
Boehringer Mannheim GmbH
BM/HITACHI 917 Automatic Analyzer
Host Interface Manual

System Interface - Functional Specifications

Including features of the BM/Hitachi 917 Version 2
and Appendix for BM/Hitachi 917 Rack Version

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1. Introduction

This manual provides the specifications for bidirectional data transmission between an **HITACHI Model 917 Automatic Analyzer** by Boehringer Mannheim GmbH and an external laboratory host system via asynchronous serial connection. The hardware components required as well as the communication rules are described. They highlight the general considerations to be taken into account in any approach to realize the data communication between different computer systems.

This specification illustrates the fundamental considerations for the host link and contains information concerning the following:

- Hardware
 - What interface hardware is required?
 - How is the physical connection established?
- Use and control of the data transmission
 - How to set the transfer and communication parameters?
 - What is the formal structure of the strings and values to be transmitted and what influence can be taken on it?
 - What kind of data or variables can be transmitted?
 - How and by which system is the data transfer initiated?
- Software protocol
 - What does the transmission protocol used for communication between the two systems look like?
 - What does the host at the other end of the data link do and what rules has the program at the host link to follow?

Working with the host interface you will find that the data transfer from the host computer to the **HITACHI Model 917 Automatic Analyzer** can be done in a very easy, comfortable and reliable way.

If problems with the installation or questions about the transfer should arise please contact the responsible person of Boehringer Mannheim Service Department or directly the Service Management of the Central Marketing Department of Boehringer Mannheim GmbH (Germany):

**Boehringer Mannheim GmbH
Technical Productmanagement
Data Technique**

**Sandhofer Straße 116
D-68305 Mannheim
Phone: (49) 621 / 759-2464
Telefax: (49) 621 / 759-4591**

Figure 1 gives an general idea of the 917 interface data flow between the analyzer, the control unit (CU) and the host system. More detailed description will be found in this document.

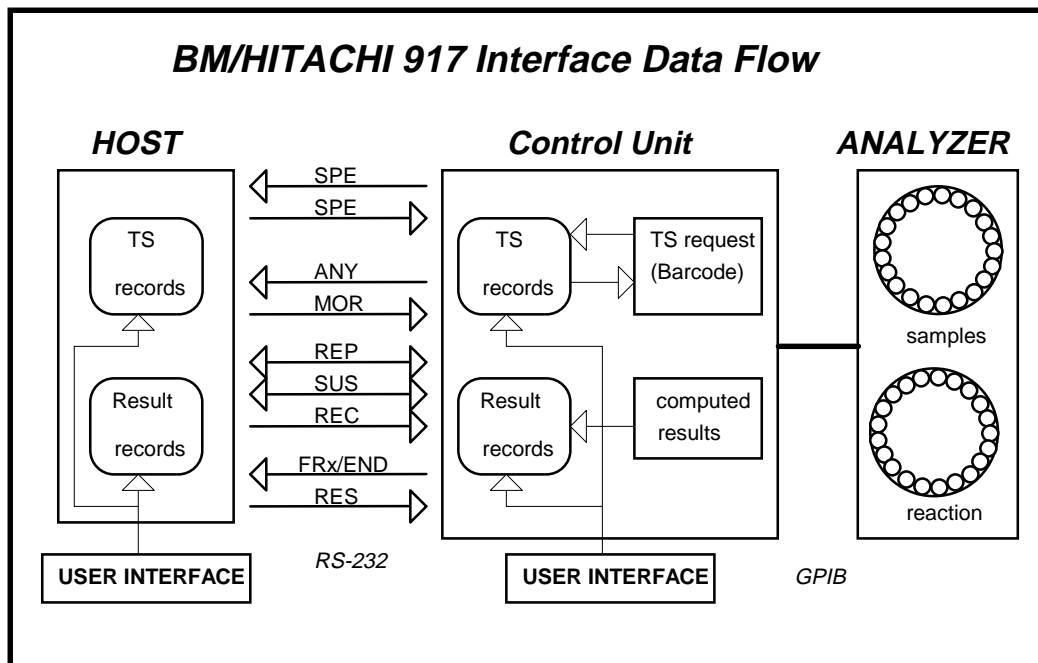


Figure 1: BM/HITACHI 917 Interface data flow

- (1) Realtime test selection request is made for:
 - Routine samples, if the record is not existing or the test selection is zero.
 - Rerun/Autorerun samples, if inquiry is enabled (**HOST SETTING** screen)
 - STAT samples, if inquiry is enabled (**HOST SETTING** screen) and bar code reader is on.
- (2) Realtime result transmission is made for:
 - Routine/STAT/Control samples
 - Calibration data
- (3) Batch result transmission can be initiated either by
 - the host, sending a RES frame
 - the operators request for
 - Routine or STAT results or
 - Control data or
 - Original Absorbance Data

The **HOST SETTING** screen is shown in Figure 4 on page 9.

2. Interface Setup

2.1. Connection Cable

Figure 2 and Figure 3 show two different possibilities to establish the hardware connection. Both can be used.

HIT 917 (DTE) DB 9 female	HOST (DCE) female DB 9	DB 25
Rxd Pin 2	Rxd Pin 2	Pin 3
Txd Pin 3	Txd Pin 3	Pin 2
CTS Pin 8	CTS Pin 8	Pin 5
RTS Pin 7	RTS Pin 7	Pin 4
DSR Pin 6	DTR Pin 4	Pin 20
DCD Pin 1	DCD Pin 1	Pin 8
DTR Pin 4	DSR Pin 6	Pin 6
SG Pin 5	SG Pin 5	Pin 7

Figure 2: Connection with hardware handshake

HIT 917 (DTE) DB 9 female	HOST (DCE) female DB 9	DB 25
Txd Pin 3	Txd Pin 3	Pin 2
Rxd Pin 2	Rxd Pin 2	Pin 3
CTS Pin 8	CTS Pin 8	Pin 5
RTS Pin 7	RTS Pin 7	Pin 4
DTR Pin 4	DTR Pin 4	Pin 20
DSR Pin 6	DSR Pin 6	Pin 6
SG Pin 5	SG Pin 5	Pin 7

Figure 3: Connection without hardware handshake

Connect the cable to the connector '**Serial A**' on the backside of the HP Vectra computer.

2.2. Pin Description

Table 1 shows the pin description of the RS232 serial interface.

Pin no	Signal	Explanation	Direction
3	Txd	Transmit Data	out
2	Rxd	Receive Data	in
7	RTS	Request to Send	out
8	CTS	Clear to Send	in
6	DSR	Data Set Ready	in
1	DCD	Data Carrier Detect	in
4	DTR	Data Terminal Ready	out
5	SG	Signal Ground	-

Table 1: Pin description for the 9-pin plug 'Serial A' of the HP Vectra

2.3. Specification of Communication

The table below shows the communication specifications of the host interface.

Item	Specification	Remarks
Interface	Asynchronous serial interface RS-232C	cable length max. 15m
Communication. method	Half duplex	
Character code	ASCII	
End-of-data code	[ETX] CHSH CHSL [CR]	see Table 20

Table 2: Specification of the host communication

2.4. Setup of Communication Parameters

All settings concerning the host interface are made on the **HOST SETTING** screen.
(menu path: **MAINT/UTILITY** → **SYSTEM** → **Host**)

Stand-by Tue 95/06/13 09:16

To display speed choices:
Touch the Assist Box or press Ctrl+A.

Host Communication

Speed	9600	<input type="button" value="A"/>	T/S Ask Always	Cancel	<input type="button" value="A"/>
Text Size	256	<input type="button" value="A"/>	Auto Rerun T/S	Cancel	<input type="button" value="A"/>
Parity	Even	<input type="button" value="A"/>	Manual Rerun T/S	Cancel	<input type="button" value="A"/>
Data Bits	7 Bits	<input type="button" value="A"/>	Stat T/S	Cancel	<input type="button" value="A"/>
Stop Bits	2 Bits	<input type="button" value="A"/>	Results Only	Cancel	<input type="button" value="A"/>
Instrument ID	1		Stat Results Mode	Cumulative	<input type="button" value="A"/>
Host ID	2		Send Comments	Cancel	<input type="button" value="A"/>
Retry Count	1		Host Priority	Cancel	<input type="button" value="A"/>
Retry Time	2		Communication Cycle	2	
Repeat Count	1		Communication Log	Cancel	<input type="button" value="A"/>

Figure 4: HOST SETTING screen

Serial interface parameters:

- Communication Speed 9600, 4800 baud
- Paritycheck none, odd, even
- Data Bits 7, 8
- Stop Bits 1, 2

HIT 917 specific settings:

- Maximum Text Length 256, 512, 1280 bytes (chapter 4.4.5 and 4.4.6)
- Retry Count 1 to 99 / 0 = unlimited (chapter 5.4)
- Retry Time 1 to 99 seconds (chapter 5.4)
- Repeat Count 1 to 99 / 0 = unlimited (chapter 5.4)
- Communication Cycle 2 to 10 seconds (chapter 5.1)
- Instrument Identification 1 to 9 (chapter 4.3)
- Host Identification 1 to 9 (chapter 4.3)
- Option of sending comments within the result message (chapter 4.4.4 and 4.4.5)
- Option of sending STAT results 'as soon as cooked' (chapter 4.4.5)

Test selection handling:

- 'TS Ask Always' option (chapter 4.4.3)
- 'Host Priority' (chapter 4.4.3)

Optional test selection inquiry for

- Auto Rerun (chapter 6.1)
- Manual Rerun (chapter 6.1)
- STAT (chapter 6.1)

Unidirectional communication mode:

- 'Result Only' mode (chapter 5.5)

Host Communication Trace:

- Option of recording the communication (the log is printed and cleared with the menu option **PRINT → MAINT/UTILITY → SYSTEM COMMUNICATION TRACE**) (chapter 7)

Communication is switched on on **START → PRINT HOST → MODE SET** screen by pressing the **Host Comm [Enable]** button.

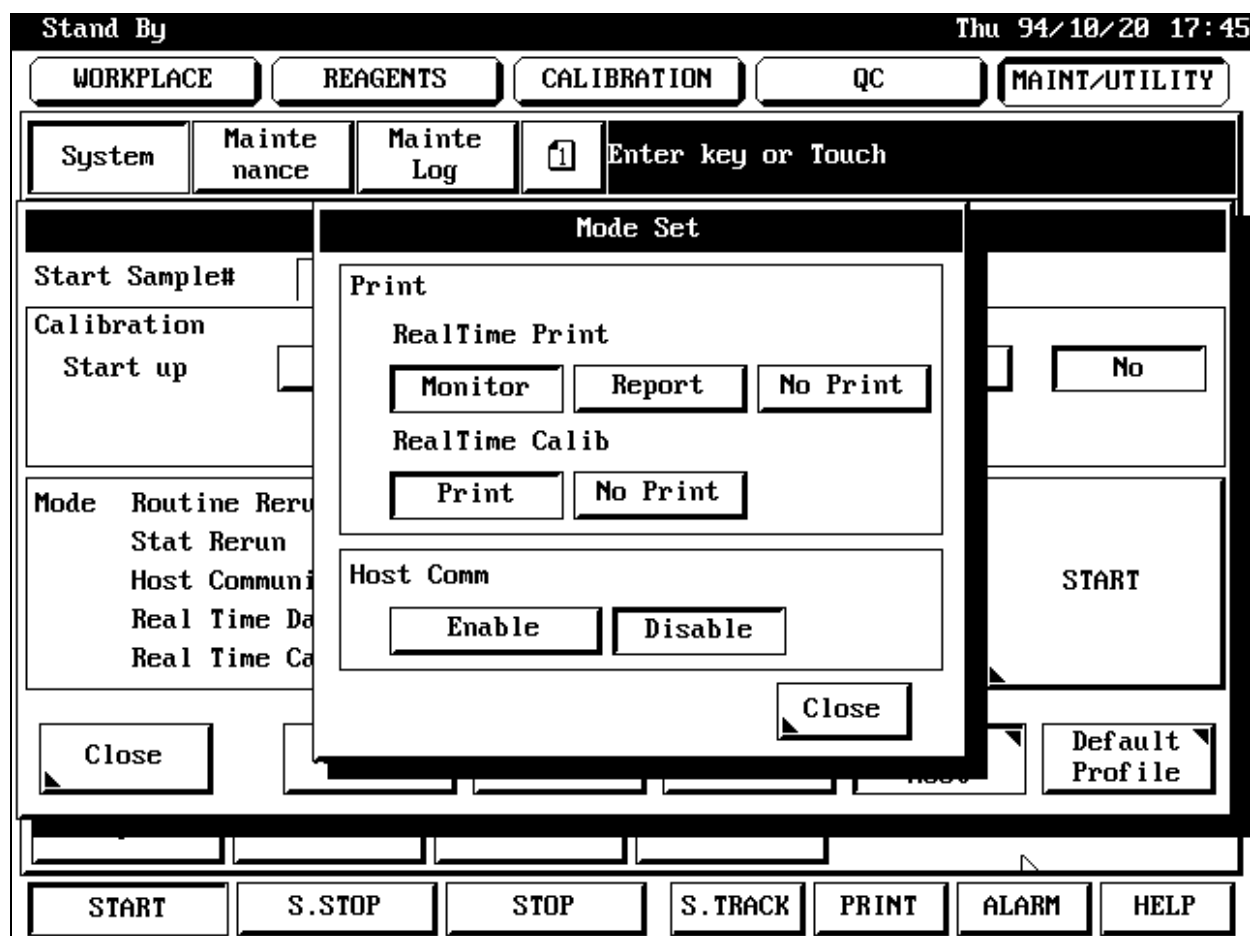


Figure 5: START CONDITIONS screen

3. Basic Workflow

There are two ways of workflow on the BM/HITACHI 917 analyzer with a host connection:

- Test selection download in batch mode before starting the RUN
- Test selection download on request during the RUN. Download means sending information from the host to the analyzer.

Test Selection Download in Batch mode

- ① The operator places the samples on the instrument
- ② The operator initiates the download of all existing test selections from host side
- ③ The operator starts the run

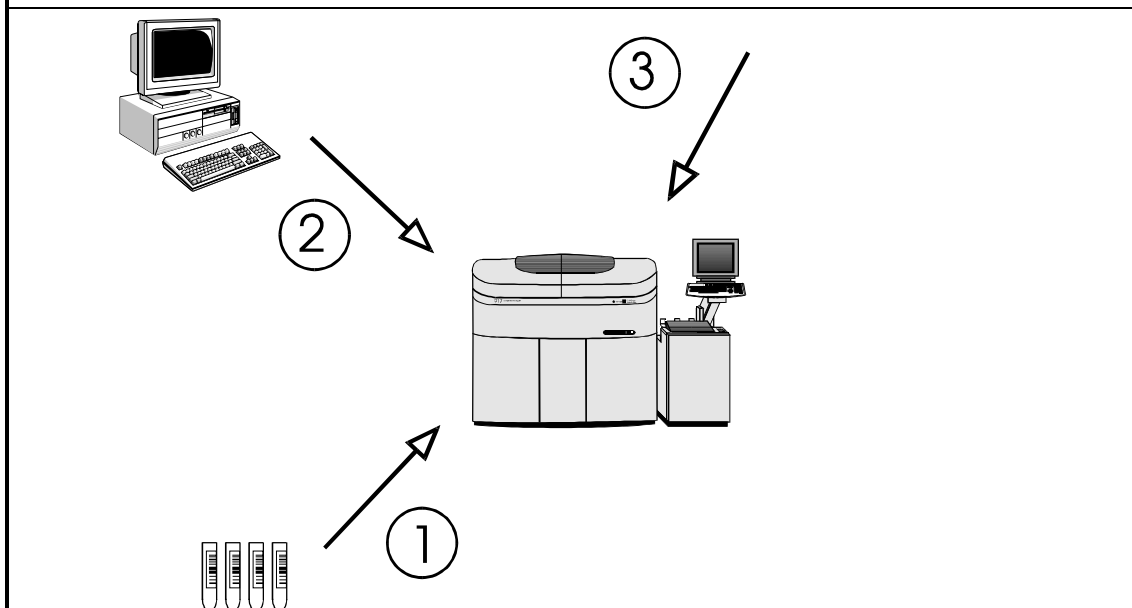
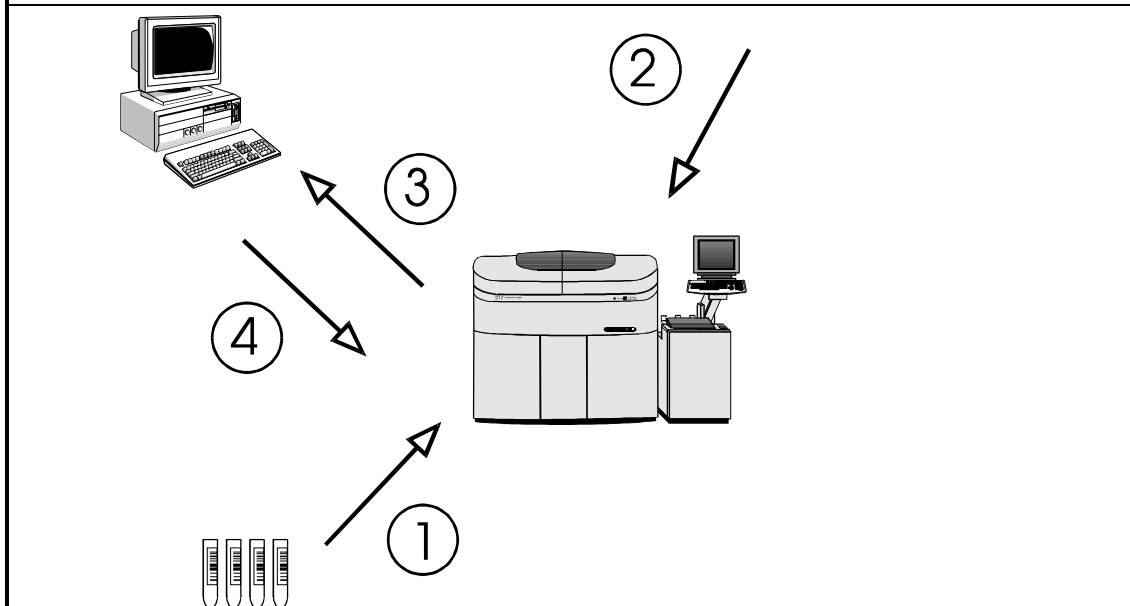


Figure 6: Test selection download in batch mode

Test Selection Download in Realtime mode

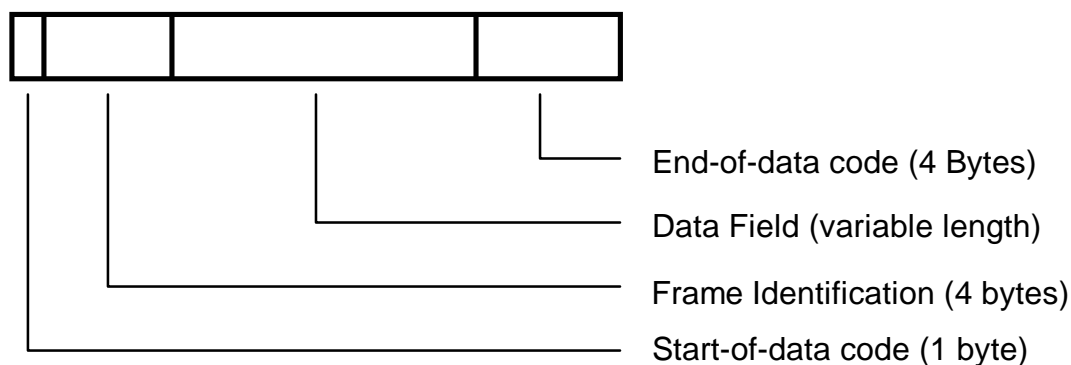
- ① The operator places the samples on the instrument
- ② The operator starts the run
- ③ Upon reading the barcode of each sample the analyzer sends a request for each sample to the host
- ④ The host sends back the corresponding test selection to the analyzer

**Figure 7: Test selection download in realtime mode**

4. Software Protocol

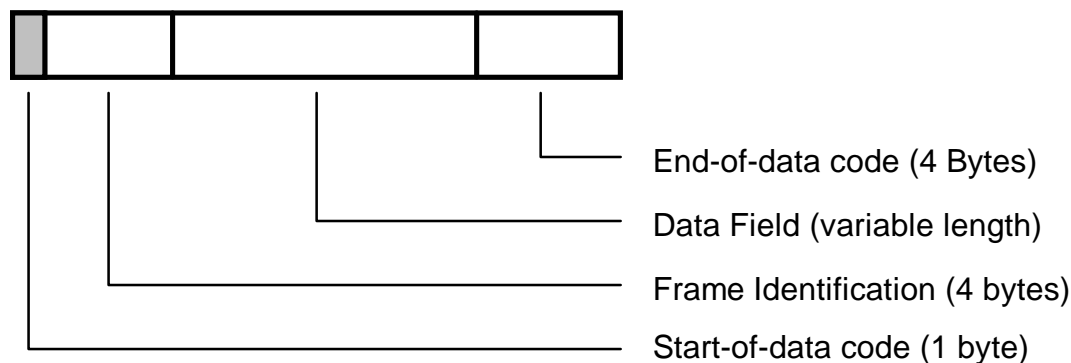
4.1. Common text format

Each message that is sent to the **CU** (control unit) or the **HOST** (laboratory computer system) consists of the following items:



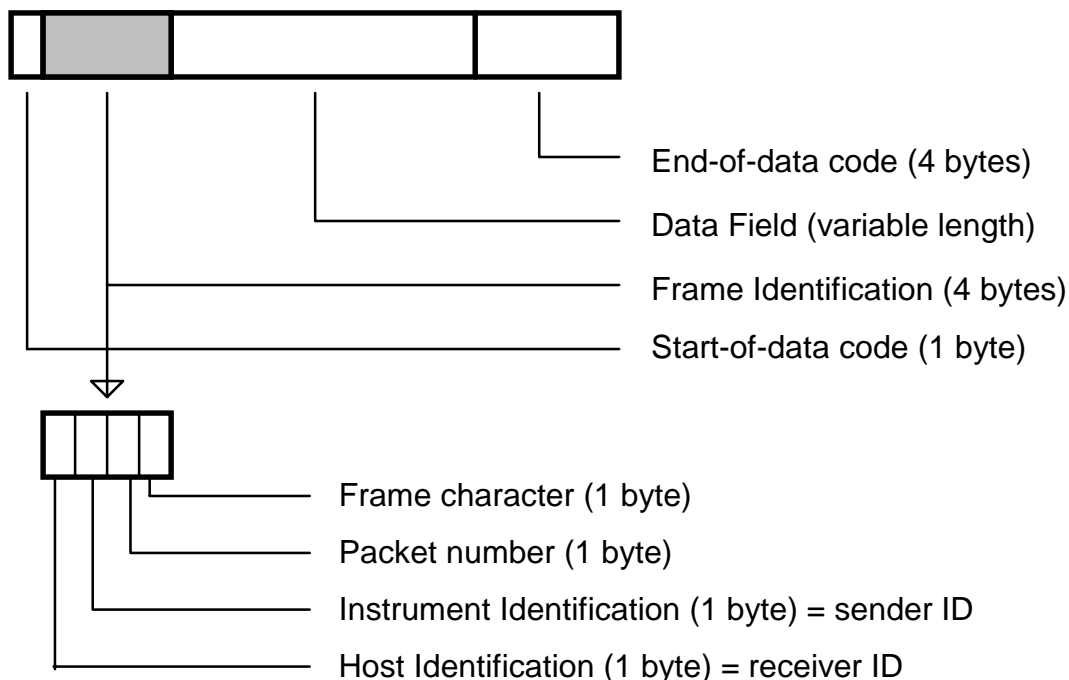
If you have a message without data (control frames **ANY**, **REP** or **MOR**, see Table 4) then the **DATA FIELD** is empty.

4.2. Start-of-data Code



Each message sent from the CU or the host starts with the **START-OF-DATA CODE** (STX = 02H).

4.3. Frame Identification



The frame identification consists of the following four items:

4.3.1. Host Identification

A numeric character ('1' to '9') is selectable on the **HOST SETTING** screen (see Figure 4 on page 9) as host identification. Host is receiver from instruments point of view.

4.3.2. Instrument Identification

A numeric character ('1' to '9') is selectable on the **HOST SETTING** screen (see Figure 4 on page 9) as instrument identification. Instrument is sender from instruments point of view.

NOTE

Sender/ receiver identification must be vice versa from the host side. The 917 ignores sender/ receiver ID.

4.3.3. Packet Number

The packet number is incremented with each packet that is sent to the host (characters '1' to '8' are used). After the frame with the packet number '8' the next frame contains the packet number '1'.

4.3.4. Frame Character

The frame character represents the purpose/ contents of the message.

No	Mnemonic	Name	Char.	ASCII Code	Sender	Note
1	FR1	Frame 1	1	31H	CU	1
2	FR2	Frame 2	2	32H		
3	FR3	Frame 3	3	33H		
4	FR4	Frame 4	4	34H		
5	FR5	Frame 5	5	35H		
6	END	End Frame	:	3AH		2
7	SPE	Specific Sample	;	3BH	CU HOST	3
8	RES	Results Request	<	3CH	HOST	4

Table 3: Frame types having a DATA FIELD

Note 1: The frame characters **FR1** to **FR5** are used, when the analytical data extends over more than one message. **FR1** is used for the first message and **END** for the final message.

Note 2: **END** alone is used when analytical data for one sample can be sent in one single message.

Note 3: The CU uses the frame character **SPE** for the test selection inquiry of only one specific sample.

The host uses **SPE** for the test selection which is being sent in response to the inquiry from the CU.

Note 4: The specific result request **RES** is used to request analytical data of a specific sample from the host to the CU. (Depending on whether the ID is provided or not, only routine and STAT samples are taken as valid. The others are ignored.)

No	Mnemonic	Name	Char.	ASCII Code	Sender	Note
9	ANY	Any inquiry	>	3EH	CU	5
10	MOR	More	>	3EH	HOST	6
11	REP	Repeat	?	3FH	CU, HOST	7
12	SUS	Suspend	@	40H	CU, HOST	8
13	REC	Received	A	41H	HOST	9

Table 4: Frame types having NO DATA FIELD

Note 5: A positive response **ANY** is used by the CU to ask the host for the following items:

- a) a test selection record for any sample that is available by the host.
- b) **RES**, **REC** or **MOR** frame requests.

Note 6: **MOR** means that the host is ready to receive analytical data. (Analytical data can be transferred from the CU to the host only when the host has sent this frame.)

Note 7: A negative response **REP** is used, when resending of the previous communication is requested. The host can send **REP** at any time. The CU, however, sends **REP** only when the response text to **ANY** is destroyed.

Note 8: The Data Bad and Suspend packet (**SUS**) is sent by the host to tell the analyzer that the last packet was bad, and that the host wants a delay before the packet is resent by the CU. The CU then resends the packet after another **ANY/MOR** cycle.

Note 9: With the Data Accepted but Suspend packet (**REC**) the host tells the analyzer that the last packet was okay. (but there is no additional delay in the communication like we know from Hitachi 747)

Frame Priorities

When two or more processings are carried out in response to a request from the host, the CU assigns priorities to them and returns a response to the host.

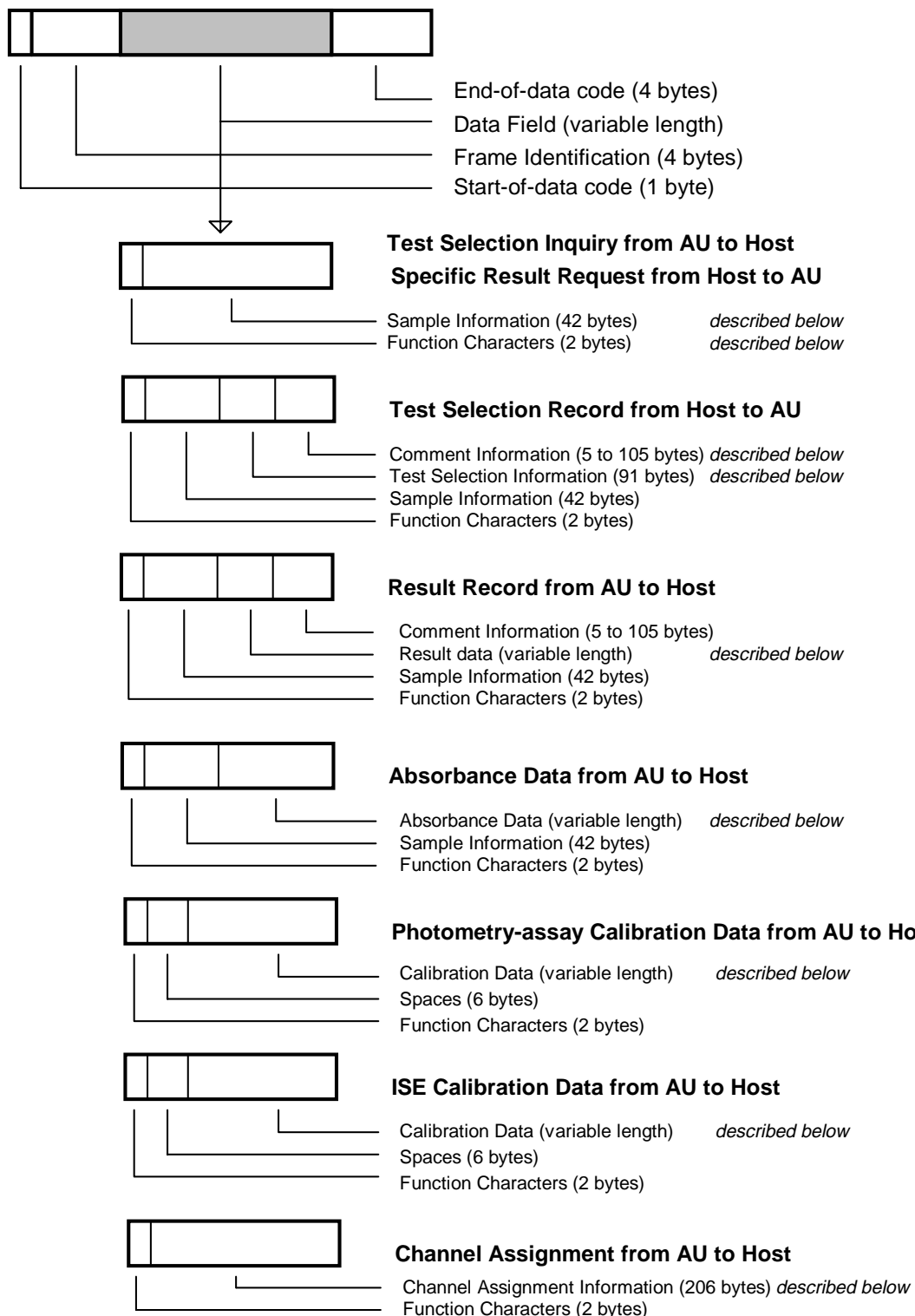
Batch communication is interrupted and suspended if the CU has a text with higher priority. This is restricted to the case where analytical data in the real-time mode is sent from CU and the transfer of analytical data is in response to a **RES** frame. After that the batch communication is restarted.

The table below shows the details of each frame and the priority.

Priority	Item
1	SPE frame for STAT samples
2	SPE frame for routine samples
3	REP frame
4	FRx,END frame for specific result request (RES from host) Sending of Channel Assignment Information
5	FRx,END frame for batch result transmission
6	FRx,END frame for realtime results

Table 5: Frame priorities

4.4. Data Field



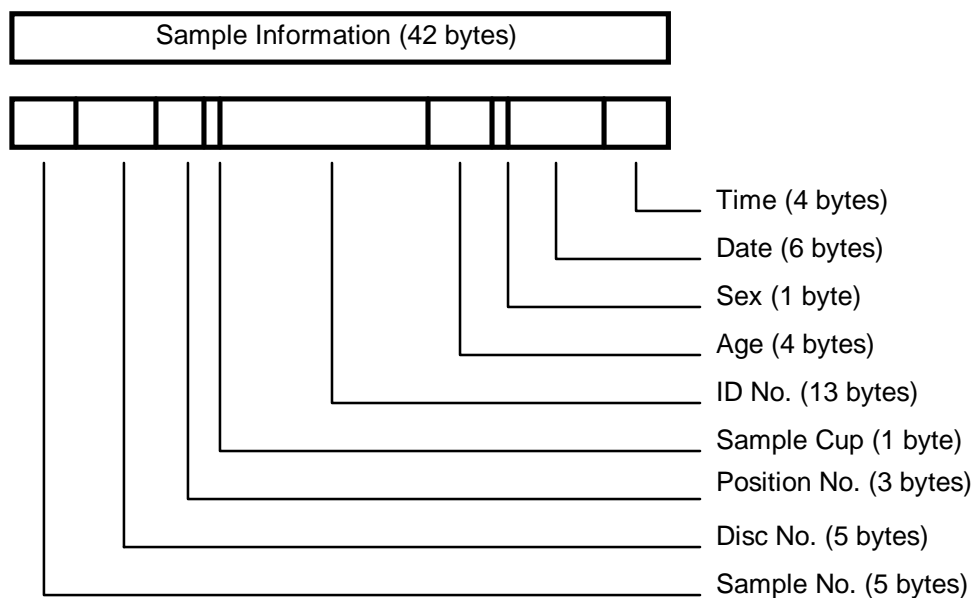
4.4.1. Function Characters

		Test Selection Info. Inquiry		Result data		
	Direction of Communication	CU <-->HOST	CU <-- HOST	CU --> HOST		HOST --> CU
	ID Provided / Not Provided	Real-time Communication	Batch Communication	Real-time Communication	Batch Communication	Result Request
		Sample Class i (1-5)	Sample Class i (1-5)	Sample Class i (1-5)	Sample Class i (1-5)	Sample Class i (1-5)
Routine sample	Provided	Ai	Ai	Ai	ai	ai
Routine sample (automatic rerun)		Bi	Bi	Bi		
Routine sample (manual rerun)		Ci	Ci	Ci		
Stat sample		Di		Di	di	di
Stat sample (automatic rerun)				Ei		
Control sample	Provided			F_	f_	
Calibration (Photometry)	/ not provided			G_		
Calibration (ISE)				H_		
Routine sample	Not Provided	Ni	Ni	Ni	ni	ni
Routine sample (Automatic Rerun)		Oi	Oi	Oi		
Routine sample (Manual Rerun)		Pi	Pi	Pi		
STAT sample				Qi	qi	qi
STAT sample (Automatic Rerun)				Ri		
Absorbance data (Routine)	provided				ii	
Absorbance data (Routine Rerun)					ji	
Absorbance data (STAT)	ki					
Absorbance data (STAT Rerun)	li					
Absorbance data (Control)	m_					
Channel Assignment Information				XA		

Table 6: Function characters

4.4.2. Composition of Sample Information

(included in **SPE**, **RES**, **FR1** to **FR5**, **END** frames)



Item	L	Routine sample	Stat sample	Control sample	Note
Sample No.	5	Format: sssss Range: bbbb1-10000	Format: sssss Range: bbbb1-bb400	Format: ccsss c: control no. Range: b1 - 40 sss: sequence no. Range: bb1 - 150	1
Disk No.	5	Format: ddddd Range: bbbb0 - bbbb9	Format: ddddd Range: bbbb0 - bbbb9	Format: bbbbd Range: d = 0 - 9 for sample disk 1 d = b for sample disk 2	2
Position No.	3	Format: ppp Range: bb1 - 110	Format: ppp Range: bb1 - 110	Format: ppp Range: bb1 - 110 for sample disk 1 Range: bb1 - b57 for sample disk 2	3
Sample Cup	1	Format: c Range: 1 - 2 1 = Standard Cup 2 = Micro Cup	Format: c Range: 1 - 2 1 = Standard Cup 2 = Micro Cup	Format: b	4
Ident No.	13	Format: nnnnnnnnnnnnn n = ident number		Format: bbbbnnnnnnn n = control name	5
Age	4	Format: aaac aaa: age no. Range: bb0 - 200 c: age unit 1 day 2 month 3 year		Format: bbbb	6
Sex	1	Format: s s: sex no. 0 other 1 male 2 female		Format: b	7
Date	6	Format: mmddyy mm: month dd: day yy: year		Format: LLLLLL L = Control Lot no. (first 6 digits)	8
Time	4	Format: hhmm hh: hour mm: minute		Format: LLbb L = Control lot no. (last 2 digits)	8

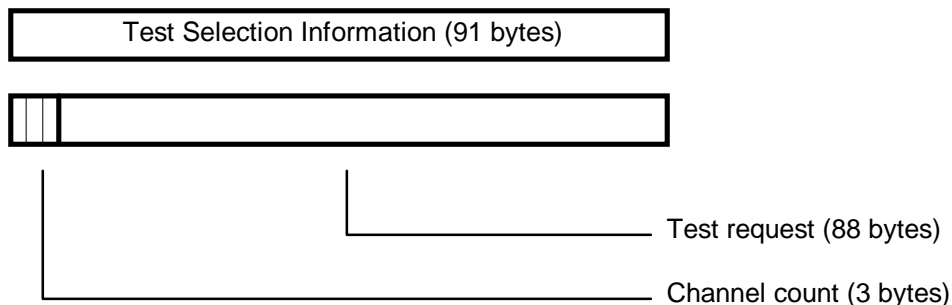
Table 7: Format of sample information / b = space (20H)

- Note 1:** <CU to HOST>: For an inquiry in ID mode, spaces are given.
- Note 2:** <CU to HOST>: For an inquiry in ID mode, spaces are given.
- Note 3:** <CU to HOST>: For an inquiry in ID mode, spaces are given.
- Note 4:** <CU to HOST>: Sample cup information which the CU has is sent.
<HOST to CU>: If the information is not set, '1' is set for it.
- Note 5:** When the ID-No. is within 13 digits, it is right justified and preceded by spaces.
In case of no ID-mode the CU treats the ID-No. as a comment.
- Note 6:** <CU to HOST>: If the info. is not set, spaces are sent.
<HOST to CU>: Set age information that is sent from the CU.
- Note 7:** <CU to HOST>: If the info. is not set, a space is sent.
<HOST to CU>: Set sex information that is sent from the CU.
- Note 8:** <CU to HOST>: The blood collection date/time which the CU has is transferred. If the date/time is not set, the sent one is set.
<HOST to CU>: Set the date/time sent from the host. Note, however, that the date/time at the CU side is set if spaces are included in each date/time field.

See chapter 7 for examples.

4.4.3. Composition of Test Selection Information

(included in **SPE** frame)



Item	Length	Range	Note
Channel count	3	'bb0' to 'b88'	1
Test request	88	Format: rrrr....rrrr Range: 0 to 4 for each character: 0 = no request 1 = normal sample volume 2 = decreased volume 3 = increased volume 4 = determined by CU (only for rerun)	2

Table 8: Format of test selection information / b = space (20H)

Note 1: If the channel count is less than 88, the channels with higher count are ignored.

Note 2: The channels are listed in ascending order.

Channel 1..86: Photometry-assay tests.

Channel 87: ISE channel.

- request for electrolytes (3 tests).
- all three tests Na/K/Cl are selected
- it is impossible to select request for any of Na, K and Cl from the host.

new in version 2

- for the rerun of class 2 samples, decreased volume (flag 2) can be selected.

Channel 88: Serum index channel:

- Request for serum indices (for 3 tests of L, H and I).

Deleting a test selection entry:

A test selection with all 88 test positions set to '0' deletes an existing test selection for the specified sample and causes the analyzer to send another test selection inquiry if the corresponding barcode appears again at the barcode reader.

In request for the isozyme test or compensation test, the other test necessary for isozyme calculation or test-to-test calculation is automatically supplied for analysis and analytical data is transferred when the other test is not requested. The additional test data for serum indexes is transferred also.

TS Ask Always mode:

If the 'TS Ask Always' mode is enabled on the **HOST SETTING** screen (see Figure 4 on page 9) the CU sends for each sample a test selection inquiry to the host even if there is already a test selection for that sample existing on the system.

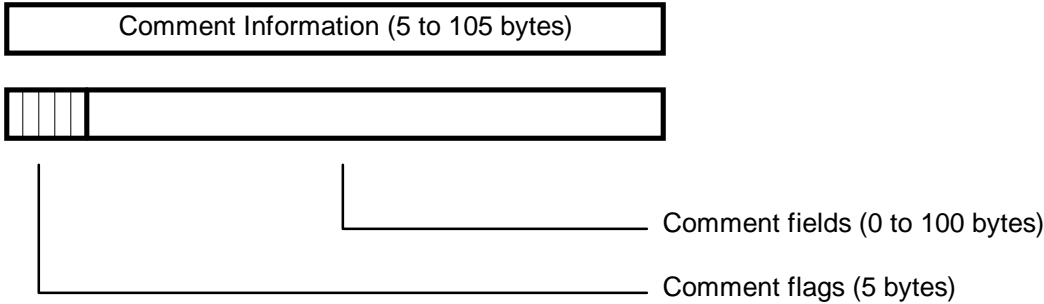
Host Priority:

With this setting on the **HOST SETTING** screen (see Figure 4 on page 9) the mastership of communication can be given either to the CU (default / 'Host Priority' disabled) or to the host.

If given to the host the CU suspends the analysis of the subsequent samples until the host responds to a sample inquiry. When a response from the host is received, the analytical sequence is resumed. It is therefore necessary to respond to any inquired sample. Even if the analysis of a sample is not required, a response to its inquiry must be made.

4.4.4. Composition of Comment Information

(included in *SPE*, *FR1* to *FR5*, *END* frame)



Item	Length	Range	Note
Comment flags	5	Format: FFFFF F: comment switch/flag 0 absence of corr. comment 1 presence of corr. comment	1
Comment 1	30	Format: cccc....cccc c: comment corresponding to flag 1	2
Comment 2	25	Format: cccc....cccc c: comment corresponding to flag 2	
Comment 3	20	Format: cccc....cccc c: comment corresponding to flag 3	
Comment 4	15	Format: cccc....cccc c: comment corresponding to flag 4	
Comment 5	10	Format: cccc....cccc c: comment corresponding to flag 5	

Table 9: Format of comment information

Note 1: For each comment flag that is set to '1', the corresponding comment text follows.

Comment info within test selection from host to CU:

If all comment flags are '0', the [ETX] code follows directly after the last comment flags.

For those comment fields that are not sent to the CU, an already existing comment text remains valid.

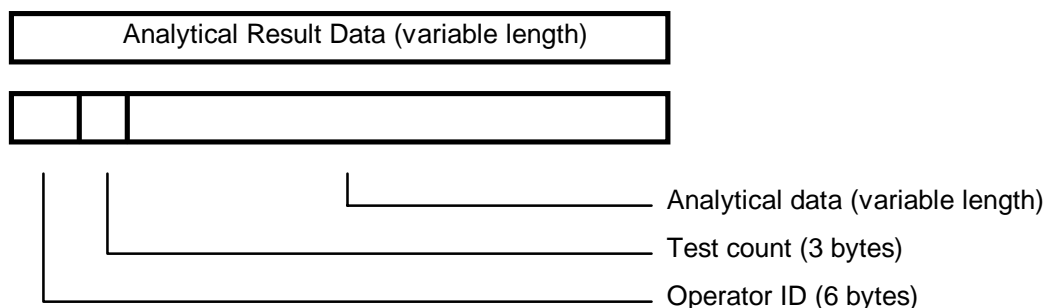
Comment info within result transmission

If enabled on the **HOST SETTING** screen (option 'Send Comments' / see Figure 4 on page 9) the comment information is sent at the end of each result transmission to the host. (Control results do not have that comment info). In this case, all five comment fields are sent (flag setting '11111' even if some comment fields are empty).

Note 2: Within the comment data fields, the character range is valid from code 20H to 7EH. (see Appendix A - ASCII Chart)

See chapter 7 for examples.

4.4.5. Composition of Result Data for Routine, Rerun, STAT and Control samples



Item	Length	Range	Note
Operator ID	6	Format: oooooo	
Test count	3	Format: ccc Range: bb0 - 100	1
Result[n] with n=1 to 'Test count'	10 each	Format: cccvvvvva ccc: Test no. Range: bb1 - b86 Photometry assay b87 - b89 Electrolyte b90 - b92 Serum index b93 - 100 Calculated tests vvvvv: Result value a: Data alarm Refer to the data alarm list (see Table 18)	2 3

Table 10: Format of analytical result data / b = space (20H)

Note 1: The CU transfers data for up to 86 tests respectively for simultaneous measurement in real-time and batch communication .

The results of the electrolytes (three tests of Na, K and Cl) are transferred with the test numbers 87 to 89, the results of serum indexes (three tests of lipemia, hemolysis and icterus) with the test numbers 90 to 92.

For the sample, for which all tests are deleted with the edited data on the **DATA REVIEW** screen, sample information followed by test count 'bb0' is transferred. In that case, no result data is transferred.

Note 2a: Format of the 6-character result value field:

Pos/Neg.	Decimal Point	Max.Digits	Example
Positive	absent	6	123456
	present	5	123.45
Negative	absent	5	-12345 bb-123
	present	4	-12.34 b-12.3

Table 11: Format of measured value / b = space (20H)

Note 2b: Qualitative Result Transmission

On the **MAINT/UTILITY → APPLICATION → RANGE** screen, it is possible to enter six-character long expressions for definable result ranges. If activated, the corresponding expression is transferred instead of the result value.

Note 3a: Results that have been modified on the **WORKPLACE → DATA REVIEW → EDIT** screen get the following marks attached if the option 'Edited Flag' was enabled on **MAINT/UTILITY → SYSTEM → ALARM** screen.

'*' (code 2AH) is displayed on the **DATA REVIEW** screen and sent to the host as alarm character.

'EDITED' is printed on the monitor printout.

Note 3b: The **MAINT/UTILITY → SYSTEM → EXEPTION** function offers the possibility to select alarm flags. All results which are flagged with those selected alarms are not sent to the host.

See chapter 7 for examples.

Text Size:

Since the text size may be 256, 512 or 1280 bytes (selectable on **HOST SETTING** screen / see Figure 4 on page 9) it can happen that the analytical data text has to be divided into several (up to 6) frames depending on the text size and the number of test results.

Text Size	256 bytes	512 bytes	1280 bytes
Max. no. of test results in one frame	19	45	100
Tests in FR1 or END	1 to 19	1 to 45	1 to 100
Tests in FR2 or END	20 to 38	46 to 90	
Tests in FR3 or END	39 to 57	91 to 100	
Tests in FR4 or END	58 to 76		
Tests in FR5 or END	77 to 95		
Tests in END	95 to 100		

Table 12: No. of test results per frame according to the text size.

The maximum number of transferable test results in one frame is calculated with the following expression:

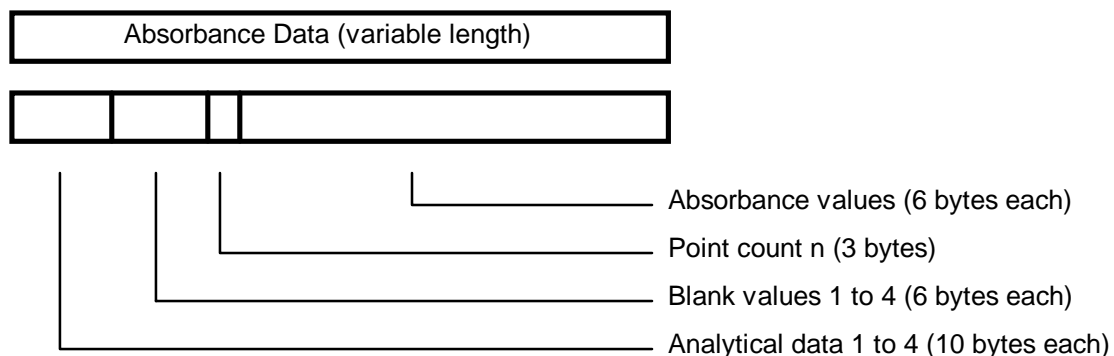
$$\text{max. no. of test results} < (\text{Text Size} - 62) / 10 \text{ (Round off fractions)}$$

If the 'Send Comments' option is enabled on the **HOST SETTING** screen (see Figure 4 on page 9), the five comment fields are sent after the last result value. If there are more than one result frame necessary the comments are only sent in the **END** frame. Since the whole comment information is 105 characters long, the maximum number of test results in the **END** frame is less than described in the table above.

STAT result transfer 'as soon as cooked':

If the option Stat Results Mode on the **HOST SETTING** screen (see Figure 4 on page 9), is set to Incremental, single STAT test results are sent to the host as soon as available

4.4.6. Absorbance Data



Item	Length	Range	Note
Analytical data [n] with n=1 to 4	4 * 10	Format: cccvvvvvva ccc: Channel no. vvvvvv: Result value a: Data alarm Refer to the data alarm list (see Table 18)	1
Blank data [n] with n=1 to 4	4 * 6	Format: cccccc	2
Point count	3	Format: ppp Range: n = bb0 - b73	3
Absorb. data [n] with n=1 to 'Point count'	n * 6	Format: aaaaaa /-aaaaa	4

Table 13: Format of absorbance data / b = space (20H)

Note 1: If two-channel simultaneous measurement is specified, data for two channels is transferred. If serum index measurement is specified, data for up to four channels (1 channel + L, H, I) is transferred.

If there is no relevant test for analytical data, 10 spaces are transferred.

Note 2: The first value is the 'Stopped cell blank', the following three values are the 'Passed cell blanks'. The values are transferred according to the analytical method of this test.

The unit for the cell blank data is 10^{-4} (10E-4) absolute. An integer is transferred preceded by space with floating sign position.

Note 3: The point count is the number of photometric points which follow the point count information. The following values may occur:

Reaction time [sec]	1	2	3	4	5	6	7	8	9	10	15	22
Point Count	4	8	11	14	17	21	25	28	31	34	50	73

Note 4: The absorbance data in the entire reaction monitoring system (data at each photometric point) is transferred in the same format as for the above cell blank data. When the point count is less than 73, the data is closely transferred in sequence starting from ABS 1.

Text Size:

Since the text size may be 256, 512 or 1280 bytes (selectable on **HOST SETTING** screen / see Figure 4 on page 9) it can happen that the absorbance data text has to be divided into several (up to 3) frames depending on the text size and the number of absorbance values.

Text Size	256 bytes	512 bytes	1280 bytes
ABS values in FR1 or END	1 to 23	1 to 65	1 to 73
ABS values in FR2 or END	24 to 56	66 to 73	
ABS values in END	57 to 73		

Table 14: No. of absorbance values per frame according to the text size.

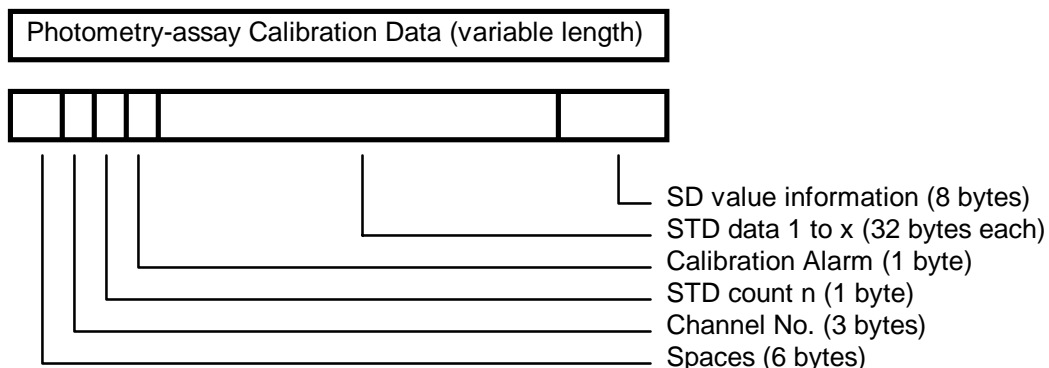
The sample information is sent in each frame; the analytical data and blank values are only sent in the first frame.

See chapter 7 for examples.

Photometric Points

#	(sec)	total	#	(sec)	total
S		Sample	36	655.899	15 min
R1	0		37	673.744	
1	7.267		38	691.588	
2	25.121		39	709.432	
3	42.965		40	727.267	
4	60.809	1 min	41	745.121	
5	78.654		42	762.965	
R2	85.500		43	780.809	
6	94.593		44	798.654	
7	111.438		45	814.593	
8	129.282	2 min	46	831.438	
9	147.126		47	849.282	
10	164.971		48	867.126	
11	182.815	3 min	49	884.971	
12	200.659		50	902.815	22 min
13	218.504		51	920.659	
14	236.348	4 min	52	938.504	
15	254.193		53	956.348	
16	270.093		54	974.193	
R3	279.000		55	990.093	
17	286.977	5 min	56	1006.977	
18	304.821		57	1024.821	
19	322.665		58	1042.665	
20	340.510		59	1060.510	
21	358.354	6 min	60	1078.654	
22	376.199		61	1096.199	
23	394.043		62	1114.043	
24	411.887		63	1131.887	
25	429.732	7 min	64	1149.732	
26	445.632		65	1165.632	
27	462.516		66	1182.516	
28	480.360	8 min	67	1200.360	
29	498.204		68	1218.204	
30	516.049		69	1236.049	
31	533.893	9 min	70	1253.893	
32	551.737		71	1271.737	
33	569.582		72	1289.582	
R4	580.500		73	1307.426	
34	587.426	10 min			
35	605.271				

4.4.7. Photometry-assay Calibration Data



Item	Length	Range	Note
Operator ID	6	Format: oooooo	
Channel no.	3	Format: ccc Range: bb1 - b86	1
STD count	1	Format: n No. of standards according to the calibration method Range: n = 1 - 6	2
Calib. alarm	1	Format: a Refer to the data alarm list (see Table 18)	3
STD[n] with n=1 to 'STD count'	32 each	Format: kaaaaaaddddd bbbbbb eeeeeu pppppp k: STD no.; Range: 1 - 6 aaaaaa 1st absorbance data ddddd 1st initial absorbance data bbbbbb 2nd absorbance data eeeeee 2nd initial absorbance data u data alarm Refer to the data alarm list (see Table 18) pppppp Prozone value	4 3
SD value	8	Format: pvvvvvd p 'Y' = SD value present 'N' = SD value absent vvvvv SD value d decimal point position	5

Table 15: Format of photometry-assay calibration data / b = space(20H)

Note 1: The test code in photometry-assay calibration which corresponds to the test code in the CU.

Note 2: When the STD count is 1, STD data 1 is followed by SD value information.

Note 3: Refer to the data alarm list (see Table 18)

Note 4: Each standard is measured twice. (1st and 2nd abs. values). The 1st and 2nd absorbance values are the results of the bichromatic measurements at the corresponding measuring point; the initial absorbance values are the results of the monochromatic measurements with only the main wavelength. (Each standard is measured with two different wavelengths).

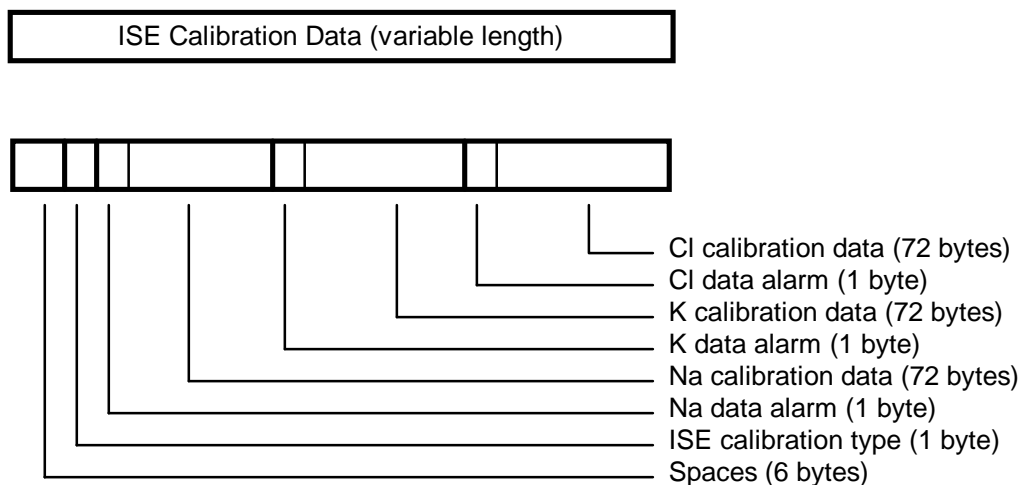
Each absorbance data is right-justified and preceded by space. The unit is 10^{-4} (10E-4) absolute. It is a 6-digit integer with sign.

Note 5: The SD value is only calculated for nonlinear and linear multi-point calibrations (3 to 6 standards). It is right-justified and preceded by space. It has no unit and the decimal point position can be set at **MAINT/UTILITY → APPLICATION → CALIB** screen.

If the SD value is absent, spaces are given instead of SD value and decimal point position.

See chapter 7 for examples.

4.4.8. ISE Calibration Data



Item	Length	Range	Note
Operator ID	6	Format: oooooo	
ISE type	1	Format: p 'B' : Tests Na, K, Cl (n = 1 to 3)	
Data alarm[n] + Calib. data [n] with n=1 to 3	1 8 * 9 each	Format: a Refer to the data alarm list (see Table 18) Format ddvvvvvva dd: Data identification Range: b1 - b8 vvvvv: measured value a: data alarm Refer to the data alarm list (see Table 18)	1

Table 16: Format of ISE calibration data / b = space(20H)

Note 1: For each of the three tests NA, K, Cl, the following eight data items are transferred:

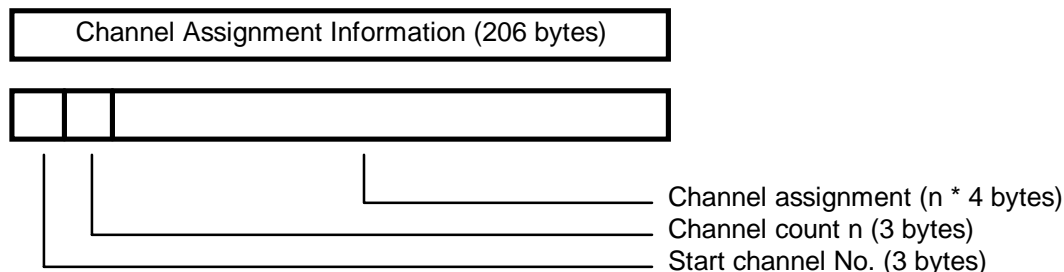
- electromotive force of internal standard solution
- electromotive force of LOW solution
- electromotive force of HIGH solution
- electromotive force of M solution
- slope level for display
- concentration of internal standard solution
- concentration of M solution
- compensation factor

The unit for the measured value is mV. It has a sign and a decimal point. Spaces are given, when there is no relevant data.

See chapter 7 for examples.

4.4.9. Channel Assignment Information

The channel assignment information for the maximum of 100 channels is transferred in two frames (**FR1** and **END**). Each frame has the following format.



Item	Length	Range	Note
Start channel	3	Format: sss Range: bb1 (first frame) b51 (second frame)	1
Channel count	3	Format: ccc Range: n = b50	1
Application code [n] with n= 1 to 50	n * 4	Format: aaaa Range: bbb1 - b910 Photometry assay b961 - b980 Calculated item b989 - b991 Electrolyte b992 - b994 Serum Index	2

Table 17: Format of channel assignment information / b = space(20H)

Note 1: The channel values are right justified and preceeded by space.

Note 2: The application code for each channel is transferred. If a channel has no application code assigned, four spaces are sent.

4.4.10. Data Alarm List

No.	Data Alarm Name	Printer	CRT	I/F	Photometry Assay			ISE			Note
					R/S	C	Std	R/S	C	Std	1
1	ADC abnormal	ADC?	A	A	o	o	o	o	o	o	
2	Cell blank abnormal	Cell?	Q	Q	o	o	o				
3	Sample short	Sampl	V	V	o	o	o	o	o	o	2
4	Reagent short	Reagn	T	T	o	o	o				2
5	Absorbance over	ABS?	Z	Z	o	o	o				
6	PROZONE error	Prozon	P	P	o	o	o				3
7	Reac limit over at all points	Limt0	I	I	o	o	o				
8	Reaction limit over except at 1 point	Limt1	J	J	o	o	o				
9	Reaction limit over except at 2 or 3 points	Limt2	K	K	o	o	o				
10	Linearity abnormal for 9 points or more	Lin.	W	W	o	o	o				
11	Linearity abnormal for 8 points or less	Lin.8	F	F	o	o	o				
12	Standard 1 absorbance abnormal	S1Abs?		H			o				
13	Duplicate error	Dup		U			o				
14	STD error	Std?		S			o				
15	Sensitivity error	Sens		Y			o				
16	Calibration error	Calib		B			o				
17	SD error	SD!		G			o				
18	Noise error	Noise	N	N				o	o	o	
19	Level error	Level	L	L				o	o	o	
20	Slope abnormal	Slope?		E						o	
21	Preparation abnormal	Margin		R						o	
22	Internal standard concentration abnormal	I.Std		D						o	

Table 18: Data alarm list (part 1)

No	Data Alarm Name	Printer	CRT	I/F	Photometry Assay			ISE			Note
					R/S	C	Std	R/S	C	Std	
23	Sample value abnormal	R.Over	&	&				o	o		
24	Test-to-test comp. error	Cmp.T	C	C	o	o		o	o		
25	Test-to-test compensation disabled	Cmp.T!	M	M	o	o		o	o		4
26	Panic value upper limit over	LIMTH	\$	\$	o			o			
27	Panic value lower limit over	LIMTL	\$	\$	o			o			
28	Random error (R-4s)	Random	@	@		o			o		
29	Systematic error 1 (2-2sA)	Systm1	#	#		o			o		
30	Systematic error 2 (2-2sW)	Systm2	#	#		o			o		
31	Systematic error 3 (4-1sA)	Systm3	#	#		o			o		
32	Systematic error 4 (4-1sW)	Systm4	#	#		o			o		
33	Systematic error 5 (10xA)	Systm5	#	#		o			o		
34	Systematic error 6 (10xW)	Systm6	#	#		o			o		
35	QC error 1	QcErr1	+	+		o			o		
36	QC error 2	QcErr2	+	+		o			o		
37	Calculation test error	Calc?	%	%	o	o		o	o		
38	Overflow	Over	O	O	o	o		o	o		4
39	Calculation disabled	???	X	X	o	o	o	o	o		4
40	Expected value upper limit over	H			o			o			5
41	Expected value lower limit over	L			o			o		o	5
42	Edited Results	Edited	*	*	o	o		o	o		
43	Calibration failure	CalErr	!	!	o	o		o	o		
44	Convergence absorbance over	>AMAX	>	>	o						
45	Repeat upper limit over	ReptH	=	=	o			o			
46	Repeat lower limit over	ReptL	=	=	o			o			

Table 19: Data alarm list (part 2)

Note 1. R/S = Routine/STAT C = Control Std = Calibration

Note 2. Data may be blanked.

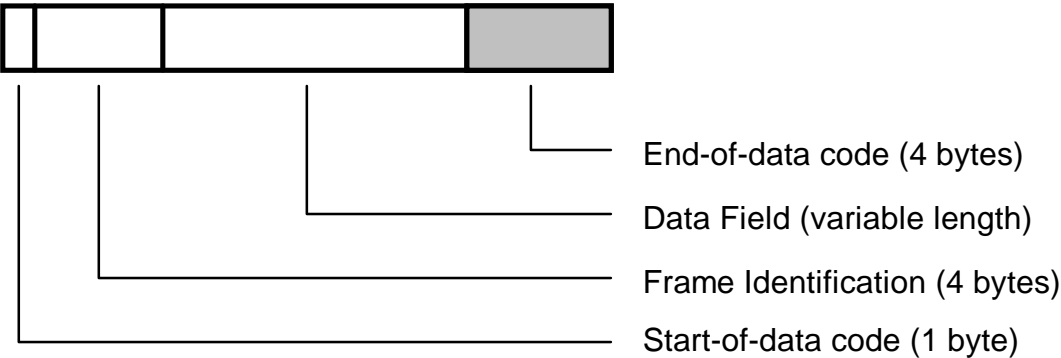
Note 3. Prozone value is output on printer only in real-time monitor mode.

Note 4. Data is blanked.

Note 5. Can exist with any other alarm.

Note: When two or more data alarms are given for a single data item, the one registered first is output.

4.5. End-of-data Code



The **END-OF-DATA** code represents the end of each text that is sent from the CU or the host. Its format is shown below:

Code	ASCII	Bytes
[ETX][CKSH][CKSL][CR]	03H [high][low] 0DH	4

Table 20: Format of the end-of-data code

Checksum Calculation:

[CKSH][CKSL] = Checksum high/low

The calculation is made as follows:

The checksum is generated as the elementary sum of all data bytes excluding [STX] and [ETX]. The result of the calculation is a 4-digit hexadecimal value. The two low order digits of that number are converted to ASCII characters. These two characters build the checksum high/low.

Example:

Test selection Inquiry from host to CU:

[STX]216;N1^^^1^^^0^^1^^^^^^^^^^^^^^^^0712941225[ETX]86[CR]
(the character ^ represents a space - 20 hex)

Checksum decimal 134
Checksum hexadecimal 86
Checksum high 8
Checksum low 6
End-of-data code [ETX]86[CR]

5. Data Transmission Control Procedure

5.1. Establishment of Data Link

After pressing the **HOST COMMUNICATION [Enable]** button on the **START → Print Host → Mode Set** screen, the CU transfers the **ANY** frame to the host. Communication is started from this point. The host has to answer within x seconds, usually with a **MOR** frame.

x is the communication cycle time which can be set from 2 to 10 seconds on the **Host SETTING** screen (see Figure 4 on page 9)

x seconds after the receipt of the **MOR** frame the CU sends the next **ANY** frame to the host

In subsequent steps, the CU and host continue transmission alternately.

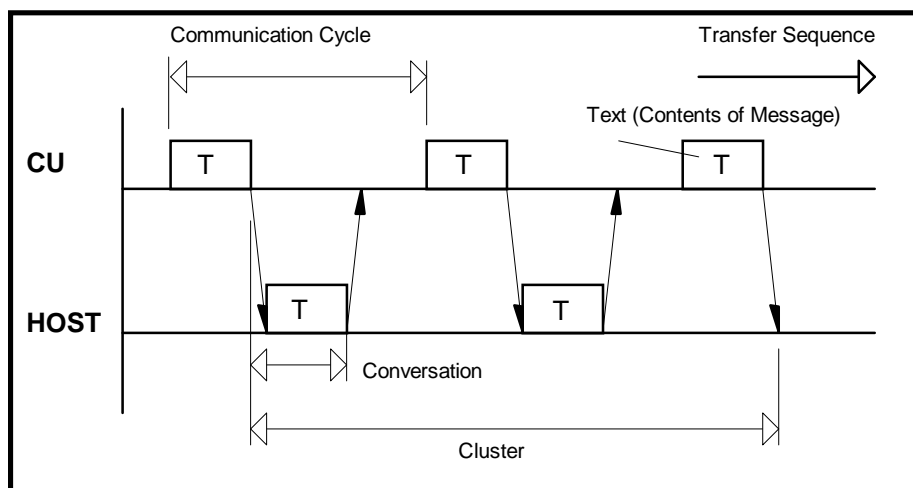


Figure 8: Common communication timing

Conversation	One message sent from the host or the CU
Communication cycle	One request from the CU with the corresponding answer from the host
Cluster	A group of conversations between the CU and the host

5.2. Response to Information Message

After receiving information, the receiver sends a response to inform the sender of the receiver status and the validity of received information.

The format of the various messages is described above. When the 256 or 512-byte mode is selected for the transferred byte count, the analytical data text may exceed 256 or 512 bytes (including start-of-data code and end-of-data code) according to the sample. In this case, the analytical data text is divided. The frame character identifies each text part.

The CU continues replying as far as the host returns a response. Even when the text, corresponding to an optional frame character is transferred and there is no more data to be sent between the CU and host, they continue sending the **ANY** frame and **MOR**

frame respectively. However, the cluster is restarted immediately if analytical data transfer, test selection directive or any other transfer is requested.

After sending a text, the host should avoid sending until reception of a response or request to/for the next in a normal condition. Otherwise the CU will output an alarm.

In transfer from the host to the CU, a pause of at least 100 msec is required.

If no response is returned or an invalid response is received, the recovery procedure is executed. In case of sending from the host, the host must always be kept ready for receiving the response.

Described below are the typical procedure for returning a response to the information message and the procedure upon receiving the response.

5.2.1. No Information to be sent

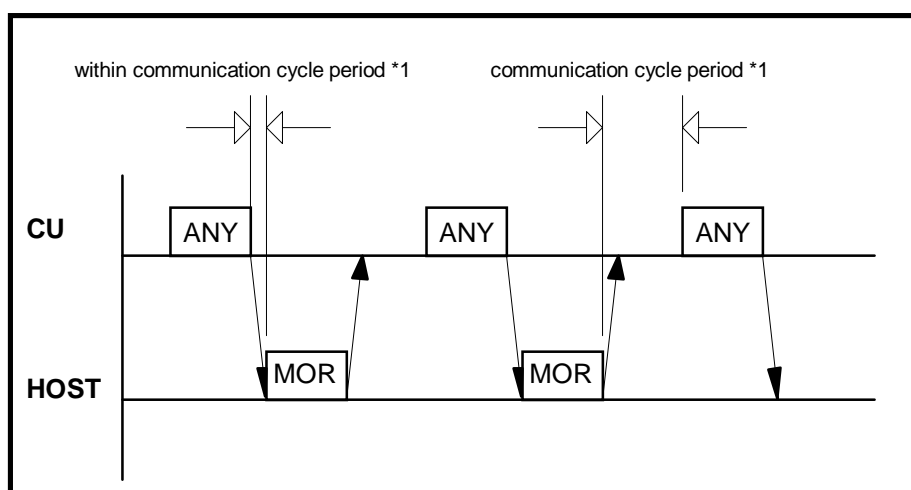


Figure 9: Communication timing without information exchange

*1: The communication cycle period can be adjusted (2 to 10 seconds / default = 2 seconds) on the **HOST SETTING** screen (see Figure 4 on page 9).

The CU continues returning the **ANY** frame in response to the **MOR** frame from the host. This procedure continues even when the CU and host have no information to be sent. Following conditions must be satisfied:

- There is no test selection information to be sent to the host.
- Analytical data is not output in the real time mode.
- There is no request for the **RES** frame.
- Specification through the screen is not made.

In this case, the CU sends the **ANY** frame in the lapse of the communication cycle period after receiving the **MOR** frame from the host (a point when the final end-of-data code is recognized).

After receiving from the CU, the host should return a response as soon as possible within the following communication cycle period.

5.2.2. Transfer of Communication Control Message

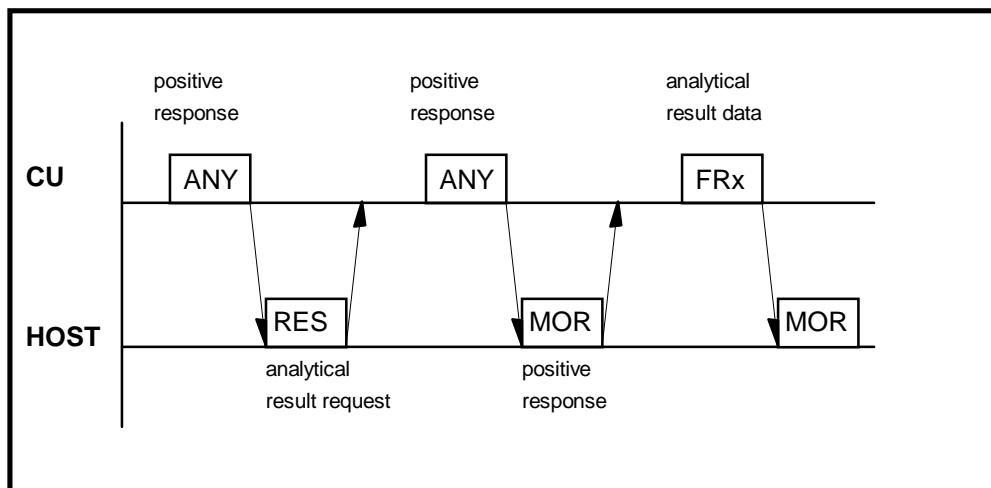


Figure 10: Transfer of communication control message

The **RES**, **ANY**, **MOR**, **REP**, **SUS**, **REC** frames are available for the communication control message.

For details, refer to the Frame types in Table 3 on page 16.

5.2.3. Transfer of Test Selection Information

(a) Test selection directive from the host to the CU (batch mode)

Usually the host will send test selections in advance of the sample's arrival on the analyzer. The host can send the test selection packet in response to the **ANY** frame from the CU.

(b) Test selection inquiry from the CU to the host (realtime mode)

If the test selection is not sent by the host, the CU can ask for specific test selections from the host. The test selection inquiries are sent to the host when samples are ready for processing and no test selections are available at the CU or the 'TS Ask always' option is enabled on the **HOST SETTING** screen (see Figure 4 on page 9). This case is shown in Figure 11.

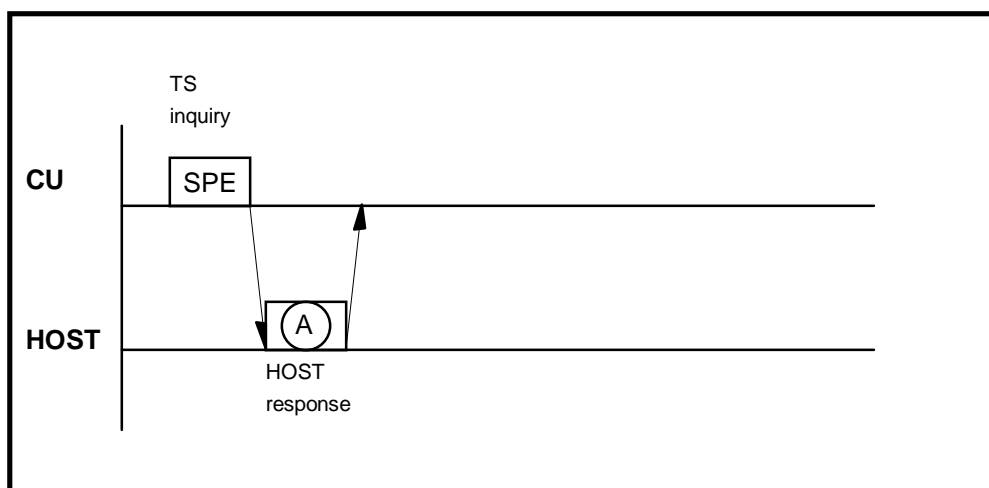


Figure 11: Test selection inquiry

The possible host responses to the specific test selection inquiry are listed in Table 21.

Frame A	Description
SPE	Respond with test selection for the sample requested. If the test selection is received correctly and in time, then this test selection will be used for the sample. If the test selection is not received, then the Default test selection will be used if one has been configured by the operator. If no Default test selection has been configured, then the sample will be skipped.
MOR	The host indicates that it cannot respond to test selection information inquiry but is ready to receive analytical data. In this case the alarm message 'T/S Availability Error' is displayed on the screen.
REC	The host indicates that it wants to suspend the communication with the CU for a specified time because it is neither possible to respond to test selection inquiry nor possible to receive analytical data.

Table 21: Host response to test selection inquiry

5.2.4. Transfer of Result Data

(a) Result request with the **RES** frame from the host to the CU

The host can make a request to the CU for the analytical data of a specific sample by use of the **RES** frame. The request could be for results which have not been received yet or for results which the CU has already sent.

The CU will respond with the **ANY** frame, to indicate that the request was received. The result will be returned to the host. If the CU cannot find the requested sample's result, no response will be given to the host to indicate this. The request was accepted by the CU, but this does not mean that the result is available to the CU.

The CU will store up to ten requests in an internal buffer. This buffer is periodically checked by the CU. The buffer will only hold ten requests, and subsequent requests

are ignored. A request slot is cleared when a result is sent. All slots are cleared when the system is reset by switching off/on.

Because of the limit of ten slots, the host should be circumspect about using this feature. If requests are made for samples that do not exist, the request will never be fulfilled, and if all slots are used, this feature will become essentially disabled. This feature needs not to be implemented because the CU sends the result in realtime as soon as possible after completion.

(b) Result transfer from the CU to the host

The target is of course, getting results back to the host. For this the CU uses result frames.

There are three cases for result-sending:

- Real-time mode; the results are sent as soon as they are available at the CU side. This is the normal way.
- Batch mode; the results are transferred manually by the operator (see the **DATA REVIEW** screen)
- After result request; this method is described above (see (a)).

Figure 12 shows the result transmission procedure in normal case and in Table 23 the possible host responses to result frames are listed.

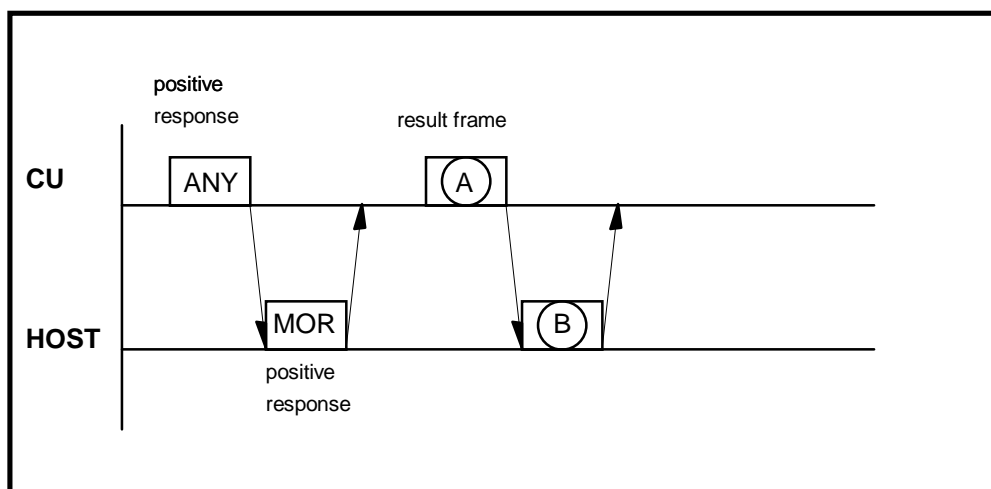


Figure 12: Result transmission

Frame A	Description
FR1 to END	Analytical data (including calibration and absorbance result)

Table 22: CU result frames FR1 to FR5 / END

Frame B	Description
REP	when text in A is abnormal
MOR	to receive analytical data next time also
REC	to direct test selection
SUS	to suspend communication
SPE	to indicate test selection
RES	to request a specific sample

Table 23: Host response to FR1 to FR5 / END

Transmission Procedure in Special Case.

Results from a patient's sample can be sent in up to six result frame packets (depending on the number of results and the maximum message length). Each frame requires a **MOR** from the host before the next frame will be sent. Ideally, the CU will try to transfer all packets for a sample without sending any other type of packet. There are instances, such as the analyzer needing test selection information, in which the CU can afford to wait for the current sample's result frames to transfer. One effect of this system is, that there is no delay for **SPE** frames. This case is shown in Figure 13.

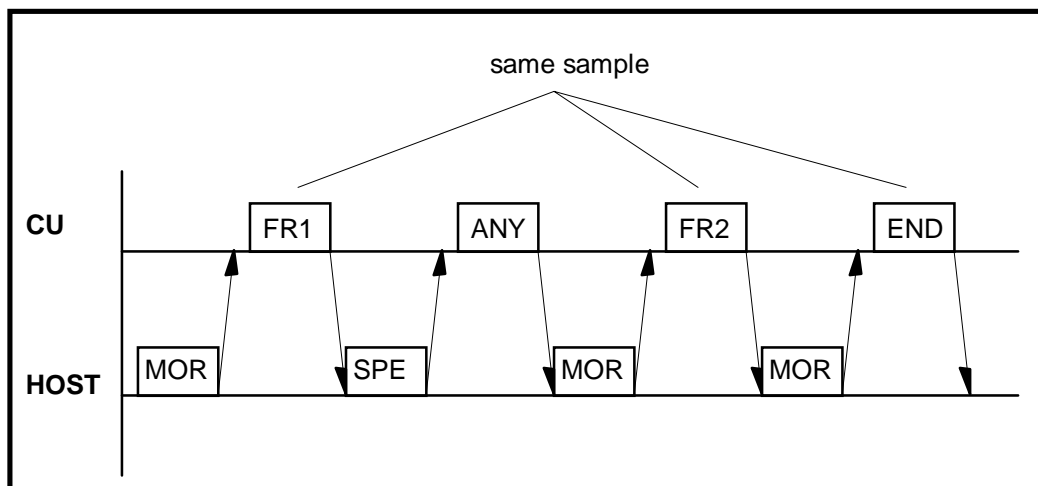


Figure 13: Result transmission with three frames and SPE interrupt

5.2.5. Resending Request

If there is any abnormality in the contents of the text received from the CU or the host, resending is requested with the **REP** frame. Figure 14 shows this procedure if the CU sends the **REP** frame; in Figure 15 the host sends the **REP** frame.

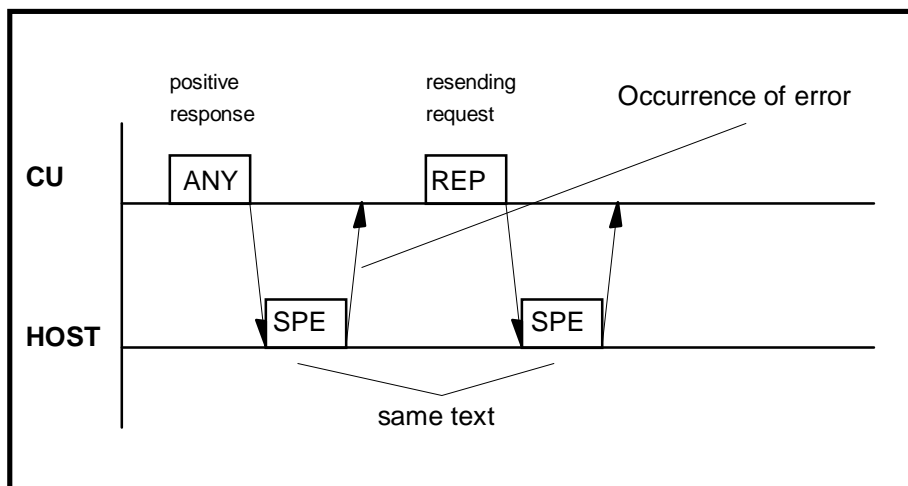


Figure 14: Resending request with REP frame from CU to host

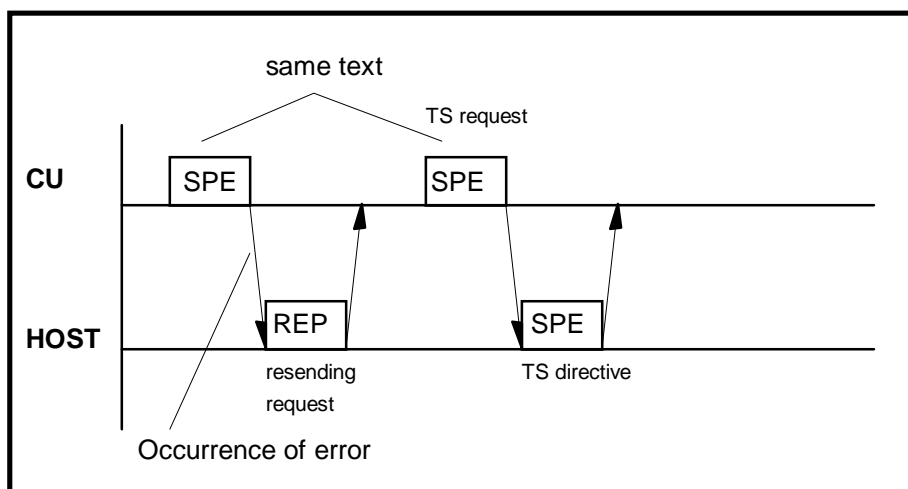


Figure 15: Resending request with REP frame from host to CU

5.3. Termination and Restart of Communication

Condition of Termination	Real-time Communication	Batch Communication	Restart of Communication
Specification of [Disable] for 'Host Comm'	STOP	STOP	Change from [Disable] to [Enable] for 'Host Comm' Previous contents of communication are all canceled.
Occurrence of send/receive time-out error	STOP	STOP	Same as above
Occurrence of hardware error alarm related to communication			Same as above
Occurrence of HD read error during sending of analytical data to the host		STOP	Remaining samples in specified range are not sent. Upon restart, samples in newly specified range are sent.
Stop directive through screen during sending of analytical data to the host		STOP *	Same as above
Occurrence of HD read error during transfer of analytical data for specific sample to the host			Relevant sample alone is canceled.
Detection of abnormality in text (discrepancy in end-of-data code between CU and host for example)			-----
Occurrence of E. STOP-Level alarm at CU side			-----

Table 24: Termination and restart of communication

Note*:

Transfer of analytical data is stopped regardless of sample type (routine, STAT or control sample).

Example: Cancellation during batch transfer of analytical data is possible with the 'Flush' buttons on the **SEND HOST** windows

5.4. Retry and Repeat of Communication

(1) Retry of Communication

If the host does not respond to an **ANY** frame within the communication cycle time (2 to 10 seconds), the CU issues the warning 126-001 ("timeout error on reception") and continues sending the last frame that was not acknowledged by the host (if the last frame was the **ANY** frame, then a **REP** frame is sent). On the **HOST SETTING** screen (see Figure 4 on page 9) the number of these retries to reestablish the data link ('Retry Count' option) can be set from '1' to '99'. (or '0', which stands for an infinite number of retries). Also the time between these retries ('Retry Time' option) can be set from '1' to '99' seconds on this screen.

After the last retry without host answer the CU issues the warning 126-014 ("communication was disabled after the specified number of retries") the communication is switched off.

(2) Repeat Communication

On the occurrence of a communication error, a repeat is requested immediately (with **REP** frame). If the number of repeat frames ('Repeat Count' option on the **HOST SETTING** screen can be set from '1' to '99') is reached, the CU cancels sending the current text and transfers the next text.

5.5. RESULT-ONLY mode

In this mode, analytical data alone is transferred to the host and resending request (**REP** frame) from the CU or host or response to specific sample request is not made.

If [**Enable**] is specified for 'Result Only' on the **HOST SETTING** screen (see Figure 4 on page 9), the CU returns no response to test selection inquiry or test selection directive even when [**Enable**] is specified for the test selection inquiry. The CU waits for two seconds or more after sending ETX in the analytical data text and proceeds to transfer to the host regardless of the communication procedure (realtime or batch result transmission).

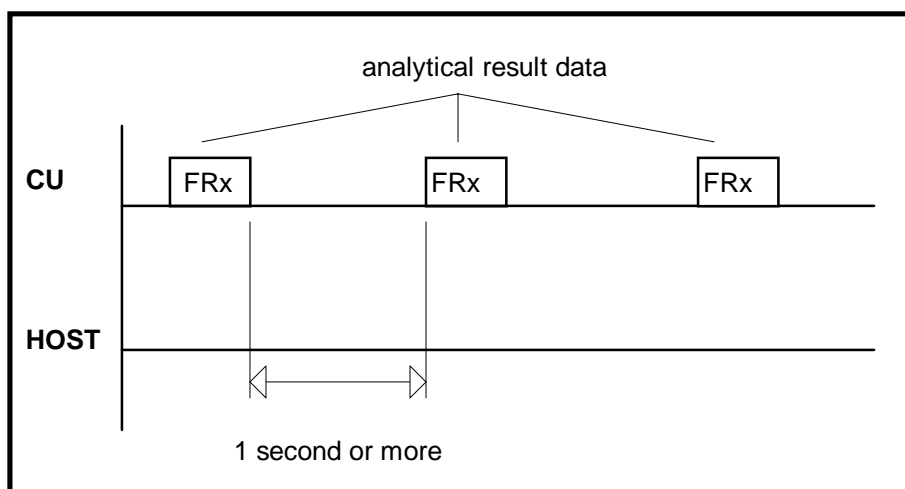


Figure 16: Timing in case of 'Result Only' option enabled

6. Communication Functions

6.1. Function List for Test Selection Data

Function		Inquiry	Directive	Conditions	Note
Routine sample				Invalid when [Enable] is specified for 'Result Only' on HOST SETTING screen (see Figure 4 on page 9)	
STAT sample	with ID			Valid when [Enable] is specified for 'STAT TS Inq' on HOST SETTING screen	
	without ID			Invalid when [Enable] is specified for 'Result Only'	
Manual Rerun sample	Routine sample			Valid when [Enable] is specified for 'Manual Rerun Inq' on HOST SETTING screen (Note 1) Invalid when [Enable] is specified for 'Result Only'	1
Automatic Rerun sample	Routine sample			Valid when [Enable] is specified for 'Auto Rerun Inq' on HOST SETTING screen (Note 2) Invalid when [Enable] is specified for 'Result Only'	2

Table 25: Function list for test selection data

Note 1: When [**Disable**] is specified for 'Rerun Only Inq', an inquiry is not sent from the analyzer to the host. However, for any sample that has been measured at least once in the analyzer, the test selection directive can be accepted from the host.

Note 2: When [**Disable**] is specified for 'Auto Rerun Inq', an inquiry is not sent from the analyzer to the host. However, for any sample that has been measured at least once in the analyzer, the test selection directive can be accepted from the host.

6.2. Function List for Result Data

Function		Real-time Communication	Batch Communication	Specific Sample Request from host	Conditions
Routine sample					Specific sample request is invalid when [Enable] is specified for 'Result Only' on HOST SETTING screen (see Figure 4 on page 9)
STAT sample					
Control sample					
Automatic/Manual	Routine sample				
Rerun sample	STAT sample				
Calibration					
Original absorbance					

Table 26: Function list for result data

Comments:

- The above real-time communication indicates a communication carried out while the instrument is busy in analysis, and the batch communication indicates a communication when specified through the screen.
- Batch result communication is initiated on ...

WORKPLACE → DATA REVIEW → SEND HOST screen
for Routine and STAT results

WORKPLACE → DATA REVIEW → REACTION MONITOR → SEND HOST screen
for Routine, STAT and Rerun Absorbance data

QC → INDIVIDUAL → SEND HOST screen
for Control results

QC → INDIVIDUAL → DATA LIST → REACTION MONITOR → SEND HOST screen
for Control Absorbance data

With the [Flush] button on the corresponding screens a running transmission can be aborted.

6.3. Function List for Analyzer Information Transfer

Function	Conditions
Channel Assignment Information	sent to the host when communication is started for the first time after power on.

Table 27: Function list for analyzer information

7. Communication Trace

7.1. Overview

If enabled on the **HOST SETTING** screen (option 'Comm Trace' / see Figure 4 on page 9) the contents of the communication between the CU and host is stored on the hard disk. To check the contents of communication, the stored data is output onto the printer as a report.

7.2. Trace Data

The time of communication execution, the direction of communication and the contents of the message are stored.

The data to be stored differs between the following two cases.

a) In normal communication.

The host ID, Instrument ID, packet no., frame character, function character and sample information (sample no., disk no., position no. and ID no. alone) are stored.

Note, however, that only the host ID, Instrument ID, packet no., frame character and function character are stored for the text which does not contain sample information.

b) Upon Occurrence of any error during communication.

The details of the error and all characters up to occurrence of the error are stored.

Note, however, that only the host ID, Instrument ID, packet no., frame character, function character and sample information (same as in a) above) are stored the same as in normal communication if send time-out occurs during sending from the CU to the system.

7.3. Reset and Printout of Trace Data

To printout and/or delete the trace data file, proceed
PRINT → MAINT/UTILITY → SYSTEM COMMUNICATION TRACE.

7.4. Trace Data Storing Performance

Data of up to 2000 cycles (conversation) can be stored.

8. Example Traces

Example 1: Test Selection inquiry / Test selection / Result

Example 2: Absorbance data from CU to host

Example 3: Photometry assay Calibration data from CU to host

Example 4: ISE Calibration data from CU to host

Example 5: Control data from CU to host

Example 6: Specific Result Request from host to CU

Example 7: Channel Assignment Information from CU to host

Common explanations for the following HIT 917 trace lists:		
<u>Format</u>		
1st column	Sender of text (CU=Control Unit)	
2nd column	Sending time	
3rd column	Trace data	
<u>Replacement of Control charcters</u>		
<u>Mnemonic</u>	<u>meaning</u>	<u>replaced ASCII code</u>
[STX]	start of text	02H
[ETX]	end of text	03H
[CR]	carriage return	0DH
^	space	20H

Table 28: Communication trace details

The communication trace was aquired with the Interface Testprogram 'HOST917.EXE' (developed by the Technical Productmanagement / Data Technique department)

8.1. Test Selection inquiry from CU to host incl. Result

[illegible]

Text format of example 1a: Test Selection Inquiry from the CU

Inquiry: The CU sends a test selection inquiry. (each character ^ stands for a blank - ASCII code 20h)	
CU 12:32:05,89 [STX]216;N1^^^1^^^0^^1^^^^^^^^^^^^^^^^^^^^0712941225[ETX] 86[CR]	
[STX]	Start of text (ASCII code 02H)
2	Host-ID : 2
1	Instrument-ID : 1
6	Packet number : 6
;	Frame character : ; for TS inquiry
N	Function character: N for - routine sample - without barcode reader - realtime communication
1	Class : 1
[Sample information]	
^^^1	Sample number : 1
^^^0	Disk number : 0
^^1	Position : 1
1	Cup : Standard
^^^^^^^^^^^^	Ident-No : (undefined)
^^^^	Age : (undefined)
^	Sex : (undefined)
071294	Date : 12th of July 1994
1225	Time : 12:25
[ETX]	End of text (ASCII code 03H)
86	Checksum
[CR]	Carriage return (ASCII code 0DH)

Text format of example 1b: Test Selection from the Host

[illegible]

Text format of example 1c: Result Transmission from the CU

The CU sends the result to the host. (each character ^ stands for a blank - ASCII code 20h)	
CU 12:43:29,60 [STX]213:N1^^^^1^^^^0^^11only^comment1^35310712941225^^^^ ^^^^5^^1^^^3.5\$^^2^^^331^^87^113.1^^88^^4.81^^89^^84.2^11 111Smith^^^^^^^^^^^^^^^^^^^^John^^^^^^^^^^^^^^^^^^^^ ^Comm^3^^^^^^^^^^^^^^^^Comm^4^^^^^^^^^^^^Comm^5^^^^[ETX]12[CR]	
[STX] 2 1 3 : N	Start of text (ASCII code 02H) Host-ID : 2 Instrument-ID : 1 Packet number : 3 Frame character : : for Result Function character: N for - routine - without barcode reader - realtime communication
1 [Sample information] ^^^^1 ^^^^0 ^^1 1 only comment1 ^353 1 071294 1225 [Result Information] ^^^^^^	Class : 1 Sample number : 1 Disk number : 0 Position : 1 Cup : Standard Ident-No : (treated as comment) Age : 35 Years Sex : male Date : 12th of July 1994 Time : 12:25
^^5 ^^1 ^^^3.5 \$ ^^2 ^^^331 ^ ^87 ^113.1 ^ ^88 ^^4.81 ^ ^89 ^^84.2 ^	Operator ID No. of results : 5 1. Result Test no. : 1 Result : 3.5 Alarm : \$ for LIMIT high 2. Result Test no. : 2 Result : 331 Alarm : no alarm 3. Result Test no. : 87 (ISE Na) Result : 113.1 Alarm : no alarm 4. Result Test no. : 88 (ISE K) Result : 4.81 Alarm : no alarm 5. Result Test no. : 89 (ISE Cl) Result : 84.2 Alarm : no alarm
[Comments] 11111 Smith^^^^^^^^^^^^^^^^^^^^ John^^^^^^^^^^^^^^^^^^^^ Comm^3^^^^^^^^^^^^^^^^ Comm^4^^^^^^^^^^ Comm^5^^^^	Comment fields 1 to 5 are selected Comment field 1 Comment field 2 Comment field 3 Comment field 4 Comment field 5
[ETX] 12 [CR]	End of text (ASCII code 03H) Checksum Carriage return (ASCII code 0DH)

8.2. Absorbance data from CU to host

CU 17:08:46,08 [STX]217>[ETX]D8[CR]
Host 17:08:46,19 [STX]217>[ETX]D8[CR]

CU 17:08:51,57 [STX]218:11^^^1^^^0^^1^^^^^^^^^^^^^^^^^3^0712941408^^1^
^^3.7\$^^^236^^^238^^^
237^11^^6205^^6377^^6444^^6486^^6525^^6553^^6576^^6597^^6
613^^6624^^6639[ETX]1B[CR]
Host 17:08:51,96 [STX]218>[ETX]D9[CR]

CU 17:08:57,12 [STX]211>[ETX]D2[CR]
Host 17:08:57,23 [STX]211>[ETX]D2[CR]

Text format of example 2: Absorbance data from the CU

The CU sends original absorbance data to the host. (each character ^ stands for a blank - ASCII code 20h)	
CU 17:08:51,57 [STX]218:i1^^^1^^^0^^1^^^^^^^^^^^^^^^^^3^0712941408^^1^^ ^^3.7\$^^236^^^238^^^ 237^11^^6205^^6377^^6444^^6486^^6525^^6553^^6576^^6597^^6 613^^6624^^6639[ETX]1B[CR]	
[STX]	Start of text (ASCII code 02H)
2	Host-ID : 2
1	Instrument-ID : 1
8	Packet number : 8
:	Frame character : : for Result
i	Function character: i for - routine - absorbance data
1	Class : 1
^^^1	Sample number : 1
^^^0	Disk number : 0
^^1	Position : 1
^	Cup : Standard
^^^^^^^^^^^^^^	Ident-No : (treated as comment)
^^^3	Age : in Years
^	Sex : male
071294	Date : 12th of July 1994
1408	Time : 14:08
^^1	1. Test no. : 1
^^^3.7	Result : 3,7
\$	Alarm : \$
^^^	2. Test no.
^^^^^^	2. Result
^	2. Alarm
^^^	3. Test no.
^^^^^^	3. Result
^	3. Alarm
^^^	4. Test no.
^^^^^^	4. Result
^	4. Alarm
^^^^^^	1. blank value
^^^236	2. blank value
^^^238	3. blank value
^^^237	4. blank value
^11	No. of Abs. values : 11
^^6205	Absorbance value 1 : 6205
^^6377	Absorbance value 2 : 6377
^^6444	Absorbance value 3 : 6444
^^6486	Absorbance value 4 : 6486
^^6525	Absorbance value 5 : 6525
^^6553	Absorbance value 6 : 6553
^^6576	Absorbance value 7 : 6576
^^6597	Absorbance value 8 : 6597
^^6613	Absorbance value 9 : 6613
^^6624	Absorbance value 10 : 6624
^^6639	Absorbance value 11 : 6639
[ETX]	End of text (ASCII code 03H)
1B	Checksum
[CR]	Carriage return (ASCII code 0DH)

8.3. Photometry-assay Calibration data from CU to host

CU 15:44:58,80 [STX]211>[ETX]D2[CR]
Host 15:44:58,87 [STX]211>[ETX]D2[CR]

CU 15:45:01,05 [STX]212:G^^^^^^^12^1^^1316^^1396^^1312^^1383^^^^^^02^^
6726^^7385^^6671^^7321^^^^^^0N^^^^^^[ETX]AB[CR]
Host 15:45:01,17 [STX]212>[ETX]D3[CR]

CU 15:45:03,21 [STX]213>[ETX]D4[CR]
Host 15:45:03,26 [STX]213>[ETX]D4[CR]

Text format of example 3:

The CU sends photometry assay calibration data to the host. (each character ^ stands for a blank - ASCII code 20h)	
CU 15:45:01,05 [STX]212:G^^^^^^^12^1^^1316^^1396^^1312^^1383^^^^^02^^ 6726^^7385^^6671^^7321^^^^^^0N^^^^^^[ETX]AB[CR]	
[STX] 2 1 2 : G^ ^^^^^ ^^1 2 ^ 1 ^^1316 ^^1396 ^^1312 ^^1383 ^ ^^^^^0 2 ^^6726 ^^7385 ^^6671 ^^7321 ^ ^^^^^0 N ^^^^^ ^ [ETX] AB [CR]	Start of text (ASCII code 02H) Host-ID : 2 Instrument-ID : 1 Packet number : 2 Frame character : : for Result Function character: G for Photometric Calibration Operator ID Channel no. : 1 No. of standards : 2 Calibration alarm STD No. 1 1st absorbance data 1st initial absorbance data 2nd absorbance data 2nd initial absorbance data data alarm Prozone value STD No. 2 1st absorbance data 1st initial absorbance data 2nd absorbance data 2nd initial absorbance data data alarm Prozone value N for 'no SD value' value decimal point position End of text (ASCII code 03H) Checksum Carriage return (ASCII code 0DH)

8.4. ISE Calibration data from CU to host

```
CU    15:41:10,05 [STX]212>[ETX]D3[CR]
Host  15:41:10,10 [STX]212>[ETX]D3[CR]

CU    15:41:12,41 [STX]213:H^^^^^^B^^1^-32.0^^2^-34.8^^3^-27.3^^4^-26.8^^5
      ^^60.0^^6^133.6^^7^^163^^8^^^4^^1^-38.0^^2^-50.6^^3^-
      29.0^^4^-31.7^^5^^58.7^^6^^4.92^^7^^6.31^^8^-0.02^^1^111
      .6^^2^113.5^^3^106.5^^4^107.3^^5^-39.8R^6^^89.5^^7^^115^
      ^8^^^1^[ETX]F7[CR]
Host  15:41:12,73 [STX]213>[ETX]D4[CR]
```

Text format of example 4:

The CU sends ISE calibration data to the host.
(each character ^ stands for a blank - ASCII code 20h)

```
CU    15:41:12,41 [STX]213:H^^^^^^B^^1^-32.0^^2^-34.8^^3^-27.3^^4^-26.8^^5
      ^^60.0^^6^133.6^^7^^163^^8^^^4^^1^-38.0^^2^-50.6^^3^-
      29.0^^4^-31.7^^5^^58.7^^6^^4.92^^7^^6.31^^8^-0.02^^1^111
      .6^^2^113.5^^3^106.5^^4^107.3^^5^-39.8R^6^^89.5^^7^^115^
      ^8^^^1^[ETX]F7[CR]
```

[STX]	Start of text (ASCII code 02H)
2	Host-ID : 2
1	Instrument-ID : 1
3	Packet number : 2
:	Frame character : : for Result
H^	Function character: G for Photometric Calibration
^^^^^	Operator ID
B	ISE Type B = Tests Na, K, Cl
^	Na data alarm
^1	Cal. data 1
^-32.0	value = -32
^	data alarm 1
^2	Cal. data 2
^-34.8	value = -34,8
^	data alarm 2
^3	Cal. data 3
^-27.3	value = -27,3
^	data alarm 3
^4	Cal. data 4
^-26.8	value = -26,8
^	data alarm 4
^5	Cal. data 5
^^60.0	value = 60
^	data alarm 5
^6	Cal. data 6
^133.6	value = 133,6
^	data alarm 6
^7	Cal. data 7
^^^163	value = 163
^	data alarm 7
^8	Cal. data 8
^^^^-4	value = -4
^	data alarm 8

Text format of Example 4 cont.

^ ^1 ^-38.0 ^ ^2 ^-50.6 ^ ^3 ^-29.0 ^ ^4 ^-31.7 ^ ^5 ^^58.7 ^ ^6 ^^4.92 ^ ^7 ^^6.31 ^ ^8 ^-0.02 ^	K data alarm Cal. data 1 value = -38 data alarm 1 Cal. data 2 value = -50,6 data alarm 2 Cal. data 3 value = -29 data alarm 3 Cal. data 4 value = -31,7 data alarm 4 Cal. data 5 value = 58,7 data alarm 5 Cal. data 6 value = 4,92 data alarm 6 Cal. data 7 value = 6,31 data alarm 7 Cal. data 8 value = -0,02 data alarm 8
^ ^1 ^111.6 ^ ^2 ^113.5 ^ ^3 ^106.5 ^ ^4 ^107.3 ^ ^5 ^-39.8 R ^6 ^^89.5 ^ ^7 ^^^115 ^ ^8 ^^^^^1 ^	Cl data alarm Cal. data 1 value = 111,6 data alarm 1 Cal. data 2 value = 113,5 data alarm 2 Cal. data 3 value = 106,5 data alarm 3 Cal. data 4 value = 107,3 data alarm 4 Cal. data 5 value = -39,8 data alarm 5 Cal. data 6 value = 89,5 data alarm 6 Cal. data 7 value = 115 data alarm 7 Cal. data 8 value = 1 data alarm 8
[ETX] F7 [CR]	End of text (ASCII code 03H) Checksum Carriage return (ASCII code 0DH)

8.5. Control data from CU to host

CU 15:52:21,51 [STX]218>[ETX]D9[CR]
Host 15:52:21,57 [STX]218>[ETX]D9[CR]

CU 15:52:23,82 [STX]211:F1^^117^^^^^^^^^^^^^^^^PNU^^^^^^^^^^^^^^^^^^^^^^
^^^^7^^1^^^3.5^^^2^^^340^^^3^^1.69^^^5^^^5.1^^87^116.4^^8
8^^4.80^^89^^85.4^[ETX]05[CR]
Host 15:52:23,98 [STX]211>[ETX]D2[CR]

CU 15:52:26,17 [STX]212>[ETX]D3[CR]
Host 15:52:26,23 [STX]212>[ETX]D3[CR]

Text format of example 5:

The CU sends control data to the host. (each character ^ stands for a blank - ASCII code 20h)	
CU 15:52:23,82 [STX]211:F1^^117^^^^^^^^^^^^^^^^PNU^^^^^^^^^^12345678^^^^^^ ^^^^7^^1^^^3.5^^^2^^^340^^^3^^1.69^^^5^^^5.1^^87^116.4^^8 8^^4.80^^89^^85.4^[ETX]05[CR]	
[STX] 2 1 1 : F 1 ^^1 17 ^^^^^ ^^^ ^ ^^^^^PNU^^^^^ ^^^^ ^ 12345678 ^^ ^^^^^ ^^7 ^^1 ^^^3.5 ^ ^^2 ^^^340 ^ ^^3 ^^1.69 ^ ^^5 ^^^5.1 ^ ^87 ^116.4 ^ ^88 ^^4.80 ^ ^89 ^^85.4 ^ [ETX] 05 [CR]	Start of text (ASCII code 02H) Host-ID : 2 Instrument-ID : 1 Packet number : 1 Frame character : : for Result Function character: F for Control / realtime Class : 1 Control No. : 1 Sequence No. : 17 Disk No : 5 spaces Position : 3 spaces Cup : 1 space ID containing Control name Age : 4 spaces Sex : 1 space Control Lot no. : 12345678 2 spaces Operator ID No. of results : 7 Test No. : 1 value : 3,5 Alarm : no alarm Test No. : 2 value : 340 Alarm : no alarm Test No. : 3 value : 1,69 Alarm : no alarm Test No. : 5 value : 5,1 Alarm : no alarm Test No. : 87 value : 116,4 Alarm : no alarm Test No. : 88 value : 4,8 Alarm : no alarm Test No. : 89 value : 85,4 Alarm : no alarm End of text (ASCII code 03H) Checksum Carriage return (ASCII code 0DH)

8.6. Specific Result Request from host to CU

```
CU      17:08:08,19 [STX]217>[ETX]D8[CR]
Host    17:08:08,30 [STX]217>[ETX]D8[CR]

CU      17:08:13,46 [STX]218>[ETX]D9[CR]
Host    17:08:13,57 [STX]218<n1^^^1^^^0^1^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^<ETX
          >E8[CR]

CU      17:08:13,78 [STX]211>[ETX]D2[CR]
Host    17:08:13,89 [STX]211>[ETX]D2[CR]

CU      17:08:19,28 [STX]212:n1^^^1^^^0^11^^^^^^^^^^^^^^^^^3^0628940914^^^
          ^^^7^1^^^3.6^^^2^^^343^^^3^1.99^^^5^^^5.1^^87^107.1^^8
          8^^4.08^^89^^77.8^11111Kommentar^1^^^^^^^^^^^^^^^^^^^^
          ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
          ^^^^^^^^^[ETX]A0[CR]
Host    17:08:19,67 [STX]212>[ETX]D3[CR]
```

Text format of example 6:

The host sends a specific result request / the CU sends back the corresponding result, if available
(each character ^ stands for a blank - ASCII code 20h)

```
Host 17:08:13,57 [STX]218<n1^^^1^^^0^1^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^[ETX]
[E8[CR]
```

[STX]	Start of text (ASCII code 02H)
2	Host-ID : 2
1	Instrument-ID : 1
8	Packet number : 8
<	Frame character : < for Result request
n	Function character: n for
	- routine sample
	- without barcode reader
	- batch communication
1	Class : 1
^^^1	Sample number : 1
^^^0	Disk number : 0
^1	Position : 1
^	Cup : (undefined)
^^^^^^^^^^^^	Ident-No : (undefined)
^^^^	Age : (undefined)
^	Sex : (undefined)
^^^^^^	Date : 12th of July 1994
^^^^	Time : 12:25
[ETX]	End of text (ASCII code 03H)
E8	Checksum
[CR]	Carriage return (ASCII code 0DH)

8.7. Channel Assignment Information from host to CU

```
CU    15:24:22,98 [STX]214>[ETX]D5[CR]
Host  15:24:23,03 [STX]214>[ETX]D5[CR]

CU    15:24:25,35 [STX]2151XA^^1^50^^4^^7^288^104^166^^^^^^^^^^^^^^^^^^^^
      ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
      ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
      ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^[ETX]37[CR]
Host  15:24:25,57 [STX]215>[ETX]D6[CR]

CU    15:24:27,82 [STX]216:XA^51^50^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
      ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
      ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
      ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^989^990^9
      91^992^993^994^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^[ETX]15[CR]
Host  15:24:28,03 [STX]216>[ETX]D7[CR]

CU    15:24:30,12 [STX]217>[ETX]D8[CR]
Host  15:24:30,17 [STX]217>[ETX]D8[CR]
```

Text format of example 7a:

The CU sends the channel assignment to the host (first frame) (each character ^ stands for a blank - ASCII code 20h)	
CU 15:24:25,35 [STX]2151XA^^1^50^^^4^^^7^288^104^166^^^^^^^^^^^^^^^^^^^^ ^^ ^^ ^^[ETX]37[CR]	
[STX]	Start of text (ASCII code 02H)
2	Host-ID : 2
1	Instrument-ID : 1
5	Packet number : 5
1	Frame character : 1 for 1. Result frame
XA	Function character: XA for Channel Assignment
^^1	Start channel no. : 1
^50	No. of channels : 50
^^^4	Application code 1: 4
^^^7	Application code 2: 7
^288	Application code 3: 288
^104	Application code 4: 104
^166	Application code 5: 166
^^^^	Channels 6 to 50 are not set 4 spcaes each
[ETX]	End of text (ASCII code 03H)
37	Checksum
[CR]	Carriage return (ASCII code 0DH)

Text format of example 7b:

The CU sends the channel assignment to the host (2. frame) (each character ^ stands for a blank - ASCII code 20h)	
CU 15:24:27,82 [STX]216:XA^51^50^^ ^^ ^^ ^^ 91^992^993^994^^ [ETX]15[CR]	
[STX]	Start of text (ASCII code 02H)
2	Host-ID : 2
1	Instrument-ID : 1
6	Packet number : 6
:	Frame character : : for last Result frame
XA	Function character: XA for Channel Assignment
^51	Start channel no. : 51
^50	No. of channels : 50
^^^^	Channels 51 to 86 are not set => 4 spcaes each
....	
^989	Application code 87: 989
^990	Application code 88: 990
^991	Application code 89: 991
^992	Application code 90: 992
^993	Application code 91: 993
^994	Application code 92: 994
....	
^^^^	Channels 93 to 100 are not set => 4 spcaes each
[ETX]	End of text (ASCII code 03H)
37	Checksum
[CR]	Carriage return (ASCII code 0DH)

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Appendix A - ASCII Chart

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

Appendix B - Differences between HITACHI 911 and 917

Communication Cycle Period:

HIT 911: 5 sec

HIT 917: selectable on the **HOST SETTING** screen (2 to 10 sec / default 2 sec)

Mastership of Test Selection Inquiry Communication:

HIT 911: Mastership is given to the AU: if the host does not respond to the inquiry from the AU within the specified time the sample is skipped.

HIT 917: Mastership selectable on the **HOST SETTING** screen to CU or host.
If mastership is given to the host, the CU waits analyzing the subsequent samples until the test selection of the actual sample is received.

Transmission of Absorbance Data:

HIT 911: only in realtime mode

HIT 917: only in batch mode

Transmission of Calculated Test Results:

HIT 911: No

HIT 917: Yes (like 747)

Transmission of Channel Assignment Information:

HIT 911: No

HIT 917: After power on or change of channel assignment (the application codes of all channels are sent to the host)

Maximum Size of Transferred Data:

HIT 911: 256, 512 bytes (selectable on **SYSTEM PARAMETER** screen)

HIT 917: 256, 512, 1280 bytes (selectable on **HOST SETTING** screen)

Sample Cup Selection within Test Selection Info

HIT 911: Default or one of five different sample cups can be specified from host

HIT 917: Standard or Micro Cup can be specified from host

End-of-data Codes:

HIT 911: 5 different end-codes (selectable on **SYSTEM PARAMETER** screen)

HIT 917: only one end-of-data code with checksum (like 747)

Retry Count:

HIT 911: 1 to 99 retries in case of no host answer (selectable on **SYSTEM PARAMETER** screen)

HIT 917: 1 to 99 retries and 0 for unlimited (selectable on **HOST SETTING** screen)

Function characters:

Completely different (see manual)

Frame format:

Completely different (see manual)

New features of HIT 917 V1:

Instrument ID (sender), Host ID (receiver), Packet No. in each message

(ID's for sending are selectable on the **HOST SETTING** screen. Received ID's will be ignored)

'TS Ask Always' mode selectable on **HOST SETTING** screen (like 747)

Option of **sending the comment fields within the result message** selectable on **HOST SETTING** screen.

Repeat Counter: Number of **REP** frames can be set from '1' to '99' or '0' for unlimited (selectable on **HOST SETTING** screen)

New features of HIT 917 V2:

Class numbers 3, 4 and 5 can be sent within the test selection for a specific sample.

The **Control Lot Number** is sent within the sample information section of the control result frame.

The six-character **Operator ID** is sent within the result frame.

STAT results can be sent **'As soon as cooked'**.

Data alarms can be selected where results with those selected alarms are not sent to the host (**Exception**).

Appendix C - Differences between V2 Disk and Rack Version

1. Automatic Rerun

The automatic rerun is not supported by the Rack version:

That means; the instrument does not send requests for the auto rerun to the host and also does not accept test selections for the auto rerun from the host.

2. Manual Rerun

To perform a **manual rerun** the rerun samples have to be placed in a pink rerun rack which has to be placed on the supply trays L or R or the additional gate.

If the **barcode mode is disabled** the operator has to enter the rack and position number for the manual rerun on the Data Review screen.

3. Sample Information

3.1. Sample Number

Within the Sample Information section of the corresponding messages, the 5-digit sample number field has the following format:

Routine/Rerun	STAT	Controls
bbbb1-10000	bbbb1-bb400	ccsss cc = b1-40 / sss = bb1-150

(b = space)

3.2. Disk/Rack Number

The 5-digit disk/rack number field has the following format:

Routine	Routine Rerun	STAT	Control
b4001-b8999	bA001-bA200	bbbbbb	bbbbbb
rack types red 4001-4999 gray 5000-6999 yellow 7000-8999	rack type pink A001-A200		

(b = space)

3.3. Position Number

The 3-digit position number field has the following format:

Routine/Rerun	STAT	Control
bb1-bb5	bb1-b10	b11-b57

(b = space)

4. Additional Gate

When starting operation in either Barcode or Sample Number mode, the Rack system checks whether host communication is enabled or disabled. The additional gate will become active or inactive according to this setting as follows:

Mode	Host Communication	Status of the Additional gate
Barcode	ON/OFF	active
S. No.	ON with TS inquiry	active
	ON without TS inquiry (result only)	inactive
	OFF	inactive

Although the host communication status can be changed manually during operation, the status of the additional gate should be protected not to be changed during operation.

Appendix D - Error Check Functions

If the contents of the received text falls under any condition shown in the table below the CU judges that there is an abnormal character and outputs an alarm:

Attribute	Item	Error Condition	Remarks
Text Information	Host ID, Instrument ID	if the character is not within '0' to '9'	
	Packet No.	if the character is not within '1' to '8'	
	Frame character	if there is an irrelevant frame character	
Sample Information	Sample no. disk no. position no. sample cup	if a number is out of the specified range	no alarm is output if the items consist of spaces (in the ID mode)
	ID no.	In the ID mode, the ID number must be right-justified. Character range \$20 to \$FE	if the ID consists of spaces in the ID mode, an alarm is output.
	Age, Sex, Date, Time	if the contents of each item is out of the specified range	
Inquiry Information	Test Selection	if the test flags are not within '0' to '4' if the channel count is out of the specified range	
	Comment Information	Character range 20h to FEh	

Appendix E - Table of Communication Errors

Contents	Alarm Code
A receiving timeout has occurred	126-001
A transmission timeout has occurred	126-002
A checksum error has occurred	126-003
A parity error has occurred	126-004
A framing error has occurred	126-005
An overrun error has occurred	126-006
A frame error has occurred	126-007
A text length error has occurred	126-008
A function character error has occurred	126-009
A sample information data error has occurred	126-010
A test selection data error has occurred	126-011
A comment error has occurred	126-012
A host ID, instrument ID or packet no. error has occurred	126-013
Communication disabled after the specified number of retries	126-014

Appendix F - Text Configuration Table

The columns and rows of the following tables have the following contents:

Frame type	Frame	Frame items	
Sender	bytes	Item length in bytes	

The following abbreviations are used: **HID**: Host Identification / **AID**: Analyzer Identification / **PN**: Packet number

Positive response	ANY	STX	HID	AID	PN	>	ETX	CSH	CSL	CR
CU	9	1	1	1	1	1	1	1	1	1

Positive response	MOR	STX	HID	AID	PN	>	ETX	CSH	CSL	CR
Host	9	1	1	1	1	1	1	1	1	1

Negative response	REP	STX	HID	AID	PN	?	ETX	CSH	CSL	CR
CU / Host	9	1	1	1	1	1	1	1	1	1

Bad and suspend	SUS	STX	HID	AID	PN	@	ETX	CSH	CSL	CR
CU / Host	9	1	1	1	1	1	1	1	1	1

Ok and suspend	REC	STX	HID	AID	PN	A	ETX	CSH	CSL	CR
Host	9	1	1	1	1	1	1	1	1	1

TS Request	SPE	STX	HID	AID	PN	;	Fu	Sample Information	ETX	CSH	CSL	CR
CU	53	1	1	1	1	1	2	42	1	1	1	1

Result Request	RES
Host	53

STX	HID	AID	PN	<	Fu	Sample Information	ETX	CSH	CSL	CR
1	1	1	1	1	2	42	1	1	1	1

Test selection	SPE
Host	249

STX	HID	AID	PN	;	Fu	Sample Information	Channel Count	Test selection	Comments	ETX	CSH	CSL	CR
1	1	1	1	1	2	42	3	88	105	1	1	1	1

Analytical data	FR1 to END
AU	1167

STX	HID	AID	PN	:	Fu	Sample Information	Operator	Channel count	Analytical data 1 to 100	Comments	ETX	CSH	CSL	CR
1	1	1	1	1	2	42	6	3	1000	105	1	1	1	1

Absorbance data	FR1 to END
AU	558

STX	HID	AID	PN	:	Fu	Sample Information	Analytical data 1 to 4	Blank data 1 to 4	Point count	ABS values 1 to 73	ETX	CSH	CSL	CR
1	1	1	1	1	2	42	40	24	3	438	1	1	1	1

Photometry assay Calib	END
AU	222

STX	HID	AID	PN	:	G_	Operator	Test no.	STD count	Calib alarm	STD data 1 to 6	SD value	ETX	CSH	CSL	CR
1	1	1	1	1	2	6	3	1	1	192	8	1	1	1	1

ISE Calib	END
AU	237

STX	HID	AID	PN	:	H_	Operator	ISE type	ISE calibration data 1 to 3	ETX	CSH	CSL	CR
1	1	1	1	1	2	6	1	219	1	1	1	1

Channel Assignment	FR1 / END
AU	217

STX	HID	AID	PN	:	XA	Start channel	Channel count	Application codes 1 to 50	ETX	CSH	CSL	CR
1	1	1	1	1	2	3	3	200	1	1	1	1

The above tables show the text configuration when the maximum text length is set to 1280 bytes.
For details about the format of the data items refer to the corresponding chapter in this document.