REX-USB62

USB-SPI/I2C Analyzer

User's Manual

2013.03

Rev. 2.0

RATOC Systems, Inc.

1. Introduction

(1-1)Specifications

By using REX-USB62, you can do a sampling signal on the SPI/I2C bus, and analyze/display the signal by application software.

This product has both Monitor mode which monitor signal on the bus and Analyzer mode which analyze timing of signal on the bus.
You can switch these modes by the bundled utility.
(Default setting is Analyzer mode)

[Main features of the bundled application]

* Refer to 3.How to use analyzer/monitor tool for a simple usage of the application, and refer to 4.Each function of analyzer/monitor tool for the detailed each function of the bundled application.

・Monitor bus data(One-shot/Free-run)
・Start capturing data by external trigger input
・Output external trigger, start capturing data by detecting specified data pattern
・Filter data display(I2C only)
・Search data
・Save data
・Switch analyzation of I2C with 2 channel
(Can not analyze 2 channel simultaneously)

Common functions and other functions for each mode

Function		Common functions	Other functions for each mode
	Monitor mode	・Display captured data with dump data ・One-shot capture ・Save capture data ・Search captured data ・Filter display(I2C only) ・External input trigger to start capture data ・Firmware update ・Compatible HS protocol (I2C only)	・SPI can treat 24MHz bus ・I2C can treat 1MHz bus ・Free-run capture & display ・Capture by trigger
	Analyzer Mode		・SPI can treat 16MHz bus ・I2C can treat 4MHz bus ・Can sample data on SPI/I2C bus by 50MHz(Max) and display sampling data by wave form ・Check characteristics of I2C bus signal

[The latest firmware program is available through our website]

To meet future addition to or change of specifications of this product, you can update firmware on this product. The latest firmware program is available through our website.

Specifications on hardware

Item	Content of specifications
Interface	USB2.0 Hi-Speed Device
Connect	USB mini B connector
Voltage	5V (available from USB bus power)
Consumption current	150mA
Support interface	SPI: Max frequency 24MHz(Monitor mode) Max frequency 16MHz(Analyzer mode) I2C: Max frequency 1MHz(Monitor mode) Max frequency 4MHz(Analyzer mode)
Power supply	1.8V(±5%), 2.5V(±5%), 3.3V(±5%) 5.0V(±5%, VBUS=5.0V)
Dimension	58(W) x 95(D) x 18(H) mm (Exclude the bundled cable / rubber foot)
Weight	Approx. 60g (Exclude the bundled cable)
Operating environment	Temperature:5～55℃ Humidity:20～80%(Non-condensing)

* If you use an external USB Hub, you need to use a self-powered USB Hub.
(If you use bus-powered USB Hub, this product won't work.)

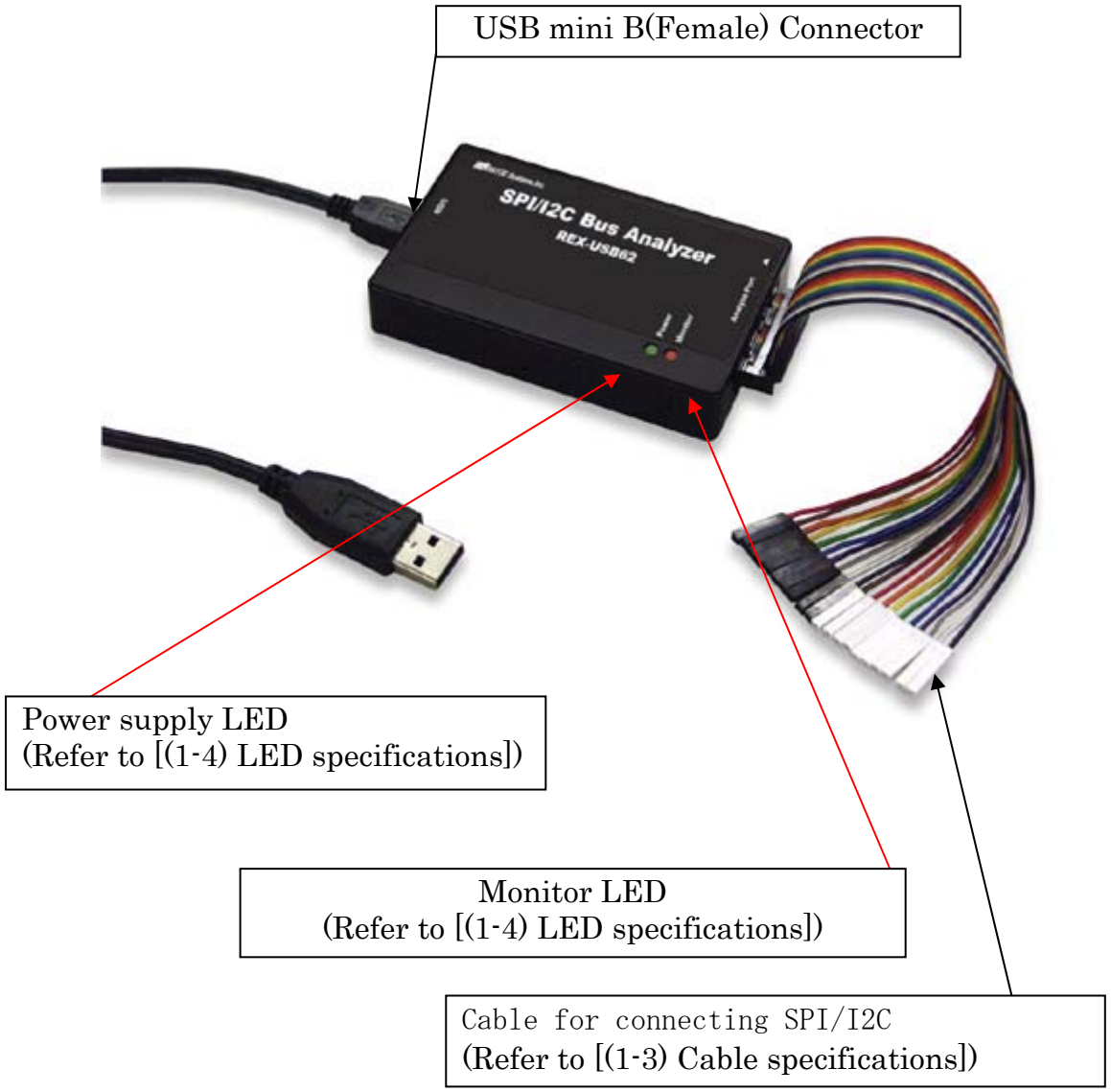
Specifications on software

Item	Content of specifications
Installer	REX-USB62 driver Analyzer/Monitor tool Switch tool between Analyzer/Monitor mode
OS	Windows 8/7/Vista/XP * Also works on 64bit version

(1-2) Package contents

REX-USB62 package includes:

- ☑ REX-USB62
- ☑ CD-ROM
- ☑ USB A - mini B cable
- ☑ SPI/I2C cable
- ☑ Warranty Card



(1-3) Cable specifications

The below is an explanation of the specifications on the bundled cable to connect a target device.

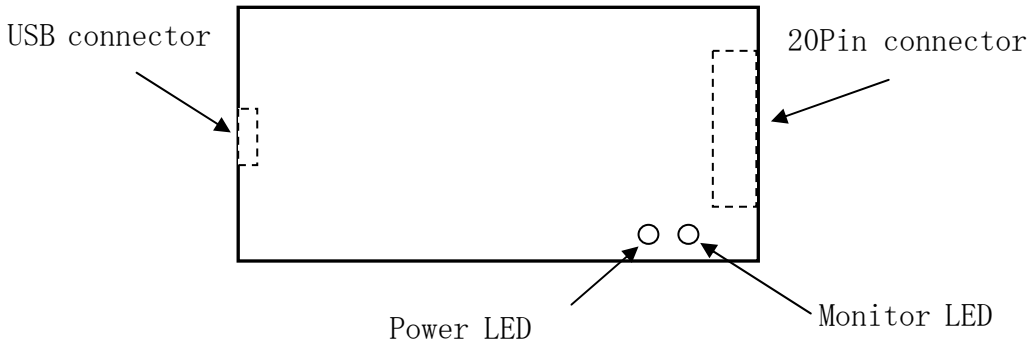
Pin#	Housing color	Cable Color	Signal name	Usage
1	Black	Brown	GND	Ground
2	Black	Red	Reserved	N/A
3	Black	Orange	TRGIN0	Trigger terminal to start to monitor *(N.B.)
4	Black	Yellow	TRGOUT	I2C Trigger output terminal
5	Black	Green	TRGIN1	Trigger terminal to start to monitor *(N.B.)
6	Black	Blue	GND	Ground
7	Black	Purple	TRGIN2	Trigger terminal to start to monitor *(N.B.)
8	Black	Gray	I2C SCL(Main)	Connect SCL terminal of a target
			SPI SS	Connect SS terminal of a target
9	Black	White	TRGIN3	Trigger terminal to start to monitor *(N.B.)
10	Black	Black	I2C SDA(Main)	Connect a SDA terminal of a target
			SPI SCK	Connect a SCK terminal of a target

Pin#	Housing color	Cable Color	Signal name	Usage
11	White(Gray)	Brown	TRGIN4	Trigger terminal to start to monitor *(N.B.)
12	White(Gray)	Red	I2C SCL(Sub)	Connect a SCL terminal of a target
			SPI MOSI	Connect a SDI(input) terminal of a target
13	White(Gray)	Orange	Power	Input/Output power supply for a target device
14	White(Gray)	Yellow	I2C SDA(Sub)	Connect a SDA terminal of a target
			SPI MISO	SDO(Output) terminal of a target
15	White(Gray)	Green	GND	Ground
16	White(Gray)	Blue	GND	Ground
17	White(Gray)	Purple	GND	Ground
18	White(Gray)	Gray	GND	Ground
19	White(Gray)	White	GND	Ground
20	White(Gray)	Black	Power	Input/Output power supply for a target device

*** (Note) Threshold of trigger input (TRIGIN0～4) is as follows:**
Under 10% of voltage of power supply is recognized as Low.
Over 90% of voltage of power supply is recognized as High.

(1-4) Specifications on LED

The below explains LED on REX-USB62.

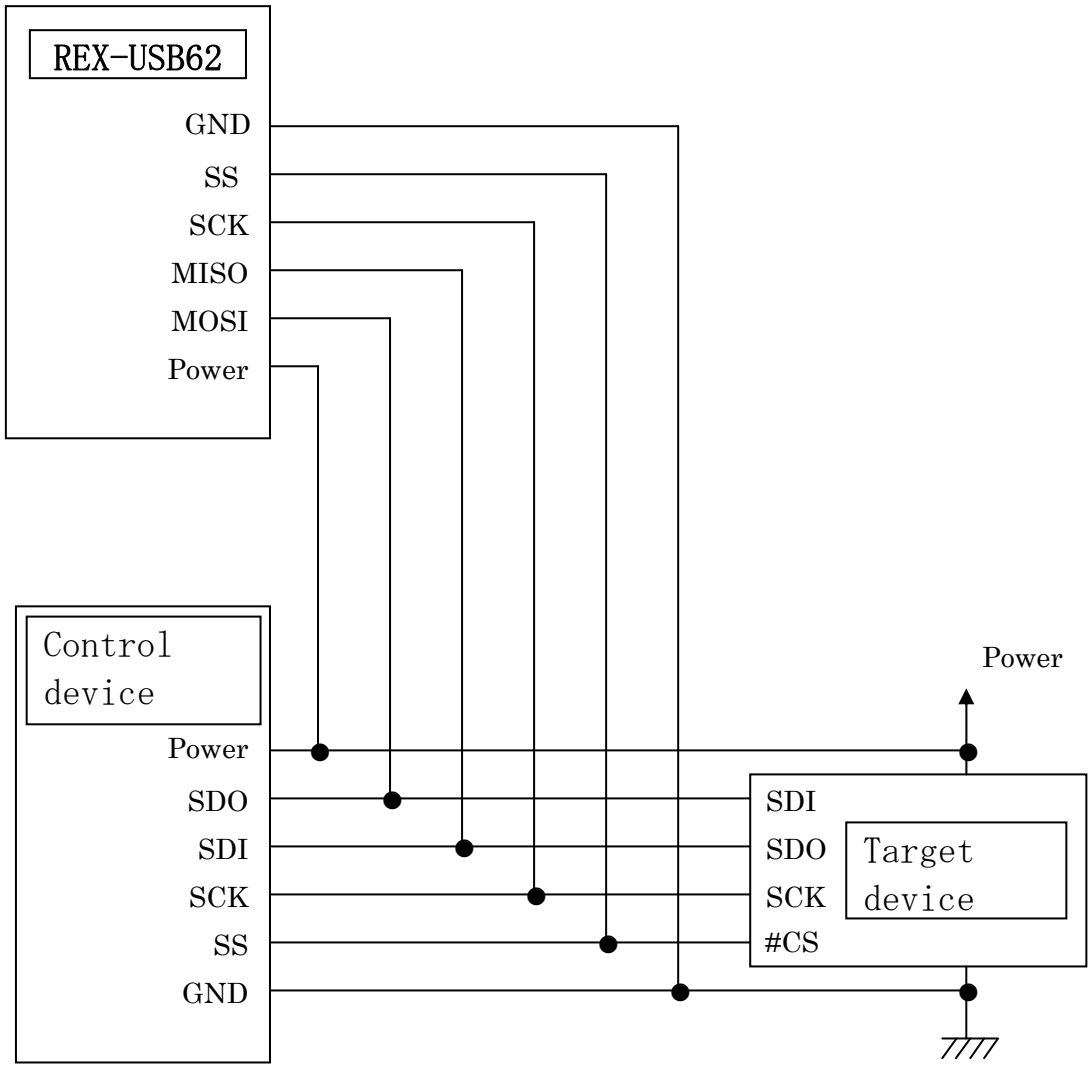


<table>
<tr><th>Name</th><th>Operation</th></tr>
<tr><td>Monitor LED</td><td>
<table>
<tr><th></th><th>Idle</th><th>Monitor/Analyzer
(at sampling)</th></tr>
<tr><td>Monitor mode</td><td>Green
comes on</td><td>Green blinks</td></tr>
<tr><td>Analyzer mode</td><td>Orange
comes on</td><td>Orange blinks</td></tr>
</table>
* When error occurs and sampling stops, red LED comes on.
* While firmware is updating, red LED blinks.
</td></tr>
<tr><td>Power LED</td><td>
The below shows voltage when the device provide power to the bus.
<table>
<tr><td>OFF</td><td>LED doesn’t come on</td></tr>
<tr><td>1.8V</td><td>Red and Orange comes on alternately</td></tr>
<tr><td>2.5V</td><td>Red comes on</td></tr>
<tr><td>3.3V</td><td>Orange comes on</td></tr>
<tr><td>5.0V</td><td>Green comes on</td></tr>
</table>
※While firmware is updating, green LED blinks.
</td></tr>
</table>

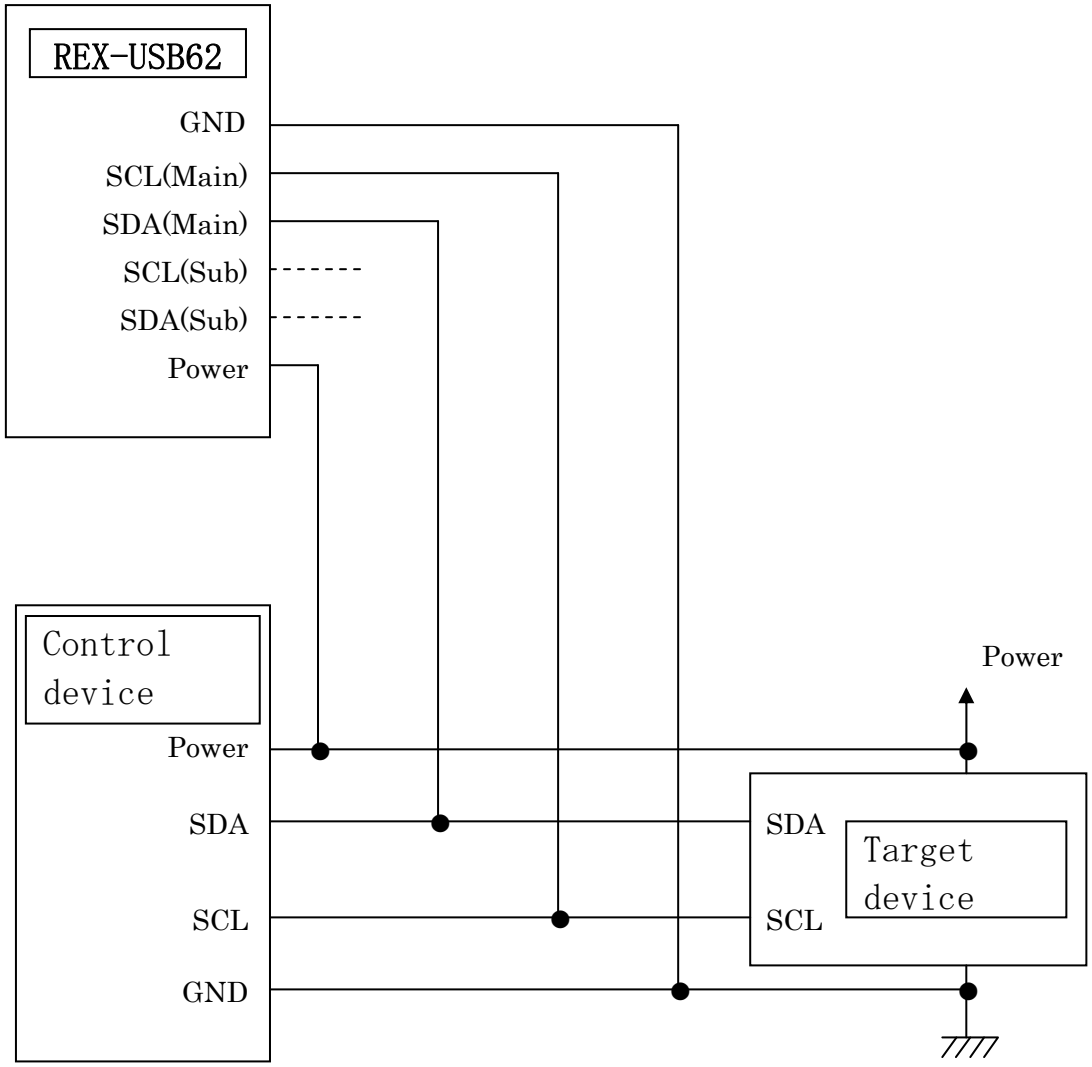
(1-5) Sample of connection

The below is a sample of connection for communication with a SPI/I2C target device.

SPI connection



I2C connection



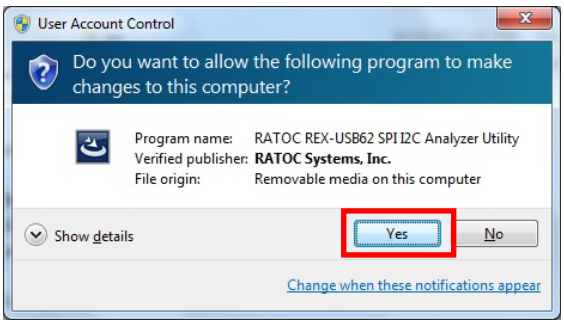
2. Setting up on Windows

(2-1) Installing on Windows 8/7/Vista/XP

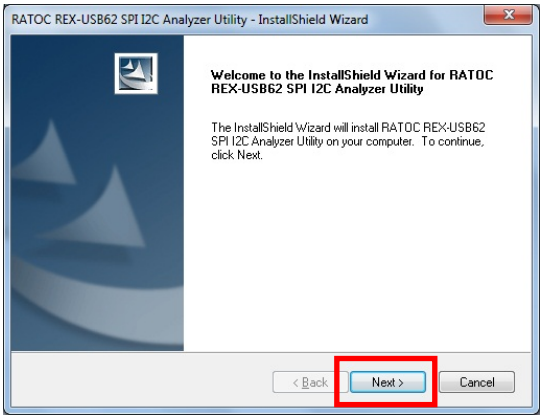
Before connecting this product, execute USB62_Setup.exe at the bundled CD-ROM and install necessary drivers by following the below procedure.

The [REX-USB62 device drivers] [Analyzer/Monitor tool][Switching tool for Analyzer and Monitor] will be installed.

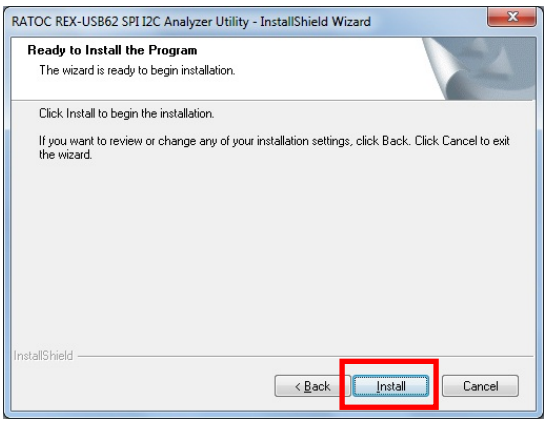
Click [Yes] if the dialog shown on the right appear.



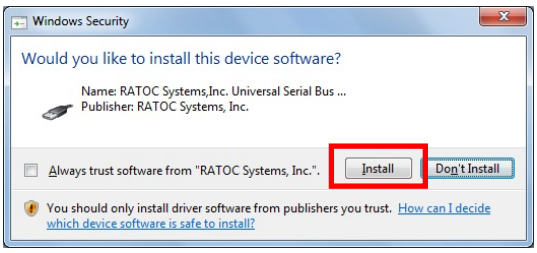
Click [Next>] when the dialog shown on the right appear.



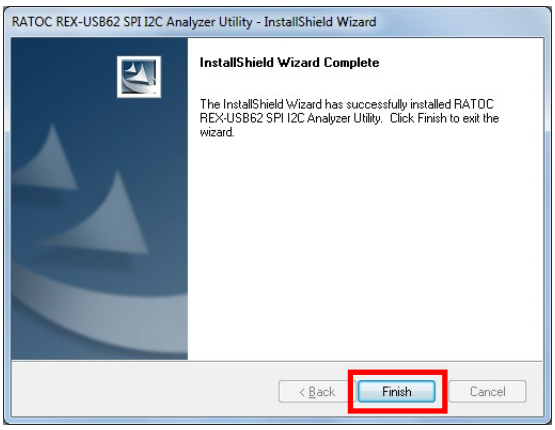
Click [Install] when the dialog shown on the right appear.



Click [Install] when the dialog shown on the right appear.



Set up finished.

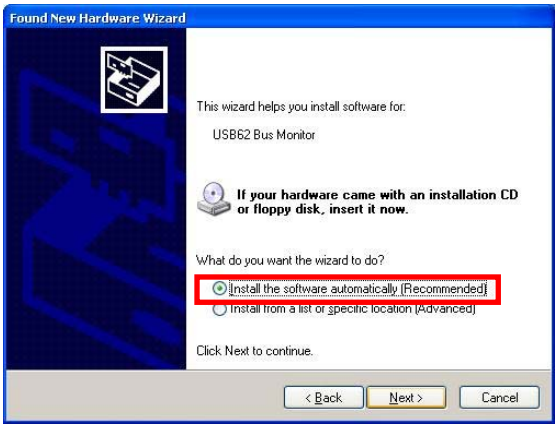


When connecting REX-USB62, installation will automatically finish.
Proceed to [(2-2)Confirmation of installation] and confirm the installation finished properly.

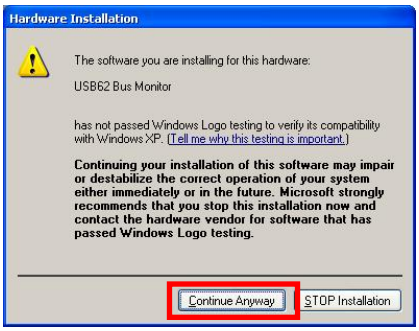
* On Windows XP, after connecting REX-USB62, the below wizard will appear. Follow the below steps to install.

Select [No, not this time] and click [Next(N)>].

Select [Install the software automatically(Recommended)] and Click [Next(N)>].



Click [Continue Anyway].



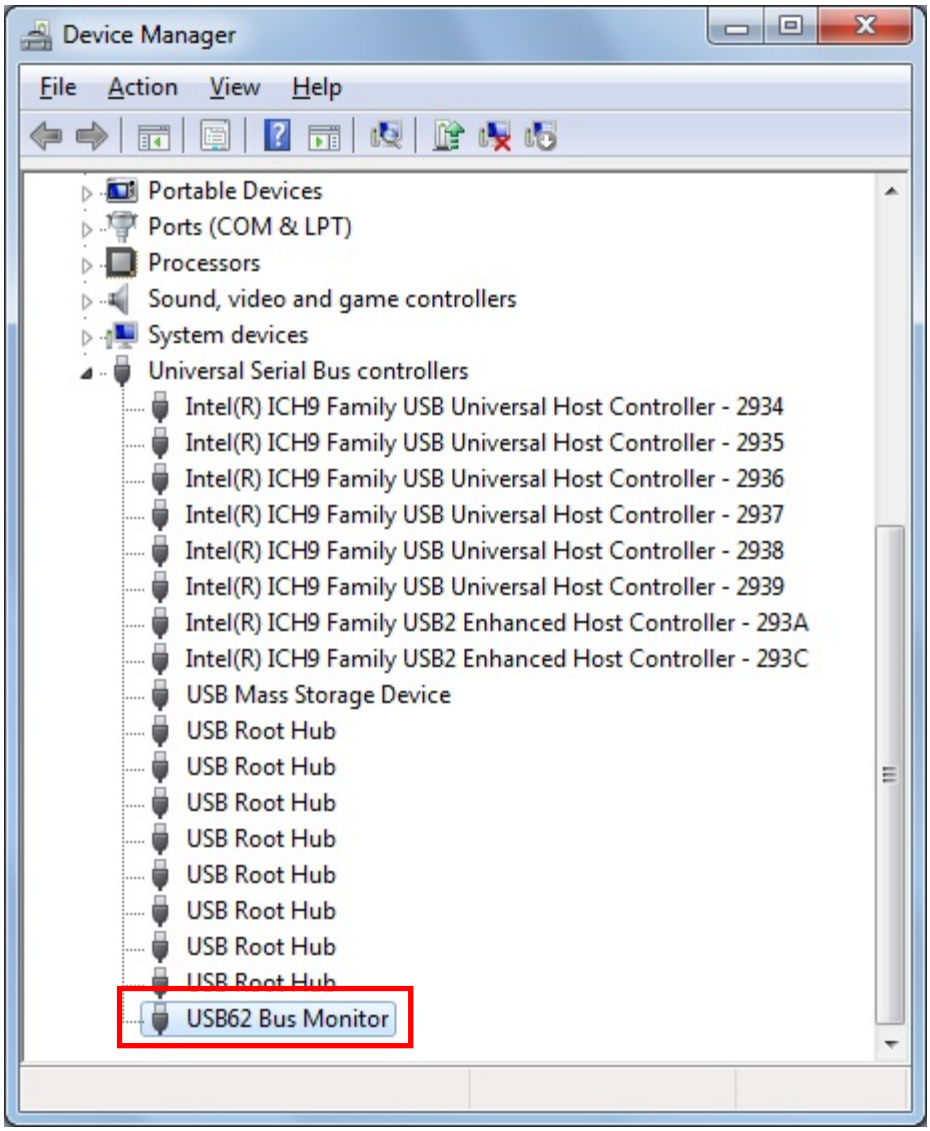
Installation finished.

Proceed to [(2-2)Confirmation of installation] and confirm the installation finished properly.

(2-2) Confirmation of installation

Open [Device Manager].
(* On Windows XP, open [Control Panel] and then, [System]. And, double-click [System] and select the [Hardware] tab. And then, click the [Device Manager] button.)

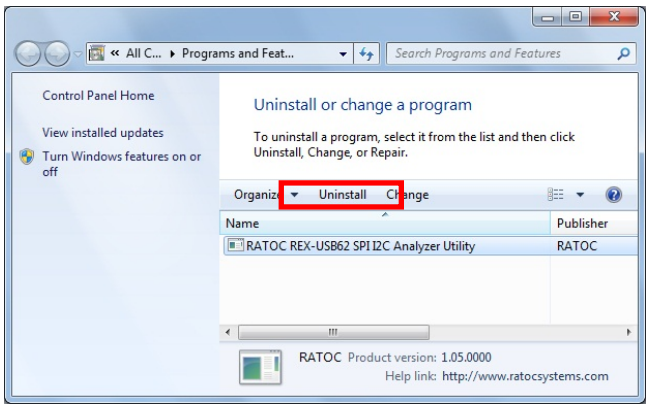
Confirm [USB62 Bus Monitor] is recognized properly under the [Universal Serial Bus Controller].



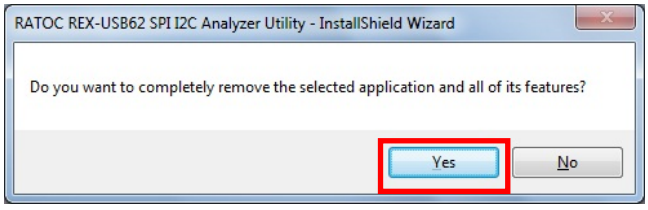
(2-3) How to uninstall

To uninstall REX-USB62, open [program and function] at the [Control Panel]. (On Windows XP, open [Add program and delete].

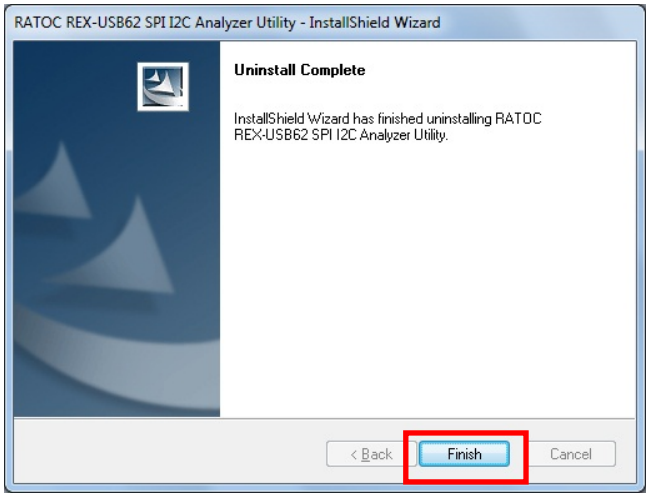
Select [RATOC REX-USB62 SPI I2C Analyzer Utility] and click [Uninstall].



Click [Yes(Y)].



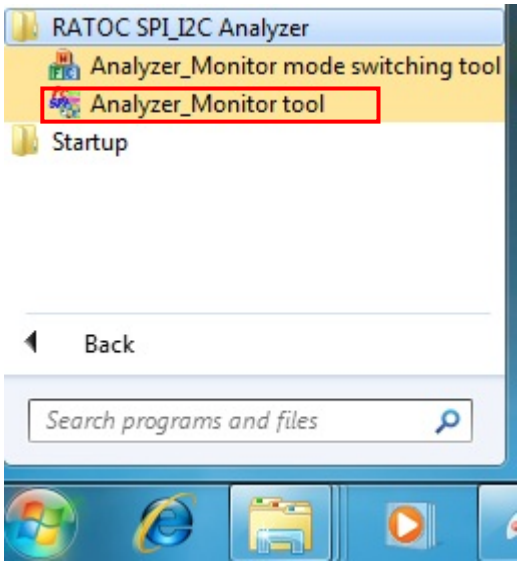
Uninstall finished.



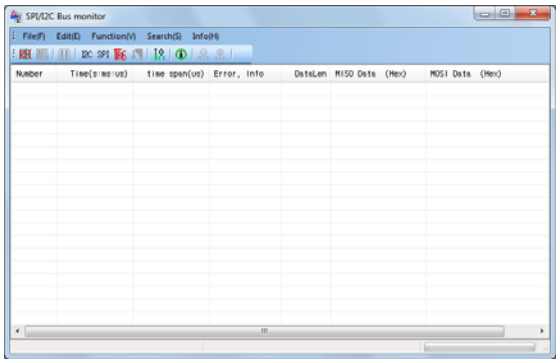
3. How to use Analyzer/Monitor tool

The below explains how to use Analyzer_Monitor tool installed in Chapter2.

This Analyzer_Monitor tool is installed at the [RATOC SPI_I2C Analyzer] of the [All programs] at the [Start] menu.



When Analyzer_Monitor tool start up, the window shown in the right will appear.
(For each function, refer to (4-1)Explanation of each function of Analyzer_Monitor tool in Chapter 4.Each function of Analyzer_Monitor tool.



The below explains how to capture data at each mode of SPI/I2C and confirm the captured data.

Caution when you use application

- Never remove REX-USB62 during sampling.
  (i.e. Never unplug the USB cable)
- Never remove other USB devices during sampling.
- While application is running, don't use sleep mode / hibernation mode.
- If you restart or go into sleep/hibernation mode while REX-USB62 is connected, you need to remove REX-USB62 and then, remove REX-USB62 and re-connect REX-USB62.
- When you start this application, you need to finish all the other running applications. Especially, never start all the other functions during sampling.
  Be careful not to start back ground process(including Virus scan, etc.).
- If you use Analyzer_Monitor mode switching tool, close this application.

(3-1)How to use SPI analyzer mode

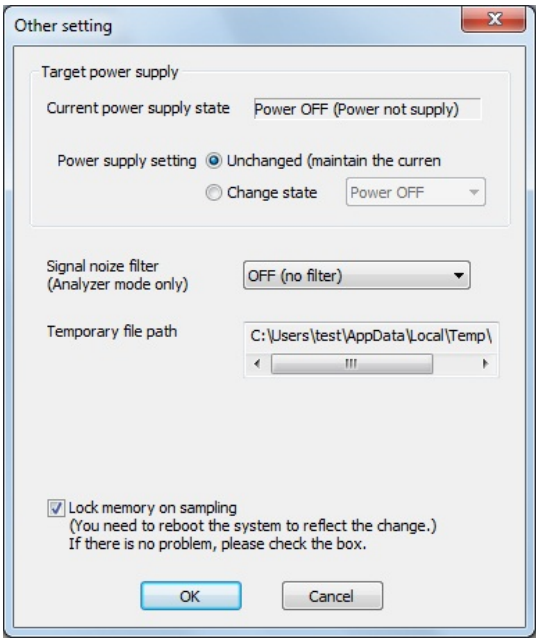
The below is an explanation for how to capture data in SPI analyzer mode and how to analyze captured data.
Refer to (4-2)How to use SPI analyzer mode in Chapter 4.Each function of Analyzer_Monitor tool for further information.

[Preparation]

Connect each cable and click  at the tool bar and set power supply.

If power is supplied from external, [Current power supply state] shows [PowerON].

If power is supplied to external or REX-USB62, select [Change state] at [Power supply setting] and set voltage level.

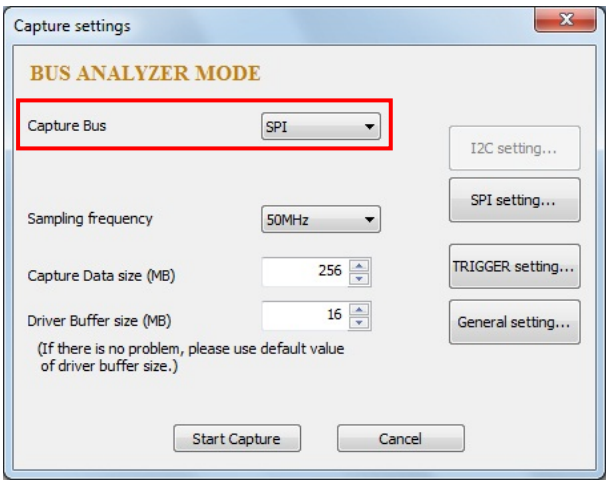


[Data capture]

If you click  at the tool bar, capture setting window will appear.

Select [SPI] at [Capture Bus] and click [Start Capture].

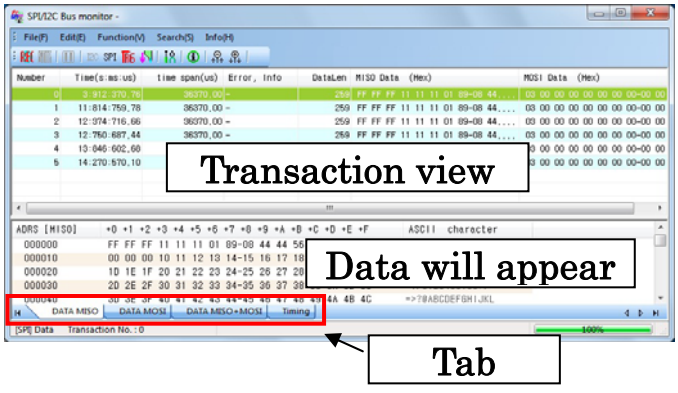
Captured data will sequentially appear on the application.
If you click  at the tool bar, capture will end.



[Data analyzation]

Captured data will appear, as shown in the right, and selected transaction data will appear at the lower part.

You can select [DATA MISO], [DATA MOSI], [DATA MISO+MOSI], [Timing] to change display method.



(3-2) How to use SPI monitor mode

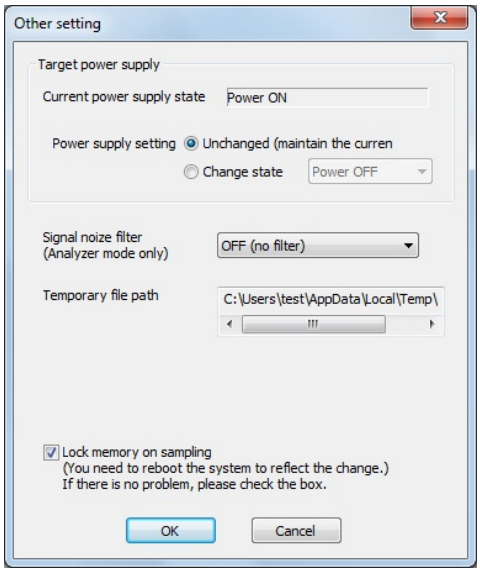
The below is an explanation for how to capture data in SPI monitor mode and how to analyze captured data.
Refer to (4-2)How to use SPI monitor mode in Chapter 4.Each function of Analyzer_Monitor tool for further information.

[Preparation]

Connect each cable and click  at the tool bar and set power supply.

If power is supplied from external, [Current power supply state] shows [Power ON].

If power is supplied to external or REX-USB62, select [Change state] at [Power supply setting] and set voltage level.

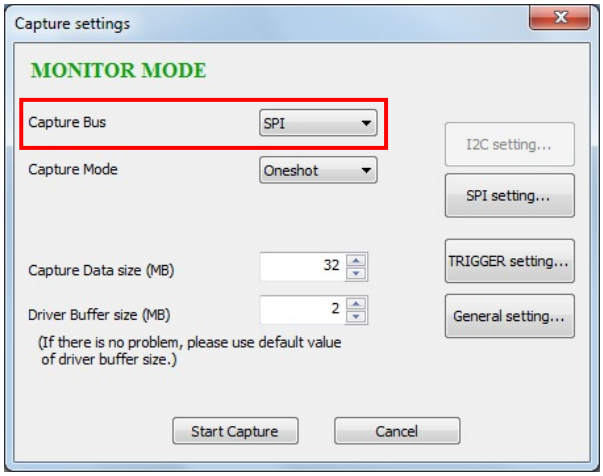


[Data capture]

If you click  at the tool bar, capture setting window will appear.

Select [SPI] at [Capture Bus] and click [Start Capture].

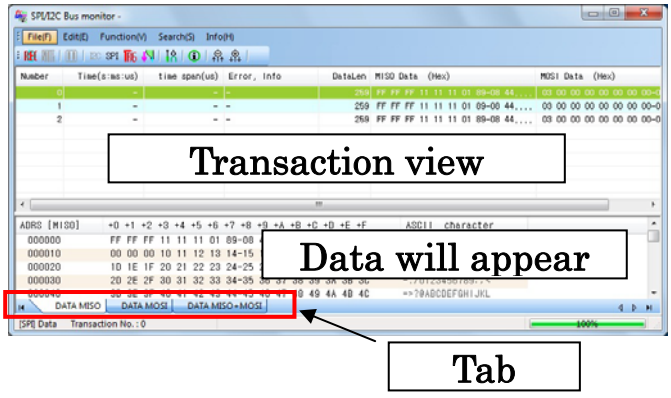
Captured data will sequentially appear on the application.
If you click  at the tool bar, capture will end.



[Data analyzation]

Captured data will appear, as shown in the right, and selected transaction data will appear at the lower part.

You can select [DATA MISO], [DATA MOSI], [DATA MISO+MOSI] to change display method.



(3-3) How to use I2C analyzer mode

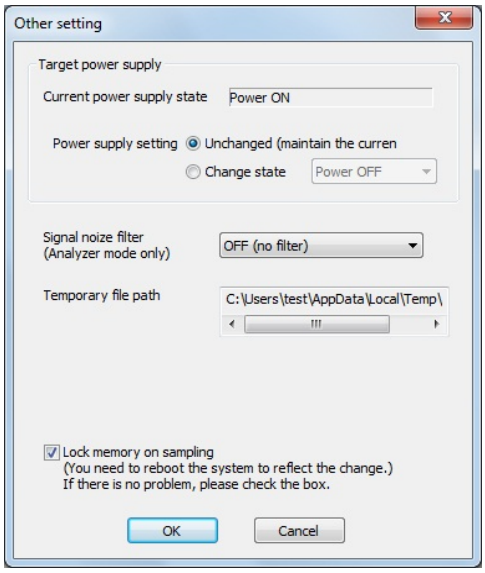
The below is an explanation for how to capture data in I2C analyzer mode and how to analyze captured data.
Refer to (4-4)How to use I2C analyzer mode in Chapter 4.Each function of Analyzer_Monitor tool for further information.

[Preparation]

Connect each cable and click  at the tool bar and set power supply.

If power is supplied from external, [Current power supply state] shows [Power ON].

If power is supplied to external or REX-USB62, select [Change state] at [Power supply setting] and set voltage level.

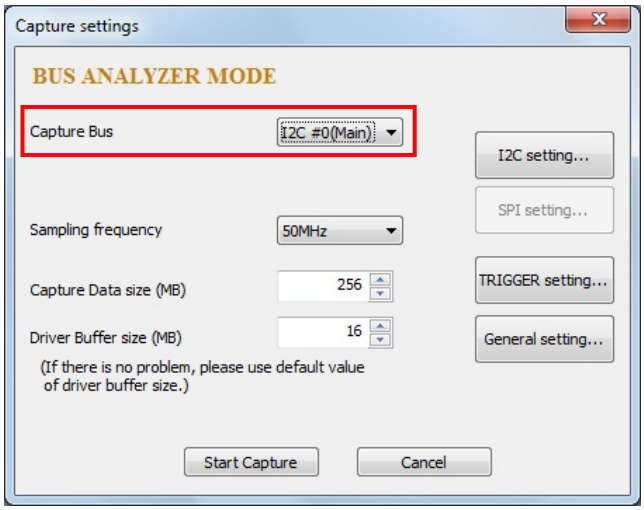


[Data capture]

If you click  at the tool bar, capture setting window will appear.

Select [I2C #0(Main)] at [Capture Bus] and click [Start Capture].
* when a target is connected to I2C SCL(Main)/I2C SDA(Main)

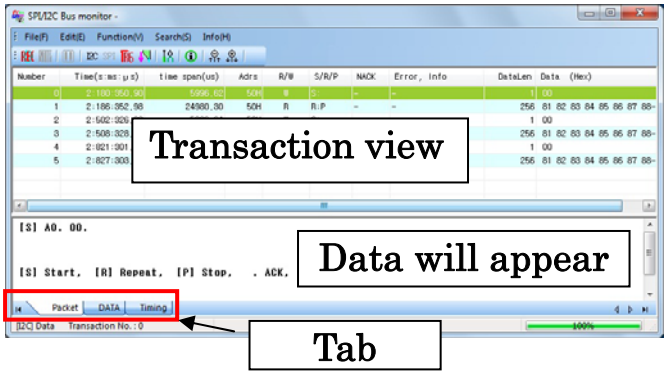
Captured data will sequentially appear on the application.
If you click  at the tool bar, capture will end.



[Data analyzation]

Captured data will appear, as shown in the right, and selected transaction data will appear at the lower part.

You can select [Packet],[DATA],[Timing] to change display method.



(3-4) How to use I2C monitor mode

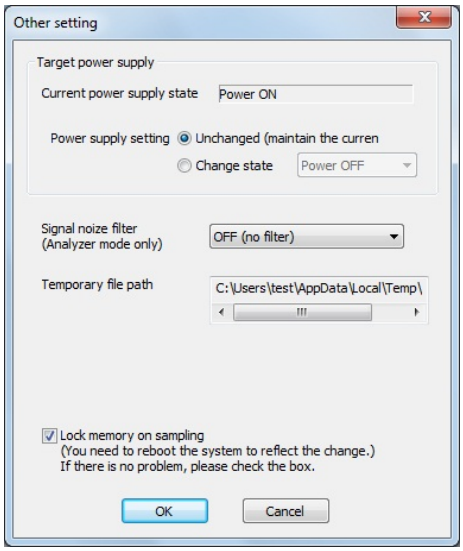
The below is an explanation for how to capture data in I2C monitor mode and how to analyze captured data.
Refer to (4-5)How to use I2C monitor mode in Chapter 4.Each function of Analyzer_Monitor tool for further information.

[Preparation]

Connect each cable and click  at the tool bar and set power supply.

If power is supplied from external, [Current power supply status] shows [Power ON].

If power is supplied to external or REX-USB62, select [Change state] at [Power supply setting] and set voltage level.

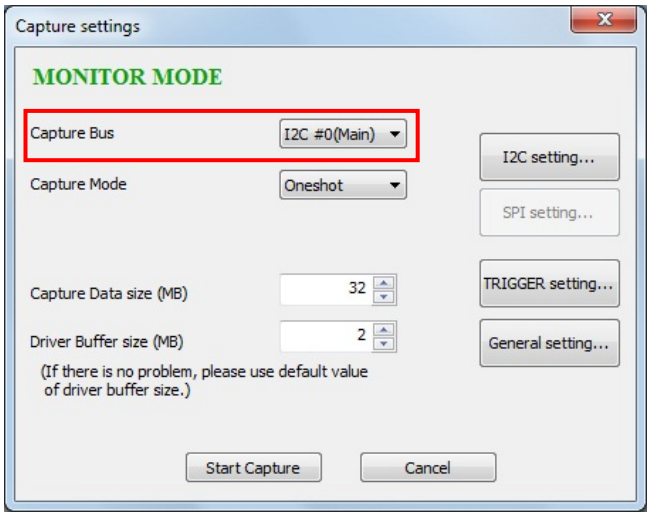


[Data capture]

If you click  at the tool bar, capture setting window will appear.

Select [I2C #0(Main)] at [Capture Bus] and click [Start Capture].
* when a target is connected to I2C SCL(Main)/I2C SDA(Main)

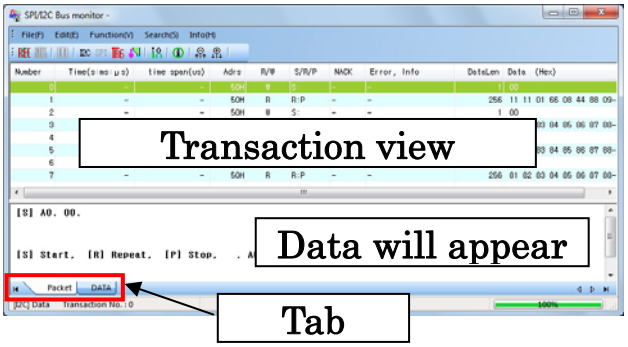
Captured data will sequentially appear on the application.
If you click  at the tool bar, capture will end.



[Data analyzation]

Captured data will appear, as shown in the right, and selected transaction data will appear at the lower part.

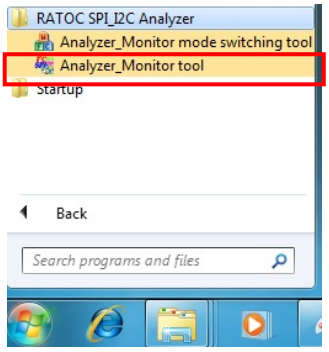
You can select [Packet],[DATA] to change display method.



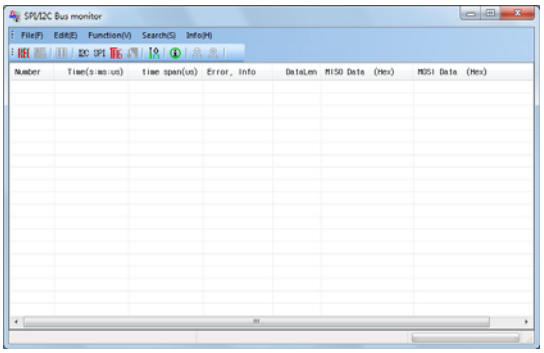
4. Each function of Analyzer Monitor tool.

The below explains each function of Analyzer Monitor tool.

Analyzer Monitor tool is registered at [All programs]-[RATOC SPI_I2C Analyzer] at the [Start] menu.



When Analyzer Monitor tool start up, the window shown in the right will appear.
For each function, refer to (4-1) Explanation of each function of Analyzer Monitor tool.



The following is an explanation of each function of this application and how to use each mode of SPI/I2C.

(4-1) Explanation of each function of Analyzer Monitor tool
(4-2) How to use SPI analyzer mode
(4-3) How to use SPI monitor mode
(4-4) How to use I2C analyzer mode
(4-5) How to use I2C monitor mode
(4-6) Other functions

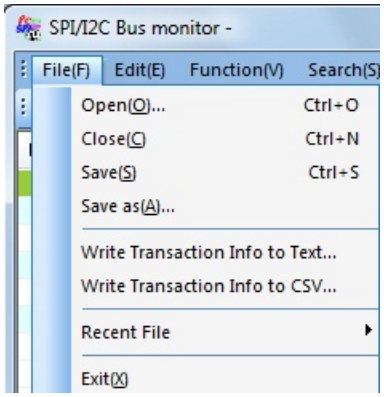
Caution when you use the application

- Never remove REX-USB62 during sampling.
  (i.e. Never unplug the USB cable)
- Never remove other USB devices during sampling.
- While the application is running, don't use sleep/hibernation mode.
- If you restart or go into sleep/hibernation mode while REX-USB62 is connected, you need to remove REX-USB62 and then, re-connect REX-USB62.
- When you start the application, you need to finish all the other running applications. Especially during sampling, never start all the other applications. Be careful not to start background process (including virus scan, etc.).
- If you use Analyzer Monitor mode switching tool, close this application.

(4-1) Explanation of each function of Analyzer Monitor tool

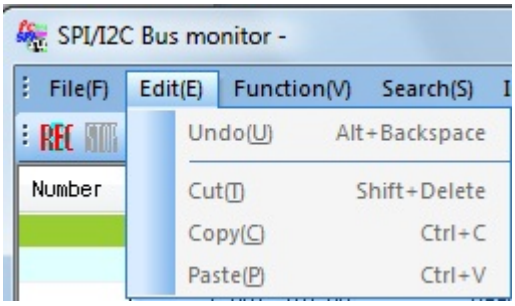
Menu bar

File(F)



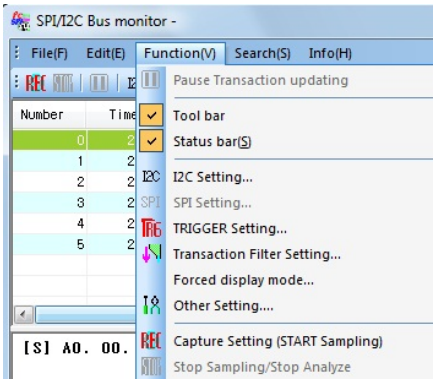
- Open(O) : Open a file which this application saved.
- Close(C) : Close a capture window.
- Save(S) : Overwrite current captured data.
- Save as (A) : Save current captured data as a new name.
- Write Transaction Info to Text… :
  Write transaction information to a text file.
- Write Transaction Info to CSV… :
  Write transaction view information to CSV file.
- Recent File : Open a file which this application used before.
  (The extension of a file is .SIC)
- Exit(X) : Close this application.

Edit(E)



* This function doesn't work.

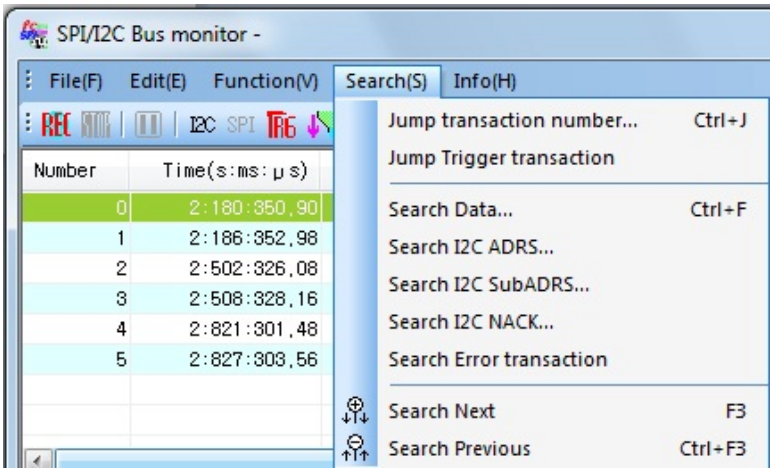
Function(V)



- Pause Transaction updating : Pause to renew display of transaction.
- Tool bar : Display/hide the tool bar.
- Status bar(S) : Display/hide the status bar.
- I2C Setting : Each setting of I2C can be made.
  -- Refer to Page.4-19 for analyzer mode.
  -- Refer to Page.4-25 for monitor mode.
- SPI Setting : Each setting of SPI can be made.
  -- Refer to Page.4-7 for analyzer mode.
  -- Refer to Page.4-13 for monitor mode.
- TRIGGER Setting : Each trigger setting can be made.
  -- Refer to Page.4-9 for SPI analyzer mode.
  -- Refer to Page.4-15 for SPI monitor mode.
  -- Refer to Page.4-21 for I2C analyzer mode.
  -- Refer to Page.4-28 for I2C monitor mode.
- Transaction Filter Setting
  : Display transaction information after filtering them.
  (*Refer to (4-6) Other functions)
- Forced display mode : Display even invalid transaction forcefully.
  (*Refer to (4-6) Other functions)
- Other Setting : Set power supply, signal noise filter.
  Display a path of a working folder this application uses.
  -- Refer to Page.4-10 for SPI analyzer mode.
  -- Refer to Page.4-17 for SPI monitor mode.
  -- Refer to Page.4-22 for I2C analyzer mode.
  -- Refer to Page.4-32 for I2C monitor mode.
- Capture setting(START sampling)
  : Start sampling
  -- Refer to Page.4-7 for SPI analyzer mode.
  -- Refer to Page.4-13 for SPI monitor mode.
  -- Refer to Page.4-19 for I2C analyzer mode.
  -- Refer to Page.4-25 for I2C monitor mode.

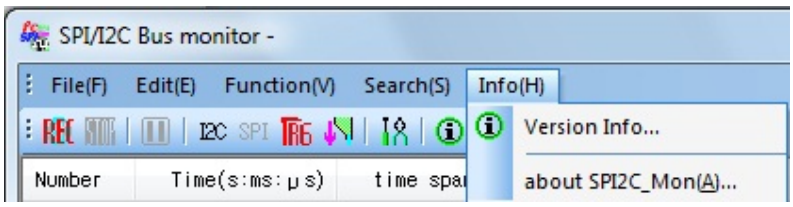
- Stop Sampling/Stop Analyze : Stop sampling or analyzation.

Search(S)



- Jump transaction number…
  : Jump a designated transaction number.
- Jump Trigger transaction
  : Jump to a transaction where a trigger occurs.
- Search Data… : Search a designated data pattern.
- Search I2C ADRS… : Search a designated I2C address.
- Search I2C SubADRS… : Search a designated I2C sub-address.
- Search I2C NACK : Search I2C NACK.
- Search Error transaction
  : Search failed transaction.
- Search Next : Search data in the forward direction.
- Search Previous : Search data in the backward direction.

Info(H)



- Version Info… : Display a current mode of REX-USB62(Monitor/ Analyzer), version such as firmware/CPLD/driver/ Application, path of working folder, remained physical memory.
- about SPI2C_Mon(A) : Display a version of this application.

About Tool bar


: Start sampling.
This is the same function as selecting [Function(V)]-[Capture setting(START sampling)] from the menu bar.
-- Refer to Page.4-7 for SPI analyzer mode.
-- Refer to Page.4-13 for SPI monitor mode.
-- Refer to Page.4-19 for I2C analyzer mode.
-- Refer to Page.4-25 for I2C monitor mode.


: Stop sampling or analyzation.
This is the same function as selecting [Function(V)]-[Stop Sampling/Stop Analyze] from the menu bar.


: Pause to renew display of transaction.
This is the same function as selecting [Function(V)]-[Pause Transaction updating] from the menu bar.


: Each setting of I2C can be made.
This is the same function as selecting [Function(V)]-[I2C Setting] from the menu bar.
-- Refer to Page.4-20 for analyzer mode.
-- Refer to Page.4-26 for monitor mode.


: Each setting of SPI can be made.
This is the same function as selecting [Function(V)]-[SPI Setting] from the menu bar.
-- Refer to Page.4-8 for analyzer mode.
-- Refer to Page.4-14 for monitor mode.


: Each trigger setting can be made.
This is the same function as selecting [Function(V)]-[TRIGGER Setting] from the menu bar.
-- Refer to Page.4-9 for SPI analyzer mode.
-- Refer to Page.4-15 for SPI monitor mode.
-- Refer to Page.4-21 for I2C analyzer mode.
-- Refer to Page.4-28 for I2C monitor mode.


: Display transaction information after filtering them.
This is the same function as selecting [Function(V)]-[Transaction Filter Setting] from the menu bar.


: Set power supply, signal noise filter.
Display a path of a working folder this application uses.
-- Refer to Page.4-10 for SPI analyzer mode.
-- Refer to Page.4-17 for SPI monitor mode.
-- Refer to Page.4-22 for I2C analyzer mode.
-- Refer to Page.4-32 for I2C monitor mode.
This is the same function as selecting [Function(V)]-[Other Setting] from the menu bar.

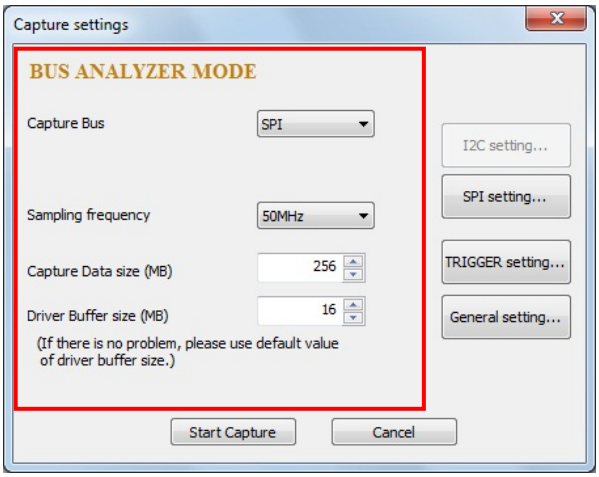
 : Display a current mode of REX-USB62 (Monitor/Analyzer), version such as firmware/CPLD/driver/application, path of working folder, remained physical memory.
This is the same function as selecting [Info(H)]-[Version Info] from the menu bar.

 : Search data in the forward direction.
This is the same function as selecting [Search(S)]-[Search Next] from the menu bar.

 : Search data in the backward direction.
This is the same function as selecting [Search(S)]-[Search Previous] from the menu bar.

(4-2) How to use SPI analyzer mode

If you click the REC button or select [Function(V)]-[Capture setting(START sampling)], the following screen will appear.



After confirming [BUS ANALYZER MODE] appears, set the following.
If [MONITOR MODE] appears, finish this application and refer to 5.Switching Analyzer/Monitor mode to switch modes from monitor mode to analyzer mode.

[Capture Bus]
Select SPI.

[Sampling frequency]
Select a sampling frequency from 50MHz/20MHz/10MHz to capture data.
(Select 50MHz to have a less margin of error on timing.
Please note, the higher the frequency is, the bigger data size is.)

[Capture Data size(MB)]
Set a maximum size of captured data. (1 - 480MB)
If a default value of 256MB is insufficient, change this value.
* If you select 480MB, more than 964MB of an available physical memory is required.

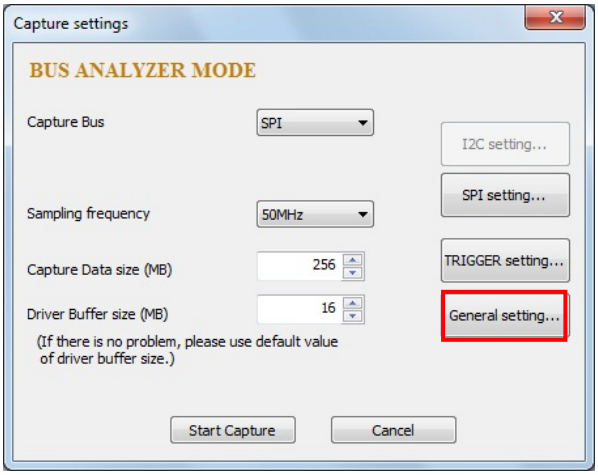
[Driver Buffer size(MB)]
Set a buffer size secured in the driver. (1 - 16MB)
(Sampled data will be sent to the buffer secured in the driver.)

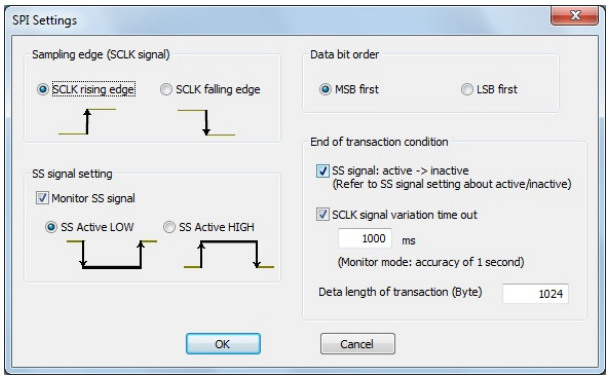
Next, set [SPI Settings] [TRIGGER Setting] [Other Setting].

[SPI Settings]

By clicking the [SPI setting] button, make each setting of SPI.

This setting is the same function as clicking the SPI button at the tool bar or selecting [Function(V)]-[SPI Setting] from the menu bar.





[Sampling edge(SCLK signal)]

Set a timing of sampling clock.

[SS signal setting]

If SS signal is required to decide whether transaction ends or not, this setting is necessary.

- SS Active LOW --- When SS signal changes from LOW to HIGH, transaction is taken as end.
- SS Active HIGH --- When SS signal changes from HIGH to LOW, transaction is taken as end.

[Data bit order]

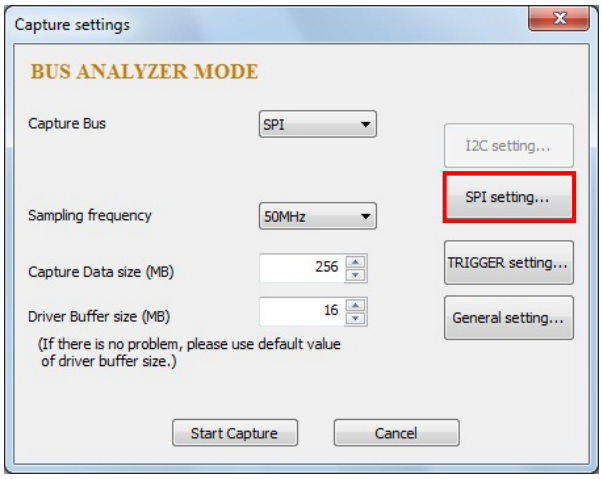
- MSB first --- Data is processed in the order from MSB to LSB.
- LSB first --- Data is processed in the order from LSB to MSB.

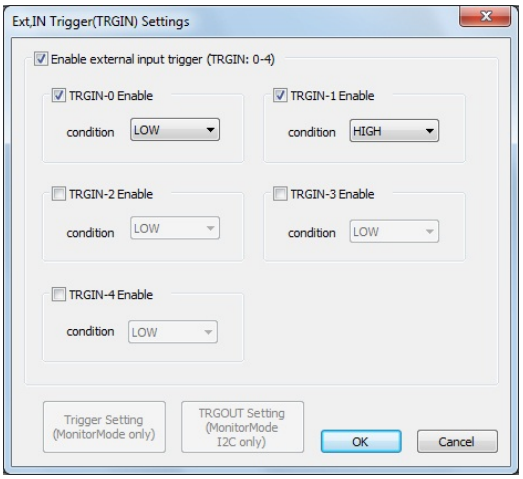
[End of transaction condition]

- SS signal active -> inactive
  (This is coordinated by the SS signal setting)
  -- When SS signal changes from active to inactive, transaction is taken as end.
  (The [SS signal setting] button described above need to be enabled.)
- SCLK signal variation time out
  -- If SCLK signal doesn't change for a specified time (Unit: millisecond), transaction is taken as end.
- Data length of transaction(Byte)
  -- If data length of transaction is longer than a specified length, transaction forcefully ends at the specified length.

[TRIGGER setting]
By clicking the [TRIGGER setting] button, you can set conditions of external input trigger to start capturing.

This setting is the same function as clicking the  button at the tool bar or selecting [Function(V)]-[TRIGGER Setting] from the menu bar.

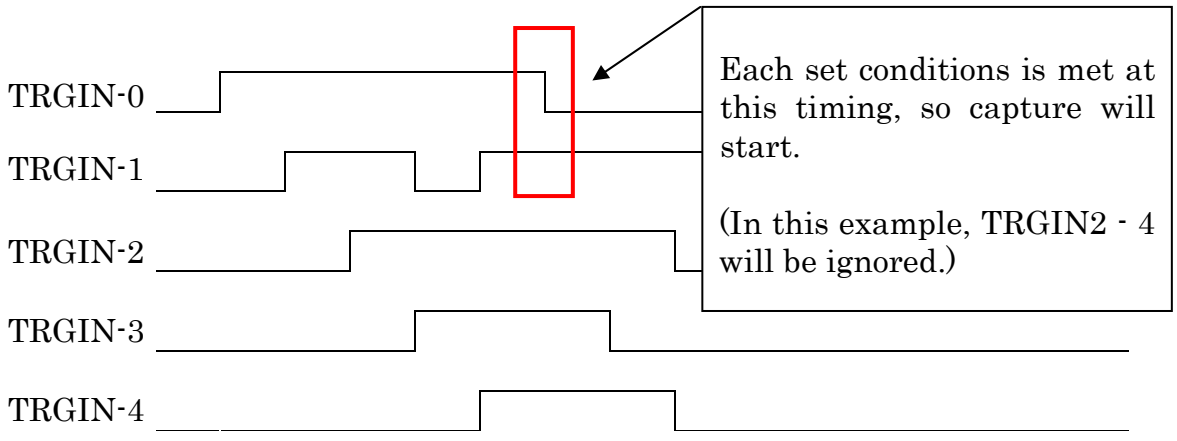




In case of using the external input trigger, enable the check box at [Enable external input trigger(TRGIN:0-4)] and enable TRGIN0 - TRGIN4 which is necessary.

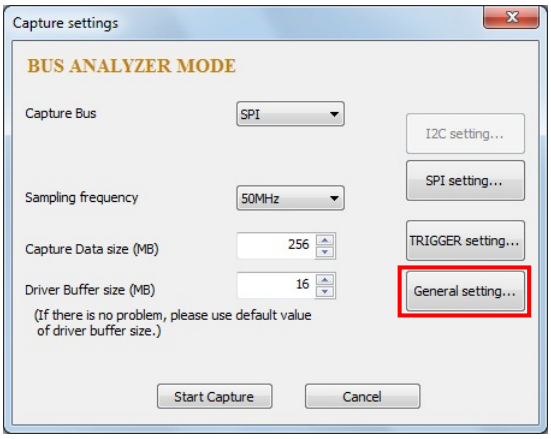
Once each set conditions is met at the same time, capture will start.
(Threshold of trigger input(TRIGIN0 - 4) is as follows:
Below 10% of power voltage is recognized as Low.
Over 90% of power voltage is recognized as High.)

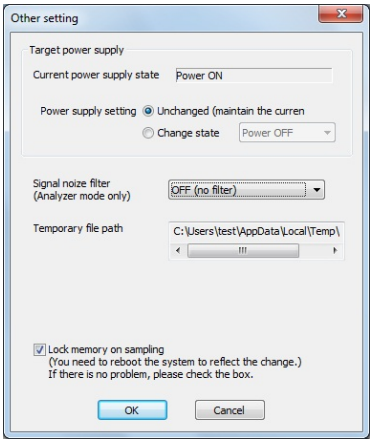
Eg : If TRGIN-0(Condition LOW), TRGIN-1(Condition HIGH) is set



[General setting]
By clicking the [General setting] button, make a setting of power supply, signal noise filter, temporary file path.

This setting is the same function as clicking the  button at the tool bar or selecting [Function(V)]-[Other setting] from the menu bar.





[Current power supply state]
In case of [Power ON], REX-USB62 is powered.
In case of [Power OFF (Power not supply)], REX-USB62 isn't powered.
(In this case, data capture can not work)

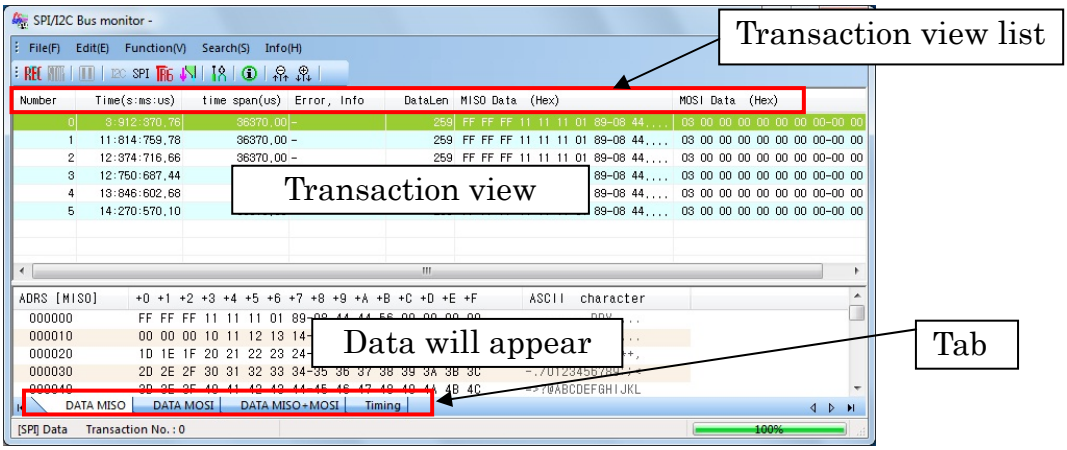
[Power supply setting]
- Unchanged(maintain the current)--- REX-USB62 works at the setting shown at [Current power supply state].
- Change state --- Select power voltage to supply external or REX-USB62 from Power OFF / 1.8V / 2.5V / 3.3V / 5.0V.

[Signal noise filter(Analyzer mode only)]
This function is to reduce a signal noise.
- OFF(no filter) --- This doesn't use the function of signal noise reduction.
- 2 clock --- This removes change (noise) of signal under 2 clock.
- 3 clock --- This removes change (noise) of signal under 3 clock.
- 4 clock --- This removes change (noise) of signal under 4 clock.

[Temporary file path] This shows a temporary file path.

[Lock memory on sampling]
- Please try to uncheck the check box when memory error happens during sampling even if there is enough space of memory available. In this way, this memory error may not appear. But, if you uncheck the check box, please note some data may not be treated, buffer overrun may happen, or an unexpected error may happen. So, if there is no problem, please check the check box.

[Display and analyzation of captured data]



[Transaction view list]

[Number]
Serial number for transaction.

[Time(sec:ms:us)]
Time from the time when capture starts until the time each transaction starts.

[time span(us)]
Necessary time for each transaction (micro-second :unit).

[Error]
Displays whether error is detected or not.

[DataLen]
Data length of each transaction.

[MISO Data (Hex)]
Data of slave output or master input is displayed in Hexadecimal.

[MOSI Data (Hex)]
Data of slave input or master output is displayed in Hexadecimal.

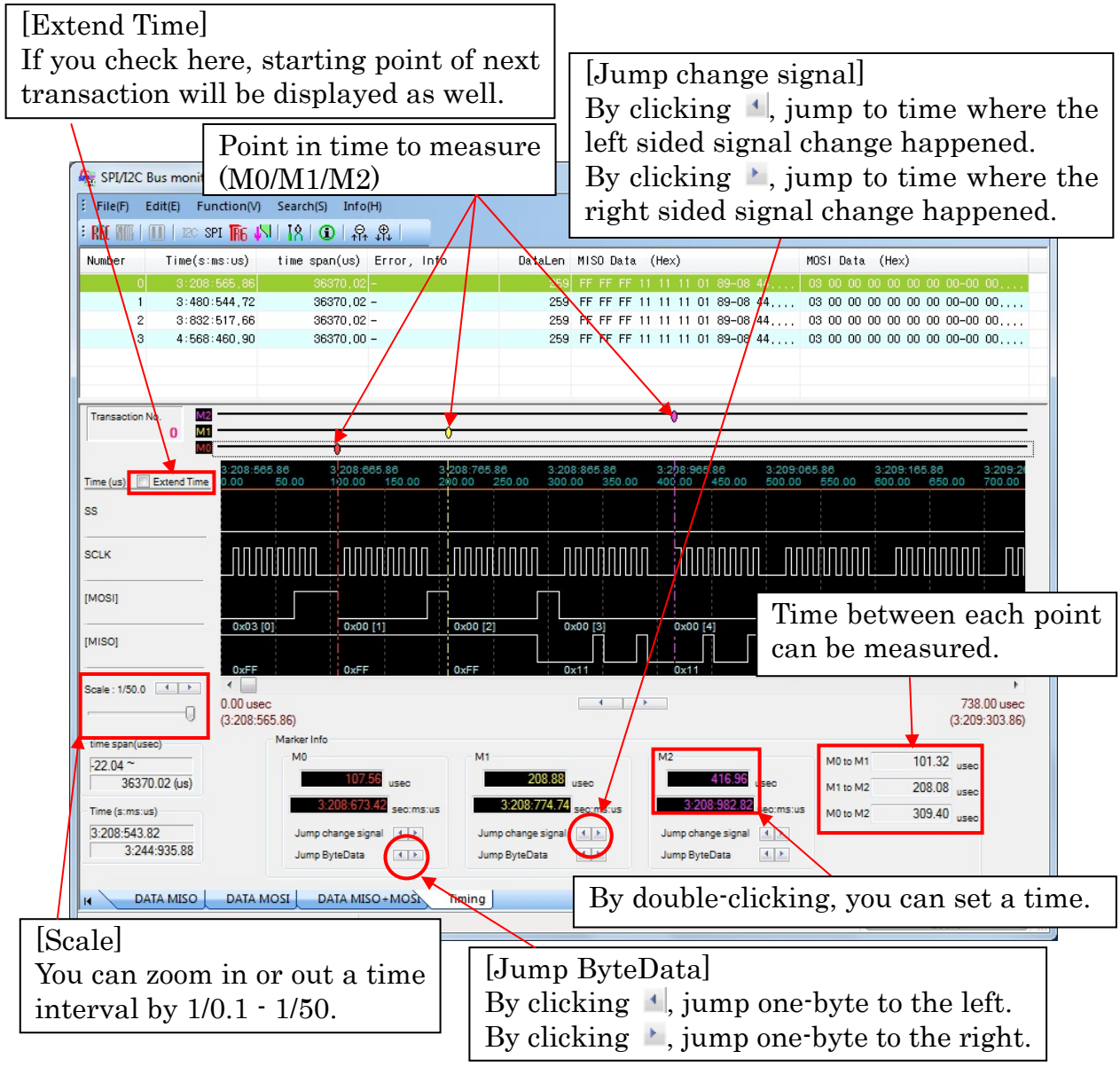
[Each Tab]

[DATA MISO]
MISO data is displayed in the data window. (ASCII code is also displayed)

[DATA MOSI]
MOSI data is displayed in the data window. (ASCII code is also displayed)

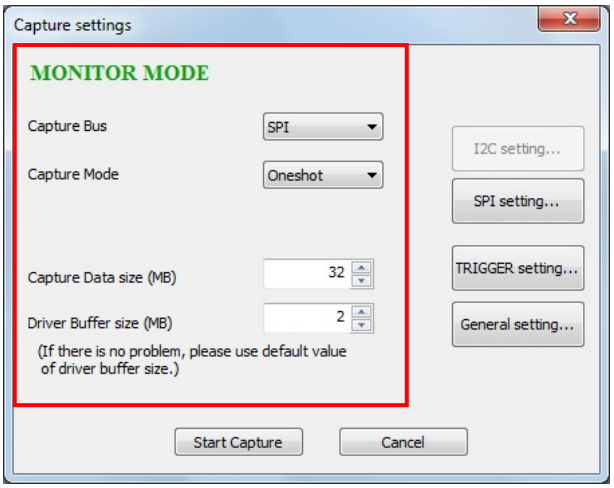
[DATA MISO＋MOSI]
MISO data and MOSI data is displayed in the data window.
(ASCII code is also displayed)

[Timing]
The window will change from the data window to the below window, and you can confirm each status on signal. And you can set 3 points in time where you can measure time, so that you can measure time between these 3 points.



(4-3) How to use SPI monitor mode

If you click  at the tool bar, or select [Function(V)]-[Capture setting(START capturing)], the following window will appear.



Please confirm [MONITOR MODE] is displayed and confirm the below:

(If [BUS ANALYZER MODE] is displayed, finish this application and switch modes to [MONITOR MODE]. Refer to Chapter 5.Analyzer_Monitor switching tool to switch modes.)

[Capture Bus]
Select SPI.

[Capture Mode]

- One shot --- Capturing will automatically finish when the captured data size reach the size specified at [Capture Data size(MB)].
- Free Run --- In this mode, keep capturing until pause or detection of trigger set before. If captured data size is over the size specified at [Capture Data size(MB)], data will be overwritten from the beginning.

[Capture Data size(MB)]
Specify data size to be captured. (1 - 192MB)
* Available physical memory size over 388MB is required to specify data size over 192MB. If the default value (32MB) isn't enough, please set another value.

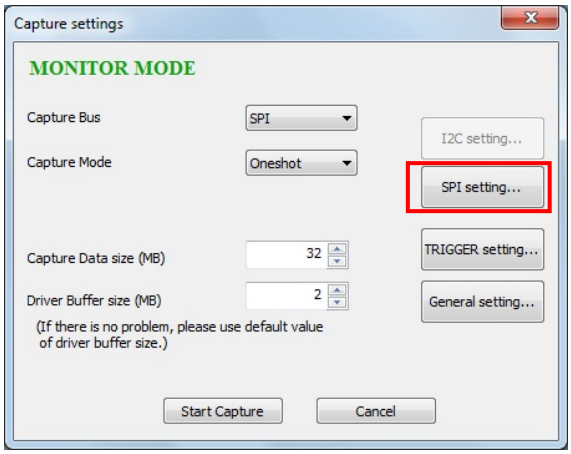
[Driver Buffer size(MB)]
Specify buffer size secured in the driver. (1 - 16MB)
(Sampled data will be sent to the buffer secured in the driver.)

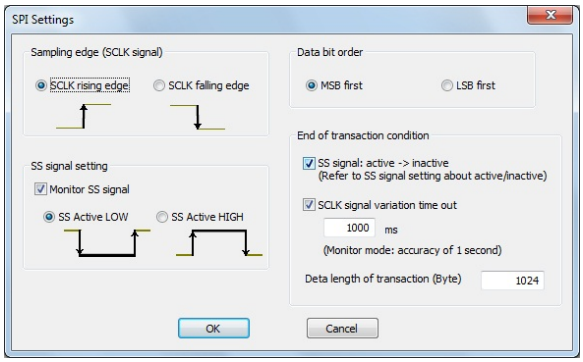
Next, make a setting for [SPI setting] [TRIGGER setting] [General setting].

[SPI setting]

By clicking [SPI setting], make a setting for SPI.

This setting is the same function as clicking the SPI button at the tool bar, or [Function(V)]-[SPI setting] from the menu bar.





[Sampling edge(SCLK signal)]

Set a timing where sampling clock is set.

[SS signal setting]

If SS signal is required to decide whether transaction ends or not, this setting is necessary.

- SS Active LOW --- When SS signal changes from LOW to HIGH, transaction is taken as end.
- SS Active HIGH --- When SS signal changes from HIGH to LOW, transaction is taken as end.

[Data bit order]

- MSB first --- Data is processed in the order from MSB to LSB.
- LSB first --- Data is processed in the order from LSB to MSB.

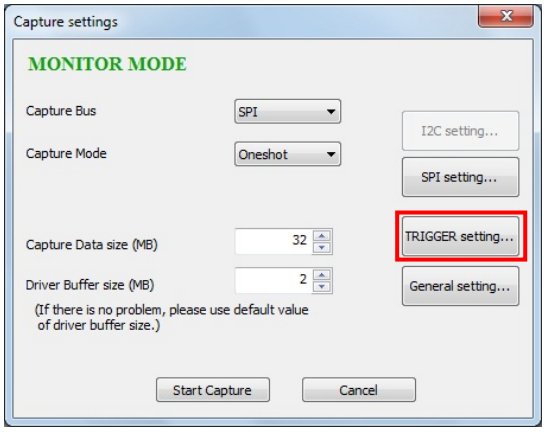
[End of transaction condition]

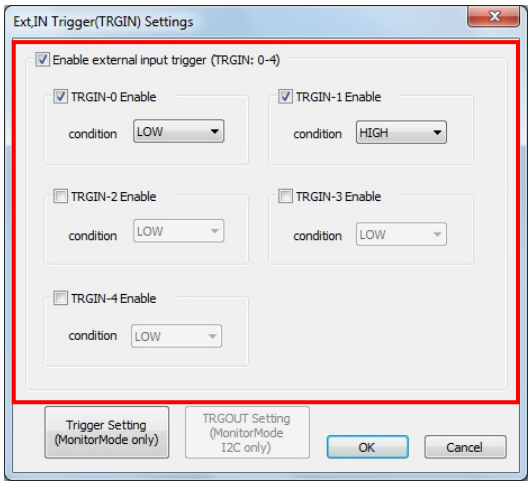
- SS signal active -> inactive
  (This is coordinated by the SS signal setting)
  -- When SS signal changes from active to inactive, transaction is taken as end.
  (The [SS signal setting] button described above need to be enabled.)
- SCLK signal variation time out
  -- If SCLK signal doesn't change for a specified time (Unit: millisecond), transaction is taken as end.
- Data length of transaction(Byte)
  -- If data length of transaction is longer than a specified length, transaction forcefully ends at the specified length.

[TRIGGER setting]

By clicking the [TRIGGER setting] button, you can set conditions of external input trigger to start capturing.

This setting is the same function as clicking the  button at the tool bar or selecting [Function(V)]-[TRIGGER Setting] from the menu bar.

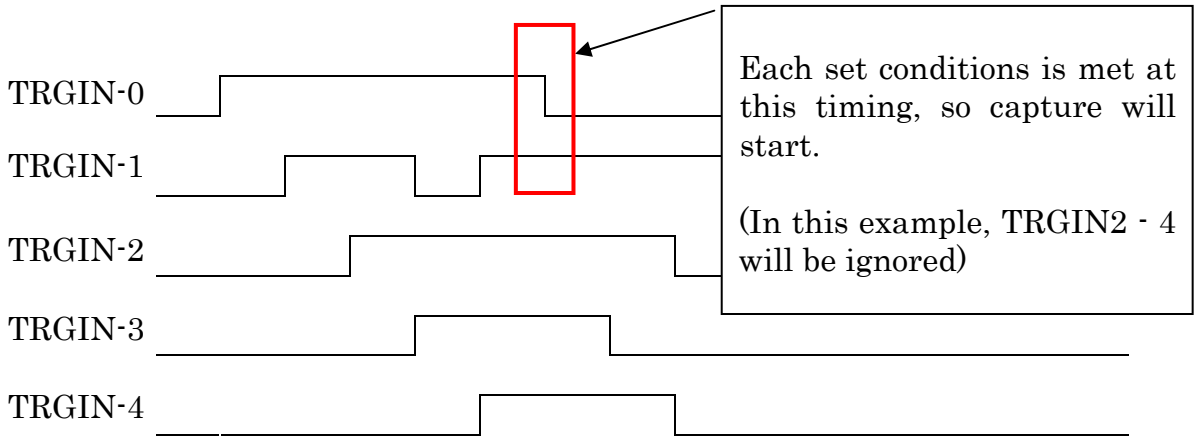




In case of using the external input trigger, enable the check box at [Enable external input trigger(TRGIN:0-4)] and enable TRGIN0 - TRGIN4 which is necessary.

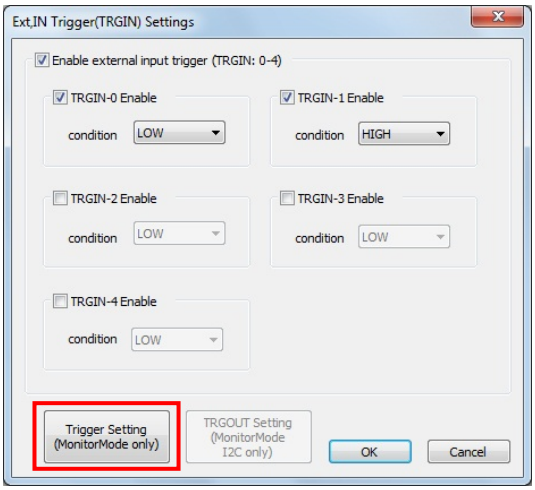
Once each set conditions is met at the same time, capture will start.
(Threshold of trigger input(TRIGIN0 - 4) is as follows:
Below 10% of power voltage is recognized as Low.
Over 90% of power voltage is recognized as High.)

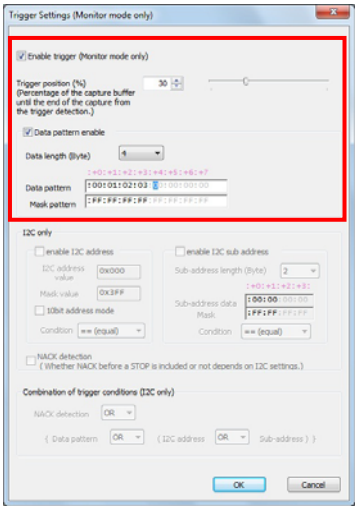
Example : If TRGIN-0(Condition LOW) and TRGIN-1(Condition HIGH) is set



[Trigger Settings(Monitor mode only)]

By clicking [Trigger Setting(Monitor Mode only)], the following window will appear.
(* Only free run mode is valid)





[Enable trigger(Monitor mode only)]
Data specified by [Data pattern] will be detected and capture will finish when captured data reach the size specified by [Trigger position(%)].

[Trigger position(%)]
Specify buffer size of which data is from trigger detection until end of capturing.
Buffer size is specified by percentage.
Example : If capture data size is 100MB, and trigger position(%) is 30%

① Capture will finish after approx 30MB data is captured from trigger detection.
② Capture data before trigger detection is approx 70MB.

[Data pattern enable]
- Data length(Byte) --- Specify data length of data pattern to detect trigger.
- Data pattern --- Specify data pattern to detect trigger.
- Mask pattern --- AND OPERATION for a value specified at [Mask pattern] and [capture data], and trigger at a value specified at [Data pattern].

Example : Mask pattern 01110001
capture data 10110101

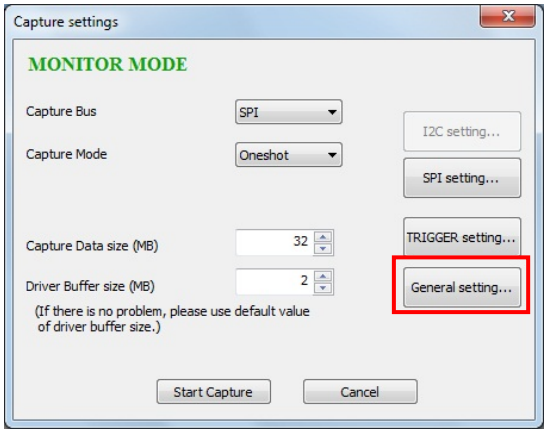
AND OPERATION 00110001

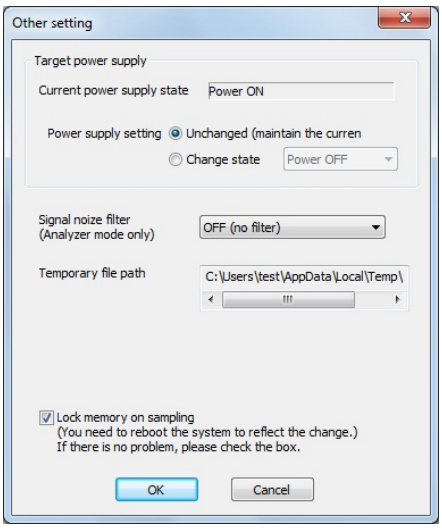
This value is triggered at a value specified at [Data pattern].

[General setting]

By clicking [General setting], make a setting of power supply, signal noise filter, temporary file path.

This setting is the same function as clicking the  button at the tool bar or selecting [Function(V)]-[Other setting] from the menu bar.





[Current power supply state]

If status is [Power ON], REX-USB62 is powered.
If status is [Power OFF(Power not supply)], REX-USB62 is not powered.
(In this case, data capture can not work)

[Power supply setting]

- Unchanged(maintain the current) --- REX-USB62 works at the setting shown at [Current power supply state].
- Change state --- Select power voltage to supply external or REX-USB62 from Power OFF / 1.8V / 2.5V / 3.3V / 5.0V.

[Signal noise filter(Analyzer mode only)]

Monitor mode doesn't use this filter.

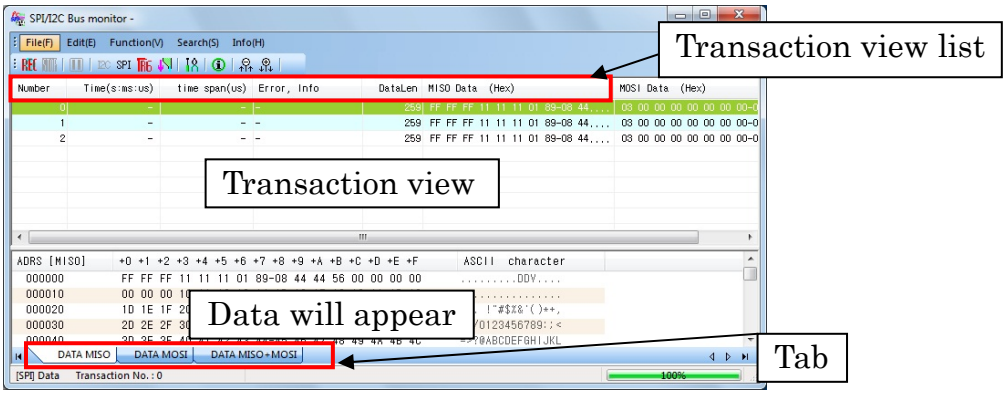
[Temporary file path]

This shows a temporary file path.

[Lock memory on sampling]

- Please try to uncheck the check box when memory error happens during sampling even if there is enough space of memory available. In this way, this memory error may not appear. But, if you uncheck the check box, please note some data may not be treated, buffer overrun may happen, or an unexpected error may happen. So, if there is no problem, please check the check box.

[Display and analyzation of captured data]



[Transaction view list]

[Number]
Serial number for transaction.

[Time(sec:ms:us)]
Time from the time when capture starts until the time each transaction starts.

[time span(us)]
Necessary time for each transaction(micro-second :unit).

[Error]
Displays whether error is detected or not.

[DataLen]
Data length of each transaction.

[MISO Data (Hex)]
Data of slave output or master input is displayed in Hexadecimal.

[MOSI Data (Hex)]
Data of slave input or master output is displayed in Hexadecimal.

[Each Tab]

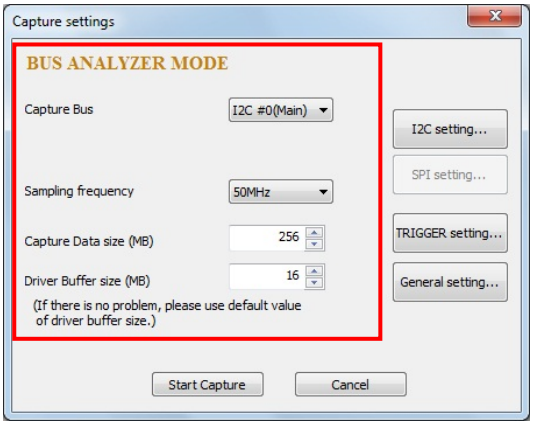
[DATA MISO]
MISO data is displayed in the data window. (ASCII code is also displayed)

[DATA MOSI]
MOSI data is displayed in the data window. (ASCII code is also displayed)

[DATA MISO＋MOSI]
MISO data and MOSI data is displayed in the data window.
(ASCII code is also displayed)

(4-4) How to use I2C analyzer mode

If you click  at the tool bar, or selecting [Function(V)]-[Capture setting(START sampling)], the following window will appear.



Confirm [BUS ANALYZER MODE] is displayed and make the following setting.
(If [MONITOR MODE] is displayed, finish this application and switch modes to [BUS ANALYZER MODE]. Refer to Chapter 5.Analyzer_Monitor switching tool to switch modes.)

[Capture Bus]
Select I2C #0(Main). (With I2C interface, you can connect 2 bus lines at most. If I2C SCL(Sub)/I2C SDA(Sub) is used, please select I2C #1(Sub))

[Sampling frequency]
Select a sampling frequency from 50MHz/20MHz/10MHz to capture data.
(To make error of timing judgment less, select 50MHz.
Please note, the higher the frequency is, the bigger data size is.)

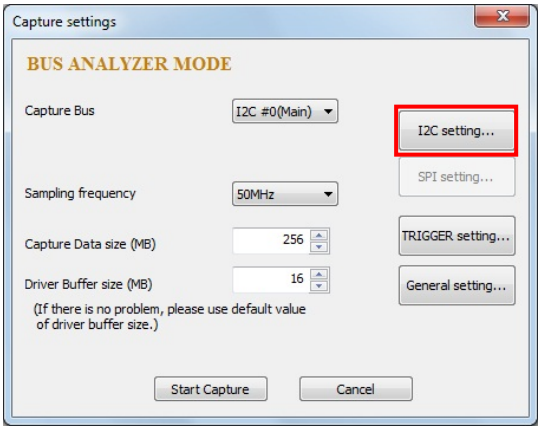
[Capture Data size(MB)]
Specify data size to be captured. (1 - 480MB)
If the default value (256MB) isn't enough, please set another value.
* Available physical memory size over 964MB is required to specify data size over 480MB.

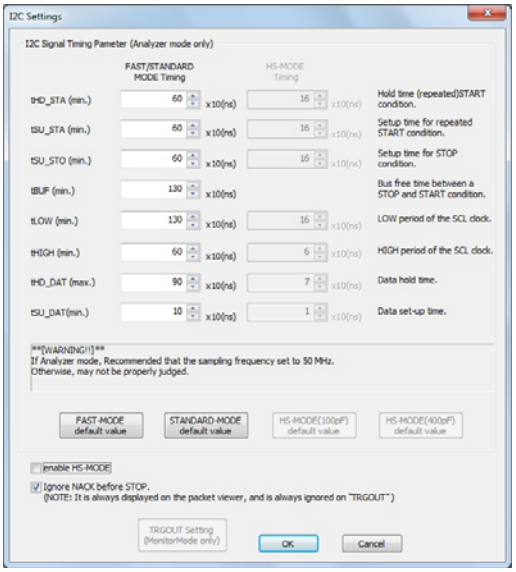
[Driver Buffer size(MB)]
Specify buffer size secured in the driver. (1 - 16MB)
(Sampled data will be sent to the buffer secured in the driver.)

Next, make a setting for [I2C setting] [TRIGGER setting] [General setting].

[I2C setting]

By clicking [I2C setting], make a setting for I2C.
This setting is the same function as clicking the I2C button at the tool bar, or [Function(V)]-[I2C setting] from the menu bar.





[I2C Signal Timing Parameter(Analyzer mode only)]
This can detect part which is not sufficient to AC characteristic value.
The default value can be changed.

Symbol	Explanation
tHD_STA *1	Hold time(repeated) [START] conditions After this period, the first clock pulse will be created.
tSU_STA *1	Set-up time for repeated [START] conditions
tSU_STO *1	Set-up time for [STOP] conditions
tBUF	Bus free time between [STOP] conditions and [START] conditions
tLOW *2	"L" period of SCL clock
tHIGH *2	"H" period of SCL clock
tHD_DAT *2	Data hold time
tSU_DAT *2	Data set-up time

Conditions of the above setting are not met, a message at the error section of the transaction view(Page.4-23) will be shown.
*1 --- will highlight appropriate part of the shown wave with color(Page.4-24)
*2 --- will highlight appropriate part of the shown wave with color(Page.4-24)
(You need to check [Show Error Timing](Page.4-24))
[FAST-MODE Default value] –If I2C bus mode is fast mode, this setting is valid.
[STANDARD-MODE Default value] --- If I2C bus mode is standard mode, this setting is valid.
[HS-MODE(100pF) Default value] --- If I2C bus mode is HS-MODE(100pF), this setting is valid.

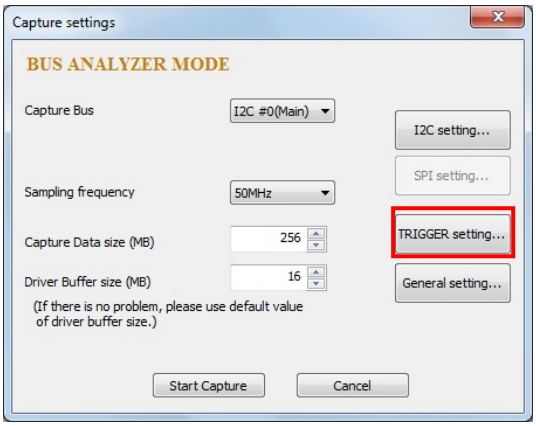
[HS-MODE(400pF) Default value] --- If I2C bus mode is HS-MODE(400pF), this setting is valid.
[Enable HS-MODE] --- If this setting is checked, HS-MODE setting is enabled.

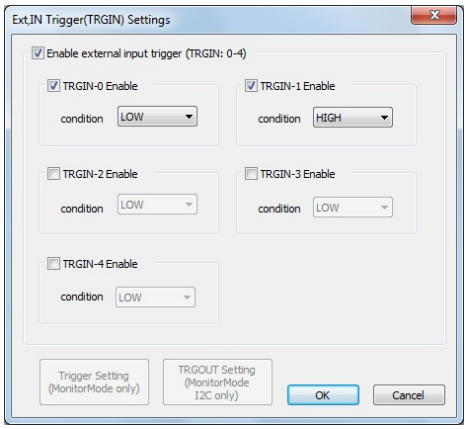
[Ignore "NACK" before [STOP]] --- NACK before STOP conditions aren't treated as error.

[Trigger Settings]

By clicking the [TRIGGER setting] button, you can set conditions of external input trigger to start capturing.

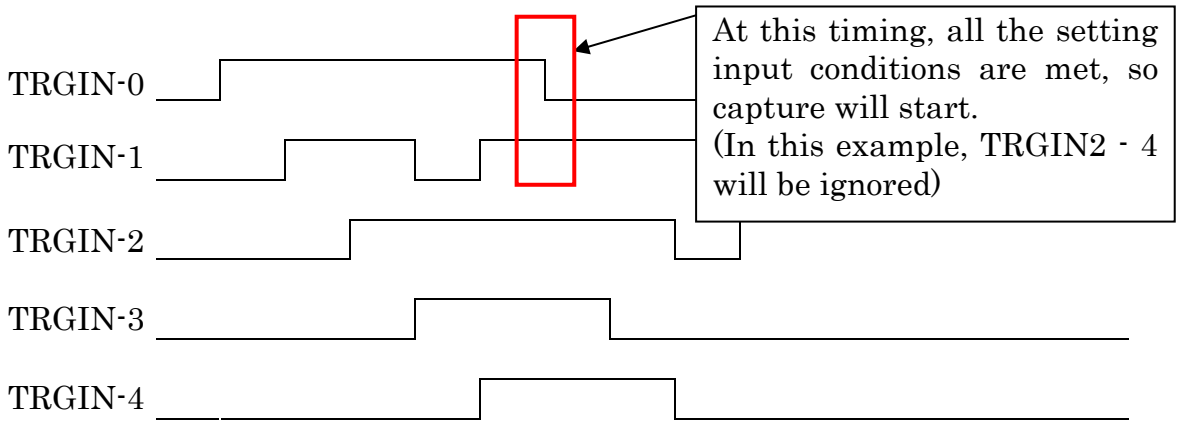
This setting is the same function as clicking the  button at the tool bar, or [Function(V)]-[TRIGGER setting] from the menu bar.





To use an external input trigger, check the check box at [Enable external input trigger(TRGIN:0-4)] and also check the check box for TRGIN0 - TRGIN4.
Once all the setting input conditions are met at the same time, capture will start.
(Threshold of trigger input(TRIGIN0 - 4) is as follows:
Under 10% of voltage of power supply will be low.
Over 90% of voltage of power supply will be High)

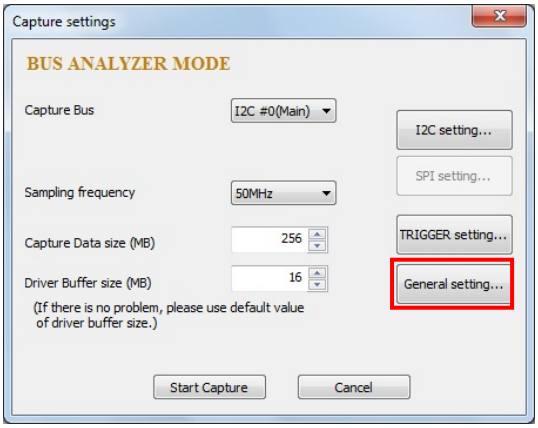
Example : If TRGIN-0(Condition LOW) and TRGIN-1(Condition HIGH) is set

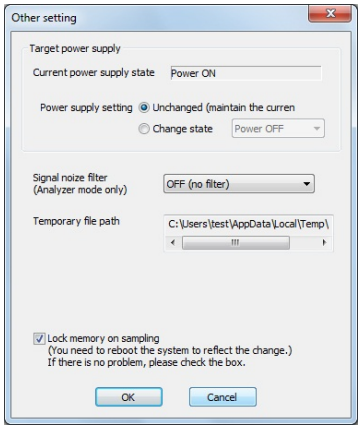


[General setting]

By clicking [General setting], make a setting of power supply, signal noise filter, temporary file path.

This setting is the same function as clicking the  button at the tool bar, or [Function(V)]-[Other setting] from the menu bar.





[Current power supply state]

If status is [Power ON], REX-USB62 is powered.

If status is [Power OFF(Power not supply)], REX-USB62 is not powered. (In this case, to capture data don't work)

[Power supply setting]

- Unchanged(maintain the current) --- REX-USB62 works at the setting shown at [Current power supply state].
- Change state --- Select power voltage to supply external or REX-USB62 from Power OFF / 1.8V / 2.5V / 3.3V / 5.0V.

[Signal noise filter(Analyzer mode only)]

This is a function to reduce signal noise filter.

- OFF(No filter) --- This doesn't use a function to reduce signal noise.
- 2 clock --- This removes a signal change(noise) under 2 clock.
- 3 clock--- This removes a signal change(noise) under 3 clock.
- 4 clock --- This removes a signal change(noise) under 4 clock.

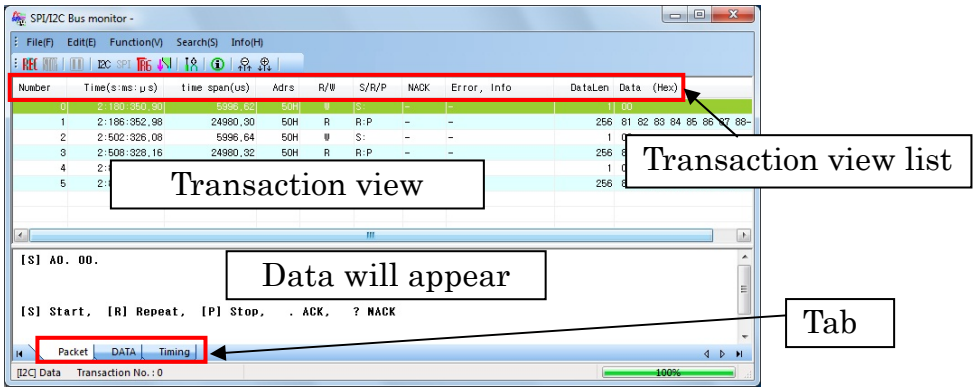
[Temporary file path]

This shows a temporary file path.

[Lock memory on sampling]

- Please try to uncheck the check box when memory error happens during sampling even if there is enough space of memory available. In this way, this memory error may not appear. But, if you uncheck the check box, please note some data may not be treated, buffer overrun may happen, or an unexpected error may happen. So, if there is no problem, please check the check box.

[Display and analyzation of captured data]



[Transaction view list]

[Number]
Serial number for transaction.

[Time(sec:ms:us)]
Time from the time when capture starts until the time each transaction starts.

[time span(us)]
Necessary time for each transaction(μ second :unit).

[Adrs]
Address of I2C device.

[R/W]
Read/Write is displayed.

[S/R/P]
S : Start conditions.
R : Repeat start conditions.
P : Stop conditions.

[NACK]
Displays whether NACK is detected or not.

[Error]
Displays whether error is detected or not.

[DataLen]
Data length of each transaction.

[Data (Hex)]
Each transaction data in Hexadecimal.

[Each Tab]

[Packet]
I2C packet data is displayed.

[DATA]
Captured data is dumped in Hexadecimal and ASCII character.

[Timing]
The window will change from the data window to the below window, and you can confirm each status on signal. And you can set 3 points in time where you can measure time, so that you can measure time between these 3 points.

[Extend Time]
If you check here, starting point of next transaction will be displayed as well

[Jump change signal]
By clicking ◀, jump to time where the left sided signal change happened.
By clicking ▶, jump to time where the right sided signal change happened.

Point in time to measure (M0/M1/M2)

[Scale]
You can zoom in or out an time interval by 1/0.1 - 1/50.

Time between each point can be measured.

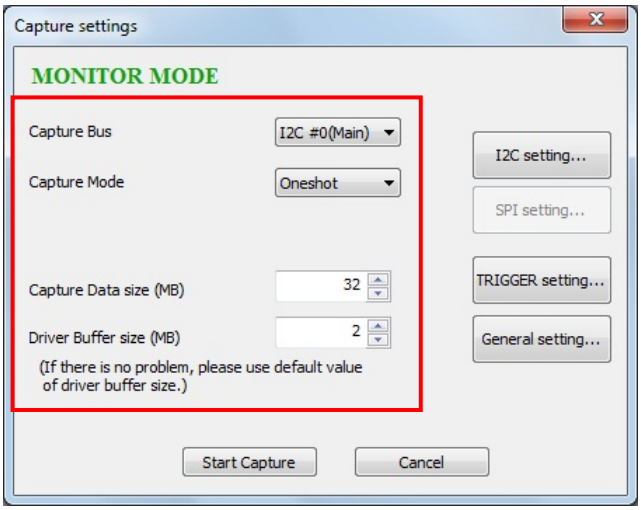
[Show Error Timing]
If you check here, [*2 written at Page.4-20] is not met, an appropriate part of wave will be highlighted with color.

By double-clicking, you can set a time.

[Jump ByteData]
By clicking ◀, jump one-byte to the left.
By clicking ▶, jump one-byte to the right.

(4-5) How to use I2C monitor mode

If you click  at the tool bar, or selecting [Function(V)]-[Capture setting(START sampling)], the following window will appear.



Confirm [MONITOR MODE] is displayed and make the following setting.
(If [BUS ANALYZER MODE] is displayed, finish this application and switch modes to [MONITOR MODE]. Refer to Chapter 5.Analyzer_Monitor switching tool to switch modes.)

[Capture Bus]
Select I2C #0(Main). (With I2C interface, you can connect 2 bus lines at most. If I2C SCL(Sub)/I2C SDA(Sub) is used, please select I2C #1(Sub))

[Capture Mode]

- One shot --- Capturing will automatically finish when the captured data size reach the size specified at [Capture Data size(MB)].
- Free Run --- In this mode, keep capturing until pause or detection of trigger set before. If captured data size is over the size specified at [Capture Data size(MB)], data will be overwritten from the beginning.

[Capture Data size(MB)]
Specify data size to be captured. (1 - 192MB)
If the default value(192MB) isn't enough, please set another value.

- Available physical memory size over 388MB is required to specify data size over
- 192MB.

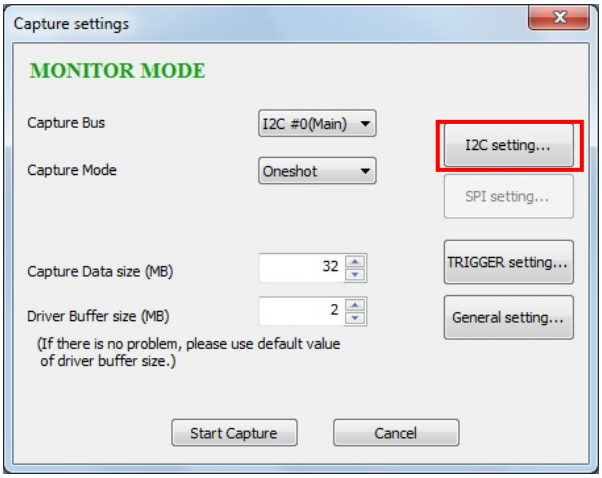
[Driver Buffer size(MB)]
Specify buffer size secured in the driver. (1 - 16MB)
(Sampled data will be sent to the buffer secured in the driver.)

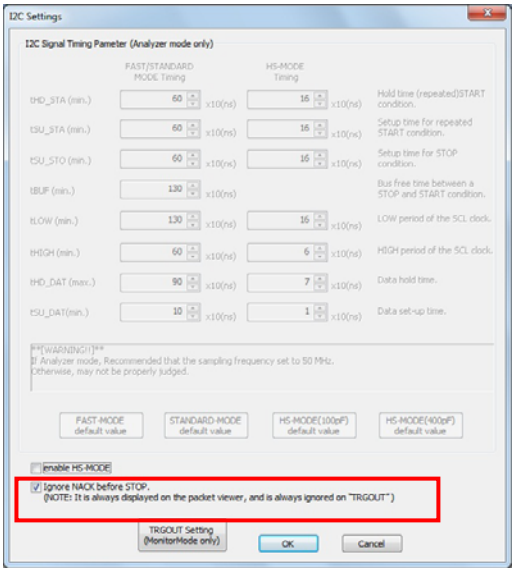
Next, make a setting for [I2C setting] [TRIGGER setting] [General setting].

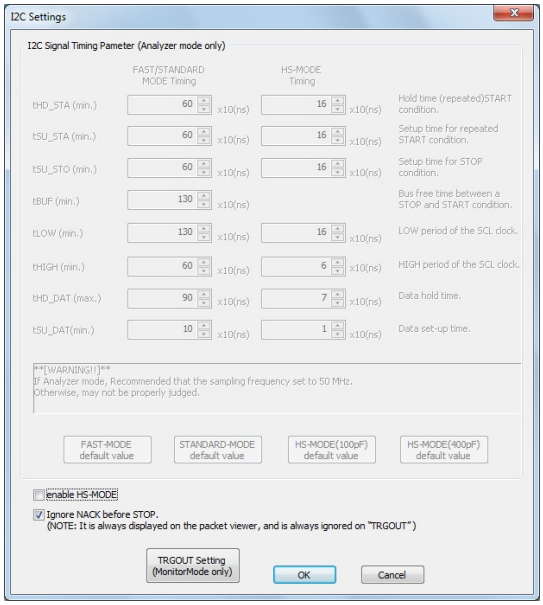
[I2C setting]

By clicking [I2C setting], make a setting for I2C.

This setting is the same function as clicking the  button at the tool bar, or [Function(V)]-[I2C setting] from the menu bar.

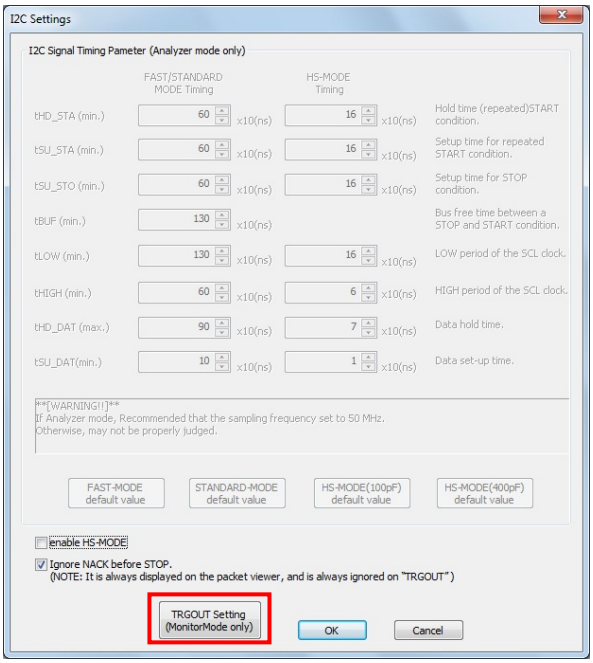




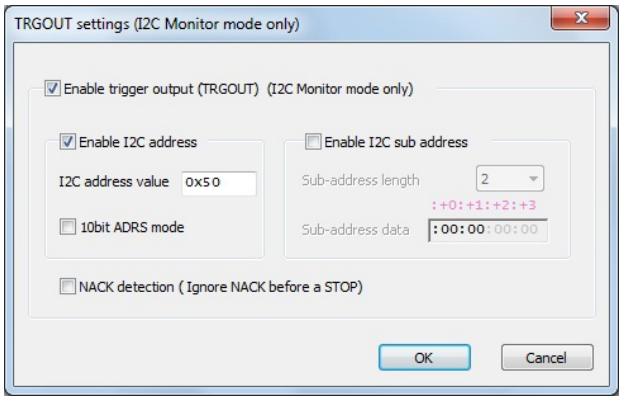


[Ignore "NACK" before [STOP]] --- NACK before STOP conditions aren't treated as error.

[Trigger output(TRGOUT) setting(Monitor Mode only)]



If you click this button, the following window will appear.



[Enable trigger output(TRGOUT)(I2C Monitor mode only)
If data set is triggered, LOW signal will be output from I2C trigger output terminal (TRGOUT).(When STOP conditions are detected, it will change to HIGH)

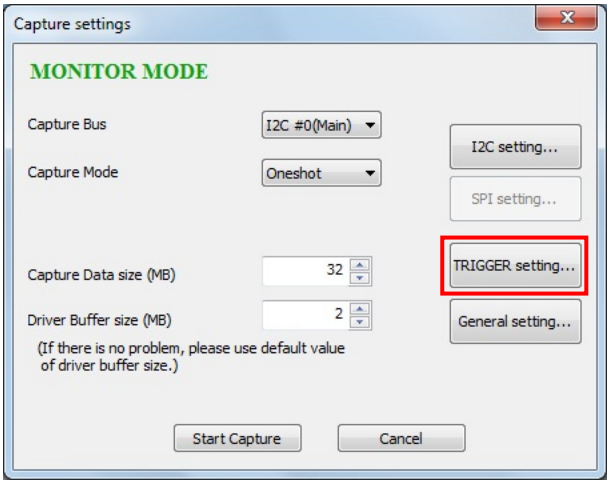
[Enable I2C address]
Use a set I2C address as trigger.

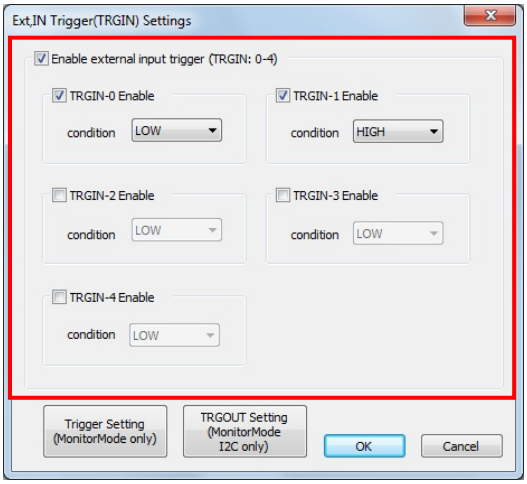
[Enable I2C sub address]
Use a set I2C sub address as trigger.

[NACK detection(Ignore NACK before a STOP)]
Use a NACK for trigger.

[TRIGGER setting]
By clicking the [TRIGGER setting] button, you can set conditions of external input trigger to start capturing.

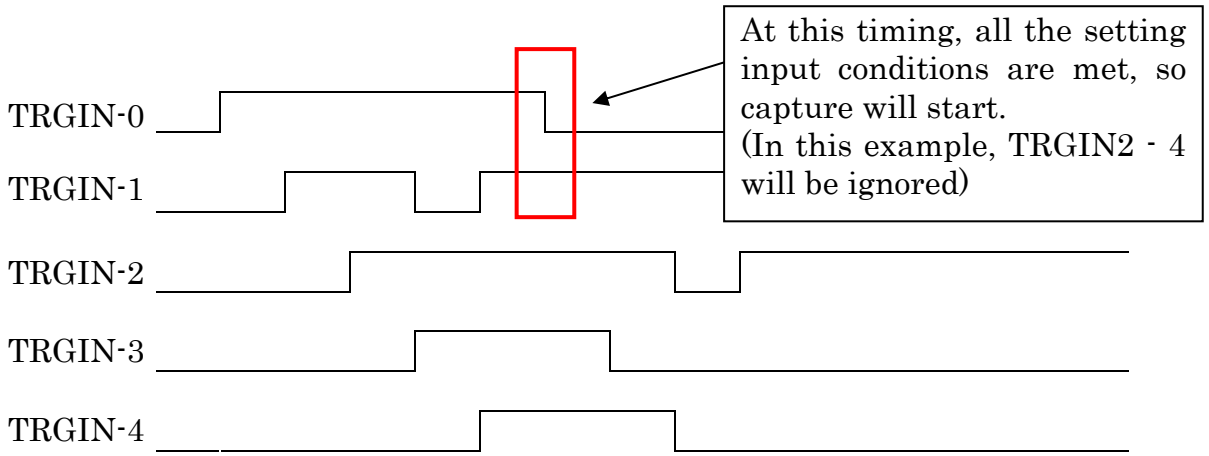
This setting is the same function as clicking the  button at the tool bar, or [Function(V)]-[TRIGGER setting] from the menu bar.





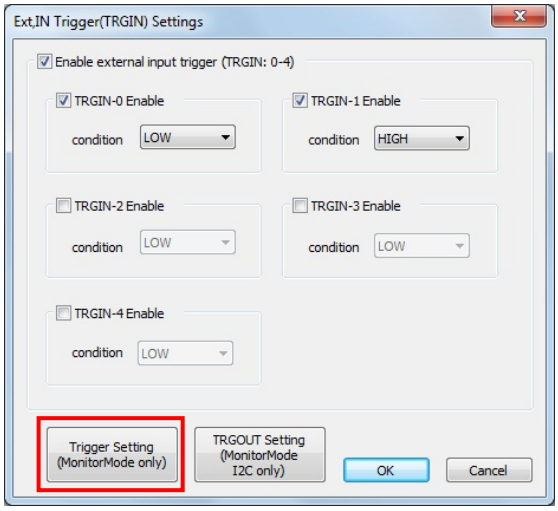
To use an external input trigger, check the check box at [Enable external input trigger(TRGIN:0-4)] and also check the check box for TRGIN0 - TRGIN4.
Once all the setting input conditions are met at the same time, capture will start.
(Threshold of trigger input(TRIGIN0 - 4) is as follows:
Under 10% of voltage of power supply will be Low.
Over 90% of voltage of power supply will be High)

Example : If TRGIN-0(Condition LOW) and TRGIN-1(Condition HIGH) is set

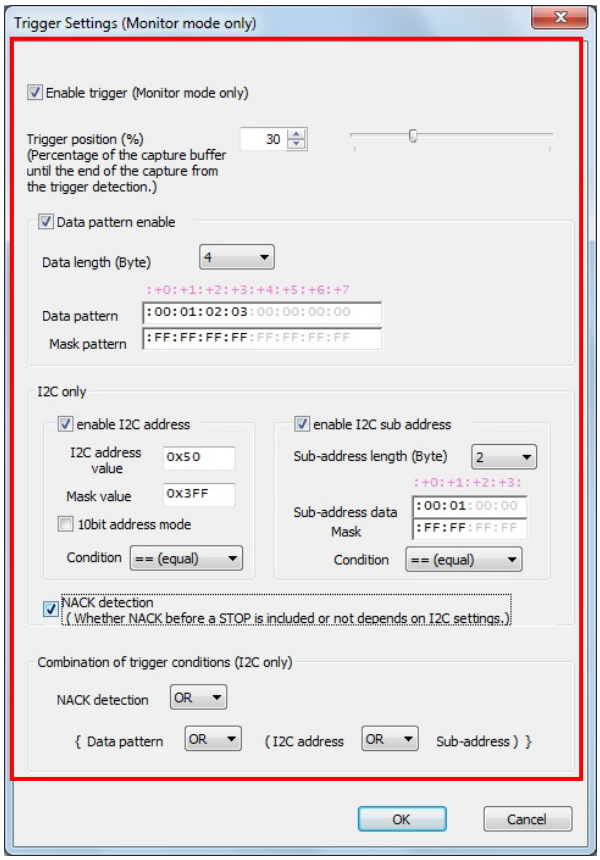


[Trigger Setting(Monitor mode only)]

(* This is valid only for free run mode)



If you click [Trigger Setting(Monitor Mode only)], the following window will appear.



[Enable trigger(Monitor mode only)]

Data specified by [Data pattern] will be detected and capture will finish when captured data reach the size specified by [Trigger position(%)].

[Trigger position(%)]
Specify data size of which data is from trigger detection until end of capturing.
Data size is specified by percentage.

Example : If capture data size is 100MB, and trigger position(%) is 30%

① Capture will finish after approx 30MB data is captured from trigger detection.
② Capture data before trigger detection is approx 70MB.

[Data pattern enable]

- Data length(Byte) --- Specify data length of data pattern to detect trigger.
- Data pattern --- Specify data pattern to detect trigger.
- Mask pattern --- AND OPERATION for a value specified at [Mask pattern] and [capture data], and trigger at a value specified at [Data pattern].

Example : Mask pattern 01110001
capture data 10110101

AND OPERATION 00110001

This value is triggered at a value specified at [Data pattern].

[enable I2C address]

- I2C address value --- Specify an I2C address for trigger detection.
- Mask value --- AND OPERATION for a value specified at [Mask value] and captured I2C address, and trigger at a value specified at [I2C address value].(Refer to [Data pattern enable].)
- Condition --- Select trigger conditions.

[enable I2C sub address]

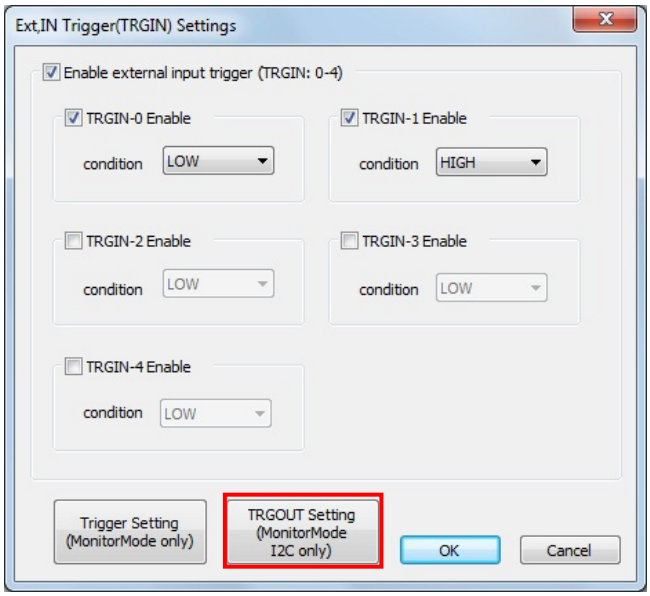
- Sub-address length --- Specify a length of I2C sub-address for trigger detection.
- Sub-address data --- Specify an I2C sub-address for trigger detection.
- Mask --- AND OPERATION for a value specified at [Mask] and captured I2C sub-address, and trigger at a value specified at [sub-address data].(Refer to [Data pattern enable].)
- Condition --- Select trigger conditions.

[Whether NACK before a STOP is included or not depends on I2C settings]

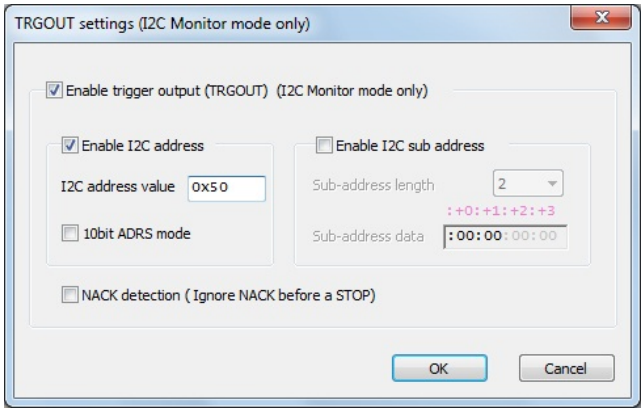
Use a NACK as trigger detection. (For NACK before a [STOP], set it at  of the tool bar, or from [Function(V)]-[I2C setting].

[Combination of trigger conditions(I2C only)]
AND OPERATION・OR OPERATION for each trigger conditions.

[Trigger output setting(Monitor mode I2C only)]



If you click [TRGOUT Setting(Monitor Mode I2C only)], the following window will appear.

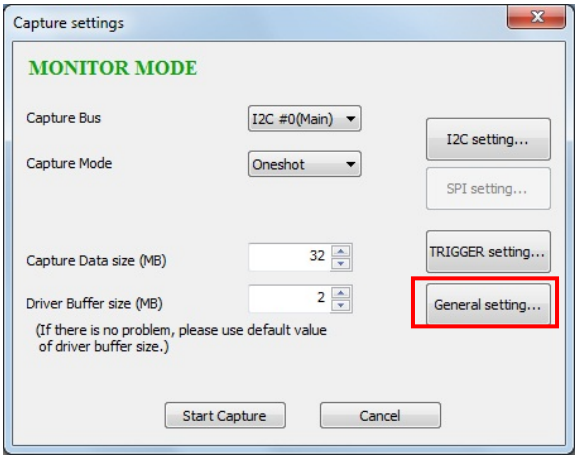


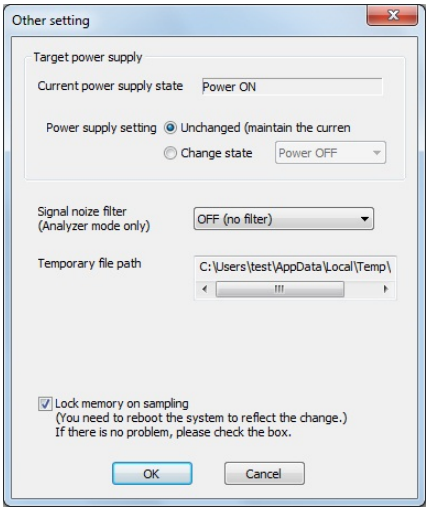
Refer to Page.4-27 at [Trigger output(TRGOUT) setting(Monitor Mode only)].

[General setting]

By clicking [General setting], make a setting of power supply, signal noise filter, temporary file path.

This setting is the same function as clicking the  button at the tool bar, or [Function(V)]-[Other setting] from the menu bar.





[Current power supply state]

If status is [Power ON], REX-USB62 is powered.
If status is [Power OFF(Power not supply)], REX-USB62 is not powered.
(In this case, to capture data don't work)

[Power supply setting]

- Unchanged(maintain the current) --- REX-USB62 works at the setting shown at [Current power supply state].
- Change state --- Select power voltage to supply external or REX-USB62 from Power OFF / 1.8V / 2.5V / 3.3V / 5.0V.

[Signal noise filter(Analyzer mode only)]

Monitor mode doesn't use this filter.

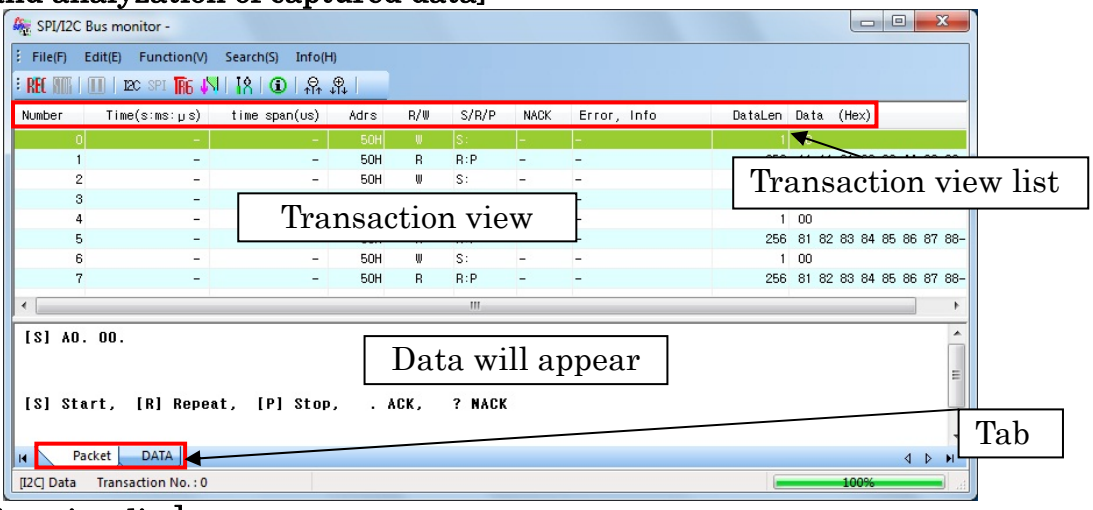
[Temporary file path]

This shows a temporary file path.

[Lock memory on sampling]

- Please try to uncheck the check box when memory error happens during sampling even if there is enough space of memory available. In this way, this memory error may not appear. But, if you uncheck the check box, please note some data may not be treated, buffer overrun may happen, or an unexpected error may happen. So, if there is no problem, please check the check box.

[Display and analyzation of captured data]



[Transaction view list]

[Number]
Serial number for transaction.

[Time(sec:ms:us)]
Time from the time when capture starts until the time each transaction starts.

[time span(us)]
Necessary time for each transaction(μ second :unit).

[Adrs]
Address of I2C device.

[R/W]
Read/Write is displayed.

[S/R/P]
S : Start conditions.
R : Repeat start conditions.
P : Stop conditions.

[NACK]
Displays whether NACK is detected or not.

[Error]
Displays whether error is detected or not.

[DataLen]
Data length of each transaction.

[Data (Hex)]
Each transaction data in Hexadecimal.

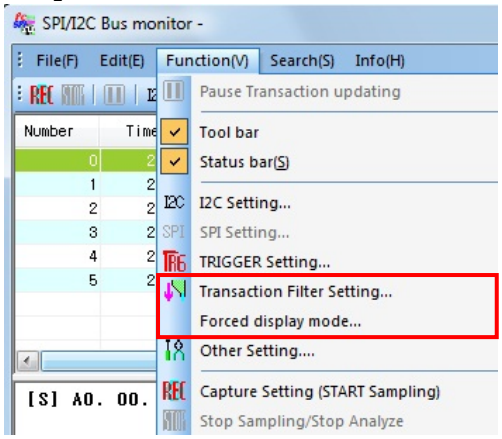
[Each Tab]

[Packet]
I2C packet data is displayed.

[DATA]
Captured data is dumped in Hexadecimal and ASCII character.

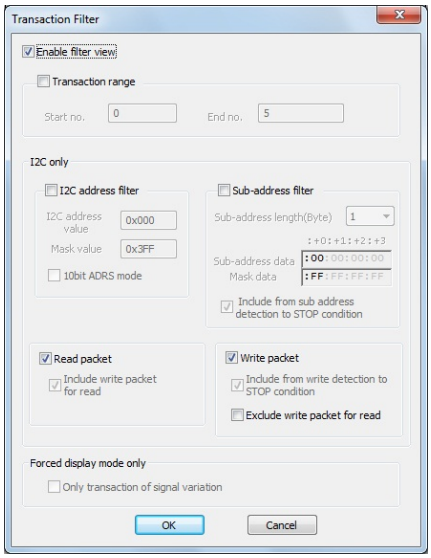
(4-6) Other functions

The below is an explanation of other functions of analyzer･monitor tool.



[Transaction filter setting]

This function enables filter view of captured data.



[Enable filter view]

If you check this check box, you enable filter function you set.

[Transaction range]

Specify a transaction number to be displayed.

[I2C address filter]

- I2C address value --- Specify I2C address to be displayed.
- Mask value --- AND OPERATION for a value specified at [Mask value] and a value specified at [I2C address value], and make a filter view at a value specified at [I2C address].

[Sub-address filter]

- Sub-address length(Byte) ---Specify an I2C sub-address length to be displayed.
- Sub-address data --- Specify an I2C sub-address to make a filter view.
- Mask data --- AND OPERATION for a value specified at [Mask data] and a captured [Sub-address data], and make a filter view at a value specified at [Sub-address data].
- Include from sub address detection to STOP condition-- If you check this check box, filter is ranging from detection part of sub-address to STOP condition.

[Read packet]

At this section, you can make the following filter view setting:

- Include write packet for read

[Write packet]

At this section, you can make the following filter view setting:

- Include from write detection to STOP condition
- Exclude write packet for read

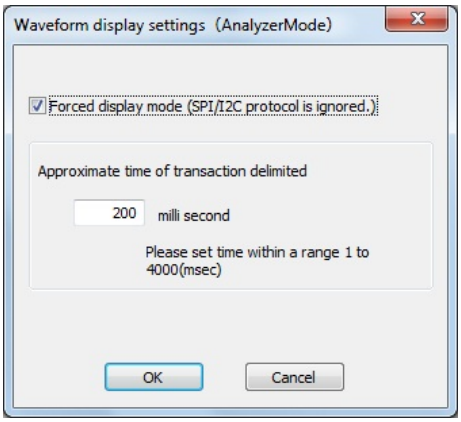
[Forced display mode only]

At this forced display mode(analyzer mode), you can make the following filter view setting:(If you check this check box, transaction without any signal change will not be displayed.)

- Only transaction of signal variation

[Forced display mode]

At this mode, you can forcefully display only signal data from sampled data by ignoring SPI/I2C protocol(This mode is valid for analyzer mode only).
Without analyzing protocol, this mode displays waveform by separating transaction at an interval of specified time.



If you check the check box at [Forced display mode(SPI/I2C protocol is ignored)], data will be displayed at an interval of specified time.

5. Switching of Analyzer/Monitor mode

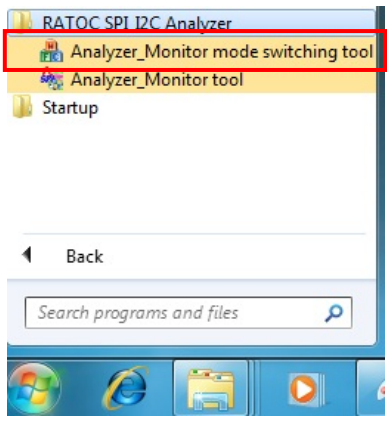
This chapter explains [Switching tool for Analyzer and Monitor] installed at Chapter 2. (Default setting is Analyzer mode.)

Warning when you switch modes

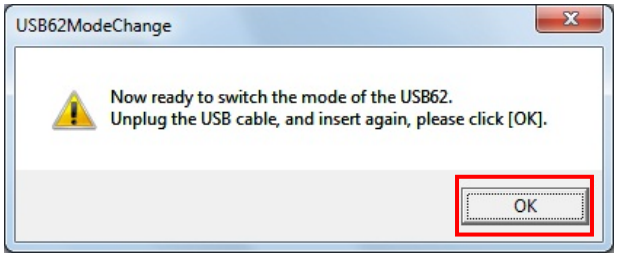
- If you use Analyzer_Monitor mode switching tool, finish Anayzer_Monitor tool.
- Don't remove the USB cable except the instruction prompted by this application. If you mistakenly remove the USB cable and an unexpected error happens, you may need to send REX-USB62 to us to repair it.

(5-1) How to switch Analyzer mode and Monitor mode

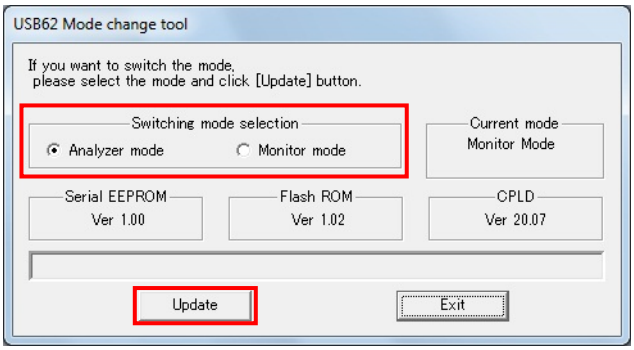
Analyzer_Monitor mode switching tool is registered at [RATOC SPI_I2C Analyzer] from [Programs] at the Windows start menu.



When Analyzer_Monitor mode switching tool starts up, the window shown in the right will appear.
Remove the USB cable and connect it again. Then, click [OK].

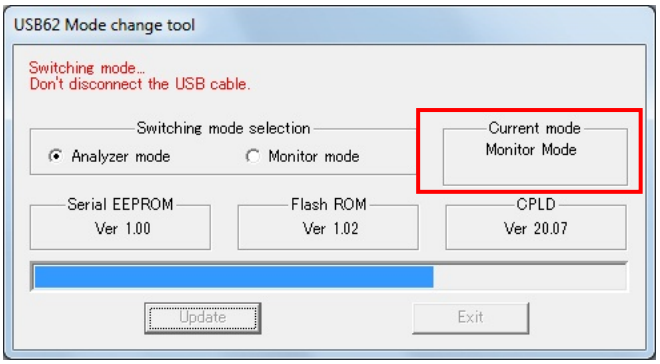


Select the mode and click [Update].

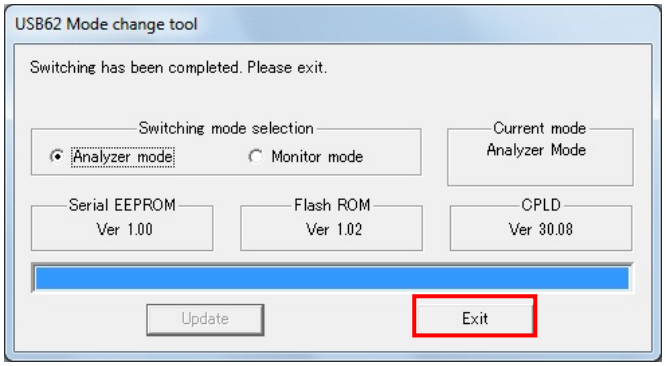


Never remove the USB cable during switching modes.

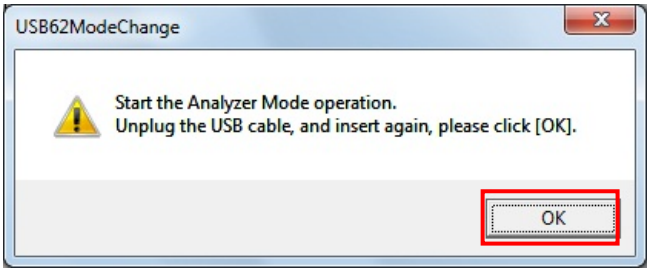
Confirm [Current mode] will be changed.



Click [Exit].



Remove the USB cable and connect it again. Then, click [OK].

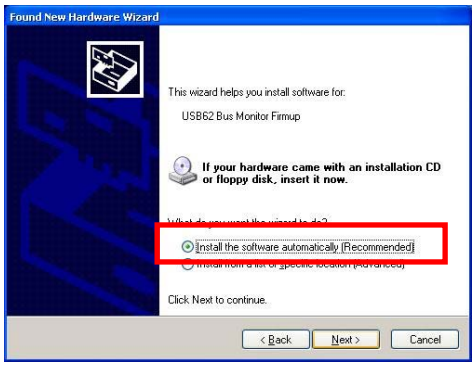


Now, switching modes has completed.

* The first time switching mode is made on Windows XP, Found New Hardware Wizard will appear. Please follow the below steps to make an installation.

Select [No, not this time] at the Found New Hardware Wizard and click [Next>].

Select [Install software automatically (Recommended)] and click [Next>].



Windows Logo warning window will appear and click [Continue Anyway].

Click [Finish].
Now, the installation of the driver for switching tool has completed.