NanoEnTek
Revolutionary Wave for Human Welfare

FREND LIS communication protocol

rev.8

Crazy
Tangible play
CreActive
4P Human Care

www.digital-bio.com

Contact Us
12F, Ace High-end Tower, 235-2, Guro-3dong,
Guro-gu, Seoul, 152-740, KOREA
Tel. +82.02.6220.7984 / muicke@digital-bio.com

Document history

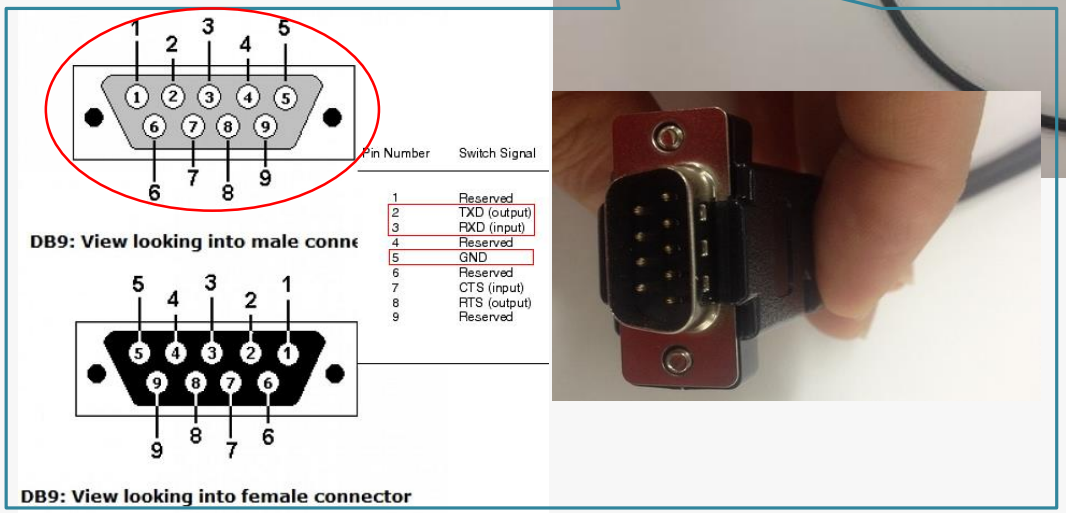
Rev	Date	Writer	
0		Johnny KIM	
6	2014.07.17	Dongjin Yoo	
7	2018.08.25	Younkyun LIM	
8	2018.05.24	Younkyun LIM	Add contents, Serial Communication (P.3)

Communication Interface

- Communication Interface: RS232-C
- Hardware interface: serial port
- COM port - setting value
  - Baud Rate : 9600 bps
  - Data bit : 8
  - Parity bit : None
  - Stop bit : 1
  - Flow control : None

Serial port connection

serial port



Serial command Interface(FREND ➧ Host)

NanoEnTek
Revolutionary Wave for Human Welfare

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	Data type	0x20: Test data 0x30: Error log data 0x31: Start Raw data 0x32: Raw data 0x33: End raw data 0x40: Ready for transfer **0x50: QC data**
Data Length	2	Hi byte	Packet length
		Low byte	Packet length
Data	N		Sending Data
Check Sum	1		
End	1	0x7F	End Data

Serial Response Interface(Host ➧ FREND)

NanoEnTek
Revolutionary Wave for Human Welfare

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	Data type	0x20: Test data 0x30: Error log data 0x31: Start Raw data 0x32: Raw data 0x33: End raw data 0x40: Ready for transfer **0x50: QC data**
Data Length	2	Hi byte	0x00
		Low byte	0x01
State	1	Receive result	0x01 : Success 0xFF : Fail
Check Sum	1		
End	1	0x7F	End Data

Calculate Check sum

- ## Check sum Example

  Check sum = (BYTE)(Command + Length(Hi) + Length(Low) + Data(0) + Data(1) + … + Data(n))

- ## Example

  Data : 223

  0x02 0x11 0x00 0x03 0x32 0x32 0x33 0xAB 0x7F

  STX Cmd L(H) L(L) 2 2 3 Checksum ETX

  Checksum = 0x11 + 0x00 + 0x03 + 0x32 + 0x32 + 0x33

Configuration data – Test result field

NanoEnTek
Revolutionary Wave for Human Welfare

- Product Name
- Patient ID
- User ID
- Order number
- Lab ID
- Lot number
- Test Menu
- Test Result
- Test Unit
- Reference range – minimum
- Reference range – maximum
- Test date
- Test time
- Software version

- Example
  - Product Name : FREND
  - Patient ID : Jason
  - User ID : Johnny
  - Order #: 123
  - Lab ID: NANOENTEK
  - Lot number : 302060
  - Test Menu : PSA
  - Test Result : 3.97
  - Test Unit : ng/ml
  - Reference Range : 0.1 ~ 25.0
  - Test Date : 20130905
  - Test Time : 133430
  - Software version : 1.0.0.0

  - | : Divide field

FREND|Jason|Johnny|123|NANOENTEK|302060|0x1E|3.97|ng/ml|0.1|25.0|20130905|
133430| 1.0.0.0

Configuration Data – Error report data field

NanoEnTek
Revolutionary Wave for Human Welfare

- Error log data
  - Test menu : PSA
  - Date : 20130905
  - Time : 1336
  - Patient ID : Jason
  - Error message type : EMTF-04
  - Integral0 : 8664
  - Integral1 : 2520
  - Integral2 : 4856
  - Integral3 : 23062
  - Ratio0 : 0.376
  - Ratio1 : 0.109
  - Ratio2 : 0.211
  - Lot number : 302060
  - Product Serial number : F1010031909
  - Software version : 1.0.0.0
  - Firmware version : 1.0.0.0
  - | : Divide field
  - Example

PSA|20130905|1336|Jason|EMTF-04|8664|2520|4856|23062|0.376|0.109|0.211|
302060|F1010031909| 1.0.0.0 | 1.0.0.0

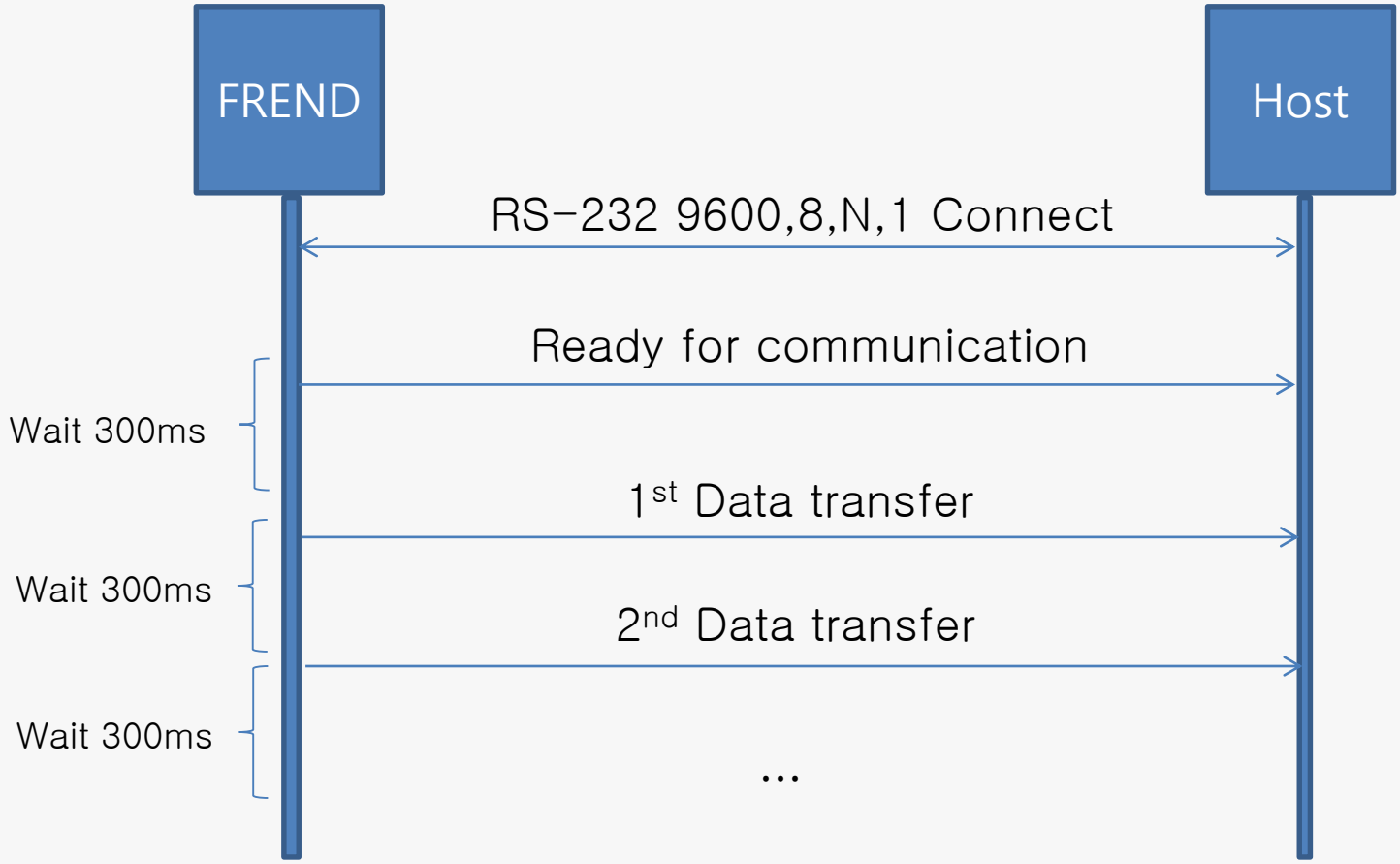
Configuration Data – QC result field

NanoEnTek
Revolutionary Wave for Human Welfare

- **QC data**
  - Date : 20131112
  - Time : 1459
  - Laser Power Pass or Fail : Pass
  - Laser Alignment Pass or Fail : Pass
  - Calculate Ratio Pass or Fail : Fail
  - QC Pass or Fail : Fail

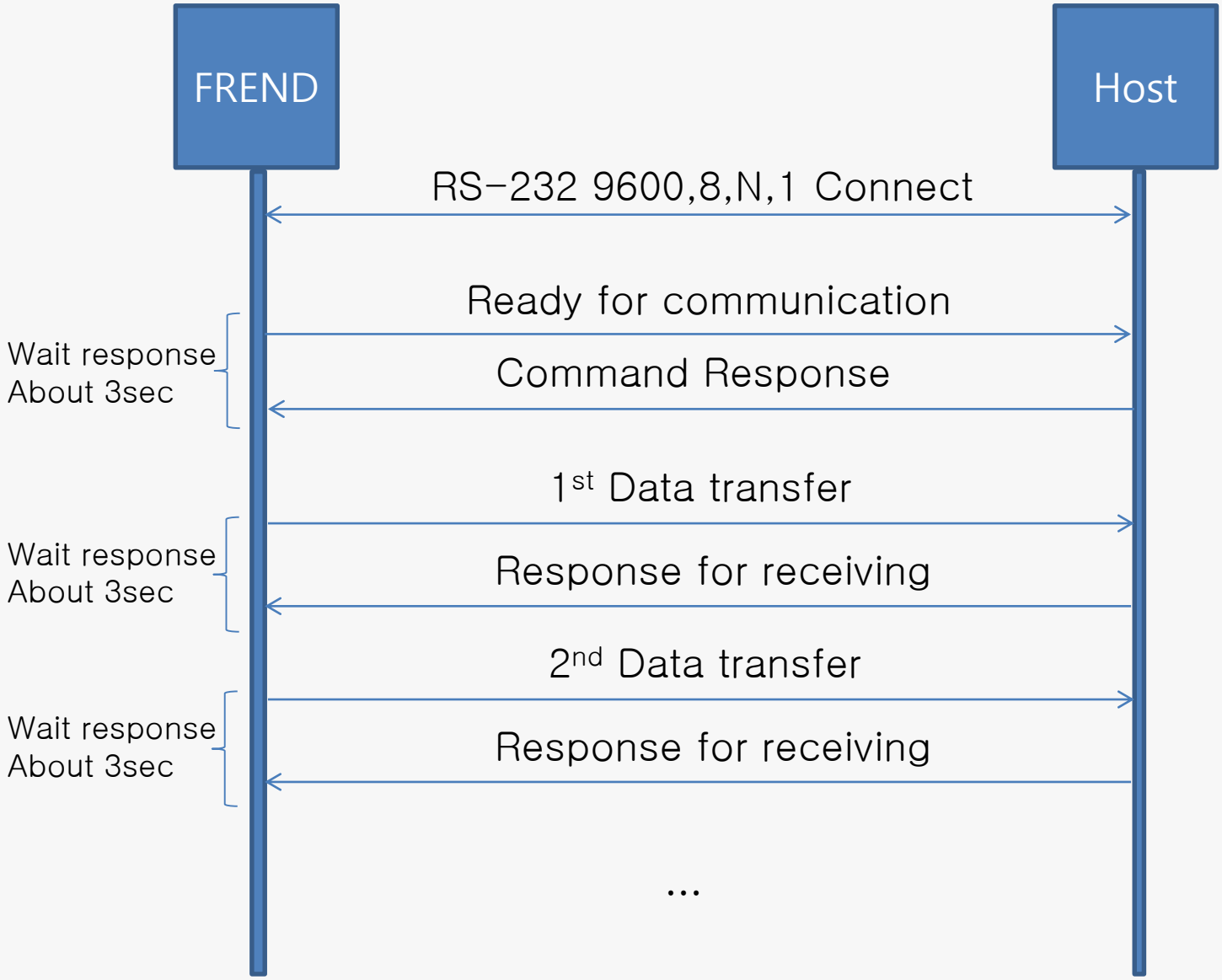
20131112|1459|Pass|Pass|Fail|Fail

1-way Communication – Normal operation



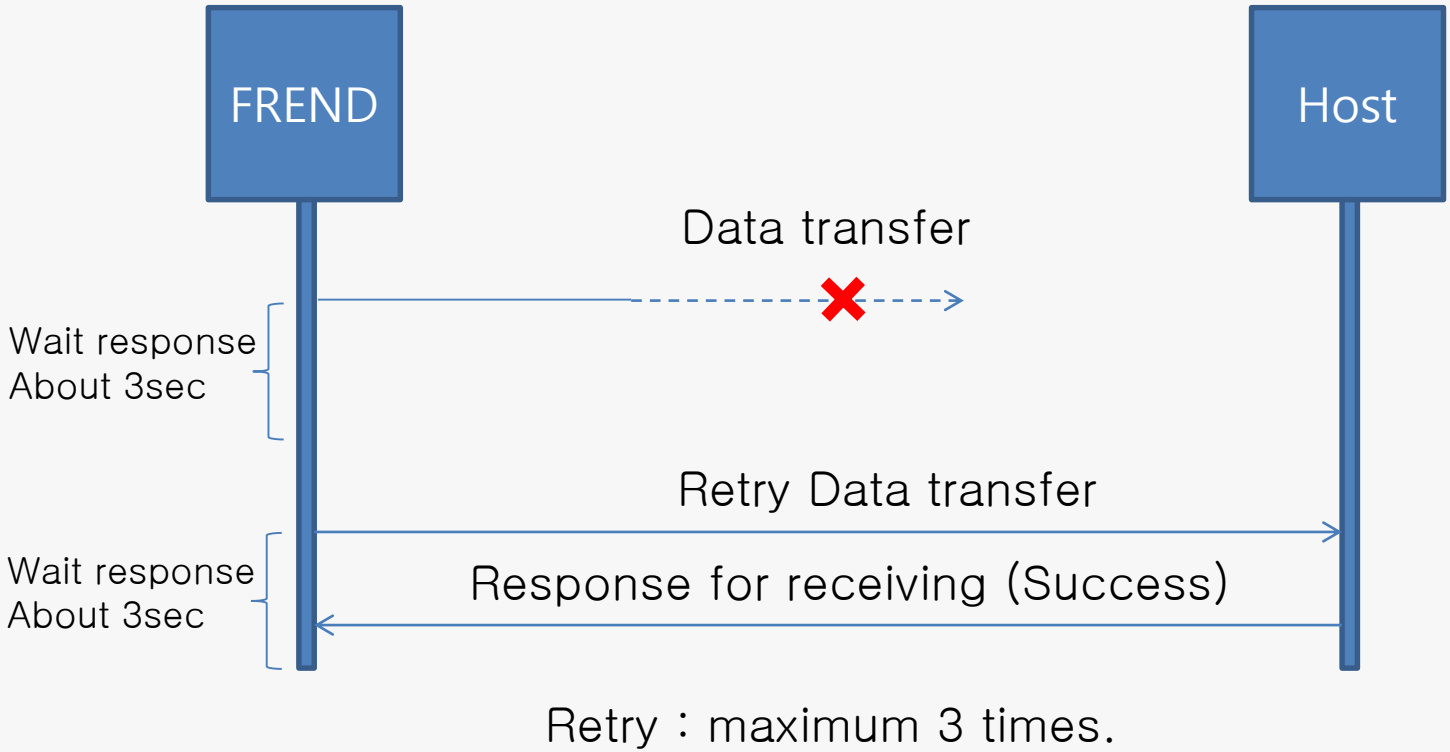
1. 1-way communication is just send the data from FREND to Host.
2. It cannot handle of error control.
3. It is assumed that the data does not lost.

2-way Communication – Normal operation



2-way Communication – Error handling

- Lost command

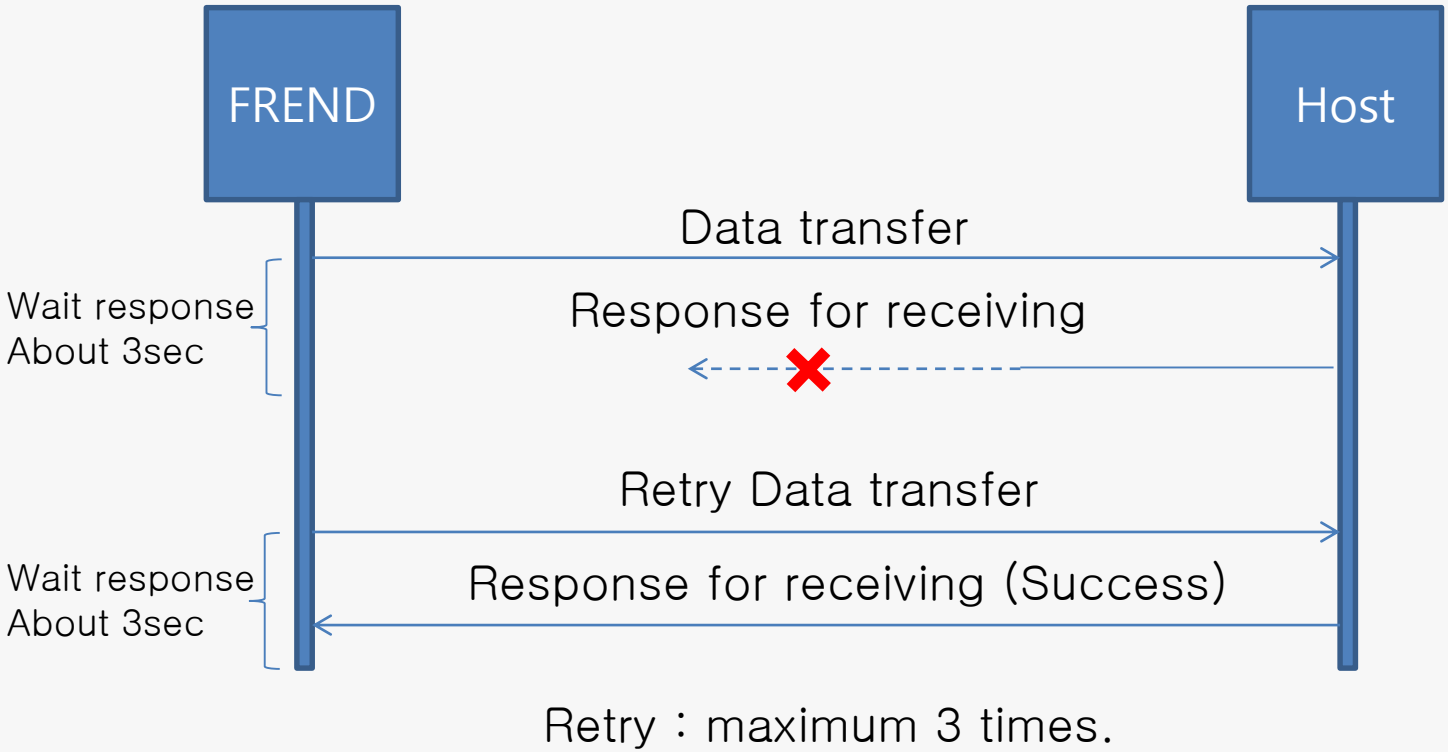


1. The FREND send data to host.
2. Wait 3 seconds for the response from host.
3. If the data lost during transfer to host, the FREND does not receive the response from host.
4. In this case, the FREND send the data again.

2-way Communication – Error handling

NanoEnTek
Revolutionary Wave for Human Welfare

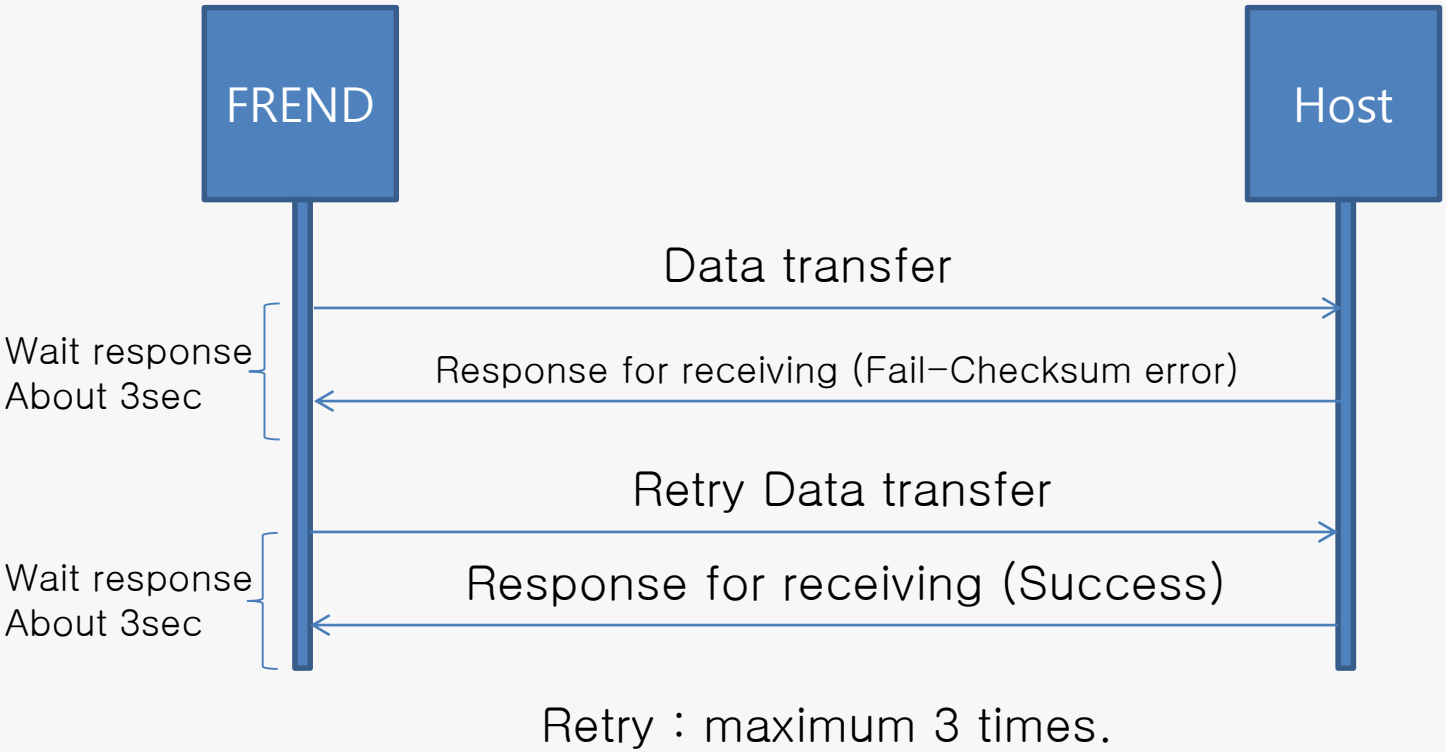
- Lost Response



1. The FREND send data to host.
2. Wait 3 seconds for the response from host.
3. If the response lost during transfer to FREND, the FREND does not receive the response from host.
4. In this case, the FREND send the data again.

2-way Communication – Error handling

- Checksum Error



1. The FREND send data to host.
2. The host calculate the checksum.
3. If the check sum does not correct, the host send “fail” code.
4. In this case, the FREND send the data again.

Test menu code (Defalut)

NanoEnTek
Revolutionary Wave for Human Welfare

ID	CODE	NAME	ALIAS	TEXTCODE	UNIT	ML	MH
1	12	Troponin I	TnI	TNI	ng/mL	0.05	20
2	13	CK - MB	CK-MB	CKMB	ng/mL	1	80
3	14	Myoglobin	Myo	MYO	ng/mL	5	500
4	15	Cardiac Triple	Triple	Cardiac Triple		0	1
5	16	hsCRP	hsCRP	HSCRP	ng/mL	0.3	10
6	17	D-Dimer	D-Dimer	DDMR	ng/mL	0	3000
7	18	NT-proBNP	NT-proBNP	NTPBNP	pg/mL	5	35000
8	19	BNP	BNP	BNP	pg/mL	30	2500
9	20	FABP	FABP	FABP	ng/mL	2	3000
10	30	PSA	PSA	PSA	ng/mL	0.03	25
11	32	AFP	AFP	AFP	ng/mL	1	400
12	34	CEA	CEA	CEA	ng/mL	1	400
13	35	Testosterone	Testos.	Testosterone	ng/dL	20	1500
14	40	TSH	TSH	TSH	mIU/L	0.06	25
15	41	Free T4	Free T4	Free T4	ng/dL	0.4	6
16	42	Total T3	Total T3	Total T3	ng/mL	0.25	8
17	45	Thyroid Duo	Thyroid D	Thyroid Duo		0	1
18	50	Vitamin D	Vitamin D	Vitamin D	ng/mL	10	110
19	60	PCT	PCT	PCT	ng/mL	0.07	32

1. This is the test menu table.
2. When we sent the data packet, we sent “CODE” data.

Test menu code (USA)

NanoEnTek
Revolutionary Wave for Human Welfare

ID	CODE	NAME	ALIAS	TEXTCODE	UNIT	ML	MH
1	12	Troponin I	TnI	TNI	ng/mL	0.05	20
2	13	CK - MB	CK-MB	CKMB	ng/mL	1	80
3	14	Myoglobin	Myo	MYO	ng/mL	5	500
4	15	Cardiac Triple	Triple	Cardiac Triple		0	1
5	16	hsCRP	hsCRP	HSCRP	ng/mL	0.3	10
6	17	D-Dimer	D-Dimer	DDMR	ng/mL	0	3000
7	18	NT-proBNP	NT-proBNP	NTPBNP	pg/mL	5	35000
8	19	BNP	BNP	BNP	pg/mL	30	2500
9	20	FABP	FABP	FABP	ng/mL	2	3000
10	30	PSA	PSA	PSA	ng/mL	0.08	25
11	32	AFP	AFP	AFP	ng/mL	1	400
12	34	CEA	CEA	CEA	ng/mL	1	400
13	35	Testosterone	Testos.	Testosterone	ng/dL	20	1500
14	40	TSH	TSH	TSH	mIU/L	0.06	25
15	41	Free T4	Free T4	Free T4	ng/dL	0.4	6
16	42	Total T3	Total T3	Total T3	ng/mL	0.25	8
17	45	Thyroid Duo	Thyroid D	Thyroid Duo		0	1
18	50	Vitamin D	Vitamin D	Vitamin D	ng/mL	13	96
19	60	PCT	PCT	PCT	ng/mL	0.07	32

1. This is the test menu table.
2. When we sent the data packet, we sent “CODE” data.

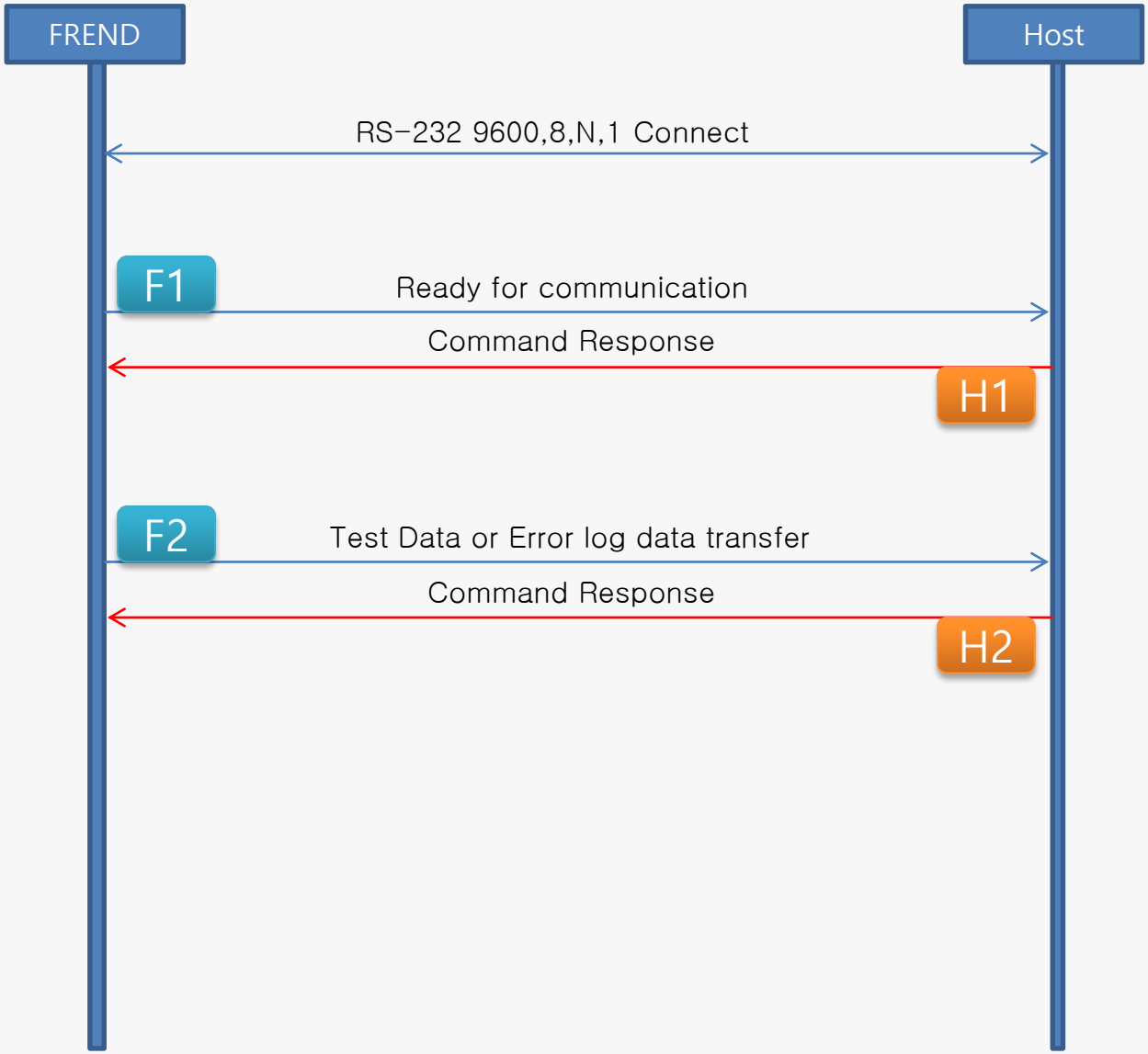
Example

NanoEnTek
Revolutionary Wave for Human Welfare

- Test data information
  - Product name : FREND
  - Patient ID : Jason
  - User ID : Johnny7984
  - Order #: 123
  - Lab ID: NANOENTEK
  - Lot number : 302060
  - Test Menu : PSA - 0x1E(30)
  - Test Result : 3.97
  - Test Unit : ng/ml
  - Reference Range => MIN : 0.1
  - Reference Range => MAX : 25.0
  - Test Date : 20130905
  - Test time : 133630
  - Software version : 1.0.0.0

- **QC data information**
  - Date : 20131112
  - Time : 1459
  - Laser Power Pass or Fail : Pass
  - Laser Alignment Pass or Fail : Pass
  - Calculate Ratio Pass or Fail : Fail
  - QC Pass or Fail : Fail

- Error log data information
  - Test menu : PSA
  - Date : 20130905
  - Time : 1330
  - Patient ID : Jason
  - Error message : EMTF-04
  - Integral0 : 8664
  - Integral1 : 2520
  - Integral2 : 4856
  - Integral3 : 23062
  - Ratio0 : 0.376
  - Ratio1 : 0.109
  - Ratio2 : 0.211
  - Lot number : 202220
  - Product Serial number : F1010031909
  - Software version : 1.0.0.0
  - Firmware version : 1.0.0.0



Example - Ready for communication

NanoEnTek
Revolutionary Wave for Human Welfare

F1 FREND -> Host

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x40	0x40 : Ready for transfer
Data Length	2	0x00	Packet length
		0x00	Packet length
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

H1 Host -> FREND (Response Pass)

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x40	0x40 : Ready for transfer
Data Length	2	0x00	Packet length
		0x01	Packet length
State	1	0x01	Success : 0x01 Fail : 0xFF
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

Example – Test Result

NanoEnTek
Revolutionary Wave for Human Welfare

F2 FREND -> Host

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x20	0x20 : Test data
Data Length	2	0x00	Packet length
		0x4A	
Data	N bytes		FREND|Jason|Johnny7984|123|NANOENTEK|302060|0x1E|3.97|ng/ml|0.1|25.0|20130905 133630|1.0.0.0
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

H2 Host -> FREND (Response Pass)

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x20	0x20 : Test data
Data Length	2	0x00	Packet length
		0x01	Packet length
State	1	0x01	Success : 0x01 Fail : 0xFF
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

Example – Test Result (multi item)

NanoEnTek
Revolutionary Wave for Human Welfare

F2 FREND –> Host

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x20	0x20 : Test data
Data Length	2	0x00	Packet length
		0x4A	
Data	N bytes		FREND|Jason|Johnny7984|123|NANOENTEK|157001|0x0E|<5.00|ng/ml|5|500|20170821 133630|1.3.2.1
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

F2 FREND –> Host

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x20	0x20 : Test data
Data Length	2	0x00	Packet length
		0x4A	
Data	N bytes		FREND|Jason|Johnny7984|123|NANOENTEK|302060|0x0E|3.97|ng/ml|0.1|25.0|20130905 133630|1.0.0.0
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

Example – Test Result (multi item)

NanoEnTek
Revolutionary Wave for Human Welfare

F2 FREND -> Host

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x20	0x20 : Test data
Data Length	2	0x00	Packet length
		0x4A	
Data	N bytes		FREND|Jason|Johnny7984|123|NANOENTEK|302060|0x1E|3.97|ng/ml|0.1|25.0|20130905 133630|1.0.0.0
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

H2 Host -> FREND (Response Pass)

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x20	0x20 : Test data
Data Length	2	0x00	Packet length
		0x01	Packet length
State	1	0x01	Success : 0x01 Fail : 0xFF
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

Example – Error log data

NanoEnTek
Revolutionary Wave for Human Welfare

F2 FREND -> Host

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x30	0x30 : Error log data
Data Length	2	0x00	Packet length
		0x82	
Data	N bytes		PSA|20130905 1336|110011|(EMTF-04)|8664|2520|4856 |23062|0.376|0.109|0.211|302060|303310|F1010031909|1.0.0.0| 1.0.0.0
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

H2 Host -> FREND (Response Pass)

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x30	0x30 : Error log data
Data Length	2	0x00	Packet length
		0x01	Packet length
State	1	0x01	Success : 0x01 Fail : 0xFF
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

Example – QC data

NanoEnTek
Revolutionary Wave for Human Welfare

F2 FREND -> Host

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x50	0x50 : QC data
Data Length	2	0x00	Packet length
Data	N bytes		20131112|1459|Pass|Pass|Fail|Fail
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data

H2 Host -> FREND (Response Pass)

ITEM	BYTE	DESC	REMARK
Start	1	0x24	Start Data
Type	1	0x50	0x50 : QC data
Data Length	2	0x00	Packet length
		0x01	Packet length
State	1	0x01	Success : 0x01 Fail : 0xFF
Check Sum	1		Refer to "Calculate check sum"
End	1	0x7F	End Data