**Hitachi High-Technologies**

Sales Information

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Title

LABOSPECT 008 AS HOST COMMUNICATION SPECIFICATION

Product information

Name of product LABOSPECT 008 AS HITACHI AUTOMATIC ANALYZER

Name of module Not applicable

Category Host interface

Subject

Description of host interface specification for LABOSPECT 008 AS

Contents

Refer to subsequent pages for details.

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LABOSPECT 008 AS HOST INTERFACE SPECIFICATION

Content

1	HARDWARE SPECIFICATION FOR EXTERNAL SYSTEM	3
1.1	Outline	3
1.2	Interface Signal.....	3
1.3	RS-232C Communication Connection Method	4
1.3.1	Connector Position	4
1.3.2	Connection Cable and Cable Length	4
1.3.3	Connection Specification	4
2	HOST COMMUNICATION SPECIFICATION.....	5
2.1	Interface Specification for Application Layer	5
2.1.1	Outline.....	5
2.1.2	Realtime communication	9
2.1.3	Batch Communication	18
2.1.4	Contents of Communication Text	21
2.1.5	Operating Condition Setting	32
2.1.6	Error Processing	35
2.2	Specifications of ASTM Upper/Lower Layer Interface for Host Communication	42
2.2.1	Outline.....	42
2.2.2	Specifications of Physical Layer (Electrical Specifications)	43
2.2.3	ASTM Communication Protocol	44
2.2.4	Structure of ASTM Communication Program	45
2.2.5	ASTM Syntax.....	46
2.2.6	ASTM Lower Layer	71
2.3	Examples of Host Communication Messages	76
2.3.1	Introduction	76
2.3.2	Communication Order (Flow of Information Exchanged) on Application Layer	76
2.3.3	Examples of Communication Messages in ASTM Upper Layer	78
2.3.4	Examples of Communication Messages in ASTM Lower Layer	93

1 HARDWARE SPECIFICATION FOR EXTERNAL SYSTEM

1.1 Outline

In automatic analyzer, data communication is performed via RS-232C of CU PC.

1.2 Interface Signal

List of interface signals is shown in Table1-1, while Table 1-2 describes the level and meaning of the interface signals.

Table1-1 List of Interface Signals

Abbrev.	Signal	Signal Direction (LABOSPECT 008 AS side) (Host system 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	←

Table 1-2 Level and Meaning of RS-232C Interface Signals

Level Signal	Positive Level (*1)	Negative Level (*1)
TXD	SPACE	MARK(no signal)
RXD	Start bit Data "0" (*2)	Stop bit Data "1" (*2)
RTS	ON	OFF
DTR	Data "1"	Data "0"
CTS	ON Data "1" Data communication permitted	OFF Data "0" Data communication prohibited
DCD	ON Data "1" Data communication permitted	OFF Data "0" Data communication prohibited

*1: PositiveOutput +12 V, Input +3 V to +15 V

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

*2: Data "0" and data "1" indicate correspondence with binary number when the CPU reads or writes data or status.

1.3 RS-232C Communication Connection Method

1.3.1 Connector Position

RS-232C port at the rear of CU PC is used. Connect it to COM port at this time. (Description might be different depending on PC.)

1.3.2 Connection Cable and Cable Length

LABOSPECT 008 AS utilizes DSUB-9 pin (male). The connectors described below are used on the cable side.

- HDEB-9S (manufactured by Hirose Electric Co., Ltd.) or an equivalent
- Cable length is 15m at maximum.

1.3.3 Connection Specification

(1) CU PC Pin Arrangement

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

Shielded Communication cable should be used. The cable is connected to both connector shells of analyzer and host computer separately.

(3) Example of Connection

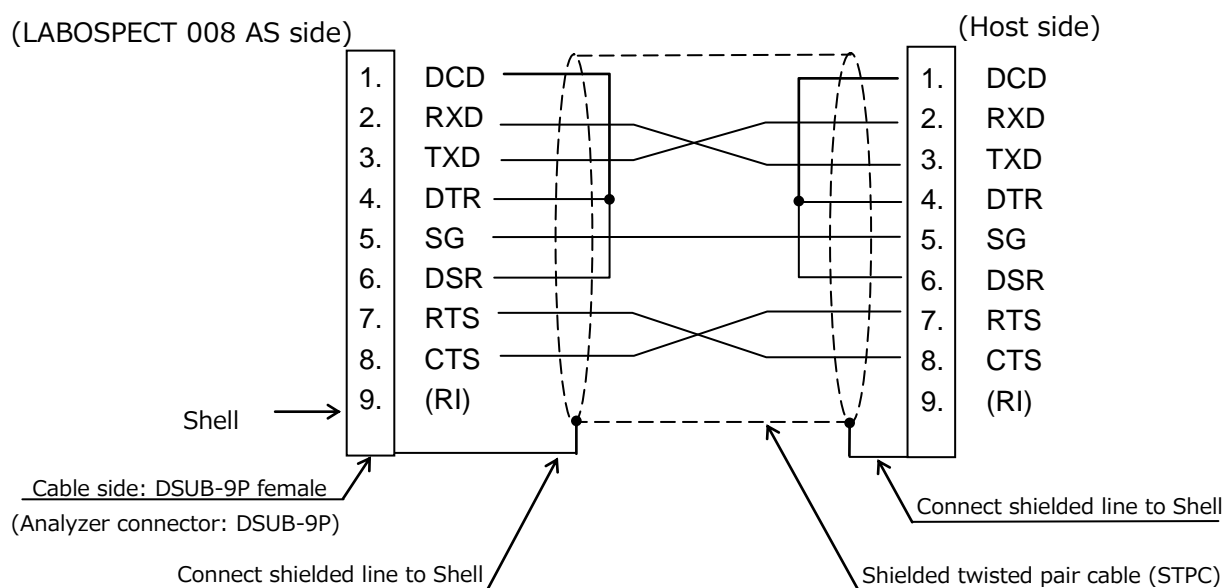


Fig 1-1 RS-232C Communication Connection Example (General PC Pin Array)

2 HOST COMMUNICATION SPECIFICATION

2.1 Interface Specification for Application Layer

2.1.1 Outline

(1) Differences from LABOSPECT 008 AS

The communication specifications for the LABOSPECT 008 AS are nearly the same as those for LABOSPECT 008. Differing points are described below.

- LABOSPECT 008 AS supports new communication text format only.
LABOSPECT 008 AS does not support existing communication text format supported by LABOSPECT 008.
- Specification of Auto rerun test selection inquiry is different from LABOSPECT 008. In LABOSPECT 008, communication text of "First measurement result data send" is inquiry of automatic rerun. When timeout of auto rerun response occurs, analyzer performs "Auto rerun test selection inquiry". In LABOSPECT 008 AS, communication text of "Auto rerun test selection inquiry" is send to inquire auto rerun after "First measurement result data send". When timeout occurs, auto rerun is not inquired again.

(2) Foreword

The interface specification for communication between this analyzer and the host consists of three levels as indicated below.

Stipulated here is the specification for application layer.

Interface specification for ASTM upper and lower layers is given in section 2.2 of this document.

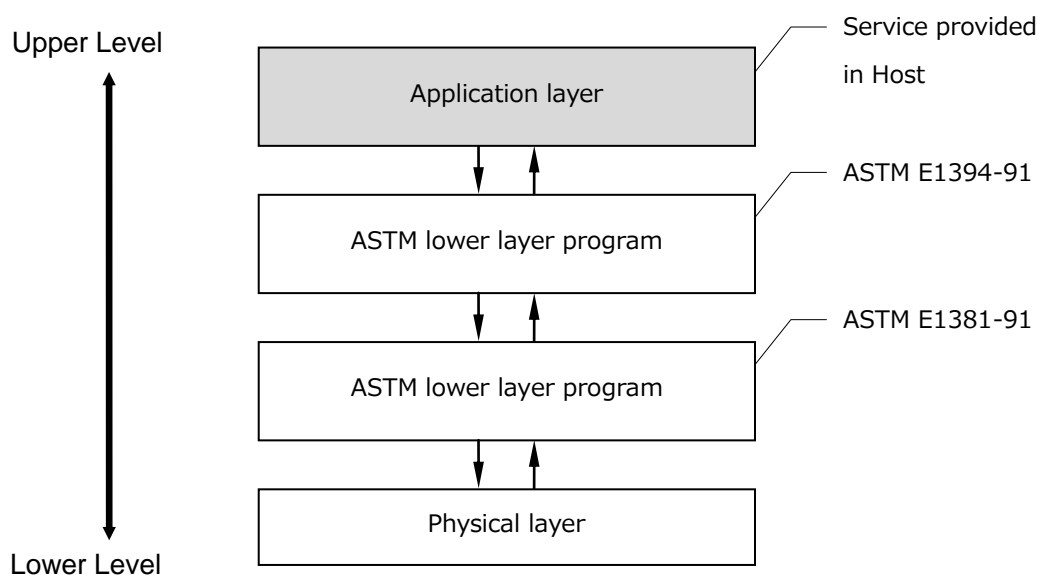


Fig 2-1 Host Communication Processing Hierarchy

(3) System Configuration and Host Positioning

The LABOSPECT 008 AS consists mainly of three types of units --- Control unit for setting analytical conditions and displaying/editing of analytical results; several Analytical units for mixing sample and reagent and conducting analysis; and a Sampler unit having a rack transfer function for carrying samples to the analytical units, plus functions common to the entire system (Refer to Fig 2-2). In LABOSPECT 008 AS, the host is connected to the control unit via RS-232C interface, and mainly used for sending/receiving test selection information on patient samples and/or measurement result data.

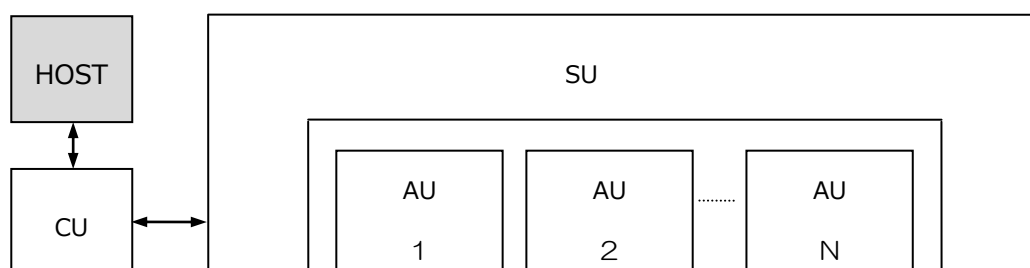


Fig 2-2 System Configuration and Host Positioning

(4) LABOSPECT 008 AS Operating Method

(a) Identification of Sample

Samples handled in the system are divided into calibrators used for creating working curve parameters (for calibration), quality control samples, routine samples and STAT samples. Routine samples are placed on two kinds of racks for operation --- routine rack for routine analysis, and rerun rack used for running analysis again. STAT rack is placed on STAT rack for interrupting routine analysis.

STAT samples placed on these racks are thus referred to as routine samples, STAT samples, and rerun samples respectively.

LABOSPECT 008 AS reads out the ID of the rack on which the samples are placed, identifies the sample type according to the rack ID range, and conducts analysis that matches the conditions. A maximum of five samples can be placed on a single rack. The relation between kinds of samples handled by the LABOSPECT 008 AS, kinds of samples and racks and rack ID is indicated in Table 2-1. The LABOSPECT 008 AS reads barcode label attached toward the rear on the rack side. This corresponds to Barcode ID given in エラー! 参照元が見つかりません。 . Rack No. is same as Label ID attached on the top of rack.

Table 2-1 Sample Types and Rack No.

Sample Type	Kind of Rack	Barcode ID	Label ID	Intended Purpose	Auto Rerun
Routine	Routine rack (gray)	50001-50999	00001-00999	Routine analysis of patient samples	○
		60000-60999	01000-01999		
		70000-70999	02000-02999		
		80000-80999	03000-03999		
		51000-51999	10000-10999		
		61000-61999	11000-11999		
		71000-71999	12000-12999		
		81000-81999	13000-13999		
		52000-52999	20000-20999		
		:	:		

Sample Type	Kind of Rack	Barcode ID	Label ID	Intended Purpose	Auto Rerun
		: 88000-88999 59000-59999 69000-69999 79000-79999 89000-89999	: 83000-83999 90000-90999 91000-91999 92000-92999 93000-93999		
STAT	STAT rack (red)	40001-40999	E0001-E0999	Analysis of STAT samples	○
Rerun	Rerun rack (pink)	00001-00999	R0001-R0999	Re-analysis of routine samples	×
Quality Control	Control rack (white)	30001-30999	C0001-C0999	For quality control	×
Calibrator	Calibration rack (black)	20001-20999	S0001-S0999	For calibration	×
Wash Solution	Wash rack (green)	10001-10999	W0001-W0999	For washing flow path (not for analysis)	×

Furthermore, there are five more samples other than calibrator and wash solution that are classified into "Serum", "Urine", "Plasma", "CSF" and "Other" (called as Sample type). Analytical parameters specific to each type of samples can be set at the Control unit of the LABOSPECT 008 AS.

Note that the wash rack is not used in Host communication.

(b) Sample No. Mode and Sample ID Mode

Method for operating the LABOSPECT 008 AS varies according to whether sample ID is utilized. Settings of Sample type, Sample Class, Rack No., Position, and Barcode settings (Sequence No./Sample ID) plus Sequence No. and Sample ID are important key information for accessing the patient database on the LABOSPECT 008 AS.

The features of each mode are given below.

<Sample No. Mode>

For routine samples, Sample No. are assigned in order from the set analysis start Sequence No. for each type of rack (sample ID) at the control unit, and the Sequence No., sample ID and sample type are used as keys in management of patient information (test selection information, measurement result data).

For STAT samples, the rack ID-position No. where the sample is set, plus sample No. and sample type are key information in accessing the patient database.

<Sample ID mode>

Sample ID mode is set by the system, and sample ID (barcode) attached to a test tube is read automatically. The read-out sample ID and sample type are keys in management of patient information. Unlike the sample No. mode, this mode features that operation can be made without concern for the order of analysis.

As for host connection, it is necessary to match the operating mode on the host with the

LABOSPECT 008 AS. Selection of operating mode can be made in standby status. Note that the selection must be made simultaneously on the host side.

Explained next is real-time communication (2.1.2) in which information required for analysis is transferred in synchronization with the LABOSPECT 008 AS operation, and batch communication (2.1.3) where patient information is sent/received according to instruction from the control unit or host.

2.1.2 Realtime communication

The relation between realtime communication function, sample type and sample class is indicated in Table 2-2. Details of the communication procedure and each communication function are described below.

Table 2-2 Realtime Communication Functions

Communication Function	Patient Sample			QC Sample	Calibrator
	Routine	STAT	Rerun QC		
Test Selection Inquiry	○	○	○	×	×
Measurement Result Data Send	○	○	○	○	○
Auto rerun Test Selection Inquiry	○	○	×	×	×
Auto Rerun Test Selection Reception	○	○	×	×	×
Auto Rerun Result Data Send	○	○	×	×	×

(In the above table, “○” indicates available, “×” indicates not available)

(1) Communication Procedure

Communication with the Host is carried out in the order of a) to e) in Fig 2-3 according to the analytical procedure of the LABOSPECT 008 AS.

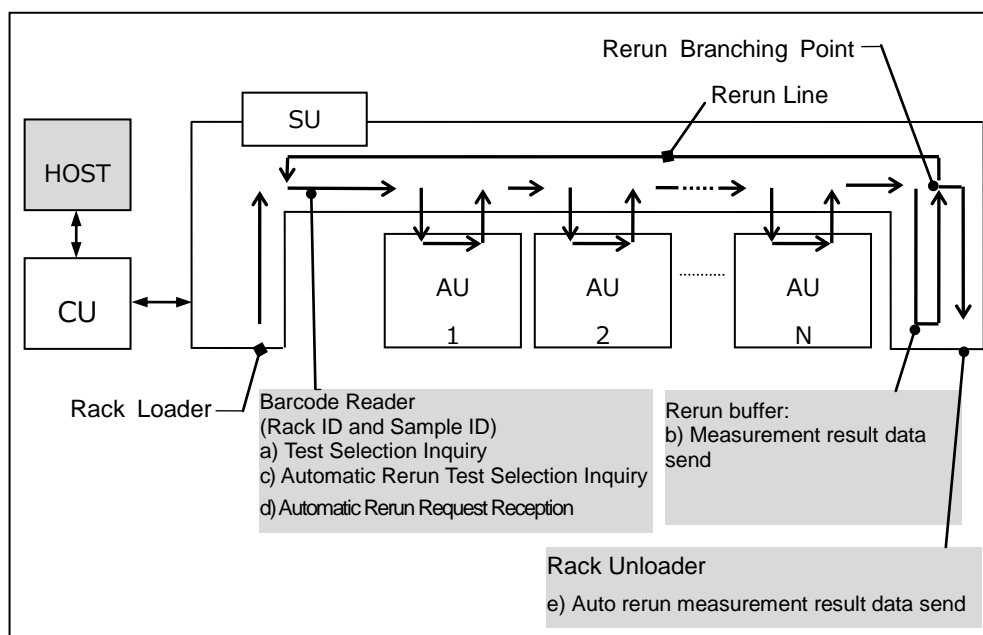


Fig 2-3 Analysis Flow and Communication Procedure

(a) Test Selection Information Inquiry

Racks containing up to five samples are loaded into analyzer successively from the rack loader, rack ID and sample ID are read out, and inquiry on test selection information is sent to the host using the read-out IDs as a key (step a) in above figure).

The inquiry text consists of one message per sample.

The Analyzer determines the sample transfer line according to the test selection information received from the host, and transfers the sample racks sequentially to the analytical modules.

A response timeout of inquiry can be set at the Control unit. A sample not received within the set time is regarded as an error sample and an inquiry will be made for the next sample. If the set time is long, rack transfer to the analytical modules will be delayed. Note that if an inquiry timeout is not set, the system waits and rack is staying at Barcode Reader until test selection information is received from the host; it is therefore recommended to set an inquiry timeout.

(b) Measurement Result Data Send

At ISE unit and photometric analysis units (hereinafter called AU), analysis is conducted based on test selection information received from the control unit, and when analysis is completed, the measurement result data are reported to the control unit.

The control unit collects the measurement results from AU, and when all of the results for a certain sample have been collected, it sends the result data to the host computer.

The sending of results to the host computer, therefore, does not follow the order of loaded samples.

On Send to Host screen, unit of sending measurement results to the host computer can be selected from unit of samples or tests.

In the case of auto rerun, sample racks are held in the rerun buffer until all of the measurement results have been acquired.

Measurement results on QC samples are sent when data of all test have collected or in unit of tests, according to setting. Therefore, measurement result of the same QC sample (in one analysis) might be sent to the host computer more than once. As for calibrators, the measurement results are sent per test. In the sending of results for routine, STAT, routine rerun and STAT rerun samples results to which an "exclude from output" alarm is attached will not be sent.

(c) Auto Rerun Test Selection Inquiry

LABOSPECT 008 AS inquiries rerun tests to the host computer for samples for which the LABOSPECT 008 AS has sent measurement result data. With respect to a sample for which rerun test inquiry has been received, the response timeout is monitored in the same manner as in (a) above.

(d) Auto Rerun Test Selection information Reception

The host can send auto rerun test selection information with respect to samples for which the LABOSPECT 008 AS has sent measurement result data. A reception timeout can be set for the time between sending of automatic rerun test selection information inquiry to the host and reception of the auto rerun test selection information on that sample. When the function for receiving auto rerun test selection information is validated, the host computer must send to the LABOSPECT 008 AS information that there is no rerun test, even for samples not subject to auto rerun test.

If the set time is long, the progress of analysis will be delayed.

If a reception timeout has not been set, rack will wait at Sample ID reading part until test selection information is received from the host; it is therefore recommended to set a reception timeout.

If a new test is added to the received auto rerun test selection information, then rerun and added tests are pipetted.

If the host sends a request for rerun tests for the samples in the Rack unloader, it is accepted as a batch request.

(e) Auto Rerun Measurement Result Data Send

For a rack designated for rerun, measurement is executed in the same manner as in the initial time, and when completed the result is reported to the control unit. The control unit collects the rerun results from all of the analytical modules, and when the results for one sample are output, they are sent to the host as rerun measurement results. On Send to Host screen, unit of sending measurement results to the host computer can be selected from unit of samples or tests. Racks are sent to the rack unloader if all the samples on the rack are designated for rerun, but if there is a request for added tests or initial tests, these racks will be held in the rerun buffer.

(2) Test Selection Information Inquiry

(a) Inquiry Unit

Test selection inquiry is made per sample. When “TS Inquire Always” (Refer to (2) in 2.1.5) is specified, an inquiry will be made regardless of presence or absence of test selection information in the patient database, and when “TS Inquire Always” is not specified, an inquiry will be made only for a sample for which there is no test selection information.

(b) Processing at Occurrence of Reception Timeout Error

An inquiry will not be made for the next sample until the test selection information on the requested sample is received or until a reception timeout error occurs.

Sample analysis is delayed until then. When a reception timeout occurs, a cancel request for inquiry for that sample will be sent to the host, and the system will proceed to the inquiry for the next sample. For details on the cancel request (cancellation of inquiry for certain test), refer to (10) Message Termination Record in section 2.2.5 ASTM Syntax. Note that a reception timeout can be set at the operating unit (Refer to (1) Operating Condition Setting in 2.1.5).

(c) Inquiry Key Information

Table 2-3 indicates the inquiry key information. If the key information included in the received test selection information differs from that in the inquiry, the LABOSPECT 008 AS will not recognize it as test selection information on the requested sample, and instead will store it as batch request test selection information on another sample.

Table 2-3 Test Selection Inquiry Key Information

Key Information	Description
Sample class	Routine or STAT sample
Sample type	Serum, Plasma, Urine, CSF, Other None
Sequence No.	Sample No. in Analysis sequence. Valid when sample ID mode is not set for routine or STAT samples.
Sample ID	Barcode data read out when barcode reader is used. Used as comment when barcode reader is not used.
Rack No.	Rack No. read by LABOSPECT 008 AS. Range differs depending on routine, STAT and rerun racks.
Position	Location of samples on rack

Table 2-3-1 indicates key information sent to the host at inquiry for test selection information (TS). Tables 2-3-2 and 2-3-3 indicate key information used for verification at reception of TS.

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

	Sample No. Mode					Sample ID mode				
	Routine			STAT		Routine			STAT	
	First run	Auto rerun	Manual rerun	First run	Auto rerun	First run	Auto rerun	Manual rerun	First run	Auto rerun
Sequence No.	○	○	○	○	○	0 Fixed	0 Fixed	0 Fixed	0 Fixed	0 Fixed
Sample ID	○	○	○	○	○	○	○	○	○	○
Rack No.	○	○	○	○	○	○	○	○	○	○

Position	○	○	○	○	○	○	○	○	○	○
Sample type	○	○	○	○	○	○	○	○	○	○
Sample class	○	○	○	○	○	○	○	○	○	○

○: indicates information sent from LABOSPECT 008 AS.

Table 2-3-2 Key Information used for Verification at TS Reception

	Sample No. Mode					Sample ID mode				
	Routine			STAT		Routine			STAT	
	First run	Auto rerun	Manual rerun	First run	Auto rerun	First run	Auto rerun	Manual rerun	First run	Auto rerun
Sequence No.	○	○	×	○	○	×	×	×	×	×
Sample ID	×	×	×	×	×	○	○	○	○	○
Rack No.	×	×	○	○	○	*2	×	*2	*2	×
Position	×	×	○	○	○	*2	×	*2	*2	×
Sample type	○	○	○	○	○	*1	○	*1	*1	○
Sample class	○	○	○	○	○	○	○	○	○	○

○: indicates information that will be checked by LABOSPECT 008 AS, while “×” indicates information that will be ignored by LABOSPECT 008 AS.

*1: When the host sends to LABOSPECT 008 AS its response to an inquiry that does not include a sample type, this will not be handled as key information by LABOSPECT 008 AS.

*2: When the host sends to LABOSPECT 008 AS its response to an inquiry that does not include a sample type, this will be handled as key information by LABOSPECT 008 AS.

Table 2-3-3 Key Information Used for Verification at TS Reception for Sample with Barcode Read Error

	Sample ID mode		
	Routine		STAT
	First run	Auto rerun	First run
Sequence No.	×	×	×
Sample ID	×	×	×
Rack No.	○	○	○
Position	○	○	○
Sample type	*1	○	*1
Sample class	○	○	○

“○” indicates information that will be checked by LABOSPECT 008 AS, while “×” indicates information that will be ignored by LABOSPECT 008 AS.

*1: When the host sends to LABOSPECT 008 AS its response to an inquiry that does not include a sample type, this will not be handled as key information by LABOSPECT 008 AS.

(d) TS Information Used for Analysis

If a response to an inquiry is not received within the set time, an alarm will be registered and measurement will be conducted using the TS information or default TS information registered in advance on the LABOSPECT 008 AS. Table 2-4 indicates the relation between request from the host and TS information in the LABOSPECT 008 AS. This applies when “TS Inquire Always” is specified for communication with the host computer. When “TS Inquire Always” is not specified, inquiry will not be sent to the host computer when there is TS information.

Table 2-4 Relation between Request from Host and TS

Sample Type	TS from Host	TS in LABOSPECT 008 AS		Measurement Procedure
		Patient TS	Default TS	
Routine/STAT	○	○	○	Measurement conducted with combination of TS from host and patient TS in LABOSPECT 008 AS
	○	○	×	Measurement conducted with combination of TS from host and patient TS in LABOSPECT 008 AS
	○	×	○	Measurement conducted with TS from host
	○	×	×	Measurement conducted with TS from host
	×	○	○	Measurement conducted with patient TS in LABOSPECT 008 AS
	×	○	×	Measurement conducted with patient TS in LABOSPECT 008 AS
	×	×	○	Measurement not conducted
	×	×	×	Measurement not conducted
Rerun	○	○	-	Measurement conducted with combination of TS from host and patient TS in LABOSPECT 008 AS
	○	×	-	Measurement conducted with TS from host
	×	○	-	Measurement conducted with patient TS in LABOSPECT 008 AS
	×	×	-	Measurement not conducted

(“○” indicates there is TS and a request for it, “×” indicates there is no TS or TS is available but there is no request, and “-” indicates invalid.)

TS: Test selection information

Patient TS: TS registered in advance in the LABOSPECT 008 AS (manually registered TS or TS received by batch communication)

TS from Host: TS received via inquiry

Default TS: TS generated for cases where there is no test selection information

(e) Analytical Test Masking

If an abnormality occurs in a reagent or calibration result, it will suspend measurement of the test which the abnormality occurred. This function is referred to as “auto masking”. Furthermore, there is a function for suspending measurement for a test in increments of test by instruction from the control unit, at the discretion of the user; this is referred to as “manual masking”. Tests that have been masked by either of these functions will not undergo analysis even if there is a request for analysis from the host computer.

(f) Operating Method for Manual Rerun

Reanalysis of a patient sample that incurred an analytical error is called manual rerun, and such sample is called a rerun sample. This function is applied only for routine samples, and cannot be executed for STAT samples.

Described below are the differences between inquiries in Sample No. mode and Sample ID mode.

1) Rerun sample TS inquiry in Sample No. mode

After replacing the sample on the rerun rack, the rack No. and position No. on the rerun rack for the replaced sample are registered at the control unit. This establishes the relation between rack No./position No. and sequence No. This operation is called rerun rack assignment. For the sample thus assigned to the rack, the sample class and sequence No. in the inquiry text are valid.

[Processing on host computer when assignment not made to rerun rack]

When conducting operation at the control unit without the rack assignment mentioned above, the LABOSPECT 008 AS will send an inquiry to the host computer using sequence No. as 0 and with rack No. and position No. as key information. If the relation between sequence No. and rack No./position No. on rerun rack is already established on the host side, it will be necessary to change the sequence No. to any other than 0 for transmission. But if a reception timeout occurs with respect to the inquiry, a cancel request will be sent against the inquiry. If TS for the relevant sample is received after the timeout, it will be handled as a batch TS transmission. And if a corresponding sample No. does not exist on the host computer, it will be returned sequence No. as 0. When sample No. 0 is returned, it will be processed while assuming the sequence No. of the relevant sample is invalid, the LABOSPECT 008 AS will not conduct measurement, and an error [194-12: Host Communication Error] will occur. Processing will be halted until a reception timeout is issued.

2) Rerun sample TS inquiry in Sample No. mode

In Sample ID mode, reanalysis can be made with the routine rack, not rerun rack.

As at the initial analysis, TS inquiry is sent to the host computer using the read-out barcode as a key. Whether the sample is the initial one or the rerun is determined by the number of analysis. If a sample of the same ID and sample type as the read-out one has already been analyzed at least once, it is considered as Rerun, and if not yet analyzed at all, it is considered as First run.

(g) Analysis of Sample with which Barcode Read Error Occurred in Sample ID Mode

Read Error Occurred in Sample ID Mode

The control unit is provided with a support function for measuring a routine sample/STAT sample with which barcode read error has occurred or to which a barcode label has not been attached. Registration is made on the Barcode Read Error screen. The sample ID (barcode) with which a read error occurred can be registered via manual input for Rack ID-Position on this screen. If a sample ID (barcode) is registered via manual input with respect to a position where read error occurred during measurement, then TS will be inquired of the host while using the manually input sample ID, rack ID-position and sample type as key information.

[TS function for sample incurring barcode read error]

If [Test Selection ASK in Barcode Read Error] is specified on [External Connection Settings]-[Test Selection Inquiry Settings] screen, the following processing will take place. If a barcode read error occurs on the LABOSPECT 008 AS, an inquiry will be made using asterisks (ASCII code 0x2A) [*****] for sample ID of 22 characters. A sample ID corresponding to Rack ID-Position is prepared in advance on the host computer, and a response can be made using this sample ID in place of [*****]. If a sample ID of [*****] is sent as it is from the host computer, this character string will be recognized as the sample ID and stored in the LABOSPECT 008 AS. And then, analysis starts. The same sample ID will be overwritten as with sample IDs in general. If sample ID cannot be obtained from the host computer when using this function, then a sample ID that will not be duplicated can be issued or a timeout set in the LABOSPECT 008 AS can be awaited without responding to the inquiry. If a timeout occurs, an error [150-1: host TS receive error] will be issued.

(h) Analysis of Sample of Sample type: None in Sample ID Mode

If the sample type on a none rack is unknown on [System]-[Rack Assignment] screen, the LABOSPECT 008 AS will make an inquiry about a sample of Sample type: None.

Host computer prepares sample type corresponding to rack ID-position and sample ID and can be responded.

If a reply is sent from the host without sample type, an error will occur and the response will not be accepted.

In the case of a none rack, samples of different sample type may be present on the same rack.

(3) Measurement Result Data Send

The LABOSPECT 008 AS will, upon acquiring all of the measurement results on one sample from the analytical units, send the results to the host computer. On Send to Host screen, unit of sending measurement results to the host computer can be selected from unit of samples or tests. Measurement result data will be sent without regard to the rack supply sequence since analysis time (reaction time) will vary depending on kind of tests.

The text of measurement result data varies with sample type. Table 2-5 indicates the kinds of measurement result data that will be sent in realtime communication.

Table 2-5 Kinds of Measurement Result Data

Sample Type		Kind of Measurement Result Data
Routine/STAT samples		Routine/STAT sample measurement result data
Calibrator	Photometric tests	Photometric calibration result data
	ISE tests	ISE calibration result data
Quality control sample		Control measurement result data

(4) Auto Rerun TS Reception

(a) Sample Type

Auto rerun can be executed only for routine and STAT samples, and not for any other type of sample.

(b) Rerun Judgment, and Processing at Occurrence of Reception Timeout Error

Upon receiving auto rerun TS information from the host computer, LABOSPECT 008 AS registers it in the patient database. LABOSPECT 008 AS checks whether all on-board samples have rerun test or not.

(c) Acceptance Key Information

The acceptance key information in LABOSPECT 008 AS is the same as that described before in Table 2-3.

If even one of the data sent with the measurement result data differs from the key information, it will not be regarded as rerun data on the requested sample and instead will be stored as batch information on a different sample.

(d) Auto Rerun Judgment with Data Alarm

In addition to the auto masking and channel masking described before, reference should be made to "Data alarm list" in Table 2-22 for details on judgment on whether to execute auto rerun or not.

(5) Auto Rerun TS Inquiry

(a) Key Information Used for Inquiry

The same key information as used at the initial inquiry will be used. The inquiry text consists of one message per sample.

(b) Auto Rerun Judgment with Data Alarm

According to the description in Table 2-22 Data Alarm List, LABOSPECT 008 AS judged

whether auto rerun is executed or not. An auto rerun TS inquiry will not be executed for a sample to which a data alarm is attached.

(c) Processing at Occurrence of Reception Timeout Error

An inquiry will not be made for the next sample until the test selection information on the requested sample is received or until a reception timeout error occurs. Sample analysis is delayed until then. When a reception timeout occurs, a cancel request for inquiry for that sample will be sent to the host, and the system will proceed to the inquiry for the next sample. For details on the cancel request (cancellation of TS request), refer to 13 of (9) Request Information Record in section 2.2.5 ASTM Syntax.

(d) TS Information Used for Analysis

If a response to an inquiry is not received, an alarm will be registered and the LABOSPECT 008 AS will conduct analysis using the determined rerun TS information. Default TS information will not be used during rerun measurement. Table 2-6 indicates the relation between request from the host and TS information in the LABOSPECT 008 AS.

Table 2-6 TS Information Used in Auto Rerun

Sample Type	TS from HOST	TS in LABOSPECT 008 AS		Rerun Process
		LABOSPECT 008 AS-Determined TS	DefaultTS	
Routine/STAT samples	○	○	-	Measurement conducted with combination of TS from Host and LABOSPECT 008 AS-determined TS
	○	×	-	Measurement conducted with TS from Host
	×	○	-	Measurement conducted with LABOSPECT 008 AS-determined TS
	×	×	○	Measurement not conducted

("○" indicates there is TS and a request for it, "×" indicates there is no TS or TS is available but there is no request, and "-" indicates invalid.)

TS: Test selection information

TS from Host: TS received via inquiry

LABOSPECT 008 AS-determined TS: Rerun TS information due to data alarm at first run

Default TS TS generated for cases where there is no test selection information

(6) Auto Rerun Measurement Result Data Send

As with first run, results are sent to the host when the measurement results from all of the analytical modules are output for one sample. On Send to Host screen, unit of sending measurement results to the host computer can be selected from unit of samples or tests.

2.1.3 Batch Communication

Table 2-7 lists the batch communication functions. Each communication function is detailed below.

Table 2-7 Batch Communication Functions

Communication Function	Source of Request	Patient Sample			Calibrator	Quality Control Sample
		Routine	STAT	Rerun		
Receiving of test selection information	HOST	○	○	○	×	×
Sending of measurement result data	HOST	○	○	○	×	×
	CU	○	○	○	×	○
Sending of reaction monitor data	CU	○	○	○	×	○

(○: executable, ×: non-executable)

(1) Receiving of test selection information

The host can register test selection information for routine/STAT samples in LABOSPECT 008 AS at any timing. However, when test selection information of measuring test is received from host, the relevant test selection information will not be registered. The LABOSPECT 008 AS exchanges a large amount of information with the host. To reduce the communication load during analysis, it is recommended to register test selection information with this function before analysis.

(a) Key Information Used for Inquiry

In batch communication, the kind of key information used for registration in the analyzer database differs depending on the operation mode of the analyzer, like in real-time communication. Registered routine/STAT samples are overwritten if they have the same key information as received samples, and the received routine/STAT samples are registered as new sample if a sample having the same key information is not found. Table 2-8 shows the key information used for registration in the analyzer database at batch communication.

Table 2-8 Key Information Used for Registration in Analyzer Database

Analytical Mode	Key Information				
	Sample Class	Sample Type	Sample No.	Sample ID	Rack -Position
Sample No. mode	Routine	○	○	×	×
	STAT	○	0 Fixed	×	○
	Rerun	○	○	×	×
Sample ID mode	Routine	○	×	○	×
	STAT	○	0 Fixed	○	×
	Rerun	○	×	○	×

(○: Information used for registration in database, ×: ignored information)

For the routine/STAT samples loading rack, set a rack No. range for each sample type in the control unit. For the STAT sample, error occurs if the sample type or Rack No - Position received from the host computer is outside the range set in the control unit.

(b) Number of Registrable Samples

A combined total of 12,000 routine and STAT samples can be registered in the analyzer database. Error occurs if the test selection information received from the host cannot be registered due to this restriction.

(c) Number of Registrable Tests

Up to 100 tests (excluding the tests whose result data is obtained and for which no rerun request is made) can be registered in the analyzer database for each sample regardless of batch or real-time communication. Error occurs if the number of request tests received from the host computer exceeds 100.

(2) Measurement Result Data Send

Measurement result data can be sent collectively by requesting from control unit or the host computer.

(a) Instruction from Control Unit

Select sample from the Data Review screen.

Measurement result data of selected routine/STAT samples and quality control samples are collectively sent to the host computer. You can choose sending of result data either including or excluding the previously sent test.

(b) Request from Host

Measurement result data of routine/STAT samples requested from the host computer is sent.

Request cannot be made for quality control samples.

In both (a) and (b), you cannot specify sending of only first run result or rerun result.

Result data to be sent is determined according to the rules given below (in the order of from 1) to 3)).

4) is a rule only for (a).

1) Measurement result data is present.

2) For routine/STAT samples, result data is not attached alarm specified in the Review By Exception screen.

3) Select Result is specified^{*1} or there is only one result left for the same test.

*Note1: You can specify result of first run or rerun in the Data Review screen. Selected Result data will be sent. The result data marked with an alarm specified in the Review By Exception screen cannot be selected.

[Example]

No.	First Run			Rerun			Result Data to be Sent		Explanation
	Selection	Result Data	Sending to Host	Selection	Result Data	Sending to Host	Request from Host	Designation of Not-yet Sent Data to Host	
1	-	1.0	Sent	-	2.0	Sent	Not yet sent	Not yet sent	Needs to select result data.
2	Selected	3.0	Sent	-	4.0	Not yet sent	1st run result sent	Not yet sent	
3	-	* 5.0	Not yet sent	-	6.0	Not yet sent	Rerun result	Rerun result	
4	-	7.0	Not yet sent	Selected	8.0	Sent	Rerun result	Not yet sent	
5	-	9.0	Not yet sent	-			1st run result	1st run result	
6	-	10.0	Not yet sent	-			1st run result	1st run result	

NOTE: "*" in the result data column indicates that an exception alarm is added to the relevant data.

(3) Sending of Reaction Monitor Data(photometric test)

You can specify sending of Reaction monitor data under graphical display or sending of Reaction monitor data for multiple patients selected from the list. A difference in absorbance between two wavelengths multiplied by 10,000 is sent.

2.1.4 Contents of Communication Text

Table 2-9 shows the communication text list. The contents of each text are detailed below. Refer to 2.2 "Specifications of ASTM Upper/Lower Layer Interface for Host Communication" for the format of a communication text.

Table 2-9 Communication Text List

Communication Text	Direction	Real-time	Batch
Test selection inquiry	LABOSPECT 008 AS → HOST	○	×
Auto rerun test selection inquiry	LABOSPECT 008 AS → HOST	○	×
Test selection information	HOST → LABOSPECT 008 AS	○	○
Automatic rerun test selection information	HOST → LABOSPECT 008 AS	○	×
Routine/STAT sample measurement result data	LABOSPECT 008 AS → HOST	○	○
Photometric calibration result data	LABOSPECT 008 AS → HOST	○	×
ISE calibration result data	LABOSPECT 008 AS → HOST	○	×
Control measurement result data	LABOSPECT 008 AS → HOST	○	○
Reaction monitor data (Photometry)	LABOSPECT 008 AS → HOST	×	○
Result sending request	HOST → LABOSPECT 008 AS	×	○

(○: available, ×: unavailable)

(1) Test Selection Inquiry

Test selection inquiry is made per sample. Table 2-10 shows the test selection inquiry information for one sample.

Table 2-10 Test Selection Inquiry Information for One Sample

No.	Item	Sample	System Mode	Qty	Description
1	Classification detail code	-	-	1	First run / Rerun
2	Sample type	-	-	1	1: Serum, 2: Urine, 3: Plasma, 4: CSF, 5: Other, 0: None
3	Sequence No.	Routine/STAT	ID	1	-
			S.No.	1	1 to 60,000
4	Rack No.	Note1	-	1	Range differs depending on the sample type ^{note1} .
5	Position	-	-	1	1 to 5
6	ID No.	-	ID	1	Sample Barcode
			S.No.	1	Patient Comment

System Mode - ID: Sample ID mode, S. No. : Sample No. mode

NOTE 1: Refer to (4) in 2.1.1.

(2) Auto Rerun TS Inquiry

Automatic rerun test selection inquiry is made for each sample. Table 2-11 shows the automatic rerun test selection inquiry information for one sample. Note that no inquiry is made for the sample which caused a data alarm such as "Sample short," "Reagent short," "Sample probe clogging" or "Calibration error" in first analysis.

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

No.	Item	Sample	System Mode	Qty	Description
1	Classification Detail Code	-	-	1	Auto rerun
2	Sample Type	-	-	1	1: Serum, 2: Urine, 3: Plasma, 4: CSF, 5: Other
3	Sequence No.	Routine/ STAT	ID	1	-
			S.No	1	1 to 60,000
4	Rack No.		-	1	Range differs depending on the sample type. (Refer to Table 2-1.)
5	Position	-	-	1	1to 5
6	ID No.	-	ID	1	Sample Barcode
			S.No	1	Patient Comment

System Mode- ID: Sample ID mode, S. No.: Sample No. mode

(3) Test Selection Information and Automatic Rerun Test Selection Information

The analyzer accepts test selection information of any other sample than inquired at the host computer through batch communication. Batch communication is accepted for any sample. The same tests are put in the communication text both for real-time and batch communication. Table 2-12 shows the test selection information for one sample.

Table 2-12 Test Selection Information for One Sample

No.	Item	Sample	System Mode	Qty	Description
1	Sample class	-	-	1	Routine/STAT
2	Classification detail code	-	-	1	First run / Rerun
3	Sample type	-	-	1	1: Serum, 2: Urine, 3: Plasma, 4: CSF, 5: Other
4	Sequence No.	Routine/S TAT	ID	1	-
			S.No	1	1 to 60,000
5	Rack No.		-	1	Range differs depending on the sample type. (Refer to Table 2-1.)
6	Position	-	-	1	1to 5
7	Cup type	-	-	1	Standard cup or micro cup
8	I ID No.	-	ID	1	Sample Barcode
			S.No	1	Patient Comment
9	Host Test code	-	-	100	Send test codes specified on [Utility]-[System]-[External Connection Settings]-[Text Settings] (1 to 60000). Send request for serum index measurement in a combination of (L, H, I). Test request in any other combination except the above cannot be accepted. <ul style="list-style-type: none"> You can request for ISE analysis in a free combination of Na, K and Cl. However, test request is not accepted when Decrease and Normal are set for the combination (including the registered one in the LABOSPECT 008 AS). Request calculated test using with assigned Host code. Maximum number of registrable tests: Photometric test = 200, ISE = 3, Serum index = 3, Calculated test = 8 Note that a total of 100 registered tests can be accepted at a time.
10	Request information ^{*4}	-	-	100	Request clear, normal volume, decreased volume, increased volume, Dilution ratio 3, 5, 10, 20, 50
11	Patient Comment ^{*1}	-	-		100 half size of characters in total
12	Unit of Age ^{*1}	-	-		Day, Month, Year
13	Age ^{*1}	-	-		0 to 200
14	Sex ^{*1}	-	--		Male, Female, Unknown
15	Blood drawing	-	-		Year, month, day, hour, minute, second

	date ^{*1} ^{*2}				
--	----------------------------------	--	--	--	--

System Mode

ID: Sample ID mode, S. No.: Sample No. mode

Notes:

1. Not sent unless comment sending (explained in 2.1.5 Operating Condition Setting) is set.
2. 2001 to 2037 for the year
3. For test selection information for the STAT sample through batch communication, the sample number is fixed at 0. Receive text error alarm is output if the sample number is any other than 0.
4. When it is used for twin tests analysis (HbA1c), request information of first test and second test should be the same settings.
For example, if request information of first test is set as "Decreased", second test is also set as "Decreased".

(4) Patient Sample Measurement Result Data

The same tests are put in the communication text both for real-time and batch communication. Table 2-13 shows the details of routine/STAT sample measurement result data for one sample.

Table 2-13 Measurement Result Data for One Sample

No.	Item	Sample	System Mode	Qty	Description
1	Sample class	-	-	1	Routine and STAT
2	Classification Detail Code	Routine/STAT	-	1	First run/Rerun
3	Sample Type	-	-	1	1: Serum, 2: Urine, 3: Plasma, 4: CSF, 5: Other
4	Sequence No.	Routine/STAT	ID	1	-
			S.No.	1	1 to 60,000
5	Rack No.	-	-	1	Range differs depending on the sample type. (Refer to Table 2-1.)
6	Position	-	-	1	1 to 5
7	ID No.	-	ID	1	Sample Barcode
			S.No	1	Comment displayed on screen
8	Host Test code	-	-	100	Send test codes specified on [Utility]-[System]-[External Connection Settings]-[Text Settings] (1 to 60000). Serum indexes are sent in a combination of (L, H, I). Maximum number of registrable tests: Photometry = 120, ISE = 3, Serum index = 3, Calculated test = 8 Note that a total of 100 registered tests can be accepted at a time.
9	Request information	-	-	100	Standard volume, Decreased volume, Increased volume Dilution ratio ^{*4} '3', '5', '10', '20', '50'
10	Measured value	-	-	100	6-byte character with sign and decimal point ^{*2}
11	Unit of measurement	-	-	100	8-byte character
12	1st/rerun for each result	-	-	100	First run, Rerun
13	Data alarm	-	-	100	Refer to Table 2-22.
14	Measurement date ^{*3}	-	-	1	Year, month, day, hour, minute, second
15	Operator ID ^{*5}	-	-	1	Operator ID at measurement
16	Patient Comment ^{*1}	-	-	1	100 half size of characters in total
17	Unit of Age ^{*1}	-	-	1	Day, Month, Year
18	Age ^{*1}	-	-		0 to 200
19	Sex ^{*1}	-	--		Male, Female, Unknown
20	Blood drawing date ^{*1 *3}	-	-		Year, month, day, hour, minute, second
21	Pipetting date ^{*3}	-	-	1	Year, month, day, hour, minute, second

System Mode

ID: Sample ID mode, S. No.: Sample No. mode

Notes:

1. Not sent unless comment sending (explained in 2.1.5 Operating Condition Setting) is set.
2. Expressed in 6 steps as shown in Table 2-14 when the qualitative test is specified.

3. 2001 to 2037 for the year
4. Not included in measurement result data request information for the test which is not carried out.
5. In case of Log-off mode, 2 half-size characters are sent.

Table 2-14 Qualitative Value Send Data

Test	Range of Measured Value	Send Data
Photometry	Measured value \leq Qualitative concentration 1	-2
	Qualitative concentration 1 < Measured value \leq Qualitative concentration 2	-1
	Qualitative concentration 2 < Measured value \leq Qualitative concentration 3	0
	Qualitative concentration 3 < Measured value \leq Qualitative concentration 4	1
	Qualitative concentration 4 < Measured value \leq Qualitative concentration 5	2
	Qualitative concentration 5 < Measured value	3

(5) Photometric calibration result data

Photometric calibration result data is sent only in real-time communication. Table 2-15 shows the details of photometric calibration result data for one test

Table 2-15 Photometric calibration result data for One Test

No.	Item	Sample	System Mode	Qty	Description
1	Sample class	-	-	1	Calibrator
2	Analytical module name	-	-	1	Refer to No. 6 of (12) Photometric Calibration Result Record in 2.2.5.
3	Host test code	-	-	1	Test codes to be sent are specified on [Utility]-[System]-[External Connection Settings]-[Text Settings] (1 to 60000).
4	Data alarm	-	-	1	Refer to Table 2-22.
5	Measured value	-	-	24	Refer to No. 9 of (12) Photometric Calibration Result Record in 2.2.5.
6	SD value	-	-	1	6-byte character with sign and decimal point
7	Operator ID ^{*1}	-	-	1	Operator ID at measurement

Note1: In case of Log-off mode, 2 half-size characters are sent.

(6) ISE Calibration Result Data

Photometric calibration result data is sent only in real-time communication. Table 2-16 shows the details of ISE calibration result data for one test.

In case of ISE, the number of tests is 2 for “Na/K” analysis and 3 for “Na/K/Cl” analysis. There is no other combination.

Table 2-16 ISE calibration result data for One Test

No.	Item	Sample	System Mode	Qty	Description
1	Sample class	-	-	1	Calibrator
2	ISE Calibration Type	-	-	1	ISE
3	Calibration alarm	-	-	1	Refer to Table 2-22.
4	Measured value	-	-	8	Refer to No. 12-14 of (13) ISE Calibration Result Record in 2.2.5.
5	Data alarm	-	-	8	Refer to Table 2-22.
6	Operator ID ^{*1}	-	-	1	Operator ID at measurement

Note1: In case of Log-off mode, 2 half-size characters are sent.

(7) Quality Control Sample Measurement Result Data

The same tests are put in the communication text both for real-time and batch communication. Table 2-17 shows the details of quality control sample measurement result data for one sample.

Table 2-17 Quality Control Sample Measurement Result Data for One Sample

No.	Item	Sample	System Mode	Qty	Description
1	Sample class	-	-	1	Quality Control Sample
2	Classification Detail Code	-	-	1	First run
3	Sample Type	-	-	1	1: Serum, 2: Urine, 3: Plasma, 4: CSF, 5: Other
4	Control No.	-	-	1	1 to 100
5	Sequence number	-	-	1	1 to 150
6	Rack No.	-	-	1	Refer to Table 2-1.
7	Position	-	-	1	1 to 5
8	Control Name	-	-	1	Characters input on screen
9	Host Test code	-	-	100	Send test codes specified on [Utility]-[System]-[External Connection Settings]-[Text Settings] (1 to 60000).
10	Request information	-	-	100	Normal volume
11	Measured value	-	-	100	6-byte character with sign and decimal point
12	Unit of measurement	-	-	100	8-byte character
13	Data alarm	-	-	100	Refer to Table 2-22.
14	Measurement date ^{*1}	-	-	1	Year, month, day, hour, minute, second
15	Operator ID ^{*2}	-	-	1	Operator ID at measurement
16	Pipetting date ^{*1}	-	-	1	In order of Year, month, day, hour, minute, second

Notes:

1. 2001 to 2037 for the year
2. In case of Log-off mode, 2 half-size characters are sent.

(8) Reaction monitor data

This function is available only for batch communication. The text configuration does not depend on the sample type. Table 2-18 shows the details of Reaction monitor data for one test.

Table 2-18 Reaction monitor Data for One Test

No.	Item	Sample	System Mode	Qty	Description
1	Sample class	-	-	1	Routine, STAT, QC
2	Classification Detail Code	Routine/STAT	-	1	First run/Rerun
		QC	-	1	-
3	Sample Type	-	-	1	1: Serum, 2: Urine, 3: Plasma, 4: CSF, 5: Other
4	Analytical module name	-	-	1	Refer to No. 4 of (11) Photometric Raw (Absorbance) Data Record: Reaction monitor record in 2.2.5.
5	Sequence No.1	Routine/STAT	S.No.	1	1 to 60,000
			ID	1	-
		QC	-	1	1 to 100 (Control No.)
6	Sequence No.2	Routine/STAT	-	1	-
				1	-
		QC	-	1	1 to 150 (Sequence No.)
7	ID No.	Routine/STAT	S.No.	1	Patient Comment
		-	ID	1	Sample Barcode
		QC	-	1	Control Name
8	Rack No.	-	-	1	Refer to Table 2-1
9	Position	-	-	1	1 to 5
10	Cell No.	-	-	1	S module=406, P module=160
11	Inner/outer cell information	-	-	1	-
12	Reaction Time	-	-	1	3 to 10
13	Measurement date ^{*1}	-	-	1	In order of Year, month, day, hour, minute, second
14	Host Test code	-	-	1	Send test codes specified on [Utility]-[System]-[External Connection Settings]-[Text Settings] (1 to 60000).
15	Measured value	-	-	1	6-byte character
16	Request information	-	-	1	Standard volume, Decreased volume, Increased volume Dilution ratio '3', '5', '10', '20', '50'
17	Data alarm	-	-	1	Refer to Table 2-22.
18	Cell blank absorbance	-	-	4	Difference in absorbance between 2 wavelengths
19	Number of photometric points	-	-	34	S module=38, P module=34
20	Reaction monitor absorbance	-	-	34	Difference in absorbance between 2 wavelengths

21	Operator ID ^{*2}	-	-	1	Operator ID at measurement
22	Pipetting date ^{*1}	-	-	1	Year, month, day, hour, minute, second

Notes:

1. 2001 to 2037 for the year
2. In case of Log-off mode, 2 half-size characters are sent.

(9) Measurement Result Send Request

This function is used for requesting the LABOSPECT 008 AS to send measurement result data to the host computer. Table 2-19 shows the contents of a measurement result send request for one sample.

Table 2-19 Measurement Result Send Request for One Sample

No.	Item	Sample	System Mode	Qty	Description
1	Classification Detail Code	-	-	1	First run/Rerun
2	Sample Type	-	-	1	1: Serum, 2: Urine, 3: Plasma, 4: CSF, 5: Other
3	Sequence No.	Routine/ STAT	ID	1	-
			S.No.	1	1 to 60,000
4	Rack No.	-	-	1	Range differs depending on the sample type. (Refer to Table 2-1.)
5	Position	-	-	1	1 to 5
6	ID No.	-	ID	1	Sample Barcode
			S.No.	1	Patient Comment

NOTE1: Measurement result to be sent from the LABOSPECT 008 AS is determined according to the above (4) Patient Sample Measurement Result Data (whether 1st or rerun result).

2.1.5 Operating Condition Setting

You can set various conditions related to host operation in the [Utility] job – [System] –[Host Communication Setting] screen and [Review by Exception] screen in the control unit. For the setting specifications related to hardware, refer to section 1. HARDWARE SPECIFICATION FOR EXTERNAL SYSTEM. Described here are the specifications for setting of various operating conditions. Table 2-20 lists operating condition settings. The function of each setting is detailed below.

Table 2-20 Operating Condition Setting List

Screen Name	Item	Outline
Communication Settings	Automatic Recovery of Session	Specify whether to automatically reconnect the analyzer upon communication breakdown.
Text Settings	Send Conc. of chemistry Qualitative Tests	Specify whether to send the measurement results for chemistry qualitative test.
	Calibration result information Send	Specify whether to send the measurement result for calibration test.
	Send Comments	Specify whether to send comments of routine/STAT samples.
	Send Time Stamp of Pipetting Samples	Specify whether to send pipetting data/time
	Host Test Code	Specify whether to set application code to a host-send test code.
Test Selection Inquiry Setting	Test Selection Timeout	Set a time period for timeout of response to inquiry about test selection information and auto rerun test selection information.
	Automatic Rerun Test Selection	Specify whether to inquire about auto rerun test selection information.
	Manual Rerun Test Selection	Specify whether to inquire about test selection information for the manual rerun sample.
	STAT Test Selection	Specify whether to inquire about test selection information for the STAT sample.
	Test Selection Inquire Always	Specify whether to make an inquiry regardless of test selection information in the LABOSPECT 008 AS.
	Test Selection Priority Mode	Specify whether to avoid sending other information until test selection information is received from the host computer at test inquiry or automatic rerun inquiry from the LABOSPECT 008 AS.
	Test Selection Ask in Barcode Read Error	Specify whether to inquire about test selection information for sample with barcode read error.
Review By Exception setting	Exception alarm	Specify whether to send the measurement result with a given data alarm to the host computer.
Result Upload Settings	Result Upload Settings	Specify the sending method of routine, STAT, control or calibration results. Select it from "By Sample", "By Test" or "No Upload".
	As Soon As Setting	Specify whether to inquire about auto rerun test selection information. In case of active, inquire auto rerun when all results specified auto rerun get together.

- (1) **TS Timeout**

This function is applied to inquiry about test selection information (routine, STAT and rerun samples) and automatic rerun test selection information in real-time communication. The inquiry text is composed of one message for each sample and sent in units of message. So set a time period for Host timeout of response to inquiry from the LABOSPECT 008 AS for each message. If the time period for timeout has not been set, the analyzer waits until it receives test selection information from the host. It is therefore recommended to set a time period for timeout.
- (2) **Automatic Rerun TS**

This function is applied to automatic rerun test selection from the host in real-time communication. When the function is specified, timeout of receiving rerun tests is valid at sending of measurement results during analysis in automatic rerun mode. When the function is not specified, rerun is determined at the LABOSPECT 008 AS.
- (3) **Manual Rerun TS**

This function is applied to automatic rerun test selection from the host in real-time communication. When the function is specified, test selection inquiry for the rerun sample is carried out during analysis. When the function is not specified, the inquiry is not made.
- (4) **STAT Sample TS**

This function is applied to test selection information inquiry for the STAT sample in real-time communication. When the function is specified, test selection inquiry for the STAT sample is carried out during analysis. When the function is not specified, the inquiry is not made.
- (5) **TS Ask in Barcode Read Error**

This function is applied to test selection information inquiry for the routine and STAT samples in ID mode. When the function is specified, test selection information inquiry is made for the sample whose barcode cannot be read and which is not registered as a barcode read error.
- (6) **TS Inquire Always**

This function is applied to test selection information inquiry for the routine and STAT samples in real-time communication. It is not applied to test selection information inquiry for the rerun sample and automatic rerun test selection inquiry. When the function is specified, inquiry is made whether test selection information exists or not in the LABOSPECT 008 AS. If not specified, inquiry will be made only for the samples without test selection information. Note that default test selection information is independent of registration (TS Inquire Always).
- (7) **TS Priority Mode**

This function is applied to inquiry about test selection and automatic rerun test selection information in real-time communication. This function avoids any other communication until test selection information is received from the host computer or timeout occurs after sending from the LABOSPECT 008 AS a test selection inquiry or the first measurement result for automatic rerun test inquiry. When this mode is specified, TS Timeout can be set in a range of 1 to 18 seconds. Time period for timeout is set to 18 seconds.
- (8) **Automatic Recovery of Session**

This function automatically reconnects the LABOSPECT 008 AS upon communication breakdown due to the occurrence of a communication error according to the ASTM 1381-91 standard. Even

when the function is specified, the texts which caused a communication error and those sent from the host by the time of completion of the reconnection process at the LABOSPECT 008 AS are rejected. If the same alarm at the communication breakdown level occurs 5 times in succession, the LABOSPECT 008 AS is not recovered automatically.

(9) Send Comments

This function is applied to the entire host communication.

When the function is specified, the host can register test selection information with patient comments added. The patient comments stored at the LABOSPECT 008 AS are sent to the host together with measurement result data and Reaction monitor data.

When the function is not specified, the patient comments are not sent/received.

(10) Host Test Code

This function is applied to the entire host communication.

Application codes are converted into Host test codes according to the settings on [Utility]-[System]-[External Connection Settings]-[Text Settings], and Host communication is performed.

(11) Send Conc. of Chemistry Qualitative Tests

This function is applied to Result send. When the function is specified, the LABOSPECT 008 AS sends measurement results for chemistry qualitative test with qualitative judgment value and quantitative values to host.

(12) Review By Exception setting

On [System]-[Review By Exception] screen, measurement result can be specified whether to send to host computer depending on attached data alarm. This function is applied to result data send of routine/STAT samples regardless of first run, rerun, or batch/realtime communication. It is not applied to Reaction monitor, Quality control sample and calibrator. Only measurement result with data alarm set as "no sending" will not be sent to host. Measurement result data with data alarm other than the above will be sent to host. Where there is no measurement result data to be sent during realtime send, only sample data is sent to host because of auto rerun judgment at Host.

(13) Result Upload Settings

This function is applied to calibration result send for the routine sample, STAT sample, rerun sample, control sample and calibration in real-time communication. Routine sample, STAT sample, rerun sample, and control sample can be specified as any of "By Sample", "By Test" or "No Upload". Calibration can be specified as any of "By Test" or "No Upload".

In case of "By Sample", result for each test will be sent to host when AU outputs results during operation. In case of "By Test", all results about sample are outputted and then, send to host. In case of "No Upload", no measurement result will be sent to host.

(14) As Soon As Setting

This function is applied to auto rerun inquiry for the routine and STAT samples in real-time communication. In case of set as "active", auto rerun inquiry is sent when all test results of auto rerun get together.

2.1.6 Error Processing

Described below are the communication errors detected by the application layer. For the errors detected by the ASTM upper layer program, refer to (16) Error Handling in ASTM Upper Layer Program in 2.2.5 and (5) Communication Error Handling in ASTM Lower Layer Program in 2.2.6 for those detected by the ASTM lower layer program.

(1) Errors Detected by Application Layer

Table 2-21 lists the communication errors detected by the application layer.

If an error is detected, the relevant alarm code (given in the table) is displayed on the Alarm screen.

Table 2-21 Communication Error List

Communication Function	Alarm Code		Description	Processing
	Main	Sub		
Test selection information receive error	150	1	Response to inquiry is not made within a set time in the operation screen.	×
		14	Response to inquiry is not made within 10 minutes. This alarm is issued to call your attention. The system remains in communication status	-
		15	Increase or Decrease is requested for the sample volume in ISE test for any other sample than urine.	×
		16	Increase is specified for the sample volume in ISE test for the urine sample.	×
		7	In serum index measurement, any other combination than (L, H, I) is specified, or Increase or Decrease is specified for the sample volume.	×
		2	Error occurs in database.	×
		3	Dilution ratio is out of range.	×
		4	The below sample information value is wrong. Application code, Sample Type, Sample ID, Sequence No., Rack No., Position	×
		5	Writing error of database occurs.	×
		6	Database file is full. Sample information is deleted.	×
		9	STAT Rack No. is out of range.	×
		10	STAT Rack Position is out of range.	×
		11	STAT rack position assignment is already registered.	×
		12	Sample ID characters are abnormal.	×
		13	Tests are overlapped and requested.	×
		17	TS inquiry failed. (Timeout)	×
	152	Application code	HbA1c or Hb test is requested.	×
	171	1	The test code requested by the host is not registered in the LABOSPECT 008 AS.	×

Communication Function	Alarm Code		Description	Processing
	Main	Sub		
Rerun test selection information receive error	151	1	Response to inquiry is not made within a set time in the operation screen.	×
		14	Response to inquiry is not made within 10 minutes. This alarm is issued to call your attention. The system remains in communication status.	-
		15	Increase or Decrease is requested for the sample volume in ISE test for any other sample than urine.	×
		16	Increase is specified for the sample volume in ISE test for the urine sample.	×
		7	In serum index measurement, any other combination than (L, H, I) is specified, or Increase or Decrease is specified for the sample volume.	×
		2	Error occurs in database.	×
		3	Dilution ratio is out of range.	×
		4	The below sample information value is wrong. Application code, Sample Type, Sample ID, Sequence No., Rack No., Position	×
		5	Writing error of database occurs.	×
		6	Database file is full. Sample information is deleted.	×
		20	Tests are overlapped and requested.	×
	153	Application code	HbA1c or Hb test is requested.	×
	172	1	The test code requested by the host is not registered in the LABOSPECT 008 AS.	×
Receive Text Error	181	1	Sample type is out of range.	×
		2	Sample type is out of range.	×
		3	Rack Position is out of range.	×
		4	Classification detail code is out of range.	×
		5	Application code is out of range.	×
		6	Blood drawing date is out of range.	×
		7	Age is out of range.	×
		8	Age unit is not valid.	×
		9	Sex is not valid.	×
		10	Type of sample cups is not valid.	×
	194	12	Sequence No. is out of range.	×
	340	120	TS count is beyond the specified number.	×
Application code convert error (send)	170	Application code	Application code is not converted into host test code during measurement result sending.	×
Application code convert error (receive)	171	1	Application code is not converted from host test code during measurement result receiving.	×

Explanation of Processing Column

×: The communication text is destroyed for the sample which caused an error.

- : The same processing as for sub code 2 is performed.

Table 2-22 Data Alarm List

Alarm code	Data alarm name	Output string	Chemistry				ISE				Auto Rerun	Remark
			Routine	STAT	Ctrl	Std	Routine	STAT	Ctrl	Std		
0	(No Alarm)										Not executed	
1	ADC abnormal	ADC.E	○	○	○	○	○	○	○	○	Executed	
2	ABS Cell blank abnormal	>Cuvet	○	○	○	○					Executed	
3	Sample short	Samp.S	○	○	○	○	○	○	○	○	Not executed	Space may be left for data. No automatic rerun TS inquiry is performed.
4	Reagent short	Reag.S	○	○	○	○					Not executed	Space is left for data.
5	ABS over	>Abs	○	○	○	○					Executed	
6	Prozone Error	>Proz	○	○							Executed	
7	Reaction limit over (all points)	>Reac0	○	○	○	○					Executed	
8	Reaction limit over (2nd ..) (except one point)	>Reac1	○	○	○	○					Executed	
9	Reaction limit over (3rd ..) (except two or three points)	>Reac2	○	○	○	○					Executed	
10	Linearity abnormal 1(9 points or more)	>Lin	○	○	○	○					Executed	
11	Linearity abnormal 2 (8 points or less)	>Lin	○	○	○	○					Executed	
12	S1ABS abnormal	S1A.E				○					-	
13	DUPLICATE error	Dup.E				○					-	
14	STANDARD error	Std.E				○				○	-	
15	SENSITIVITY error	Sens.E				○					-	
16	CALIB error	Cal.E				○				○	-	
17	SD limit error	SD.E				○					-	
18	ISE Noise error	ISE.N					○	○	○	○	Executed	

Alarm code	Data alarm name	Output string	Chemistry				ISE				Auto Rerun	Remark
			Routine	STAT	Ctrl	Std	Routine	STAT	Ctrl	Std		
19	ISE Voltage Level error	ISE.E					○	○	○	○	Executed	
20	Slope abnormal	Slop.E								○	-	
21	Preparation abnormal	Prep.E								○	-	
22	IS concentration abnormal	IStd.E								○	-	
23	ISE Sample range over	<>Test					○	○	○		Executed	
24	Data error in comp. Test	CmpT.E	○	○	○		○	○	○		Executed	
25	Unable to calculate comp. Test	CmpT.?	○	○	○		○	○	○		Executed	Space is left for data.
26	PANIC value over (upper) Technical Limit	>Test	○	○			○	○			Executed	
27	PANIC value over (lower) Technical Limit	<Test	○	○			○	○			Executed	
28	Random error in real-time QC	R4SD			○				○		-	
29	Systematic error 1 in real-time QC	S2-2Sa			○				○		-	
30	Systematic error 2 in real-time QC	S2-2Sw			○				○		-	
31	Systematic error 3 in real-time QC	S4-1Sa			○				○		-	
32	Systematic error 4 in real-time QC	S4-1Sw			○				○		-	
33	Systematic error 5 in real-time QC	S10Xa			○				○		-	
34	Systematic error 6 in real-time QC	S10Xw			○				○		-	
35	QC error 1	Q3SD			○				○		-	
36	QC error 2	Q2.5SD			○				○		-	
37	Calculation test	ClcT.E	○	○	○						Executed	

Alarm code	Data alarm name	Output string	Chemistry				ISE				Auto Rerun	Remark
			Routine	STAT	Ctrl	Std	Routine	STAT	Ctrl	Std		
	error											
38	Overflow	Over.E	○	○	○		○	○	○		Not executed	Space is left for data.
39	Calculation not possible	Calc.?	○	○	○	○	○	○	○	○	Executed	Space is left for data.
40	Outside of expected value (upper)	H	○	○	○		○	○	○		Not executed	The data alarm is not outputted.
41	Outside of expected value (lower)	L	○	○	○		○	○	○		Not executed	The data alarm is not outputted.
42	Edited test	Edited	○	○	○		○	○	○		Not executed	This data alarm is attached to data of a test edited on the Data Review screen. Data before editing is cleared. Attachment of this alarm can be specified on the screen.
43	Calibration result abnormal (Sample Flag)	Cal.E	○	○	○		○	○	○		Not executed	
44	Repeat limit over (upper)	>Rept	○	○			○	○			Executed / Not executed	Execution of auto rerun or its avoidance is settable on the screen.
45	Repeat limit over (lower)	<Rept	○	○			○	○			Executed / Not executed	Execution of auto rerun or its avoidance is settable on the screen.
46 to 47	-											These data alarms are not outputted.
48	QC control range over (upper limit)	QCH			○				○		-	
49	QC control range over (lower limit)	QCL			○				○		-	
50	-										-	The data alarm is not outputted.
51	Response(ISE) abnormal 1	Rsp1.E								○	-	
52	Response(ISE) abnormal 2	Rsp2.E								○	-	
53	Conditioning(ISE)	Cond.E								○	-	

Alarm code	Data alarm name	Output string	Chemistry				ISE				Auto Rerun	Remark
			Routine	STAT	Ctrl	Std	Routine	STAT	Ctrl	Std		
	abnormal											
54	Sample probe (S2) pressure value error	S2Pr.E	○	○	○						Not applicable	Apply to only Hb/HbA1c tests(No apply to % HbA1c)
55	-										-	The data alarm is not outputted.
56	Kinetic unstable (Prozone error 2)	>Kin	○	○							Executed	
57 to 58	-										-	These data alarms are not outputted.
59	Stop mixing	MIXSTP	○	○	○	○					Executed	
60	Mixing current low	MIXLOW	○	○	○	○					Executed	
61	Sample volume abnormal	Samp.V	○	○	○						Not executed	Space is left for data.
62 to 71	-										-	These data alarms are not outputted.
72	Sample clot	Smp.C	○	○	○	○	○	○	○	○	Not executed	Space is left for data. No automatic rerun TS inquiry is performed.
73	Carry over detergent short	Det.S	○	○	○	○					Not executed	
74 to 82	-										-	These data alarms are not outputted.
83	Sample carry over for modules	Samp.O	○	○			○	○			Not executed	
84 to 100	-										-	These data alarms are not outputted.
101	Reagent Expired Date	ReagEx	○	○	○	○					Not executed	
102	-										-	The data alarm is not outputted.
103	Serum index interference lipaemia	>I.L	○	○			○	○			Not executed	
104	Serum index interference hemolysis	>I.H	○	○			○	○			Not executed	
105	Serum index interference icteric	>I.I	○	○			○	○			Not executed	
106	Serum index interference lipaemia / hemolysis	>I.LH	○	○			○	○			Not executed	
107	Serum index specific interference lipaemia / icteric	>I.LI	○	○			○	○			Not executed	
108	Serum index	>I.HI	○	○			○	○			Not	

Alarm code	Data alarm name	Output string	Chemistry				ISE				Auto Rerun	Remark
			Routine	STAT	Ctrl	Std	Routine	STAT	Ctrl	Std		
	interference hemolysis / icteric										executed	
109	Serum index interference lipaemia / hemolysis / icteric	>I.LHI	○	○			○	○			Not executed	
110 to 112	-										-	These data alarms are not outputted.
113	Abs. difference error	>A.Dif	○	○	○	○					Executed	

Terminology of Data Alarm List

Alarm code:	Alarm code outputted to HOST
Data alarm name:	Name of data alarm
Output Strings:	Character strings outputted onto each device
Photometry :	Output conditions in photometry assay.
ISE:	Output Conditions in ISE tests Output for ○
Routine:	Routine Sample analysis
STAT:	STAT sample analysis
Ctrl:	Quality Control sample analysis
Std:	Calibrator analysis
Auto rerun:	Execution or non-execution of auto rerun

2.2 Specifications of ASTM Upper/Lower Layer Interface for Host Communication

2.2.1 Outline

(1) Introduction

This section describes the details of the ASTM's upper and lower layer programs which are based on the standards described below.

(2) Background

For communications with a host computer, ASTM (American Society of Testing and Materials) has recently drafted standard E1381-91 (Specification for Low-Level Protocol to Transfer Messages Between Clinical Laboratory Instruments and Computer Systems) and E1394-91 (Standard Specification for Transferring Information Between Clinical Instruments and Computer Systems).

The basic specifications of the above standards are described in ANSI standard X12, which standardizes communications in different categories of industries.

In response to such moves, the LABOSPECT 008 AS implements a host communication interface which conforms to the above-mentioned ASTM standards.

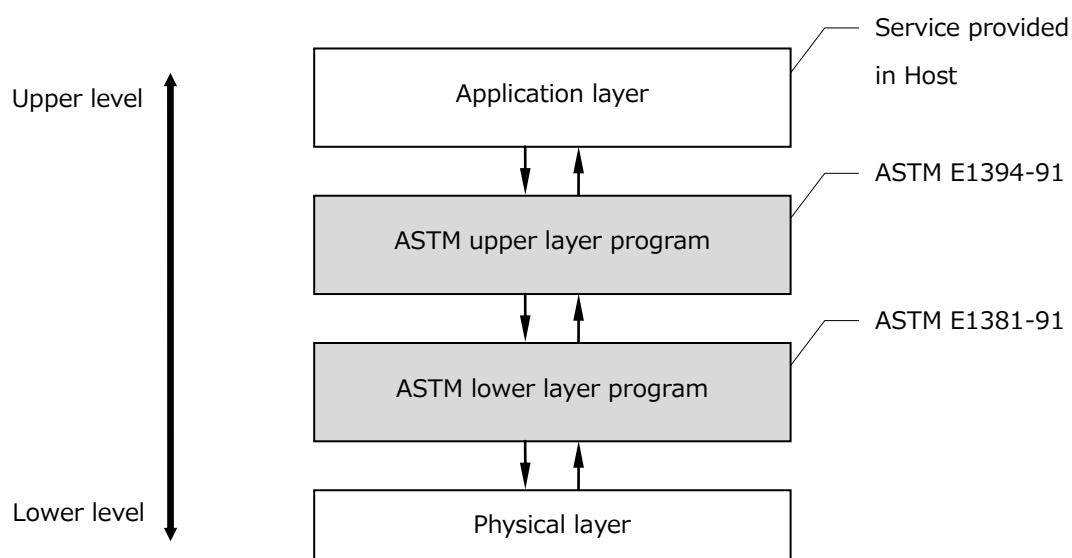


Fig 2-4 Host Communication Processing Hierarchy

2.2.2 Specifications of Physical Layer (Electrical Specifications)

Table 2-23 Physical layer Specification

Item	Specification	Remarks
Communication speed	19200 bps, 9600 bps, 4800 bps	It can be selected on System - Host setup screen.
Character composition	Refer to Table 2-24.	
Communication port	1 port	
Electric signal	Conformity with EIA-232-D-1986	
Cable length	Max. 15 m	

One character is composed of 1 start bit, data bit, parity bit and stop bit. Data bit, parity bit and stop bit are selectable among the 8 types shown below.

Table 2-24 Character Composition

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

Note: Eight data bits must be selected for sending/receiving Kanji or Kana character in shifted JIS code in the Japanese-language mode.

2.2.3 ASTM Communication Protocol

A sentence to be exchanged between an analyzer and a host computer can contain plural test selections of more than one patient and the plural results of each test selection.

Generally, those pieces of information can be expressed in a hierarchical structure.

Concretely, information describing sentence (Sentence) can contain plural patients (Patient), each Patient can contain plural test selections (Order) and each Order can contain plural test results (Result) as shown in Fig 2-5 below.

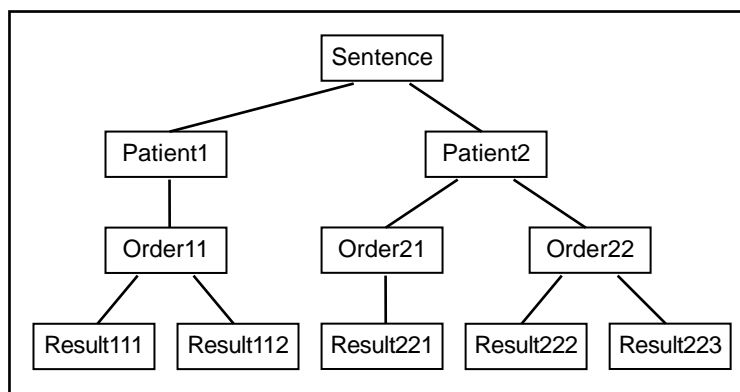


Fig 2-5 Hierarchical Structure

According to The ASTM protocol, such a hierarchical structure is mapped in the one-dimensional world, namely communication.

For instance, the hierarchical structure shown above is expressed approximately as follows.

Start of message – Patient 1 – Order 11 – Result 111

– Result 112 – Patient 2 – Order 21 – Result 221

– Order 22 – Result 222 – Result 223 – end of message

When the communication program finds a result in a sentence, it checks back the sentence received so far and interprets the result as one corresponding to the order that lately appeared and also as one corresponding to the patient information that lately appeared.

Thus, in a sentence, a hierarchical order of patient, order and result is recognized.

In the above description, the number at the head of a patient/order/result line is called a sequence No. and denotes a “serial No. of the information in the present hierarchy.”

Note:

In the ASTM standards, a term “patient record” is used. However, LABOSPECT 008 AS controls not patient data but sample data. Patient data is controlled by a host computer.

2.2.4 Structure of ASTM Communication Program

A program for communications based on ASTM consists of an upper layer program and lower layer program.

With the upper layer program, a message is generated and delivered to the lower layer program. Also, a message from the lower layer program is received and interpreted.

The correct method of writing sentences, namely syntax is stipulated by ASTM.

With the lower layer program, a message from the upper layer program is processed for handover to the physical layer and a message is composed using frames received from the physical layer. The physical layer refers to a physical communication medium. It is a generic term of medium such as serial communication or Ethernet. This layer has intrinsic reliability and transfer rate. A received message which is decomposed so as to match the characteristics of the medium becomes the frames. This decomposing method is stipulated with regard to serial communication by ASTM.

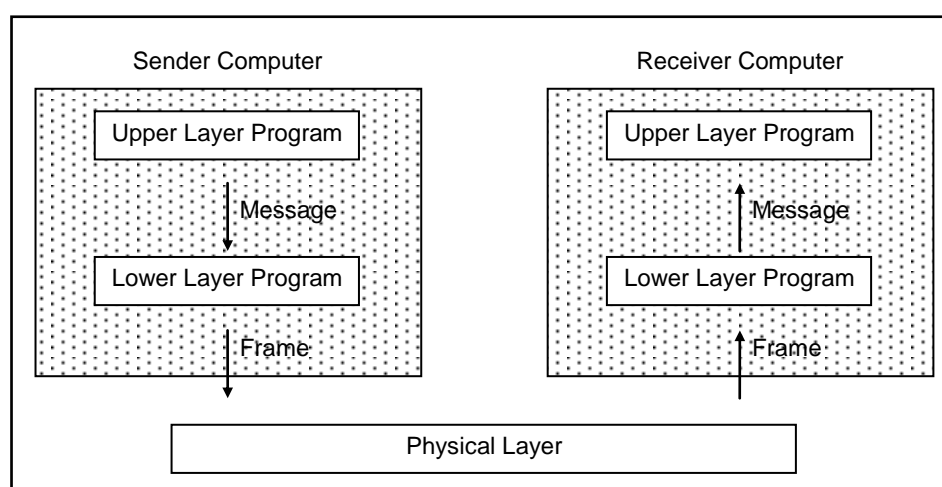


Fig 2-6 Layer Structure of ASTM Communication

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

2.2.5 ASTM Syntax

The structure of a sentence to be transmitted according to the ASTM communication protocol is described here. Between an analyzer and a host computer, data such as test order and result are exchanged, and all the data to be exchanged will follow the syntax detailed below.

(1) Definition of Terms

(a) Message

A message is composed of an array of some records (Refer to “(b) Record”) and it is a minimum unit of information to be transmitted between an analyzer and a host computer. A message begins with a “message header record” which indicates its beginning and ends with a “message termination record” which indicates its end.

(b) Record

A record consists of some fields (Refer to “(c) Field”) and represents a complete set of information (such as test result report or direction of test selection). In a message, a record may be repeated or used only once. The leading one character of a record is a code which symbolizes the meaning of the record.

(c) Field

A field is a minimum element which composes information in the ASTM communication program. Field attributes (such as name, type, meaning, etc.) are defined here for each record.

(2) Message Coding Rules

Described here are special characters such as delimiter for expanding a message composed of records and fields, and message coding rules.

(a) Kanji

Shift JIS code (SJIS) is used to encode Kanji character.

Kanji is encoded by double byte characters XY; X is first single-byte character meeting the below
 $0x81 \leq X \leq 0x9F$ or $0xE0 \leq X \leq 0xFF$,

(Alphameric characters following 0x is defined as hexadecimal.) and Y is second single-byte character meeting the below.

$0x40 \leq Y \leq 0xFC$

In the ASTM processing, when single-byte character corresponding to the above X is found out on field, system checks the next single-byte character is corresponding to Y and recognizes XY as Kanji character.

Note: The second single-byte character (Y) of Kanji might include delimiter but escape sequence (as discussed later) will not be encoded in Y. Therefore, communication program needs to recognize the following second byte Y as “field value” after finding first byte of the above X.

(b) Record End Character

This character specifies the end of a record. It always uses an Carriage Return (ASCII code: 0x0D).

(c) Field Delimiter = Vertical Bar ‘|’

This is a character which delimits adjacent fields in a record.

It also delimits the first record ID (character which appears at the head of a record) and the next field. By the character which appears at the second character position of a message header record (which appears at the head of a message), a desired character can be defined as the field delimiter in the subsequent messages, but use of '|' is recommended.

(d) Repetitive Delimiter = Backslash '/'

When a field is formed by repeating the same kind of data, it is called a repetitive field.

A delimiter used between the repetitive data items in a repetitive field is termed as "repetitive delimiter." Although a desired character can be defined as a repetitive delimiter by message header record, use of '/' is recommended.

(e) Component Delimiter = Caret '^'

A component delimiter refers to a delimiter between the elements. Although a desired character can be defined as a component delimiter by message header record, use of '^' is recommended.

(f) Escape Character = Ampersand '&'

In a field containing a general text, an escape character is specified so that a delimiter can be expressed. When this character appears in the relevant field, the next character will have a special meaning (detailed later). A desired character can be defined as an escape character by message header record, use of '&' is recommended.

(g) Expression of Special Character by Escape Characters

The following escape sequences (character string beginning and ending with &) are defined. When any of the sequences is detected in a field, it will be converted into the corresponding character in its interpretation.

&F&	Conversion into field delimiter
&S&	Conversion into component delimiter
&R&	Conversion into repetitive delimiter
&E&	Conversion into escape character

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

(h) Processing for Message Sending

Processing procedure for the upper layer program to send a message is describe below.

1) The first record defined in a message is coded in the following procedure.

- Record ID is entered as the first character.
- The fields in this record are sequentially coded in the following procedure.
 - A field delimiter is entered.
 - When there is no data, none will be entered.
 - There is data, but it is a null value (data clearing instruction). Then, "" (2 double quotation marks) will be entered.
 - In case of a component field, the following procedure is carried out.
 - a. When there are two or more component elements, they will be delimited by component delimiter.
 - b. There is data, but it is a null value (data clearing instruction). Then, "" (2 double quotation marks) will be entered.
 - c. When there is no field data, no character will be entered in the relevant component.
 - d. When there is no field data at the final component, there is no need for delimiting with a component delimiter. For example, the following codes 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

- As the end of this record, a Carriage Return character (hex 0xD) is entered.

2) Step 1) is repeated for the next record.

(i) Processing for Message Reception

Processing procedure for the upper layer program to receive a message is describe below.

- All the records, fields, component elements and excess repetitions that are not expected on the reception side will be ignored.
- If there is no expected record, all the field values in the record will be interpreted to be nonexistent.
- If a field or component element is not the expected one, it will be interpreted to be nonexistent.
- If it is impossible to judge a field value to be nonexistent or a null value, it will be interpreted as the latter.
- Received data will be interpreted and processed.

(3) Field Attributes

The record definition tables in (4) to (13) define the attributes of the fields which compose each record. How to read those tables is described here.

No.	Attribute Name	Explanation
1	Serial No. (No)	Field position A serial No. in which the relevant field appears in a certain record.
2	Field name (Field)	Name of this field
3	Validity (V)	A field without "x" in the validity column is defined in the ASTM standards; it will be ignored even though received.
4	Repetition (R)	Indicates whether this field is repeated or not. (Space) : Not repeated x : Repeated
5	Comment	Explanation of this field
6	Type	A field has any of the following type names. <ul style="list-style-type: none"> • ST : StringCharacter string • TX : Text :A group of character strings (printable letters) Although character strings are arbitrary ones, a special sequence for display on the terminal unit is defined. (Refer to "(g) Expression of special character by escape characters" in (2) of 2.2.5.) • NM : Numeric.....Value "+" or "-" is prefixed. If not prefixed, "+" is taken. A numeric without decimal point is regarded as an integer. Leading zero, and trailing zero in a numeric with decimal point are allowed. • DT : Date.....A 4-digit A.D. year is used without fail. Format is YYYYMMDD (YYYY for a 4-digit A.D. year, MM for a month, DD for a day of the month). For example, September 5, 2012 is represented by 20120905. • TM : Time.....A time specified on 24-hour scale. Format is HHMMSS (HH for hour, MM for minute, SS for second). • TS : Time Stamp.....A combination of DT and TM. Format is YYYYMMDDHHMMSS. • CM : Component..... Component (a field consisted of multiple data divided by component delimiters)
7	Max. length	The maximum number of valid characters in the relevant field excluding escape characters.

(4) Message Header Record

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'H' is used.
2	Delimiter Definition	x		ST	4	Four types of characters are defined: field delimiter, repetition delimiter, component delimiter, and escape character. The first one is defined as a field delimiter as well as a delimiter for the Record Type ID. These four characters are: ' ¥^&'
3	Message Control ID					
4	Access Password					
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					
7	Reserved Field					
8	Sender Telephone Number					
9	Characteristics of Sender					
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

No.	Field	V	R	Type	Max. Length	Comments
						"TSREQ": TS inquiry "RSUPL": Result transmission "PCUPL": Transmission of photometric calibration results "ICUPL": Transmission of ISE 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	This means the processing method for the message. 'P' is always used in the existing conditions.
13	Version No.	x		NM	1	Communication Program version: '1' is always used in the existing conditions.
14	Date and Time of Message					

(5) Patient Information Record

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'P' is used.
2	Sequence Number	x		NM	6	Sequence No. of a patient information record in a specific message. This number starts from 1.
3	Practice Assigned Patient ID					
4	Laboratory Assigned Patient ID					
5	Patient ID No. 3					
6	Patient Name					
7	Mother's Maiden Name					
8	Birth date					
9	Patient Sex	x		ST	1	Indicate patient sex. M': Male, 'F': Female, 'U': Unknown. In case of Null, it should be "U".
10	Patient Race					
11	Patient Address					
12	Reserved Field					
13	Patient Phone No					
14	Attending Physician ID					
15	Special Field 1	x		CM	5	Indicate Patient age. The format is as follows. <Age>^<Age Unit> <Age> Type: NM; Maximum length: 3 Indicate Patient age. In case of Null, it should be 0. <Age Unit> Type: ST; Maximum length: 1 'Y': Year, 'M': Month, 'D': Day. In case of Null, it should not be registered.

(6) Test Order Record

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'O' is used.
2	Sequence Number	x		NM	6	Indicates the sequence No. of a test order record in the present hierarchy. Since this record is located at a hierarchical level under patient information record, it is given a sequence number which increments whenever a new patient record appears.
3	Specimen ID	x		ST	22	Indicates the ID of the relevant sample. In case of a control sample, this ID indicates Control name (10 characters) + Space (2 characters) + Lot No. (8 characters).
4	Instrument Specimen ID	x		CM	20	<p><Sample No>^<Rack ID >^<Position No>^<Rack Type>^<Container Type></p> <p><Sample No.> Type: NM; Maximum length: 6 Indicates the number of a sample. The sample No. of a control sample is shown below, for example, (Control No.) × 1000 + (Sequence No.)</p> <p><Rack ID> Type: ST, Maximum length: 5 Indicates the ID of sample rack.</p> <p><Position No> Type: NM; Maximum length: 1 A value from 1 to 5. A position on the rack is indicated.</p> <p><Rack Type>: Type: ST, Maximum length: 2 Indicate the type of racks. 'S1': Type1 of Routine, STAT Sample (Serum) 'S2': Type2 of Routine, STAT Sample (Urine) 'S3': Type3 of Routine, STAT Sample (Plasma) 'S4': Type4 of Routine, STAT Sample (CSF) 'S5': Type5 of Routine, STAT Sample (Other) 'QC': Quality Control</p> <p><Container type> Type: ST, Maximum length: 2 Indicate the type of Sample container. 'SC': Standard sample cup 'MC' Micro sample cup In case of no value, new sample is registered as "Standard standard sample cup" and already-registered sample is registered using the same sample container type which is already</p>

No.	Field	V	R	Type	Max. Length	Comments
						registered. For sending measurement result of QC sample, SC': standard sample cup is always used.
5	Universal Test ID	x	x	CM	12	<p>Indicates test request.</p> <p>Repetition can be made up to 100 requests. Maximum number is 100 for test selection information. The format is as follows.</p> <p>^^<Host Code>^<Dilution></p> <p><Host Code> Type: NM, Maximum length: 5 Indicate host code. The range is from Host code 1 to 60,000.</p> <p><Dilution> Type: ST or NM, Maximum length: 3 In test selection,</p> <p>1) No specification: Photometric and ISE tests will be carried out with standard sample volume.</p> <p>2) 'clr': Cancels a request for the specified test. This is effective only in test selection information.</p> <p>3) 'Inc': An increased sample volume can be specified for a photometric test.</p> <p>4) 'Dec': A decreased sample volume can be specified for a photometric test. This can also be specified for an ISE request for sample type 2 (urine).</p> <p>5) '3', '5', '10', '20', '50': A dilution factor is specified for a photometric test and operation is started.</p> <p>'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</p> <p>In result sending, For a photometric/ISE test, 'Dec', 'Inc', '3', '5', '10', '20', '50' or 'no specification (standard volume)' will be sent.</p>
6	Priority	x		ST	1	<p>Indicates the priority order among patient samples (routine and STAT). This is not used for control samples.</p> <p>'S': STAT sample, 'R': Routine sample</p>
7	Requested/Ordered Date and Time					
8	Specimen Collection Date and Time	x		TS	14	<p>Indicates the date and time of sampling. The format is as follows.</p> <p>YYYYMMDDHHMMSS</p>
9	Collection End Time					

No.	Field	V	R	Type	Max. Length	Comments
10	Collection Volume					
11	Collector ID					
12	Action Code	x		ST	1	Indicates an information reporting mode. N : Sending of results on routine/STAT samples from analyzer Q : Sending of results on control sample from analyzer A : Test request from HOST C: Test Cancel from HOST Cancel test request specified by Universal Test ID.
13	Danger Code					
14	Relevant Clinical Information					
15	Date/Time Specimen Received					
16	Specimen Descriptor	x		NM	1	Indicates the type of sample with number 1-5.
17	Ordering Physician					
18	Physician's Telephone Number					
19	User Field No.1					
20	Users Field No.2					
21	Laboratory Field No.1					
22	Laboratory Field No.2					
23	Date/Time Results Reported or Last Modified	x		TS	14	Indicates the date and time of obtaining the results. This cannot be ordered from the host computer. The format is as follows. YYYYMMDDHHMMSS
24	Instrument Charge to Computer System					
25	Instrument Section ID					
26	Report Types	x		ST	1	Indicates the type of communication. 'O': Test request (from host computer) 'F': Result sending (to host computer)
27	Reserved Field					
28	Location or Ward of Specimen Collection					
29	Nosocomial Infection Flag					
30	Specimen Service					
31	Specimen Institution					

(7) Result Record

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'R' is used.
2	Sequence Number	x		NM	6	Since this record is located at a hierarchical level under Test Order record, it is given a sequence number which increments like 1,2,... whenever a new test order record appears.
3	Universal Test ID	x		CM	24	Indicates test request. The following format is used. ^^<Host Code>/<Dilution> <Host Code> Type: NM, Maximum length: 5 <Dilution> Type: ST or NM, Maximum length: 3 Refer to "(5) Universal Test ID" of "(6) Test Order Record."
4	Data or Measurement Value	x		CM	15	Indicate measured value. The format is as follows. In case of photometric, ISE, Serum index, calculation tests, Quantitative tests <measurement value> Qualitative tests < qualitative judgment value>^< measurement value > or, <qualitative judgment value> Sending tests vary depending on function selection. For details, refer to (12) in 2.1.5 Operating Condition Setting.
5	Units	x		ST	8	Indicates the unit name of measurement result.
6	Reference Ranges					
7	Result Abnormal Flags	x		ST	2	Indicates that measurement result is normal or abnormal. 'L' : Measured value is below the normal value range. 'H' : Measured value is above the normal value range. 'LL' : Measured value is below low technical limit. 'HH' : Measured value is above high technical limit. 'N' : Normal 'A' : Abnormal
8	Nature of Abnormality Testing					
9	Result Status	x		ST	1	Indicates how many times this sample was tested. 'F': First-run result 'C': Rerun result
10	Date of Change in					

No.	Field	V	R	Type	Max. Length	Comments
	Instrument Normative values Units					
11	Operator Identification	x		ST	6	Indicates operator ID used for analysis. This cannot be ordered from the host computer. *In case of Logoff mode, 2 half-size characters are set.
12	Data/Time Test Started	x		TS	14	Indicate pipetting data/time. The format is as follows. YYYYMMDDHHMMSS
13	Date/Time Test Completed					
14	Instrument Identification	x		ST	4	Indicates the ID of the module used for analysis. <Routine/STAT samples> P1: Photometric test, Serum index, %HbA1c ISE1: ISE tests N/A: Calculated tests <Quality control sample> P1: Photometric test, Serum Index, %HbA1c, Calculated test (photometry) ISE1: ISE test, Calculated tests (ISE)
15	Order Count	x		NM	3	Indicate the number of order counts of the relevant sample of the relevant test. For example, Order count normally becomes First run: 1 and rerun: 2... In case of additional test request, order count becomes at the time of additional request. Because measurement performed by each rack, the same order count is assigned to sample on the same rack. (When samples of different order counts are put on the same rack, maximum order count plus 1 is assigned.) Tests of the same order count are a group of tests requested at the same time. Compensated tests of calculated test or test-to-test compensation are measured again with respect to each requested timing. Therefore, the same tests measure multiple times depending on additional request and measurement results of the same test with different order count are sent as much as measurement performed. On the other hand, Host links calculated test and compensated test, and test to be compensated and compensated test using same order count. <Routine/STAT samples> 1 to 400 <Quality control sample> 1

No.	Field	V	R	Type	Max. Length	Comments
16	Multi Measure Count	x		NM	1	Indicates the number of test counts of multiple analyses of the relevant samples. <Routine/STAT samples> 1 <Quality control sample> 1 to 5
17	Reagent Priority	x		NM	2	Indicates use priority of reagents used for analysis. <Routine/STAT samples> 0: Reagents in use <Quality control sample> 0: Reagents in use, 1-59: Standby reagents In case of no use, it should be null. In case of calculated test or ISE tests, it should be null.
18	Reagent Lot	x		CM	27	Indicates Lot No. of reagent used for analysis. The format is as follows. <R1 reagent Lot No.>^<R2 reagent Lot No.>^<R3 reagent Lot No.> ^ <Dilution Lot No.> <Lot No.> Type: ST Maximum length: 6 In case of no use, it should be null.
19	Reagent Sequence	x		CM	23	Indicates Sequence No. of reagent used for analysis. The format is as follows. <R1 reagent Sequence No.>^<R2 reagent Sequence No.>^<R3 reagent Sequence No.> ^ <Dilution Sequence No.> <Sequence No.> Type: NM Maximum length: 5 In case of no use, it should be null.

(8) Comment Record

(a) Result Flag [C-RES]

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'C' is used.
2	Sequence Number	x		NM	6	Indicates the sequence No. of a comment record (result flag) in the present hierarchy. Since this record is located at a hierarchical level under Result record (result flag), it is given a sequence number which increments whenever a new Comment record appears.
3	Comment Source	x		ST	1	'I' is used.
4	Comment Text	x		NM	3	The number of data alarms for measured value is given.
5	Comment Type	x		ST	1	'I' is used. It indicates that this record is a Result flag.

(b) Comment [C-CMM]

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'C' is used.
2	Sequence Number	x		NM	6	Indicates Sequence No. of a Comment record in the present hierarchy. Since this record is located at a hierarchical level under patient information record, it is given a sequence number which increments whenever a new comment record appears.
3	Comment Source	x		ST	1	'I' is used.
4	Comment Text	x		CM	104	Indicates Comments for the sample. Comments can be displayed and edited on the operation screen. ^^^^ is always sent depending on "Comment Send" settings on [System]-[Communication]-[Message Text] screen. The format is as follows. <Comment1>^<Comment2>^<Comment3>^ <Comment4>^<Comment5> <Comment1 > Type: ST; Maximum length: 30 <Comment2> Type: ST; Maximum length: 25 <Comment3> Type: ST; Maximum length: 20 <Comment4> Type: ST; Maximum length: 15 <Comment5> Type: ST; Maximum length: 10
5	Comment Type	x		ST	1	'G' is used. Indicates this record is a Comment.

(9) Request Information Record

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'Q' is used.
2	Sequence Number	x		NM	6	Indicates Sequence No. of a request information record in the present hierarchy. Since this record is located at a hierarchical level under patient information record, it is given a sequence number which increments whenever a new patient record appears.
3	Starting Range ID Number	x		CM	48	Indicates a sample to be inquired. The format is as follows. ^^ <Sample ID>^<Sample No>^<Rack ID>^<Position No>^<Rack Type>^<Container Type>^<Kind> <Sample ID> Type: ST, Maximum length: 22 Refer to 3. Specimen ID in "(6) Test Order Record." <Sample No.> Type: NM; Maximum length: 5 Refer to 4. Instrument Specimen ID in "(6) Test Order Record." <Rack ID> Type: ST, Maximum length: 5 Refer to 4. Instrument Specimen ID in "(6) Test Order Record." <Position No> Type: NM; Maximum length: 1 Refer to 4. Instrument Specimen ID in "(6) Test Order Record." <Rack ID> Type: ST, Maximum length: 2 S0: None Refer to 4. Instrument Specimen ID in "(6) Test Order Record." for other than S0. <Container type> Type: ST, Maximum length: 2 Refer to 4. Instrument Specimen ID in "(6) Test Order Record." <Kind> Type: ST; Maximum length: 2 Sample Type 'R1': First Run Sample 'R2': Rerun samples
4	Ending Range ID Number					
5	Universal Test ID	x		ST	3	'ALL' is used.
6	Nature of Request Time Limits					
7	Beginning Request Results Date and Time					
8	Ending Request Results Date and Time					
9	Requesting Physician Name					

10	Requesting Physician Telephone Number					
11	User Field No.1					
12	User Field No.2					
13	Request Information Status Codes	x		ST	1	Indicates the purpose of this record. 'O': Request for a desired test (sent to host computer). 'A': Cancellation of request for a desired test (sent to host computer). 'F': Measurement result

(10) Message Termination Record

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'L' is used.
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]

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'M' is used.
2	Sequence Number	x		NM	6	Indicates Sequence No. of a photometric raw data record in the present hierarchy. Since this record is located at a hierarchical level under result record, it is given a sequence number which increments whenever a new result record appears.
3	Record Type Sub ID	x		ST	3	'ABS' is used. It indicates that this record is an absorbance record.
4	Module ID	x		ST	4	Indicates the ID of the module used for analysis. Refer to 14. Instrument Identification (a) in "(7) Result Record."
5	Cell No	x		NM	3	Indicates Reaction Cell No. A value within 1 to 408 is input. (S=max408, P=max160)
6	Input Information	x		NM	1	Nothing is written.
7	Reaction Time	x		NM	2	Indicates Reaction time (minute). A value within 3 to 10 is input.
8	Number of Points	x		NM	2	Indicates the number of reaction points. A value within 1 to 38 is input. (S=max38, P=max34)
9	Cell Blank Data	x	x	NM	6	Indicates cell blank absorbance. A difference between absorbance data at main and sub wavelengths (main-wavelength absorbance data - sub-wavelength absorbance data) is repeated for 4 data.
10	Delta ABS Data	x	x	NM	6	Indicates absorbance. A difference between absorbance data at main and sub wavelengths (main-wavelength absorbance data - sub-wavelength absorbance data) is repeated for reaction points.

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

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'M' is used.
2	Sequence Number	x		NM	6	This record appears at the hierarchical level under message header record. For a single record, 1 is assigned to this field. For specification of plural records, serial numbers starting from 1 are assigned, respectively.
3	Record Type Sub ID	x		ST	3	'PCR' is used. It indicates that this record is a photometric calibration result record.
4	Operator ID	x		ST	6	Indicates operator ID used for analysis. *In case of Logoff mode, 2 half-size characters are set.
5	Test Code	X		CM	8	Indicates a test subjected to calibration. The format is as follows. ^^<Host Code> <Host Code> Type: NM, Maximum length: 5 The range is from Host code 1 to 60,000.
6	Module ID	X		ST	2	Indicates the ID of the module used for analysis. Refer to 14. Instrument Identification in "(7) Result Record."
7	Calibration Alarm	X		NM	3	Indicates a calibration alarm.
8	SD Data Field	X		NM	6	Indicates SD data.
9	STD Data	X	X	CM	38	Indicate absorption value of standard solution (calibrator). The format is as follows. <Absorbance data in first run>^<initial or final absorbance data in first run>^<absorbance data in second run>^<initial or final absorbance data in second run>^<data alarm>^<prozone check value>¥... Data is repeated according to measurements of STD1 to STD6. Unmeasured STD data is null. *If no value for the result, space will be displayed for STD data. However, generated data alarm is attached. <Absorbance data in first run> Type: NM, Max. length: 6 <Initial or final absorbance data in first run> Type: NM, Max. length: 6 <Absorbance data in second run> Type: NM, Max. length: 6 <Initial or final absorbance data in second run> Type: NM, Max. length: 6 <Data alarm> Type: NM, Max. length: 3 <Prozone check value> Type: NM, Max. length: 6
10	Reagent Lot	x		CM	27	Indicates Lot No. of reagent used for analysis.

No.	Field	V	R	Type	Max. Length	Comments
						The format is as follows. <R1 reagent Lot No.>^<R2 reagent Lot No.>^<R3 reagent Lot No.> <Lot No.> Type: ST Maximum length: 6 In case of no use, it should be null.
11	Reagent Sequence	x		CM	23	Indicates Sequence No. of reagent used for analysis. The format is as follows. <R1 reagent Sequence No.>^<R2 reagent Sequence No.>^<R3 reagent Sequence No.> <Sequence No.> Type: NM Maximum length: 5 In case of no use, it should be null.
12	Reagent Expired Flag	x		NM	1	Indicates reagent status used for analysis is expired or not. 0: Within expiration period 1: Reagent Expired
13	Calibrator Lot	x		CM	53	Indicates Lot No. of calibrator used for analysis. The format is as follows. <Calibrator1 Lot No.>^<Calibrator2 Lot No.>^<Calibrator3 Lot No.>^<Calibrator4 Lot No.>^<Calibrator5 Lot No.>^<Calibrator6 Lot No.> <Lot No.> Type: ST Maximum length: 8 In case of no use, it should be null.
14	Measurement Data	x		TS	14	Indicates measurement data/time. The format is as follows. YYYYMMDDHHMMSS

(13) ISE Calibration Result Record [M-ICR]

No.	Field	V	R	Type	Max. Length	Comments
1	Record Type ID	x		ST	1	'M' is used.
2	Sequence Number	x		NM	6	This record appears at the hierarchical level under message header record. For a single record, 1 is assigned to this field. For specification of plural records, serial numbers starting from 1 are assigned, respectively.
3	Record Type Sub ID	x		ST	3	'ICR' is used. It indicates that this record is a ISE calibration result record.
4	Operator ID	x		ST	6	Indicates operator ID used for analysis. *In case of Logoff mode, 2 half-size characters are set.
5	Module ID	x		ST	4	Indicates the ID of the module used for analysis. Refer to 14. Instrument Identification in "(7) Result Record."
6	Na calibration Alarm	x		NM	3	Indicates a calibration alarm of Na test.
7	K calibration Alarm	x		NM	3	Indicates a calibration alarm of K test.
8	Cl calibration Alarm	x		NM	3	Indicates a calibration alarm of Cl test.
9	Na data Alarm	x		CM	31	Indicates a data alarm of Na test. The format is as follows. <Data alarm on internal standard EMF>^<data alarm on Low solution EMF>^<data alarm on High solution EMF>^<data alarm on calibrator EMF>^<data alarm on slope data for display>^<data alarm on internal standard solution concentration>^<data alarm on calibrator solution concentration>^<data alarm on correction factor> <Data alarm for ISE internal standard solution EMF> Type: NM; Maximum length: 3 <Data alarm for Low solution EMF> Type: NM; Maximum length: 3 <Data alarm for High solution EMF> Type: NM; Maximum length: 3 <Data alarm for Calibrator solution EMF> Type: NM; Maximum length: 3 <Data alarm for slope data for display> Type: NM; Maximum length: 3 <Data alarm for internal standard solution concentration> Type: NM; Maximum length: 3 <Data alarm for Calibrator solution concentration> Type: NM; Maximum length: 3 <Data alarm for correction factor> Type: NM; Maximum length: 3
10	K data Alarm	x		CM	31	Indicates a data alarm on K test.

No.	Field	V	R	Type	Max. Length	Comments
						For format, refer to data alarm of Na test.
11	Cl data Alarm	x		CM	31	Indicates a data alarm of Cl test. For format, refer to data alarm of Na test.
12	Na data	x		CM	55	Indicates a calibration result of Na test. The format is as follows. <Data on internal standard EMF>^<data on Low solution EMF>^<data on High solution EMF>^<data on calibrator EMF>^<data on slope data for display>^<data on internal standard solution concentration>^<data on calibrator solution concentration>^<data on correction factor> *When result becomes sample short or probe clogging detection, space will be displayed for calibration result. <Data for ISE internal standard solution EMF> Type: NM; Maximum length: 6 <Data for Low solution EMF> Type: NM; Maximum length: 6 <Data for High solution EMF> Type: NM; Maximum length: 6 <Data for Calibrator solution EMF> Type: NM; Maximum length: 6 <Data for slope data for display> Type: NM; Maximum length: 6 <Data for internal standard solution concentration> Type: NM; Maximum length: 6 <Data for Calibrator solution concentration> Type: NM; Maximum length: 6 <Data for correction factor> Type: NM; Maximum length: 6
13	K data	x		CM	55	Indicates a calibration result of K test. For format, refer to data alarm of Na test.
14	Cl data	x		CM	55	Indicates a calibration result of Cl test. For format, refer to data alarm of Na test.

(14) Messages to be sent by analyzer

The following table lists the messages to be sent from the analyzer (messages to be received by the host computer).

Message name	Occurrence Cause
Test Selection Inquiry	<ul style="list-style-type: none"> Test selection is inquired immediately after loading of sample racks (passing through Sample/Rack BCR)(for both new run and rerun).
Routine/STAT sample measurement result data Control measurement result data	<ul style="list-style-type: none"> When all the measured values of samples are obtained, they will be reported. Measured values are reported in response to an inquiry from the host computer. The measured value of a desired sample is transmitted when this is specified from Control unit.
Auto Rerun Test Selection Inquiry	<ul style="list-style-type: none"> Test selection is inquired immediately after loading of sample racks (for rerun).
Photometric calibration result data	<ul style="list-style-type: none"> Just when the result of photometric calibration is output, it is reported.
ISE calibration result data	<ul style="list-style-type: none"> Just when the result of ISE calibration is output, it is reported.
Reaction monitor data	<ul style="list-style-type: none"> The photometric raw data (absorbance) of a desired sample is reported when it is specified from Control unit.

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
Test Selection Inquiry Auto Rerun Test Selection Inquiry	H Q L	TSREQ ^ REAL
Routine/STAT sample measurement result data Control measurement result data	H P O C-CMM {R C-RES} nL where n=0 to 100	RSUPL ^ REAL RSUPL ^ BATCH RSUPL ^ REPLY
Photometric calibration result data	H M-PCR L	PCUPL ^ REAL
ISE calibration result data	H M-ICR L	ICUPL ^ REAL
Reaction monitor data	H P O C-CMM R C-RES M-ABS L	ABUPL ^ BATCH

(15) Messages to be sent by HOST

The following table lists the messages to be sent from the host computer (message to be received by the analyzer).

Message name	Occurrence Cause
Test selection information Auto Rerun Test Selection information	· Tests requested for a sample are ordered.
Result sending request	· Result values of a sample are inquired.

The syntax of each message is described below.

Message Name	Syntax	Comment or Special Instructions
Test selection information Auto Rerun Test Selection information	H P O C-CMM L	TSDWN ^ REPLY TSDWN ^ BATCH
Result sending request	H Q L	RSREQ ^ REAL

(16) Error Handling in ASTM Upper Layer Program

Errors to be detected in the ASTM upper layer program are indicated here.

Communication errors to be detected in the application layer program are indicated in 2.1.6, and errors to be detected in the ASTM lower layer program are indicated in 2.2.6 (5).

When an error is detected, the corresponding alarm code listed in Table 2-25 is indicated on the alarm window of this analyzer.

Table 2-25 Error Handling in ASTM Upper Layer Program

Alarm Code		Description
Main	Sub	
126	21	There are no valid records.
	22	Leading record is not a header record.
	23	An undefined record exists.
	24	An unspecified record exists.
340	1	L record does not have adequate field delimiters.
	2	L record does not have its end.
	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	Universal Test ID does not have adequate component delimiters.
	32	Action Code & Value are not valid.
	36	Comment 1 of "Comment or Special Instructions" is not a valid value.
	37	H record does not have adequate field delimiters.
	38	"Comment or Special Instructions" is not a valid value.
	39	H record does not have its end.
	40	P record does not have adequate field delimiters.
	41	Sequence Number of P record is not a valid value.
	44	P record does not have its end.
	45	Application Code is not a valid value.
	47	O record does not have adequate field delimiters.
	48	Sequence Number of O record is not a valid value.
	50	Instrument Specimen ID of O record is not a valid value.
	57	O record does not have its end.
	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	Q record does not have adequate field delimiters.
	64	Sequence Number of Q record is not a valid value.
	67	Q record does not have its end.
	68	C record does not have adequate field delimiters.
	69	Sequence Number of C record is not a valid value.
	73	C record does not have its end.

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

2.2.6 ASTM Lower Layer

The ASTM lower layer program receives a message whose sending is requested by the upper layer program, divides it into frames and delivers them to a communication medium from which the message is transferred to the opposite side.

The lower layer program also assembles the frames received from a communication medium to reconstruct them into a message and delivers it to the ASTM upper layer program.

The structure of those frames and the communication procedures at message sending/receiving are explained here.

(1) Communication Specifications of ASTM Lower Layer Program

Table 2-26 Communication Specifications of ASTM Lower Layer Program

Item	Specification	Description
Layout of Frames	<p>Intermediate Frame: <STX> FN text <ETB> C1 C2 <CR><LF></p> <p>Final Frame: <STX> FN text <ETX> C1 C2 <CR><LF></p>	<p>◆ Control characters (sandwiched by < and >) : <STX>stands for control character (HEX 02), <ETB> for (HEX 17), <CR> for (HEX 0D), <LF>for (HEX 0A), <ETX> for (HEX 03)</p> <p>◆ text: Part of divided message</p> <p>◆ FN: FN is expressed by a single ASCII numeral within 0 to 7. This stands for a serial number of frame. The leading frame after message division is numbered 1, the next frame is numbered 2 and so on. A frame after frame 7 is numbered 0 followed by frame No. 1. That is, FN has default of 1 and then increments by 1 whenever a new frame appears to take the remainder after subtraction from 8.</p> <p>◆ C1 and C2 : When hexadecimally expressing the 1 byte obtained by byte-based addition from FN to <ETB> for an intermediate frame or from FN to <ETX> for the final frame, the upper-digit character (161) stands for C1 and the lower-digit character (160) stands for C2. As characters, 0 to 9 or A to F are used.</p>
Character composition of frame "text"	<p>Characters other than <SOH><STX><ETX><EOT><ENQ><ACK><DLE><NAK><SYN><ETB><LF><DC1><DC2><DC3><DC4></p>	<p><SOH> stands for control character (HEX 01); <EOT> for (HEX 04), <ENQ> for (HEX 05), <ACK> for (HEX 06), <DLE> for (HEX 10), <NAK> for (HEX 15), <SYN> for (HEX 16) and <DC1> to <DC4> for (HEX 11 to 14).</p>
Maximum length of frame	247 character	<p>One frame can have 247 characters as a total of maximum 240 text characters and 7 frame control characters. A message within 240 characters is transmitted as one final frame. A message beyond 240 characters is divided into frames within 240 characters, which become intermediate frames plus only one final frame.</p>

(2) ASTM 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, ASTM 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 ASTM 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 ASTM 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 2-27.

Table 2-27 Explanation of Matrix Notation

Notation	Description
Send*<character>*	Control characters are sent. <EOT> stands for control character (HEX 04); <ENQ> for (HEX 05), <ACK> for (HEX 06) and <NAK> for (HEX 15).
Count=1	FN (frame No.) is set at default value 1.
Timer=<value>	Timer is set at <value>. At seconds determined by <value> after this setting, a Timeout event occurs. This setting cancels previous timer setting.
Retry=0	Frame resending count is reset.
Retry ⁺⁺	Resending count is incremented by 1.
Count ⁺⁺	"1" is added to FN (frame No.) and the remainder after its subtraction from 8 is set. (Count= (Count+1) mod 8)
Btimer=<value>	Btimer is another timer different from Timer. Unless Btimer is at zero, sending is prohibited. If sending is desired on both sides, Btimer is used for preferential control of sending right by providing a difference in sending prohibition time.
Event Send	Event Send issues send request to itself (ASTM lower layer).
Delay=<value>	Add waiting time of <value>msec in itself (ASTM lower layer).

Note on Processing: Measure at Occurrence of Link Contention

Link contention refers to a contention for the right to send as a result of simultaneous <ENQ> transmissions from both analyzer and host computer. In this case, priority is given to the analyzer according to the ASTM1381 standard. Host computer is required to wait at least 20 seconds until a sending request (<EMQ>) comes from the analyzer and ready by for issuance of a sending request. After completion of sending from the analyzer (<EOT>), its communication status returns to the Idle status. Therefore, after issuing a sending request from the host computer, the pending message should be sent. Upon sending the message, however, a link contention may recur. In this case also, priority is given to sending from the analyzer.

In the event of a link contention, a host communication error alarm (126-9) is issued, but this does not cause a problem on communications. However, if a link contention recurs when (<ENQ>) is sent again from the host computer simultaneously with a sending request (<ENQ>) from the analyzer as a procedure after occurrence of a link contention, a host communication error alarm (126-9) is issued and communication stops.

(3) Receiving Procedure Matrix of ASTM Lower Layer Program

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	Bad Frame
Idle	goto Awake	goto Data to Send								
Awake			Send *NAK*	Send *ACK* Count=1 Timer=30						
			goto Idle	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	Count++ Send *ACK* Timer=30	Send *NAK* Timer=30
								goto Receive Waiting	goto Receive Waiting	goto Receive Waiting
Have Data to Send								Send *EOT* Timer=30	Count++ Send *EOT* Timer=30	Send *EOT* Timer=30
								goto Receive Waiting	goto Receive Waiting	goto Receive Waiting

Event Name	Description
Receive *ENQ*	Control character ENQ (HEX 05) was received. This corresponds to a sending request from the opposite side.
Send Request	A message sending request was received from the upper layer program.
Not Ready to Receive	A sending request came from the opposite side, but this side is not yet ready for reception.
OK to Receive	A sending request came from the opposite side and this side is ready for reception.
Arrival of Frame	One frame was received from the opposite side.
Receive *EOT*	Control character EOT (HEX 04) was received. This corresponds to a sending end request from the opposite side.
Timeout	Timer count-down reached zero.
Good Repeat Frame	As a result of checking the received frame, its frame number was found to coincide with that of the frame received immediately before it.
Good New Frame	As a result of checking the received frame, its frame number was found to match the remainder of 8 after taking the frame number of the previously received frame plus 1.
Bad Frame	Any of the following was received. (1) Character not specified for frame, (2) Checksum error, (3) Wrong Frame No.

Status Name	Description
Idle	Neither reception nor transmission is underway. This is the same status as in the ASTM sending procedure matrix.
Awake	A sending request is received from the opposite side.
Receive Waiting	Waiting for frame reception or the end of sending from the opposite side.
Frame Received	Frame has been received from the opposite side.
Have Data to Send	Waiting for frame reception from the opposite side in order to issue a request for changeover to sending from this side.

(4) Sending Procedure Matrix of ASTM Lower Layer Program

Event Status	Receive *ENQ*	Send Request	Btimer ≠0	Btimer =0	Receive *NAK*	Receive *EOT*	Timeout	Receive *ACK*	No Frame	Frame Ready	Retry>6	Retry<=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 *1				Btimer=1 0 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 Waiting2					Retry++ goto Old Frame	Retry=0 Count++ goto Next Frame *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 *3 Delay=10										

Note 1: "Btimer=20/goto Idle" for host computer. Therefore, priority on transmission right is given to the analyzer. (If a link contention occurs, a wait time of at least 20 seconds is needed for start of sending from the analyzer. As soon as sending is completed, the Idle status returns and Btimer is set to 0. Then, the next sending is allowed from the host computer.)

Note 2: "Send*EOT*, Btimer=15/goto Idle" for host computer. This is also a scheme for giving priority on transmission right to the analyzer.

Note 3: Status still remains "Awake".

Event Name	Description
Receive *ENQ*	Control character ENQ (HEX 05) was received. This corresponds to a sending request from the opposite side.
Send Request	A message sending request was received from the upper layer program.
Btimer≠0	Sending is temporarily stopped by Btimer.
Btimer=0	Sending is allowed.
Receive *NAK*	Control character NAK (HEX 15) was received. This corresponds to a resending request from the opposite side.
Receive *EOT*	Control character EOT (HEX 04) was received. This corresponds to a receiving end request from the opposite side. The analyzer does not accept this request.
Timeout	Timer count-down reached zero.
Receive *ACK*	Control character ACK (HEX 06) was received. This corresponds to a frame normal reception report from the opposite side.
No Frame	There are no frames to be sent (all frames have been sent).
Frame Ready	A frame to be sent is ready.
Retry>6	Retry exceeded 6 times, so resending is no longer allowed.
Retry<=6	Resending is still possible.

Status	Description
Idle	Neither reception nor transmission is underway. This is the same status as in the ASTM sending procedure matrix.
Data to Send	A message sending request is judged from the upper layer program and if sendable, a sending request is issued to the opposite side.
Send Waiting	Waiting for response to a sending request.
Next Frame	The next frame is prepared and sent.

Status	Description
Send Waiting2	Waiting for response to the sent frame.
Old Frame	Resending of a frame is judged.

(5) Communication Error Handling in ASTM Lower Layer Program

Errors to be detected in the ASTM lower layer program are indicated here. Communication errors to be detected in the application layer program are indicated in 2.1.6, and errors to be detected in the ASTM upper layer program are indicated in 2.2.5 (16).

When an error is detected, the corresponding alarm code listed in Table 2-28 is indicated on the alarm window of this analyzer.

Table 2-28 Error Handling in ASTM Lower Layer Program

Alarm code		Description	Communication Block
Main	Sub		
126	1	Line initialization failed on this analyzer.	○
	4	<ENQ> was sent as a sending request from this analyzer, but sending was impossible because of <NAK> response.	×
	5	<ENQ> was sent as a sending request from this analyzer, but the host computer did not reply <ACK> or <NAK> within 15 seconds. Or <NAK> response is exceeding 6 times consecutively. (Link timeout)	○
	6	A text frame was sent with <STX> from this analyzer, but the host computer replied <NAK> because of a reception error. Therefore, the frame was sent again.	×
	7	A text frame was sent with <STX> from this analyzer, but the host computer did not reply <ACK> or <NAK> within 15 seconds.	○
	8	The number of retries exceeded the upper limit 6.	○
	9	<ENQ> was sent as a sending request from this analyzer, but the host computer also issued <ENQ> as a sending request concurrently. (link contention)	×
	11	When this analyzer was in the receiver status, it replied <ACK> or <NAK>, but neither <STX> nor <EOT> was received within 30 seconds. (Reception timeout)	○
	12	A message was received though this analyzer was not ready for reception.	×
	17	In sending of <NAK> due to reception of an abnormal frame, the number of retries exceeded the upper limit 12.	○
	19	Sending of an 8-bit code was attempted under 7-bit transmission setting. An 8-bit code was sent via conversion to "#."	×
	20	Automatic reconnection with the host computer occurred 5 times in succession.	○
	26	Reception from the host computer failed.	×
	25	Communication with Host computer blocked.	○(*)
	209	Communication error occurs and communication line is off.	×

Communication Block ○: Communication stops or does not start.

×: Communication does not stop.

- * In case of RS232C cable error (cable is unplugged or cable failure etc), Host communication block alarm (126-25) occurs. In this case, communication with host computer is blocked once, it tries to connect again. In case of successful connection, analyzer is waiting for next event. (The status becomes "Waiting for next event.") Status "Online" remains unchanged on Communication Setting screen of analyzer.

2.3 Examples of Host Communication Messages

2.3.1 Introduction

This section shows examples of the communication messages to be exchanged between the analyzer and external system (Host computer) according to “Specifications of Application Layer Program Interface for Host Communication” in 2.1 and “Specifications of ASTM Upper/Lower Layer Program Interface for Host Communication” in 2.2.

Special note:

A blank character space (ASCII CODE 0x20) in a message is shown as “□” (used for space).

The following communication message examples may include biochemically unrealistic data in order to contain various settings.

In these examples, the names of the analyzer and external system are written as “LST008AS” and “host”, respectively.

This section uses the following abbreviations.

Sequence No.: S.No

Test selection: TS

2.3.2 Communication Order (Flow of Information Exchanged) on Application Layer

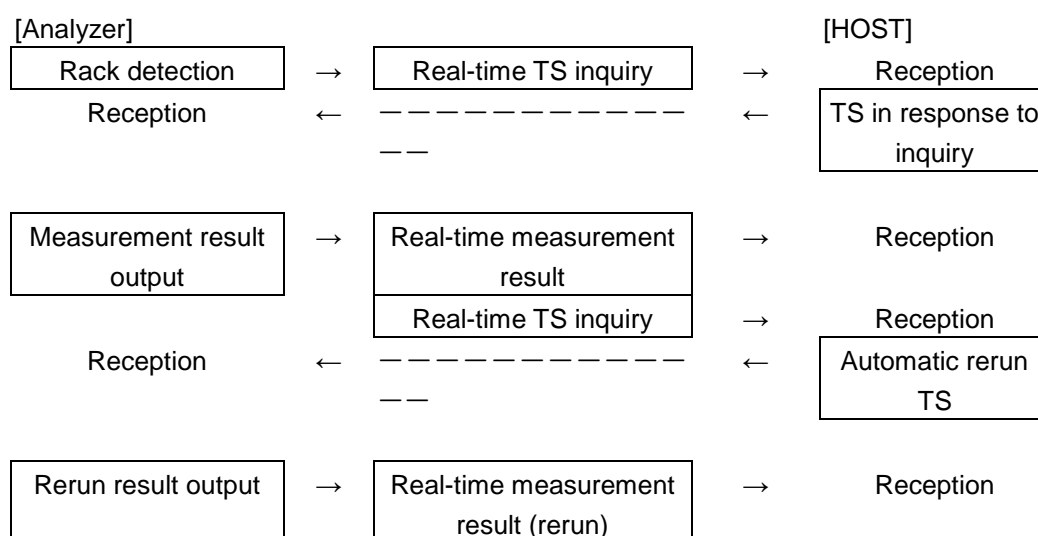
Shown here is a sequential flow of the information items to be exchanged based on the service provided using the host communications defined in “Specifications of Application Layer Program Interface for Host Communication” in 2.1.

(1) Realtime communication

When each trigger shown below occurs during operation, it is automatically sent to the host computer. After sending, the analyzer waits for reception of response information from the host computer till the timeout point (to be set on each operation screen).

This information exchange process is called “real-time communication.” Details are specified in “(1) Communication procedure” in “2.1.2 Real-Time Communication.”

Shown here is the information exchange which focuses on a single sample when test selection information (TS) is inquired, measurement result is sent and automatic rerun is carried out.



(2) Batch Communication

When sending is directed on the operation screen, the information specified in “2.1.3 Batch Communication” will be sent. In this case, the analyzer does not send information automatically due to any trigger nor wait for reception of any response from the host computer within the timeout point unlike the above-mentioned real-time communication. This process is also followed in batch transmission from the host side.

2.3.3 Examples of Communication Messages in ASTM Upper Layer

The information exchange described in "2.3.2 Communication Order on Application Layer" is shown here using example messages on the communication hierarchy which follow descriptions in "2.2.5 ASTM Syntax" of ASTM upper layer program (ASTM1394-91).

(1) Main Communication Messages in Real-time Communication

The communication messages to be exchanged in the aforementioned real-time communication are shown in order. The relevant messages correspond to analysis of a routine sample of sample No. (S.No) 416 in the sample No. (S.No.) mode.

(a) Real-time TS Inquiry (Analyzer → HOST)

```
H|¥^&|||LST008AS^1|||||host|TSREQ^REAL|P|1<CR>
  Q|1|^Thisisasample . . . . . ^416^00002^1^^S1^SC^R1||ALL|||||O<CR>
L|1|N<CR>
```

For this message example, Pos. 1 of the routine rack having rack No. 00002 is used and "Thisisasample" is already input from the screen as the patient ID of the sample at this position. (However, the message is handled as a comment inside the analyzer because of sample No. mode. And, the patient ID is set in 22 characters.)

For Sender Name or ID "LST008AS^1" and Receiver ID "host" in an H record, the character strings "LST008AS" and "host" entered from screen are directly used and sent.

"1" in the Sender Name or ID "LST008^1" stands for a communication program version, which is fixed to "1" for transmission according to the present host interface specifications.

<Details of H record are stipulated in "(4) Message Header Record" of 2.2.5.>

<Details of Q record are stipulated in "(9) Result Information Record" of 2.2.5.>

(b) TS in Response to Inquiry (HOST → analyzer)

This message is a reply to the above-mentioned TS inquiry.

S.No = 416, Rack No. = 00002, Pos = 1, First TS request, Test code = 301 only

```
H|¥^&|||host^1||||LST008AS|TSDWN^REPLY|P|1<CR>
P|1||||M||||48^Y<CR>
O|1| . . . . .
|416^00002^1^^S1^SC|^301^R||20040612150536|||A|||1|||||O<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

S.No = 416, Rack No. = 00002, Pos = 1, First TS request, Test code = 295, 301 and ISE

```
H|¥^&|||host^1||||LST008AS|TSDWN^REPLY|P|1<CR>
P|1||||M||||48^Y<CR>
O|1| . . . . .
|416^00002^1^^S1^SC|^295^¥^^301^¥^^989^¥^^990^¥^^991^R||20040612150536|||
A|||1|||||O<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

On the analyzer side, 4 information items "routine sample," "first run," "serum" and "sequence No. 416" are used in this example for checking if response matches inquiry.

The information used for check varies with mode and sample type. Details are specified in (2) Test Selection information Inquiry (c) Inquiry Key Information of 2.1.2 Realtime Communication.

Information other than used for check can be changed. In this example, the host computer changed patient ID to "" (all blank character spaces) for sending it back.

For order of analysis test, Host code 295,301(photometry) and 989,990,991 (ISE) indicates standard sample volume with test request. Host code except these indicate test not requested by Host.

<Details of O record are stipulated in "(6) Test Order Record" of 2.2.5.>

Sender Name or ID "host^1" and Receiver ID "LST008AS" in an H record can be set freely when they are sent from the host computer.

Note that for "communication program version" in Sender Name or

ID, any of 0 or more character strings is usable on host computer as desired, but a component delimiter "^" is always required in a field.

(c) Real-time Measurement Result Sending (Analyzer → Host)

This is a sending of the measurement result in response to the test selection information in above (b).

S.No = 416, Rack No. = 00002, Pos = 1, First result sending

Test code = 301, Concentration = 2.1, without data alarm,

Operator ID=HITSRV, Pipetting Date and Time=2004/12/29 11:05:22

Lot No. used for analysis: R1=000001, Sequence No. R1=00001

```
H|¥^&|||LST008AS^1|||host|RSUPL^REAL|P|1<CR>
P|1|||M|||48^Y<CR>
O|1| . . . . .
|416^00002^1^^S1^SC|^301^R||20040612150536|||N|||1|||20041229110052|||F<CR>
C|1||comment1 . . . . .^comment2 . . . . .
. . .^comment3 . . . . .^comment4 . . . . .^comment5 . . .|G<CR>
R|1|^301/|2.1|g/L||N||F||HITSRV||P|1|1|0|000001^^|
00001^^<CR>
C|1||0||<CR>
L|1|N<CR>
```

S.No = 416, Rack No. = 00002, Pos = 1, First result sending

Test code = 295, Concentration = 38, without data alarm,

Test code = 301, concentration = -97, data alarm 45 (below lower repeat limit),

Test code = 989, concentration = 13.4, data alarm 44 (above upper repeat limit),

Test code = 990, concentration = 0.46, data alarm 23 (sample value abnormal),

Test code = 991, concentration = 8.2, data alarm 23 (sample value abnormal),

```
H|¥^&|||LST008AS^1|||host|RSUPL^REAL|P|1<CR>
P|1|||M|||48^Y<CR>
O|1| . . . . .
|416^00002^1^^S1^SC|^295^¥^^301^¥^^989^¥^^990^¥^^991^R||20040612150536|||
N|||1|||20041229110052|||F<CR>
C|1||comment1 . . . . .^comment2 . . . . .
. . .^comment3 . . . . .^comment4 . . . . .^comment5 . . .|G<CR>
R|1|^295/|38|g/L||N||F||HITSRV||P|1|1|0|000001^^|00001^^<CR>
C|1||0||<CR>
R|1|^301/|-97|g/L||A||F||HITSRV||P|1|1|0|000001^^|00001^^
<CR>
C|1||45||<CR>
R|1|^989/|13.4|mmol/L||A||F||HITSRV|||SE1|1|^|^<CR>
C|1||0||<CR>
R|1|^990/|0.46|mmol/L||A||F||HITSRV|||SE1|1|^|^<CR>
C|1||23||<CR>
R|1|^991/|8.2|mmol/L||A||F||HITSRV|||SE1|1|^|^<CR>
C|1||23||<CR>
L|1|N<CR>
```


(d) Automatic Rerun TS Registration (HOST →Analyzer)

S.No = 416, Rack No. = 00002, Pos = 1, Auto TS request, Test code = 301

```
H|¥^&|||host^1||||LST008AS|TSDWN^REPLY|P|1<CR>
P|1|||||M|||||48^Y<CR>
O|1| . . . . .
|416^00002^1^^S1^SC^R2|^301^R||20040612150536|||A||||1|||||O<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

(2) Sample Number mode

(a) First Routine Sample TS Inquiry and Response

Refer to (1) in 2.3.4.

(b) Routine Sample Manual Rerun TS Inquiry and Response

1) Real-time TS inquiry (Analyzer → HOST)

(The following message stands for a case where a sample of S.No 1001 is assigned to position 1 on the rerun rack R0020 in S.No mode.)

```
H|¥^&|||LST008AS^1|||host|TSREQ^REAL|P|1<CR>
Q|1|^ . . . . . ^1001^R0020^1^^S1^SC^R2||ALL|||O<CR>
L|1|N<CR>
```

<Details of Q record are stipulated in “(9) Request Information Record” of 2.2.5.>

2) Response to above TS inquiry (HOST → Analyzer)

```
H|¥^&|||host^1|||LST008AS|TSDWN^REPLY|P|1<CR>
P|1|||M|||48^Y<CR>
O|1| . . . . .
|1001^R0020^1^^S1^SC|^602^¥^^1011^dec|R||20000630130531|||A|||1|||O<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

3) Non-assignment of manual rerun rack (Analyzer → HOST)

(The following message stands for a routine serum sample, S.No unassigned, rack R0001 and position 3 in S.No mode.)

```
H|¥^&|||LST008AS^1|||host|TSREQ^REAL|P|1<CR>
Q|1|^ . . . . . ^0^R0001^3^^S1^SC^R2||ALL|||O<CR>
L|1|N<CR>
```

<Details of Q record are stipulated in “(9) Result Information Record” of 2.2.5.>

If a rerun rack number and a position number are not assigned on the screen, the analyzer makes an inquiry in S.No 0.

In this case, S.No can be assigned on the host computer.

4) Response to above TS inquiry (HOST → Analyzer)

(The following message corresponds to a case where S.No 10000 is assigned for the above sample inquiry.)

```
H|¥^&|||host^1|||LST008AS|TSDWN^REPLY|P|1<CR>
P|1|||M|||48^Y<CR>
O|1| . . . . .
|10000^R0001^3^S1^SC|^601^¥^1011^R||20000630130531|||A|||1|||O<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

(c) First STAT Sample TS Inquiry and Response

1) Real-time TS inquiry (Analyzer → HOST)

(The following message stands for STAT sample of serum, S.No: 10, rack E0001 and position 5 in S. No mode.)

```
H|¥^&|||LST008AS^1|||host|TSREQ^REAL|P|1<CR>
Q|1|^ . . . . . ^10^E0001^5^S1^SC^R1||ALL|||O<CR>
L|1|N<CR>
```

<Details of Q record are stipulated in “(9) Result Information Record” of 2.2.5.>

2) Response to above TS inquiry (HOST → Analyzer)

```
H|¥^&|||host^1|||LST008AS|TSDWN^REPLY|P|1<CR>
P|1|||M|||48^Y<CR>
O|1| . . . . .
|10^E0001^5^S1^SC|^601^¥^1011^dec¥^1012^400|S||20000630150835|||A|||1|||O
<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

(d) Measurement Result Sending Request from Host Computer (HOST → Analyzer)

(The following message stands for serum samples of S.No 1234 in S.No mode.)

```
H|¥^&|||host^1|||LST008AS|RSREQ^REAL|P|1<CR>
Q|1|^ . . . . . ^1234^00036^1^S1^SC^R1|ALL|||F<CR>
L|1|N<CR>
```

<Details of Q record are stipulated in “(9) Result Information Record” of 2.2.5.>

(e) Measurement Result Sending from Screen

Refer to (e) in (3) of 2.3.4.

(f) Batch Absorbance Record Sending (Analyzer → HOST)

(The following message stands for the absorbance record of the S.No 1091 measured in test code 601 using the analyzer.)

```
H|¥^&|||LST008AS^1|||host|ABUPL^BATCH|P|1<CR>
P|1|||M|||48^Y<CR>
O|1| . . . . .
|1091^00008^1^^S1^SC|^601^|R||19970909213721|||N|||1|||19970909213721|||F<CR>
C|1||comment1 . . . . .^comment2 . . . . .
. . ^comment3 . . . . .^comment4 . . . . .^comment5 . . |G<CR>
R|1|^601/|102|g/L||N||F||HITSRV||P1|1|0|000001^^000001^|00002^^00002^<CR>
C|1||0|<CR>
M|1|ABS|P1|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<CR>
L|1|N<CR>
```

<Details of M record are stipulated in “(11) Photometric Raw Data (Absorbance) Record” of 2.2.5.>

(g) Batch TS Download

Refer to (g) in (3) of 2.3.3.

(3) Sample ID mode

(a) First Routine Sample TS Inquiry and Response

1) Real-time TS inquiry (Analyzer → HOST)

(The following message stands for a sample ID mode of serum ID0000004027.)

ID = 0000004027, Rack No. = 00008, Pos = 5, First TS inquiry

```
H|¥^&|||LST008AS^1|||host|TSREQ^REAL|P|1<CR>
Q|1|^ . . . . . 0000004027^0^00008^5^^S1^SC^R1||ALL|||O<CR>
L|1|N<CR>
```

<Details of Q record are stipulated in "(9) Result Information Record" of 2.2.5.>

2) Response to above TS inquiry (HOST → Analyzer)

ID = 0000004027, Rack No. = 00008, Pos = 5, first TS request, Test code = 295 only

```
H|¥^&|||host^1|||LST008AS|TSDWN^REPLY|P|1<CR>
P|1|||M|||25^Y<CR>
O|1| . . . . .
0000004027|0^00008^5^^S1^SC|^295^|R||20040612150536||A||1|||O<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

<Details of O record are stipulated in "(6) Test Order Record" of 2.2.5.>

3) Barcode read error sample inquiry mode (Analyzer → HOST)

(The following message corresponds to a case where sample is a routine serum sample, ID is not assigned, rack No. is 00001 and position No. is 5 in ID mode.)

```
H|¥^&|||LST008AS^1|||host|TSREQ^REAL|P|1<CR>
P|1|||M|||48^Y<CR>
Q|1|^*****^0^00001^5^^S1^SC^R1||ALL|||O<CR>
L|1|N<CR>
```

<Details of Q record are stipulated in "(9) Result Information Record" of 2.2.5.>

If rack number and position number are not assigned to a barcode read error sample beforehand from the screen, the analyzer inquires the numbers with ID: *****

(22 asterisks in ID22 character mode). ID can be assigned on the host computer.

4) Response to above TS inquiry (HOST → Analyzer)

(The following message corresponds to a case where ID1234567890123 is assigned for the above-mentioned sample inquiry.)

```
H|¥^&|||host^1||||LST008AS|TSDWN^REPLY|P|1<CR>
P|1||||M||||48^Y<CR>
O|1| . . . . .
1234567890123|0^00001^1^^S1^SC|^601^¥^^1011^dec¥1012^400|R||2000063013123
6||A||1||||O<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

(b) Routine Sample Manual Rerun TS Inquiry and Response

Refer to (b) in (2) of 2.3.3.

(c) First STAT Sample TS Inquiry and Response

Refer to (c) in (2) of 2.3.3.

(d) Measurement Result Sending Request from Host

Refer to (d) in (2) of 2.3.3.

(e) Measurement Result Sending from Screen (Analyzer → HOST)

(The following message corresponds to a case where a measurement result sending of ID36 is specified from the screen and “Edited data” alarm (42) is attached to Test code 601.)

Operator ID=HITSRV, Pipetting Date and Time=2000/06/30 15:20:08

Lot No. of reagent used for analysis R1=000001, R3=000001

Sequence No. R1=00002, R3=00002

```
H|¥^&|||LST008AS^1||||host|RSUPL^BATCH|P|1<CR>
P|1||||M||||48^Y<CR>
O|1| . . . . .
36|0^00113^1^^S1^SC|^601^R||20000630150536||||1||||20000630151732||F<CR>
C|1||comment1 . . . . .^comment2 . . . . .
. . . ^comment3 . . . . .^comment4 . . . . .^comment5 . . |G<CR>
R|1|^601/|9.30|g/L|A|F||HITSRV|20000630152008|P|1|1||0|000001^^000001^|00002^
^00002^<CR>
C|1||42||<CR>
L|1|N<CR>
```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

<Details of R record are stipulated in “(7) Result Record” of 2.2.5.>

<Details of C record are stipulated in “(8) Comment Record” of 2.2.5.>

(f) Batch Photometric Raw Data Sending

Refer to (f) in (2) of 2.3.3.

(g) Batch TS Download

1) First routine sample batch TS download (HOST → Analyzer)

(The following message stands for ID 462 and rack No. 00001.)

```

H|¥^&||||host^1||||LST008AS|TSDWN^BATCH|P|1<CR>
P|1|||||M||||48^Y<CR>
O|1| . . . . .
462|0^00001^1^^S1^SC|^^^601^dec¥^^^611^inc¥^^^612^R||20040612150542||||A||||1|||||O<CR>
C|1||Comment1^Comment2^Comment3^Comment4^Comment5|G<CR>
L|1|N<CR>

```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

(4) Quality Control Samples

(a) Real-Time Sending of ISE Control Sample Measurement Result (Analyzer → HOST)

Control No. = 3, Sequence No. = 18, Rack No. = C0011, Pos = 3,

Test code of ISE tests = 989, 990, 991

Operator ID=HITSRV, Pipetting Date and Time=2000/06/30 10:35:15 AM

```

H|¥^&|||LST008AS^1|||host|RSUPL^REAL|P|1<CR>
P|1|||U|||<CR>
O|1|ISECNT . . . . .
|3018^C0011^3^QC^SC|^989^¥^990^¥^991^||||Q|||SC|||20041227103307|||F<CR>
C|1||^G<CR>
R|1|^989/|239.7|mmol/L||N|||HITSRV|20041227103515||SE2|1|^|^<CR>
C|1||0|<CR>
R|1|^990/|8.37|mmol/L||N|||HITSRV|20041227103515||SE2|1|^|^<CR>
C|1||0|<CR>
R|1|^991/|2.3|mmol/L||A|||HITSRV|20041227103515||SE2|1|^|^<CR>
C|1||23|<CR>
L|1|N<CR>

```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

<Details of R record are stipulated in “(7) Result Record” of 2.2.5.>

<Details of C record are stipulated in “(8) Comment Record” of 2.2.5.>

(b) Real-time Sending of Photometric Control Sample Measurement Result (Analyzer → HOST)

{The following message corresponds to a control sample named cont01 of control No. 5 and sequence No. 17 (5 × 1000 + 17 = 5017)}.

Control No. = 5, Sequence No. = 17, Rack No. = C0001, Pos = 1, Test code of photometric test = 295

Operator ID=HITSRV, Pipetting Date and Time=2004/12/27 10:35:15

Lot No. of reagents used for analysis (in use): R1=000001, R3=000001

Sequence No. R1=00002、R3=00002

```

H|¥^&|||LST008AS^1|||host|RSUPL^REAL|P|1<CR>
P|1|||U|||<CR>
O|1|cont01 . . . . .
|5017^C0001^1^QC^SC|^295^||||Q|||1|||20041227103309|||F<CR>
C|1||^G<CR>
R|1|^295/|113|g/L||N|||HITSRV|20041227103515||P1|1|O|000001^00000
1^|00002^00002^<CR>
C|1||O|<CR>
L|1|N<CR>

```

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

<Details of R record are stipulated in “(7) Result Record” of 2.2.5.>

<Details of C record are stipulated in “(8) Comment Record” of 2.2.5.>

(c) Sending of Photometric Control Sample Raw Data (Analyzer→HOST)

(The following message corresponds to a control sample named cont001 of control No. 1 and sequence

No. 1 (1 × 1000 + 1 = 1001) and the raw data of test code 602.)

Operator ID=HITSRV, Pipetting Date and Time=2000/05/20 01:32:20

Lot No. of reagents used for analysis (in use): R1=000001, R3=000001

Sequence No. R1=00002、R3=00002

```
H|¥^&|||LST008AS^1|||||host|ABUPL^BATCH|P|1<CR>
P|1|||||U|||||^<CR>
O|1|cont001 . . . . .|1001^C0001^1^^QC^SC|^602^|||||Q||||1|||||20000520013008|||F<CR>
C|1||^|^|^G<CR>
R|1|^602/|31.2|g/L||N||||HITSRV|20000520013220||P1|1|0|000001^^000001|00002^^0000
2^<CR>
C|1|||0||<CR>
M|1|ABS|P1|1||3|11|-3559¥-3560¥-3560¥0|249¥247¥242¥241¥242¥254¥248¥242
¥235¥214¥229<CR>
L|1|N<CR>
```

<Details of M record are stipulated in “(11) Absorbance Record” of 2.2.5.>

(5) Calibrator

(a) Sending of Photometric Standard Solution Measurement Result

1) Example 1 (Analyzer → HOST)

(The following message stands for use of STD1 and STD3 alone in 2-point measurement.)

```
H|¥^&|||LST008AS^1||||host|PCUPL^REAL|P|1<CR>
M|1|PCR|HITSRV|^~^602|P|0|0|33^2428^268^1310^^¥~~~~¥77^2474^172^1331^^¥~~~~¥~~~~
¥~~~~|000001^^000001^|00002^^00002^|0|00000001^^00000003^^|20120807100315<CR>
L|1|N<CR>
```

<Details of M record are stipulated in “(13) Photometric Calibration Result Record” of 2.2.5.>

2) Example 2 (Analyzer → HOST)

(The following message stands for STD3 alone in span-point measurement.)

```
H|¥^&|||LST008AS^1||||host|PCUPL^REAL|P|1<CR>
M|1|PCR| HITSRV |^602|P1|0|0|^~~~~¥~~~~¥77^2474^172^1331^^¥
~~~~¥~~~~¥~~~~|000001^^000001^|00002^^00002^|0|^00000003^^^|20120807100315<CR>
L|1|N<CR>
```

<Details of M record are stipulated in “(13) Photometric Calibration Result Record” of 2.2.5.>

(b) Sending of ISE Calibration Measurement Result (Analyzer → HOST)

```
H|¥^&|||LST008AS^1||||host||ICUPL^REAL|P|1<CR>
M|1||CR|
|ISE11|14|14|14|19^^19^20^22^16^|19^^19^20^22^16^|19^^19^20^22^16^|-324^-324^-3
24^-324^^21474^-21474|-324^-324^-324^-324^^21474^-21474|-324^-324^-324^-32
4^^21474^-21474|A<CR>
L|1|N<CR>
```

<Details of M record are stipulated in “(13) ISE Calibration Result Record” of 2.2.5.>

(6) Others

Shown here are examples of special communication messages.

In some messages, a section on which attention should be focused is indicated in **bold characters**.

(a) TS Inquiry Cancel Request

The analyzer sends the following message for canceling its inquiry due to timeout, etc.

When "A" is specified in Request Information Status Codes of Q record, the request will be canceled.

S.No = 416, Rack No. = 00002, Pos = 1, first TS inquiry cancel

```
H|¥^&|||LST008AS^1|||host|TSREQ^REAL|P|1<CR>
Q|1|^ . . . . . ^416^00002^1^^S1^R1||ALL|||A<CR>
L|1|N<CR>
```

<Details of Q record are stipulated in "(9) Request Information Record" of 2.2.5.>

Because the above message is the cancellation of a request, there is no need for a reply.

However, after the cancellation, the host side is allowed to send a TS to the analyzer via a batch TS transmission.

(b) Other Escape Sequence Sequences

Batch sending of measurement result (Analyzer → HOST)

(The following message stands for a sample ID mode of ID|¥&/.)

```
H|¥^&|||LST008AS^1|||host|RSUPL^BATCH|P|1<CR>
P|1|||M|||48^Y<CR>
O|1| . . . . .
&F&&S&&R&&E&/|0^00113^1^^S1^SC|^601^R||20000630150536|||N|||1|||20000630151
732||F<CR>
C|1||comment1 . . . . . ^comment2 . . . . .
. . . ^comment3 . . . . . ^comment4 . . . . . ^comment5 . . |G<CR>
R|1|^601/|2.00|g/L|N||F||HITSRV||P|1|000001^^000001^|00002^^00002^<CR>
C|1||0||<CR>
L|1|N<CR>
```

<Details of O record are stipulated in "(6) Test Order Record" of 7.3.6.>

<Details of R record are stipulated in "(7) Result Record" of 7.3.6.>

<Details of C record are stipulated in "(8) Comment Record" of 7.3.6.>

(c) Response without Test request (HOST-->Analyzer)

(The following message corresponds to a case where there are no tests requested from the host computer.)

```
H|¥^&|||host^1||||LST008AS|TSDWN^REPLY|P|1<CR>
P|1|||||M||||48^Y<CR>
O|1| . . . . .
1234567890123|0^00001^1^^S1^SC||R||20000630131236||||N||||1|||||O<CR>
C|1||comment1^comment2^comment3^comment4^comment5|G<CR>
L|1|N<CR>
```

The Universal Test ID field in (5) of O record must be a null value.

<Details of O record are stipulated in “(6) Test Order Record” of 2.2.5.>

2.3.4 Examples of Communication Messages in ASTM Lower Layer

The communication messages with the ASTM upper layer program in 2.2 are shown here using example messages on the communication hierarchy which follows the ASTM lower layer program (ASTM1381-91), namely the provisions in "ASTM lower layer program" in 2.2.5. Examples of the actual messages to be exchanged through divisions in 240 characters according to the above protocol are directly shown with ENQ, ACK, EOT, etc. attached. Checksum and the number of characters per frame are exactly expressed.

(1) Real-time TS Inquiry and Response (normal)

(The following messages are examples of normal communications corresponding to 2.3.4 where serum sample number is 416 in the S.No mode.)

(*1) Communicating direction code S stands for the direction from the LBS008AS (LABOSPECT 008 AS) to host computer, while R stands for the direction from the host computer to LBS008AS (LABOSPECT 008 AS).

Table 2-29 Examples of Communication Messages

1	2004/08/29	11:34:05	S(*1)	<ENQ>
2	2004/08/29	11:34:06	R	<ACK>
3	2004/08/29	11:34:06	S	<STX>1H ¥^& LST008AS^1 host TSREQ^REAL P 1<CR> Q 1 ^~^416^50002^1^~S1^SC^R1 ALL O<CR> L 1 N<CR>ETX>25<CR>LF>
4	2004/08/29	11:34:06	R	<ACK>
5	2004/08/29	11:34:07	S	<EOT>
6	2004/08/29	11:34:08	R	<ENQ>
7	2004/08/29	11:34:08	S	<ACK>
8	2004/08/29	11:34:09	R	<STX>1H ¥^& host_COMPUTER LST008AS TSDWN^REPLY P 1<CR> P 1 M 23^Y<CR> O 1 416^50002^1^~S1^SC ^~301^ R 2004061 2150536 A 1 O<CR>C 1 comment1^comment2^comment3^com ment4^comment5 G<CR> L 1 N<CR>ETX>CE<CR>LF>
9	2004/08/29	11:34:09	S	<ACK>
10	2004/08/29	11:34:09	R	<EOT>

- (2) When the Host Computer is not Ready for Reception (normal)
 (The following messages are examples of sending <NAK> as a reply to <ENQ> because the host computer is not ready for reception.)

1	2004/08/29	13:37:23	S	<ENQ>
2	2004/08/29	13:37:23	R	<NAK>
3	2004/08/29	13:37:33	S	<ENQ>
4	2004/08/29	13:37:33	R	<ACK>
5	2004/08/29	13:37:33	S	<STX>1H ¥~& LST008AS^1 host TSREQ^REAL P 1<CR> Q 1 ^~^416^50002^1^^S1^SC^R1 ALL O<CR> L 1 N<CR>XETX>25<CR>XLF>
6	2004/08/29	13:37:33	R	<ACK>
7	2004/08/29	13:37:33	S	<EOT>

1st row: The analyzer sent <ENQ> to the host computer.

2nd row: The host computer usually responds with <ACK>, but sent back <NAK> because it was not ready for reception.

3rd row: Because the analyzer received <NAK> from the host computer, it resent <ENQ> after 10 seconds.

4th row: Because the host computer has been ready for reception, it responded with <ACK>.

5th row onward: The analyzer made TS inquiry.

(3) Link Contention (normal)

(The following messages are examples in case a link contention occurred.)

(Reference should also be made to those messages as an example of the selective usage of <ETB> and <ETX> in case of multiple frames (a sent text longer than 240 characters) or as message examples when frame No. exceeds 7.)

1	2004/09/03	22:58:38	S	<ENQ>
2	2004/09/03	22:58:38	R	<ACK>
3	2004/09/03	22:58:38	S	<STX>1H ¥^& LST008AS^1 host TSREQ^REAL P 1<CR> Q 1 ^~^416^50002^1^~S1^SC^R1 ALL O<CR> L 1 N<CR>×ETX>25<CR>×LF>
4	2004/09/03	22:58:38	R	<ACK>
5	2004/09/03	22:58:38	S	<EOT>
6	2004/09/03	22:58:40	S	<ENQ>
7	2004/09/03	22:58:40	R	<ENQ>
8	2004/09/03	22:58:41	S	<ENQ>
9	2004/09/03	22:58:41	R	<ACK>
10	2004/09/03	22:58:41	S	<STX>1H ¥^& LST008AS^1 host RSUPL^REAL P 1<CR> P 1 M 23^Y<CR> O 1 9900129600122701225012 0^50051^3^~S1^SC ^~81^¥^~1^¥ ~2^¥^~3^¥^~4^¥^~5^¥^~6^¥^~7^¥^~21^¥^~22^¥^~23^¥^~24^¥ ~26^¥^~27^¥^~31^¥^~41^¥^~42^¥^~43^¥^~44^¥^~45^¥^~46^¥ ~9^¥^~32^¥^~33^¥^~<ETB>FE<CR>×LF>
11	2004/09/03	22:58:42	R	<ACK>
12	2004/09/03	22:58:42	S	<STX>2^34¥^~35¥^~36¥^~37¥^~8¥^~56¥^~989¥^~990¥^~ ^991^ R 1 20041103205148 F<CR>C 1 ^ ^ ^ ^ G<CR> R 1 ^~81^/1.72 mg/ N <ETB>99<CR>×LF>
13	2004/09/03	22:58:42	R	<ACK>
14	2004/09/03	22:58:42	S	<STX>3F P1<CR> C 1 O <CR> R 2 ^~1^/86 U/ N F P1<CR> C 1 O <CR> R 3 ^~2^/97 U/ N F P1<CR> C 1 O <CR> R 4 ^~3^/277 U/ N F P1<CR> C 1 O <CR> R 5 ^~4^/596 U/ N F P1<CR> C 1 O <CR> R 6 ^~5^/136 U/ N F P1<CR> C 1 O <CR> R 7 ^~6^/17<ETB>BC<CR>×LF>
15	2004/09/03	22:58:43	R	<ACK>
16	2004/09/03	22:58:43	S	<STX>40 U/ N F P1<CR> C 1 O <CR>

			R 8 7/310 U/1 N F P1<CR>
			C 1 O <CR>
			R 9 21/31.2 mg/d N F P1<CR>
			C 1 O <CR>
			R 10 22/3.62 mg/d N F P1<CR>
			C 1 O <CR>
			R 11 23/6.3 mg/d N F P1<CR>
			C 1 O <CR>
			R 12 24/7.1 g/d N F <ETB>08<CR>×LF>
17	2004/09/03	22:58:43	R <ACK>
18	2004/09/03	22:58:43	S <STX>5 P1<CR>
			C 1 O <CR>
			R 13 26/0.00 mg/1 LL F P1<CR>
			C 1 27 <CR>
			R 14 27/-0.03 mg/1 LL F P1<CR>
			C 1 27 <CR>
			R 15 31/160 mg/d N F P1<CR>
			C 1 O <CR>
			R 16 41/181 ug/d N F P1<CR>
			C 1 O <CR>
			R 17 42/173 ug/d N F P1<ETB>94<CR>×LF>
19	2004/09/03	22:58:44	R <ACK>
20	2004/09/03	22:58:44	S <STX>6<CR>
			C 1 O <CR>
			R 18 43/12.9 mg/d N F P1<CR>
			C 1 O <CR>
			R 19 44/6.7 mg/d N F P1<CR>
			C 1 O <CR>
			R 20 45/3.3 mg/d N F P1<CR>
			C 1 O <CR>
			R 21 46/110 ug/d N F P1<CR>
			C 1 O <CR>
			R 22 9/161 U/1 N F P1<CR>
			C 1 O <CR>
			R<ETB>09<CR>×LF>
21	2004/09/03	22:58:45	R <ACK>
22	2004/09/03	22:58:45	S <STX>7 23 32/92 mg/d N F P1<CR>
			C 1 O <CR>
			R 24 33/39 mg/d N F P1<CR>
			C 1 O <CR>
			R 25 34/176 mg/d N F P1<CR>
			C 1 O <CR>
			R 26 35/1100 mEq/1 N F P1<CR>
			C 1 O <CR>
			R 27 36/399 mg/d N F P1<CR>
			C 1 O <CR>

			R	R 28 37/ 2.1 % N <ETB>27<CR>LF>
23	2004/09/03	22:58:45	R	<ACK>
24	2004/09/03	22:58:45	S	<STX>0F P1<CR>
				C 1 O <CR>
			R	R 29 8/ 250 g/ N F P1<CR>
				C 1 O <CR>
			R	R 30 56/ 64.9 mg/d N F P1<CR>
				C 1 O <CR>
			R	R 31 989/ 148.9 mmol/ N F SE1<CR>
				C 1 O <CR>
			R	R 32 990/ 5.53 mmol/ N F SE1<CR>
				C 1 O <CR>
			R	R 33 991/ 108.9 mmol/ N F SE<ETB>33<CR>LF>
25	2004/09/03	22:58:46	R	<ACK>
26	2004/09/03	22:58:46	S	<STX>11<CR>
				C 1 O <CR>
				L 1 N<CR>ETX>75<CR>LF>
27	2004/09/03	22:58:46	R	<ACK>
28	2004/09/03	22:58:46	S	<EOT>
29	2004/09/03	22:58:46	R	<ENQ>
30	2004/09/03	22:58:46	S	<ACK>
31	2004/09/03	22:58:46	R	<STX>1H ¥^& host_COMPUTER LST008AS TSDWN^REPLY P 1<CR>
				P 1 M 23^Y<CR>
				O 1 416^50002^1^S1^SC ^301^R 20040612
				150536 A O<CR>C 1 comment1^comment2^comment3^comment4^comment5 G<CR>
				L 1 N<CR>ETX>CE<CR>LF>
32	2004/09/03	22:58:47	S	<ACK>
33	2004/09/03	22:58:48	R	<EOT>

Up to 5th row:

TS inquiry has been made normally.

6th and 7th rows:

A link contention has occurred.

8th row:

The analyzer waited 1 second and then resent <ENQ>.

Measurement results are now sent in real time.

Up to 28th row:

Measurement results have been sent normally in real time.

29th row onward:

With regard to the sample inquired up to the 5th row, the host computer has

sent a test selection request.

12/14/16th rows etc:

<ETB> is used because of intermediate frames.

3rd, 26th and 31st rows:

<ETX> is used because of the final frame.

24th row:

Frame No. is set to 0 because the number of frames exceeded 7.

26th row:

Frame No. has returned to 1.

(4) Link Timeout (abnormal)

(The following messages are examples to be exchanged when <ENQ> was sent, but link timeout has occurred because <ACK>, <NAK> or <ENQ> was not replied.)(Timeout always occurs at 15 seconds.)

In this waiting status, any code other than the above three, e.g., <STX> will be ignored though received.

1	2004/08/29	14:35:05	S	<ENQ>
2	2004/08/29	14:35:20	S	<EOT>

(5) Sum Error (abnormal)

(The following messages correspond to a case where <NAK> was replied due to the abnormal sum value of the received frame and a retry was made.)

1	2004/08/29	14:44:08	R	<ENQ>
2	2004/08/29	14:44:08	S	<ACK>
3	2004/08/29	14:44:08	R	<STX>1H ¥^& host^1 LST008AS TSDWN^BATCH P 1<CR> O 1 287^50236^1^^S1^SC ^1^¥^^5^ R 200406 12150536 A 1 O<CR>C 1 ^ ^ G<CR> L 1 N<CR>XETX>00<CR>LF>
4	2004/08/29	14:44:09	S	<NAK>
5	2004/08/29	14:44:09	R	<STX>1H ¥^& host^1 LST008AS TSDWN^BATCH P 1<CR> P 1 M 23^Y<CR> O 1 287^50236^1^^S1^SC ^1^¥^^5^ R 200406 12150536 A 1 O<CR>C 1 ^ ^ G<CR> L 1 N<CR>XETX>5C<CR>LF>
6	2004/08/29	14:44:09	S	<ACK>
7	2004/08/29	14:44:09	R	<EOT>

4th row: The analyzer answers <NAK> due to abnormal Sum value of frame received at 3rd row (00 in the above messages).

5th row onward: Host resend message of normal sum value and it processed normally

(6) Protocol Violation (abnormal)

(The messages shown below correspond to the following case. TS download was attempted, but it caused violation due to lack of <STX>.

Though <NAK> was answered, no retry was made.)

1	2004/08/29	15:13:18	R	<ENQ>
2	2004/08/29	15:13:18	S	<ACK>
3	2004/08/29	15:13:18	R	1H ¥^& host^1 LST008AS TSDWN^BATCH P 1<CR> O 1 281^50231^1^^S1^SC ^1^¥^^5^ R 200406 12150536 A 1 O<CR>C 1 ^ ^ G<CR> L 1 N<CR>XETX>92<CR>LF>
4	2004/08/29	15:13:18	S	<NAK>
5	2004/08/29	15:13:48	S	<EOT>

- 4th row: The analyzer an abnormal frame, which is not headed by <STX>, on the 3rd row, so it answered <NAK>.
- 5th row: The analyzer waited for a retry from the host computer (timeout always occurs at 30 seconds), but sent <EOT> because no retry was made.

End of document