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Document Number

POC-HA-C-52A-033

[Software Requirement Specifications]
Communication Specifications
(Variant Specification)

Product Name

ADAMS A1c Lite
HA-8380V

	Approval	Check	Check	Author	Dept./Team Responsible
First Issue	Okumura Dec. 24, 2014	Egawa Dec. 24, 2014	Satake Dec. 22, 2014	Fujimoto Dec. 18, 2014	Point of Care Team 3, Product Development Division

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ARKRAY, Inc.

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Revision history

Rev. No.	Rev. Date	Item	Description	Reason
-	Dec. 18, 2014	-	First issue	Newly prepared for Variant specification based on POC-HA-C-48B-011 Communication Specifications.
A	Mar. 6, 2015	2.7.4. Measurement result message	Deletion of the following sentence: "For details of the errors, see POC-HA-C-52A-038 Abnormal Value List."	Deleted because this document is not distributed to other companies or countries.

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Chapter 1. Introduction

1.1. Overview

This document describes specifications of the ADAMS A1c Lite HA-8380V external communication standard format. The communication format basically follows the HA-8180V standard format.

1.2. Scope

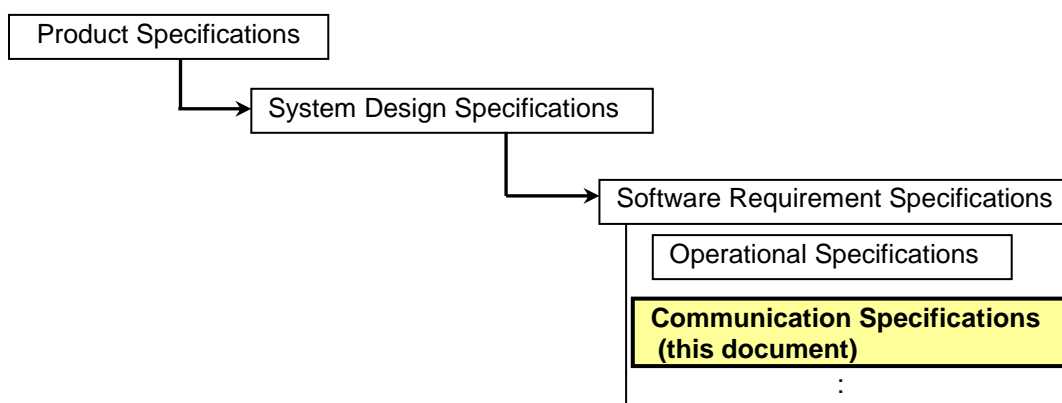
This document describes specifications of the HA-8380V communication standard format. Other than this format, this instrument also has a compatible format with an existing instrument (HA-8160VP). For specifications of the compatible format, see the relevant communication specifications.

This document includes RS-232c communication specifications. For protocol of external output using Ethernet (optional), see "HA-8180-C-47B-028 Ethernet Specifications".

Note that this document applies only to the HA-8380 Variant specification. Communication specifications for the HA-8380 standard specification are described in a separate document.

1.3. Position of this document

This document is prepared with the Product Specifications as an input, and positioned as an input document for the Software Design Specifications. The contents of this document must be consistent with those of the Product Specifications. In development completion evaluation for this instrument, it must be verified that this document is followed correctly.



1.4. References

Reference documents are shown below.

No.	Specifications	Document No.
(1)	HA-8380V Product Specifications	POC-HA-B-48B-002
(2)	HA-8380V Communication Specifications	HA-8180-C-46B-037
(3)	Error Trouble Specifications	POC-HA-C-48B-002
(4)	Operational Specifications (Service Mode)	POC-HA-C-52A-013

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Chapter 2. Interface Specifications

HA-8380V adopts the communication protocol compliant with ASTM-1381 (ARKRAY standard). Note that the HA-8380V standard format differs from the compatible formats in the transmission method, number of retransmissions, time-out, etc.

2.1. Compatibility of the standard format

This instrument has the standard communication format just as the existing model (HA-8180V), but there are some incompatibilities between the two formats due to the system difference. The incompatible items are described below.

2.1.1. Differences in standard formats between HA-8380 Variant specification (HA-8380V) and HA-8180V

Item		Difference	
		HA-8180V	HA-8380V
2.2. RS-232C Communication setting	Transmission rate	Selectable from 300, 600, 1200, 2400, 4800, <u>9600</u> , and 19200 bps.	Selectable from 600, 1200, 2400, 4800, <u>9600</u> , and 19200 bps.
2.5.5. Notes for designing the external device	Measurement interval	Fast mode: 48 seconds Variant mode: 90 seconds	Fast mode: 100 seconds Variant mode: 160 seconds
	Action taken when measurement interval is exceeded	Skip measurement	End measurement
2.7.1. Communication control code	Header record Instrument name	HA-8180V	HA-8380V
2.7.2. Query message	<input type="checkbox"/> Query record Rack ID	Rack ID	"01"
2.7.3. Response message	<input type="checkbox"/> Test order record Rack ID	Rack ID	"01"
2.7.4. Measurement result message <input type="checkbox"/> Test order record	3. Patient ID (2) Port No.	Port No.	Port No. (In small volume measurement: "0000")
	3. Patient ID (3) Rack ID	Rack ID	"01"
	6. Priority (1) Measurement type	Sample, control, STAT	Sample , control, small volume sample
	20. Additional comment	(3) Column degradation information (3)-1. Normal (3)-2. Column degradation	(3) Column degradation/calibration timing notification information (3)-1. Normal (3)-2. Column degradation only (3)-3. Calibration timing notification only (3)-4. Column degradation/calibration timing notification

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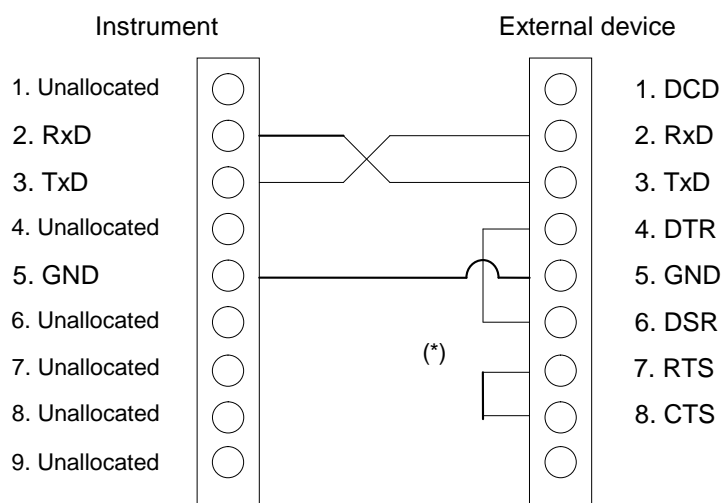
2.2. RS-232C communication settings

Item	Description
Interface	Voltage type (RS-232C compliant, bit serial output)
Transmission method	Asynchronous communication method Half-duplex simplex alternate communication
Transmission rate	Selectable from 600, 1200, 2400, 4800, <u>9600</u> and 19200 bps
Start bit	1 bit
Data bit	8 bits
Parity bit	None
Stop bit	1 bit

Note 1) "Start bit" and "Stop bit" represent the binary digits "0" and "1" respectively.

Note 2) The default value is underlined.

2.3. Connection between this instrument and an external device (Connector pin numbers, signals and cables)



(*) When the CTS and RTS terminals are used on the external device, connect them in the cable.
When the DSR and DTR terminals are used on the external device, connect them in the cable.

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2.4. RS-232C Communication frame structure

2.4.1. Frame structure

STX	FN	Transmission data (Max. 240 bytes)	ETB or ETX	CSH	CSL	CR	LF
-----	----	---------------------------------------	------------------	-----	-----	----	----

2.4.2. Maximum frame length

The maximum frame length is 247 bytes, including STX, ETB or ETX, Checksum, CR and LF. The maximum transmission data length is 240 bytes (247 - 7). If the transmission data length exceeds 240 bytes, it will be sent in several frames.

2.4.3. Frame control code

Code	Hexadecimal	Description
STX	02H	Start of text (frame)
FN	30H - 37H '0' - '7'	Frame No. Begins with "1" and incremented by one. Returns to "0" after reaching "7".
Transmission data		Communication text
ETB	17H	End of transmission block
ETX	03H	End of text (frame)
CSH	Note 1)	Checksum high
CSL		Checksum low
CR	0DH	Carriage return
LF	0AH	Line feed

Note 1) Calculation of checksum

Checksum is calculated by adding up the bytes from after STX through ETX or ETB and dividing the sum by 256 to express its remainder in 2-digit hexadecimal form. The first and second characters of the checksum represent "CSH" and "CSL" respectively.

[Example]

If the sum of the bytes after STX through ETX is 1,000:

$$1,000 \bmod 256 = 232 = \text{E8H}$$

CSH = 'E' (45H), CSL = '8' (38H)

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2.5. RS-232C communication protocol

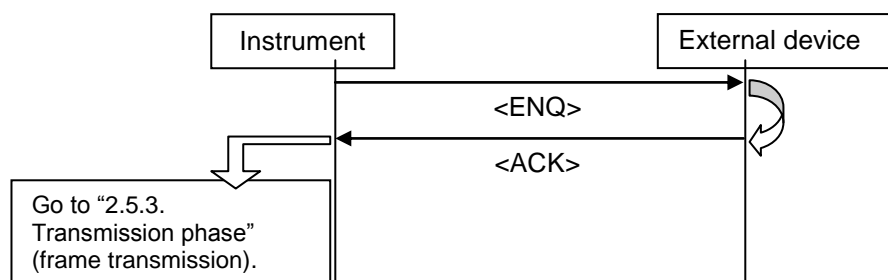
2.5.1. Communication control code

Code	Hexadecimal	Description
ENQ	05H	Enquiry (request for start)
ACK	06H	Acknowledgement
NAK	15H	Negative acknowledgement
EOT	04H	End of transmission and request for receive interrupt

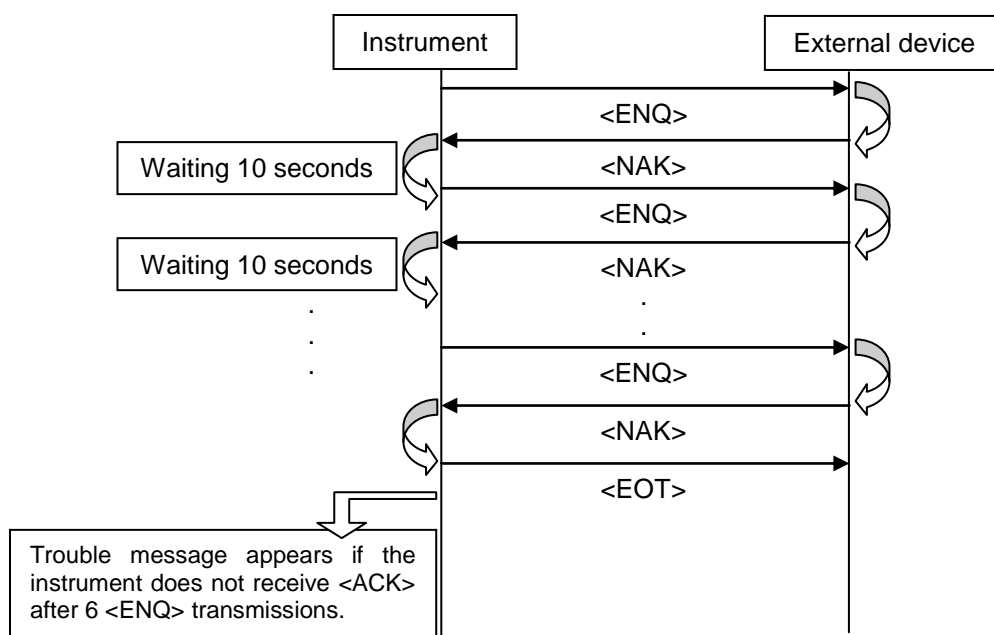
2.5.2. Establishment phase

(1) Instrument <ENQ> transmission

- The instrument transmits <ENQ> when it has a message to send.
- If the instrument receives a response other than <ACK> and <ENQ> after sending <ENQ>, it performs the same process as when it receives <NAK> (described later).
- If the instrument receives <ACK> after sending <ENQ>, it moves on to transmission phase.



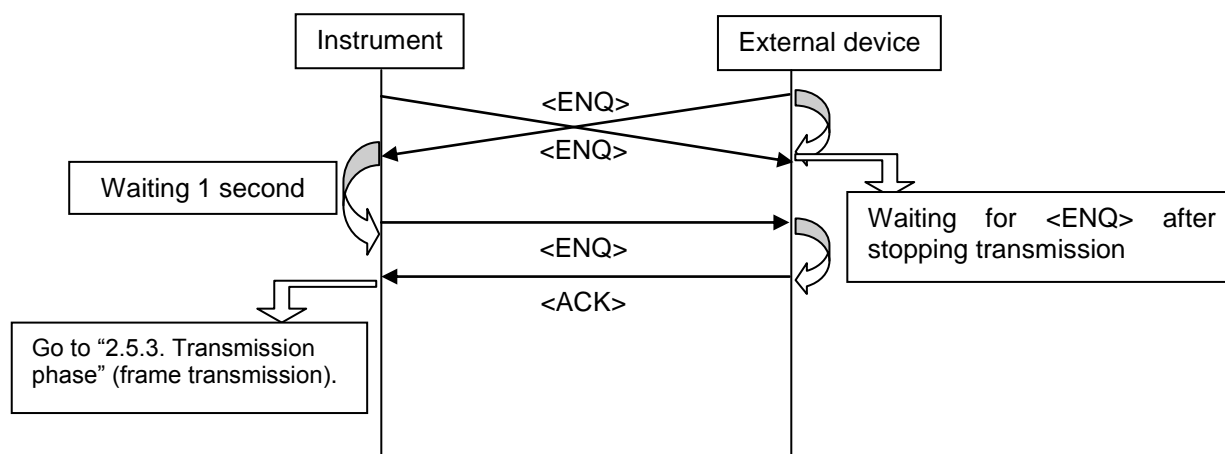
- If the instrument receives <NAK> after sending <ENQ>, it retransmits <ENQ> after waiting for a certain period of time.
- If the instrument does not receive <ACK> after transmitting <ENQ> 6 times (including the first transmission), it sends <EOT> before giving a trouble message. (*)



(*) The trouble message is designed to avoid entering into an infinite loop.

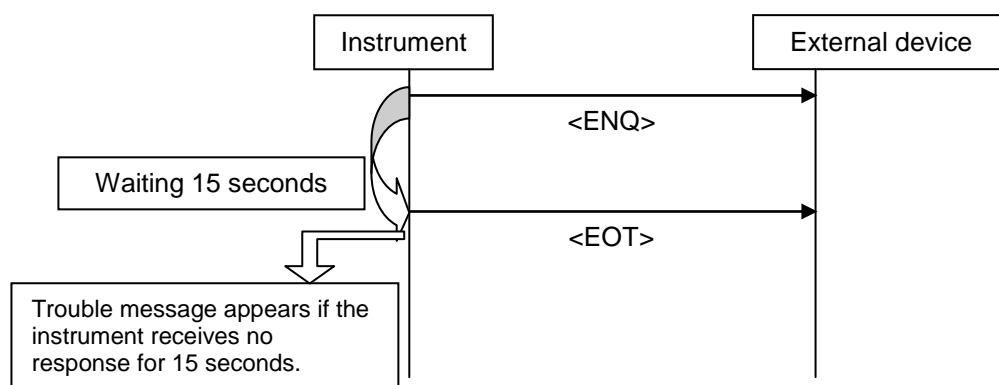
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- If the instrument receives <ENQ> after sending <ENQ>, it retransmits <ENQ> after waiting for 1 second (*).
- If the PC receives <ENQ> after sending <ENQ>, it stops transmitting and waits for <ENQ>. If it does not receive <ENQ> after waiting for 20 seconds, it retransmits <ENQ>.



(Note) If a collision of <ENQ> occurs, <ENQ> from the instrument is given priority over that from the external device and the device will wait for <ENQ>.

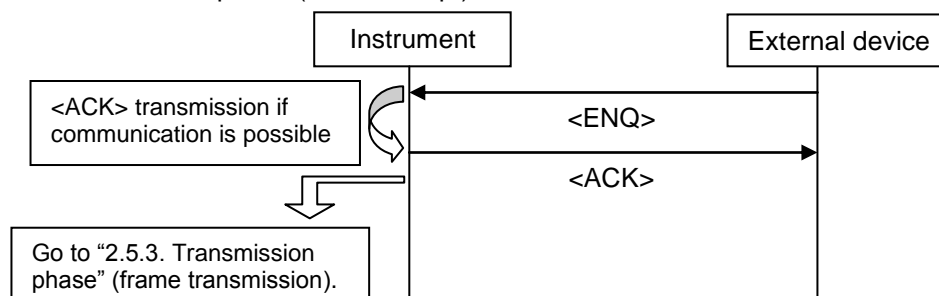
If the instrument receives no response for 15 seconds, it sends <EOT> before giving a trouble message. (*)



(*) The trouble message is designed to detect cable disconnection, including unplugged cables.

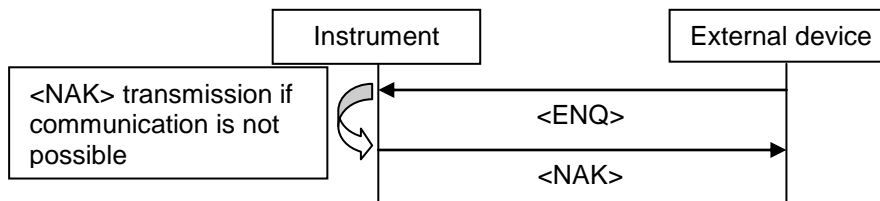
(2) Instrument <ENQ> receipt

- After receiving <ENQ>, the instrument sends <ACK> if communication is possible, and moves on to the transmission phase (frame receipt).



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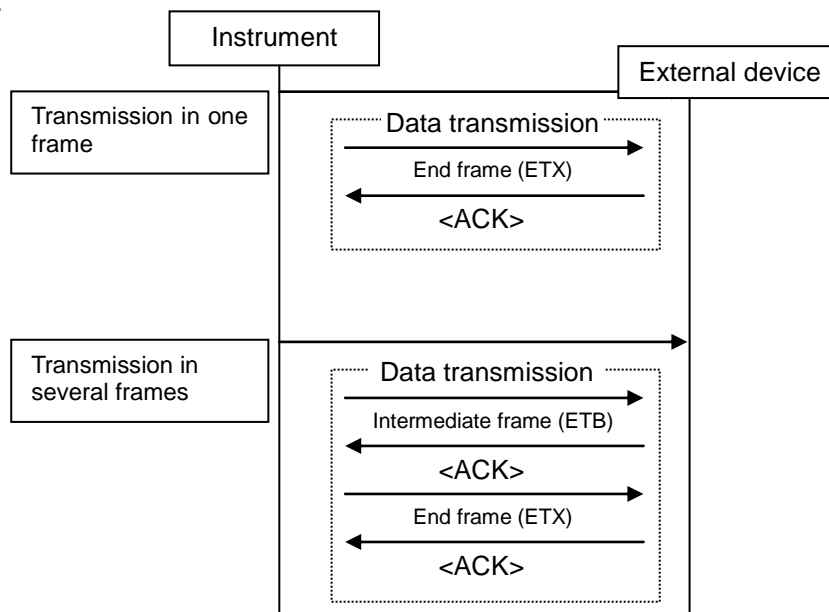
After receiving <ENQ>, the instrument sends <NAK> if communication is not possible.



2.5.3. Transmission phase

(1) Instrument frame transmission

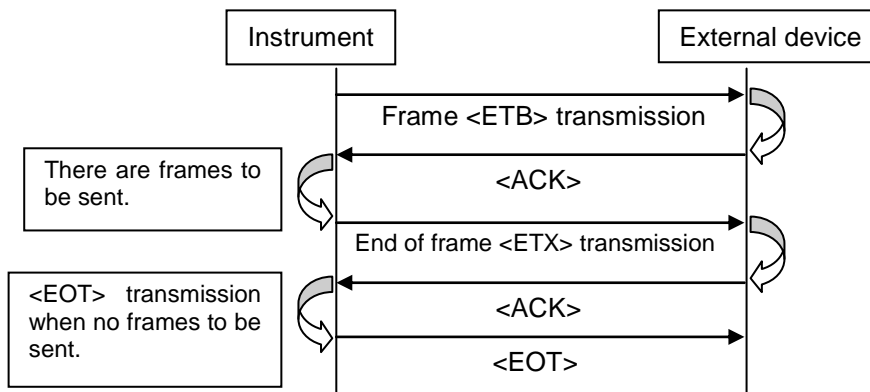
- The instrument divides the data into several frames, if it exceeds the maximum frame length (240-byte data).



- If the instrument receives a response other than <ACK> and <EOT> after transmitting frame, it performs the same process as when it receives <NAK>.
- If the instrument receives <ACK> or <EOT> (*) after transmitting frame and there is no more frame to send, it transmits <EOT>. If there are any frames to send, it transmits the next frame.

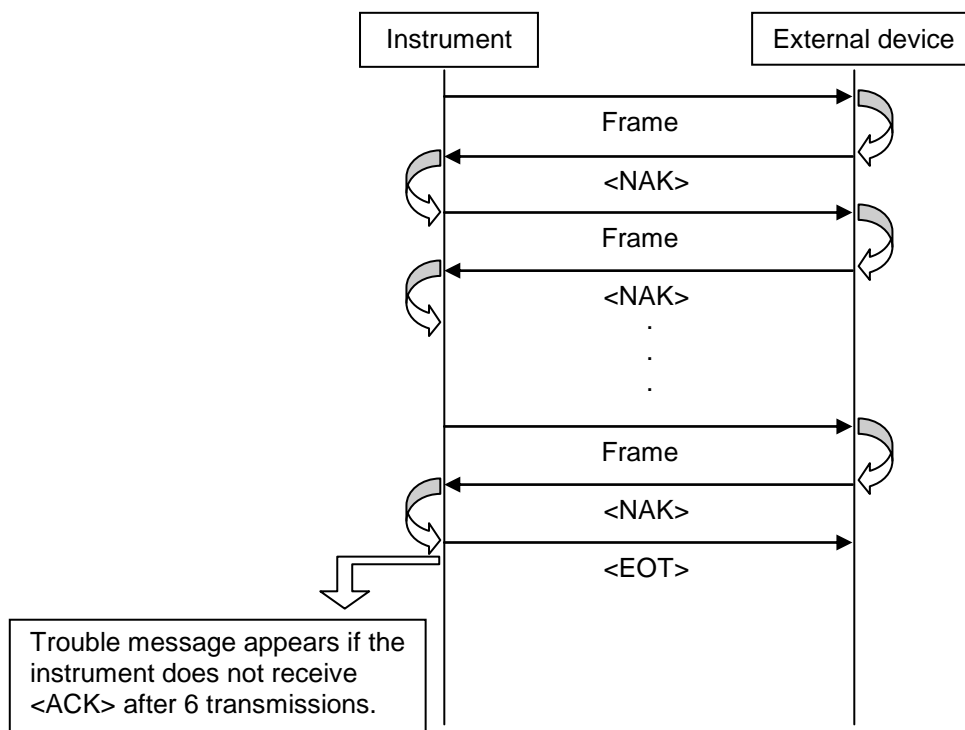
(*) **When the instrument receives <EOT> after frame transmission, it regards <EOT> as “Acknowledgement” (<ACK>), not “End of transmission” (<EOT>).**

- The instrument transmits <EOT> after completion of all the frame transmissions.



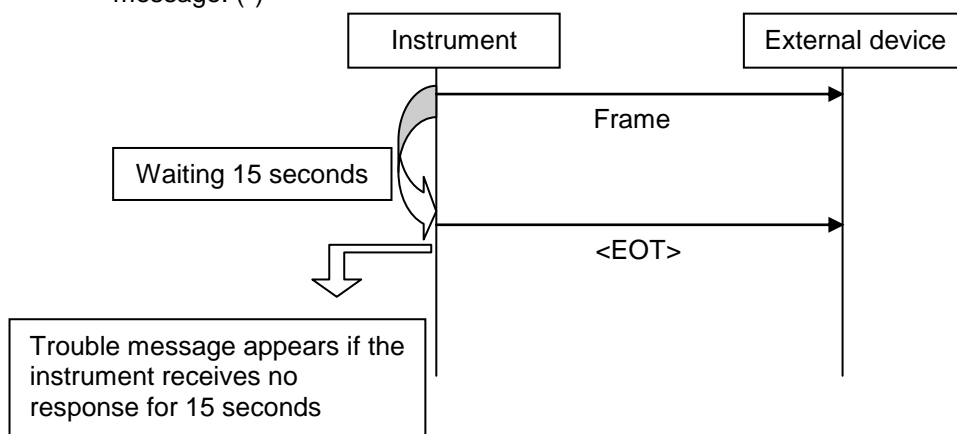
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- The instrument retransmits the same frame if it receives <NAK> after sending a frame.
- If the instrument does not receive <ACK> after transmitting the same frame 6 times (including the first transmission), it sends <EOT> before giving a trouble message. (*)



(*) The trouble message is designed to avoid entering into an infinite loop.

- If the instrument receives no response for 15 seconds, it sends <EOT> before giving a trouble message. (*)



(*) The trouble message is designed to detect cable disconnection, including unplugged cables.

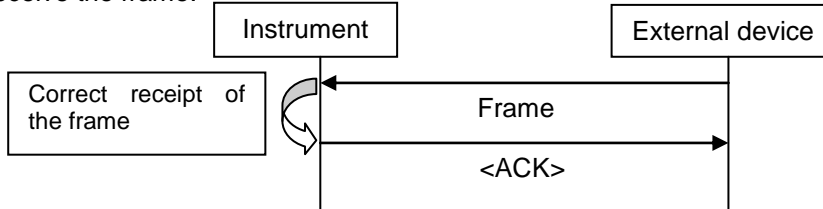
(2) Process before retransmission

If the instrument receives a response other than <ACK> after transmitting data, it will wait for a certain period of time before retransmitting the data. During this period, the instrument disregards any data sent from the external device.

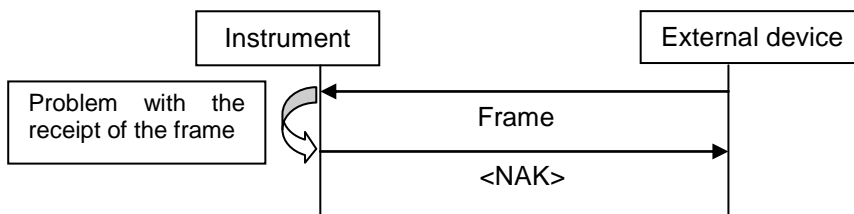
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(3) Instrument frame receipt

- After receiving a frame, the instrument checks whether it has received the frame correctly. If the instrument confirms the correct receipt of the frame, it transmits <ACK> after becoming ready to receive the frame.

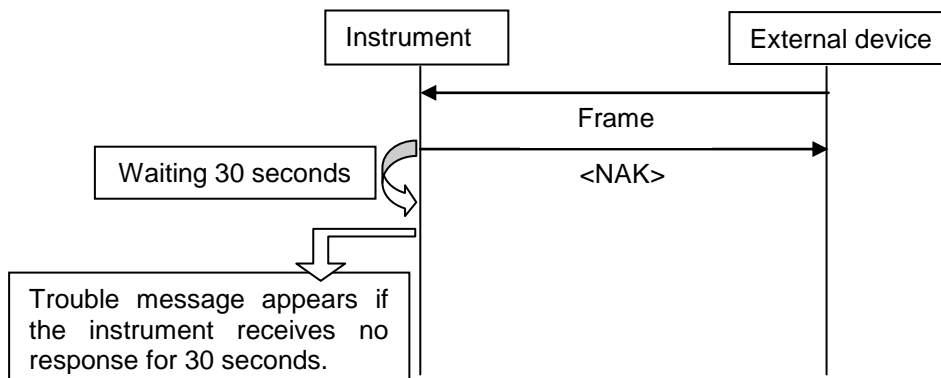


- After receiving a frame, the instrument checks whether it has received the frame correctly. If the instrument finds any problem with the receipt of the frame, it transmits <NAK> after becoming ready to receive the frame again.



(*) Despite the correct receipt of the frame, <NAK> may be transmitted. If this causes a problem for the PC, lower the setting of the baud rate.

- If the instrument does not receive <EOT> or the receipt completion of the next frame (<CR><LF> at the end of the frame) within 30 seconds after sending a response, it gives a trouble message. (*)

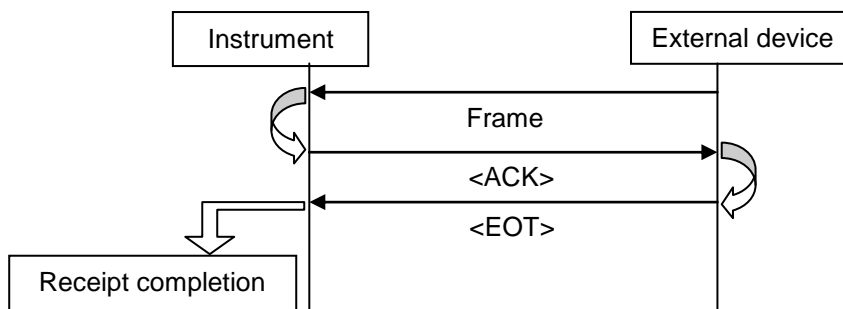


(*) The trouble message is designed to avoid entering into an infinite loop.

Criteria for the correct receipt of the frame:

- No character errors shall be detected (parity error, framing error, etc.).
- Frame checksum shall match the checksum calculated based on the frame received.
- The frame number shall be equal to or one greater than that of the previously received frame.

The instrument determines the receipt completion of all the frames when it receives <EOT>.



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2.5.4. Time-out, number of retransmissions and waiting time settings

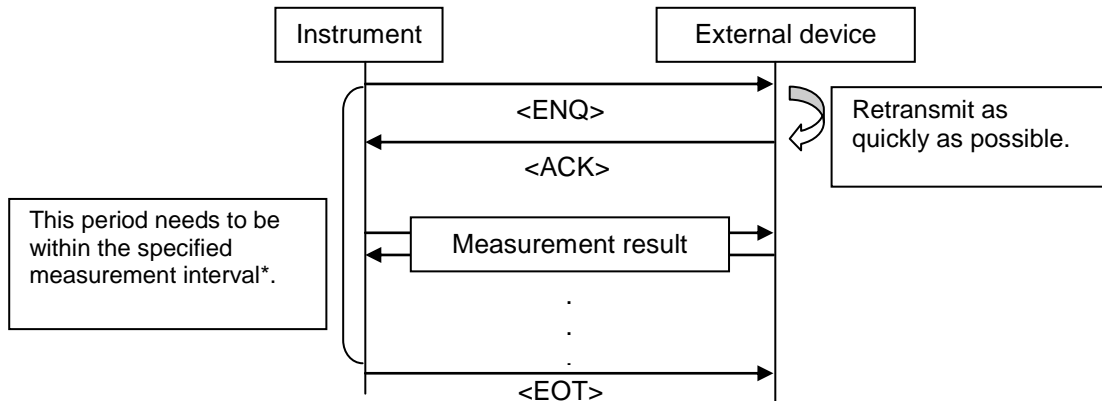
It is advisable to set the following parameters individually. If this is difficult, however, the same value can be used (e.g. setting the same value for the non-response time-out after <ENQ> transmission and frame transmission).

Item	Description	Default
Time-out	Non-response time-out after <ENQ> transmission	15 seconds
	Non-response time-out after frame transmission	15 seconds
	The maximum time between sending a response and receiving <EOT> or the receipt completion of the next frame	30 seconds
Number of retransmissions	The number of retransmissions when receiving <NAK> after <ENQ> transmission	6 times
	The number of retransmissions when receiving <NAK> after frame transmission	6 times
Waiting time	The maximum waiting time when receiving <NAK> after <ENQ> transmission	10 seconds
	The maximum waiting time when receiving <ENQ> after <ENQ> transmission	1 seconds

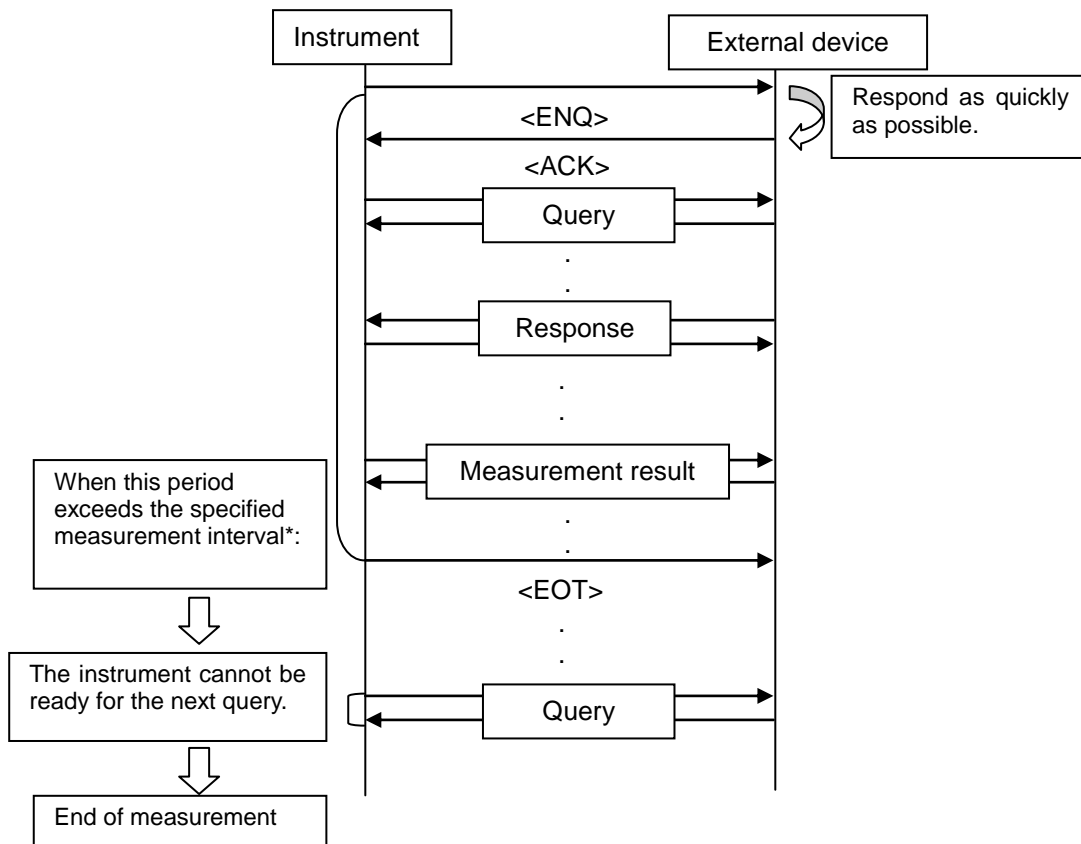
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2.5.5. Notes for designing the external device

- After receiving data from the instrument, the external device has to retransmit as quickly as possible. If responses from the external device are late and communication time for one measurement result exceeds the measurement time, the instrument does not enter standby mode until it finishes outputting data.



- When a query function is used, a sequence of communications; query, response and sending measurement result data; has to finish within the time of measurement. If it exceeds measurement time, the instrument has to finish the measurement because it cannot be ready for the next measurement.



*Variant mode: 160 seconds, Fast mode: 100 seconds

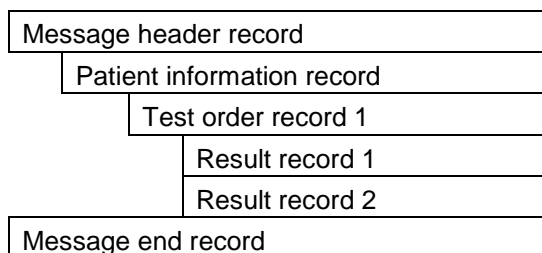
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2.6. Communication data structure

2.6.1. Message

Data sent and received in communication is called “message”. One message is composed of multiple records in the following hierarchy. The message starts with the header record and finishes with the end record.

Example: Measurement result message



2.6.2. Record

Each record is composed of multiple fields and its content is defined by its record type. The number of fields in a record is fixed according to the record type. The data length in the field is variable (Min. 0 when omitted). Each field is divided by field delimiters. Delimiters are left for the field omitted so as to indicate the field has been omitted. (Delimiters at the end of the record may be omitted.)

Example: Result record

	Field	Example
1	Record type	R
2	Record sequence No.	1
3	Measurement item	HbA1c
4	Measurement value	5.5
5	Unit	%
6	x (Omitted)	No output (NULL)
7	Abnormal flag	ERR.
8	x (Omitted)	No output (NULL)
9	Test result status	F
10	x (Omitted)	No output (NULL)
11	x (Omitted)	No output (NULL)
12	Measurement start date and time	200203041010
	Record terminator	<CR>

R|1|^ValueHbA1c|5.5|%||ERR.||F|||200203041010<CR>

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2.7. Communication format

This section describes the communication format.

- (1) Query message (instrument -> external device)
- (2) Response message (external device -> instrument)
- (3) Measurement result message (instrument -> external device)

2.7.1. Common record

All the messages above include common records (header and end records). This section provides information about the header and end records.

Descriptions of the fields that are defined by "ASTM 1394" and not used in this format have been omitted. Missing field numbers are unallocated fields.

□ Header record

Header record is composed of 14 fields.

No.	Field	Description	Remark (Example)
1	Record type	(1) Set character	(1) "H"
2	Delimiter setting	(1) Set character Field delimiter Repeat delimiter Component delimiter Escape delimiter	(1) " \$^&"
5	Sender name	(1) Instrument name: Set characters (2) Instrument No. (S/N): 8-digit number (3) Instrument version: Numbers and characters (4) Surplus: Space	(1) "HA-8380V" (2) "10900001" (3) "V01.00" (4) " "
14	Communication date/time	(1) Communication date/time (YYYYMMDDHHMM): 12-digit number (Year, Month, Day, Hour, Minute)	(1) "200607191010"
	End of record	(1) End of record	(1) <CR> (0x0D)

<Example> 12---345-----678901234-----

H|\$^&|||HA-8380V^10900001^V01.00 |||||200203111010<CR>

□ End record

End record is composed of 3 fields.

No.	Field	Description	Remark (Example)
1	Record type	(1) Set character	(1) "L"
2	Sequence No.	(1) Set character	(1) "1"
3	End code	(1) Indicates whether measurement has been normally completed. ("Normal end": Set character)	(1) "N"
	End of record	(1) End of record	(1) <CR> (0x0D)

<Example > 12-3-

L|1|N<CR>

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2.7.2. Query message

This section describes the query message structure and each record.

■ Query message structure (instrument -> external device)

Message header record	H
Query record	Q
Message end record	L

□ Query record

Query record is composed of 13 fields.

No.	Field	Description	Remark (Example)
1	Record type	(1) Set character	(1) "Q"
2	Sequence No.	(1) Set character	(1) "1"
3	Patient ID	(1) Barcode ID: 18-digit number/character/symbol ^(*) (2) Port No.: 4-digit number (3) Rack ID: 2-digit number	(1) "012345678901234567" (2) "0001" (3) "01" ^(*)
13	Query code	(1) Indicates the content of query. (Request an order): Set character	(1) "O"
	End of record	(1) End of record	(1) <CR> (0x0D)

<Example> 12-3-----4567890123-

Q|1|012345678901234567^0001^01|||||||O<CR>

^(*) The maximum digit number for the barcode ID is 18. If it is not met, "-" will be used for the lower position.

^(*) Although there is no "Rack ID" for HA-8380V, dummy value is entered so that the instrument is compatible with HA-8180.

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2.7.3. Response message

■ Response message structure (external device -> instrument)

Message header record	H
Patient information record	P
Test order record	O
Message end record	L

□ Patient information record

Patient information record is composed of 2 fields.

No.	Field	Description	Remark (Example)
1	Record type	(1) Set character	(1) "P"
2	Sequence No.	(1) Sequence number starting with "1"	(1) "1"
	End of record	(1) End of record	(1) <CR> (0x0D)

<Example> 12-

P|1<CR>

□ Test order record

Test order record is composed of 16 fields, which are different from those of the measurement result message.

No.	Field	Description	Remark (Example)
1	Record type	(1) Set character	(1) "O"
2	Sequence No.	(1) Set digit	(1) "1"
3	Patient ID	(1) Barcode ID: 18- digit number/character/symbol ^(*) (2) Port No.: 4-digit number (3) Rack ID: 2-digit number	(1) "012345678901234567" (2) "0001" (3) "01"
5	Measurement item	(1) Measurement item name (either of below) (1)-1. Measure: Set character ^(*) (1)-2. No measure: No output	(1)-1. "^^^HbA1c" (1)-2. NULL (No output)
6	Priority	(1) Measurement type (either of below) ^(*) (1)-1. Sample: Set character (1)-2. Control: Set character	(1)-1. "R" (1)-2. "C"
16	Sample type	(1) Sample type (either of below) (1)-1. Whole blood: No output (1)-2. Hemolysis: Set character (1)-3. Anemia: Set character	(1)-1. NULL (No output) (1)-2. "H" (1)-3. "A"
	End of record	(1) End of record	(1) <CR> (0x0D)

<Example>12-3-----45-----6-7890123456-

O|1|012345678901234567^0001^01||^^HbA1c|R|||||||H<CR>

^(*) For the barcode ID, the same string of characters as that in the Patient ID field of query message is set. If a different ID is set, the instrument gives a "T-811: ID mismatch" message and suspends measurement.

^(*) Measurement item consists of four components but the first three are not used.

^(*) As query is not performed in small volume measurement, the sample type of test order record in response message does not include small volume measurement.

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2.7.4. Measurement result message

This section describes the measurement result message structure and each record.

■ Measurement result message structure (instrument -> external device)

Message header record	H
Patient information record	P
Test order record	O
Result record	R
Message end record	L

□ Patient information record

Patient information record is composed of the same fields as those of the response message.

□ Test order record

Test order record is composed of 20 fields, which are different from those of “2.7.3. Response message”.

No.	Field	Description	Remark (Example)
1	Record type	(1) Set character	(1)“O”
2	Sequence No.	(1) Set number	(1)“1”
3	Patient ID	(1) Barcode ID: 18-digit number/character/symbol ⁽¹⁾ (2) Port No.: 4-digit number (3) Rack ID: 2-digit number	(1)“012345678901234567” (2)“0001” ⁽²⁾ (3)“01”
4	Measurement No.	(1) Measurement No.: 4-digit number	(1)“0001”
5	Measurement item	(1) Measurement item name ⁽³⁾ HbA1c: Set character	(1)“^^^HbA1c”
6	Priority	(1) Measurement type (either of below) ⁽⁴⁾ (1)-1. Sample: Set character (1)-2. Control: Set character (1)-3. Small volume sample: Set character	(1)-1. “R” (1)-2. “C” (1)-3. “M”
16	Sample type	(1) Sample type (either of below) (1)-1. Whole blood: No output (1)-2. Hemolysis: Set character (1)-3. Anemia: Set character	(1)-1. NULL (No output) (1)-2. “H” (1)-3. “A”
20	Additional comment	(1) HbA1c measurement error information 8-digit number (Hexadecimal) (2) Set character 8-digit number (Hexadecimal) (3) Colum degradation/calibration timing notification information (3)-1. Normal (3)-2. Column degradation only (3)-3. Calibration timing notification only (3)-4. Column degradation/calibration timing notification (4) Measurement mode (either of below) (4) -1. Variant mode (4)-2. Fast mode (5) Eluent A: Lot No., expiry (6) Eluent B: Lot No., expiry (7) Eluent C: Lot No., expiry	(1)“00000000” ⁽⁵⁾ (2) “00000000” (3)-1. “0” (3)-2. “1” (3)-3. “2” (3)-4. “3” (4)-1. “V” (4)-2. “F” (5) “0A1101”“2011-01” (6) “0C1112”“2011-03” (7) “0D3331”“2011-04”

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		(8) Hemolysis washing solution: Lot No., expiry	(8) "9L1121""2010-12"
		(9) Standard solution: Lot No., expiry	(9) "C189C05""2010-05"
	End of record	End of record	<CR> (0x0D)

<Example> 12-3-----4----5-----6-7890123456-7890

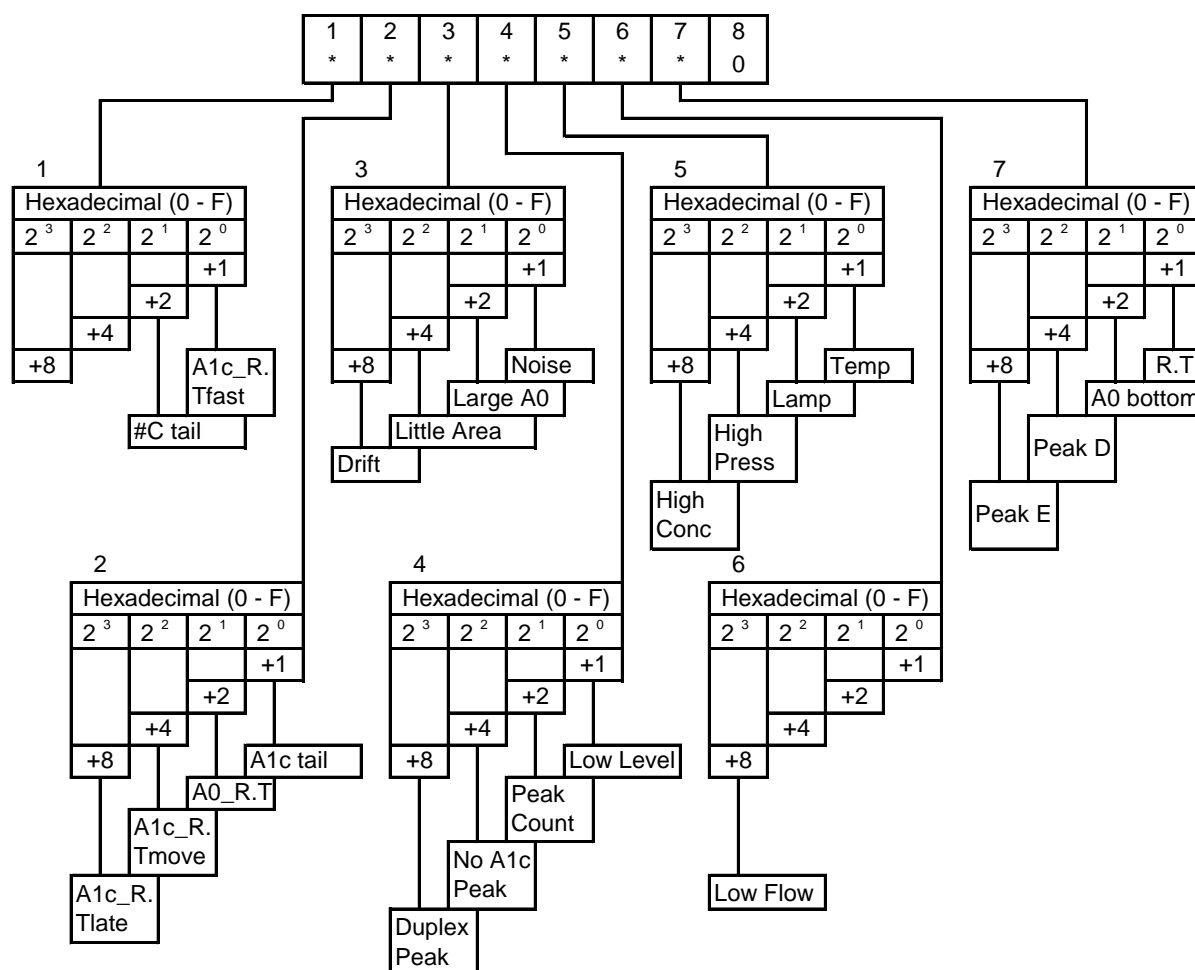
O|1|0123456789012-----^0001^01|0001|^HbA1c|R|||||||H||||00000000^00000000^0^

V^0A1101^2011-0^0C1112^2011-03^0D3331^2011-04^9L1121^2010-12^CA89C05^2010-05<CR>

- (*1) The maximum number of digits for the barcode ID is 18. If it is not met, "-" will be used for the lower position.
- (*2) As there is no "Port No." for small volume measurement, the value is set at "0000".
- (*3) Measurement item consists of four components but the first three are not used.
- (*4) "STAT measurement" is not included in the HA-8380V specifications. Because the small volume measurement function is added to HA-8380V (after the launch), the sample type includes "small volume measurement" along with normal and control measurements.

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[Bit array for error information] (*5)



- | | |
|--|--|
| 1 (None) | 4 Duplex Peak ... Duplex peaks |
| (None) | No A1c Peak ... Cannot detect S-A1c peaks |
| #C tail ... L-A1c tail | Peak Count ... Abnormal peak count |
| A1c_R.T fast ... S-A1c retention time (early) | Low Level ... Hb: Abnormally low value |
| 2 A1c_R.T late ... S-A1c retention time (late) | 5 High Conc ... Hb: Abnormally high value |
| A1c_R.T move ... S-A1c R. time fluctuation | High Press ... High pressure tube: High pressure |
| A0_R.T ... HbA0 retention time | Lamp ... Low optical unit light |
| A1c tail ... S-A1c tail | Temp ... Temperature control |
| 3 Drift ... Drift baseline | 6 Low Flow ... High pressure tube: Low pressure |
| Little Area ... Hb: Low value | |
| Large A0 ... HbA0: Abnormally high value | |
| Noise ... Noise detected | |
| | 7 Peak E ... Abnormal peak (E) detected |
| | Peak D ... Abnormal peak (D) detected |
| | A0 bottom ... HbA0 bottom |
| | R.T ... Retention time |

□ **Result record (Sequence No. 1)**

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One result record is composed of 12 fields.

1.Record type 2.Sequence No. 3.Item name 4.Meas. value 5.Unit - 7.Abnormal flag - 9.Test result status - - 12.Meas. start date/time

No.	Field	Description	Remark (Example)
1	Record type	(1) Set character	(1) "R"
2	Sequence No.	(1) Sequence number starting with "1"	(1) "1"
3	Measurement item	(1) Item name: Set characters (either of below) ^{(*)1} (1)-1. HbA1c measurement value (1)-2. IFCC measurement value (1)-3. HbF measurement value (1)-4. Total area (1)-5. HbA1ab peak ^{(*)2} (1)-6. HbA1c peak ^{(*)2} (1)-7. HbF peak ^{(*)2} (1)-8. L-A1c peak ^{(*)2} (1)-9. #A0 peak ^{(*)2} (1)-10. A0 peak ^{(*)2} (1)-11. S peak ^{(*)2} (1)-12. C peak ^{(*)2} (1)-13. Peak (no name) ^{(*)2} (1)-14. Bottom time ^{(*)6} (1)-15. Baseline contact position time ^{(*)6} (1)-16. HbA1c peak fractionation time ^{(*)6} (1)-17. HbF peak fractionation time ^{(*)6} (1)-18. HbS peak fractionation time ^{(*)6} (1)-19. HbC peak fractionation time ^{(*)6} (1)-20. Time for chromatogram scale adjustment ^{(*)6+7} (1)-21. Value for chromatogram scale adjustment ^{(*)7} (1)-22. A/D count value ^{(*)6} (1)-23. A/D count value ^{(*)6} (1)-51. A/D count value ^{(*)6}	(1)-1. "^^^ValueHbA1c" (1)-2. "^^^ValueIFCC" (1)-3. "^^^ValueHbF" (1)-4. "^^^AreaTotal" (1)-5. "^^^PeakHbA1ab" ^{(*)2} (1)-6. "^^^PeakSA1c" ^{(*)2} (1)-7. "^^^PeakHbF" ^{(*)2} (1)-8. "^^^PeakLA1c" ^{(*)2} (1)-9. "^^^Peak#A0" ^{(*)2} (1)-10. "^^^PeakA0" ^{(*)2} (1)-11. "^^^PeakHbS" ^{(*)2} (1)-12. "^^^PeakHbC" ^{(*)2} (1)-13. "^^^Peak" ^{(*)2} (1)-14. "^^^TimeBottom" ^{(*)6} (1)-15. "^^^TimeBase" ^{(*)6} (1)-16. "^^^TimeSA1c" ^{(*)6} (1)-17. "^^^TimeHbF" ^{(*)6} (1)-18. "^^^TimeHbS" ^{(*)6} (1)-19. "^^^TimeHbC" ^{(*)6} (1)-20. "^^^TimeGain" ^{(*)6+7} (1)-21. "^^^ValueGain" ^{(*)7} (1)-22. "^^^ADCount1" ^{(*)6} (1)-23. "^^^ADCount2" ^{(*)6} (1)-51. "^^^ADCount0" ^{(*)6}

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4	Measurement value	(1) Data: Numbers/symbols (for item name) (1)-1. HbA1c measurement value (area ratio) (1)-2. IFCC measurement value (concentration) (1)-3. HbF measurement value (area ratio) (1)-4. Total count value (1)-5. HbA1ab peak appearance time, area value, area ratio (1)-6. HbA1c peak appearance time, area value, area ratio (1)-7. HbF peak appearance time, area value, area ratio (1)-8. L-A1c peak appearance time, area value, area ratio (1)-9. #A0 peak appearance time, area value, area ratio (1)-10. A0 peak appearance time, area value, area ratio (1)-11. S peak appearance time, area value, area ratio (1)-12. C peak appearance time, area value, area ratio (1)-13. Peak appearance time, area value, area ratio (1)-14. Bottom time ^{(*)3} (1)-15. Baseline contact position (start/end) time ^{(*)4} (1)-16. HbA1c peak fractionation time (1)-17. HbF peak fractionation time (1)-18. HbS peak fractionation time (1)-19. HbC peak fractionation time (1)-20. Time for chromatogram scale adjustment (1)-21. Value for chromatogram scale adjustment (1)-22. A/D count value ^{(*)5} (1)-23. A/D count value ^{(*)5} (1)-51. A/D count value ^{(*)5}	(1)-1. "10.0" (1)-2. "101" (1)-3. "10.2" (1)-4. "45000" (1)-5. "121^123451^12.1" (1)-6. "122^123452^12.2" (1)-7. "123^123453^12.3" (1)-8. "124^123454^12.4" (1)-9. "125^123455^12.5" (1)-10. "126^123456^12.6" (1)-11. "126^123456^12.6" (1)-12. "127^123457^12.7" (1)-13. "127^123457^12.7" (1)-14. "123^234^345" ^{(*)3} (1)-15. "123^234^345" ^{(*)4} (1)-16. "123^234" (1)-17. "123^234" (1)-18. "123^234" (1)-19. "123^234" (1)-20. "123" (1)-21. "123^234" (1)-22. "1234^2345^.. ." ^{(*)5} (1)-23. "1234^2345^.. ." ^{(*)5} (1)-51. "1234^2345^.. ." ^{(*)5}
5	Unit	(1) Unit: Symbol (For item name) (1)-1. Area ratio (%) (1)-2. Concentration (mmol/mol) (1)-3. Area ratio (%) (1)-4. Total count value (1)-5. Peak appearance time (sec.), area value, area ratio (%) (1)-6. Peak appearance time (sec.), area value, area ratio (%) (1)-7. Peak appearance time (sec.), area value, area ratio (%) (1)-8. Peak appearance time (sec.), area value, area ratio (%) (1)-9. Peak appearance time (sec.), area value, area ratio (%) (1)-10. Peak appearance time (sec.), area value, area ratio (%) (1)-11. Peak appearance time (sec.), area value, area ratio (%) (1)-12. Peak appearance time (sec.), area value, area ratio (%) (1)-13. Peak appearance time (sec.), area value, area ratio (%) (1)-14. Bottom time (sec.) (1)-15. Baseline contact position (start/end) time (sec.) (1)-16. HbA1c peak fractionation time (sec.) (1)-17. HbF peak fractionation time (sec.) (1)-18. HbS peak fractionation time (sec.) (1)-19. HbC peak fractionation time (sec.) (1)-20. Time for chromatogram scale adjustment (sec.) (1)-21. Value for chromatogram scale adjustment (mOD) (1)-22. A/D count value (1)-23. A/D count value (1)-24. A/D count value (1)-51. A/D count value	(1)-1. "%" (1)-2. "mmol/mol" (1)-3. "%" (1)-4. "count" (1)-5. "sec^count^%" (1)-6. "sec^count^%" (1)-7. "sec^count^%" (1)-8. "sec^count^%" (1)-9. "sec^count^%" (1)-10. "sec^count^%" (1)-11. "sec^count^%" (1)-12. "sec^count^%" (1)-13. "sec^count^%" (1)-14. "sec" (1)-15. "sec" (1)-16. "sec" (1)-17. "sec" (1)-18. "sec" (1)-19. "sec" (1)-20. "sec" (1)-21. "mOD" (1)-22. "count" (1)-23. "count" (1)-24. "count" (1)-51. "count"

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7	Abnormal flag	(1) Abnormal flag (1) -1. Normal (1) -2. Abnormal	(1)-1. NULL (No output) (1)-2. "ERR." (Set character)
9	Test result status	(1) Set character	(1) "F"
12	Measurement start date/time	(1) Measurement start date/time (YYYYMMDDHHMM): (1)-1. Year, Month, Date, Hour, Minute: 12-digit number After (1)-2.: No output	(1)-1. "200607191010" After (1)-2. NULL (No output)
	End of record	End of record	<CR> (0x0D)

<Example> 12-3-----4---5-6789-012

```

R|1|^^^ValueHbA1c|3.5|%||||F|||200812151200<CR>
R|2|^^^ValueIFCC|20|mmol/mol||||F<CR>
R|3|^^^ValueHbF|0.5|%||||F<CR>
R|4|^^^AreaTotal|38897|count||||F<CR>
R|5|^^^PeakHbA1ab|4^895^2.3|sec^count^%||||F<CR>
R|6|^^^PeakHbA1ab|6^934^2.4|sec^count^%||||F<CR>
R|7|^^^PeakHbF|8^194^0.5|sec^count^%||||F<CR>
R|8|^^^PeakLA1c|13^467^1.2|sec^count^%||||F<CR>
R|9|^^^PeakSA1c|19^1361^3.5|sec^count^%||||F<CR>
R|10|^^^PeakA0|36^35046^90.1|sec^count^%||||F<CR>
R|11|^^^PeakHbS|47^4844^16.5|sec^count^%||||F<CR>
R|12|^^^PeakHbC|66^4513^15.1|sec^count^%||||F<CR>
R|13|^^^TimeBottom|1^5^8^10^16^31^48|sec||||F<CR>
R|14|^^^TimeBase|0^29|sec||||F<CR>
R|15|^^^TimeSA1c|16^29|sec||||F<CR>
R|16|^^^TimeHbF|9^11|sec||||F<CR>
R|17|^^^TimeHbS|46^48|sec||||F<CR>
R|18|^^^TimeHbC|65^67|sec||||F<CR>
R|19|^^^TimeGain|32|sec||||F<CR>
R|20|^^^ValueGain|10^350|mOD||||F<CR>
R|21|^^^ADCount1|006F^006E^006E^006F^006E^006E^006E^006F^006D^006D^006D^0070^
0072^006E^006D^006E^006E^006D^006E^006E^006E^006D^006D^006D^006D^
006D^006E^006E^006E|count||||F<CR>
R|22|^^^ADCount2|006F^0070^0071^0075^007B^0082^0086^0088^008A^008B^008F^0095^00A2^
00B8^00D4^00F3^010F^0123^0132^013B^0141^0142^0140^013B^0135^012C^
0124^011A^0112^010A|count||||F<CR>

(...)

R|50|^^^ADCount0|0080^007F^007E^007D^007E^007D^007B^007B^007B^007A^0078^0079^007B^
007E^007B^0078^0078^0079^0079^0079^0078^0078^0078^0077^0077^
0077^0077^0077^0077|count||||F<CR>

```

(*1) Measurement item consists of four components but the first three are not used.

(*2) The maximum number of peaks is 20.

(*3) Bottom time consists of a maximum of 20 components. (All are bottom data.)

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The output number varies depending on the detected peaks.

- (*4) Baseline contact position time consists of a maximum of 20 components. (All are contact position time data.) The output number varies depending on the contact positions between the baseline and chromatogram.
- (*5) A/D count value consists of a maximum of 30 components and is expressed in 4-digit hexadecimal form.
Variant mode: A/D count value consists of 30 records (900 components).
Fast mode: A/D count value consists of 16 records (480 components).
- (*6) Data required for creating chromatogram.
- (*7) "Time for chromatogram scale adjustment" indicates "switching time" in the variant mode but "HbA1c peak time" in the Fast mode. In the variant mode, two values are shown for chromatogram scale adjustment, whereas in the fast mode, there is only one value for chromatogram scale adjustment. As such, two identical values ("19^19") are outputted in the Fast mode.

2.7.5. Procedure for creating chromatogram in the external device

For information on how to create chromatogram when data is received in the standard format, see "HA-8180-M-47B-011 Procedure for Creating Chromatogram Using External Output (HA-8180V)".

- E.O.D. -