# SUSIDemo4 Demo Program Instructions

## **For Windows**

#### Introduction

The SUSI demo program demonstrates how to incorporate SUSI library into user's own applications. The program is written in C# programming language and based upon .NET Compact Framework 4.6, Visual Studio 2015. If you plan to write your own application you can refer to the source code of the Demo program which contains all functions provided by Advantech SUSI. Contact with your local FAE if you have any question about this.

#### **Environment Requirements**

Windows XP Embedded Windows XP 32-bit Windows 7 (x86 / x64) WES7 (x86 / x64) Windows 8 Desktop (x86 / x64) Windows 10 (x64) Windows 11 (x64)

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## 1. Hardware Monitor

Hardware monitor will read out all accessible hardware sensors for voltage, temperature, fan speed and current of the board, and record the Minimum and Maximum value of them.

🖳 Demo Tool				-		×
Help						
SDRAM GPIO HWM	I2C Informati	on Smart Fan SMB	us Storage(EC)	Thermal Protection	Panel	WDog
Item Name Voltage	Value	Minimum Value	Maximum Value	Unit		
+12V	12.04	11.87	12.09	v		
+5V	5.05	5.02	5.07	V		
VBAT	2.87	2.85	2.88	V		
Temperature CPU Temperature Fan	39.8	38.1	63.4	Celsius		
COM Module FAN	3420	0	5463	RPM		
Carrier Board FAN	0	0	0	RPM		

Figure 1

## 2. Panel

Flat Panel:	Backlight 1	~
LVDS PWM Attri	ibute	
Frequency:	25000 Hz Set	Get
Polarity:	O Invert   Native	Get
LVDS Backlight	t Control	
Backlight:	● On ○ Off	Get
LVDS Backlight	tBrightness	
Method:		
1	70	
0	100	Get
0%	100%	

#### Figure 2 Panel

#### 2.1 Starting of Panel

- Select the target panel from the Flat Panel menu.
- Click Get button of each function to get its current value.

#### 2.2 Backlight Attribute Settings

- For frequency, click Set/Get button aside to set/get the desired value.
- For polarity, select Invert/Native radio buttons to set polarity. If polarity is not controllable, the Invert/Native radio buttons will be unclickable.

#### 2.3 Backlight ON/OFF

- In Backlight Control region, select On/Off radio button to turn on/off. If backlight On/Off is not controllable, the radio buttons will be unclickable.
- Click Get button to get its current On/Off status.

#### 2.4 Brightness Adjustment

- In Backlight Brightness region, select PWM/ACPI/WMI radio button to select the control method of brightness. If backlight controlling method is not controllable, the radio button will be unclickable.
- The WMI is not SUSI API. Please refer to the sample source code in below path after SUSI complete installation.
   Col Program Files) Advantace) SUSI Applications) SUSIA

C:\Program Files\Advantech\SUSI\Applications\SUSI4

Demo\C\src\BrightnessWMI

- Pull the Seekbar to adjust the brightness value.
- Click Get button to get the current brightness value.

## 3. Watchdog Timer

Watchdog timer:	Watchdog 1	~
Information		
Maximum delay tim	ie: 6553500 ms	Minimum delay time: 0 ms
Maximum event tim	ie: 3276700 ms	Minimum event time: 0 ms
Maximum reset tim	ie: 3276700 ms	Minimum reset time: 0 ms
Minimum unit:	100 ms	
Control		
Delay time:	0 ms	
Reset time:	0 ms	
Event Type:	None ~	
Event time:	0 ms	Start Trigger Stop

#### Figure 3 Watchdog Timer

#### 3.1 Information of Time Setting

The upper region shows the information for watchdog timer, including supported minimum unit, maximum time and minimum time of delay, event and reset time in milliseconds. Any input value out of the range will lead the SUSI API returning an error/failed message. Minimum unit indicated that when setting any of the value in watchdog, all of them should be an integer multiple of minimum unit.

#### **Example of Time Setting:**

Take figure 3 as an example, the supported max delay time is 6553.5 seconds, the min delay time is 0 second, and the min unit time is 0.1 second(100 milliseconds); and every value setting should be an integer multiple of 100 milliseconds, therefore, you cannot set 150ms as a time here.

#### 3.2 Delay Time Setting

• Set the delay time within range of max/min delay time; for the detail of value setting, please refer to section **Information of Time Setting**.

## 3.3 Reset Time Setting

- Set the reset time within range of max/min reset time; for the detail of value setting, please refer to section **Information of Time Setting**.
- As the watchdog timer reaches the end of reset time, the reset process of the board will be started.

#### 3.4 Event Type and Event Time Setting

- *Event Type* includes None, IRQ, SCI, Power Button and pin event. Pin event is an OEM function base on the EC firmware. Event time will be editable when event type is selected as IRQ, SCI, Power Button or Pin event, when Event type is None, you don't need to insert the event time.
- Set the event time within range of max/min event time; for the detail of value setting, please refer to section **Information of Time Setting**.
- As the watchdog timer reaches the end of event time, the event of selected event type will be triggered. If the event is selected as IRQ, a callback function will be called; in our demo program, the callback function will display a message box with texts "Get IRQ Event" or shows the digit number on 80 port messages on your device.
- Some boards will not support event time, in these cases, text box event type and event time will be disabled.

## 3.5 Watchdog Timer Control

#### • Start Timer:

When all settings are ready, click Start button to start watchdog timer.

• Trigger Timer:

When watchdog timer is started and the delay time ends, click Trigger button to reset/restart the timer.

#### • Stop Timer:

When watchdog timer is started, click Stop button will completely stop the timer.

## **4. GPIO**

#### Pin Selection

Single Pin	O Multi-Pin	Support inputs:	1				
Bank number:	0	$\sim$	Support outputs:	1			
Pin number:	0 (GPIO00)	$\sim$					
State							
Mask:	1						
Direction:	0				Set	Get	
Level:	0				Set	Get	

#### Figure 4 Single-Pin mode

Pin Selection							
O Single Pin	🔿 Single Pin 💿 Multi-Pin			000000000000	0000000000001111111		
Bank number:	: 0 ~		Support outputs:	0000000000000000000000000000111111			
Pin number:	0 (GPIO00)	$\sim$					
State	31 24	16	) 8 <u> </u>	0			
Mask:	0000000	0000000	00000000 11111	111			
Direction:	0000000	0000000	0000000 0000	1111 Set	Get		
Level:	0000000	0000000	0000000 0000	1111 Set	Get		

#### Figure 5 Multi-Pin mode

#### **4.1 GPIO Pin Selection**

The GPIO function provides two setting modes for pins: *Single-Pin* and *Multi-Pin*, see figure 4 and figure 5 respectively.

- In *single-pin mode*, you can set and get one pin at a time. Select pin number from Pin number menu to set and get its individual value; pins are numbered from 0 to the total number of GPIO pins minus 1.
- In *multi-pin mode*, you can set and get the entire bank of pins at a time. Select bank number from Bank number menu to set and get all values of an entire bank pins.

## 4.2 Supported Inputs/Outputs of GPIO Pins

• Support inputs and support outputs indicate that whether each pin is available or controllable as an input and an output. 1 means it id supportive for that transmission direction. For example in figure 5, the board only supports 8 pins of GPIO in bank 0.

## 4.3 Mask of GPIO Pins

- Mask defines which of its pin is enabling (bit 1) or disabling (bit 0) for set/get of both Direction and Level.
- Before the setting of direction and level of GPIO pins, mask should be filled with a mask value and mask cannot be all zero.

#### 4.4 Direction Setting

- Direction defines the I/O direction of pins, 1 as input and 0 as output.
- Click Set/Get button to set/get the Direction value.

#### 4.5 Level Setting

- Level defines the level of pins, 1 stands for high level and 0 stands for low level.
- Click Set/Get button to set/get the Level value. Please note that when the direction of a pin is set as 1, setting Level will not work for it.

I2C Host:	I2C Channel 1		-
Protocol <ul> <li>Transfer</li> <li>Combine</li> </ul>		Frequency	
Slave Address 00 (HEX) (HEX) Tbit (HEX) 10bit Input Data: (HEX) 00	Command 00 (HEX) Byte O Word O 1	Read Length: 0 None Write Length: 1	
Result: (HEX) Slave address (7-bit) of 70 A0 A2 A4 A6 A8 AA A			
WR Combined		Probe Read Write	

## Figure 6 I<sup>2</sup>C in Transfer mode

I2C Host:	I2C Channel 1					
Protocol		Frequency				
<ul> <li>Transfer</li> <li>Combine</li> </ul>		0 - 100K	Set Get			
Combine						
Slave Address	Command					
A2 (HEX)	00 (HEX)	Read Length:	16			
🖲 7bit 🕕 10bit	● Byte ○ Word ○	None Write Length:	1			
Input Data: (HEX)						
00						
Result: (HEX)						
AA BB CC DD EE 0F 00	01 02 03 04 05 06 07 08 09	9				
WR Combined		Probe	Read Write			

Figure 7 I<sup>2</sup>C in Combine mode

## 5.1 Starting of I<sup>2</sup>C

• Select an I<sup>2</sup>C host, before the starting of any operation.

#### 5.2 I<sup>2</sup>C Protocol: Transfer and Combine

- Choose the protocols, Transfer or Combine, by clicking the radio button.
- When selecting as Transfer protocol, Read and Write button will be functional (Otherwise they will be disabled), see figure 6. For how to read/write through this protocol, refer to for section Read from I2C Device and section Write to I2C Device more details.
- When selecting as Combine protocol, WR Combined button will be functional (Otherwise it will be disabled), see figure 7. For how to read/write through this protocol, refer to section **Write/Read Combined** for more details.

## 5.3 I<sup>2</sup>C Frequency

- Click Get button to get current frequency of I<sup>2</sup>C, and Set button to set your desired value for frequency.
- Select radio 0-100k button to insert a value of frequency between 0 to 100 KHz, or select 400kHz to directly fill in the frequency as 400kHz.
- For Intel chip and AMD chip I<sup>2</sup>C frequency, it is set the configure of standard speed, fast speed and high speed. Set 100kHz, it set the standard speed. Set 400kHz, it set the fast speed. Not set high speed option. The real frequency of standard speed or fast speed are based on the chipset.

## 5.4 Slave address of the I<sup>2</sup>C Device

- Select radio button of 7bit or 10bit for the slave address, and insert an address of the device on I<sup>2</sup>C. If you'd like to know the address of the existing device, see section **Probe for I2C Device** for more details.
- Text box of slave address will prevent you from inserting a value that is out of range.
- For x86 devices, the I<sup>2</sup>C slave address contains read/write bit. The slave address left shit 1 bit for showing and used on SUSI. For example, the GPIO use the TCA9554 chip and the slave address is 0x40, 0x40 contain the read/write bit. It means 0x40 for writing and 0x41 for reading.
- For RISC devices, the I<sup>2</sup>C slave address not contains read/write bit. For example, the GPIO use the TCA9554 chip and the slave address is 0x20, and use 0x20 as the salve address to access the TCA 9554 GPIO.

## 5.5 Command/Offset of the I<sup>2</sup>C Device

- Select radio button of Byte, Word or None for the Command.
- Text box of command will prevent you inserting a value that is out of range; Text box in command region will limit the value in FF h for Byte mode and FFFF h for Word mode; when mode None is selected, the text box will be disabled.

## 5.6 Probe for I<sup>2</sup>C Device

- The Probe function will do an address scan of the selected host, each detected address stand for a slave address of a slave device connected to the I<sup>2</sup>C.
- The detected address will be shown in the Result text box in 7-bit or 10-bit format, depend on your selection of the radio buttons of slave address.

## 5.7 Read from I<sup>2</sup>C Device

- Insert the specified slave address and command. For more detail of these, please refer to **Slave address** and **Command**.
- Insert the length of data you'd like to read in text box Read Length, and then click Read button for read/receive operation.
- The read result will be shown in the Result text box.

## 5.8 Write to I<sup>2</sup>C Device

- Insert the specified slave address and command. For more detail of these, please refer to **Slave address** and **Command**.
- Insert the data to be written in text box Input Data, notes for text box Input Data and text box Write Length please see the details in (2) and (3) of section \*Notices for the <u>inputs</u>.
- Click Write button for write/send operation.
- The write result will be shown in the Result text box.

## 5.9 Write/Read Combined

- Insert the specified slave address and command. For more detail of these, please refer to **Slave address** and **Command**.
- You can either read or write data, or read and write data at the same time in this operation; therefore, either the data for read or write should be provided. For reading, read length should be provided. For writing, input data should be provided. Notes for text box Input Data and text box Write Length please see the details in (2) and (3) of \*Notices for the <u>inputs</u>.

- Click WR Combined button to do the Read/Write combined operations.
- The read/write result will be shown in the Result text box.

#### **\*Notices for the inputs of I<sup>2</sup>C page:**

- Needed value should be provided; Gray text box indicates that it does not need an input value and the text box will be not be editable.
- (2) Text box Write Length will automatically count the length of the data inserted in the Input Data text box.
- (3) Text box Input Data allows inputs of characters [0-9], [a-f], [A-F] and space only. When you are inserting multiple bytes, add a space to let the program know that you are going to insert the next byte data.
- (4) For EC I<sup>2</sup>C 256 bytes read and write, it is an OEM EC function. The supporting base on the EC firmware.

## 6. SMBus

SMBus Host:		SMBus Extern	nal				~
Control							
Protocal:	Quick	د ~	~				
Slave Address:	00	(HEX)	Read Length:	0			
Command:	00	(HEX)	Write Length:	1			
Input Data: (HE) 00	X)						
Result: (HEX)							
Slave address of 10 88 90 94 CE		ted devices:					
				Probe	Read	tW t	rite

#### **Figure 8 SMBus**

#### 6.1 Starting of SMBus

• Select a SMBus host, before the starting of any operation of SMBus.

#### **6.2 SMBus Protocol**

- Choose one of the protocols for SMBus at the pull-down menu Protocol; supported protocols include Quick, Byte, Byte Data, Word Data, Block, and I2C Block.
- For each protocol, needed value should be provided; gray text box indicates that it does not need an input value and the text box will not be editable.

#### 6.3 Slave Address of SMBus Device

- Insert the slave address of the desired device on SMBus in Slave Address text box. If you'd like to know the address of the existing device, see section **Probe for SMBus Device** for more details.
- Slave Address must be an 8- bit value, where the least bit is a don't-care value. For example, the address of a slave device is 0x69, then you should insert D2 or D3; setting D2 (1101 0010) or D3 (1101 0011) will get the same results.

## 6.4 Read from SMBus Device

- Insert the specified slave address and command. For more detail of slave address, please refer to **Slave Address**.
- Insert the length of data you'd like to read in text box Read Length, and then click Read button for read/receive operation.
- The read result will be shown in the Result text box.

#### 6.5 Write to SMBus Device

- Insert the specified slave address and command. For more detail of slave address, please refer to **Slave Address**.
- Insert the data to be written in text box Input Data, notes for text box Input Data and text box Write Length please see the details in (2) and (3) of section \*Notices for the inputs.
- Click Write button for write/send operation.
- The write result will be shown in the Result text box.

#### 6.6 Probe for SMBus Device

- The Probe function is for address scan of the selected target device, each detected address stand for a slave address of a slave device connected to the SMBus.
- The detected address will be shown in the Result text box in an 8-bit format; for example, a slave address is 0x69, then it will be shown as D2.

## \*Notices for the inputs of SMBus page:

- (1) Needed value should be provided; Gray text box indicates that it does not need an input value and the text box will not be editable.
- (2) Text box Write Length will automatically count the length of the data inserted in the Input Data text box.
- (3) Text box Input Data allows inputs of characters [0-9], [a-f], [A-F] and space only. When you are inserting multiple bytes, add a space to let the program know that you are going to insert the next byte data.

## 7. Storage

iManager Storage:	Storage area standard	~
Access		
Total size (Byte):	128 Offset: 00 (HEX) Read Length: 128	
Block size (Byte):	: 128 Write Length: 1	
Data: (HEX)	EE	Write
	~	
Result: (HEX)	EE 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D	Read
Write Protection		
Write Protection	Status: Unlock	Get Status
Password Maxim	nun Length: 32	
Password:	Lock	Unlock
	Figure 9 Storage	

Write Protection		
Write Protection Status: Lock		Get Status
Password Maximun Length: 32		
Password:		
01234567	Lock	Unlock

**Figure 10 Write Protection for Storage** 

## 7.1 Starting of Storage

• Storage is an area that can store your own data, so first select a Storage area that you'd like to store data in from the Storage Device menu.

## 7.2 Read from Storage area

- Set the offset of the selected storage area and the length of data you'd like to read, insert the value in Offset text box and Read Length text box respectively.
- Click Read button to get/receive the data.
- The read result will be shown in the Result text box, as shown in figure 9.

## 7.3 Write to Storage area

- Set the offset of the selected storage area and insert the data you'd like to write in the Data text box. Notes for text box Input Data and text box Write Length please see the details in (1) and (2) of section **\*Notices for the inputs**.
- Click Write button to set/send the data.
- The write result (success or fail) will be shown in the Result text box.

## 7.4 Write Protection of Storage area

- Write protection let user having a chance to protect data in the storage area with password, see figure 10.
- Click **Lock** button to lock the storage with the password inserted in the Password text box.
- Click **Unlock** button to unlock the storage with the password inserted in the Password text box.
- Click **Get Status** button to refresh the current write protection Status.

## \*Notices for the inputs of Storage page:

- (1) Text box Write Length will automatically count the length of the data inserted in the Input Data text box.
- (2) Text box Input Data allows inputs of characters [0-9], [a-f], [A-F] and space only. When you are inserting multiple bytes, add a space to let the program know that you are going to insert the next byte data.

# 8. Smart Fan

Fan controller:	COM Module FAN ~				
Mode O Full O OFF	⊚ Ma	anual 🔿 Auto	Information Speed: 344	7 RPM	
Control					
PWM:	50	%			
Auto					
Thermal Source:	CPU Temperature 🗸 🗸		Op Mode:	• PWM C	RPM
			Maximum PWM:	100	%
Low Stop:	30	Celsius	Minimum PWM:	30	%
Low Limit:	40	Celsius	Maximum RPM:	6000	RPM
High Limit:	85	Celsius	Minimum RPM:	2000	RPM
				Set	Get

Figure 11 Smart Fan in Manual mode

Fan controller:	COM Module FAN			
Mode O Full O OFF	. O Manual 💿 Auto	Information Speed: 368	4 RPM	
Control				
PWM:	55 <b>%</b>			
Auto				
Thermal Source:	CPU Temperature 🗸 🗸	Op Mode:	● PWM ○ RPM	
		Maximum PWM:	100 %	
Low Stop:	30 Celsius	Minimum PWM:	30 %	
Low Limit:	40 Celsius	Maximum RPM:	6000 RPM	
High Limit:	85 Celsius	Minimum RPM:	2000 RPM	
			Set G	et

Figure 12 Smart Fan in Auto mode

## 8.1 Starting of Smart Fan

• Select a controller in Fan controller, before the starting of any operation.

## 8.2 Mode of Fan

- There are 4 modes for fan controller to choose from:
  - Mode Full will let the fan run in full speed. Refer to (1) of section Controlling of FanControlling of Fan for details of controlling in Manual mode.
  - (2) Mode OFF will turn off the fan. Refer to (2) of section Controlling of FanControlling of Fan for details of controlling in Manual mode.
  - (3) Mode Manual allow user to insert the desire PWM value for the fan, see figure 11 and refer to (3) of section Controlling of Fan for details of controlling in Manual mode.
  - (4) **Mode Auto** will automatically adjust the fan speed according to the temperature of the thermal source, see figure 12 and refer to (4) of section **Controlling of Fan** for details of controlling in Manual mode.
- Some boards might not support all modes; unsupported modes will have its radio button disabled (become gray and unclickable).

## 8.3 Information of Fan Speed

• In the information region, current speed will be shown; the speed value will be updated every 3 seconds.

## 8.4 Controlling of Fan

- Click **Get** button to get the current mode and status of the target fan.
- Click **Set** button to set the desired mode and status.
- Mode Settings:
  - (1) Mode Full
    - 1. Click Full radio button.
    - 2. Press Set button.
  - (2) Mode OFF
    - 1. Click OFF radio button.
    - 2. Press Set button.
  - (3) Mode Manual
    - 1. Click Manual radio button.
    - Insert a specified value in the PWM text box(will be editable in Manual mode)
    - 3. Press Set button.

#### (4) Mode Auto

- 1. Click Auto radio button
- 2. Select a thermal source and insert the specified value of Low Stop, Low Limit, High Limit and Maximum, Minimum PWM/RPM
- 3. Press the Set button to set the configuration.
- \*Note: The speed of selected fan will reach Maximum PWM/RPM, when the temperature rises above the High Limit. The speed will drop to Minimum PWM/RPM, when the temperature is down to Low Limit. The fan will be turn off or keep at lower PWM/RPM strength under super I/O chip, when the temperature is below Low Stop; and it will be turn on, when the temperature is above Low Stop.

## 9. Thermal Protect

Thermal Protection:	Thermal Protect 1 ~	-
Control		
Thermal Source:	CPU Temperature 🗸	
Event Type:	Shutdown ~	
Trigger Temperature	125 Celsius (Range: 70 - 125)	
Clear Temperature:	60 Celsius (Range: 0 - 70) Set Get	]

**Figure 13 Thermal Protect** 

#### 9.1 Starting of Thermal Protect

• Select a target device in **Thermal Protection**.

#### 9.2 Controlling of Thermal Protect

- (1) Select a thermal source in the Source menu.
- (2) Select an Event type such as Shutdown, Throttle, Power off or None in the Event Type menu.
- (3) Insert the trigger temperature.
- (4) Insert the clear temperature.
- (5) After all settings are ready, click Get/Set button to get/set the controlling configuration.

**\*Note:** • Some of the boards might not support all of the event types.

• Trigger Temperature:

When temperature of the thermal source exceeds the Trigger Temperature, the event of the selected Event Type will be sent.

• Clear Temperature:

When temperature of the thermal source is under the Clear Temperature, the event of selected Event Type will be cleared.

# **10.Information**

This page contains the available system information which SUSI gathers from the device

By the appearance of any of the information, user can learn that whether the SUSI libraries and drivers are installed well and loaded successfully. There will at least be Boot up times and Running time on the page.

Driver version and Library version show the major SUSI version (4.2) and the revision number (23721).

If there is any problem, it is recommended to send a screenshot of this page or key in the information displayed here to your local FAE.

Help						
SDRAM GPIO HWM I2C	Information Smart Fan	SMBus	Storage(EC)	Thermal Protection	Panel	WDog
Item Name	Content					
Susi4 Information						
Spec version	1,0					
Boot up times	1540					
Running time (hours)	76					
Microsoft Plug-and-Play ID	AHC, 0xEC0					
Platform revision	2,0					
Board manufacturer	ADVANTECH					
Board name	SOM-6884					
Board serial number	1234567890					
BIOS revision	(68840000060X012)					
Platform type	COM-E Type6					
Firmware name	T00093758					
Driver version	4.2.23721					
Library version	4.2.23721					
Firmware version	0.9.3758					

#### **Figure 14 Platform Information**