition	x		ST	4	Defines Field delimiter, Repeat delimiter, Component delimiter, and four (4) Escape characters. The first character defines the Field delimiter and also corresponds to the Field delimiter of the Record Type ID. Four characters for this are: | \ ^ &
3	Message Control ID					no data
4	Access Password					no data
5	Sender Name or ID	x		CM	36	Indicates the name of sending analyzer version of communication program. <Analyzer name on sending side>^<version of communication program> <Analyzer name on sending side> Type: TX, Max. length: 30 For sending messages from an analyzer, its name defined on the Host Communication Setting screen will be sent. The characters usable for an analyzer name are alphanumeric and minus (-) sign. <Communication program version> Type: NM; Maximum length: 5

						'1' is always used in the existing conditions.
6	Sender Street Address					no data
7	Reserved Field					no data
8	Sender Telephone Number					no data
9	Characteristics of Sender					no data
10	Receiver ID	x		ST	30	Analyzer name on reception side for sending from analyzer: A host computer name defined on the Host Communication Setting screen will be sent. Characters that can be used in a host name are alphanumeric characters and the minus (-) symbol. For sending from host computer: An analyzer name defined on the Host Communication Setting screen will be sent. This is a field for the automatic analyzer to check if the message is sent to itself. However, this check is not performed.
11	Comment or Special Instructions	x		CM	11	The format is as follows. < Meaning of message>^< Cause of occurrence> <Meaning of message> Type: ST, Maximum length: 5 "TSREQ": TS inquiry "RSUPL": Result transmission "PCUPL": Transmission of photometric calibration results "ABUPL": Transmission of Reaction monitor data "TSDWN": Test requests "RSREQ": Request for result transmission <Cause of message generation> Type: ST, Maximum length: 5 REAL: Realtime communication BATCH: Communication due to a transmission request from the control unit or the host computer. REPLY: Response to a request
12	Processing ID	x		ST	1	Indicates the processing method for the messages. Currently 'P' is always used.
13	Version No.	x		NM	1	Enter version number of the communication program. Currently '1' is always used.
14	Date and Time of Message	x		TS	14	timestamp message header created

(5) Patient Information Record

P|1|||||||M||||||48^Y

P|1|||||||U||||||0^

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘P’
2	Sequence Number	x		NM	6	Sequence number of the Patient Information Record in the message. It begins with ‘1’.
3	Practice Assigned Patient ID					no data
4	Laboratory Assigned Patient ID					no data
5	Patient ID No. 3					no data
6	Patient Name					no data
7	Mother’s Maiden Name					no data
8	Birthdate					no data
9	Patient Gender	x		ST	1	Indicates the sample gender. ‘M’ : Male, ‘F’ : Female, ‘U’ : Unidentified NULL : Unidentified
10	Patient Race					no data
11	Patient Address					no data
12	Reserved Field					no data
13	Patient Phone No					no data
14	Attending Physician ID					no data
15	Special Field 1	x		CM	5	Indicates the patient age, The format is as follows. <Age>^<Age Unit> <Age> Format: NM, Max Length: 3 1～200 0 : Unidentified <Age Unit> Format: NM, Max Length: 1 ‘Y’: year, ‘M’: Month, ‘D’: day NULL: Unidentified Note: NULL value sent: “0^”

(6) Test Order Record

Sample ID Mode

O|1|0000004027|0^50008^5^^S1|^^^29161^|R||20150216173132||||A||||1|||||||20150216173132|||O

O|1|0000004027|0^50008^5^^S1|^^^29161^|R||20150216173132||||N||||1|||||||20150217134312|||F

Control Result

O|1|cont01 12345678|5017^C0001^1^^QC|^^^29161^|||||||Q||||^30805^20160229|||||||20150218131646|||F

Sample No. Mode

O|1||416^50002^1^^S1|^^^29161^\^^^29191^|R||20150216143455||||A||||1|||||||20150216143455|||O

O|1||416^50002^1^^S1|^^^29161^\^^^29191^|R||20150216142801||||N||||1|||||||20150216142800|||F

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use 'O'
2	Sequence Number	x		NM	6	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.
3	Specimen ID	x		ST	22	Indicates sample ID. Control : Control name(ten characters)+blank (two characters)+lot name (eight characters). If less than max length, set left –justification. Sample ID: Neither right nor left justified, just set digit number of valid sample ID because blank is identified as the character of valid sample ID.
4	Instrument Specimen ID	x		CM	18	<Sample No>^<Rack ID >^<Position No>^^<Rack Type> <Sample No> Type: NM Max length: 6 Control: (control registration number) x 1000 + (sequence number) <Rack ID>: ST Max length: 5 <Position No> Type: NM Max length: 1 Values 1 ~ 5. Indicates location where the sample is loaded on the rack <Rack Type> Type: ST Max length: 2 **When sent from Host** S0: Type of Routine/STAT (mixed) --(empty): Type of Routine/STAT(mixed) S1: Type of Routine/STAT (Whole Blood) S2: Type of Routine/STAT (Hemolysate) S3: Type of Routine/STAT (Serum/Plasma) S4: Type of Routine/STAT (Urine) QC: Control Remark: The ordered rack type is not checked for consistency with the ordered sample type by the analyzer. **When sent from Analyzer in Result Upload**

						message: S1: Type of Routine/STAT (Whole Blood) S2: Type of Routine/STAT (Hemolysate) S3: Type of Routine/STAT (Serum/Plasma) S4: Type of Routine/STAT (Urine) QC: Control Remark: If Host downloads empty or “S0” rack type, the Analyzer sets this value according to the sample type.
5	Universal Test ID	x	x	CM	12	Indicates test request. Repetition can be made up to 200 requests. Maximum number is 200 for test selection information. The format is as follows. ^^^<Host Code>^<Dilution> <Host Code> Type: NM, Maximum length: 5 Indicate host code. The range is from Host code 1to 60,000. <Dilution> Type: ST or NM, Maximum length: 3 In test selection, 1) No specification: Photometric tests will be carried out with standard sample volume. 2) ‘clr’: Cancels a request for the specified test. This is effective only in test selection information. 3) ‘Inc’: An increased sample volume can be specified for a photometric test. 4) ‘Dec’: A decreased sample volume can be specified for a photometric test. 5) ‘3’, ‘5’, ‘10’, ‘20’, ‘50’: A dilution factor is specified for a photometric test and operation is started. ‘3’.....Dilution to 1/3 concentration ‘5’.....Dilution to 1/5 concentration ‘10’.....Dilution to 1/10 concentration ‘20’.....Dilution to 1/20 concentration ‘50’.....Dilution to 1/50 concentration In result sending, For a photometric test, ‘Dec’, ‘Inc’, ‘3’, ‘5’, ‘10’, ‘20’, ‘50’ or ‘no specification (standard volume)’ will be sent.
6	Priority	x		ST	1	Indicates the priority order among patient samples. Not used for Control Samples. S: STAT R: Routine NULL: Control
7	Requested/Ordered Date and Time					no data
8	Specimen Collection Date and Time	x		TS	14	Date and time specimens were collected is designated by YYYYMMDDHHMMSS. NULL: Control Result / no data
9	Collection End Time					no data
10	Collection Volume					no data
11	Collector ID					no data
12	Action Code	x		ST	1	Indicates type of information for the report N: Routine/STAT sample measurement results from analyzer Q: Control sample measurement results send

						from analyzer A: Test request from host C: Cancellation of request from host To cancel all test request specified by Universal Test ID.
13	Danger Code					no data
14	Relevant Clinical Information					no data
15	Date/Time Specimen Received					no data
16	Specimen Descriptor	x		CM	15	Sample Material: < sample types > Type: NM, Max Length: 1 Identities sample types by the numbers from 1 to 4. 1: Whole Blood 2:Hemolysate 3: Ser/Plasma 4:Urine e.g. “3” QC Material: <empty>^<Material-ID>^<ExpiryDate> <Material-ID> Type: NM, Max Length: 5 QC Code <ExpiryDate>: Type: DT, Max Length: 8 YYYYMMDD (DD: Always end of month.) e.g. “^821^20150531”
17	Ordering Physician					no data
18	Physician's Telephone Number					no data
19	User Field No.1					no data
20	Users Field No.2					no data
21	Laboratory Field No.1					no data
22	Laboratory Field No.2					no data
23	Date/Time Last Sample Arrived	x		TS	14	Indicates the date and time the sample arrived. Sample Barcode Reading Time as displayed in ‘Data Review’ GUI YYYYMMDDHHMMSS. Note: This is ignored while receiving records by c513. Sent by the analytical system only.
24	Instrument Charge to Computer System					no data
25	Instrument Section ID					no data
26	Report Types	x		ST	1	Indicates type of communications O: Test request from host F: Result send to host
27	Reserved Field					no data

28	Location or Ward of Specimen Collection					no data
29	Nosocomial Infection Flag					no data
30	Specimen Service					no data
31	Specimen Institution					no data

(7) Result Record

Quantitative

R|1|^^^29101/|3|g/L||N||F||HITSRV|20150217134334|20150217134514|P1^012345678901

Qualitative

With disabled the function "Conc. Of Chemistry Qualitative Tests Upload".

R|1|^^^29101/|3|g/L||N||F||HITSRV|20150217134334|20150217134514|P1^012345678901

With enabled the function "Conc. Of Chemistry Qualitative Tests Upload".

R|1|^^^29101/|3**^10.0**|g/L||N||F||HITSRV|20150217134334|20150217134514|P1^012345678901

Control Result

R|1|^^^20503/|31.2|g/L||N||||HITSRV|20150217113211|20150217114240|P1^012345678901

Overflow

R|1|^^^29161/|^ |g/L||A||F||HITSRV|20150217134334|20150217134514|P1^012345678901

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use 'R'
2	Sequence Number	x		NM	6	Indicates sequence numbers for the Test Request Record in the current layer. Since this record is the layer that follows the Test Order record, each time a new Test Request Record is presented, it is numbered consecutively; 1, 2, etc.
3	Universal Test ID	x		CM	24	Photometric/Calculated tests ^^^<Application Code>/<Dilution> <Application Code> Type: NM Max Length: 5 <Dilution> Type: ST or NM Max Length: 3 See "(6) TS record 5 Universal Test ID".
4	Data or Measurement Value	x		CM	15	The formats are as follows. Photometric Calculated tests Quantitative: <measurement value> Qualitative: <qualitative judgment value>^< measurement value > or <qualitative judgment value> Sending text is different depending on function selection. *If no value as a result, measurement value shall be 6 spaces. See "2.1.5 Management Condition Setting(12)".
5	Units	x		ST	8	Indicates units of the analytical data.
6	Reference Ranges					no data
7	Result Abnormal Flags	x		ST	2	Indicates normal/abnormal for measurement result. L: Lower than reference values

						H: Higher than reference values LL: Lower than technical lower limit value HH: Higher than technical higher limit value N: Normal A: Abnormal
8	Nature of Abnormality Testing					no data
9	Result Status	x		ST	1	Indicates the number of the test conducted for the analytical data F: First run result C: Rerun result X: Result cannot be calculated NULL: QC result
10	Date of Change in Instrument Normative values Units					no data
11	Operator Identification	x		ST	6	Identifies the operator ID conducted for the analytical data. This field is not specified by a host. *When logoff mode, set 2 spaces (ASCII code 0x20).
12	Data/Time Test Started	x		TS	14	Date and time corresponding the test was pipetted is designated by YYYYMMDDHHMMSS
13	Date/Time Test Completed	x		TS	14	Date and time corresponding the test calculation is finished by YYYYMMDDHHMMSS
14	Instrument Identification	x		ST	15	Indicates the ID of the analytical unit (module) that performed the analysis. <Module-ID>^<Module-Serial> <Module-ID> always ‘P1’ <Module-Serial> Type: ST, Max Length:12

(8) Comment Record

(a) Result Flag [C-RES]

C|1|I|42|I

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘C’.
2	Sequence Number	x		NM	6	Indicates the sequence number of the Comment Record(Result Flag) in the current layer. Since this record is in the layer following the Measurement Result Record, each time a new Comment Record(Result Flag) is presented, it is numbered consecutively; 1, 4, etc.
3	Comment Source	x		ST	1	Use ‘I’.
4	Comment Text	x		NM	3	The value of the dataflag (see Table 2-22)
5	Comment Type	x		ST	1	Use ‘I’. Indicates this record is result flag.

(b) Comment [C-CMM]

All Comment is set
C|1|I|comment1 ^comment2 ^comment3
^comment4 ^comment5 |G

Comment is nothing
C|1|I|^^^^|G

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘C’.
2	Sequence Number	x		NM	6	Indicates the sequence number of the Comment Record(Comment) in the current layer. Since this record is in the layer following Patient Information Record, each time a new Comment Record(Comment) is presented, it is numbered consecutively; 1, 2, etc.
3	Comment Source	x		ST	1	Use ‘I’.
4	Comment Text	x		CM	104	Indicates the comment for sample .These comments can be displayed or edited on the screen of the analyzer. [System]-[Communication]-[Communication] The format is as follows. <Comment1>^<Comment2>^<Comment3>^<Comment4>^<Comment5> Comment1 Type: ST Max Length: 30 Comment2 Type: ST Max Length: 25 Comment3 Type: ST Max Length: 20 Comment4 Type: ST Max Length: 15 Comment5 Type: ST Max Length: 10 Note: In the case of analyzer to host, each comment should be a max length string. If the length of the comment is less than the specified number, the string should be left-align. Even if one or all comments are empty the host must send 4 component delimiters (‘^^^^’) in this field.
5	Comment Type	x		ST	1	Use ‘G’. Indicates this record is comment.

(8a) Manufacturer Records for Traceability

(a) Reagent Trace [M-RTRA]

Used a Diluent

M|1|RTRA|1001101^000001^2^201512^0|868732^000001^1000002^201602^0

Not used a Diluent

M|1|RTRA|1001101^000001^2^201512^0|^^^^

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘M’.
2	Sequence Number	x		NM	6	Indicates the sequence number of the Manufacturer Record (Comment) in the current layer. Each time a new Reagent Trace Record is presented, it is numbered consecutively; 1, 2, etc.
3	Record Type Sub ID	x		ST	4	Use ‘RTRA’ Indicates this record is Reagent Trace record.
4	Reagent Trace	x		CM	32	<ReagID>^<ReagLot>^<ReagSerial>^<ReagExpDate>^<ReagPrio> <ReagID> Type:NM, Max Length:7 - The reagent ID (Cassette Code) <ReagLot> Type: ST, Max Length:6 - The reagent lot string <ReagSerial> Type: NM, Max Length:7 - The cassette serial number <ReagExpDate> Type DT, Max Length:6 - YYYYMM expiration date <ReagPrio> Type NM , Max Length:2 - ‘0’, ‘1’…’n’ (current or SB reagent) Note: This is a mandatory record and omitted fields must contain NULL (empty) value. Sent by the analytical system only. In case of a calculated test, the analytical system send 4 component delimiters (‘^^^^’) in this field.
5	Diluent Trace	x		CM	32	<DilID>^<DilLot>^<DilSerial>^<DilExpDate>^<DilPrio> <DilID> Type: NM, Max Length:7 - The diluent ID (Cassette Code) <DilLot> Type: ST, Max Length:6 - The diluent lot string <DilSerial> Type: NM, Max Length:7 - The cassette serial number <DilExpDate> Type DT, Max Length:6 - YYYYMM expiration date <DilPrio> Type NM, Max Length:2 - ‘0’, ‘1’…’n’ (current or SB diluent) Note: This is a mandatory record and omitted fields must contain NULL (empty) value. Sent by the analytical system only In case of Routine/STAT/QC, if a test was measured without a diluent, the analytical system send 4 component delimiters (‘^^^^’) in this field. In case of Calibration, the analytical system always send 4 component delimiters (‘^^^^’) in this field.

(b) Calib Trace (M-CTRA)

Hb / A1c
M|1|CTRA|322

%HbA1c / Calculated Test
M|1|CTRA|

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘M’.
2	Sequence Number	x		NM	6	Indicates the sequence number of the Manufacturer Record (CalibTrace) in the current layer. Since this record is in the layer following Reagent Trace (M_RTRA), each time a new Calib Trace Record is presented, it is numbered consecutively
3	Record Type Sub ID	x		ST	4	Use ‘CTRA’ Indicates this record is Reagent Trace record.
4	Calibration ID	x		NM	10	<CalibID> Type: NM, Max Length:10 - the calibration reference ID Note: this is a mandatory record and omitted fields must contain NULL (empty) value Sent by the analytical system only

(c) Test Result Trace (M-TTRA)

Result of First Order
M|1|TTRA|1|1

Result of Second Order
M|1|TTRA|2|1

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘M’.
2	Sequence Number	x		NM	6	Indicates the sequence number of the Manufacturer Record(Test Result Trace) in the current layer. Each time a new Test Result Trace Record is presented, it is numbered consecutively; 1, 2, etc.
3	Record Type Sub ID	x		ST	4	Use ‘TTRA’ Indicates this record is Test Result Trace record.
4	Order Count	x		NM	3	Indicates order count to the relevant sample which received relevant test request. Order count normally becomes first run:1, rerun: 2,... However in case of additional test request, order count becomes at the time of additional request. The same count tests indicate the test group requested with the same timing. Compensated test of calculated test is measured again with respect to each requested timing. Therefore, for some additional requests, the same tests are measured a plurality of times and measurement results of the same test with different count are sent as many as measurement are performed. On the other hand, Host can associate the measurement results of calculated test and compensated test with the same count. <Routine/STAT> : 1 to 400 <Control> : 1
5	Multi Measure Count	x		NM	3	Indicates the multi measure count for the relevant samples. <Routine/STAT> : 1~200 <Control> : 1 to 5

(9) Request Information Record

Analyzer -> Host: Request for TS

Sample ID Mode

Q|1|^^Thisissample^0^50002^1^^S1^R1||ALL|||||||O

Sample ID Mode and Barcode Read Error and “TS aks in barcode read error” enabled.

Q|1|^^**********^0^50001^5^^S1^R1||ALL|||||||O

Sample No. Mode

Q|1|^^^1234^50036^1^^S1^R1||ALL|||||||O

Q|1|^^^1234^50036^1^^S1^R1||ALL|||||||F

Analyzer -> Host: Cancel last request

Q|1|^^1234567890123^0^40001^2^^S1^R2||ALL|||||||A

Host -> Analyzer: Request for Result

Q|1|^^0000004027^0^50008^5^^S1^R1||ALL|||||||F

Q|1|^^0000004027^0^50008^5^^S1^RS||ALL|||||||F

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	X	ST		1	Use ‘Q’
2	Sequence Number	X	NM		6	Indicates the sequence numbers for the Request Information Record in the current layer. Since this record is the layer that follows the patient information record, it resets to ‘1’ each time a new Test Request Record is presented, and then it is numbered consecutively; 1, 2, etc.
3	Starting Range ID Number	X	CM		45	Indicates a sample to be inquired. ^^ <Sample ID>^<Sample No>^<Rack ID>^<Position No>^ ^<Rack Type>^<Kind> <Sample ID> Type: ST Max Length: 22 See “(6) Test Order Record 3 Specimen ID” <Sample No> Type: NM Max Length: 5 See “(6) Test Order Record 4 Instrument Specimen ID” Note: It is “0(zero)” in Barcode ID mode. <Rack ID> Type: ST Max Length: 5 See “(6) Test Order Record 4 Instrument Specimen ID” <Position No> Type: NM Max Length: 1 See “(6) Test Order Record 4 Instrument Specimen ID” <Rack Type> Type: ST Max Length: 2 S0: Mix S1: Whole Blood S2: Hemolysate S3: Serum/Plasma S4: Urine <Kind> Type: ST Max Length: 2

						R1: First run sample R2: Rerun sample RS: Results of selected items(Note 1) (RS can be used only in RSREQ)
4	Ending Range ID Number					no data
5	Universal Test ID	X		ST	3	Use ‘ALL’.
6	Nature of Request Time Limits					no data
7	Beginning Request Results Date and Time					no data
8	Ending Request Results Date and Time					no data
9	Requesting Physician Name					no data
10	Requesting Physician Telephone Number					no data
11	User Field No. 1					no data
12	User Field No. 2					no data
13	Request Information Status Codes	X		ST	1	Indicates the purpose of this record. O: Request for request tests to host A: Cancel request for request tests to host F: Measurement result

Note 1: RS can be used to "Request for Result" from host. When the host specifies RS, the measurement result which be transmitted to HOST is the following.

(1) A Test has 1st result and rerun result.

Send a result of test which was selected in Data Review Screen.

If a result of test is not selected in Data Review Screen, a result of test is not sent.

(2) A Test has 1st result only

Send a 1st result of test.

(10) Message Termination Record

L|1|N

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘L’
2	Sequence Number	x		NM	6	Always ‘1’
3	Termination Code	x		ST	1	N: Normal termination

(11) Photometric Raw data (Absorbance) Record [M-ABS]

M|1|ABS|P1^012345678901|2||10|38|195\197\195\0|2\-1\0\-2\1\0\-1\3\2\0\0\3\-1\1\1\1\1\1\1\3\1\3\3\4\2\1\2\2\-1\2\4\-1\3\3\0\-1\-2\0

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘M’
2	Sequence Number	x		NM	6	Indicates the sequence numbers for the photometric record in the current layer. Since this record is the layer that follows the measurement result record, it resets to ‘1’ each time a new Test Request Record is presented, and then it is numbered consecutively; 1, 2, etc.
3	Record Type Sub ID	x		ST	3	Use ‘ABS’ Indicates this record is photometric record.
4	Module ID	x		ST	4	Module ID analyzed. See “(7) Result Record” 14 Instruction Identification.
5	Cell No	x		NM	3	Number of the Reaction Cell Input values 1 to 221.
6	Input Information	x		NM	1	There is no value in this field
7	Reaction Time	x		NM	2	Reaction time (Unit: minutes). Input values 3 to 10.
8	Number of Points	x		NM	2	Reaction point number. Input values 1 to 34.
9	Cell Blank Data	x	x	NM	6	Repeat field. Cell blank absorbance. The difference between the main wavelength and sub-wavelength absorbance data [(main wavelength absorbance data) - (sub-wavelength absorbance data)] can be repeated up to 4 points.
10	Delta ABS Data	x	x	NM	6	Repeat field. The difference between the main wavelength and the sub-wavelength absorbance data [(main wavelength absorbance data) - (sub-wavelength absorbance data)] repeated up to the value indicated by Point Number.

(12) Photometric Calibration Result Record[M-PCR]

M|1|PCR|HITSRV|^^^29101|P1^Serial-ABC|16||0^9300^0^9300^0^0\^^^^^\0^9300^0^9300^0^0\^^^^^\^^^^^\^^^^^\^^^^^||||30001^00000001^201512\^^\30003^12345678^201502\^^\^^\^^|20150214095607|g/L

No	Field	V	R	Format	Max Length	Comments
1	Record Type ID	x		ST	1	Use ‘M’.
2	Sequence Number	x		NM	6	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.
3	Record Type Sub ID	x		ST	3	Use ‘PCR’. Indicates this record is photometric calibration result record
4	Operator ID	x		ST	6	ID of the operator who performed the calibration at the analyzer. *When logoff mode, set 2 spaces (ASCII code 0x20).
5	Test Code	x		CM	8	^^^<AppCode> <Application Code> Type: NM Max Length: 5 Host code is 1 to 60,000.
6	Module ID	x		ST	2	See “(7) Result Record” 14 Instruction Identification.
7	Calibration Alarm	x		NM	3	Calibration alarm.
8	SD Data Field	x		NM	6	SD value data.
9	STD Data	x	x	CM	38	Repeat Field. Repeated from STD1 to STD6 for as many as there are. Format<Absorbance Data for the first time>^<First time for the first one or the final absorbance data>^<Absorbance Data of the second time>^<Second time for the first one or the final absorbance data>^<Data Alarm>^<Prozone Value>\... Repeat from STD 1 to STD 6. Not measured STD: NULL *If no value as a result, STD data shall be spaced. However, the data alarm added at that time should be set. <Absorbance Data for the first time> Type : NM Max Length : 6 <First time for the first one or the final absorbance data> Type : NM Max Length : 6 <Absorbance Data of the second time> Type : NM Max Length : 6 <Second time for the first one or the final absorbance data> Type : NM Max Length : 6 <Data Alarm> Type : NM Max Length : 3 <Prozone Value> Type : NM Max Length : 6
10	Reserved Field					no data

11	Reserved Field					no data
12	Reserved Field					no data
13	Calibrator	x		CM	53	Calibrator used for analysis. The format is as follows. <Cal1 ID >^<Cal1 Lot>^<Cal1 ExpDate>\ <Cal2 ID >^<Cal2 Lot>^<Cal2 ExpDate>\ <Cal3 ID >^<Cal3 Lot>^<Cal3 ExpDate>\ <Cal4 ID >^<Cal4 Lot>^<Cal4 ExpDate>\ <Cal5 ID >^<Cal5 Lot>^<Cal5 ExpDate>\ <Cal6 ID >^<Cal6 Lot>^<Cal6 ExpDate> <Cal ID> - The calibrator ID (Calibrator Code) Type : NM Max Length : 5 Not used: NULL <Cal Lot > - The calibrator lot string Type : ST Max Length : 8 Not used: NULL <Cal ExpDate> - YYYYMM expiration date Type : DT Max Length : 6 Not used: NULL
14	Measurement Data	x		TS	14	Date and time measurement was performed is designated by YYYYMMDDHHMMSS.
15	Units	x		ST	8	Indicates units of the analytical data.

(13) Messages Transmitted by the Analyzer

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

Message Name	Reasons
TS Inquiry	TS inquiry is performed immediately after sample rack is carried in (passing through ID reader) (New, Rerun).
Routine/STAT sample measurement results data Control sample measurement results data	- 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 host. - Transmits results of the selected samples by instruction at the analyzer.
Automatic Rerun TS Inquiry	Inquiry is made for the test selection after measurement result report for sample (rerun)
Photometric calibration results data	Reports at the point when the Photometry calibration results are output.
Reaction Process Data	Reports on the reaction process absorption of the selected samples by instruction at the analyzer.

In any case, an identifier for the cause of generation is set in the "Comment or Special Instructions" field of (4) Message header record.

The syntax of each message is described below.

Message Name	Syntax	Comment or Special Instructions
TS inquiry Automatic Rerun TS	H Q L	TSREQ^REAL
Routine/STAT sample measurement results data Control sample measurement results data	H P O C-CMM { R M-TTRA C-RES M-RTRA M-CTRA } n L But n=0 to 200	RSUPL^REAL RSUPL^BATCH RSUPL^REPLY
Photometric calibration results data	H M-PCR M-RTRA M-CTRA L	PCUPL^REAL
Reaction Process Data	H P O C-CMM R M-TTRA C-RES M-ABS M-RTRA M-CTRA L	ABUPL^BATCH

(14) Messages sent by host

The messages sent by the host (messages received by the automatic analyzer) are shown in the table below.

Message name	Message trigger
TS information Automatic rerun TS information	- This issues a request for a test of a certain sample.
Measurement results request	- An inquiry is issued for the measurement values for a certain sample.

The syntax of each message is shown below.

Message name	Syntax	Comment or Special Instructions
TS information Automatic rerun TS information	H P O C-CMM L	TSDWN^REPLY TSDWN^BATCH
Measurement results send request	H Q L	RSREQ^REAL

(15) Error processing in ASTM upper layer

These describe the errors detected by the ASTM upper layer. Communication errors detected by the application layer are shown in 2.1.6 (5).

All received messages where an error was detected are invalidated (discarded).

When an error is detected, the alarm codes below are displayed in the Alarm screen shown in the operation screen of the analyzer.

Table 2-25 System Alarm List in ASTM upper layer

Alarm Code		Description
Major	Sub	
126	21	No valid records.
	22	Leading record is not a header record.
	23	Undefined record exists.
	24	Unspecified record exists.
340	1	Field delimiters of L record are insufficient.
	2	No record end for L record.
	3	Termination Code is not a valid value.
	12	Priority is not a valid value.
	19	Report Type is not a valid value.
	22	Starting Range ID Number is not a valid value.
	24	Request Information Status Code is not a valid value.
	31	Component delimiters of Universal Test ID are insufficient.
	32	Action Code & Value is not a valid.
	36	Comment1 of “Comment or Special Instructions” is not a valid value.
	37	Field delimiters of H record are insufficient.
	38	Comment or Special Instructions is not a valid value.
	39	No record end for H record.
	40	Field delimiters of P record are insufficient.
	41	Sequence Number of P record is not a valid value.
	44	No record end for P record.
	45	Application Code is not a valid value.
	47	Field delimiters of O record are insufficient.
	48	“Sequence Number” of O record is not a valid value.
	50	Instrument Specimen ID of O record is not a valid value.
	57	No record end for O record.
	59	Sample ID is not a valid value.
	60	Sample No. is not a valid value.
	61	Rack ID is not a valid value.
	62	Rack Position is not a valid value.
	63	Field delimiters of Q record are insufficient.
	64	Sequence Number of Q record is not a valid value.
	67	No record end for Q record.
	68	Field delimiters of C record are insufficient.
	69	Sequence Number of C record is not a valid value.
	73	No record end for C record.

Processing for Recovery from Error: Received messages are all invalidated (canceled).

2.2.6. NCCLS LIS1-A Lower Layer (Data Link Layer)

NCCLS LIS1 (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. NCCLS LIS1 lower layer also constructs frames received from a communication medium to recreate messages to be transferred to the NCCLS LIS2 (upper layer) as reception messages. Configuration and communication procedures for transmission and reception of frames are explained in the following chapters.

(1) NCCLS LIS1-A Lower Layer Communication Methods

Table 2-25. Lower Layer Communication Methods is shown below.

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) - Text: Text is part of a split message. - FN: FN = Frame Number. FN is a single ASCII number. 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. - 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'.
Character Configuration of Frame Text (Text)	Characters other than <SOH><STX><ETX> <EOT><ENQ><ACK> <DLE><NAK><SYN> <ETB><CR><LF> <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, the total come to 247 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>.

(2) NCCLS LIS1-A Communication Procedure Matrix

Communication procedure matrix is used to explain the communication procedures by describing actions at occurrence of an event in a certain status into the cells laid out on a matrix whose abscissa and ordinate represent events and status, respectively.

Using the matrix, NCCLS LIS1 receiving and sending procedures are explained here.

The matrix is divided into the ones for receiving and sending, which have the same Idle status. The NCCLS LIS1 communication program is initially in the Idle status. When an event for message sending request is sent from the upper layer, sending process begins, and receiving process begins when a reception request is sent from the opposite station via a communication medium. Thus, the program moves from one matrix to the other and then reversely. The NCCLS LIS1 program executes either receiving or sending at a time and cannot execute them both simultaneously.

Written in the cells of each matrix are processing to be executed when each event is received and the status to be moved next. A processing and the next status are separated by a horizontal line, and “goto” is prefixed to the next status. Other description methods are explained in table 2-26.

Table 2-26 Description of Matrix Notation

Notation	Description
Send*<character>*	Sends control character <EOT> is control character(HEX 04), <ENQ> is control character(HEX 05) <ACK> is control character(HEX 06), <NAK> is control character(HEX 15)
Count=1	Sets default value at 1 for FN(frame number)
Timer=<Value>	Sets timer for <value>. After exceeding the set <Value> seconds, timeout event is occurred. This setting cancels previous timer setting.
Retry＝0	Resets retransmission count of frame.
Retry^{++}	Adds 1 to retransmission count.
Count^{++}	Sets by adding 1 to FN (frame number) and calculating remainder 8. (Count=(Count+1) mod 8)
Btimer=<Value>	Btimer is different from Timer. Transmission Is inhibited unless Btimer is zero. It is used to execute priority control of transmission right with time differences for transmission inhibition when transmissions in both need..
Event Send	Issues transmission request to itself (ASTM lower layer).
Delay=<Value>	Inputs waiting time of <Value>msec for itself (ASTM lower layer) processing.

Notes for processing: Remedy for Link Contention Occurrence

Link contention is the contention for transmission right when both analyzer and host sent <ENQ> at the same time. In this case, priority for analyzer is defined by NCCLS LIS1-A standard. Host side should wait at least 20 seconds and provide for transmission request. After completion of transmission<ENQ> from analyzer, communication state of analyzer returns to idle state. Then transmit communication message which was to have been transmitted just as before after issuing transmission request. However, it could happen that link contention is occurred again. In that case, analyzer has priority in the same way.

Although host communication abnormality alarm (126-9) is occurred when link contention is occurred,

there is no problem with communication. However, if link contention is reoccurred against retransmission request (<ENQ>) by analyzer for addressing after link contention, host communication abnormality alarm(126-9) is occurred, then communication is interrupted.

（3） Receiving Procedure Matrix for NCCLS LIS1Lowyer layer

EVENT / STATUS	Receive *ENQ*	Send Request	Not Ready to Receive	OK to Receive	Arrival of Frame	Receive *EOT*	Timeout	Good Repeat Frame	Good New Frame	Bod Frame
Idle	goto Awake	goto Data to Send								
Awake			Send *NAK* --- goto Idle	Send *ACK* Count = 1 Timer=30 --- goto Receive Waiting						
Receive Waiting					goto Frame Received	Btimer=0 --- goto Idle	goto Idle			
Frame Received		goto Have Data to Send						Send *ACK* Timer=30 --- goto Receive Waiting	Count++ Send *ACK* Timer=30 --- goto Receive Waiting	Send *NAK* Timer=30 --- goto Receive Waiting
Have Date to Send								Send *EOT* Timer=30 --- goto Receive Waiting	Count++ Send *EOT* Timer=30 --- goto Receive Waiting	Send *EOT* Timer=30 --- goto Receive Waiting

Event Name	Description
Receive *ENQ*	Received control character ENQ(HEX 05). This is equal to transmission request from the other side.
Send Request	Received send request for message from upper layer.
Not Ready to Receive	Received send request from the other side, but not ready to receive at this side.
OK to Receive	Received send request for the other side, available for reception.
Arrival of Frame	Received one frame form the other side.
Receive *EOT*	Received control character EOT (HEX 04). This is equal to transmission ending request from the other side.
Timeout	Timer is decremented to zero.
Good Repeat Frame	It is find out that the number of the received frame is coincident with the one which was received from last time as a result of checking.
Good New Frame	It is find out that the frame number received is coincident with the one which adds 1 to the frame number received from last time and deducts Reminder 8 as a result of checking.

Event Name	Description
Bad Frame	Received one of the following. (1) Character undefined by frame, (2) Checksum error, (2) Wrong frame number

State	Description
Idle	A state in which neither receive nor send are executed. A state in common with Sending Procedure Matrix for ASTM.
Awake	A state in which send request was received from the other side,
Receive Waiting	A state of waiting for frame receive or transmission ending.
Frame Received	A state in which frame was received from the other side,
Have Data to Send	A state of waiting for frame receive from the other side and being about to issue switching request for sending from this side.

（4） Sending Procedure for NCCLS LIS1Lower Layer

Event / Status	Receive *ENQ*	Send Request	Btimer <≠0>	Btimer <=0>	Receive *NAK*	Receive *EOT*	Timeout	Receive *ACK*	No Frame	Frame Ready	Retry >6	Rety<=6
Idle	goto Awake	goto Data to Send										
Data to Send			goto Idle	Send *ENQ* Count =1 Timer =15 goto Send Waiting								
Send Waiting	Btimer=1 goto Idle Note 1				Btimer =10 goto Idle		Send *EOT* goto Idle	Retry=0 goto Next Frame				
Next Frame									Send *EOT* goto Idle	Send Frame Timer=15 goto Send Waiting2		
Send Waitng2					Retry^{++} goto Old Frame	Retry=0 Count^{++} goto Next Frame Note 2	Send *EOT* goto Idle	Retry=0 Count^{++} goto Next Frame				
Old Frame											Send *EOT* goto Idle	Send Frame Timer=15 goto Send Waiting2
Awake		Event Send Request Note 3 Delay＝10										

Note 1: In case of host, it is “Btimer=20/goto Idle”. Therefore analyzer has priority for transmission right.(When link contention is occurred, wait for transmission from analyzer at least 20 seconds. After completion of transmission from analyzer, communication state of analyzer returns to Idle state., then next transmission from host can be executed as Btimer=0)

Note 2: In case of host, it is “Send＊EOT＊, Btimer=15/goto Idle”. It is also a mechanism to make analyzer a priority.

Note 3: the state remains Awake

Event Name	Description
Receive *ENQ*	Received control character ENQ (HEX 05). This is equal to sending send request from the other side.
Send Request	Received send request for message from upper layer.
Btimer≠0	Transmission temporary stop by the upper layer
Btimer＝0	Available for sending.
Receive *NAK*	Received control character NAK (HEX 15). This is equal to resend request from the other side.
Receive *EOT*	Received control character EOT (HEX 04). This is equal to ending receive request from the other side.
Timeout	Timer is decremented to zero.
Receive *ACK*	Received control character ACK (HEX 06). This is equal to report for from normal receiving from the other side.
No Frame	No more frames to send (Finished sending all).
Frame Ready	Frame is ready to send
Retry＞6	Not available for sending due to exceeding 6 times.
Retry＜＝6	Still available for sending.

State	Description
Idle	A state in which neither receive nor send are executed. A state in common with NCCLS LIS1Sending Procedure Matrix for NCCLS LIS1.
Data to Send	Determine message send request from the upper layer and issue send request to the host if it is the sate of being possible.
Send Waiting	Waiting for a response for send request.
Next Frame	Prepare for next frame and send.
Send Waiting2	Waiting for a response for the frame which was sent.
Old Frame	Determine frame rerun

(5) Communication Error Processing in NCCLS LIS1Lower Layer

This describes the errors detected by the NCCLS LIS1lower layer. Errors detected by the application layer are described in 2.1.6, Errors detected by the NCCLS LIS2upper level program are described in 2.2.5(15).

All received messages where an error was detected are invalidated (discarded).

When an error is detected, the alarm codes below are displayed in the operation screen of the analyzer.

- Major classifications are "126", Subclassification are 1, 4 to 9, 11,12, 16,17,19,20,26,27,200.

*When RS232C cable abnormality (cable disconnection or cable failure, etc), host communication abort alarm (126-27) is occurred. In this case, abort temporarily the communication with host, then try reconnection. When the connection is successful, the analyzer turns to next event stand-by state of next event. ([Start]-[Host Setting]-)“Communication ON” in the host communication setting screen of analyzer is kept on.

2.3. Host Communication Message Examples

2.3.1. Introduction

This document provides examples of communication messages exchanged between the automatic analyzer and external system (host) for each communication layer based on "2.1 Host Communication Application Layer Interface Specifications" and "2.2 Host Communication NCCLS LIS2/1Upper/Lower Interface Specifications".

Notes

Blanks spaces (ASCII code 0x20) in the message are printed as.

These communication message examples may contain data that is biochemically unrealistic for incorporating various setting types.

In these communication message examples, the analyzer name is set as "cobasc513" and the external system name is set as "HOST".

The terminology below is used in this document.

Sample number: S.No

Test selection information: TS

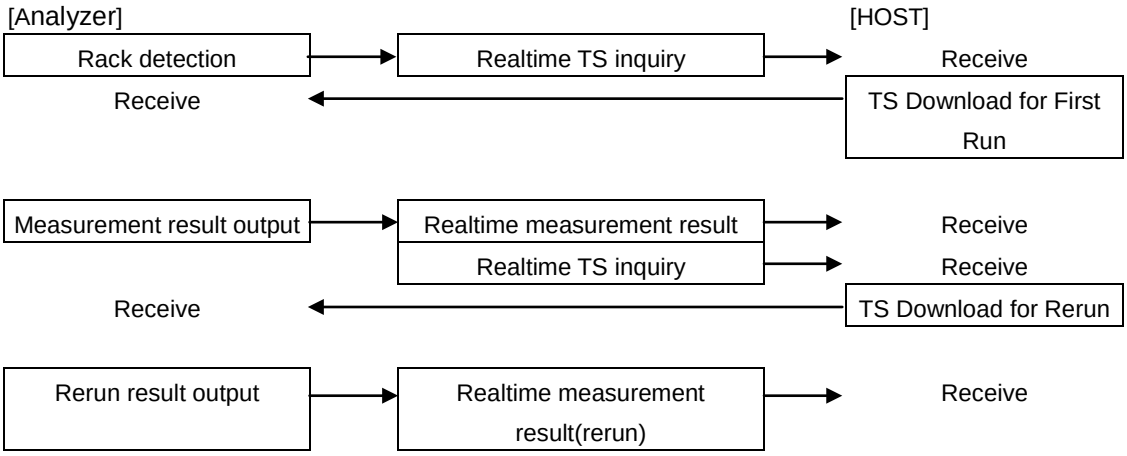
2.3.2. Communication order in Application layer (Flow of information exchanged)

This describes exchanged data according to the order based on service using Host Communication which is defined by “2.1 Host Communication Application Layer Interface Specifications”.

(1) Realtime Communication

When the following each triggers are generated during operation, the data is sent to HOST automatically. After send, the analyzer waits the response information from HOST by timeout period which is preset on operation screen. Realtime communication means that information is exchanged between the analyzer and HOST. The detail is defined in “2.1.2 Realtime Communication (1) Communication sequence”.

This describes exchanged information of one sample when test selection information (TS) inquiry, measurement results data send and automatic rerun are preformed.



(2) Batch Communication

The information defined in “2.1.3 Batch Communication” is sent when the send is instructed on operation screen. In this case, the information is not sent automatically by some triggers and the analyzer does not wait by receiving some responses from HOST in timeout period, unlike realtime communication mentioned above. Batch send from HOST side is the same way, too.

2.3.3. NCCLS LIS2Upper Layer Communication Message Examples

This describes exchanged information defined in “2.3.2 Communication order in Application layer” with text examples which are defined “2.2.5 NCCLS LIS2Syntax” of NCCLS LIS2-A2Upper Layer

2.3.3.1. Routine/STAT sample: S.No mode

2.3.3.1.1. TS inquiry and the response (Routine sample)

[1] First TS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150316160013<CR>
Q|1|^^testid^416^50002^2^^S1^R1||ALL|||||||O<CR>
L|1|N<CR>
```

[2] Response for First TS inquiry (Host to Analyzer)

```
H|\^&|||HOST^1|||||cobasc513|TSDWN^REPLY|P|1|20150316160014<CR>
P|1|||||||M||||||48^Y<CR>
O|1|testid|416^50002^2^^S1|^^^29161^\^^^29191^|R||20150316160014||||A||||1|||||||20150316160
014|||O<CR>
C|1|I|aaa^bbb^ccc^^|G<CR>
L|1|N<CR>
```

[3] First measurement result sending in realtime (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REAL|P|1|20150316160145<CR>
P|1|||||||M||||||48^Y<CR>
O|1|testid|416^50002^2^^S1|^^^29101^\^^^29131^\^^^29161^\^^^29191^|R||20150316160014||||N||
||1|||||||20150316160013|||F<CR>
C|1|I|aaa                    ^bbb                    ^ccc                    ^^|G<
CR>
R|1|^^^29101/||mmol/L||L||F||bmserv|20150316160026|20150316160145|P1^1400-01<CR>
M|1|TTRA|1|1<CR>
C|1|I|101|I<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
R|2|^^^29131/|4.895|mmol/L||H||F||bmserv|20150316160026|20150316160145|P1^1400-01<CR>
M|2|TTRA|1|1<CR>
C|2|I|101|I<CR>
M|2|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|2|CTRA|736<CR>
R|3|^^^29161/|1.45|%||H||F||bmserv|20150316160026|20150316160145|P1^1400-01<CR>
M|3|TTRA|1|1<CR>
C|3|I|101|I<CR>
M|3|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|3|CTRA|<CR>
R|4|^^^29191/|-7.6|mmol/mol||L||F||bmserv|20150316160026|20150316160145|P1^1400-01<CR>
M|4|TTRA|1|1<CR>
C|4|I|101|I<CR>
M|4|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|4|CTRA|<CR>
L|1|N<CR>
```

[4] Automatic Rerun TS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150316160148<CR>
Q|1|^^testid^416^50002^2^^S1^R2||ALL|||||||O<CR>
L|1|N<CR>
```

[5] Response for Automatic Rerun TS inquiry (Host to Analyzer)

```
H|\^&|||HOST^1|||||cobasc513|TSDWN^REPLY|P|1|20150316160148<CR>
```

```
P|1|||||||M||||||48^Y<CR>
O|1|testid|416^50002^2^^S1|^^^29161^\^^^29191^|R||20150316160148||||A||||1|||||||2015031616014
8|||O<CR>
C|1|I|aaa^bbb^ccc^^|G<CR>
L|1|N<CR>
```

[6] Rerun measurement result sending in realtime (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REAL|P|1|20150316160307<CR>
P|1|||||||M||||||48^Y<CR>
O|1|testid|416^50002^2^^S1|^^^29101^\^^^29131^\^^^29161^\^^^29191^|R||20150316160148||||N||
||1|||||||20150316160013|||F<CR>
C|1|I|aaa                    ^bbb                    ^ccc                    ^^|G<
CR>
R|1|^^^29101/||mmol/L||L||C||bmserv|20150316160151|20150316160307|P1^1400-01<CR>
M|1|TTRA|2|1<CR>
C|1|I|101|I<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
R|2|^^^29131/|4.895|mmol/L||H||C||bmserv|20150316160151|20150316160307|P1^1400-01<CR>
M|2|TTRA|2|1<CR>
C|2|I|101|I<CR>
M|2|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|2|CTRA|736<CR>
R|3|^^^29161/|1.45|%||H||C||bmserv|20150316160151|20150316160307|P1^1400-01<CR>
M|3|TTRA|2|1<CR>
C|3|I|101|I<CR>
M|3|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|3|CTRA|<CR>
R|4|^^^29191/|-7.6|mmol/mol||L||C||bmserv|20150316160151|20150316160307|P1^1400-01<CR>
M|4|TTRA|2|1<CR>
C|4|I|101|I<CR>
M|4|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|4|CTRA|<CR>
L|1|N<CR
```

2.3.3.1.2. TS inquiry and the response (STAT sample)

[1] First TS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150316165009<CR>
Q|1|^^Thisissample^2^40001^1^^S1^R1||ALL|||||||O<CR>
L|1|N<CR>
```

[2] Response for First TS inquiry (Host to Analyzer)

```
H|\^&|||HOST^1|||||cobasc513|TSDWN^REPLY|P|1|20150316165010<CR>
P|1|||||||U||||||23^Y<CR>
O|1|Thisissample|2^40001^1^^S1|^^^29161^\^^^29191^|S||20150316165010||||A||||1|||||||2015031
6165010|||O<CR>
C|1|I|^^^^|G<CR>
L|1|N<CR>
```

[3] First measurement result sending in realtime (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REAL|P|1|20150316165134<CR>
P|1|||||||U||||||23^Y<CR>
O|1|Thisissample|2^40001^1^^S1|^^^29101^\^^^29131^\^^^29161^\^^^29191^|S||20150316165010
||||N||||1|||||||20150316165009|||F<CR>
C|1|I|                    ^                    ^                    ^^|G<
CR>
R|1|^^^29101/||mmol/L||L||F||bmserv|20150316165020|20150316165133|P1^1400-01<CR>
```

```
M|1|TTRA|1|1<CR>
C|1|I|101|I<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
R|2|^^^29131/|4.895|mmol/L||H||F||bmserv|20150316165020|20150316165133|P1^1400-01<CR>
M|2|TTRA|1|1<CR>
C|2|I|101|I<CR>
M|2|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|2|CTRA|736<CR>
R|3|^^^29161/|1.45|%||H||F||bmserv|20150316165020|20150316165133|P1^1400-01<CR>
M|3|TTRA|1|1<CR>
C|3|I|101|I<CR>
M|3|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|3|CTRA|<CR>
R|4|^^^29191/|-7.6|mmol/mol||L||F||bmserv|20150316165020|20150316165133|P1^1400-01<CR>
M|4|TTRA|1|1<CR>
C|4|I|101|I<CR>
M|4|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|4|CTRA|<CR>
L|1|N<CR>
```

2.3.3.1.3. Batch TS Download (Routine sample)

```
H|\^&|||HOST^1|||||cobasc513|TSDWN^BATCH|P|1|20150213153355<CR>
P|1|||||||M|||||48^Y<CR>
O|1||462^50001^1^^S1|^^^29161^|R||20150213153555||||A||||1|||||||2015021315335255|||O<CR>
C|1|I|Comment1^Comment2^Comment3^Comment4^Comment5|G<CR>
L|1|N<CR>
```

2.3.3.1.4. Batch TS Download (STAT sample)

```
H|\^&|||HOST^1|||||cobasc513|TSDWN^BATCH|P|1|20150213153355<CR>
P|1|||||||M|||||48^Y<CR>
O|1||0^40001^1^^S1|^^^29161^|S||20150213153555||||A||||1|||||||2015021315335255|||O<CR>
C|1|I|Comment1^Comment2^Comment3^Comment4^Comment5|G<CR>
L|1|N<CR>
```

2.3.3.1.5. RS inquiry and the response from Host (Routine sample)

[1] RS inquiry (Host to Analyzer)

```
H|\^&|||HOST^1|||||cobasc513|RSREQ^REAL|P|1|20150220090542<CR>
Q|1|^^^12^50101^1^^S2^R1||ALL|||||||F<CR>
L|1|N<CR>
```

[2] Response for First TS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REPLY|P|1|20150220090544<CR>
P|1|||||||M|||||48^Y<CR>
O|1||12^50101^1^^S2|^^^29251^|R||20150216142801||||N||||1|||||||20150216142800|||F<CR>
C|1|I|                                    ^^^^|G<CR>
R|1|^^^29251/|2.5|g/L||N||F||HITSRV|20150216142823|20150216143836|P1^D1-01-01-00<CR>
M|1|TTRA|1|1<CR>
C|1|I|0|I<CR>
M|1|RTRA|1001001^000001^1^201512^0|^^^^<CR>
M|1|CTRA|375<CR>
L|1|N<CR>
```

2.3.3.1.6. RS inquiry and the response from Host (STAT sample)

[1] RS inquiry (Host to Analyzer)

```
H|\^&|||HOST^1|||||cobasc513|RSREQ^REAL|P|1|20150220090542<CR>
```

```
Q|1|^^^15^40101^1^^S2^R1||ALL|||||||F<CR>
L|1|N<CR>
```

[2] Response for First TS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REPLY|P|1|20150220090544<CR>
P|1|||||||M||||||48^Y<CR>
O|1||15^40101^1^^S2|^^^29251^|R||20150216142801||||N||||1|||||||20150216142800|||F<CR>
C|1|I|                                    ^^^^|G<CR>
R|1|^^^29251/|2.5|g/L||N||F||HITSRV|20150216142823|20150216143836|P1^D1-01-01-00<CR>
M|1|TTRA|1|1<CR>
C|1|I|0|I<CR>
M|1|RTRA|1001001^000001^1^201512^0|^^^^<CR>
M|1|CTRA|375<CR>
L|1|N<CR>
```

2.3.3.1.7. Batch RS send from operation screen (Routine sample)

[1] RS send

See “2.3.3.1.1 [3]”

Note: H-11 is replaced from “RSUPL^REAL” to “RSUPL^**BATCH**”

[2] Reaction process data send

```
H|\^&|||cobasc513^1|||||HOST|ABUPL^BATCH|P|1|20150217124935<CR>
P|1||||||M||||||23^M<CR>
O|1|HEM101|1^00051^1^^S2|^^^221^|R||20150215101209||||N||||2|||||||20150217104708|||F<CR>
C|1|I|aaaa                                ^^ccc                              ^^eee            |G  <CR>
R|1|^^^221/|7.380|mmol/L||H||F||*OPEN*|20150217104734|20150217104849|P1^1400-01<CR>
M|1|TTRA|1|1<CR>
C|1|I|0|I<CR>
M|1|ABS|P1^1400-01|122||10|34|0\0\0\0|-4000\-3935\-3855\-3760\-3650\-3525\-3385\-3230\-3060\-
2875\-2675\-2460\-2230\-1985\-1725\-1450\-1160\-855\-535\-200\1500\1587\1681\1782\1890\2005
\2127\2256\2392\2535\2685\2842\3006\3177<CR>
M|1|RTRA|374553^606650^900002^201605^0|^^^^<CR>
M|1|CTRA|738<CR>
L|1|N<CR>
```

2.3.3.1.8. Batch RS send from operation screen (STAT sample)

[1] RS send

See “2.3.3.1.2[3]”

Note: H-11 is replaced from “RSUPL^REAL” to “RSUPL^**BATCH**”

[2] Reaction process data send

```
H|\^&|||cobasc513^1|||||HOST|ABUPL^BATCH|P|1|20150303174512<CR>
P|1|||||||M||||||48^Y<CR>
O|1||3^E0001^1^^S1|^^^29131^|S||20150213153555||||N||||1|||||||20150303165647|||F<CR>
C|1|I|Comment1                                ^Comment2                                ^Comment3
^Comment4          ^Comment5    |G<CR>
R|1|^^^29131/|          |mmol/L||A||X||bmserv|20150303165658|20150303165806|P1^1400-01<CR>
M|1|TTRA|1|1<CR>
C|1|I|39|I<CR>
M|1|ABS|P1^1400-01|140||10|34|600\525\475\0|-2500\-2385\-2255\-2110\-1950\-1775\-1585\-1380
\-1160\-925\-675\-410\-130\165\475\800\1140\1495\1865\2250\4500\4637\4781\4932\5090\5255\5
427\5606\5792\5985\6185\6392\6606\6827<CR>
M|1|RTRA|374553^606650^900002^201605^0|868731^606620^2000^201601^0<CR>
```

```
M|1|CTRA|695<CR>
L|1|N<CR>
```

2.3.3.2. Routine/STAT sample: S.ID mode

2.3.3.2.1. TS inquiry and the response (Routine sample)

[1] First TS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150303145935<CR>
Q|1|^^0000004027^0^50008^5^^S1^R1||ALL|||||||O<CR>
L|1|N<CR>
```

[2] Response for First TS inquiry (Host to Analyzer)

```
H|\^&|||HOST^1|||||cobasc513|TSDWN^REPLY|P|1|20150303145936<CR>
P|1|||||||U||||||23^Y<CR>
O|1|0000004027|0^50008^5^^S1|^^^29161^|R||20150303145936||||A||||1|||||||20150303145936|||O<
CR>
C|1|I|comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

[3] First measurement result sending in realtime (Analyzer to Host)

Original Data Upload was checked.

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REAL|P|1|20150303150058<CR>
P|1|||||||U||||||23^Y<CR>
O|1|0000004027|0^50008^5^^S1|^^^29101^\^^^29131^\^^^29161^|R||20150303145936||||N||||1|||||||
20150303145935|||F<CR>
C|1|I|comment1^comment2^comment3^comment4^comment5|G<CR>
R|1|^^^29101/|^          |mmol/L||LL||F||bmserv|20150303145945|20150303150057|P1^1400-01<CR
>
M|1|TTRA|1|1<CR>
C|1|I|27|I<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
R|2|^^^29131/|4.895|mmol/L||HH||F||bmserv|20150303145945|20150303150057|P1^1400-01<CR>
M|2|TTRA|1|1<CR>
C|2|I|26|I<CR>
M|2|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|2|CTRA|736<CR>
R|3|^^^29161/|1.45|%||H||F||bmserv|20150303145945|20150303150057|P1^1400-01<CR>
M|3|TTRA|1|1<CR>
C|3|I|37|I<CR>
M|3|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|3|CTRA|<CR>
L|1|N<CR>
```

2.3.3.2.2. TS inquiry and the response (STAT sample)

[1] First TS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150303151153<CR>
Q|1|^^1234567890123^0^40001^2^^S1^R1||ALL|||||||O<CR>
L|1|N<CR>
```

[2] Response for First TS inquiry (Host to Analyzer)

```
H|\^&|||HOST^1|||||cobasc513|TSDWN^REPLY|P|1|20150303151153<CR>
P|1|||||||U||||||23^Y<CR>
O|1|1234567890123|0^40001^2^^S1|^^^29161^\^^^29191^|S||20150303151153||||A||||1|||||||2015030
3151153|||O<CR>
```

```
C|1|I|^^^^|G<CR>
L|1|N<CR>
```

[3] First measurement result sending in realtime (Analyzer to Host)

Original Data Upload was checked.

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REAL|P|1|20150303151308<CR>
P|1||||||U||||||23^Y<CR>
O|1|1234567890123|0^40001^2^^S1|^^^29101^\^^^29131^\^^^29161^\^^^29191^|S||2015030315115
3||||N||||1||||||20150303151152|||F<CR>
C|1|I|                                        ^^^^|G<CR>
R|1|^^^29101/|^         |mmol/L||LL||F||bmserv|20150303151156|20150303151308|P1^1400-01<CR>
M|1|TTRA|1|1<CR>
C|1|I|27|I<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
R|2|^^^29131/|4.895|mmol/L||HH||F||bmserv|20150303151156|20150303151308|P1^1400-01<CR>
M|2|TTRA|1|1<CR>
C|2|I|26|I<CR>
M|2|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|2|CTRA|736<CR>
R|3|^^^29161/|1.45|%||H||F||bmserv|20150303151156|20150303151308|P1^1400-01<CR>
M|3|TTRA|1|1<CR>
C|3|I|37|I<CR>
M|3|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|3|CTRA|<CR>
R|4|^^^29191/|-7.6|mmol/mol||L||F||bmserv|20150303151156|20150303151308|P1^1400-01<CR>
M|4|TTRA|1|1<CR>
C|4|I|37|I<CR>
M|4|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|4|CTRA|<CR>
L|1|N<CR>
```

2.3.3.2.3. TS inquiry and the response (Barcode read error and enabled function TS ask for barcode read error)

[1] First TS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150303153408<CR>
Q|1|^^**********************^0^50001^5^^S1^R1||ALL||||||||O<CR>
L|1|N<CR>
```

[2] Response for First TS inquiry (Host to Analyzer)

```
H|\^&|||HOST^1|||||cobasc513|TSDWN^REPLY|P|1|20150303153409<CR>
P|1||||||U||||||23^Y<CR>
O|1|BC012345678901|0^50001^5^^S1|^^^29161^\^^^29191^|R||20150303153409||||A||||1||||||20150
303153409|||O<CR>
C|1|I|^^^^|G<CR>
L|1|N<CR>
```

2.3.3.2.4. Batch TS Download (Routine sample) (Host to Analyzer)

```
H|\^&|||cobasc513^1|||||HOST|TSDWN^BATCH|P|1|20150303163409<CR>
P|1||||||M||||||23^Y<CR>
O|1|ROUTINE_TESTID|0^^^^S1|^^^29161^|R||20150215101209||||A||||1||||||20150215101209|||O<C
R>
C|1|I|aaaa^bbb^ccc^ddd^eee|G<CR>
L|1|N<CR>
```

2.3.3.2.5. Batch TS Download (STAT sample) (Host to Analyzer)

```
H|\^&|||cobasc513^1|||||HOST|TSDWN^BATCH|P|1|20150303164409<CR>
P|1|||||||M||||||23^Y<CR>
O|1|STAT_TESTID|0^^^^S2|^^^29281^|S||20150215101209||||A||||2|||||||20150215101209|||O<CR>
C|1|I|aaaa^bbb^ccc^ddd^eee|G<CR>
L|1|N<CR>
```

2.3.3.2.6. RS inquiry and the response from Host (Routine sample)

[1] RS inquiry (Host to Analyzer)

```
H|\^&|||cobasc513^1|||||HOST|RSREQ^REAL|P|1|20150303164809<CR>
Q|1|^^0000004027^0^50008^5^^S1^R1||ALL|||||||F<CR>
L|1|N<CR>
```

[2] Response for First RS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REPLY|P|1|20150303164809<CR>
P|1|||||||U||||||23^Y<CR>
O|1|0000004027|0^50008^5^^S1|^^^29101^\^^^29131^\^^^29161^|R||20150303145936||||N||||1|||||||
20150303145935|||F<CR>
C|1|I|comment1^comment2^comment3^comment4^comment5|G<CR>
R|1|^^^29101/|^          |mmol/L||LL||F||bmserv|20150303145945|20150303150057|P1^1400-01<CR
>
M|1|TTRA|1|1<CR>
C|1|I|27|I<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
R|2|^^^29131/|4.895|mmol/L||HH||F||bmserv|20150303145945|20150303150057|P1^1400-01<CR>
M|2|TTRA|1|1<CR>
C|2|I|26|I<CR>
M|2|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|2|CTRA|736<CR>
R|3|^^^29161/|1.45|%||H||F||bmserv|20150303145945|20150303150057|P1^1400-01<CR>
M|3|TTRA|1|1<CR>
C|3|I|37|I<CR>
M|3|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|3|CTRA|<CR>
L|1|N<CR>
```

2.3.3.2.7. RS inquiry and the response from Host (STAT sample)

[1] Rerun RS inquiry (Host to Analyzer)

```
H|\^&|||cobasc513^1|||||HOST|RSREQ^REAL|P|1|20150303174317<CR>
Q|1|^^1234567890123^0^40002^2^^S1^R2||ALL|||||||F<CR>
L|1|N<CR>
```

[2] Response for Rerun RS inquiry (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REPLY|P|1|20150303174443<CR>
P|1|||||||U||||||23^Y<CR>
O|1|1234567890123|0^40001^2^^S1|^^^29161^\^^^29191^\^^^29131^\^^^29101^|S||201503031511
53||||N||||1|||||||20150303165618|||F<CR>
C|1|I|                                    ^^^^|G<CR>
R|1|^^^29161/|1.45|%||H||C||bmserv|20150303165630|20150303165743|P1^1400-01<CR>
M|1|TTRA|2|1<CR>
C|1|I|37|I<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|<CR>
R|2|^^^29191/|-7.6|mmol/mol||L||C||bmserv|20150303165630|20150303165743|P1^1400-01<CR>
M|2|TTRA|2|1<CR>
```

```
C|2|I|37|I<CR>
M|2|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|2|CTRA|<CR>
R|3|^^^29131/|4.895|mmol/L||HH||C||bmserv|20150303165630|20150303165743|P1^1400-01<CR>
M|3|TTRA|2|1<CR>
C|3|I|26|I<CR>
M|3|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|3|CTRA|736<CR>
R|4|^^^29101/|^          |mmol/L||LL||C||bmserv|20150303165630|20150303165743|P1^1400-01<CR
>
M|4|TTRA|2|1<CR>
C|4|I|27|I<CR>
M|4|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|4|CTRA|724<CR>
L|1|N<CR>
```

2.3.3.2.8. Batch RS send from operation screen (Routine sample)

[1] RS send (Analyzer to Host)

See “2.3.3.2.1 [3]”

Note: H-11 is replaced from “RSUPL^REAL” to “RSUPL^**BATCH**”

[2] Reaction process data send (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|ABUPL^BATCH|P|1|20150303175610<CR>
P|1|||||||U||||||23^Y<CR>
O|1|0000004027|0^50008^5^^S1|^^^29101^|R||20150303145936||||N||||1|||||||20150303145935|||F<C
R>
C|1|I|comment1^comment2^comment3^comment4^comment5|G<CR>
R|1|^^^29101/|^          |mmol/L||LL||F||bmserv|20150303145945|20150303150057|P1^1400-01<CR>
M|1|TTRA|1|1<CR>
C|1|I|27|I<CR>
M|1|ABS|P1^1400-01|71||10|34|100\100\100\0|100\188\276\363\451\539\627\715\803\891\979\1067\
1155\1243\1330\1418\1506\1594\1682\1770\1857\1945\2033\2121\2209\2297\2385\2473\2561\2649
\2737\2824\2912\2693<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
L|1|N<CR>
```

2.3.3.2.9. Batch RS send from operation screen (STAT sample)

[1] RS send (Analyzer to Host)

See “2.3.3.2.2 [3]”

Note: H-11 is replaced from “RSUPL^REAL” to “RSUPL^**BATCH**”

[2] Reaction process data send (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|ABUPL^BATCH|P|1|20150303175228<CR>
P|1|||||||U||||||23^Y<CR>
O|1|1234567890123|0^40001^2^^S1|^^^29101^|S||20150303151153||||N||||1|||||||20150303165618|||
F<CR>
C|1|I|                                    ^^^^|G<CR>
R|1|^^^29101/|^          |mmol/L||LL||F||bmserv|20150303151156|20150303151308|P1^1400-01<CR
>
M|1|TTRA|1|1<CR>
C|1|I|27|I<CR>
M|1|ABS|P1^1400-01|137||10|34|100\100\100\0|100\188\276\363\451\539\627\715\803\891\979\10
```

```
67\1155\1243\1330\1418\1506\1594\1682\1770\1857\1945\2033\2121\2209\2297\2385\2473\2561
\2649\2737\2824\2912\2693<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
L|1|N<CR>
```

2.3.3.3. Control sample

2.3.3.3.1. Measurement result sending in realtime (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|RSUPL^REAL|P|1|20150218131825<CR>
P|1|||||||U||||||0^<CR>
O|1|cont01  12345678|5017^C0001^1^^QC|^^^29101^|||||||Q||||^30805^20160229||||||20150218131
646|||F<CR>
C|1|I|^^^^|G<CR>
R|1|^^^29101/|20|g/L||N||||HITSRV|20150218131700|20150218132725|P1^Serial-ABC<CR>
M|1|TTRA|1|1<CR>
C|1|I|0|I<CR>
M|1|RTRA|1000001^000001^2^^0|^^^^<CR>
M|1|CTRA|12<CR>
L|1|N<CR>
```

2.3.3.3.2. Batch RS send from operation screen

[1] RS send (Analyzer to Host)

See “2.3.3.3.1”

Note: H-11 is replaced from “RSUPL^REAL” to “RSUPL^**BATCH**”

[2] Reaction process data send (Analyzer to Host)

```
H|\^&|||cobasc513^1|||||HOST|ABUPL^BATCH|P|1|20150217113444<CR>
P|1|||||||U||||||0^<CR>
O|1|cont001  000lot27|1001^C0001^2^^QC|^^^20503^|||||||Q||||^30801^20160229||||||20150217113
207|||F<CR>
C|1|I|^^^^|G<CR>
R|1|^^^20503/|31.2|g/L||N||||HITSRV|20150217113211|20150217114240|P1^012345678901<CR>
C|1|I|0|I<CR>
M|1|ABS|P1^012345678901|1||3|11|-3559\-3560\-3560\0|249\247\242\241\242\254\248\242\235\214
\229<CR>
M|1|TTRA|1|5<CR>
M|1|RTRA|2002^^^^1|901^^^^0<CR>
M|1|CTRA|731<CR>
L|1|N<CR>
```

2.3.3.4. Photometric Calibrator

2.3.3.4.1. Measurement result sending in realtime (Analyzer to Host)

[1] Only STD1 and STD3 are used in 2 points measurement

```
H|\^&|||cobasc513^1|||||HOST|PCUPL^REAL|P|1|20150218131753<CR>
M|1|PCR|HITSRV|^^^29101|P1^Serial-ABC|16||0^9300^0^9300^0^0\^^^^^\0^9300^0^9300^0^0\^^^^^
\^^^^^\^^^^^|||30001^00000001^201512\^^\30003^12345678^201502\^^\^^\^^|20150214095607|g/L<
CR>
M|1|RTRA|2^^^^0|^^^^<CR>
M|1|CTRA|14<CR>
L|1|N<CR>
```

[2] STD3 only are used in span points measurement

H|\^&|||cobasc513^1|||||HOST|ABUPL^BATCH|P|1|20150303175610<CR>
P|1|||||||U||||||23^Y<CR>
O|1|0000004027|0^50008^5^^S1|^^^29101^|R||20150303145936||||N||||1|||||||20150303145935|||F<CR>
C|1|I| ^^^^|G<CR>
R|1|^^^29101/|^ |mmol/L||LL||F||bmserv|20150303145945|20150303150057|P1^1400-01<CR>
M|1|TTRA|1|1<CR>
C|1|I|27|I<CR>
M|1|ABS|P1^1400-01|71||10|34|100\100\100\0|100\188\276\363\451\539\627\715\803\891\979\1067\1155\1243\1330\1418\1506\1594\1682\1770\1857\1945\2033\2121\2209\2297\2385\2473\2561\2649\2737\2824\2912\2693<CR>
M|1|RTRA|374553^606650^900003^201605^0|868731^606620^158^201601^0<CR>
M|1|CTRA|724<CR>
L|1|N<CR>

2.3.3.5. Cancellation request of TS inquiry (Analyzer to Host)

The analyzer sends the following communication message when the inquiry is canceled due to timeout and others.

Cancellation request is performed by instruction A in the Request Information Status Codes field of Q record.

H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150218130701<CR>
Q|1|^^^416^50002^1^^S1^R1||ALL||||||||**A**<CR>
L|1|N<CR>

Do not return TS as response because the above communication message is a cancellation of inquiry.

2.3.3.6. Response without test order (HOST to Analyzer)

The following communication message is sent when there is no test order from HOST side.

H|\^&|||HOST^1|||||cobasc513|TSDWN^REPLY|P|1|20150216173357<CR>
P|1|||||||U||||||23^Y<CR>
O|1|TEST2|0^50001^2^^S1||R||20150216173357||||A||||1|||||||20150216173357|||O<CR>
C|1|I|comment1^comment2^comment3^comment4^comment5|G <CR>
L|1|N<CR>

Set Null value for No.5 Universal Test ID field of O record.

2.3.4. NCCLS LIS1Lower Layer Communication Message Examples

This describes “2.2 NCCLS LIS2Upper Communication Messages” with text examples which are defined ASTM1381-91(“2.2.5 NCCLS LIS1Lower Layer”), describes actual communication message examples which are divided by each 240 characters and exchanged according to this protocol with ENQ,ACK,EOT.

Checksum and the number of character on each frame are exactly expressed.

(1) Realtime TS inquiry and the response(normal)

(The following communication messages are normal communication examples corresponding to 2.3.4 and sent in the case of whole blood S.No=416 in sample No mode)

(*1)Communication direction: S is Analyzer => HOST, R is HOST => Analyzer

Table 2-29 Communication Message Examples

1	2015/02/13	15:38:18	S(*1)	<ENQ>
2	2015/02/13	15:38:18	R	<ACK>
3	2015/02/13	15:38:18	S	<STX>1H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150213153817<CR>
				Q|1|^^^416^50001^1^^S1^R1||ALL|||||||O<CR>
				L|1|N<CR>
				<ETX>E0<CR>
				<LF>
4	2015/02/13	15:38:18	R	<ACK>
5	2015/02/13	15:38:18	S	<EOT>
6	2015/02/13	15:38:19	R	<ENQ>
7	2015/02/13	15:38:19	S	<ACK>
8	2015/02/13	15:38:19	R	<STX>1H|\^&|||cobasc513^1|||||HOST|TSDWN^REPLY|P|1|20150213153818<CR>
				P|1||||||M||||||23^Y<CR>
				O|1||416^50001^1^^S1|^^^29161^\^^^29191^|R||20150213153818||||A||||1||||||20150213153818|||O<CR>
				C|1|I|^^^^|G<CR>
				L|1|N<CR>
				<ETX>2F<CR>
				<LF>
9	2015/02/13	15:38:19	S	<ACK>
10	2015/02/13	15:38:19	R	<EOT>

(2) Not ready to Receive(normal)

(The following communication message is sent when <NAK> is returned as response of <ENQ> because host is not ready to receive.)

1	2015/02/13	16:38:18	S	<ENQ>
2	2015/02/13	16:38:18	R	<NAK>
3	2015/02/13	16:38:28	S	<ENQ>
4	2015/02/13	16:38:28	R	<ACK>

5	2015/02/13	16:38:29	S	<STX>1H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150213163829<CR>
				Q|1|^^^456^50001^1^^S1^R1||ALL|||||||O<CR>
				L|1|N<CR>
				<ETX>E0<CR>
				<LF>
6	2015/02/13	16:38:29	R	<ACK>
7	2015/02/13	16:38:29	S	<EOT>

1st raw : Analyzer sent <ENQ> to host.

2nd raw : Although Host normally returns <ACK>, but returned <NAK> instead because host was not ready.

3rd raw : Analyzer received <NAK> from host and resent <ENQ> after ten seconds later.

4th raw : Host was available and returned <ACK>

5th raw : Analyzer made TS inquiries.

(3) Link Contention(normal)

(The following communication message example is sent when link contention is occurred.)

(They can be also used as a reference of example for proper use between <ETB> and <ETX> on multi frame(when sending text exceeds 240 characters) and for when the frame No exceeds 7.)

1	2015/02/13	16:21:32	S	<ENQ>
2	2015/02/13	16:21:32	R	<ACK>
3	2015/02/13	16:21:33	S	<STX>1H|\^&|||cobasc513^1|||||HOST|TSREQ^REAL|P|1|20150213162132<CR>
				Q|1|^^^469^50001^1^^S1^R1||ALL|||||||O<CR>
				L|1|N<CR>
				<ETX>E1<CR>
				<LF>
4	2015/02/13	16:21:33	R	<ACK>
5	2015/02/13	16:21:33	S	<EOT>
6	2015/02/13	16:21:33	S	<ENQ>
7	2015/02/13	16:21:33	R	<ENQ>
8	2015/02/13	16:21:34	S	<ENQ>
9	2015/02/13	16:21:34	R	<ACK>
10	2015/02/13	16:21:34	S	<STX>1H|\^&|||cobasc513^1|||||HOST|RSUPL^REAL|P|1|20150213162133<CR>
				P|1||||||U||||||0^<CR>
				O|1|HEM101|1^00051^1^^S2|^^^221^\^^^251^\^^^281^|R|||||N|||2||||||2015021316 2010|||F<CR>
				C|1|I| ^^ ^^ |G<CR>
				<ETB>57<CR>
				<LF>
11	2015/02/13	16:21:34	R	<ACK>
12	2015/02/13	16:21:34	S	<STX>2R|1|^^^221/|7.380|mmol/L||H||F||admin|20150213161040|2015021316114 0|P1^1400-01<CR>
				M|1|TTRA|1|1<CR>
				C|1|I|0|I<CR>
				M|1|RTRA|374553^606650^900002^201605^0|^^^^<CR>
				M|1|CTRA|738<CR>

				R|2|^^^251/|^ |mmol/L||A||X||admin|20150213161040|20150213161140|P1^1400-01<CR>
				<ETB>A9<CR>
				<LF>
13	2015/02/13	16:21:35	R	<ACK>
14	2015/02/13	16:21:35	S	<STX>3M|2|TTRA|1|1<CR>
				C|2|I|39|I<CR>
				M|2|RTRA|374553^606650^900002^201605^0|^^^^<CR>
				M|2|CTRA|741<CR>
				R|3|^^^281/|^ |%||A||X||admin|20150213161040|20150213161140|P1^1400-01<CR>
				M|3|TTRA|1|1<CR>
				C|3|I|39|I<CR>
				M|3|RTRA|374553^606650^900002^201605^0|^^^^<CR>
				M|3|CTRA|<CR>
				L|1|N<ETB>B8<CR>
				<LF>
15	2015/02/13	16:21:35	R	<ACK>
16	2015/02/13	16:21:35	S	<STX>4<CR>
				<ETX>44<CR>
				<LF>
17	2015/02/13	16:21:35	R	<ACK>
18	2015/02/13	16:21:36	S	<EOT>
19	2015/02/13	16:21:36	R	<ENQ>
20	2015/02/13	16:21:36	S	<ACK>
21	2015/02/13	16:21:36	R	<STX>1H|\^&|||cobasc513^1|||||HOST|TSDWN^REPLY|P|1|20150213162135<CR> >
				P|1||||||U|||||23^Y<CR>
				O|1||469^50001^1^^S1|^^^221^|R||20150213162135||||A||||1||||||20150213162137| ||O<CR>
				C|1|I|^^^^|G<CR>
				L|1|N<CR>
				<ETX>0B<CR>
				<LF>
22	2015/02/13	16:21:36	S	<ACK>
23	2015/02/13	16:21:36	R	<EOT>

Up to 5th raw : TS inquiries has been made normally.

6, 7th raw : Link contention has occurred.

8 th raw : The analyzer waited 1 second and then resent <ENQ>.
Measurement results are now sent in real time.

Up to 18th raw : Measurement result send in realtime was done normally.

From 19th raw : With regard to the sample inquired up to the 5th row, the host computer has sent a test selection request.

10, 12, 14th raw etc.: <ETB> is used due to middle frame.

3rd, 16, 21th raw : <ETX> is used due to final frame.

(4) Link Time Out (abnormal)

(The following communication message example is sent when link timeout is occurred due to no response <ACK> or <NAK> or <ENQ> to <ENQ> which was sent.) (Link Time Out is fixed 15 seconds.)

It is ignored even if there is others such as e.g. <STX> excluding above 3 codes.

1	2015/02/13	14:35:05	S	<ENQ>
2	2015/02/13	14:35:20	S	<EOT>

(5) Sum Error (abnormal)

（The following communication messages are sent when host returned <NAK > and retry was performed due to sum abnormally of received frame.

1	2015/02/13	16:29:15	R	<ENQ>
2	2015/02/13	16:29:16	S	<ACK>
3	2015/02/13	16:29:16	R	<STX>1H|\^&|||cobasc513^1|||||HOST|TSDWN^BATCH|P|1|20150213162915<CR>
				P|1|||||||U||||||23^Y<CR>
				O|1||475^50001^1^^S1|^^^29161^\^^^29191^\^^^961^|R||20150213162915||||A||||1|||||||20150213162915|||O<CR>
				C|1|I|^^^^|G<CR>
				L|1|N<CR>
				<ETX>00<CR>
				<LF>
4	2015/02/13	16:29:16	S	<NAK>
5	2015/02/13	16:29:16	R	<STX>1H|\^&|||cobasc513^1|||||HOST|TSDWN^BATCH|P|1|20150213162915<CR>
				P|1|||||||U||||||23^Y<CR>
				O|1||475^50001^1^^S1|^^^29161^\^^^29191^\^^^961^|R||20150213162915||||A||||1|||||||20150213162915|||O<CR>
				C|1|I|^^^^|G<CR>
				L|1|N<CR>
				<ETX>FB<CR>
				<LF>
6	2015/02/13	16:29:17	S	<ACK>
7	2015/02/13	16:29:17	R	<EOT>

4th raw : Analyzer returned <NAK> due to an abnormality of frame sum value received in 3rd raw(it is 00 in above communication message).

From 5th raw : Host resent the communication message of normal sum value and was performed normally.

（6） Protocol Violations(abnormal）

(The following communication messages are sent when there was no retry although <NAK> is returned due to violation because of no <STX> despite trying TS download.

1	2015/02/13	15:13:18	R	<ENQ>
2	2015/02/13	15:13:18	S	<ACK>
3	2015/02/13	15:13:18	R	1H|\^&|||cobasc513^1|||||HOST|TSDWN^BATCH|P|1|20150213151318<CR>
				P|1|||||||U||||||23^Y<CR>
				O|1||475^50001^1^^S1|^^^29161^\^^^29191^\^^^961^|R||20150213151318||||A||||1||||||||20150213151318|||O<CR>
				C|1|I|^^^^|G<CR>
				L|1|N<CR>
				<ETX>FB<CR>
				<LF>
4	2015/02/13	15:13:18	S	<NAK>
5	2015/02/13	15:13:48	S	<EOT>

4th raw : Analyzer returned <NAK> because abnormal frame which has no <STX> at the head of the frame in 3rd raw was received.

5th raw : Analyzer sent <EOT> because it waited retry from host(time limit is “30 seconds” fixed) but retry was performed.