SEMA® User Manual

(Applicable to SEMA Linux Version ≥ 4.4.0
and SEMA Windows Version ≥ 4.2.15)

January 30, 2026

Leading EDGE COMPUTING

ADLINK
LEADING EDGE COMPUTING

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Revision History

Revision	Release Date	Description of Changes
1.0	30/01/2026	Initial version of User manual for SEMA Windows and Linux

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1. Introduction

SEMA (Smart Embedded Management Agent) is a middleware developed by ADLINK to monitor, control, and manage embedded and industrial computing platforms. It provides a standardized interface (EAPIs) in compliance to PICMG EAPI specification providing access low-level hardware features that are managed by the Embedded Controller (EC) or BMC (Board Management Controller).

This document explains how to test each supported function using the command-line interface on Windows and Linux.

2. Supported Functionalities

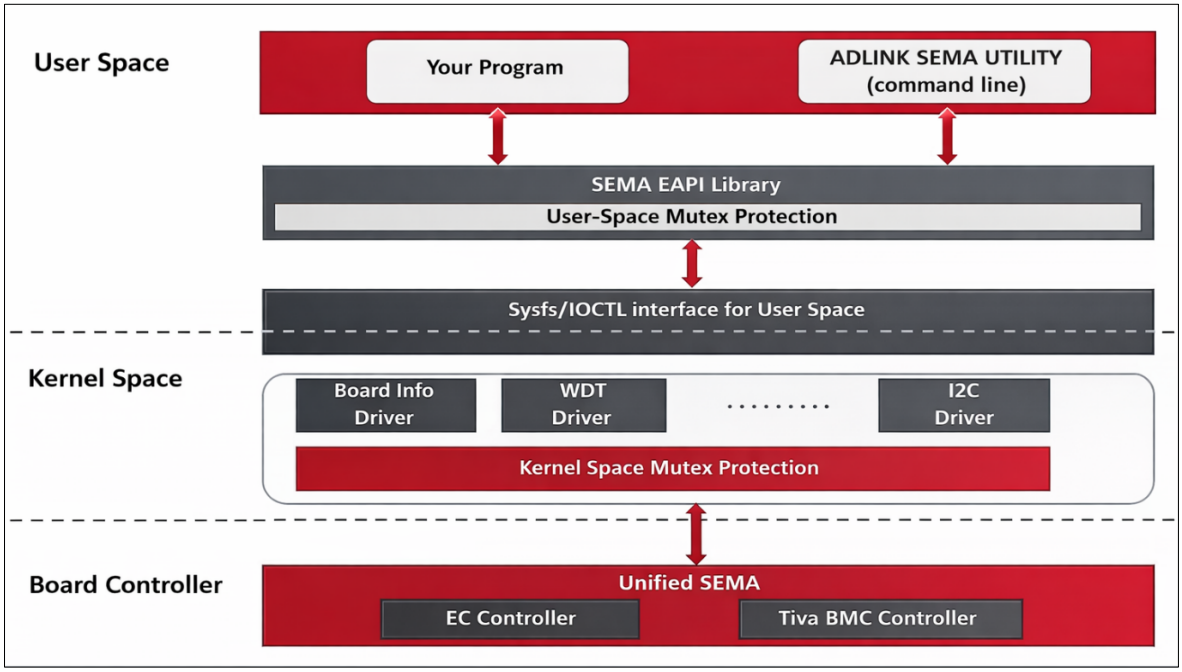
- Board information and manufacturing data
- Hardware monitoring
- Watchdog control
- GPIO control (only support PCA9535 and SX1509 I/O expander)
- I2C access
- Temperature monitoring
- Fan monitoring and control
- Non-volatile storage access (e.g., EEPROM)
- Backlight control (LVDS panels)
- Error logging

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3. Architecture

3.1. For Linux Platform



- **User Space Layer:**
  User applications and the ADLINK SEMA utility access hardware services through the SEMA EAPI library. User-space mutex protection ensures safe multi-threaded access before requests are forwarded to the kernel.

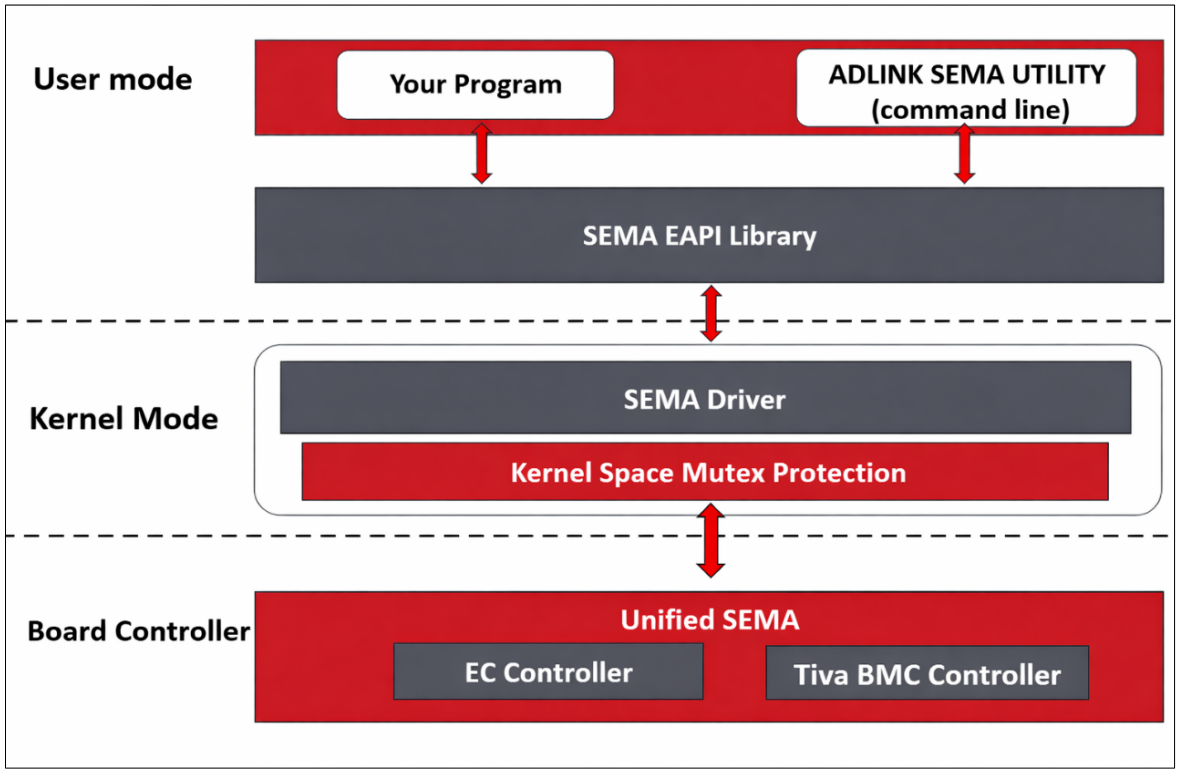
- **Kernel Space Layer:**
  Hardware drivers (Board Info, WDT, I^2C, etc.) receive requests via the **Sysfs/IOCTL** interface. Kernel-level mutex protection synchronizes driver operations and prevents race conditions during hardware access.

- **Board Controller Layer:**
  The Unified SEMA interface communicates with embedded controllers such as the EC and Tiva BMC. This layer executes low-level control and monitoring functions for reliable board management.

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3.2. For Windows Platform



- **User Mode:**
  User applications and the ADLINK SEMA command-line utility access hardware services through the SEMA EAPI Library. This layer provides a unified API interface for board management and monitoring operations.
- **Kernel Mode:**
  The SEMA Driver receives requests from user space and acts as the main communication bridge between applications and the hardware controllers. It handles command routing and low-level device coordination.
- **Board Controller Layer:**
  The EC Controller and Tiva BMC Controller execute hardware control and monitoring functions through the Unified SEMA interface. This layer directly manages board-level sensors, power, and system features.

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4. Feature Testing

4.1. For Linux Platform

To utilize the SEMA command line interface, access the Linux command terminal.

Test Environment:

Module: cExpress-MTL [Base: Express Base 6]

BIOS Version: 1.07.10

Firmware version: ADLINK 008

OS: Ubuntu 22.04

Kernel Version 5.15

SEMA Utility Version

```
$ sudo semautil version
```

```
adlink@adlink-Default-string:~$ sudo semautil version

SEMA Version : ADLINK-SEMA-UNIFIED-LINUX-V5_R0_0_25_12_17
```

Help Menu

```
$ sudo semautil /h
```

```
adlink@adlink-Default-string:~$ sudo semautil /h

Usage:
- Display this screen:
        semautil /h

- Get SEMA Version:
        semautil version


- Watch Dog:
  1. semautil /w get_cap
  2. semautil /w start [sec (0-65535)]
  3. semautil /w trigger
  4. semautil /w stop
  5. semautil /w pwrup_enable [sec (60-65535)]
     Note:
        Start time will be different for the different platforms.
        Please go to BIOS menu to check it
  6. semautil /w pwrup_disable


- Storage:
  1. semautil /s get_cap [Region]
  2. semautil /s read [Region] [Address] [Length]
  3. semautil /s write [Region] [Address] [string/value]
  4. semautil /s hex_write [Region] [Address] [value]
```


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4.1.1. Board Information

Allows the users to query essential system and manufacturer details for diagnostic and inventory purposes.

```
$ sudo semautil /i get_bd_info [EAPI ID]
```

```
adlink@adlink-Default-string:~$ sudo semautil /i

- System monitor-Board Info:
  1. semautil /i get_bd_info [EAPI ID]
       1  : Board manufacturer name
       2  : Board name
       3  : Board serial number
       4  : Board BIOS revision
       5  : HW revision
       6  : Board platform type
       7  : BMC bootloader revision
       8  : BMC application revision
       9  : Board restart event
       10 : Board repair date
       11 : Board manufacturer date
       12 : Board MAC address 1
       13 : Board MAC address 2
       14 : Board 2nd HW revision number
       15 : Board 2nd serial
```

Board Manufacturer Name

```
$ sudo semautil /i get_bd_info 1
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 1

Board manufacturer name: ADLINK Technology Inc.
```

Board Name

```
$ sudo semautil /i get_bd_info 2
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 2

Board name: cExpress-MTL
```

Board Serial Number

```
$ sudo semautil /i get_bd_info 3
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 3

Board serial number: 244110003L
```


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Board BIOS Revision

```
$ sudo semautil /i get_bd_info 4
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 4

Board BIOS revision: 1.07.10
```

Hardware Revision

```
$ sudo semautil /i get_bd_info 5
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 5

Board HW revision: abcd
```

Board Platform Type

```
$ sudo semautil /i get_bd_info 6
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 6

Board platform type:
```

BMC Bootloader Revision

```
$ sudo semautil /i get_bd_info 7
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 7
Get EApi information failed
EApiBoardGetStringA error 22, Invalid argument
```

Application Revision/Firmware Revision

```
$ sudo semautil /i get_bd_info 8
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 8

Board application revision: ADLINK       008
```

Board Restart Event

Indicates the cause of the last system restart.

```
$ sudo semautil /i get_bd_info 9
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 9

Board restart event: Power down
```


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Board Last Repair Date

```
$ sudo semautil /i get_bd_info 10
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 10

Board repair date: 2024/07/16
```

Board Manufacturing Date

```
$ sudo semautil /i get_bd_info 11
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 11

Board manufacturer date: 2024/06/17
```

Board MAC Address 1

```
$ sudo semautil /i get_bd_info 12
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 12

Board MAC address: 00306474A1E1
```

Board MAC Address 2

Note: This feature is supported only in EC boards

```
$ sudo semautil /i get_bd_info 13
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 13

Board MAC address 2:
```

Board Secondary Hardware Revision

Note: If a value has not been written to the ODM region, the command returns an empty string.

```
$ sudo semautil /i get_bd_info 14
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 14

Board 2nd HW revision number:
```


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Board Secondary Serial Number

```
$ sudo semautil /i get_bd_info 15
```

```
adlink@adlink-Default-string:~$ sudo semautil /i get_bd_info 15

Board 2nd serial number:
```

4.1.2. Board Values

Read the real-time system and hardware parameters [corresponds to a specific sensor reading or board metric]

```
$ sudo semautil /d get_value [EAPI ID]
```

```
adlink@adlink-Default-string:~$ sudo semautil /d

- Board values:
  1. semautil /d  get_value [EAPI ID]
       1        :  EAPI Specification Version
       2        :  Boot Counter
       3        :  Running time meter value
       4        :  Vendor Specific Library Version
       5        :  CPU Temperature
       6        :  Board Temperature
       7        :  CPU Core Voltage
       8        :  2.5V Voltage
       9        :  3.3V Voltage
       10       :  Battery Voltage
       11       :  5V Voltage
       12       :  5V Standby Voltage
       13       :  12V Voltage
       14       :  CPU Fan
       15       :  System Fan 1
       16       :  Get power uptime
       17       :  Get restart event
       18       :  Get BMC capabilities
       19       :  Get extended BMC capabilities
       20       :  Board Min Temperature
       21       :  Board Max Temperature
       22       :  Board Startup Temperature
       23       :  CPU Min Temperature
       24       :  CPU Max Temperature
       25       :  CPU startup Temperature
       26       :  Get main power current
       27       :  GFX Voltage
       28       :  1.05 Voltage
       29       :  1.5 Voltage
       30       :  Vin Voltage
       31       :  System Fan 2
       32       :  System Fan 3
       33       :  Board 2nd Current Temperature
       34       :  Board 2nd Min Temperature
       35       :  Board 2nd Max Temperature
       36       :  Board 2nd Startup Temperature
       37       :  Get Board power cycle counter
       38       :  Get Board BMC Flag
       39       :  Get Board BMC Status
       40       :  IO Current
       41       :  System Temperature
       42       :  System Min Temperature
       43       :  System Max Temperature
       44       :  System Startup Temperature
```


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4.1.2.1. Dynamic Hardware Metrics / Runtime Statistics

Boot Counter

Number of hardware/software reset and successful power-up.

```
$ sudo semautil /d get_value 2
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 2

Boot counter: 784
```

Running Time Meter Value (minutes)

Represents the total uptime of the system in minutes.

```
$ sudo semautil /d get_value 3
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 3

Running Time Meter: 155310 minutes
```

Power-On Uptime

Represents the uptime of the system since last boot in seconds

```
$ sudo semautil /d get_value 16
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 16

Board powerup time: 6097 seconds
```

Restart Event

Indicates the cause of the last system restart.

```
$ sudo semautil /d get_value 17
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 17

Restart event: 0x60
```

Board Power-Cycle Counter

Indicates how many times the external power supply has been shut down (including standby voltage).

```
$ sudo semautil /d get_value 37
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 37

Power cycle counter: 496
```


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Board BMC/EC Status Flags

Displays information about the internal status of the EC/BMC

```
$ sudo semautil /d get_value 38
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 38

BMC Flag:
Exception code : NO ERROR

Mode : ATX Mode

BIOS : Standard BIOS
```

BMC status

This is not supported by EC boards.
Note: This screenshot was taken in board

```
$ sudo semautil /d get_value 39
```

4.1.2.2. Software Details

EAPI specification version

```
$ sudo semautil /d get_value 1
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 1

EAPI Specification Version: 1.0.00
```

Vendor-Specific Library Version

```
$ sudo semautil /d get_value 4
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 4

SEMA Library Version : 5.0.00
```


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4.1.2.3. Controller Capabilities (EC / BMC)

Lists the supported and unsupported features

EC/BMC Capabilities

```
$ sudo semautil /d get_value 18
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 18

BMC capabilities:

Bit       Capability                    Status                      Bit       Capability                    Status

0       Uptime and Power Cycles        : Supported                 16      I2C Bus 1                     : Supported
1       System Restart Event           : Supported                 17      I2C Bus 2                     : Supported
2       User-Flash Size                : 1024 bytes (0x0000 to 0x03FF)18       CPU Fan                       : Supported
3       Runtime Watchdog               : Supported                 19      System Fan 1                  : Not Supported
4       Temperatures                   : Supported                 20      AT/ATX Mode                   : Supported
5       Voltage Monitor                : Supported                 21      ACPI Thermal Trigger          : Supported
6       Storage of failure reason      : Not Supported             22      Power-up to last state        : Supported
7       Bootloader timeout             : Not Supported             23      Backlight Restore             : Supported
8       Display Backlight control      : Supported                 24      DTS Temperature               : Not Supported
9       Power-up Watchdog              : Supported                 25      DTS Offset Registers          : Not Supported
10      Power Monitor (current sense)  : Supported                 26      System Fan 2                  : Not Supported
11      Boot counter                   : Supported                 27      System Fan 3                  : Not Supported
12&13   Input Voltage                  : Not Supported             28      Ext-GPIO                      : Supported
                                                                   29      I2C Bus 3                     : Supported
14      Rsense of Power Monitor        : Not Supported             30      I2C Bus 4                     : Supported
15      Dual-BIOS                      : Not Supported             31      BMC ID 0                      : Other BMC
```

Extended EC/BMC Capabilities

```
$ sudo semautil /d get_value 19
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 19

Extended BMC capabilities:

Bit       Capability                    Status                      Bit       Capability                    Status

32      Board 2 Temperature            : Not Supported             40      Parameter Memory              : Supported
33      PEC Protocol                   : Not Supported             41      Extended I2C registers for Status and Data : Not Supported

                                                                   42      Ext-GPIO Input Interrupt      : Supported
35      Error log                      : Supported                 43      Hardware Monitor Input String  : Not Supported
36      1-Wire Bus                     : Not Supported             44      Ext-GPIO Pins Count           : 8 Pins
37      Wake by EC/BMC                 : Supported                 45      Power-up/Runtime Watchdog support action setting : Not Supporte
d
38      GPIO Alternate Function        : Not Supported             46      Switch BIOS immediately       : Supported
39      Soft Fan                       : Supported
```

4.1.2.4. Voltage Monitor

Note: Some voltage readings may be unsupported, as this functionality is board-specific. Refer to the BIOS to determine the supported voltages

CPU Core Voltage (mV)

```
$ sudo semautil /d get_value 7
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 7

CPU Core Voltage: 701 mV
```


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2.5V Voltage (mV)

```
$ sudo semautil /d get_value 8
```

3.3V Voltage (mV)

```
$ sudo semautil /d get_value 9
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 9

3.3V Voltage: 3362 mV
```

Battery Voltage (mV)

```
$ sudo semautil /d get_value 10
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 10

Battery Voltage: 3027 mV
```

5V Voltage (mV)

```
$ sudo semautil /d get_value 11
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 11

5V Voltage: 5183 mV
```

5V Standby Voltage (mV)

```
$ sudo semautil /d get_value 12
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 12

5V Standby Voltage: 5183 mV
```

12V Voltage (mV)

```
$ sudo semautil /d get_value 13
```

Main Power Current (mA)

```
$ sudo semautil /d get_value 26
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 26

Main power current: 459 mA
```


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GFX Voltage (mV)

```
$ sudo semautil /d get_value 27
```

1.05V Voltage (mV)

```
$ sudo semautil /d get_value 28
```

1.5V Voltage (mV)

```
$ sudo semautil /d get_value 29
```

VIN Voltage (mV)

```
$ sudo semautil /d get_value 30
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 30

Vin Voltage: 12247 mV
```

IO Current (mA)

```
$ sudo semautil /d get_value 40
```

4.1.2.5. Temperature Monitor

CPU Temperature

```
$ sudo semautil /d get_value 5
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 5

CPU temperature: 3051 K (32 C)
```

Board Temperature

```
$ sudo semautil /d get_value 6
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 6

Board Temperature: 3011 K (28 C)
```

Minimum Board Temperature

```
$ sudo semautil /d get_value 20
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 20

Board minimum temperature: 2961 K (23 C)
```


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Maximum Board Temperature

```
$ sudo semautil /d get_value 21
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 21

Board maximum temperature: 3211 K (48 C)
```

Startup Board Temperature

```
$ sudo semautil /d get_value 22
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 22

Board startup temperature: 3021 K (29 C)
```

Minimum CPU Temperature

```
$ sudo semautil /d get_value 23
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 23

CPU minimum temperature: 3031 K (30 C)
```

Maximum CPU Temperature

```
$ sudo semautil /d get_value 24
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 24

CPU maximum temperature: 3751 K (102 C)
```

Startup CPU Temperature

```
$ sudo semautil /d get_value 25
```

```
adlink@adlink-Default-string:~$ sudo semautil /d get_value 25

CPU startup temperature: 3161 K (43 C)
```

Note: Check bit 32 of Extended EC/BMC Capabilities for Board 2nd temperature support

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Board 2nd Current Temperature [Check bit 32 of Extended EC/BMC Capabilities]

```
$ sudo semautil /d get_value 33
```

Board 2nd Minimum Temperature [Check bit 32 of Extended EC/BMC Capabilities]

```
$ sudo semautil /d get_value 34
```

Board 2nd Maximum Temperature [Check bit 32 of Extended EC/BMC Capabilities]

```
$ sudo semautil /d get_value 35
```

Board 2nd Startup Temperature [Check bit 32 of Extended EC/BMC Capabilities]

```
$ sudo semautil /d get_value 36
```

System Current Temperature

```
$ sudo semautil /d get_value 41
```

System Minimum Temperature

```
$ sudo semautil /d get_value 42
```

System Maximum Temperature

```
$ sudo semautil /d get_value 43
```

System Startup Temperature

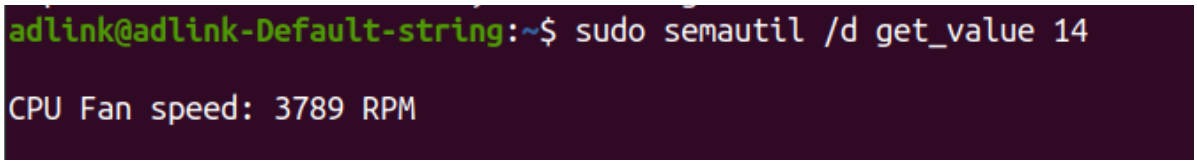
```
$ sudo semautil /d get_value 44
```

4.1.2.6. Fan Speed Monitor

Refer bit 18, 19, 26 and 27 of EC/BMC Capabilities for the fans available.

CPU Fan Speed

```
$ sudo semautil /d get_value 14
```



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System Fan 1 Speed

```
$ sudo semautil /d get_value 15
```

System Fan 2 Speed

```
$ sudo semautil /d get_value 31
```

System Fan 3 Speed

```
$ sudo semautil /d get_value 32
```

4.1.3. Watchdog Control

SEMA supports **runtime watchdog** and **power-up watchdog**.

The **Runtime Watchdog** is used to recover from operating system hangs, application software hangs, or other system malfunctions. When the runtime watchdog timer expires, the EC/BMC triggers a system reset and automatically stops the runtime watchdog.

The **Powerup Watchdog** is used to handle system reset or boot failures. The reset cycle is repeated until the system successfully boots and the application services the watchdog.

```
$ sudo semautil /w
```

```
adlink@adlink-Default-string:~$ sudo semautil /w

- Watch Dog:
  1. semautil /w get_cap
  2. semautil /w start [sec (0-65535)]
  3. semautil /w trigger
  4. semautil /w stop
  5. semautil /w pwrup_enable [sec (60-65535)]
     Note:
        Start time will be different for the different platforms.
        Please go to BIOS menu to check it
  6. semautil /w pwrup_disable
```

4.1.3.1. Runtime Watchdog

Capabilities

Display the maximum supported values for event timeout, delay, and reset timeout.

```
$ sudo semautil /w get_cap
```

```
adlink@adlink-Default-string:~$ sudo semautil /w get_cap
MaxEventTimeout : 0 seconds
MaxDelay : 0 seconds
MaxResetValue : 65535 seconds
```


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Enable

The system will reset after the specified number of seconds (timeout).

```
$ sudo semautil /w start [sec (1-65535)]
```

```
adlink@adlink-Default-string:~$ sudo semautil /w start 100
Run-time Watchdog Started with : 100 seconds
```

Trigger

Refresh the runtime watchdog using the previously configured timeout value.

```
$ sudo semautil /w trigger
```

```
adlink@adlink-Default-string:~$ sudo semautil /w trigger
Watchdog is triggered to previous number of seconds again
```

Disable

Stop the runtime watchdog.

```
$ sudo semautil /w stop
```

```
adlink@adlink-Default-string:~$ sudo semautil /w stop
Watchdog Stopped Successfully
```

4.1.3.2. Powerup Watchdog

Enable

Set the timeout value and restart the system to enable the power-up watchdog. The powerup watchdog will continue to reset the system until it is disabled by the application or BIOS.

Caution: The startup time varies by platform. Check the system boot time and configure the power-up watchdog accordingly. If the timeout is set too short, the system may continuously reset.

```
$ sudo semautil /w pwrup_enable [sec (60-65535)]
```

```
adlink@adlink-Default-string:~$ sudo semautil /w pwrup_enable 100
PowerUp Watchdog Started with : 100 seconds
```

Disable

Stop the powerup watchdog.

```
$ sudo semautil /w pwrup_disable
```

```
adlink@adlink-Default-string:~$ sudo semautil /w pwrup_disable
Powerup Watchdog is disabled successfully
```


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4.1.4. Storage Access

This section describes the commands for managing the on-board EEPROM storage **(Eg: EEPROM type: Microchip AT25256B)** connected to the EC/BMC Users can read from and write to the user flash memory region of the EEPROM.

SEMA supports three storage regions: User, Secure, and ODM.

User Region (1024 bytes)

- Intended for general user data storage.
- Accessible without restrictions.
- This region cannot be locked or protected.

Secure Region (2048 bytes)

- Reserved for secure data.
- Read and write access is restricted and requires a passcode to unlock.

ODM Region (1024 bytes)

- Contains manufacturer-defined information such as hardware revision, board serial number, last repair date, manufacturing date, MAC addresses, UUID, and other board-specific data.
- Intended primarily for manufacturer use and not for customer access.
- Data in this region can be read without restrictions; however, write access requires passcode authentication.
- The reserved portion (0x0E00–0x0FFF) is allocated for internal use and must not be modified.

Note: Customers should use the **User region** to store their data.

Region	Address range	Base address	Valid Address to Read/Write	Block size
1-User	0x0000 to 0x03FF (1KB)	0x0000	0 to 1020	4
2-Secure	0x6000 to 0x67FF (2KB)	0x6000	0 to 2044	4
3-ODM	0x0C00 to 0x0FFF (1KB)	0x0C00	0 to 1020	4

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```
$ sudo semautil /s
```

```
adlink@adlink-Default-string:~$ sudo semautil /s

Storage:
1. semautil /s get_cap [Region]
2. semautil /s read [Region] [Address] [Length]
3. semautil /s write [Region] [Address] [string/value]
4. semautil /s hex_write [Region] [Address] [value]
5. semautil /s hex_read [Region] [Address] [Length]
6. semautil /s lock [Region]
7. semautil /s unlock [Region] [Permission] [passcode]
8. semautil /s odm_write [ODM Id] [string/value]

   Region:
   1.User
   2.Secure
   3.ODM

   Permission:
   1.Read only
   2.Read/Write

   ODM Id:
   1.Hardware Revision
   2.Serial Number
   3.Last Repair date
   4.Manufacturing date
   5.2nd Hardware Revision
   6.2nd Serial Number
   7.MAC Id
   8.MAC Id 2

   Note : Unlock the ODM region to perform odm_write operation
          hex_write operation should be provided as below
          Example: semautil /s hex_write 1 128 aa bb c d
```

4.1.4.1. Capabilities

Display the **storage size and block size** of the selected region

```
$ sudo semautil /s get_cap [Region]
```

```
adlink@adlink-Default-string:~$ sudo semautil /s get_cap 1
Storage Capabilities:
Storage Size: 1024 bytes
Block Length: 4 bytes
adlink@adlink-Default-string:~$ sudo semautil /s get_cap 2
Storage Capabilities:
Storage Size: 2048 bytes
Block Length: 4 bytes
adlink@adlink-Default-string:~$ sudo semautil /s get_cap 3
Storage Capabilities:
Storage Size: 1024 bytes
Block Length: 4 bytes
```


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4.1.4.2. User Region

String Write Operation

```
$ sudo semautil /s write [Region] [Address] [string/value]
```

```
adlink@adlink-Default-string:~$ sudo semautil /s write 1 00 accd
Data Written Successfully
```

String Read Operation

```
$ sudo semautil /s read [Region] [Address] [Length]
```

```
adlink@adlink-Default-string:~$ sudo semautil /s read 1 00 4
Read Buffer: accd
```

Hex Write Operation [Supported Only for EC Boards]

To write a hexadecimal value to the specified address

```
$ sudo semautil /s hex_write [Region] [Address] [Value]
```

```
adlink@adlink-Default-string:~$ sudo semautil /s hex_write 1 00 AA BB CC DD
4 Bytes Written Successfully
```

Hex Read Operation [Supported Only for EC Boards]

To read a hexadecimal value from the specified address

```
$ sudo semautil /s hex_read [Region] [Address] [Length]
```

```
adlink@adlink-Default-string:~$ sudo semautil /s hex_read 1 00 4
Read Buffer : 0xAA 0xBB 0xCC 0xDD
```

4.1.4.3. Secure and ODM Regions [Not for customer use]

The secure and ODM regions can be accessed using

Lock

To make the Secure region read/write protected or ODM region write protected

```
$ sudo semautil /s lock [Region]
```

Unlock

The passcode must be used to gain read/write access to the Secure and ODM regions to perform String Write Operation, String Read Operation, Hex Write Operation [Supported Only for EC Boards] and Hex Read Operation [Supported Only for EC Boards]

```
$ sudo semautil /s unlock [Region] [Permission] [Passcode]
```


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ODM Write [Supported Only for EC Boards]

The following system and manufacturer details [ODM details] can be changed using this command:

1. Hardware Revision
2. Serial Number
3. Last Repair date
4. Manufacturing date
5. 2nd Hardware Revision
6. 2nd Serial Number
7. MAC Id
8. MAC Id 2

```
$ sudo semautil /s odm_write [ODM Id] [string/value]
```

```
adlink@adlink-Default-string:~$ sudo semautil /s odm_write 1 A0
Data Written Successfully
```

The written string or value can be viewed using the following

```
$ sudo semautil /i get_bd_info [EAPI Id]
```


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4.1.5. Voltage Monitor

Note: Some voltage readings may be unsupported, as this functionality is board-specific. Refer to the BIOS to determine the supported voltages.

```
$ semautil /v
```

```
adlink@adlink-Default-string:~$ sudo semautil /v

- Voltage monitor:
  1. semautil /v get_voltage_cap
  2. semautil /v get_voltage [Channel (0-15)]
```

4.1.5.1. Capability

```
$ semautil /v get_voltage_cap
```

```
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage_cap

Voltage monitor is compatible for this platform
```

4.1.5.2. Voltage Values

```
$ semautil /v get_voltage [Channel (0-15)]
```

```
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage 0
Voltage: 3027 mv
Description: RTC
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage 1
Voltage: 5183 mv
Description: 5VSB
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage 2
Voltage: 12285 mv
Description: VIN
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage 3
Voltage: 3362 mv
Description: 3.3V
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage 4
Voltage: 1088 mv
Description: VMEM
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage 5
Voltage: 3365 mv
Description: 3.3VSB
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage 6
Voltage: 763 mv
Description: VCORE
adlink@adlink-Default-string:~$ sudo semautil /v get_voltage 7
Current: 624 mA
Description: Current Input Current
```


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4.1.6. GPIO Control

```
$ sudo semautil /g
```

```
adlink@adlink-Default-string:~$ sudo semautil /g

- GPIO:
  1. semautil /g get_direction_cap    [ID]
  2. semautil /g get_direction        [GPIO Bit]
  3. semautil /g set_direction        [GPIO Bit] [0 - Output or 1 - Input]
  4. semautil /g get_level            [GPIO Bit]
  5. semautil /g set_level            [GPIO Bit] [0 - Low or 1 - High]
       GPIO set/write parameters:
       GPIO Bit  1-16
       Note: GPIO access may not be available on all platforms
```

4.1.6.1. Capabilities

```
$ sudo semautil /g get_direction_cap
```

```
adlink@adlink-Default-string:~$ sudo semautil /g get_direction_cap 1
Input/Output supported for GPIO 1
```

4.1.6.2. GPIO Direction Control

To configure the direction of the GPIO pin as Input or output.

Read Direction

```
$ sudo semautil /g get_direction [GPIO Bit]
```

```
adlink@adlink-Default-string:~$ sudo semautil /g get_direction 1
Direction : Input
```

Set Direction

```
$ sudo semautil /g set_direction [GPIO Bit] [0-Output | 1-Input]
```

```
adlink@adlink-Default-string:~$ sudo semautil /g set_direction 1 0
Direction updated successfully
```

4.1.6.3. GPIO Level Control

To configure the level of the output GPIO pin as High or Low.

Read Level

```
$ sudo semautil /g get_level [GPIO Bit]
```

```
adlink@adlink-Default-string:~$ sudo semautil /g get_level 1
Level: High
```

Set Level

```
$ sudo semautil /g set_level [GPIO Bit] [0-Low | 1-High]
```

```
adlink@adlink-Default-string:~$ sudo semautil /g set_level 1 1
GPIO Level updated successfully
```


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4.1.7. Generic I2C Access [Supported only for EC boards]

```
$ sudo semautil /i2c
```

```
adlink@adlink-Default-string:~$ sudo semautil /i2c

- Generic I2C Read/Write:
  1. semautil /i2c  bus_cap
  2. semautil /i2c  probe_device   [bus id]
  3. semautil /i2c  write_raw      [bus id] [address] [wr length] [cmd] byte0 byte1 .
..
  4. semautil /i2c  read_raw       [bus id] [address] [cmd] [re length]
  5. semautil /i2c  raw_xfer       [bus id] [address] [wr length] [rd length] byte0 b
yte1 byte2...
  6. semautil /i2c  read_xfer      [bus id] [address] [cmd type] [cmd] [read lentgh]
  7. semautil /i2c  write_xfer     [bus id] [address] [cmd type] [cmd] [length] byte0
 byte1 byte2 ...
  8. semautil /i2c  get_status

[Bus Id]:
    ID  SEMA EAPI ID                    Description
    1   EAPI_ID_I2C_EXTERNAL_1          Baseboard I2C Interface 1
    2   EAPI_ID_I2C_EXTERNAL_2          Baseboard I2C Interface 2
    3   EAPI_ID_I2C_EXTERNAL_3          Baseboard I2C Interface 3
    4   EAPI_ID_I2C_EXTERNAL_4          Baseboard I2C Interface 4
  [Command type]:
    ID  ENCODED CMD ID          Description
    1   EAPI_I2C_NO_CMD         Specify no command/index is used
    2   EAPI_I2C_ENC_STD_CMD    Extended standard 8 bits CMD
    3   EAPI_I2C_ENC_EXT_CMD    Extended standard 16 bits CMD
adlink@adlink-Default-string:~$
```

4.1.7.1. Capabilities

To display the I2C buses supported by the board along with their maximum read and write sizes.

```
$ sudo semautil /i2c bus_cap
```

```
adlink@adlink-Default-string:~$ sudo semautil /i2c bus_cap

EAPI_ID_I2C_EXTERNAL_1      is supported. maximum read size is 32 bytes, and maxim
um write size is 29 bytes.
EAPI_ID_I2C_EXTERNAL_2      is supported. maximum read size is 32 bytes, and maxim
um write size is 29 bytes.
EAPI_ID_I2C_EXTERNAL_3      is supported. maximum read size is 32 bytes, and maxim
um write size is 29 bytes.
EAPI_ID_I2C_EXTERNAL_4      is supported. maximum read size is 32 bytes, and maxim
um write size is 29 bytes.
```


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4.1.7.2. Device Probe

To display the list of slave addresses connected to the specified I2C bus.

```
$ sudo semautil /i2c probe_device [bus id]
```

```
adlink@adlink-Default-string:~$ sudo semautil /i2c probe_device 4

Slave list in EAPI_ID_I2C_EXTERNAL_4 bus:
01. 20
02. 21
03. 49
04. 50
05. 52
```

4.1.7.3. Transfer Functions

To perform separate read and write transactions

Read Transfer

```
$ sudo semautil /i2c read_xfer [bus id] [address] [cmd type]
[cmd/offset] [read length]
```

```
adlink@adlink-Default-string:~$ sudo semautil /i2c read_xfer 4 50 2 00 4
Read data:

00 : 09
01 : 09
02 : 09
03 : 09
```

Write Transfer

```
$ sudo semautil /i2c write_xfer [bus id] [address] [cmd type]
[cmd/offset] [write length] byte0 byte1 …
```

```
adlink@adlink-Default-string:~$ sudo semautil /i2c write_xfer 4 50 2 00 4 9 9 9 9

The I2C Write Transfer command is completed
```


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4.1.7.4. Raw Functions

The write_raw, read_raw, and raw_xfer commands are used for combined write/read transactions that utilize the I2C repeated-start feature.

Read Raw

```
$ sudo semautil /i2c read_raw [bus id] [address] [cmd/offset]
[read length]
```

```
adlink@adlink-Default-string:~$ sudo semautil /i2c read_raw 4 50 00 4
Read data:

00 : 01
01 : 02
02 : 03
03 : 04
```

Write Raw

When specifying the write length, include the offset. For example, to write 4 bytes of data, the total write length should be 5 bytes.

```
$ sudo semautil /i2c write_raw [bus id] [address] [write length]
[cmd/offset] byte0 byte1 …
```

```
adlink@adlink-Default-string:~$ sudo semautil /i2c write_raw 4 50 5 00 1 2 3 4

Data Written Successfully
```

4.2.7.5. Raw Transfer

The raw_xfer command performs the same combined write/read operation as write_raw and read_raw, but in a single command.

```
$ sudo semautil /i2c raw_xfer [bus id] [address] [write length]
[read_length] [cmd/offset] byte0 byte1 …
```

Read

```
adlink@adlink-Default-string:~$ sudo semautil /i2c raw_xfer 4 50 1 4 00
Read data:

00 : 01
01 : 02
02 : 03
03 : 04
```

Write

```
adlink@adlink-Default-string:~$ sudo semautil /i2c raw_xfer 4 50 5 00 00 1 2 3 4

Data Written Successfully
```


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4.1.8. Error log Description

Note: Error log functionality is supported only on certain boards, refer bit 35 of Extended EC/BMC Capabilities.

```
$ sudo semautil /e
```

```
adlink@adlink-Default-string:~$ sudo semautil /e

- Error log:
  1. semautil /e get_error_log [Position(0-31)]
  2. semautil /e get_cur_error_log
  3. semautil /e get_bmc_error_code [Error Number]
```

4.1.8.1. Error Log

Current Error Log

```
$ sudo semautil /e get_cur_error_log
```

```
adlink@adlink-Default-string:~$ sudo semautil /e get_cur_error_log
ErrorNumber:    655
Flags:          0x55
RestartEvent:   0x70
PowerCycle:     495
BootCount:      780
Time:           60
TotalOnTime:    155211
BIOS Sel:       3
Status:         0x55
CPUTemp:        36
BoardTemp:      31
```

Error Log of the Position

Position 0 contains the most recent error log entry.

```
$ sudo semautil /e get_error_log [Position (0-31)]
```

```
adlink@adlink-Default-string:~$ sudo semautil /e get_error_log 1
ErrorNumber:    654
Flags:          0x55
RestartEvent:   0x70
PowerCycle:     495
BootCount:      780
Time:           60
TotalOnTime:    155211
Bios Sel:       3
Status:         0x55
CPUTemp:        36
BoardTemp:      31
```


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4.1.8.2. BMC Error Code

To get the BMC Error code description of the provided Error number

```
$ semautil /e get_bmc_error_code [Error number]
```

```
adlink@adlink-Default-string:~$ sudo semautil /e get_bmc_error_code 655

NO_SLP_S3
```

4.1.9. BIOS Information

```
adlink@adlink-Default-string:~$ sudo semautil /src

- Get BIOS Source:
  1. semautil /src  get_src
  2. semautil /src  set_src value[0-3]
  3. semautil /src  get_bios_status

        Value   :
         0      -   By hardware configuration of currently selected BIOS
         1      -   Switch to Fail-Safe BIOS
         2      -   Switch to External BIOS (SPI0 on carrier)
         3      -   Switch to Internal BIOS (SPI0 on module)

  BIOS select status information.
        Bit2 Bit1 Bit0
         0    0    0  -   Module SPI0/ Carrier SPI1 (Standard BIOS)
         0    0    1  -   Carrier SPI0/ Module SPI1 (Fail - Safe BIOS)
         0    1    0  -   Unknown
         0    1    1  -   Module SPI0/Module SPI1 (Standard BIOS)
         1    0    0  -   Unknown
         1    0    1  -   Switch to Fail-Safe BIOS
         1    1    0  -   Switch to External BIOS
         1    1    1  -   Switch to Internal BIOS

  If Bit 2 is OFF : PICMG BIOS selected
  If Bit 2 is ON : Dual BIOS selected

adlink@adlink-Default-string:~$
```

4.1.9.1. BIOS selection status

Display the type of BIOS selected as PICMG BIOS or Dual BIOS and the state of external hardware jumper control signals.

```
$ sudo semautil /src get_bios_status
```

```
adlink@adlink-Default-string:~$ sudo semautil /src get_bios_status
PICMG BIOS selected
 0    1    1  -   Module SPI0/Module SPI1 (Standard BIOS)
```

4.1.9.2. BIOS Boot Source Configuration

Set BIOS Boot Source mode

```
$ sudo semautil /src set_src value[0-3]
```

```
adlink@adlink-Default-string:~$ sudo semautil /src set_src 2
Bios boot source mode set successfully
```


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Read BIOS Boot Source mode

```
$ sudo semautil /src get_src
```

```
adlink@adlink-Default-string:~$ sudo semautil /src get_src
2  - Switch to External BIOS(SPI0 on carrier)
```

4.1.10. UUID [Type 4]

```
$ semautil /c
```

```
adlink@adlink-Default-string:~$ sudo semautil /c

- UUID :
  1. semautil /c guid_generate_write
  2. semautil /c guid_read
```

4.1.10.1. Write New UUIDv4

```
$ sudo semautil /c guid_generate_write
```

```
adlink@adlink-Default-string:~$ sudo semautil /c guid_generate_write
Generated UUIDv4: e3565444-9996-4e90-8ac2-35bde0b1ef11
Bytes Written Successfully
adlink@adlink-Default-string:~$
```

4.1.10.2. Read UUIDv4

```
$ semautil /c guid_read
```

```
adlink@adlink-Default-string:~$ sudo semautil /c guid_read
Read Buffer : 0xE3 0x56 0x54 0x44 0x99 0x96 0x4E 0x90 0x8A 0xC2 0x35 0xBD 0xE0
0xB1 0xEF 0x11
adlink@adlink-Default-string:~$
```


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4.1.11. Smart Fan Control

This functionality is used to control the fan connected to the CPU or system.

Each fan controller supports 4 temperature trigger levels, each associated with a corresponding PWM value. Whenever a temperature trigger level is crossed, the fan speed is adjusted based on the configured PWM value for that level.

Note: Fan control functionality is supported only on certain boards, refer bit 18, 19, 26 and 27 of EC/BMC Capabilities for the fans available.

```
$ sudo semautil /f
```

```
adlink@adlink-Default-string:~$ sudo semautil /f
Wrong arguments

- Smart FAN control:
  1. semautil /f set_temp_points [FanID] [Level1] [Level2] [Level3] [Level4]
  2. semautil /f set_pwm_points  [FanID] [PWMLevel1] [PWMLevel2] [PWMLevel3] [PWMleve
l4]
  3. semautil /f get_temp_points [FanID]
  4. semautil /f get_pwm_points  [FanID]
  5. semautil /f set_temp_source [FanID] [TempSrc]
  6. semautil /f get_temp_source [FanID]
  7. semautil /f get_mode        [FanID]
  8. semautil /f set_mode        [FanID] [Mode]

     FanID
     0:CPU fan
     1:System fan 1

     Mode
     0:Auto
     1:Off
     2:On
     3:Soft

     TempSrc
     0-CPU sensor
     1-Board sensor
```

4.1.11.1. Temperature Set Points

Describes the temperature trigger level corresponding to the percentage of PWM trigger level (Maximum temperature set point = 100).

Set Temperature Trigger Levels

```
$ sudo semautil /f set_temp_points [FanID] [Level1] [Level2]
[Level3] [Level4]
```

```
adlink@adlink-Default-string:~$ sudo semautil /f set_temp_points 0 20 40 50 60
Temperature levels set successfully
```

Read Temperature Trigger Levels

```
$ sudo semautil /f get_temp_points [FanID]
```

```
adlink@adlink-Default-string:~$ sudo semautil /f get_temp_points 0
Fan ID: 0 (CPU fan)
Level1: 20
Level2: 40
Level3: 50
```


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4.1.11.2. Temperature Source

Describes which temperature sensor will be used for calculating the PWM level of the selected fan.

- The temperature source for the CPU fan can be set to either the CPU sensor or the board sensor.
- The temperature source for System Fan 1 can be set to either the CPU sensor or the carrier sensor.

Set Temperature Source

```
$ sudo semautil /f set_temp_source [FanID] [TempSrc]
```

```
adlink@adlink-Default-string:~$ sudo semautil /f set_temp_source 0 1
Temperature source is set to Baseboard sensor
```

Read Temperature Source

```
$ sudo semautil /f get_temp_source [FanID]
```

```
adlink@adlink-Default-string:~$ sudo semautil /f get_temp_source 0
Current Temperature source is Baseboard sensor
```

4.1.11.3. PWM Set Points

Describes the percentage of PWM trigger level corresponding to the temperature trigger level (Maximum PWM set point = 100).

Set PWM Trigger level

```
$ sudo semautil /f set_pwm_points [FanID] [PWMLevel1] [PWMLevel2]
[PWMLevel3] [PWMLevel4]
```

```
adlink@adlink-Default-string:~$ sudo semautil /f set_pwm_points 0 100 100 100 100
PWM levels set successfully
```

Read Temperature Trigger Levels

```
$ sudo semautil /f get_pwm_points [FanID]
```

```
adlink@adlink-Default-string:~$ sudo semautil /f get_pwm_points 0
Fan ID: 0 (CPU fan)
Level1: 100
Level2: 100
Level3: 100
Level4: 100
```


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4.1.11.4. Fan Mode

SEMA supports 4 fan modes.

- Auto – the fan will be automatically controlled using the Trigger Settings described
- Off – the fan is turned off completely
- On – the fan runs at maximum RPM (PWM level 100%)
- Soft – Auto mode with PWM Level Interpolation (i.e.) The PWM level is not adapted stepwise, but continuously.

Set Fan Mode

```
$ sudo semautil /f set_mode [FanID] [Mode]
```

```
adlink@adlink-Default-string:~$ sudo semautil /f set_mode 0 1
FAN mode set successfully
```

Read Fan Mode

```
$ sudo semautil /f get_mode [FanID]
```

```
adlink@adlink-Default-string:~$ sudo semautil /f get_mode 0
Fan id: 0 (CPU fan)
Fan Mode: 2(On)
```


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4.1.12. Backlight Control

To control the LVDS backlight panel connected to the EC/BMC.

Note: Backlight control is supported only on certain boards, refer bit 8 of EC/BMC Capabilities.

```
$ sudo semautil /b
```

Test Environment

Module: LEC-EL
OS: RHEL 9
Display unit: LVDS-FBT050-30-070004

4.1.12.1. LVDS Panel Status Control

Enable/Disable the Backlight Panel

```
$ sudo semautil /b set_bkl_enable [ID] [0 – Disable | 1 – Enable]
```

```
[root@localhost Unified_SEMA_Test]# semautil /b set_bkl_enable 0 0
Backlight OFF
```

Read the Backlight Panel Status

Display the ON/OFF status of the selected panel.

```
$ sudo semautil /b get_bkl_enable [ID]
```

```
[root@localhost Unified_SEMA_Test]# semautil /b get_bkl_enable 0
Backlight ON
```

4.1.12.2. LVDS Panel Brightness Control

Set Brightness

Set the backlight brightness (PWM) level of the specified panel. Maximum PWM level – 255

```
$ sudo semautil /b set_bkl_value [ID] [Level (0-255)]
```

```
[root@localhost Unified_SEMA_Test]# semautil /b set_bkl_value 0 50
Current Backlight Brightness is set to 50
```

Read Brightness

Display the brightness PWM level

```
$ sudo semautil /b get_bkl_value [ID]
```

```
[root@localhost Unified_SEMA_Test]# semautil /b get_bkl_value 0
Current Backlight Brightness is  200
```

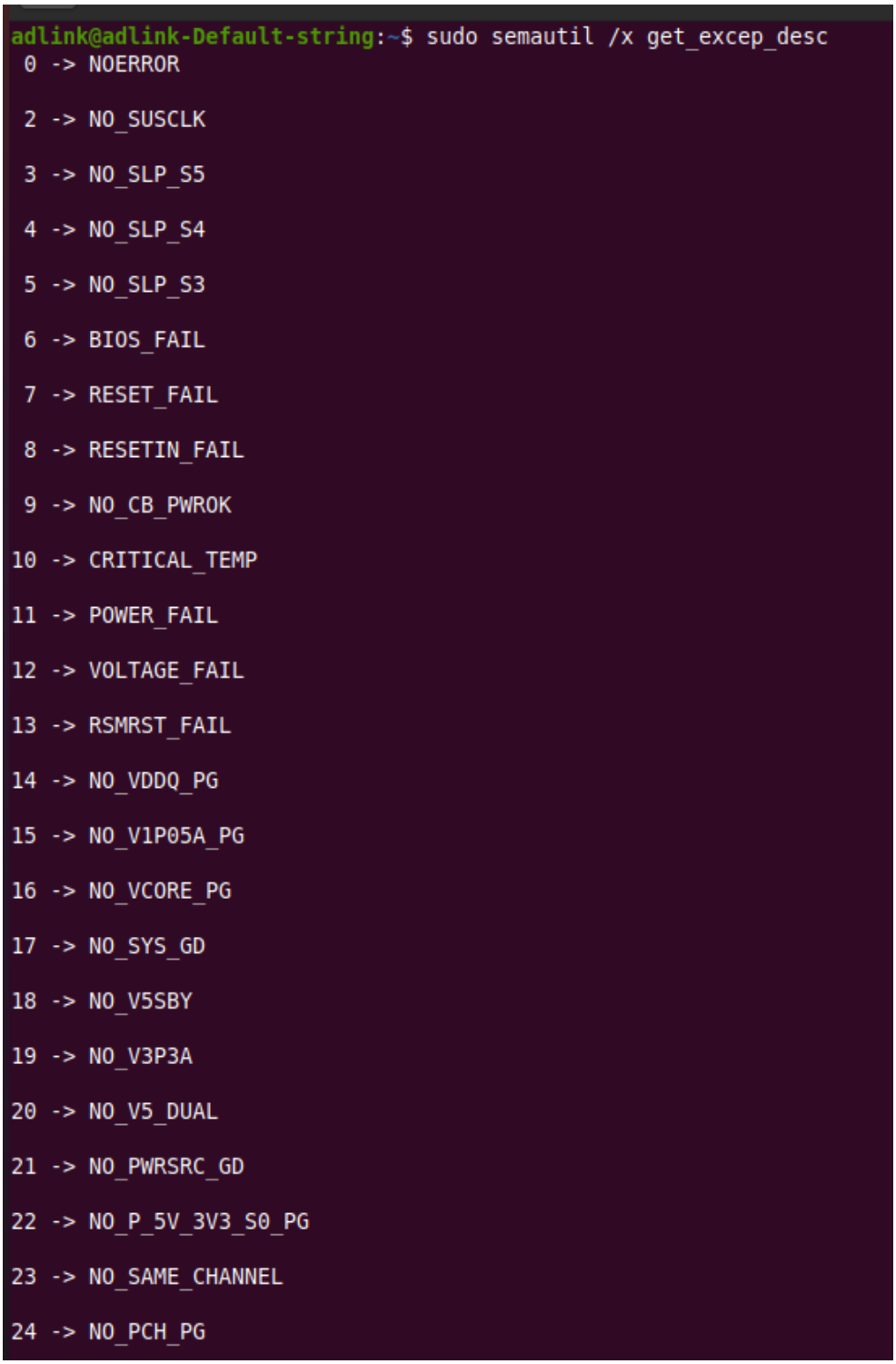

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4.1.13. Exception Description

Displays the exception codes returned by EC/BMC flags.

```
$ sudo semautil /x get_excep_desc
```



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4.1.14. SMBus Access

This functionality is supported for both EC and BMC-based boards.
To identify the devices connected to the SMBus of the hardware, refer to the hardware user manual.

```
$ sudo semautil /smb
```

```
adlink@adlink-Default-string:~$ sudo semautil /smb

- Direct access to devices connected to the PCH SMBus:
  1. semautil /smb  write_byte     [address] [Cmd] byte
  2. semautil /smb  read_byte      [address] [Cmd]
  3. semautil /smb  write_word     [address] [Cmd] byte0 byte1
  4. semautil /smb  read_word      [address] [Cmd]
```

Test Environment

Module: cExpress-AL
OS: Ubuntu 20.04 (Kernel 5.15)

According cExpress-AL user manual, the Extended GPIO is connected at SMBus address 0x40 (8-bit address).

4.1.14.1. Read Operations

Read Byte

To read 1 byte of data from the SMBus device

```
$ sudo semautil /smb read_byte [Addr] [Cmd]
```

[Addr] - 7-bit SMBus slave address
[Cmd] - SMBus command

```
adlink@adlink-Express-TL:~$ sudo semautil /smb read_byte 20 0x06

Read Data: cc
```

Read Word

To read 1 word (2 bytes) of data from the SMBus device

```
$ sudo semautil /smb read_word [Addr] [Cmd]
```

```
adlink@adlink-Express-TL:~$ sudo semautil /smb read_word 20 0x06
Read data:

00 : 11
01 : 99
```


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4.1.14.2. Write Operations

Write Byte

To write 1 byte of hexadecimal data to SMBus Device

```
$ sudo semautil /smb write_byte [Addr] [Cmd] [Data]
```

```
adlink@adlink-Express-TL:~$ sudo semautil /smb write_byte 20 0x06 cc

The SMBUS Write Byte Transfer command is completed
```

Write Word

To write 1 word (2 bytes) of hexadecimal data to the SMBus device

```
$ sudo semautil /smb write_word [Addr] [Cmd] [Data]
```

```
adlink@adlink-Express-TL:~$ sudo semautil /smb write_word 20 0x06 11 99

The SMBUS Write Word Transfer command is completed
```

To get the EAPI usage, refer to the SEMA EAPI Guide attached in the below link

Link: [Technical Resources | ADLINK]

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4.2. For Windows Platform

To utilize the SEMA command line interface, access the Windows command terminal.

Test Environment:

Module: Express-ADP [Base: Express Base 6]

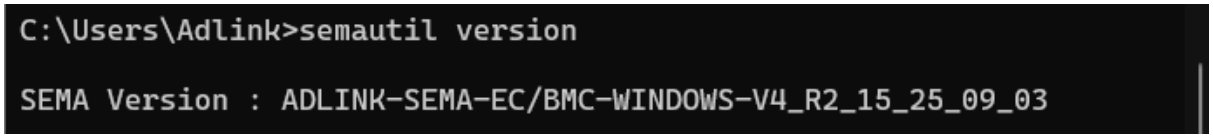
BIOS Version: 1.07.10

Firmware version: ADLINK 00A

OS: Windows 11 Home 24H2 x64

SEMA Utility Version

```
$ semautil version
```



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Help Menu

```
$ semautil /h
```

```
C:\Users\Adlink>semautil /h

Usage:
- Display this screen:
        semautil /h

- Version:
        semautil version for more help related to SEMA version

- System monitor-Board Info:
        semautil /i    for more help related to system monitor-board information functions

- Board values:
        semautil /d    for more help related to board values functions

- Watch Dog:
        semautil /w    for more help related to watchdog functions

- Storage:
        semautil /s    for more help related to storage functions

- Voltage monitor:
        semautil /v    for more help related to voltage monitor functions

- GPIO:
        semautil /g    for more help related to GPIO functions

- Generic I2C Read/Write:
        semautil /i2c  for more help related to generic I2C read/write functions

- Error log:
        semautil /e    for more help related to error log functions

- BIOS source:
        semautil /src  for more help related to BIOS source functions
```


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4.2.1. Board Information

Allows the users to query essential system and manufacturer details for diagnostic and inventory purposes.

```
$ semautil /i get_bd_info [EAPI ID]
```

```
C:\Users\Adlink>semautil /i

- System monitor-Board Info:
  1. semautil /i get_bd_info [EApi ID]
        1  : Board manufacturer name
        2  : Board name
        3  : Board serial number
        4  : Board BIOS revision
        5  : HW revision
        6  : Board platform type
        7  : BMC Bootloader revision
        8  : BMC application revision
        9  : Board restart event
        10 : Board repair date
        11 : Board manufacturer date
        12 : Board MAC address 1
        13 : Board MAC address 2
        14 : Board 2nd HW revision number
        15 : Board 2nd serial
```

EAPI ID	Data
1	Board Manufacturer Name
2	Board Name
3	Board Serial Number
4	Board BIOS Revision
5	Hardware Revision
6	Board Platform Type
7	BMC Bootloader Revision
8	Application Revision/Firmware Revision
9	Board Restart Event
10	Board Repair Date
11	Board Manufacturing Date
12	Board MAC Address 1
13	Board MAC Address 2
14	Board Secondary Hardware Revision
15	Board Secondary Serial Number

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4.2.1.1. System Information

Board Name

```
$ semautil /i get_bd_info 2
```

```
C:\Users\Adlink>semautil /i get_bd_info 2

Board name: COMHPC-sIDH
```

Board Serial Number

```
$ semautil /i get_bd_info 3
```

```
C:\Users\Adlink>semautil /i get_bd_info 3

Board serial number: QWEOJP
```

Board BIOS Revision

```
$ semautil /i get_bd_info 4
```

```
C:\Users\Adlink>semautil /i get_bd_info 4

Board BIOS revision: 1.07.10
```

Hardware Revision

```
$ semautil /i get_bd_info 5
```

```
C:\Users\Adlink>semautil /i get_bd_info 5

HW revision: 123456789
```

Board Platform Type

```
$ semautil /i get_bd_info 6
```

```
C:\Users\Adlink>semautil /i get_bd_info 6

Data: 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF
```


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BMC Bootloader Revision [Supported only for BMC boards]

Note: This screenshot was taken in MXE-210 board

```
$ semautil /i get_bd_info 7
```

```
C:\Users\ADLINK>semautil /i get_bd_info 7

BMC Bootloader revision: bl_MXE-210 4v0 Mar 31 2017 (c) ADLINK Technology Inc.
```

Application Revision/Firmware Revision

```
$ semautil /i get_bd_info 8
```

```
C:\Users\Adlink>semautil /i get_bd_info 8

BMC application revision: ADLINK       014
```

Board Restart Event

Indicates the cause of the last system restart.

```
$ semautil /i get_bd_info 9
```

```
C:\Users\Adlink>semautil /i get_bd_info 9

Board restart event: Software Reset
```

Board MAC Address 1

```
$ semautil /i get_bd_info 12
```

```
C:\Users\Adlink>semautil /i get_bd_info 12

Board MAC address 1: 0987654321
```

Board MAC Address 2

Note: This feature is supported only in EC boards

```
$ semautil /i get_bd_info 13
```

```
C:\Users\Adlink>semautil /i get_bd_info 13

Board MAC address 2: 003064123456
```


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Board Secondary Hardware Revision

Note: If a value has not been written to the ODM region, the data will consist of 16 bytes of 0xFF

```
$ semautil /i get_bd_info 14
```

```
C:\Users\Adlink>semautil /i get_bd_info 14

Data: 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF
```

Board Secondary Serial Number

```
$ semautil /i get_bd_info 15
```

```
C:\Users\Adlink>semautil /i get_bd_info 15

Board 2nd serial number: 12345678
```

4.2.1.2. Manufacture Details

Board Manufacturer Name

```
$ semautil /i get_bd_info 1
```

```
C:\Users\Adlink>semautil /i get_bd_info 1

Board manufacturer name: ADLINK Technology Inc.
```

Board Last Repair Date

```
$ semautil /i get_bd_info 10
```

```
C:\Users\Adlink>semautil /i get_bd_info 10

Data: 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF
```

Board Manufacturing Date

```
$ semautil /i get_bd_info 11
```

```
C:\Users\Adlink>semautil /i get_bd_info 11

Board manufacturer date: 04/08/2025
```


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4.2.2. Board Values

Read the real-time system and hardware parameters [corresponds to a specific sensor reading or board metric]

```
$ semautil /d get_value [EAPI ID]
```

```
C:\Users\Adlink>semautil /d

- Board values:
  1. semautil /d  get_value [EAPI ID]
       1         :  EAPI Specification Version
       2         :  Boot Counter
       3         :  Running Time Meter
       4         :  Vendor Specific Library Version
       5         :  CPU Temperature
       6         :  Board Temperature
       7         :  CPU Core Voltage
       8         :  2.5V Voltage
       9         :  3.3V Voltage
       10        :  Battery Voltage
       11        :  5V Voltage
       12        :  5V Standby Voltage
       13        :  12V Voltage
       14        :  CPU Fan
       15        :  System Fan 1
       16        :  Get power uptime
       17        :  Get restart event
       18        :  Get BMC capabilities
       19        :  Get extended BMC capabilities
       20        :  Board Min Temperature
       21        :  Board Max Temperature
       22        :  Board Startup Temperature
       23        :  CPU Min Temperature
       24        :  CPU Max Temperature
       25        :  CPU Startup Temperature
       26        :  Get main power current
       27        :  GFX Voltage
       28        :  1.05V Voltage
       29        :  1.5V Voltage
       30        :  Vin Voltage
       31        :  System Fan 2
       32        :  System Fan 3
       33        :  Board 2nd Current Temperature
       34        :  Board 2nd Min temperature
       35        :  Board 2nd Max Temperature
       36        :  Board 2nd Startup Temperature
       37        :  Get Power cycle counter
       38        :  Get Board BMC Flag
       39        :  Get Board BMC Status
       40        :  IO current
       41        :  System Temperature
       42        :  System Min Temperature
       43        :  System Max Temperature
       44        :  System Startup Temperature
```


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4.2.2.1. Dynamic Hardware Metrics / Runtime Statistics

Boot Counter

Number of hardware/software reset and successful power-up.

```
$ semautil /d get_value 2
```

```
C:\Users\Adlink>semautil /d get_value 2

Boot counter: 5433
```

Total On-Time (minutes)

Represents the total uptime of the system in minutes.

```
$ semautil /d get_value 3
```

```
C:\Users\Adlink>semautil /d get_value 3

Running Time Meter: 82471 minutes
```

Power-On Uptime

Represents the uptime of the system since last boot in seconds

```
$ semautil /d get_value 16
```

```
C:\Users\Adlink>semautil /d get_value 16

Board powerup time: 1262 seconds
```

Restart Event

Indicates the cause of the last system restart.

```
$ semautil /d get_value 17
```

```
C:\Users\Adlink>semautil /d get_value 17

Restart event: 0x20
```

Board Power-Cycle Counter

Indicates how many times the external power supply has been shut down (including standby voltage).

```
$ semautil /d get_value 37
```

```
C:\Users\Adlink>semautil /d get_value 37

Power cycle counter: 6003
```


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Board BMC/EC Status Flags

Displays information about the internal status of the EC/BMC

```
$ semautil /d get_value 38
```

```
C:\Users\Adlink>semautil /d get_value 38

BMC Flag:
Exception code : NO ERROR

Mode : AT Mode

BIOS : Standard BIOS
```

BMC status

This is not supported by EC boards.
Note: This screenshot was taken in MXE-210 board

```
$ semautil /d get_value 39
```

```
C:\Users\ADLINK>semautil /d get_value 39

Board BMC Status: 0x0
```

4.2.2.2. Software Details

EAPI specification version

```
$ semautil /d get_value 1
```

```
C:\Users\Adlink>semautil /d get_value 1

EAPI Specification Version: 1.0.00
```

Vendor-Specific Library Version

```
$ semautil /d get_value 4
```

```
C:\Users\Adlink>semautil /d get_value 4

SEMA Library Version : 4.2.15
```


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4.2.2.3. Controller Capabilities (EC / BMC)

Lists the supported and unsupported features

EC/BMC Capabilities

```
$ semautil /d get_value 18
```

```
C:\Users\Adlink>semautil /d get_value 18

BMC capabilities:

Bit       Capability                    Status                                Bit       Capability                    Status

0       Uptime and Power Cycles        : Supported                           16      I2C Bus 1                     : Supported
1       System Restart Event           : Supported                           17      I2C Bus 2                     : Not Supported
2       User-Flash Size                : 1024 bytes (0x0000 to 0x03FF)       18      CPU Fan                       : Supported
3       Runtime Watchdog               : Supported                           19      System Fan 1                  : Supported
4       Temperatures                   : Supported                           20      AT/ATX Mode                   : Supported
5       Voltage Monitor                : Supported                           21      ACPI Thermal Trigger          : Supported
6       Storage of failure reason      : Not Supported                       22      Power-up to last state        : Supported
7       Bootloader timeout             : Not Supported                       23      Backlight Restore             : Not Supported
8       Display Backlight control      : Not Supported                       24      DTS Temperature               : Not Supported
9       Power-up Watchdog              : Supported                           25      DTS Offset Registers          : Not Supported
10      Power Monitor (current sense)  : Supported                           26      System Fan 2                  : Not Supported
11      Boot counter                   : Supported                           27      System Fan 3                  : Not Supported
12&13   Input Voltage                  : Not Supported                       28      Ext-GPIO                      : Supported
                                                                             29      I2C Bus 3                     : Supported
14      Rsense of Power Monitor        : Not Supported                       30      I2C Bus 4                     : Not Supported
15      Dual-BIOS                      : Supported                           31      BMC ID 0                      : Other BMC
```

Extended EC/BMC Capabilities

```
$ semautil /d get_value 19
```

```
C:\Users\Adlink>semautil /d get_value 19

Extended BMC capabilities:

Bit       Capability                    Status                                Bit       Capability                    Status

32      Board 2 Temperature            : Not Supported                       40      Parameter Memory              : Supported
33      PEC Protocol                   : Not Supported                       41      Extended I2C registers for Status : Not Supported
                                                                             42      Ext-GPIO Input Interrupt      : Supported
35      Error log                      : Supported                           43      Hardware Monitor Input String  : Not Supported
36      1-Wire Bus                     : Not Supported                       44      Ext-GPIO Pins Count           : 12 Pins
37      Wake by EC                     : Supported                           45      Power-up/Runtime Watchdog support action setting : Not Supported

38      GPIO Alternate Function        : Not Supported                       46      Switch BIOS immediately       : Supported
39      Soft Fan                       : Supported
```


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4.2.2.4. Voltage Monitor

Note: Some voltage readings may be unsupported, as this functionality is board-specific. Refer to the BIOS to determine the supported voltages

CPU Core Voltage (mV)

```
$ semautil /d get_value 7
```

```
C:\Users\Adlink>semautil /d get_value 7

CPU Core Voltage: 1803 mV
```

2.5V Voltage (mV)

```
$ semautil /d get_value 8
```

```
$ semautil /d get_value 9
```

3.3V Voltage (mV)

```
C:\Users\Adlink>semautil /d get_value 9

3.3V Voltage: 3348 mV
```

Battery Voltage (mV)

```
$ semautil /d get_value 10
```

```
C:\Users\Adlink>semautil /d get_value 10

Battery Voltage: 2568 mV
```

5V Voltage (mV)

```
$ semautil /d get_value 11
```

```
C:\Users\Adlink>semautil /d get_value 11

Failed : Unsupported function.
```


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5V Standby Voltage (mV)

```
$ semautil /d get_value 12
```

```
C:\Users\Adlink>semautil /d get_value 12

5V Standby Voltage: 4994 mV
```

12V Voltage (mV)

```
$ semautil /d get_value 13
```

Main Power Current (mA)

```
$ semautil /d get_value 26
```

```
C:\Users\Adlink>semautil /d get_value 26

Main power current: 4880 mA
```

GFX Voltage (mV)

```
$ semautil /d get_value 27
```

1.05V Voltage (mV)

```
$ semautil /d get_value 28
```

1.5V Voltage (mV)

```
$ semautil /d get_value 29
```

VIN Voltage (mV)

```
$ semautil /d get_value 30
```

```
C:\Users\Adlink>semautil /d get_value  30

Vin Voltage: 11956 mV
```

IO Current (mA)

```
$ semautil /d get_value 40
```

```
C:\Users\Adlink>semautil /d get_value 40

IO Current: 5598 mA
```


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4.2.2.5. Temperature Monitor

CPU Temperature

```
$ semautil /d get_value 5
```

```
C:\Users\Adlink>semautil /d get_value 5

CPU temperature: 3111 K (38 C)
```

Board Temperature

```
$ semautil /d get_value 6
```

```
C:\Users\Adlink>semautil /d get_value 6

Board Temperature: 3131 K (40 C)
```

Minimum Board Temperature

```
$ semautil /d get_value 20
```

```
C:\Users\Adlink>semautil /d get_value 20

Board minimum temperature: 2951 K (22 C)
```

Maximum Board Temperature

```
$ semautil /d get_value 21
```

```
C:\Users\Adlink>semautil /d get_value 21

Board maximum temperature: 3211 K (48 C)
```

Startup Board Temperature

```
$ semautil /d get_value 22
```

```
C:\Users\Adlink>semautil /d get_value 22

Board startup temperature: 3001 K (27 C)
```


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Minimum CPU Temperature

```
$ semautil /d get_value 23
```

```
C:\Users\Adlink>semautil /d get_value 23

CPU minimum temperature: 2971 K (24 C)
```

Maximum CPU Temperature

```
$ semautil /d get_value 24
```

```
C:\Users\Adlink>semautil /d get_value 24

CPU maximum temperature: 3731 K (100 C)
```

Startup CPU Temperature

```
$ semautil /d get_value 25
```

```
C:\Users\Adlink>semautil /d get_value 25

CPU startup temperature: 3091 K (36 C)
```

Note: Check bit 32 of Extended EC/BMC Capabilities for Board 2nd temperature support

Board 2nd Current Temperature [Check bit 32 of Extended EC/BMC Capabilities]

```
$ semautil /d get_value 33
```

Board 2nd Minimum Temperature [Check bit 32 of Extended EC/BMC Capabilities]

```
$ semautil /d get_value 34
```

Board 2nd Maximum Temperature [Check bit 32 of Extended EC/BMC Capabilities]

```
$ semautil /d get_value 35
```

Board 2nd Startup Temperature [Check bit 32 of Extended EC/BMC Capabilities]

```
$ semautil /d get_value 36
```


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System Current Temperature

```
$ semautil /d get_value 41
```

```
C:\Users\Adlink>semautil /d get_value 41

System temperature: 2731 K (0 C)
```

System Minimum Temperature

```
$ semautil /d get_value 42
```

```
C:\Users\Adlink>semautil /d get_value 42

System Minimum temperature: 2731 K (0 C)
```

System Maximum Temperature

```
$ semautil /d get_value 43
```

```
C:\Users\Adlink>semautil /d get_value 43

System Maximum temperature: 2731 K (0 C)
```

System Startup Temperature

```
$ semautil /d get_value 44
```

```
C:\Users\Adlink>semautil /d get_value 44

System Startup temperature: 2731 K (0 C)
```

4.2.2.6. Fan Speed Monitor

Refer bit 18, 19, 26 and 27 of EC/BMC Capabilities for the fans available.

CPU Fan Speed

```
$ semautil /d get_value 14
```

```
C:\Users\Adlink>semautil /d get_value 14

CPU Fan speed: 0 RPM
```


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System Fan 1 Speed

```
$ semautil /d get_value 15
```

```
C:\Users\Adlink>semautil /d get_value 15

System Fan 1 speed: 0 RPM
```

System Fan 2 Speed

```
$ semautil /d get_value 31
```

System Fan 3 Speed

```
$ semautil /d get_value 32
```


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4.2.3. Watchdog Control

SEMA supports **runtime watchdog** and **power-up watchdog**.

The **Runtime Watchdog** is used to recover from operating system hangs, application software hangs, or other system malfunctions. When the runtime watchdog timer expires, the EC/BMC triggers a system reset and automatically stops the runtime watchdog.

The **Powerup Watchdog** is used to handle system reset or boot failures. The reset cycle is repeated until the system successfully boots and the application services the watchdog.

```
$ semautil /w
```

```
C:\Users\Adlink>semautil /w

- Watch Dog:
  1. semautil /w get_cap
  2. semautil /w start [sec (1-65535)]
  3. semautil /w trigger
  4. semautil /w stop
  5. semautil /w pwrup_enable [sec (60-65535)]
  6. semautil /w pwrup_disable
Note:   Start time will be different for the different platforms.
        Please go to BIOS menu to check it
```

4.2.3.1. Runtime Watchdog

Capabilities

Display the maximum supported values for event timeout, delay, and reset timeout.

```
$ semautil /w get_cap
```

```
C:\Users\Adlink>semautil /w get_cap

MaxEventTimeout : 0 seconds
MaxDelay : 0 seconds
MaxResetValue : 65535 seconds
```

Enable

The system will reset after the specified number of seconds (timeout).

```
$ semautil /w start [sec (1-65535)]
```

```
C:\Users\Adlink>semautil /w start 100

Run-time Watchdog Started with : 100 seconds
```


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Trigger

Refresh the runtime watchdog using the previously configured timeout value.

```
$ semautil /w trigger
```

```
C:\Users\Adlink>semautil /w trigger

Watchdog is triggered to 100 seconds.
```

Disable

Stop the runtime watchdog.

```
$ semautil /w stop
```

```
C:\Users\Adlink>semautil /w stop

Watchdog stopped successfully.
```

4.2.3.2. Powerup Watchdog

Enable

Set the timeout value and restart the system to enable the power-up watchdog. The powerup watchdog will continue to reset the system until it is disabled by the application or BIOS.

Caution: The startup time varies by platform. Check the system boot time and configure the power-up watchdog accordingly. If the timeout is set too short, the system may continuously reset.

```
$ semautil /w pwrup_enable [sec (60-65535)]
```

```
C:\Users\Adlink>semautil /w pwrup_enable 100

Power-Up Watchdog is load with 100 seconds
```

Disable

Stop the powerup watchdog.

```
$ semautil /w pwrup_disable
```

```
C:\Users\Adlink>semautil /w pwrup_disable

Power-Up Watchdog Disabled
```


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4.2.4. Storage Access

This section describes the commands for managing the on-board EEPROM storage **(Eg: EEPROM type: Microchip AT25256B)** connected to the EC/BMC. Users can read from and write to the user flash memory region of the EEPROM.

SEMA supports three storage regions: User, Secure, and ODM.

User Region (1024 bytes)

- Intended for general user data storage.
- Accessible without restrictions.
- This region cannot be locked or protected.

Secure Region (2048 bytes)

- Reserved for secure data.
- Read and write access is restricted and requires a passcode to unlock.

ODM Region (1024 bytes)

- Contains manufacturer-defined information such as hardware revision, board serial number, last repair date, manufacturing date, MAC addresses, UUID, and other board-specific data.
- Intended primarily for manufacturer use and not for customer access.
- Data in this region can be read without restrictions; however, write access requires passcode authentication.
- The reserved portion (0x0E00–0x0FFF) is allocated for internal use and must not be modified.

Note: Customers should use the **User region** to store their data.

Region	Address range	Base address	Valid Address to Read/Write	Block size
1-User	0x0000 to 0x03FF (1KB)	0x0000	0 to 1020	4
2-Secure	0x6000 to 0x67FF (2KB)	0x6000	0 to 2044	4
3-ODM	0x0C00 to 0x0FFF (1KB)	0x0C00	0 to 1020	4

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```
$ semautil /s
```

```
C:\Users\Adlink>semautil /s

- Storage:
  1. semautil /s get_cap   [Region]
  2. semautil /s read      [Region] [Address] [Length]
  3. semautil /s write     [Region] [Address] [string/value]
  4. semautil /s lock      [Region]
  5. semautil /s unlock    [Region] [Permission] [Passcode]
  6. semautil /s hex_write [Region] [Address] [value]
  7. semautil /s hex_read  [Region] [Address] [Length]
  8. semautil /s odm_write [ODM Id] [string/value]

       Region:
        1. User
        2. Secured
        3. ODM

       Permission
        1. Read-only
        2. Read/Write

       ODM Id:
        1.Hardware Revision
        2.Serial Number
        3.Last Repair date
        4.Manufacturing date
        5.2nd Hardware Revision
        6.2nd Serial Number
        7.MAC Id
        8.MAC Id 2

     Example: semautil /s write 1020 Aaaa 4
          It will be written to 1020, 1021, 1022, 1023

     Unlock the ODM region to perform odm_write operation

      Note : hex_write operation should be provided as below
        Example: semautil /s hex_write 1 128 aa bb c d
```

4.2.4.1. Capabilities

Display the **storage size and block size** of the selected region

```
$ semautil /s get_cap [Region]
```

```
C:\Users\Adlink>semautil /s get_cap 1

Storage Size: 1024 bytes
BlockSize: 4 bytes

C:\Users\Adlink>semautil /s get_cap 2

Storage Size: 2048 bytes
BlockSize: 4 bytes

C:\Users\Adlink>semautil /s get_cap 3

Storage Size: 1024 bytes
BlockSize: 4 bytes
```


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4.2.4.2. User Region

String Write Operation

```
$ semautil /s write [Region] [Address] [string/value]
```

```
C:\Users\Adlink>semautil /s write 1 00 accd

Data Written Successfully
```

String Read Operation

```
$ semautil /s read [Region] [Address] [Length]
```

```
C:\Users\Adlink>semautil /s read 1 00 4

The Data is "accd"
```

Hex Write Operation [Supported Only for EC Boards]

To write a hexadecimal value to the specified address

```
$ semautil /s hex_write [Region] [Address] [Value]
```

```
C:\Users\Adlink>semautil /s hex_write 1 00 aa bb cc dd

 4 Bytes Written Successfully
```

Hex Read Operation [Supported Only for EC Boards]

To read a hexadecimal value from the specified address

```
$ semautil /s hex_read [Region] [Address] [Length]
```

```
C:\Users\Adlink>semautil /s hex_read 1 00 4

Read Buffer : 0xAA 0xBB 0xCC 0xDD
```


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4.2.4.3. Secure and ODM Regions [Not for customer use and Supported Only for EC Boards]

The secure and ODM regions can be accessed using

Lock

To make the Secure region read/write protected or ODM region write protected

```
$ semautil /s lock [Region]
```

Unlock

The passcode must be used to gain read/write access to the Secure and ODM regions to perform String Write Operation, String Read Operation, Hex Write Operation [Supported Only for EC Boards] and Hex Read Operation [Supported Only for EC Boards]

```
$ semautil /s unlock [Region] [Permission] [Passcode]
```

ODM Write

The following system and manufacturer details [ODM details] can be changed using this command:

9. Hardware Revision
10. Serial Number
11. Last Repair date
12. Manufacturing date
13. 2nd Hardware Revision
14. 2nd Serial Number
15. MAC Id
16. MAC Id 2

```
$ semautil /s odm_write [ODM Id] [string/value]
```

```
C:\Users\Adlink>semautil /s odm_write 1 A0

Data Written Successfully

C:\Users\Adlink>semautil /i get_bd_info 5

HW revision: A0
```

The written string or value can be viewed using the following command:

```
$ semautil /i get_bd_info [EAPI Id]
```


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4.2.5. Voltage Monitor

Note: Some voltage readings may be unsupported, as this functionality is board-specific. Refer to the BIOS to determine the supported voltages.

```
$ semautil /v
```

```
C:\Users\Adlink>semautil /v

- Voltage monitor:
  1. semautil /v get_voltage [Channel (0 - 15)]
```

```
$ semautil /v get_voltage [Channel (0-15)]
```

```
C:\Users\Adlink>semautil /v get_voltage 0

Voltage : 2568 mv
Description : RTC

C:\Users\Adlink>semautil /v get_voltage 1

Voltage : 4994 mv
Description : 5VSB

C:\Users\Adlink>semautil /v get_voltage 2

Voltage : 11937 mv
Description : VIN

C:\Users\Adlink>semautil /v get_voltage 3

Voltage : 3345 mv
Description : 3.3V

C:\Users\Adlink>semautil /v get_voltage 4

Voltage : 1207 mv
Description : VMEM

C:\Users\Adlink>semautil /v get_voltage 5

Voltage : 3345 mv
Description : 3.3VSB

C:\Users\Adlink>semautil /v get_voltage 6

Voltage : 1803 mv
Description : VCORE

C:\Users\Adlink>semautil /v get_voltage 7

Current : 4665 mA
Description : Current Input Current
```


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4.2.6. GPIO Control

```
$ semautil /g
```

```
C:\Users\Adlink>semautil /g

- GPIO:
  1. semautil /g get_direction_cap
  2. semautil /g get_direction     [ID]  [GPIO Bit]
  3. semautil /g set_direction     [ID]  [GPIO Bit] [0 - Output or 1 - Input]
  4. semautil /g get_level         [ID]  [GPIO Bit]
  5. semautil /g set_level         [ID]  [GPIO Bit] [0 - Low or 1 - High]

  GPIO set/write parameters:
     GPIO Bit   0-15
     Note: GPIO function is not available in all platform
```

4.2.6.1. Capabilities

```
$ semautil /g get_direction_cap
```

```
C:\Users\Adlink>semautil /g get_direction_cap

Number of GPIO pins supported: 12 pins
```

4.2.6.2. GPIO Direction Control

To configure the direction of the GPIO pin as Input or output.

Read Direction

```
$ semautil /g get_direction [GPIO Bit]
```

```
C:\Users\Adlink>semautil /g get_direction 0 1

Direction: Input
```

Set Direction

```
$ semautil /g set_direction [GPIO Bit] [0-Output | 1-Input]
```

```
C:\Users\Adlink>semautil /g set_direction 0 1 0

Direction updated successfully
```

4.2.6.3. GPIO Level Control

To configure the level of the output GPIO pin as High or Low.

Read Level

```
$ semautil /g get_level [GPIO Bit]
```

```
C:\Users\Adlink>semautil /g get_level 0 1

Level: Low
```


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Set Level

```
$ semautil /g set_level [GPIO Bit] [0-Low | 1-High]
```

```
C:\Users\Adlink>semautil /g set_level 0 1 1

GPIO Level updated successfully
```

4.2.7. Generic I2C Access

```
$ semautil /i2c
```

```
C:\Users\Adlink>semautil /i2c

- Generic I2C Read/Write:
  1. semautil /i2c  bus_cap
  2. semautil /i2c  probe_device [bus id]
  3. semautil /i2c  write_raw    [bus id] [address] [wr length] [cmd] byte0 byte1 ...
  3. semautil /i2c  read_raw     [bus id] [address] [cmd] [re length]
  4. semautil /i2c  raw_xfer     [bus id] [address] [wr length] [rd length] byte0 byte1 byte2...
  5. semautil /i2c  read_xfer    [bus id] [address] [cmd type] [cmd] [read lentgh]
  6. semautil /i2c  write_xfer   [bus id] [address] [cmd type] [cmd] [length] byte0 byte1 byte2 ...
  7. semautil /i2c  get_status

[Bus Id]:
    ID  SEMA EAPI ID                  Description
    1   EAPI_ID_I2C_EXTERNAL    1st External I2C Interface
    2   EAPI_ID_I2C_EXTERNAL    2nd External I2C Interface
    3   EAPI_ID_I2C_EXTERNAL    3rd External I2C Interface
    4   EAPI_ID_I2C_EXTERNAL    4th External I2C Interface
  [Command type]:
    ID  ENCODED CMD ID          Description
    1   EAPI_I2C_NO_CMD         Specify no command/index is used
    2   EAPI_I2C_ENC_STD_CMD    Extended standard 8 bits CMD
    3   EAPI_I2C_ENC_EXT_CMD    Extended standard 10 bits CMD
```

4.2.7.1. Capabilities

To display the I2C buses supported by the board along with their maximum read and write sizes.

```
$ semautil /i2c bus_cap
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /i2c bus_cap

EAPI_ID_I2C_EXTERNAL_1 is supported. Max read size 32 bytes. Max write size 29 bytes.
EAPI_ID_I2C_EXTERNAL_2 is supported. Max read size 32 bytes. Max write size 29 bytes.
EAPI_ID_I2C_EXTERNAL_3 is supported. Max read size 32 bytes. Max write size 29 bytes.
EAPI_ID_I2C_EXTERNAL_4 is not supported
```

4.2.7.2. Device Probe

To display the list of slave addresses connected to the specified I2C bus.

```
$ semautil /i2c probe_device [bus id]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /i2c probe_device 3

Slave list in EAPI_ID_I2C_EXTERNAL_3 bus:
01. d
02. 3e
03. 50
04. 51
05. 52
06. 53
07. 54
```


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4.2.7.3. Transfer Functions

To perform separate read and write transactions

Read Transfer

```
$ semautil /i2c read_xfer [bus id] [address] [cmd type]
[cmd/offset] [read length]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /i2c read_xfer 3 50 2 00 4
Read data:

00 : 0a
01 : 0b
02 : 0c
03 : 0d
```

Write Transfer

```
$ semautil /i2c write_xfer [bus id] [address] [cmd type]
[cmd/offset] [write length] byte0 byte1 …
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /i2c write_xfer 3 50 2 00 4 a b c d

The I2C Write Transfer command is completed
```

4.2.7.4. Raw Functions [Supported only for EC Boards]

The write_raw, read_raw, and raw_xfer commands are used for combined write/read transactions that utilize the I²C repeated-start feature.

Read Raw

```
$ semautil /i2c read_raw [bus id] [address] [cmd/offset] [read
length]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /i2c read_raw 3 50 00 4
Read data:

00 : 01
01 : 02
02 : 03
03 : 04
```

Write Raw

When specifying the write length, include the offset. For example, to write 4 bytes of data, the total write length should be 5 bytes.

```
$ semautil /i2c write_raw [bus id] [address] [write length]
[cmd/offset] byte0 byte1 …
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /i2c write_raw 3 50 5 00 1 2 3 4

The I2C Write command is completed
```


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4.2.7.5. Raw Transfer

The raw_xfer command performs the same combined write/read operation as write_raw and read_raw, but in a single command.

```
$ semautil /i2c raw_xfer [bus id] [address] [write length]
[read_length] [cmd/offset] byte0 byte1 …
```

Read

```
C:\Program Files\Adlink\SEMA\Application>semautil /i2c raw_xfer 3 50 1 4 00
Read data:

00 : 0d
01 : 0c
02 : 0b
03 : 0a
```

Write

```
C:\Program Files\Adlink\SEMA\Application>semautil /i2c raw_xfer 3 50 5 0 00 d c b a

The I2C Write command is completed
```


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4.2.8. Error log Description

Note: Error log functionality is supported only on certain boards, refer bit 35 of Extended EC/BMC Capabilities.

```
$ semautil /e
```

```
C:\Users\Adlink>semautil /e

- Error log:
  1. semautil /e get_error_log  [Position(0-31)]
  2. semautil /e get_cur_error_log
  3. semautil /e get_bmc_error_code [Error Number]
```

4.2.8.1. Error Log

Current Error Log

```
$ semautil /e get_cur_error_log
```

```
C:\Users\Adlink>semautil /e get_cur_error_log
ErrorNumber:    5572
Flags:          0xb
RestartEvent:   0xa0
PowerCycle:     6002
BootCount:      5431
Time:           31735 seconds
TotalOnTime:    82451 minutes
BIOS Sel:       0x3
Status:         0xb
CPUTemp:        39 C
BoardTemp:      39 C
```

Error Log of the Position

Position 0 contains the most recent error log entry.

```
$ semautil /e get_error_log [Position (0-31)]
```

```
C:\Users\Adlink>semautil /e get_error_log 1
ErrorNumber:    5571
Flags:          0xd
RestartEvent:   0x70
PowerCycle:     6002
BootCount:      5431
Time:           31735 seconds
TotalOnTime:    82451 minutes
BIOS Sel:       0x3
Status:         0xd
CPUTemp:        39 C
BoardTemp:      39 C
```


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4.2.8.2. BMC Error Code

To get the BMC Error code description of the provided Error number

```
$ semautil /e get_bmc_error_code [Error number]
```

```
C:\Users\Adlink>semautil /e get_bmc_error_code 5572

5572  -> POWER_FAIL
```

4.2.9. BIOS Information

```
$ semautil /src
```

```
C:\Users\Adlink>semautil /src

- Get BIOS Source:
  1. semautil /src  get_src
  2. semautil /src  set_src bit-0 bit-1
  3. semautil /src  get_src_sts

Bit-0 Bit-1:
  0     0      -   By hardware configuration of currently selected BIOS
  0     1      -   Switch to Fail-Safe BIOS
  1     0      -   Switch to External BIOS (SPI0 on carrier)
  1     1      -   Switch to Internal BIOS (SPI0 on module)
```

4.2.9.1. BIOS selection status

Display the type of BIOS selected as PICMG BIOS or Dual BIOS and the state of external hardware jumper control signals.

```
$ semautil /src get_src_sts
```

```
C:\Users\Adlink>semautil /src get_src_sts

 PICMG BIOS Selected.

    Bit2  Bit1  Bit0
     0     0     0  - *M0 Module SPI0 / C1 Carrier SPI1 (Standard
BIOS)
     0     0     1  - *C0 Carrier SPI0 / M1 Module SPI1 (Fail-Safe
 BIOS)
     0     1     0  - Not PICMG Mode / Unknown
 ->  0     1     1  - *M0/M1 (Standard BIOS
     1     0     0  - Not Dual BIOS Mode / Unknown
     1     0     1  - Switch to Fail - Safe BIOS
     1     1     0  - Switch to External BIOS(SPI0 on carrier)
     1     1     1  - Switch to Internal BIOS(SPI0 on module)
```


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4.2.9.2. BIOS Boot Source Configuration

Set BIOS Boot Source mode

```
$ semautil /src set_src [bit-0] [bit-1]
```

```
C:\Users\Adlink>semautil /src set_src 0 1

BIOS Boot source mode set successfully
```

Read BIOS Boot Source mode

```
$ semautil /src get_src
```

```
C:\Users\Adlink>semautil /src get_src
Bit0  Bit1
 0     1  - Switch to Fail - Safe BIOS
```

4.2.10. UUID [Type 4]

```
$ semautil /c
```

```
C:\Users\Adlink>semautil /c

- UUID:
  1. semautil /c guid_generate_write
  2. semautil /c guid_read
```

4.2.10.1. Write New UUIDv4

```
$ semautil /c guid_generate_write
```

```
C:\Users\Adlink>semautil /c guid_generate_write

Generated GUID: {51A7E134-1C93-48EE-8288-03302D10D1B9}

GUID Written Successfully
```

4.2.10.2. Read UUIDv4

```
$ semautil /c guid_read
```

```
C:\Users\Adlink>semautil /c guid_read

Read Buffer : 0x51 0xA7 0xE1 0x34 0x1C 0x93 0x48 0xEE 0x82 0x88 0x
03 0x30 0x2D 0x10 0xD1 0xB9
```


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4.2.11. Smart Fan Control

This functionality is used to control the fan connected to the CPU or system.

Each fan controller supports 4 temperature trigger levels, each associated with a corresponding PWM value. Whenever a temperature trigger level is crossed, the fan speed is adjusted based on the configured PWM value for that level.

Note: Fan control functionality is supported only on certain boards, refer bit 18, 19, 26 and 27 of EC/BMC Capabilities for the fans available.

```
$ semautil /f
```

```
C:\Users\Adlink>semautil /f

-Smart FAN control:
  1. semautil /f set_temp_points [FanID] [Level 1] [Level 2] [Level 3] [Level 4]
  2. semautil /f set_pwm_points  [FanID] [PWM Level 1] [PWM Level 2] [PWM Level 3] [PWM Level 4]
  3. semautil /f get_temp_points [FanID]
  4. semautil /f get_pwm_points  [FanID]
  5. semautil /f set_temp_source [FanID] [TempSrc]
  6. semautil /f get_temp_source [FanID]
  7. semautil /f get_mode        [FanID]
  8. semautil /f set_mode        [FanID] [Mode]

 CPU Fan TempSrc:
        0 - CPU sensor
        1 - Board sensor

 System Fan1 TempSrc:
        0 - CPU sensor
        1 - Carrier sensor
  FanID
        0 : CPU fan
        1 : System fan 1
        2 : System fan 2
        3 : System fan 3
  Mode
        0 : Auto
        1 : Off
        2 : On
        3 : Soft
```

4.2.11.1. Temperature Set Points

Describes the temperature trigger level corresponding to the percentage of PWM trigger level (Maximum temperature set point = 100).

Set Temperature Trigger Levels

```
$ semautil /f set_temp_points [FanID] [Level1] [Level2] [Level3]
[Level4]
```

```
C:\Users\Adlink>semautil /f set_temp_points 0 10 30 40 50

Temperature levels set successfully
```


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Read Temperature Trigger Levels

```
$ semautil /f get_temp_points [FanID]
```

```
C:\Users\Adlink>semautil /f get_temp_points 0

Fan ID: 0 (CPU Fan)
Level 1 : 10
Level 2 : 30
Level 3 : 40
Level 4 : 50
```

4.2.11.2. Temperature Source

Describes which temperature sensor will be used for calculating the PWM level of the selected fan.

- The temperature source for the CPU fan can be set to either the CPU sensor or the board sensor.
- The temperature source for System Fan 1 can be set to either the CPU sensor or the carrier sensor.

Set Temperature Source

```
$ semautil /f set_temp_source [FanID] [TempSrc]
```

```
C:\Users\Adlink>semautil /f set_temp_source 0 1

Temperature source is set to 1 (Baseboard sensor)
```

Read Temperature Source

```
$ semautil /f get_temp_source [FanID]
```

```
C:\Users\Adlink>semautil /f get_temp_source 0

Current Temperature source is 1 (Baseboard sensor)
```

4.2.11.3. PWM Set Points

Describes the percentage of PWM trigger level corresponding to the temperature trigger level (Maximum PWM set point = 100).

Set PWM Trigger level

```
$ semautil /f set_pwm_points [FanID] [PWMLevel1] [PWMLevel2]
[PWMLevel3] [PWMLevel4]
```

```
C:\Users\Adlink>semautil /f set_pwm_points 0 30 45 60 80

PWM levels set successfully
```


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Read Temperature Trigger Levels

```
$ semautil /f get_pwm_points [FanID]
```

```
C:\Users\Adlink>semautil /f get_pwm_points 0

Fan ID: 0 (CPU Fan)
Level 1 : 30
Level 2 : 45
Level 3 : 60
Level 4 : 80
```

4.2.11.4. Fan Mode

SEMA supports 4 fan modes.

- Auto – the fan will be automatically controlled using the Trigger Settings described
- Off – the fan is turned off completely
- On – the fan runs at maximum RPM (PWM level 100%)
- Soft – Auto mode with PWM Level Interpolation (i.e.) The PWM level is not adapted stepwise, but continuously.

Set Fan Mode

```
$ semautil /f set_mode [FanID] [Mode]
```

```
C:\Users\Adlink>semautil /f set_mode 0 1

FAN mode set successfully.
```

Get Fan Mode

```
$ semautil /f get_mode [FanID]
```

```
C:\Users\Adlink>semautil /f get_mode 0

Fan ID: 0 (CPU Fan)

Fan Mode: 1 (Off)
```


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4.2.12. Backlight Control

To control the LVDS backlight panel connected to the EC/BMC.

Note: Backlight control is supported only on certain boards, refer bit 8 of EC/BMC Capabilities.

```
$ semautil /b
```

```
C:\Users\Adlink>semautil /b

- LVDS Backlight control:
  1. semautil /b  set_bkl_value   [ID] [Level (0-255)]
  2. semautil /b  set_bkl_enable  [ID] [0 - Disable or 1 - Enable]
  3. semautil /b  get_bkl_value   [ID]
  4. semautil /b  get_bkl_enable  [ID]
      [ID]       LCD
       0    EAPI_ID_BACKLIGHT_1
       1    EAPI_ID_BACKLIGHT_2
       2    EAPI_ID_BACKLIGHT_3
```

4.2.12.1. LVDS Panel Status Control

Enable/Disable the Backlight Panel

```
$ semautil /b set_bkl_enable [ID] [0 - Disable | 1 - Enable]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /b get_bkl_enable 0

Backlight ON
```

Read the Backlight Panel Status

Display the ON/OFF status of the selected panel.

```
$ semautil /b get_bkl_enable [ID]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /b get_bkl_enable 0

Backlight ON
```

4.2.12.2. LVDS Panel Brightness Control

Set Brightness

Set the backlight brightness (PWM) level of the specified panel. Maximum PWM level – 255

```
$ semautil /b set_bkl_value [ID] [Level (0-255)]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /b set_bkl_value 0 100

Current backlight value is set to 100
```


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Read Brightness

Display the brightness PWM level

```
$ semautil /b get_bkl_value [ID]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /b get_bkl_value 0

Current backlight value is 100
```

4.2.13. Exception Description

Displays the Exception Codes returned by EC/BMC flags.

```
$ semautil /x get_excep_desc
```

```
C:\Users\Adlink>semautil /x get_excep_desc

00  -> NOERROR
02  -> NO_SUSCLK
03  -> NO_SLP_S5
04  -> NO_SLP_S4
05  -> NO_SLP_S3
06  -> BIOS_FAIL
07  -> RESET_FAIL
08  -> RESETIN_FAIL
09  -> NO_CB_PWROK
10  -> CRITICAL_TEMP
11  -> POWER_FAIL
12  -> VOLTAGE_FAIL
13  -> RSMRST_FAIL
14  -> NO_VDDQ_PG
15  -> NO_V1P05A_PG
16  -> NO_VCORE_PG
17  -> NO_SYS_GD
18  -> NO_V5SBY
19  -> NO_V3P3A
20  -> NO_V5_DUAL
21  -> NO_PWRSRC_GD
22  -> NO_P_5V_3V3_S0_PG
23  -> NO_SAME_CHANNEL
24  -> NO_PCH_PG
```


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4.2.14. SMBus Access

This functionality is supported only on BMC-based boards.
To identify the devices connected to the SMBus of the hardware, refer to the hardware user manual.

```
$ semautil /smb
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /smb

- SMBus:
  1. semautil /smb write_word [Addr] [Cmd] [data]
  2. semautil /smb read_word  [Addr] [Cmd]
  3. semautil /smb write_byte [Addr] [Cmd] [data]
  4. semautil /smb read_byte  [Addr] [Cmd]
```

Test Environment

Module: LEC-AL
OS: Windows 10
Board BIOS revision: 5.05.10
BMC application revision: BMC LEC-AL 1v9 Jul 28 2021
BMC Bootloader revision: bl_LEC-AL 4v2 May 19 2017 (c) ADLINK Technology Inc.

According LEC-AL user manual, the GPIO expander (PCA9535A) is connected at SMBus address 0x40 (8-bit address).

4.2.14.1. Read Operations

Read Byte

To read 1 byte of data from the SMBus device

```
$ semautil /smb read_byte [Addr] [Cmd]
```

[Addr] - 7-bit SMBus slave address
[Cmd] - SMBus command

```
C:\Program Files\Adlink\SEMA\Application>semautil /smb read_byte 20 0x06

Read data: aa
```

Read Word

To read 1 word (2 bytes) of data from the SMBus device

```
$ semautil /smb read_word [Addr] [Cmd]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /smb read_word 20 0x06

Read data:
00 : aa
01 : 00
```


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4.2.14.2. Write Operations

Write Byte

To write 1 byte of hexadecimal data to SMBus Device

```
$ semautil /smb write_byte [Addr] [Cmd] [Data]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /smb write_byte 20 0x06 33

The SMBus Write Byte Transfer command is completed
```

Write Word

To write 1 word (2 bytes) of hexadecimal data to the SMBus device

```
$ semautil /smb write_word [Addr] [Cmd] [Data]
```

```
C:\Program Files\Adlink\SEMA\Application>semautil /smb write_word 20 0x06 11 22

The SMBus Write Word Transfer command is completed
```

To get the EAPI usage, refer to the SEMA EAPI Guide attached in the below link

Link: [Technical Resources | ADLINK]

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5. Annexure

5.1. Restart Event

Code	Code name	Description
0x00	SEMA_SRE_UNKNOWN	Unknown reason of restart (shown only on first BMC power-up)
0x20	SEMA_SRE_SW_RESET	A reset by software caused the restart of the system
0x30	SEMA_SRE_HW_RESET	A reset by hardware caused the restart of the system (e.g.: Reset button)
0x40	SEMA_SRE_WATCHDOG	The watchdog has restarted the system
0x50	SEMA_SRE_BIOS_FAULT	Standard BIOS is corrupted -> boot from Fail-Safe BIOS
0x60	SEMA_SRE_PWR_DOWN	The system was shut down (e.g. power button, ACPI shutdown)
0x70	SEMA_SRE_PWR_LOSS	The system was restarted after a power loss (e.g. external power supply instable or switched off while the system was running)
0x80	SEMA_SRE_PWR_CYCLE	The system is restarted after a power cycle (e.g. internal power supply has failed)
0x90	SEMA_SRE_VIN_DROP	The system is restarted after a voltage drop of the main input voltage
0xA0	SEMA_SRE_PWR_FAIL	The system is restarted after a power fail detection of an internal power supply circuit
0xB0	SEMA_SRE_CRIT_TEMP	The system was shut down by ACPI watchdog (CPU reached critical temperature)
0xC0	SEMA_SRE_WAKEUP	The system has received a wake event and resumes operation from a sleep

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5.2. Accessing I2C in Linux using I2C-tools

Test Environment:

Module: Express-DN7-C808
OS: Ubuntu 22.04 [Kernel 6.8.0-40-generic]

Accessing EEPROM using i2c-tools

The 7-bit slave address for GPIO Expander [PCA9535] is 0x20.

i2cdetect: This tool is used to scan I2C buses and detect connected devices.

To scan I2C buses and detect connected devices -

```
$ sudo i2cdetect -l
```

To list the addresses of detected bus -

```
$ sudo i2cdetect -y <Bus number>
```

```
adlink@adlink-cExpress-EL:~/Documents/sema-linux-bmc-4.3.3$ sudo i2cdetect -l
i2c-0   smbus           SMBus CMI adapter SMB0001:00            SMBus adapter
i2c-1   smbus           SMBus iSMT adapter at 7e7ff14000        SMBus adapter
i2c-2   smbus           SMBus I801 adapter at e000              SMBus adapter
i2c-3   i2c             Radeon i2c bit bus 0x90                 I2C adapter
i2c-4   i2c             Radeon i2c bit bus 0x91                 I2C adapter
i2c-5   i2c             Radeon i2c bit bus 0x92                 I2C adapter
i2c-6   i2c             Radeon i2c bit bus 0x93                 I2C adapter
i2c-7   i2c             Radeon i2c bit bus 0x94                 I2C adapter
i2c-8   i2c             Radeon i2c bit bus 0x95                 I2C adapter
i2c-9   i2c             Radeon i2c bit bus 0x96                 I2C adapter
i2c-10  i2c             Radeon i2c bit bus 0x97                 I2C adapter
```

```
adlink@adlink-cExpress-EL:~/Documents/sema-linux-bmc-4.3.3$ sudo i2cdetect -y 2
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:                         08 -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: 20 -- -- -- -- -- -- -- 28 -- -- -- -- -- -- --
30: 30 -- -- -- -- 35 UU UU -- -- -- -- -- -- -- --
40: -- -- -- -- 44 -- -- -- -- -- -- -- -- -- -- --
50: UU -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
```


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i2cdump: This tool reads and dumps the contents of an I2C device's registers. It is useful for extracting larger data sets from devices like EEPROMs, GPIOs.

```
$ sudo i2cdump -y <Bus number> <Slave Address>
```

This command dumps the contents of the device at address <Slave address> on <Bus number>

```
adlink@adlink-cExpress-EL:~$ sudo i2cdump -f -y 2 0x20
No size specified (using byte-data access)
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f    0123456789abcdef
00: 0f ff 0f ff 00 00 0f 00 XX XX XX XX XX XX XX XX    ?.?...?.XXXXXXXX
10: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
20: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
30: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
40: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
50: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
60: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
70: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
80: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
90: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
a0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
b0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
c0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
d0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
e0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
f0: XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX XX    XXXXXXXXXXXXXXXX
```

i2cget and **i2cset** commands provide read and write access of a specific register of an I2C device

Table 4. Command byte

Command	Register
0	Input port 0
1	Input port 1
2	Output port 0
3	Output port 1
4	Polarity Inversion port 0
5	Polarity Inversion port 1
6	Configuration port 0
7	Configuration port 1

```
adlink@adlink-cExpress-EL:~$ sudo i2cget -f -y 2 0x20 0x06
0x0f
adlink@adlink-cExpress-EL:~$ sudo i2cset -f -y 2 0x20 0x06 0x0e
adlink@adlink-cExpress-EL:~$ sudo i2cget -f -y 2 0x20 0x06
0x0e
```


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6. FAQs & Troubleshooting

1. **Permission Denied Error**
   Platform: Ubuntu
   Error Details: Permission denied error while trying to use the commands

```
adlink@adlink-Default-string:~$ semautil /v get_voltage 0
Get EApi information failed
EApiBoardGetVoltageMonitor error 13, Permission denied
adlink@adlink-Default-string:~$
```

   Solution: Execute the SEMA commands with root privileges (i.e.) use "sudo" in the beginning of the command

2. **Fan control**
   Explain the fan modes. What should be the setting of the fan if we require constant rpm value.
   Fan modes:
   - Auto – the fan will be automatically controlled using the Trigger Settings described
   - Off – the fan is turned off completely
   - On – the fan runs at maximum RPM (PWM level 100%)
   - Soft – Auto mode with PWM Level Interpolation (i.e.) The PWM level is not adapted stepwise, but continuously.

   Fan mode changed to "**On"** to get the constant rpm value.

3. **Backlight Control**
   Whenever Backlight enable command is passed from **Off** state, the backlight of the panel is updated to default Brightness level 200.

4. **I2C Control**
   How to view the slave devices connected to I2C in Windows?
   Refer to 4.2.7.2. Device Probe section.

5. **How to access I2C in BMC boards Linux?**
   Refer to 5.2. Accessing I2C in Linux using I2C-tools

6. **SMBus Write Fail**
   Platform: Ubuntu
   Error Details: Tried to access EEPROM in COM-HPC-cRLS using SMBus Write command and I2C tools. Both returned write failed.

```
root@COM-HPC-cRLS:~# i2cset -y 10 0x56 0x03
Error: Write failed
root@COM-HPC-cRLS:~# semautil /smb  write_byte 0x56 0 0x03
Get EApi information failed
Failed
```

   using i2c-tools command
   using semautil command

   Solution: Set the **SPD Write disable** option in BIOS to **FALSE.** Then try writing into the desired command.

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7. **GPIO Level Set Fail**
   Platform: Ubuntu
   Error Details: SEMA utility can't set level under Ubuntu 20.04.6 LTS
   Solution: The level of GPI pin cannot be changed. Only if the direction of the GPIO pin is in **OUTPUT,** the level of the GPIO pin can be changed.

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