

# GNU FreeIPMI User's Guide

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Free Intelligent Platform Management System  
Version 0.2.0 updated on 10 February 2006

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# 1 Introduction to the GNU FreeIPMI system

GNU FreeIPMI is a Free Intelligent Platform Management System Software. It provides “Remote-Console” (out-of-band), “System Management Software” (in-band) and a development library conforming to Intelligent Platform Management Interface (IPMI v1.5) standards.

GNU FreeIPMI User’s Guide concentrates installation, usage, troubleshooting and bug reporting. It corresponds to 0.2.0 release.

## 1.1 Who should read this guide?

If you want to use the *Intelligent Platform Management Interface* functionalities available on modern motherboards running GNU or any POSIX compliant operating systems, this guide is right for you.

## 1.2 IPMI - Platform Management Standard

The IPMI specifications define standardized, abstracted interfaces to the platform management subsystem. IPMI includes the definition of interfaces for extending platform management between board within the main chassis, and between multiple chassis.

The term platform management is used to refer to the monitoring and control functions that are built in to the platform hardware and primarily used for the purpose of monitoring the health of the system hardware. This typically includes monitoring elements such as system temperatures, voltages, fans, power supplies, bus errors, system physical security, etc. It includes automatic and manually driven recovery capabilities such as local or remote system resets and power on/off operations. It includes the logging of abnormal or out-of-range conditions for later examination and alerting where the platform issues the alert without aid of run-time software. Lastly it includes inventory information that can help identify a failed hardware unit.

## 2 Installing GNU FreeIPMI

You can obtain copies of source, binary, documentation and other useful information from the [GNU FreeIPMI Home Page](#).

### 2.1 Dependencies

GNU FreeIPMI is designed to have minimum dependencies on other libraries and tools. FreeIPMI Shell alone depends on GNU Guile and GNU Readline for the convenience of extension, scripting and GNU Bash like user interface. libfreeipmi library has virtually no dependencies at all.

List of dependencies under Debian GNU/Linux:

- GNU Guile - guile-1.6, guile-1.6-dev
- GNU Readline - libreadline4, libreadline4-dev

List of dependencies under Fedora or RedHat GNU/Linux:

- GNU Guile - guile-1.6.x, guile-devel-1.6.x.
- GNU Readline - readline-4.x, readline-devel-4.x

List of dependencies under FreeBSD:

- FreeBSD (tested on FreeBSD 5.3-BETA7) -  
You will need "options SYSVSEM" in your kernel config or sysvsem.ko module loaded.  
On FreeBSD > 5.2.1 You will also need "device io" in kernel or loaded as module unless  
You specify USE\_IOPERM compilation option (see note on i386\_set\_ioperm below).
- guile library (tested with guile-1.6.4\_6) - ports/lang/guile
- argp library (tested with argp-standalone-1.3) - ports/devel/argp-standalone.
- gmake

### 2.2 Building the source package.

To compile the program, you must first run the `configure` script included with the source tar ball. It works just like any other standard GNU `autoconf` created script. See the more generic configure related installation instructions below.

For complete list of options, try `configure --help`.

Note: Please run `./autogen.sh` script before `./configure`, if you are compiling FreeIPMI source from CVS.

```
# ./configure --prefix=/usr
# make
# make install
```

#### 2.2.1 Installing under FreeBSD:

Example:

```
tar xzvf freeipmi-0.1.3.tar.gz
cd freeipmi-0.1.3
env CFLAGS="-I/usr/local/include" \
  LDFLAGS="-L/usr/local/lib -largp" \
```

```

./configure
make all
# su to root
make install
mkdir -p /var/lib/freeipmi
chmod 0700 /var/lib/freeipmi
touch /var/lib/freeipmi/ipckey

```

### 2.2.1.1 Using `i386_set_ioperm(2)` instead of `io(4)` under FreeBSD:

`i386_set_ioperm` has known issues on FreeBSD 5.x (bus errors on io port access), so this patch uses `io(4)` to access io ports by default. To enable using `i386_set_ioperm` instead of `io(4)` specify `USE_IOPERM` compilation option at configure time:

Example:

```

env CFLAGS="-DUSE_IOPERM -I/usr/local/include" \
LDLFLAGS="-L/usr/local/lib -largp" \
./configure

```

## 2.3 Test Fire

GNU FreeIPMI works both in-band (with-in the system) and out-of-band (over the network). Easiest way to test if your system has IPMI support or if the installation is OK is through `bmc-info` command.

Test if IPMI works:

```

ipmitest:~# bmc-info
Device ID:          20
Device Revision:    1
                   [SDR Support]
Firmware Revision: 1.32
                   [Device Available (normal operation)]
IPMI Version:       1.5
Additional Device Support:
                   [Sensor Device]
                   [SDR Repository Device]
                   [SEL Device]
                   [FRU Inventory Device]
                   [IPMB Event Receiver]
                   [Chassis Device]
Manufacturer ID:    B000157h
Product ID:         1Bh
Aux Firmware Revision Info: 10011500h
Channel Information:
  Channel No: 0
  Medium Type: IPMB (I2C)
Protocol Type: IPMB-1.0
  Channel No: 1
  Medium Type: Asynch. Serial/Modem (RS-232)

```

```
Protocol Type: IPMB-1.0
  Channel No: 3
  Medium Type: PCI SMBus
Protocol Type: IPMI-SMBus
  Channel No: 4
  Medium Type: System Interface (KCS, SMIC, or BT)
Protocol Type: KCS
  Channel No: 6
  Medium Type: 802.3 LAN
Protocol Type: IPMB-1.0
  Channel No: 7
  Medium Type: 802.3 LAN
Protocol Type: IPMB-1.0
ipmitest:~#
```

If you don't get the expected response from `bmc-info` command, please refer to [Chapter 17 \[Trouble-shooting\]](#), page 80.

### 3 IPMI C library (libfreeipmi)

The Core of GNU FreeIPMI system consists of LAN, KCS, SMIC system interface device drivers, all packaged in a single portable C library. Management applications can access the BMC at various levels using higher level IPMI command APIs or raw read/write interface to the driver.

Library internally uses SM BIOS and PCI drivers to locate the system interfaces.

You should note that all the device drivers are completely written in user-space. If you already have any in-kernel IPMI drivers loaded, unload them before you launch any GNU FreeIPMI utility. Otherwise there are no other prerequisites.

## 4 ipmi-locate IPMI device probing tool

`ipmi-locate` tool tries to probe and display KCS/SMIC/BT/SSIF IPMI device interface informations by using various probing techniques. The tool also displays default values of IPMI device interfaces of most commonly used in BMC manufacturers. This tool may not probe on some machines, but FreeIPMI tools work on them with default values. This behavior has been seen in Tyan motherboard with SMDC card.

### 4.1 Command-line options

- `-?`, `—help`  
Give this help list.
- `—usage`  
Give a short usage message.
- `-V`, `—version`  
Print program version.

### 4.2 Example

```
www:~# ipmi-locate
Probing KCS device using SMBIOS... done
IPMI Version: 1.5
IPMI locate driver: SMBIOS
IPMI locate driver: 0
IPMI interface: KCS
BMC I2C device: (null)
BMC I/O base address: CA2
Register space: 1

Probing SMIC device using SMBIOS... FAILED

Probing BT device using SMBIOS... FAILED

Probing SSIF device using SMBIOS... FAILED

Probing KCS device using ACPI... FAILED

Probing SMIC device using ACPI... FAILED

Probing BT device using ACPI... FAILED

Probing SSIF device using ACPI... FAILED

Probing KCS device using PCI... FAILED

Probing SMIC device using PCI... FAILED
```

Probing BT device using PCI... FAILED

Probing SSIF device using PCI... FAILED

KCS device default values:  
IPMI Version: 1.5  
IPMI locate driver: DEFAULT  
IPMI locate driver: 0  
IPMI interface: KCS  
BMC I2C device: (null)  
BMC I/O base address: CA2  
Register space: 1

SMIC device default values:  
IPMI Version: 1.5  
IPMI locate driver: DEFAULT  
IPMI locate driver: 0  
IPMI interface: SMIC  
BMC I2C device: (null)  
BMC I/O base address: CA9  
Register space: 1

BT device default values:

SSIF device default values:  
IPMI Version: 1.5  
IPMI locate driver: DEFAULT  
IPMI locate driver: 0  
IPMI interface: SSIF  
BMC I2C device: /dev/i2c-0  
BMC SMBUS slave address: 20  
Register space: 1

www:~#

## 5 FISH FreeIPMI SHell

Fish provides shell, extension/plugin and scripting interface. As a shell, User has access to both in-band and out-of-band access to the host BMC through a rich set of IPMI commands.

Experienced System Administrators can quickly add features or limitlessly customize the system using the extension interface in Scheme language. For example, Pushing System Event Log data to a MySQL server, Triggering alarm upon Platform Chassis Intrusion, Generating email for critical platform events like processor temperature above threshold limit or fan failure or memory errors. . . In fact, most of the functionalities and commands of this shell are themselves implemented through Fish extensions.

### 5.1 Command-line arguments to fish

- `--no-probing`  
Do not probe IPMI devices.
- `-D, --driver-type=IPMIDRIVER`  
Use this *IPMIDRIVER* instead of auto selection. Allowed values are KCS, SMIC, SSIF and LAN.
- `--driver-address=DRIVERADDR`  
Use this *DRIVERADDR* address instead of probed one.
- `--driver-device=DEVICE`  
Use this *DEVICE* for IPMI driver.
- `-h, --hostname=IPMIHOST`  
Connect to *IPMIHOST*.
- `-u, --username=USERNAME`  
Use *USERNAME* instead of NULL. Maximum USERNAME length is 16.
- `-p, --password=PASSWORD`  
Use *PASSWORD* instead of NULL. Maximum PASSWORD length is 16.
- `-a, --auth-type=AUTHTYPE`  
Use *AUTHTYPE* instead of NONE. Allowed values are NONE, MD2, MD5, PLAIN and OEM.
- `-l, --priv-level=PRIVILEGE-LEVEL`  
Use this *PRIVILEGE-LEVEL* instead of USER. Allowed values are CALLBACK, USER, OPERATOR, ADMIN and OEM.
- `-s, --script-file=SCRIPT-FILE`  
Load and execute given SCRIPT-FILE.
- `-?, --help`  
Give this help list.
- `--usage`  
Give a short usage message.
- `-V, --version`  
Print program version.

## 5.2 Setting default startup options

Fish can be customized to great extent using Scheme language interface. You should refer to [guile], page i for advanced options.

Example configuration file: `‘/usr/etc/fish/fish.scm’`

```
;; fish.scm: default fish configuration scm

;; Customize Fish:
(fi-set-prompt! "fish# ")

;; Set driver SMS IO Base port
; (fi-set-sms-io-base! #x0CA2)

;; Set Driver Internals:
; (fi-set-default-driver-poll-interval 10)

;; Example Group Aliases
; (set! sensors-group-alias-list
;   '(
;     (mysystem . (Processor Fan "Power Supply" Current Memory Chassis))
;     (power . ("Power Supply"))
;     (security . ("Platform Chassis Intrusion Platform Security Violation"))
;   ))
```

## 5.3 Invoking fish

### 5.3.1 fish as shell

Fish takes (GNU getopt-long style) command-line arguments and starts as a shell by default with a neat readline interface. You can type `fish` commands at the prompt. Type `‘--help’` to get help on list of available commands and `‘quit’` to exit the shell.

```
www:~# fish
FreeIPMI Shell [fish-0.2.beta1]
Copyright (C) 2003-2005 FreeIPMI Core Team
This program is free software; you may redistribute it under the terms of
the GNU General Public License. This program has absolutely no warranty.
fish# help sensors
sensors [--no-probing] [--driver-type=IPMIDRIVER]
        [--driver-address=DRIVERADDR] [--driver-device=DEVICE]
        [--hostname=IPMIHOST] [--username=USERNAME]
        [--password=PASSWORD] [--auth-type=AUTHTYPE]
        [--priv-level=PRIVILEGE-LEVEL] [--verbose] [--sdr-info]
        [--flush-cache] [--list-groups] [--all] [--group=GROUP]
        [--sensors=SENSORS-LIST] [--help] [--usage] [--version]

        Displays current readings of sensor chips through BMC.
fish# quit
```

```
www:~#
```

### 5.3.2 Fish as script interpreter

To start fish as a script interpreter, you can either include script header or invoke with `fish` with `--script-file=SCRIPT-FILE` option.

Example fish self executable script:

```
#!/usr/sbin/fish -s
!#
(bmc-info-main (fi-command-line))
(display "bmc-info exited with [")
(display bmc-info-exit-status)
(display "]" status\n")
(fi-exit bmc-info-exit-status)
```

Example invoking through command-line:

```
debian-ia64:~# fish --script-file=/root/work/fish-examples/bmc-info.scm
Device ID:          20
Device Revision:    1
                   [SDR Support]
Firmware Revision: 1.32
                   [Device Available (normal operation)]
IPMI Version:       1.5
Additional Device Support:
                   [Sensor Device]
                   [SDR Repository Device]
                   [SEL Device]
                   [FRU Inventory Device]
                   [IPMB Event Receiver]
                   [Chassis Device]
Manufacturer ID:    B000157h
Product ID:         1Bh
Aux Firmware Revision Info: 10011500h
Channel Information:
  Channel No: 0
  Medium Type: IPMB (I2C)
Protocol Type: IPMB-1.0
  Channel No: 1
  Medium Type: Asynch. Serial/Modem (RS-232)
Protocol Type: IPMB-1.0
  Channel No: 3
  Medium Type: PCI SMBus
Protocol Type: IPMI-SMBus
  Channel No: 4
  Medium Type: System Interface (KCS, SMIC, or BT)
Protocol Type: KCS
  Channel No: 6
  Medium Type: 802.3 LAN
```

```

Protocol Type: IPMB-1.0
Channel No: 7
Medium Type: 802.3 LAN
Protocol Type: IPMB-1.0
bmc-info exited with 0 status
debian-ia64:~#

```

### 5.3.3 Fish extensions

Fish extensions are like normal Scheme programming with additional built-in IPMI primitives and procedures. You should refer to [\[guile\], page i](#) to learn more about writing extensions.

Example fish extension: This simple extension upon loading, will dynamically add `bmc-info` command to the fish shell.

```

;;
;; bmc-info.scm: fish extension to get BMC information.
;;
(define (bmc-info args)
  "Show BMC information"
  (fi-kcs-get-dev-id-display))
(fi-register-command! '("bmc-info" "bmc-info\n\t- Show BMC Information."))

```

Example: Loading the above ‘`bmc-info.scm`’ extension.

```

fish# load /root/work/fish-examples/bmc-info.scm
fish# help bmc-info
bmc-info
    Shows BMC Information.
fish#

```

## 6 bmc-config

A command line BMC configuration utility. You can view, set and replicate the configuration.

### 6.1 Command-line arguments to bmc-config

- `—no-probing`  
Do not probe IPMI devices.
- `-D, —driver-type=IPMIDRIVER`  
Use this *IPMIDRIVER* instead of auto selection. Allowed values are KCS, SMIC, SSIF and LAN.
- `—driver-address=DRIVERADDR`  
Use this *DRIVERADDR* address instead of probed one.
- `—driver-device=DEVICE`  
Use this *DEVICE* for IPMI driver.
- `-h, —hostname=IPMIHOST`  
Connect to *IPMIHOST*.
- `-u, —username=USERNAME`  
Use *USERNAME* instead of NULL. Maximum *USERNAME* length is 16.
- `-p, —password=PASSWORD`  
Use *PASSWORD* instead of NULL. Maximum *PASSWORD* length is 16.
- `-a, —auth-type=AUTHTYPE`  
Use *AUTHTYPE* instead of NONE. Allowed values are NONE, MD2, MD5, PLAIN and OEM.
- `-l, —priv-level=PRIVILEGE-LEVEL`  
Use this *PRIVILEGE-LEVEL* instead of USER. Allowed values are CALLBACK, USER, OPERATOR, ADMIN and OEM.
- `-o, —checkout`  
Get BMC configuration.
- `-i, —commit`  
Update BMC configuration.
- `-d, —diff`  
Show configuration differences with BMC.
- `-f, —filename=FILENAME`  
Use *FILENAME* in checkout, commit or diff.
- `-k, —key-pair=KEY-PAIR`  
Use *KEY-PAIR* in commit or diff.
- `-?, —help`  
Give this help list.
- `—usage`  
Give a short usage message.
- `-V, —version`  
Print program version.

## 6.2 Sample Configuration File

bmc-config emits current BMC configuration settings to stdout in the same format as that of configuration file, when no file argument is specified.

Example: Extracting BMC configuration to stdout.

```

debian-ia64:~# bmc-config --checkout
Section User1
## Give username
Username                               Anonymous
## Give password or leave it blank to clear password
Password
## Possible values: Yes/No
Lan_Enable_Ipmi_Msgs                   Yes
## Possible values: Yes/No
Lan_Enable_Link_Auth                   Yes
## Possible values: Yes/No
Lan_Enable_Restrict_To_Callback         No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Lan_Privilege_Limit                    User
## Give valid number
Lan_Session_Limit                      0
## Possible values: Yes/No
Serial_Enable_Ipmi_Msgs                Yes
## Possible values: Yes/No
Serial_Enable_Link_Auth                Yes
## Possible values: Yes/No
Serial_Enable_Restrict_To_Callback     No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Serial_Privilege_Limit                 User
## Give valid number
Serial_Session_Limit                   0
EndSection
Section User2
## Give username
Username                               ipmiuser
## Give password or leave it blank to clear password
Password
## Possible values: Yes/No
Lan_Enable_Ipmi_Msgs                   Yes
## Possible values: Yes/No
Lan_Enable_Link_Auth                   Yes
## Possible values: Yes/No
Lan_Enable_Restrict_To_Callback         No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Lan_Privilege_Limit                    Administrator
## Give valid number
Lan_Session_Limit                      0

```

```

## Possible values: Yes/No
Serial_Enable_Ipmi_Msgs                No
## Possible values: Yes/No
Serial_Enable_Link_Auth                 No
## Possible values: Yes/No
Serial_Enable_Restrict_To_Callback      No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Serial_Privilege_Limit                   No_Access
## Give valid number
Serial_Session_Limit                    0
EndSection
Section User3
## Give username
Username                                 operator
## Give password or leave it blank to clear password
Password
## Possible values: Yes/No
Lan_Enable_Ipmi_Msgs                    No
## Possible values: Yes/No
Lan_Enable_Link_Auth                     No
## Possible values: Yes/No
Lan_Enable_Restrict_To_Callback          No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Lan_Privilege_Limit                      No_Access
## Give valid number
Lan_Session_Limit                        0
## Possible values: Yes/No
Serial_Enable_Ipmi_Msgs                  No
## Possible values: Yes/No
Serial_Enable_Link_Auth                   No
## Possible values: Yes/No
Serial_Enable_Restrict_To_Callback        No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Serial_Privilege_Limit                    No_Access
## Give valid number
Serial_Session_Limit                      0
EndSection
Section User4
## Give username
Username                                 user
## Give password or leave it blank to clear password
Password
## Possible values: Yes/No
Lan_Enable_Ipmi_Msgs                     No
## Possible values: Yes/No
Lan_Enable_Link_Auth                      No
## Possible values: Yes/No

```

```

Lan_Enable_Restrict_To_Callback          No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Lan_Privilege_Limit                      No_Access
## Give valid number
Lan_Session_Limit                        0
## Possible values: Yes/No
Serial_Enable_Ipmi_Msgs                  No
## Possible values: Yes/No
Serial_Enable_Link_Auth                   No
## Possible values: Yes/No
Serial_Enable_Restrict_To_Callback        No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Serial_Privilege_Limit                    No_Access
## Give valid number
Serial_Session_Limit                      0
EndSection
Section LAN_Channel
## Possible values: Disabled/Pre_Boot_Only/Always_Available/Shared
Volatile_Access_Mode                     Always_Available
## Possible values: Yes/No
Volatile_Enable_User_Level_Auth           Yes
## Possible values: Yes/No
Volatile_Enable_Per_Message_Auth          No
## Possible values: Yes/No
Volatile_Enable_Pef_Alerting              No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Volatile_Channel_Privilege_Limit          User
## Possible values: Disabled/Pre_Boot_Only/Always_Available/Shared
Non_Volatile_Access_Mode                  Always_Available
## Possible values: Yes/No
Non_Volatile_Enable_User_Level_Auth        Yes
## Possible values: Yes/No
Non_Volatile_Enable_Per_Message_Auth       No
## Possible values: Yes/No
Non_Volatile_Enable_Pef_Alerting           No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Non_Volatile_Channel_Privilege_Limit       User
EndSection
Section LAN_Conf
## Possible values: Unspecified/Static/Use_DHCP/Use_BIOS/Use_Others
Ip_Address_Source                         Static
## Give valid IP Address
Ip_Address                                 192.168.1.60
## Give valid MAC Address
Mac_Address                                00:0E:0C:21:81:B4
## Give valid Subnet mask
Subnet_Mask                                255.255.255.0

```

```

## Give valid IP Address
Default_Gateway_Ip_Address          192.168.1.1
## Give valid MAC Address
Default_Gateway_Mac_Address         00:00:00:00:00:00
## Give valid IP Address
Backup_Gateway_Ip_Address           192.168.1.1
## Give valid MAC Address
Backup_Gateway_Mac_Address          00:00:00:00:00:00
EndSection
Section LAN_Conf_Auth
## Possible values: Yes/No
Callback_Enable_Auth_Type_None      No
## Possible values: Yes/No
Callback_Enable_Auth_Type_Md2       Yes
## Possible values: Yes/No
Callback_Enable_Auth_Type_Md5       Yes
## Possible values: Yes/No
Callback_Enable_Auth_Type_Straight_Password Yes
## Possible values: Yes/No
Callback_Enable_Auth_Type_Oem_Proprietary No
## Possible values: Yes/No
User_Enable_Auth_Type_None          No
## Possible values: Yes/No
User_Enable_Auth_Type_Md2           Yes
## Possible values: Yes/No
User_Enable_Auth_Type_Md5           Yes
## Possible values: Yes/No
User_Enable_Auth_Type_Straight_Password Yes
## Possible values: Yes/No
User_Enable_Auth_Type_Oem_Proprietary No
## Possible values: Yes/No
Operator_Enable_Auth_Type_None      No
## Possible values: Yes/No
Operator_Enable_Auth_Type_Md2       Yes
## Possible values: Yes/No
Operator_Enable_Auth_Type_Md5       Yes
## Possible values: Yes/No
Operator_Enable_Auth_Type_Straight_Password Yes
## Possible values: Yes/No
Operator_Enable_Auth_Type_Oem_Proprietary No
## Possible values: Yes/No
Admin_Enable_Auth_Type_None         No
## Possible values: Yes/No
Admin_Enable_Auth_Type_Md2          Yes
## Possible values: Yes/No
Admin_Enable_Auth_Type_Md5          Yes
## Possible values: Yes/No

```

```

Admin_Enable_Auth_Type_Straight_Password      Yes
## Possible values: Yes/No
Admin_Enable_Auth_Type_Oem_Proprietary        No
## Possible values: Yes/No
Oem_Enable_Auth_Type_None                     No
## Possible values: Yes/No
Oem_Enable_Auth_Type_Md2                     No
## Possible values: Yes/No
Oem_Enable_Auth_Type_Md5                     No
## Possible values: Yes/No
Oem_Enable_Auth_Type_Straight_Password        No
## Possible values: Yes/No
Oem_Enable_Auth_Type_Oem_Proprietary          No
EndSection
Section LAN_Conf_Misc
## Possible values: Yes/No
Enable_Gratuitous_Arps                        Yes
## Possible values: Yes/No
Enable_Arp_Response                           No
## Give valid number
Gratuitous_Arp_Interval                       4
EndSection
Section Serial_Channel
## Possible values: Disabled/Pre_Boot_Only/Always_Available/Shared
Volatile_Access_Mode                          Always_Available
## Possible values: Yes/No
Volatile_Enable_User_Level_Auth               Yes
## Possible values: Yes/No
Volatile_Enable_Per_Message_Auth              No
## Possible values: Yes/No
Volatile_Enable_Pef_Alerting                  No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Volatile_Channel_Privilege_Limit              User
## Possible values: Disabled/Pre_Boot_Only/Always_Available/Shared
Non_Volatile_Access_Mode                      Always_Available
## Possible values: Yes/No
Non_Volatile_Enable_User_Level_Auth           Yes
## Possible values: Yes/No
Non_Volatile_Enable_Per_Message_Auth          No
## Possible values: Yes/No
Non_Volatile_Enable_Pef_Alerting              No
## Possible values: Callback/User/Operator/Administrator/OEM_Proprietary/No_Access
Non_Volatile_Channel_Privilege_Limit          User
EndSection
Section Serial_Conf
## Possible values: Yes/No
Enable_Basic_Mode                             Yes

```

```

## Possible values: Yes/No
Enable_Ppp_Mode                               Yes
## Possible values: Yes/No
Enable_Terminal_Mode                           No
## Possible Values: Modem_Connect/Direct_Connect
Connect_Mode                                  Direct_Connect
## Give valid number
Page_Blackout_Interval                         0
## Give valid number
Call_Retry_Time                               60
## Possible values: Yes/No
Enable_Dtr_Hangup                             Yes
## Possible values: No_Flow_Control/RTS_CTS/XON_XOFF
Flow_Control                                  No_Flow_Control
## Possible values: 9600/19200/38400/57600/115200
Bit_Rate                                       115200
EndSection
Section Misc
## Possible Values: Off_State_AC_Apply/Restore_State_AC_Apply/On_State_AC_Apply
Power_Restore_Policy                          Restore_State_Ac_Apply
EndSection
debian-ia64:~#

```

### 6.3 Extracting current BMC configuration

‘checkout’ option generates a configuration file containing the current BMC settings. Configuration file is in plain text format with sections enclosing key-value pairs. Comments will guide you to choose appropriate values. Use your favorite editor (like GNU Emacs) to edit these fields. Comment character is ‘#’.

Example: Creating a BMC configuration file.

```
debian-ia64:~# bmc-config --checkout --filename=/tmp/bmc.conf
```

Alternatively you can redirect stdout to the configuration file too.

```
debian-ia64:~# bmc-config --checkout > /tmp/bmc.conf
```

### 6.4 Update BMC configuration

After customizing the BMC configuration file, you can update the BMC configuration using ‘commit’ option.

Example using configuration file:

```
debian-ia64:~# bmc-config --commit -f /tmp/bmc.conf
```

Example using a specific key:

```
debian-ia64:~# bmc-config --commit -k "LAN_conf:Ip_Address=192.168.1.60"
```

Note: At this point of time, configuration settings can only be fed through a file or key-value pairs and not stdin.

## 6.5 Compare BMC configuration

To compare the differences between current active BMC settings and the configuration file, use “diff” option

Example: Comparing the configuration file and BMC settings.

```
debian-ia64:~# bmc-config --diff -f /tmp/bmc.conf
USER:Ip_Address=192.168.10.160
BMC :Ip_Address=192.168.1.60 differs
USER:Default_Gateway_Ip_Address=192.168.10.1
BMC :Default_Gateway_Ip_Address=192.168.1.1 differs
USER:Backup_Gateway_Ip_Address=192.168.10.1
BMC :Backup_Gateway_Ip_Address=192.168.1.1 differs
debian-ia64:~# bmc-config --diff -k "User2:Username=guest"
USER:Username=guest
BMC :Username=ipmiuser differs
debian-ia64:~#
```

## 6.6 bmc-config known issues

`bmc-config` checkout in out-of-band may fail to retrieve some BMC configuration options, because of default USER privilege level. For such cases, use ADMIN privilege level.

## 7 bmc-info

`bmc-info` command displays BMC/IPMI version information and the list of additional devices supported. This command is mostly used for checking if IPMI is supported or if BMC/FRU/SDR firmware upgrade completed successfully.

### 7.1 Command-line options

- `—no-probing`  
Do not probe IPMI devices.
- `-D, —driver-type=IPMIDRIVER`  
Use this *IPMIDRIVER* instead of auto selection. Allowed values are KCS, SMIC, SSIF and LAN.
- `—driver-address=DRIVERADDR`  
Use this *DRIVERADDR* address instead of probed one.
- `—driver-device=DEVICE`  
Use this *DEVICE* for IPMI driver.
- `-h, —hostname=IPMIHOST`  
Connect to *IPMIHOST*.
- `-u, —username=USERNAME`  
Use *USERNAME* instead of NULL. Maximum USERNAME length is 16.
- `-p, —password=PASSWORD`  
Use *PASSWORD* instead of NULL. Maximum PASSWORD length is 16.
- `-a, —auth-type=AUTHTYPE`  
Use *AUTHTYPE* instead of NONE. Allowed values are NONE, MD2, MD5, PLAIN and OEM.
- `-l, —priv-level=PRIVILEGE-LEVEL`  
Use this *PRIVILEGE-LEVEL* instead of USER. Allowed values are CALLBACK, USER, OPERATOR, ADMIN and OEM.
- `-?, —help`  
Give this help list.
- `—usage`  
Give a short usage message.
- `-V, —version`  
Print program version.

### 7.2 Example

```
ipmitest:~# bmc-info
Device ID:          20
Device Revision:    1
                   [SDR Support]
Firmware Revision: 1.32
                   [Device Available (normal operation)]
IPMI Version:       1.5
```

## Additional Device Support:

- [Sensor Device]
- [SDR Repository Device]
- [SEL Device]
- [FRU Inventory Device]
- [IPMB Event Receiver]
- [Chassis Device]

Manufacturer ID: B000157h

Product ID: 1Bh

Aux Firmware Revision Info: 10011500h

## Channel Information:

Channel No: 0

Medium Type: IPMB (I2C)

Protocol Type: IPMB-1.0

Channel No: 1

Medium Type: Asynch. Serial/Modem (RS-232)

Protocol Type: IPMB-1.0

Channel No: 3

Medium Type: PCI SMBus

Protocol Type: IPMI-SMBus

Channel No: 4

Medium Type: System Interface (KCS, SMIC, or BT)

Protocol Type: KCS

Channel No: 6

Medium Type: 802.3 LAN

Protocol Type: IPMB-1.0

Channel No: 7

Medium Type: 802.3 LAN

Protocol Type: IPMB-1.0

ipmitest:~#

## 8 bmc-autoconfig

`bmc-autoconfig` utility is a wizard-like frontend to the `bmc-config` command, which has a curses/text based interfaced questionnaire asking for IP/Netmask/Gateway to be committed.

### 8.1 Command-line options

- `-u, -usage`  
Show short usage message.
- `-h, -help`  
Show help.
- `-V, -version`  
Show version information.

## 9 ipmi-raw

`ipmi-raw` tool reads hex values of IPMI command request data from standard input, executes it and displays hex values of IPMI command response data. This tool works on in-band and out-of-band.

### 9.1 Command-line options

- `--no-probing`  
Do not probe IPMI devices.
- `-D, --driver-type=IPMIDRIVER`  
Use this *IPMIDRIVER* instead of auto selection. Allowed values are KCS, SMIC, SSIF and LAN.
- `--driver-address=DRIVERADDR`  
Use this *DRIVERADDR* address instead of probed one.
- `--driver-device=DEVICE`  
Use this *DEVICE* for IPMI driver.
- `-h, --hostname=IPMIHOST`  
Connect to *IPMIHOST*.
- `-u, --username=USERNAME`  
Use *USERNAME* instead of NULL. Maximum *USERNAME* length is 16.
- `-p, --password=PASSWORD`  
Use *PASSWORD* instead of NULL. Maximum *PASSWORD* length is 16.
- `-a, --auth-type=AUTHTYPE`  
Use *AUTHTYPE* instead of NONE. Allowed values are NONE, MD2, MD5, PLAIN and OEM.
- `-l, --priv-level=PRIVILEGE-LEVEL`  
Use this *PRIVILEGE-LEVEL* instead of USER. Allowed values are CALLBACK, USER, OPERATOR, ADMIN and OEM.
- `-?, --help`  
Give this help list.
- `--usage`  
Give a short usage message.
- `-V, --version`  
Print program version.

### 9.2 Example

```
www:~# ipmi-raw
18 01
rcvd: 1C 01 00 20 81 01 20 51 9F 57 01 00 1B 00 00 15 01 10
www:~#
```

## 10 ipmi-sensors

`ipmi-sensors` utility reports the monitored system health information, such as temperatures and voltages, fan status, etc with nominal, threshold max/min readings and status descriptions.

### 10.1 command-line arguments

- `--no-probing`  
Do not probe IPMI devices.
- `-D, --driver-type=IPMIDRIVER`  
Use this *IPMIDRIVER* instead of auto selection. Allowed values are KCS, SMIC, SSIF and LAN.
- `--driver-address=DRIVERADDR`  
Use this *DRIVERADDR* address instead of probed one.
- `--driver-device=DEVICE`  
Use this *DEVICE* for IPMI driver.
- `-h, --hostname=IPMIHOST`  
Connect to *IPMIHOST*.
- `-u, --username=USERNAME`  
Use *USERNAME* instead of NULL. Maximum *USERNAME* length is 16.
- `-p, --password=PASSWORD`  
Use *PASSWORD* instead of NULL. Maximum *PASSWORD* length is 16.
- `-a, --auth-type=AUTHTYPE`  
Use *AUTHTYPE* instead of NONE. Allowed values are NONE, MD2, MD5, PLAIN and OEM.
- `-l, --priv-level=PRIVILEGE-LEVEL`  
Use this *PRIVILEGE-LEVEL* instead of USER. Allowed values are CALLBACK, USER, OPERATOR, ADMIN and OEM.
- `-v, --verbose`  
Increase verbosity in output. More `-v` more verbosity.
- `-i, --sdr-info`  
Show SDR Information.
- `-f, --flush-cache`  
Flush sensor cache.
- `-L, --list-groups`  
List sensor groups.
- `--all`  
Display all sensors (Ignore sensors ignore-list).
- `-g, --group=GROUP`  
Show sensors belongs to this *GROUP*.
- `-s, --sensors=SENSORS-LIST`  
Show listed sensors.

- `-?`, `—help`  
Give this help list.
- `—usage`  
Give a short usage message.
- `-V`, `—version`  
Print program version.

## 10.2 Setting default startup options

Example `ipmi-sensors-conf.scm` file:

```
;;; file: /usr/etc/fish/ipmi-sensors-conf.scm

;; ipmi-sensors-conf.scm: sensors configuration file

;; Sensors cache filename
; (set! sensors-sdr-cache-file "/path/to/cache-filename")

;; Example: Ignore these sensors
; (sensors-ignore! '(54 55 88))

;; Example: Group Aliases
(sensors-group-alias-list-append!
 '(
;   (mysystem . ("Processor" "Fan" "Power Supply" "Current Memory Chassis"))
;   (power . ("Power Supply"))
;   (security . ("Platform Chassis Intrusion" "Platform Security Violation"))
; ))
```

## 10.3 ipmi-sensors in action

CDC 6440 (A.K.A SR870BN4) - a Quad Itanium2 system has 136 sensors on board. GNU FreeIPMI running on Thunder supercomputer monitors 139264 sensors in total.

### 10.3.1 Sample ipmi-sensors output

```
www:~# ipmi-sensors
1: Power Unit (Power Unit): [OK]
2: BMC Watchdog (Watchdog 2): [OK]
3: Scrtv Violation (Platform Security Violation): [OK]
4: Physical Scrtv (Platform Chassis Intrusion): [LAN Leash Lost (system is unplugged f
5: POST Error (System Firmware): [OK]
6: Critical Int (Critical Interrupt): [OK]
7: Memory (Memory): [OK]
8: Logging Disabled (Event Logging Disabled): [OK]
9: Baseboard 1.2V (Voltage): 1.2054 V (1.0682/1.3328): [OK]
10: Baseboard 1.25V (Voltage): 1.2642 V (1.0192/1.4896): [OK]
11: Baseboard 1.8V (Voltage): 1.7901 V (1.6029/1.9773): [OK]
12: Baseboard 1.8VSB (Voltage): 1.8135 V (1.6029/1.9773): [OK]
```

```
13: Baseboard 2.5V (Voltage): 2.5155 V (2.1645/2.8314): [OK]
14: Baseboard 3.3V (Voltage): 3.36 V (2.9925/3.64): [OK]
15: Baseboard 3.3AUX (Voltage): 3.3089 V (2.9232/3.6946): [OK]
16: Baseboard 5.0V (Voltage): 4.966 V (4.524/5.486): [OK]
17: Baseboard 5VSB (Voltage): 5.076 V (4.4415/5.6165): [OK]
18: Baseboard 12V (Voltage): 12.028 V (10.788/13.082): [OK]
19: Baseboard 12VRM (Voltage): 12.028 V (10.602/13.392): [OK]
20: Baseboard -12V (Voltage): -12.04 V (-13.84/-10.456): [OK]
21: Baseboard VBAT (Voltage): 3.069 V (2.6815/3.627): [OK]
22: Baseboard Temp (Temperature): 39.0 C (5.0/65.0): [OK]
23: FntPnl Amb Temp (Temperature): 22.0 C (5.0/45.0): [OK]
24: Basebrd FanBoost (OEM Reserved): 39.0 C (NA/NA): [OK]
25: FP Amb FanBoost (OEM Reserved): 22.0 C (NA/NA): [OK]
26: Baseboard Fan 1 (Fan): 5661.0 RPM (2703.0/NA): [OK]
27: Baseboard Fan 2 (Fan): 5661.0 RPM (2703.0/NA): [OK]
28: Baseboard Fan 3 (Fan): 5763.0 RPM (2703.0/NA): [OK]
29: Baseboard Fan 4 (Fan): 5559.0 RPM (2703.0/NA): [OK]
30: SCSI A Term Pwr (Voltage): 4.06 V (3.2/NA): [OK]
31: SCSI B Term Pwr (Voltage): 4.04 V (3.2/NA): [OK]
32: Power Supply 1 (Power Supply): [Presence detected]
33: Power Cage Fan (Fan): 6720.0 RPM (4500.0/NA): [OK]
34: Power Cage Temp (Temperature): 34.0 C (-10.0/65.0): [OK]
35: PwrCage FanBoost (OEM Reserved): 34.0 C (NA/NA): [OK]
36: Proc Missing (Board): [OK]
37: ACPI State (ACPI Power State): [S0/G0 "working"]
38: System Event (System Event): [OK]
39: Button (Button): [OK]
40: SMI Timeout (OEM Reserved): [OK]
41: Sensor Failure (OEM Reserved): [OEM State = 0000h]
42: NMI State (OEM Reserved): [OK]
43: SMI State (OEM Reserved): [OK]
44: FSB Mismatch (OEM Reserved): [OK]
45: Processor 1 Stat (Processor): [Processor Presence detected]
46: Processor 2 Stat (Processor): [Processor Presence detected]
47: Processor1 Temp (Temperature): 37.0 C (-10.0/80.0): [OK]
48: Processor2 Temp (Temperature): 39.0 C (-10.0/80.0): [OK]
49: Proc1 FanBoost (OEM Reserved): 37.0 C (NA/NA): [OK]
50: Proc2 FanBoost (OEM Reserved): 39.0 C (NA/NA): [OK]
51: Processor Vccp (Voltage): 1.4976 V (1.0296/1.9422): [OK]
52: CPU Therm Ctrl (Temperature): [State Deasserted]
53: DIMM 1B (Slot Connector): [Slot/Connector Device installed/attached]
54: DIMM 1A (Slot Connector): [Slot/Connector Device installed/attached]
55: DIMM 2B (Slot Connector): [OK]
56: DIMM 2A (Slot Connector): [OK]
57: DIMM 3B (Slot Connector): [OK]
58: DIMM 3A (Slot Connector): [OK]
59: Hot Swap Temp (Temperature): NA (NA/NA): [Unknown]
```

```
60: HSC Drv Status (Drive Slot): [Unknown]
61: HSC Drv Presence (Drive Slot): [Unknown]
www:~#
```

### 10.3.2 Sample very-verbose output

```
www:~# ipmi-sensors -vv
Record ID: 1
Record Type: 02h
Sensor Name: Power Unit
Group Name: Power Unit
Sensor Number: 1
Slave Address/System Software ID: 10h
Event/Reading Type Code: 6Fh
Negative Hysteresis: 0
Positive Hysteresis: 0
Sensor Status: [OK]

Record ID: 2
Record Type: 02h
Sensor Name: BMC Watchdog
Group Name: Watchdog 2
Sensor Number: 3
Slave Address/System Software ID: 10h
Event/Reading Type Code: 6Fh
Negative Hysteresis: 0
Positive Hysteresis: 0
Sensor Status: [OK]

Record ID: 3
Record Type: 02h
Sensor Name: Scrtty Violation
Group Name: Platform Security Violation
Sensor Number: 4
Slave Address/System Software ID: 10h
Event/Reading Type Code: 6Fh
Negative Hysteresis: 0
Positive Hysteresis: 0
Sensor Status: [OK]

Record ID: 4
Record Type: 02h
Sensor Name: Physical Scrtty
Group Name: Platform Chassis Intrusion
Sensor Number: 5
Slave Address/System Software ID: 10h
Event/Reading Type Code: 6Fh
Negative Hysteresis: 0
```

Positive Hysteresis: 0  
Sensor Status: [LAN Leash Lost (system is unplugged from LAN)]

Record ID: 5  
Record Type: 02h  
Sensor Name: POST Error  
Group Name: System Firmware  
Sensor Number: 6  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 6  
Record Type: 02h  
Sensor Name: Critical Int  
Group Name: Critical Interrupt  
Sensor Number: 7  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 7  
Record Type: 02h  
Sensor Name: Memory  
Group Name: Memory  
Sensor Number: 8  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 8  
Record Type: 02h  
Sensor Name: Logging Disabled  
Group Name: Event Logging Disabled  
Sensor Number: 9  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 9  
Record Type: 01h  
Sensor Name: Baseboard 1.2V  
Group Name: Voltage  
Sensor Number: 16  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 98  
R Exponent: -4  
B Exponent: 2  
Linear: 64  
Analog Data Format: 0  
Lower Critical Threshold: 1.0682 Volts  
Upper Critical Threshold: 1.3328 Volts  
Lower Non-Critical Threshold: 1.0976 Volts  
Upper Non-Critical Threshold: 1.2936 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 2.499 Volts  
Normal Min.: 1.1368 Volts  
Normal Max.: 1.2544 Volts  
Nominal reading: 1.1956 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 1.2054 Volts  
Sensor Status: [OK]

Record ID: 10  
Record Type: 01h  
Sensor Name: Baseboard 1.25V  
Group Name: Voltage  
Sensor Number: 17  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 98  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 1.0192 Volts  
Upper Critical Threshold: 1.4896 Volts  
Lower Non-Critical Threshold: 1.0486 Volts  
Upper Non-Critical Threshold: 1.4504 Volts  
Lower Non-Recoverable Threshold: NA

Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 2.499 Volts  
Normal Min.: 1.078 Volts  
Normal Max.: 1.4112 Volts  
Nominal reading: 1.2446 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 1.2642 Volts  
Sensor Status: [OK]

Record ID: 11  
Record Type: 01h  
Sensor Name: Baseboard 1.8V  
Group Name: Voltage  
Sensor Number: 18  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 117  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 1.6029 Volts  
Upper Critical Threshold: 1.9773 Volts  
Lower Non-Critical Threshold: 1.6497 Volts  
Upper Non-Critical Threshold: 1.9188 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 2.9835 Volts  
Normal Min.: 1.6965 Volts  
Normal Max.: 1.872 Volts  
Nominal reading: 1.7901 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 1.7901 Volts  
Sensor Status: [OK]

Record ID: 12  
Record Type: 01h  
Sensor Name: Baseboard 1.8VSB  
Group Name: Voltage  
Sensor Number: 19  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h

B: 0  
M: 117  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 1.6029 Volts  
Upper Critical Threshold: 1.9773 Volts  
Lower Non-Critical Threshold: 1.6497 Volts  
Upper Non-Critical Threshold: 1.9188 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 2.9835 Volts  
Normal Min.: 1.6965 Volts  
Normal Max.: 1.872 Volts  
Nominal reading: 1.7901 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 1.8135 Volts  
Sensor Status: [OK]

Record ID: 13  
Record Type: 01h  
Sensor Name: Baseboard 2.5V  
Group Name: Voltage  
Sensor Number: 20  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 117  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 2.1645 Volts  
Upper Critical Threshold: 2.8314 Volts  
Lower Non-Critical Threshold: 2.223 Volts  
Upper Non-Critical Threshold: 2.7378 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 2.9835 Volts  
Normal Min.: 2.2815 Volts  
Normal Max.: 2.6793 Volts  
Nominal reading: 2.4804 Volts  
Negative Hysteresis: 2

Positive Hysteresis: 2  
Sensor Reading: 2.5155 Volts  
Sensor Status: [OK]

Record ID: 14  
Record Type: 01h  
Sensor Name: Baseboard 3.3V  
Group Name: Voltage  
Sensor Number: 21  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 175  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 2.9925 Volts  
Upper Critical Threshold: 3.64 Volts  
Lower Non-Critical Threshold: 3.08 Volts  
Upper Non-Critical Threshold: 3.535 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 4.4625 Volts  
Normal Min.: 3.15 Volts  
Normal Max.: 3.4475 Volts  
Nominal reading: 3.29 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 3.36 Volts  
Sensor Status: [OK]

Record ID: 15  
Record Type: 01h  
Sensor Name: Baseboard 3.3AUX  
Group Name: Voltage  
Sensor Number: 22  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 203  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 2.9232 Volts

Upper Critical Threshold: 3.6946 Volts  
Lower Non-Critical Threshold: 3.0044 Volts  
Upper Non-Critical Threshold: 3.5931 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 5.1765 Volts  
Normal Min.: 3.1465 Volts  
Normal Max.: 3.451 Volts  
Nominal reading: 3.2886 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 3.3089 Volts  
Sensor Status: [OK]

Record ID: 16  
Record Type: 01h  
Sensor Name: Baseboard 5.0V  
Group Name: Voltage  
Sensor Number: 23  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 26  
R Exponent: -3  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 4.524 Volts  
Upper Critical Threshold: 5.486 Volts  
Lower Non-Critical Threshold: 4.68 Volts  
Upper Non-Critical Threshold: 5.33 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 6.63 Volts  
Normal Min.: 4.784 Volts  
Normal Max.: 5.226 Volts  
Nominal reading: 4.966 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 4.966 Volts  
Sensor Status: [OK]

Record ID: 17  
Record Type: 01h  
Sensor Name: Baseboard 5VSB

Group Name: Voltage  
Sensor Number: 24  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 235  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 4.4415 Volts  
Upper Critical Threshold: 5.6165 Volts  
Lower Non-Critical Threshold: 4.5825 Volts  
Upper Non-Critical Threshold: 5.452 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 5.9925 Volts  
Normal Min.: 4.794 Volts  
Normal Max.: 5.2405 Volts  
Nominal reading: 4.982 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 5.076 Volts  
Sensor Status: [OK]

Record ID: 18  
Record Type: 01h  
Sensor Name: Baseboard 12V  
Group Name: Voltage  
Sensor Number: 25  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 62  
R Exponent: -3  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 10.788 Volts  
Upper Critical Threshold: 13.082 Volts  
Lower Non-Critical Threshold: 11.16 Volts  
Upper Non-Critical Threshold: 12.71 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 15.81 Volts

Normal Min.: 11.408 Volts  
Normal Max.: 12.462 Volts  
Nominal reading: 11.842 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 12.028 Volts  
Sensor Status: [OK]

Record ID: 19  
Record Type: 01h  
Sensor Name: Baseboard 12VRM  
Group Name: Voltage  
Sensor Number: 26  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 62  
R Exponent: -3  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 10.602 Volts  
Upper Critical Threshold: 13.392 Volts  
Lower Non-Critical Threshold: 10.912 Volts  
Upper Non-Critical Threshold: 12.958 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 15.81 Volts  
Normal Min.: 11.408 Volts  
Normal Max.: 12.462 Volts  
Nominal reading: 11.904 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 12.028 Volts  
Sensor Status: [OK]

Record ID: 20  
Record Type: 01h  
Sensor Name: Baseboard -12V  
Group Name: Voltage  
Sensor Number: 27  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: -160  
M: 72  
R Exponent: -3

B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: -13.84 Volts  
Upper Critical Threshold: -10.456 Volts  
Lower Non-Critical Threshold: -13.408 Volts  
Upper Non-Critical Threshold: -10.744 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -16.0 Volts  
Sensor Max. Reading: 2.36 Volts  
Normal Min.: -12.616 Volts  
Normal Max.: -10.96 Volts  
Nominal reading: -12.04 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: -12.04 Volts  
Sensor Status: [OK]

Record ID: 21  
Record Type: 01h  
Sensor Name: Baseboard VBAT  
Group Name: Voltage  
Sensor Number: 28  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 155  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 2.6815 Volts  
Upper Critical Threshold: 3.627 Volts  
Lower Non-Critical Threshold: 2.759 Volts  
Upper Non-Critical Threshold: 3.5185 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 3.9525 Volts  
Normal Min.: 2.8365 Volts  
Normal Max.: 3.441 Volts  
Nominal reading: 2.976 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 3.069 Volts  
Sensor Status: [OK]

Record ID: 22  
Record Type: 01h  
Sensor Name: Baseboard Temp  
Group Name: Temperature  
Sensor Number: 48  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: 5.0 Degrees C  
Upper Critical Threshold: 65.0 Degrees C  
Lower Non-Critical Threshold: 10.0 Degrees C  
Upper Non-Critical Threshold: 60.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 10.0 Degrees C  
Normal Max.: 55.0 Degrees C  
Nominal reading: 38.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 39.0 Degrees C  
Sensor Status: [OK]

Record ID: 23  
Record Type: 01h  
Sensor Name: FntPnl Amb Temp  
Group Name: Temperature  
Sensor Number: 50  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: 5.0 Degrees C  
Upper Critical Threshold: 45.0 Degrees C  
Lower Non-Critical Threshold: 10.0 Degrees C  
Upper Non-Critical Threshold: 40.0 Degrees C

Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 10.0 Degrees C  
Normal Max.: 30.0 Degrees C  
Nominal reading: 25.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 22.0 Degrees C  
Sensor Status: [OK]

Record ID: 24  
Record Type: 01h  
Sensor Name: Basebrd FanBoost  
Group Name: OEM Reserved  
Sensor Number: 51  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: NA  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: NA  
Upper Non-Critical Threshold: 60.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 5.0 Degrees C  
Normal Max.: 55.0 Degrees C  
Nominal reading: 38.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 39.0 Degrees C  
Sensor Status: [OK]

Record ID: 25  
Record Type: 01h  
Sensor Name: FP Amb FanBoost  
Group Name: OEM Reserved  
Sensor Number: 54  
Event/Reading Type Code: 01h

Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: NA  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: NA  
Upper Non-Critical Threshold: 40.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 5.0 Degrees C  
Normal Max.: 30.0 Degrees C  
Nominal reading: 25.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 22.0 Degrees C  
Sensor Status: [OK]

Record ID: 26  
Record Type: 01h  
Sensor Name: Baseboard Fan 1  
Group Name: Fan  
Sensor Number: 64  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 51  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 2703.0 RPM  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: 2856.0 RPM  
Upper Non-Critical Threshold: NA  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 RPM  
Sensor Max. Reading: 13005.0 RPM  
Normal Min.: 4488.0 RPM  
Normal Max.: 5610.0 RPM  
Nominal reading: 4998.0 RPM

Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 5661.0 RPM  
Sensor Status: [OK]

Record ID: 27  
Record Type: 01h  
Sensor Name: Baseboard Fan 2  
Group Name: Fan  
Sensor Number: 65  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 51  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 2703.0 RPM  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: 2856.0 RPM  
Upper Non-Critical Threshold: NA  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 RPM  
Sensor Max. Reading: 13005.0 RPM  
Normal Min.: 4488.0 RPM  
Normal Max.: 5610.0 RPM  
Nominal reading: 4998.0 RPM  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 5355.0 RPM  
Sensor Status: [OK]

Record ID: 28  
Record Type: 01h  
Sensor Name: Baseboard Fan 3  
Group Name: Fan  
Sensor Number: 66  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 51  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 0

Lower Critical Threshold: 2703.0 RPM  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: 2856.0 RPM  
Upper Non-Critical Threshold: NA  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 RPM  
Sensor Max. Reading: 13005.0 RPM  
Normal Min.: 4488.0 RPM  
Normal Max.: 5610.0 RPM  
Nominal reading: 4998.0 RPM  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 5661.0 RPM  
Sensor Status: [OK]

Record ID: 29  
Record Type: 01h  
Sensor Name: Baseboard Fan 4  
Group Name: Fan  
Sensor Number: 67  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 51  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 2703.0 RPM  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: 2856.0 RPM  
Upper Non-Critical Threshold: NA  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 RPM  
Sensor Max. Reading: 13005.0 RPM  
Normal Min.: 4488.0 RPM  
Normal Max.: 5610.0 RPM  
Nominal reading: 4998.0 RPM  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 5559.0 RPM  
Sensor Status: [OK]

Record ID: 30  
Record Type: 01h

Sensor Name: SCSI A Term Pwr  
Group Name: Voltage  
Sensor Number: 96  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 20  
R Exponent: -3  
B Exponent: 0  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 3.2 Volts  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: NA  
Upper Non-Critical Threshold: NA  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 5.1 Volts  
Normal Min.: 3.84 Volts  
Normal Max.: 4.32 Volts  
Nominal reading: 4.08 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 4.06 Volts  
Sensor Status: [OK]

Record ID: 31  
Record Type: 01h  
Sensor Name: SCSI B Term Pwr  
Group Name: Voltage  
Sensor Number: 97  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 20  
R Exponent: -3  
B Exponent: 0  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 3.2 Volts  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: NA  
Upper Non-Critical Threshold: NA  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts

Sensor Max. Reading: 5.1 Volts  
Normal Min.: 3.84 Volts  
Normal Max.: 4.32 Volts  
Nominal reading: 4.08 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 4.04 Volts  
Sensor Status: [OK]

Record ID: 32  
Record Type: 02h  
Sensor Name: Power Supply 1  
Group Name: Power Supply  
Sensor Number: 112  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [Presence detected]

Record ID: 33  
Record Type: 01h  
Sensor Name: Power Cage Fan  
Group Name: Fan  
Sensor Number: 115  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 60  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 4500.0 RPM  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: 4980.0 RPM  
Upper Non-Critical Threshold: NA  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 RPM  
Sensor Max. Reading: 15300.0 RPM  
Normal Min.: 6000.0 RPM  
Normal Max.: 9540.0 RPM  
Nominal reading: 8220.0 RPM  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 6720.0 RPM

Sensor Status: [OK]

Record ID: 34  
Record Type: 01h  
Sensor Name: Power Cage Temp  
Group Name: Temperature  
Sensor Number: 118  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: -10.0 Degrees C  
Upper Critical Threshold: 65.0 Degrees C  
Lower Non-Critical Threshold: -1.0 Degrees C  
Upper Non-Critical Threshold: 60.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 5.0 Degrees C  
Normal Max.: 55.0 Degrees C  
Nominal reading: 40.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 34.0 Degrees C  
Sensor Status: [OK]

Record ID: 35  
Record Type: 01h  
Sensor Name: PwrCage FanBoost  
Group Name: OEM Reserved  
Sensor Number: 119  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: NA  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: NA

Upper Non-Critical Threshold: 60.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 5.0 Degrees C  
Normal Max.: 55.0 Degrees C  
Nominal reading: 40.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 34.0 Degrees C  
Sensor Status: [OK]

Record ID: 36  
Record Type: 02h  
Sensor Name: Proc Missing  
Group Name: Board  
Sensor Number: 128  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 03h  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 37  
Record Type: 02h  
Sensor Name: ACPI State  
Group Name: ACPI Power State  
Sensor Number: 130  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [S0/G0 "working"]

Record ID: 38  
Record Type: 02h  
Sensor Name: System Event  
Group Name: System Event  
Sensor Number: 131  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 39

Record Type: 02h  
Sensor Name: Button  
Group Name: Button  
Sensor Number: 132  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 40  
Record Type: 02h  
Sensor Name: SMI Timeout  
Group Name: OEM Reserved  
Sensor Number: 133  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 03h  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 41  
Record Type: 02h  
Sensor Name: Sensor Failure  
Group Name: OEM Reserved  
Sensor Number: 134  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 73h  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OEM State = 0000h]

Record ID: 42  
Record Type: 02h  
Sensor Name: NMI State  
Group Name: OEM Reserved  
Sensor Number: 135  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 03h  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 43  
Record Type: 02h  
Sensor Name: SMI State  
Group Name: OEM Reserved

Sensor Number: 136  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 03h  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 44  
Record Type: 02h  
Sensor Name: FSB Mismatch  
Group Name: OEM Reserved  
Sensor Number: 137  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 03h  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 45  
Record Type: 02h  
Sensor Name: Processor 1 Stat  
Group Name: Processor  
Sensor Number: 144  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [Processor Presence detected]

Record ID: 46  
Record Type: 02h  
Sensor Name: Processor 2 Stat  
Group Name: Processor  
Sensor Number: 145  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [Processor Presence detected]

Record ID: 47  
Record Type: 01h  
Sensor Name: Processor1 Temp  
Group Name: Temperature  
Sensor Number: 152  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h

B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: -10.0 Degrees C  
Upper Critical Threshold: 80.0 Degrees C  
Lower Non-Critical Threshold: 0.0 Degrees C  
Upper Non-Critical Threshold: 75.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 5.0 Degrees C  
Normal Max.: 59.0 Degrees C  
Nominal reading: 47.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 37.0 Degrees C  
Sensor Status: [OK]

Record ID: 48  
Record Type: 01h  
Sensor Name: Processor2 Temp  
Group Name: Temperature  
Sensor Number: 153  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: -10.0 Degrees C  
Upper Critical Threshold: 80.0 Degrees C  
Lower Non-Critical Threshold: 0.0 Degrees C  
Upper Non-Critical Threshold: 75.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 5.0 Degrees C  
Normal Max.: 59.0 Degrees C  
Nominal reading: 47.0 Degrees C  
Negative Hysteresis: 2

Positive Hysteresis: 2  
Sensor Reading: 39.0 Degrees C  
Sensor Status: [OK]

Record ID: 49  
Record Type: 01h  
Sensor Name: Proc1 FanBoost  
Group Name: OEM Reserved  
Sensor Number: 160  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: NA  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: NA  
Upper Non-Critical Threshold: 75.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 5.0 Degrees C  
Normal Max.: 59.0 Degrees C  
Nominal reading: 47.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 37.0 Degrees C  
Sensor Status: [OK]

Record ID: 50  
Record Type: 01h  
Sensor Name: Proc2 FanBoost  
Group Name: OEM Reserved  
Sensor Number: 161  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 2  
Lower Critical Threshold: NA

Upper Critical Threshold: NA  
Lower Non-Critical Threshold: NA  
Upper Non-Critical Threshold: 75.0 Degrees C  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C  
Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 5.0 Degrees C  
Normal Max.: 59.0 Degrees C  
Nominal reading: 47.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 39.0 Degrees C  
Sensor Status: [OK]

Record ID: 51  
Record Type: 01h  
Sensor Name: Processor Vccp  
Group Name: Voltage  
Sensor Number: 184  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 10h  
B: 0  
M: 117  
R Exponent: -4  
B Exponent: 2  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: 1.0296 Volts  
Upper Critical Threshold: 1.9422 Volts  
Lower Non-Critical Threshold: 1.0881 Volts  
Upper Non-Critical Threshold: 1.8837 Volts  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: 0.0 Volts  
Sensor Max. Reading: 2.9835 Volts  
Normal Min.: 1.0881 Volts  
Normal Max.: 1.8369 Volts  
Nominal reading: 1.4859 Volts  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: 1.4976 Volts  
Sensor Status: [OK]

Record ID: 52  
Record Type: 02h  
Sensor Name: CPU Therm Ctrl

Group Name: Temperature  
Sensor Number: 192  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 03h  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [State Deasserted]

Record ID: 53  
Record Type: 02h  
Sensor Name: DIMM 1B  
Group Name: Slot Connector  
Sensor Number: 224  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [Slot/Connector Device installed/attached]

Record ID: 54  
Record Type: 02h  
Sensor Name: DIMM 1A  
Group Name: Slot Connector  
Sensor Number: 225  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [Slot/Connector Device installed/attached]

Record ID: 55  
Record Type: 02h  
Sensor Name: DIMM 2B  
Group Name: Slot Connector  
Sensor Number: 226  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 56  
Record Type: 02h  
Sensor Name: DIMM 2A  
Group Name: Slot Connector  
Sensor Number: 227  
Slave Address/System Software ID: 10h

Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 57  
Record Type: 02h  
Sensor Name: DIMM 3B  
Group Name: Slot Connector  
Sensor Number: 228  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 58  
Record Type: 02h  
Sensor Name: DIMM 3A  
Group Name: Slot Connector  
Sensor Number: 229  
Slave Address/System Software ID: 10h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [OK]

Record ID: 59  
Record Type: 01h  
Sensor Name: Hot Swap Temp  
Group Name: Temperature  
Sensor Number: 1  
Event/Reading Type Code: 01h  
Slave Address/System Software ID: 60h  
B: -128  
M: 1  
R Exponent: 0  
B Exponent: 0  
Linear: 0  
Analog Data Format: 0  
Lower Critical Threshold: NA  
Upper Critical Threshold: NA  
Lower Non-Critical Threshold: NA  
Upper Non-Critical Threshold: NA  
Lower Non-Recoverable Threshold: NA  
Upper Non-Recoverable Threshold: NA  
Sensor Min. Reading: -128.0 Degrees C

Sensor Max. Reading: 127.0 Degrees C  
Normal Min.: 15.0 Degrees C  
Normal Max.: 40.0 Degrees C  
Nominal reading: 30.0 Degrees C  
Negative Hysteresis: 2  
Positive Hysteresis: 2  
Sensor Reading: NA  
Sensor Status: [Unknown]

Record ID: 60  
Record Type: 02h  
Sensor Name: HSC Drv Status  
Group Name: Drive Slot  
Sensor Number: 2  
Slave Address/System Software ID: 60h  
Event/Reading Type Code: 6Fh  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [Unknown]

Record ID: 61  
Record Type: 02h  
Sensor Name: HSC Drv Presence  
Group Name: Drive Slot  
Sensor Number: 9  
Slave Address/System Software ID: 60h  
Event/Reading Type Code: 08h  
Negative Hysteresis: 0  
Positive Hysteresis: 0  
Sensor Status: [Unknown]

Record ID: 62  
Record Type: 08h  
Sensor Name: NONE  
Container Entity ID: 15h  
Container Entity Instance: 01h

Record ID: 63  
Record Type: 11h  
Device Name: AC Pwr Cage FRU  
Device Type: 10h  
Device Type Modifier: 00h  
FRU Entity ID: 15h  
FRU Entity Instance: 01h

Record ID: 64  
Record Type: 11h

Device Name: Pwr Supply 1 FRU  
Device Type: 10h  
Device Type Modifier: 00h  
FRU Entity ID: 0Ah  
FRU Entity Instance: 01h

Record ID: 65  
Record Type: 11h  
Device Name: DIMM 1B SPD  
Device Type: 10h  
Device Type Modifier: 01h  
FRU Entity ID: 20h  
FRU Entity Instance: 01h

Record ID: 66  
Record Type: 11h  
Device Name: DIMM 1A SPD  
Device Type: 10h  
Device Type Modifier: 01h  
FRU Entity ID: 20h  
FRU Entity Instance: 02h

Record ID: 67  
Record Type: 11h  
Device Name: DIMM 2B SPD  
Device Type: 10h  
Device Type Modifier: 01h  
FRU Entity ID: 20h  
FRU Entity Instance: 03h

Record ID: 68  
Record Type: 11h  
Device Name: DIMM 2A SPD  
Device Type: 10h  
Device Type Modifier: 01h  
FRU Entity ID: 20h  
FRU Entity Instance: 04h

Record ID: 69  
Record Type: 11h  
Device Name: DIMM 3B SPD  
Device Type: 10h  
Device Type Modifier: 01h  
FRU Entity ID: 20h  
FRU Entity Instance: 05h

Record ID: 70

Record Type: 11h  
Device Name: DIMM 3A SPD  
Device Type: 10h  
Device Type Modifier: 01h  
FRU Entity ID: 20h  
FRU Entity Instance: 06h

Record ID: 71  
Record Type: 12h  
Device Name: Basbrd Mgmt Ctlr  
Entity ID: 07h  
Entity Instance: 01h

Record ID: 72  
Record Type: 12h  
Device Name: Hot Swap Ctlr  
Entity ID: 0Fh  
Entity Instance: 03h

Record ID: 73  
Record Type: 12h  
Device Name: Chs Bridge Ctlr  
Entity ID: 07h  
Entity Instance: 01h

Record ID: 74  
Record Type: C0h  
Sensor Name: NONE  
Manufacturer ID: 157h  
OEM Data: 02 02 00 00 70

Record ID: 75  
Record Type: C0h  
Sensor Name: NONE  
Manufacturer ID: 157h  
OEM Data: 03 FC FC FC

Record ID: 76  
Record Type: C0h  
Sensor Name: NONE  
Manufacturer ID: 157h  
OEM Data: 07 00 FC FC FC 01 01 00 98 01 01 0A 3E 00 99 01 01 0A 3E 00 32 00 00 10 00 1

Record ID: 77  
Record Type: C0h  
Sensor Name: NONE  
Manufacturer ID: 157h

OEM Data: 06 01

Record ID: 78

Record Type: C0h

Sensor Name: NONE

Manufacturer ID: 157h

OEM Data: 53 44 52 20 50 61 63 6B 61 67 65 20 35 2E 36 2E 42

Record ID: 79

Record Type: C0h

Sensor Name: NONE

Manufacturer ID: 157h

OEM Data: 53 44 52 20 46 69 6C 65 20 30 2E 43

www:~#

## 11 ipmi-sel

BMC provides a centralized, non-volatile System Event Log and logs system events and certain system configuration information to this device. You can perform a postmortem analysis on a system even when the processor(s) are disabled because of a failure. ipmi-sel utility helps you view and manage system event log.

### 11.1 command-line arguments

- `--no-probing`  
Do not probe IPMI devices.
- `-D, --driver-type=IPMIDRIVER`  
Use this *IPMIDRIVER* instead of auto selection. Allowed values are KCS, SMIC, SSIF and LAN.
- `--driver-address=DRIVERADDR`  
Use this *DRIVERADDR* address instead of probed one.
- `--driver-device=DEVICE`  
Use this *DEVICE* for IPMI driver.
- `-h, --hostname=IPMIHOST`  
Connect to *IPMIHOST*.
- `-u, --username=USERNAME`  
Use *USERNAME* instead of NULL. Maximum *USERNAME* length is 16.
- `-p, --password=PASSWORD`  
Use *PASSWORD* instead of NULL. Maximum *PASSWORD* length is 16.
- `-a, --auth-type=AUTHTYPE`  
Use *AUTHTYPE* instead of NONE. Allowed values are NONE, MD2, MD5, PLAIN and OEM.
- `-l, --priv-level=PRIVILEGE-LEVEL`  
Use this *PRIVILEGE-LEVEL* instead of USER. Allowed values are CALLBACK, USER, OPERATOR, ADMIN and OEM.
- `-i, --info`  
Show general information about SEL.
- `-d, --delete=REC-LIST`  
Delete given SEL records entry.
- `-c, --delete-all`  
Delete all SEL entries.
- `-x, --hex-dump=FILE`  
Hex-dump SEL entries optionally to *FILE*.
- `-?, --help`  
Give this help list.
- `--usage`  
Give a short usage message.
- `-V, --version`  
Print program version.

## 11.2 ipmi-sel sample output

```
www:~# ipmi-sel
4:11-Dec-2005 07:03:43:Event Logging Disabled #9:Log Area Reset/Cleared
24:11-Dec-2005 07:49:05:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplugged)
44:11-Dec-2005 07:50:02:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplugged)
64:11-Dec-2005 07:52:33:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplugged)
84:11-Dec-2005 07:57:04:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplugged)
104:11-Dec-2005 07:57:07:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
124:11-Dec-2005 07:57:07:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
144:31-Dec-1969 16:00:02:Power Unit #1:AC lost
164:31-Dec-1969 16:00:13:Power Supply #112:Presence detected
184:31-Dec-1969 16:00:15:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
204:31-Dec-1969 16:00:15:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
224:31-Dec-1969 16:00:44:System Event #131:Timestamp Clock Synch
244:11-Dec-2005 07:59:03:System Event #131:Timestamp Clock Synch
264:11-Dec-2005 07:59:59:System Event #131:OEM System Boot Event
284:11-Dec-2005 08:09:46:Platform Chassis Intrusion #5:General Chassis Intrusion
304:11-Dec-2005 08:27:06:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
324:11-Dec-2005 08:27:06:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
344:11-Dec-2005 08:27:39:System Event #131:Timestamp Clock Synch
364:11-Dec-2005 08:27:41:System Event #131:Timestamp Clock Synch
384:11-Dec-2005 08:28:02:Platform Chassis Intrusion #5:General Chassis Intrusion
404:11-Dec-2005 08:31:36:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
424:11-Dec-2005 08:31:36:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
444:11-Dec-2005 08:32:10:System Event #131:Timestamp Clock Synch
464:11-Dec-2005 08:32:10:System Event #131:Timestamp Clock Synch
484:11-Dec-2005 08:32:45:System Event #131:OEM System Boot Event
504:11-Dec-2005 08:36:10:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
524:11-Dec-2005 08:36:10:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
544:11-Dec-2005 08:36:32:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
564:11-Dec-2005 08:36:32:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
584:11-Dec-2005 08:36:54:System Event #131:System Reconfigured:OEM code = 01h
604:11-Dec-2005 08:37:09:System Event #131:Timestamp Clock Synch
624:12-Dec-2005 08:37:13:System Event #131:Timestamp Clock Synch
644:12-Dec-2005 08:40:28:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
664:12-Dec-2005 08:40:28:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
684:12-Dec-2005 08:41:05:System Event #131:Timestamp Clock Synch
704:12-Dec-2005 08:41:06:System Event #131:Timestamp Clock Synch
724:12-Dec-2005 08:42:20:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
744:12-Dec-2005 08:42:20:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
764:12-Dec-2005 08:42:56:System Event #131:Timestamp Clock Synch
784:12-Dec-2005 08:42:56:System Event #131:Timestamp Clock Synch
804:12-Dec-2005 08:43:33:System Event #131:OEM System Boot Event
824:12-Dec-2005 08:50:58:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
844:12-Dec-2005 08:50:58:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
864:12-Dec-2005 08:51:18:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplugged)
```

```
884:12-Dec-2005 08:51:35:System Event #131:Timestamp Clock Synch
904:12-Dec-2005 08:51:41:System Event #131:Timestamp Clock Synch
924:12-Dec-2005 08:51:43:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
944:12-Dec-2005 08:51:46:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
964:12-Dec-2005 08:51:46:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
984:12-Dec-2005 08:52:18:System Event #131:Timestamp Clock Synch
1004:12-Dec-2005 08:52:18:System Event #131:Timestamp Clock Synch
1024:12-Dec-2005 08:52:29:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1044:12-Dec-2005 08:54:00:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1064:12-Dec-2005 08:54:03:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
1084:12-Dec-2005 08:54:03:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
1104:12-Dec-2005 08:54:39:System Event #131:Timestamp Clock Synch
1124:12-Dec-2005 08:54:39:System Event #131:Timestamp Clock Synch
1144:12-Dec-2005 08:55:17:System Event #131:OEM System Boot Event
1164:12-Dec-2005 09:13:59:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
1184:12-Dec-2005 09:13:59:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
1204:12-Dec-2005 09:14:35:System Event #131:Timestamp Clock Synch
1224:12-Dec-2005 09:14:36:System Event #131:Timestamp Clock Synch
1244:12-Dec-2005 09:15:14:System Event #131:OEM System Boot Event
1264:31-Dec-1969 16:00:08:Power Supply #112:Presence detected
1284:31-Dec-1969 16:00:10:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 26h
1304:31-Dec-1969 16:00:10:Fan #68:Fan:Trigger reading = 00h:Trigger reading = 1Dh
1324:31-Dec-1969 16:01:32:Platform Chassis Intrusion #5:General Chassis Intrusion
1344:31-Dec-1969 16:00:08:Platform Chassis Intrusion #5:General Chassis Intrusion
1364:31-Dec-1969 16:00:08:Power Supply #112:Presence detected
1384:31-Dec-1969 16:00:07:Platform Chassis Intrusion #5:General Chassis Intrusion
1404:31-Dec-1969 16:00:08:Power Supply #112:Presence detected
1424:31-Dec-1969 16:00:02:Power Unit #1:AC lost
1444:31-Dec-1969 16:00:13:Power Supply #112:Presence detected
1464:31-Dec-1969 16:00:51:System Event #131:Timestamp Clock Synch
1484:12-Dec-2005 09:26:13:System Event #131:Timestamp Clock Synch
1504:12-Dec-2005 09:27:12:System Event #131:OEM System Boot Event
1524:12-Dec-2005 10:06:36:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1544:12-Dec-2005 10:06:58:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1564:12-Dec-2005 10:10:00:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1584:12-Dec-2005 10:10:07:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1604:13-Dec-2005 06:50:05:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1624:14-Dec-2005 11:16:23:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1644:15-Dec-2005 07:35:40:System Event #131:Timestamp Clock Synch
1664:15-Dec-2005 07:35:37:System Event #131:Timestamp Clock Synch
1684:15-Dec-2005 07:36:11:System Event #131:OEM System Boot Event
1704:18-Dec-2005 12:41:53:System Event #131:Timestamp Clock Synch
1724:18-Dec-2005 12:41:50:System Event #131:Timestamp Clock Synch
1744:18-Dec-2005 12:42:23:System Event #131:OEM System Boot Event
1764:19-Dec-2005 04:50:50:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1784:19-Dec-2005 04:50:51:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
1804:25-Dec-2005 13:33:22:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
```

```
1824:25-Dec-2005 13:33:23:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
1844:26-Dec-2005 14:36:16:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
1864:26-Dec-2005 14:36:55:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
1884:26-Dec-2005 14:42:33:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
1904:26-Dec-2005 14:42:36:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
1924:27-Dec-2005 02:20:51:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
1944:27-Dec-2005 02:20:59:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
1964:27-Dec-2005 04:16:11:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
1984:27-Dec-2005 04:16:21:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2004:27-Dec-2005 05:06:46:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2024:27-Dec-2005 05:06:55:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2044:28-Dec-2005 08:30:42:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2064:28-Dec-2005 08:31:03:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2084:28-Dec-2005 08:32:39:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2104:28-Dec-2005 08:33:20:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2124:28-Dec-2005 08:42:29:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2144:28-Dec-2005 08:43:28:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2164:03-Jan-2006 16:40:37:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2184:03-Jan-2006 16:40:45:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
2204:03-Jan-2006 16:40:58:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
www:~#
```

## 12 bmc-watchdog

`bmc-watchdog` is a daemon and configuration utility for BMC watchdog timer. When run as a daemon, it periodically resets the timer so that, should the system lock up, the BMC can perform an appropriate emergency recovery action.

The `bmc-watchdog` tool typically executes as a cronjob or daemon to manage the watchdog timer. A user must be root in order to run `bmc-watchdog`.

### 12.1 BMC Watchdog Theory

A BMC watchdog timer is part of the Intelligent Platform Management Interface (IPMI) specification and is only available to BMCs that are compliant with IPMI. When a BMC watchdog timer is started, it begins counting down to zero from some positive number of seconds. When the timer hits zero, the timer will execute a pre-configured pre-timeout interrupt and/or timeout action.

In order to stop the pre-timeout interrupt or timeout action from being generated, the watchdog timer must be periodically reset back to its initial beginning value.

The BMC watchdog timer automatically stops itself when the machine is rebooted. Therefore, when a machine is brought up, the BMC watchdog timer must be setup again before it can be used.

Typically, a BMC watchdog timer is used to automatically reset a machine that has crashed. When the operating system first starts up, the BMC timer is set to its initial countdown value. At periodic intervals, when the operating system is functioning properly, the watchdog timer can be reset by the OS or a userspace program. Thus, the timer never counts down to zero. When the system crashes, the timer cannot be reset by the OS or userspace program. Eventually, the timer will countdown to zero and reset the machine.

### 12.2 command-line arguments

#### 12.2.1 bmc-watchdog general options

The following commands are available to `bmc-watchdog`.

The following options can be used by any command.

- `-h, --help`  
Display the help menu. If a specific command (`--set`, `--get`, `--reset`, `--start`, `--stop`, `--clear`, or `--daemon`) is listed on the command line, only the specific options for that command will be listed.
- `-v, --version`  
Display the version information.
- `-o int, --io-port=int`  
Identify the System Base Address for KCS SMS/IO. By default, `'0x0CA2'` is used. Port `'0x8A2'` is also common. If the io-port number is prefixed with a `'0x'`, it is assumed to be a base-16 integer. Otherwise, it is assumed to be a base-10 integer.
- `-f string, --logfile=string`  
Specify an alternate logfile from the default of `'/var/log/freeipmi/bmc-watchdog.log'`.

- `-n, --no-logging` Turns off all logging done by `bmc-watchdog`.

## 12.2.2 bmc-watchdog command options

The following commands are available to `bmc-watchdog`.

- `-s, --set`  
Set BMC Watchdog Configuration. BMC watchdog timer configuration values can be set using the set command options listed below under [Section 12.2.3 \[bmc-watchdog set options\]](#), page 62. If a particular configuration parameter is not specified on the command line, the current configuration of that parameter will not be changed.
- `-g, --get`  
Get BMC watchdog configuration and state. The current configuration and state is printed to standard output.
- `-r, --reset`  
Reset BMC watchdog timer.
- `-t, --start`  
Start BMC watchdog timer identical to `--reset` command when the timer is stopped. Does nothing if the timer is currently running.
- `-y, --stop`  
Stop BMC watchdog timer. Stops the current timer.
- `-c, --clear`  
Clear BMC watchdog configuration. Clears all configuration values for the watchdog timer, except for timer use, which is kept at its current value.
- `-d, --daemon`  
Run `bmc-watchdog` as a daemon. Configurable BMC watchdog timer options are listed below under [Section 12.2.5 \[bmc-watchdog daemon options\]](#), page 64. The configuration values are set once, then the daemon will reset the timer at specified periodic intervals. Every time the BMC watchdog timer is reset, a log entry will be generated in the ‘`bmc-watchdog`’ log. The default log is stored at ‘`/var/log/freeipmi/bmc-watchdog.log`’. The daemon can be stopped using the ‘`--stop`’ command, ‘`--clear`’ command, or by setting the ‘`stop_timer`’ flag on the ‘`--set`’ command.

## 12.2.3 bmc-watchdog set options

The following options can be used by the set command to set or clear various BMC watchdog configuration parameters.

- `-u int, --timer-use=int`  
Set timer use. The timer use value can be set to one of the following:
  - ‘1’ = BIOS FRB2
  - ‘2’ = BIOS POST
  - ‘3’ = OS\_LOAD
  - ‘4’ = SMS OS
  - ‘5’ = OEM
- `-m int, --stop-timer=int`  
Set stop timer flag. A flag value of ‘0’ stops the current BMC watchdog timer. A value of ‘1’ doesn’t turn off the current watchdog timer.

- `-l int, --log=int`  
Set log flag. A flag value of '0' turns logging on. A value of '1' turns logging off.
- `-a int, --timeout-action=int`  
Set timeout action. The timeout action can be set to one of the following:
  - '0' = No action
  - '1' = Hard Reset
  - '2' = Power Down
  - '3' = Power Cycle
- `-p int, --pre-timeout-interrupt=int`  
Set pre-timeout interrupt. The pre timeout interrupt can be set to one of the following:
  - '0' = None
  - '1' = SMI
  - '2' = NMI
  - '3' = Messaging Interrupt
- `-z secs, --pre-timeout-interval=secs`  
Set pre-timeout interval in seconds.
- `-F, --clear-bios-frb2`  
Clear BIOS FRB2 Timer Use flag.
- `-P, --clear-bios-post`  
Clear BIOS POST Timer Use flag.
- `-L, --clear-os-load`  
Clear OS Load Timer Use flag.
- `-S, --clear-sms-os`  
Clear SMS/OS Timer Use flag.
- `-O, --clear-oem`  
Clear OEM Timer Use Flag.
- `-i secs, --initial-countdown=secs`  
Set initial countdown in seconds.
- `-w, --start-after-set`  
Start timer after set command if timer is stopped. This is typically used when bmc-watchdog is used as a cronjob. This can be used to automatically start the timer after it has been set the first time.
- `-x, --reset-after-set`  
Reset timer after set command if timer is running.
- `-j, --start-if-stopped`  
Don't execute set command if timer is stopped, just start timer.
- `-k, --reset-if-running`  
Don't execute set command if timer is running, just reset timer. This is typically used when bmc-watchdog is used as a cronjob. This can be used to reset the timer after it has been initially started.

### 12.2.4 bmc-watchdog start options

The following options can be used by the start command.

- `-G int, --gratuitous-arp=int`  
Suspend or don't suspend gratuitous ARPs while the BMC timer is running. A flag value of '1' suspends gratuitous ARPs. A value of '0' will not suspend gratuitous ARPs. If this option is not specified, gratuitous ARPs will not be suspended.
- `-A int, --arp-response=int`  
Suspend or don't suspend BMC-generated ARP responses while the BMC timer is running. A flag value of '1' suspends ARP responses. A value of '0' will not suspend ARP responses. If this option is not specified, ARP responses will not be suspended.

### 12.2.5 bmc-watchdog daemon options

The following options can be used by the daemon command to set the initial BMC watchdog configuration parameters.

- `-u int, --timer-use=int`  
Set timer use. The timer use value can be set to one of the following:
  - '1' = BIOS FRB2
  - '2' = BIOS POST
  - '3' = OS\_LOAD
  - '4' = SMS OS
  - '5' = OEM
- `-l int, --log=int`  
Set Log Flag. A flag value of '0' turns logging on. A value of '1' turns logging off.
- `-a int, --timeout-action=int`  
Set timeout action. The timeout action can be set to one of the following:
  - '0' = No action
  - '1' = Hard Reset
  - '2' = Power Down
  - '3' = Power Cycle
- `-p int, --pre-timeout-interrupt=int`  
Set pre-timeout interrupt. The pre timeout interrupt can be set to one of the following:
  - '0' = None
  - '1' = SMI
  - '2' = NMI
  - '3' = Messaging Interrupt
- `-z secs, --pre-timeout-interval=secs`  
Set pre-timeout interval in seconds.
- `-F, --clear-bios-frb2`  
Clear BIOS FRB2 Timer Use flag.
- `-P, --clear-bios-post`  
Clear BIOS POST Timer Use flag.
- `-L, --clear-os-load`  
Clear OS Load Timer Use flag.
- `-S, --clear-sms-os`  
Clear SMS/OS Timer Use flag.

- `-O, --clear-oem`  
Clear OEM Timer Use flag.
- `-i secs, --initial-countdown=secs`  
Set initial countdown in seconds.
- `-G int, --gratuitous-arp=int`  
Suspend or don't suspend gratuitous ARPs while the BMC timer is running. A flag value of '1' suspends gratuitous ARPs. A value of '0' will not suspend gratuitous ARPs. If this option is not specified, gratuitous ARPs will not be suspended.
- `-A int, --arp-response=int`  
Suspend or don't suspend BMC-generated ARP responses while the BMC timer is running. A flag value of '1' suspends ARP responses. A value of '0' will not suspend ARP responses. If this option is not specified, ARP responses will not be suspended.
- `-e, --reset-period` Time interval to wait before resetting timer. The default is '60' seconds.

### 12.3 bmc-watchdog example

Setup a `bmc-watchdog` daemon that resets the machine after '15 minutes' (900 seconds) if the OS has crashed.<sup>1</sup>

```

debian-ia64:~# bmc-watchdog -d -u 4 -p 0 -a 1 -i 900
debian-ia64:~# ps -C bmc-watchdog
  PID TTY          TIME CMD
 1035 ?            00:00:00 bmc-watchdog
debian-ia64:~#

```

### 12.4 bmc-watchdog known issues

`bmc-watchdog` may fail to reset the watchdog timer if it is not scheduled properly. It is always recommended that `bmc-watchdog` be executed with a high scheduling priority.

On some machines, the hardware based SMI Handler may disable a processor after a watchdog timer timeout if the timer use is set to something other than SMS/OS.

---

<sup>1</sup> see default `bmc-watchdog` rc script `/etc/init.d/bmc-watchdog` a more complete example.

## 13 IPMI power control utility

Remote out-of-band chassis control utility to perform power-up, power-down, power-cycle, hard-reset, pulse-diagnostics-interrupt and OS soft shutdown operations.

PowerMan <http://www.llnl.gov/linux/powerman/> now supports `ipmipower` as a remote power control device.

Whenever a power command (`--on`, `--off`, `--cycle`, `--reset`, `--stat`, `--pulse`, or `--soft`) is specified on the command-line, `ipmipower` will run in non-interactive mode. `ipmipower` will attempt to run the power command on all hostnames listed on the command line then exit.

If no power commands are specified on the command line, `ipmipower` will run in interactive mode. Interactive mode gives the user a command-line interface to enter various commands. Details of the interactive command line interface can be found under [Section 13.1.1 \[ipmipower basic options\]](#), page 66 section.

### 13.1 Command-line arguments

#### 13.1.1 ipmipower basic options

The following options are basic options for `ipmipower`.

- `-h, --hostnames host1,host2,...`  
The list of hostname addresses to be controlled by `ipmipower`. The hostnames must resolve to the IP address of the NIC connected to the remote host BMC. If hostnames do not resolve to proper BMC IP addresses, RMCP ping messages will not discover the remote host or power commands will time out. This option is required if a power command (`--on`, `--off`, `--cycle`, `--reset`, or `--stat`, `--pulse`, `--soft`) is specified on the command-line. Hostnames may be specified in a range format; see [Section 13.4 \[Host ranges\]](#), page 72 section.
- `-u, --username name`  
Sets the username to use when authenticating with the BMC. The user must have *operator* or *administrator* privilege to run the `--on`, `--off`, `--reset`, `--cycle`, `--pulse`, or `--soft` power control commands. The user needs only *user* privileges to determine the status of the machine through `--stat`. If not specified, a null username (Anonymous Login 'User ID 1') is assumed.
- `-p, --password password`  
Sets the *password* to use when authenticating with the BMC. If not specified, a null password is assumed.
- `-n, --on`  
Power on the target hosts.
- `-f, --off`  
Power off the target hosts.
- `-c, --cycle`  
Power cycle the target hosts.
- `-r, --reset`  
Reset the target hosts.

- `-s, --stat`  
Get power status of the target hosts.
- `-j, --pulse`  
Send power diagnostic interrupt to target hosts.
- `-k, --soft`  
Initiate a soft-shutdown of the OS via ACPI.
- `-H, --help`  
Display the help menu and exit.
- `-V, --version`  
Display the version information and exit.
- `-C, --config file`  
Specify alternate configuration file.

### 13.1.2 ipmipower advanced options

The following advanced options are used to change the behavior of `ipmipower`.

- `-a, --authtype auth-type`  
Sets the authentication type to use with `ipmipower`. The currently available authentication types are:

```

    'none'
    'straight_passwd_key' => (default)
    'md2'
    'md5'

```

- `-g, --on-if-off`  
The IPMI specification does not require the `cycle` or `reset` commands to turn on a machine that is currently powered off. This option will force `ipmipower` to issue a power on command instead of a power cycle or hard reset command if the remote machine's power is currently off.
- `-o, --outputtype output-type`  
Sets the output type to use with `ipmipower`. The currently available output types are:

```

    'none'
    'newline'    => (default)
    'hostlist'

```

Hostlist output can be used to shorten output if the number of nodes in your cluster is quite large. However, hostlist output will only output after the slowest node has completed its power control operation.

### 13.1.3 ipmipower network options

The following options are used to change the behavior of the actual `ipmipower` network protocol used.

- `-t, --timeout time-out`  
Sets the *time-out* in milliseconds. `ipmipower` uses the *time-out* value to determine when to give up on a power command. If not specified, a default *time-out* of 20000 milliseconds (20 seconds) is used.

- `-y, --retry-timeout retry-timeout`

Sets the *retry-timeout* in milliseconds. The IPMI protocol sends a series of packets back and forth to a remote host BMC in order to perform a power control operation. When a response to any individual packet is not received after *retry-timeout* milliseconds, `ipmipower` will retry sending that packet. If not specified, packet retransmissions will occur after '400' milliseconds (0.4 seconds). The value *ms* must be less than the time out length specified with '`--timeout`'. Packet retransmissions can be disabled by setting the *retry-timeout* length to '0'.

Note how this option differs from the '`--timeout`' option above. The '`--timeout`' option refers to the entire amount of time the IPMI protocol has to complete a power control operation. The '`--retry`' option refers to the amount of time any individual packet within the IPMI protocol has to complete.
- `-b, --retry-backoff-count retry-backoff-count`

After every *retry-backoff-count* retransmissions, `ipmipower` will increase the *retry-timeout* length by another factor for the duration of the current power control operation. This is done to reduce network traffic and allow BMC buffers to empty. If not specified, *retry-backoff-count* is '8'. Retransmission backoff can be disabled by setting the retry backoff count to '0'.
- `-i, --ping-interval ping-interval`
- `-z, --ping-timeout ping-timeout`

`ipmipower` will send RMCP ping discovery messages every *ping-interval* milliseconds to discover all remote hosts and confirm its support of IPMI. Power commands cannot be sent to a host until it is discovered. If a remote host does not respond within *ping-timeout* milliseconds, a host will be considered undiscovered and power commands will not be sent to it. If not specified, *ping-interval* is '5000' milliseconds (5 seconds) and *ping-timeout* is '30000' milliseconds (30 seconds). Ping discovery requests can be disabled by setting the ping interval to '0'. If ping discovery messages are disabled, power commands will be attempted without knowledge of the host's existence or its support of IPMI. The value of *ping-interval* must be less than the *ping-timeout* length. RMCP ping discovery messages are automatically disabled in non-interactive mode.
- `-v, --ping-packet-count ping-packet-count`
- `-w, --ping-percent ping-percent`

It is difficult to distinguish between a missing node and node with a bad connection when using just RMCP pings and timeouts. For example, if a link consistently drops 80% of the packets to a particular node, a power control operation may have difficulty completing, although a recent pong response makes `ipmipower` believe the node exists and is functioning properly. The '`--ping-packet-count`' and '`--ping-percent`' options alleviate this problem. `ipmipower` will monitor ping packets in *ping-packet-count* chunks. If `ipmipower` does not receive a response to greater than *ping-percent* of those packets, `ipmipower` will assume the link to this node is bad and will not send power control operations to that node until the connection is determined to be reliable. If not specified, *ping-packet-count* is '10' and *ping-percent* is '50'. This heuristic can be disabled by setting either *ping-packet-count* or *ping-percent* to '0'. This feature is not

used if *ping-interval* is set to '0'. Note that the '--ping-percent' option takes an integer as an argument, not a decimal.

- -x, --ping-consec-count *ping-consec-count*  
*ping-consec-count* is another measurement used to determine if a node should be considered discovered, undiscovered, or with a bad connection. If a valid response was received from the last *ping-consec-count* RMCP ping packets, a node will be considered discovered, regardless if *ping-packet-count* and *ping-percent* statistically consider the link to be unreliable. If not specified, *ping-consec-count* is '5'. This feature can be disabled by setting *ping-consec-count* to '0'. This feature is not used if *ping-interval*, '--ping-packet-count', or '--ping-percent' are set to '0'.

## 13.2 ipmipower configuration file

The *ipmipower* configuration file can be used to set default values to *ipmipower* when values aren't set on the command line. This allows users to avoid typing in a long list of command line options everytime *ipmipower* is executed. It can also be used to hide usernames and passwords from the *ps* command. See [Section 13.7 \[ipmipower known issues\]](#), page 73 for details.

By default, the configuration file is stored at '/etc/ipmipower.conf'. But users may select a different configuration file at the command line through the '--config' option.

The user can still override the configuration file values by specifying the options on the command line. The configuration file does not stop a user from specifying certain options.

### 13.2.1 Configuration options

The following are a list of configuration options that can be specified in the configuration file. Each configuration option must be listed on a separate line. Arguments for an option are separated by any amount of whitespace. Multiple arguments are also separated by whitespace. Comments can be marked by using the pound sign ("#") character, and lines can be continued on the next using backslash ("\").

Note that it is possible to list the username and password in the configuration file. If this data is stored in a configuration file, system administrators should limit access to this file.

- hostnames *host1 host2 host3 . . .*

Specify the default hostnames. Multiple hostnames or hostname ranges can be specified by separating each range by whitespace. See [Section 13.4 \[Host ranges\]](#), page 72 for information on hostname ranges. For example, any of the following configuration listings would be acceptable:

```
hostnames host1 host2 host3 foo1 bar1
hostnames host1,host2,host3,foo1,bar1
hostnames host [1-3] foo1 bar1
hostnames host [1-3] foo1,bar1
```

At most 64 hostnames or hostname ranges can be separated by whitespace.

- username *username*  
Specify the default *username* to use.

- password *password*  
Specify the default *password* to use.
- authtype *authtype*  
Specify the default authentication type to use. `ipmipower` currently supports the following authentication types:
  - ‘straight\_passwd\_key’
  - ‘md2’
  - ‘md5’
- on-if-off enable|disable
- outputtype *outputtype*  
Specify the default outputtype type to use. `ipmipower` currently supports the following output types:
  - ‘none’
  - ‘newline’ => (default)
  - ‘hostlist’
- timeout *timeout*  
Specify the *timeout* in ms.
- retry-timeout *timeout*  
Specify the retry *timeout* in ms. See [Chapter 13 \[ipmipower\], page 66](#) for an explanation on the difference between this is the *timeout* option.
- retry-backoff-count *num*  
Specify the retry backoff count.
- ping-interval *interval-length*  
Specify the ping *interval-length* in ms.
- ping-timeout *timeout*  
Specify the ping *timeout* length in ms.
- ping-packet-count *count*  
Specify a new ping packet *count*.
- ping-percent *num*  
Specify a new ping percent.
- ping-consec-count *count*  
Specify a new ping consec *count*.

### 13.3 ipmipower interactive commands

`ipmipower` provides the following interactive commands at the ‘`ipmipower>`’ prompt. Before any power commands (‘`on`’, ‘`off`’, ‘`cycle`’, ‘`reset`’, ‘`stat`’, ‘`pulse`’, or ‘`soft`’) can be used, hostnames must be configured into `ipmipower`, either through the command prompt or the `hostnames` command below.

- hostnames *str*  
Specify a new set of hosts, no *str* to unconfigure all hosts.
- username *str*  
Specify a new username, no *str* for null username.

- password *str*  
Specify a new password, no *str* for null password.
- on *host*  
Turns on all hosts, or only the specified host.
- off *host*  
Turns off all hosts, or only the specified host.
- cycle *host*  
Power cycle all hosts, or specified host.
- reset *host*  
Hard reset all hosts or specified host.
- stat *host*  
Queries power status for all hosts, or only the specified host.
- pulse *host*  
Send pulse diagnostic interrupt to all hosts, or only the specified host.
- soft *host*  
Initiate a soft-shutdown of the OS via ACPI to all hosts, or only the specified host.
- help  
Display the help menu.
- advanced  
Display the advanced help menu.
- network  
Display the network help menu.
- quit  
Quit ipmipower.
- authtype *str*  
Specify a new authentication type:
  - ‘none’
  - ‘straight\_passwd\_key’
  - ‘md2’
  - ‘md5’
- outputtype *str*  
Specify a new output type:
  - ‘none’
  - ‘newline’
  - ‘hostlist’
- config  
Output the current configuration.
- timeout *ms*  
Specify a new timeout length.
- retry-timeout *ms*  
Specify a new retry timeout length.
- retry-backoff-count *num*  
Specify a new retry backoff count.

- ping-interval *ms*  
Specify a new ping interval length.
- ping-timeout *ms*  
Specify a new ping timeout length.
- ping-packet-count *num*  
Specify a new ping packet count.
- ping-percent *num*  
Specify a new ping percent.
- ping-consec-count *num*  
Specify a new ping consec count.

### 13.4 Host ranges

As noted above, `ipmipower` accepts a range of hostnames in the general form: `prefix[n-m,l-k,...]`, where  $n < m$  and  $l < k$ , etc., as an alternative to explicit comma separated lists of hosts. This form should not be confused with regular expression character classes (also denoted by `[]`). For example, `foo[19]` does not represent `foo1` or `foo9`, but rather represents a degenerate range: `foo19`.

This range syntax is meant only as a convenience on clusters with a `prefixNN` naming convention and specification of ranges should not be considered necessary – the list `foo1,foo9` could be specified as such, or by the range `foo[1,9]`.

Some examples of range usage follow:

```
foo[01-05] instead of foo01,foo02,foo03,foo04,foo05
foo[7,9-10] instead of foo7,foo9,foo10
foo[0-3] instead of foo0,foo1,foo2,foo3
```

As a reminder to the reader, some shells will interpret brackets (`[` and `]`) for pattern matching. Depending on your shell, it may be necessary to enclose ranged lists within quotes.

### 13.5 ipmipower example

Determine the power status of `foo[0-2]` with null username and password.

```
ipmipower -h foo[0-2] --stat
```

Determine the power status of `foo[0-2]` with non-null username and password.

```
ipmipower -h foo[0-2] -u foo -p bar --stat
```

Hard reset nodes `foo[0-2]` with non-null username and password.

```
ipmipower -h foo[0-2] -u foo -p bar --reset
```

Hard reset the nodes configured in a configuration file.

```
ipmipower -C /etc/powerctrl.conf --reset
```

Example `ipmipower` session:

```
debian-sid:~# ipmipower --hostnames debian-ia64 --password "realsecret" --stat
debian-ia64: on
debian-sid:~# ipmipower --hostnames debian-ia64 --password "realsecret" --off
debian-ia64: ok
```

```
debian-sid:~# ipmipower --hostnames debian-ia64 --password "realsecret" --stat
debian-ia64: off
debian-sid:~# ipmipower --hostnames debian-ia64 --password "realsecret" --on
debian-ia64: ok
debian-sid:~#
```

## 13.6 Use with powerman

The `powerman` device configuration file `ipmipower.dev` supplied with `powerman` 1.0.20 and beyond can be used to control one or more instances of `ipmipower` in coprocess mode.

Due to deficiencies within `powerman`, the power control operations `--on`, `--off`, `--cycle`, `--reset` will be reported as successful, despite any errors that may occur. The user should use the `--query` option to ensure that all remote hosts were successfully powered on or off.

It is recommend that the `--on-if-off` option be used with `ipmipower` when it is used in conjunction with `powerman`. This will ensure `ipmipower` behaves similarly to other `powerman` devices.

## 13.7 Known issues with the ipmipower command

In order to prevent brute force attacks, some BMCs will *lock up* after a number of username, password, or privilege errors. There is no known way to cleanly deal with a *locked up* BMC. The best option is to simply **wait awhile**.

On certain operating systems, if you input your username and password on the command line, the username and password may be discovered by other users when using the `ps` command or looking in the `/proc` file system. The most secure solution is to enter the username and password while in interactive mode. If administrators do not wish to type in their username and password at the interactive prompt, they can be listed in a configuration file, in which the access to this file can be limited.

IPMI specifications do not require BMCs to perform a power control operation before returning a completion code to the caller. Therefore, it is possible for `ipmipower` power status queries to initially return information other than what you are expecting. For example, if a `power off` operation is performed, a BMC may return a successful completion-code to `ipmipower` before the `power off` operation is actually performed. Subsequent power status queries may return `on` for several seconds, until the BMC actually performs the `power off` operation.

## 14 ipmiping

IPMI discovery and reachability test tool.

`ipmiping` uses the IPMI Get Authentication Capabilities request datagram to elicit an IPMI Get Authentication Capabilities response from a remote host. The utility can be used to verify if a remote host supports IPMI.

Returns '0' to the environment if it receives at least '1' response from the remote host. Otherwise, it exists with a value of '1'.

### 14.1 command-line arguments

#### 14.1.1 Synopsis

`ipmiping` [OPTIONS] destination

The following options are available

- `-h`  
Display the help menu.
- `-V`  
Display the version information.
- `-c count`  
Stop after sending *count* request packets.
- `-i interval`  
Wait *interval* seconds between sending each packet. The default is to wait for one second between each packet.
- `-I interface-address`  
Set source address to specified *interface-address*. Argument may be numeric IP address or name of device.
- `-t timeout`  
Time to wait for a response, in seconds. Default is five seconds.
- `-v`  
Verbose Display.

### 14.2 ipmiping example

Example: Test the BMC reachability of host 'debian-ia64' using IPMI protocol.

```
debian-sid:~# ipmiping debian-ia64
ipmiping debian-ia64 (192.168.1.60)
response received from 192.168.1.60: rq_seq=0
response received from 192.168.1.60: rq_seq=1
response received from 192.168.1.60: rq_seq=2
response received from 192.168.1.60: rq_seq=3
response received from 192.168.1.60: rq_seq=4
response received from 192.168.1.60: rq_seq=5
--- ipmiping debian-ia64 statistics ---
6 requests transmitted, 6 responses received in time, 0.0% packet loss
```

Example: Test the BMC reachability of host 'debian-ia64' in verbose mode.

```
debian-sid:~# ipmiping -v debian-ia64
ipmiping debian-ia64 (192.168.1.60)
response received from 192.168.1.60: rq_seq=0, auth: none=set md2=set md5=set passwd=s
response received from 192.168.1.60: rq_seq=1, auth: none=set md2=set md5=set passwd=s
response received from 192.168.1.60: rq_seq=2, auth: none=set md2=set md5=set passwd=s
response received from 192.168.1.60: rq_seq=3, auth: none=set md2=set md5=set passwd=s
response received from 192.168.1.60: rq_seq=4, auth: none=set md2=set md5=set passwd=s
--- ipmiping debian-ia64 statistics ---
5 requests transmitted, 5 responses received in time, 0.0% packet loss
```

Example: Test the BMC reachability of host 'debian-ia64' by sending exactly 2 packets.

```
debian-sid:~# ipmiping -c 2 debian-ia64
ipmiping debian-ia64 (192.168.1.60)
response received from 192.168.1.60: rq_seq=0
response received from 192.168.1.60: rq_seq=1
--- ipmiping debian-ia64 statistics ---
2 requests transmitted, 2 responses received in time, 0.0% packet loss
debian-sid:~#
```

### 14.3 ipmiping known issues

It has been observed that some remote BMCs can get *confused* and delay packet responses if duplicate packets are sent in succession very quickly. For example, this could happen if the user repeatedly executes `ipmiping -c 1 destination` very quickly. There is no known way to cleanly deal with a *confused* BMC. The best option is to simply **wait awhile**.

## 15 rmcpping

RMCP/IPMI discovery and reachability test tool.

`rmcpping` uses the RMCP ping request datagram to elicit an RMCP pong response from a remote host. The utility can be used to verify if a remote host supports RMCP or IPMI.

Returns 0 to the environment if it receives at least '1' response from the remote host. Otherwise, it exits with a value of '1'.

### 15.1 Command-line arguments

#### 15.1.1 Synopsis

`rmcpping` [OPTIONS] destination

- `-h`  
Display the help menu.
- `-V`  
Display the version information.
- `-c count`  
Stop after sending count ping packets.
- `-i interval`  
Wait *interval* seconds between sending each packet. The default is to wait for one second between each packet normally.
- `-I interface-address`  
Set source address to specified *interface-address*. Argument may be numeric IP address or name of device.
- `-t timeout`  
Time to wait for a response, in seconds. Default is '5' seconds.
- `-v` Verbose display.

### 15.2 rmcpping example

Example: Test the BMC reachability of host 'debian-ia64' using RMCP protocol.

```
debian-sid:~# rmcpping debian-ia64
rmcpping debian-ia64 (192.168.1.60)
pong received from 192.168.1.60: msg_tag=0
pong received from 192.168.1.60: msg_tag=1
pong received from 192.168.1.60: msg_tag=2
pong received from 192.168.1.60: msg_tag=3
pong received from 192.168.1.60: msg_tag=4
pong received from 192.168.1.60: msg_tag=5
pong received from 192.168.1.60: msg_tag=6
pong received from 192.168.1.60: msg_tag=7
pong received from 192.168.1.60: msg_tag=8
--- rmcpping debian-ia64 statistics ---
 9 pings transmitted, 9 pongs received in time, 0.0% packet loss
```

Example: Test the BMC reachability of host 'debian-ia64' in verbose mode.

```
debian-sid:~# rmcpping -v debian-ia64
rmcpping debian-ia64 (192.168.1.60)
pong received from 192.168.1.60: msg_tag=0, ipmi supported
pong received from 192.168.1.60: msg_tag=1, ipmi supported
pong received from 192.168.1.60: msg_tag=2, ipmi supported
pong received from 192.168.1.60: msg_tag=3, ipmi supported
pong received from 192.168.1.60: msg_tag=4, ipmi supported
--- rmcpping debian-ia64 statistics ---
5 pings transmitted, 5 pongs received in time, 0.0% packet loss
```

Example: Test the BMC reachability of host 'debian-ia64' by sending exactly 2 packets.

```
debian-sid:~# rmcpping -c 2 debian-ia64
rmcpping debian-ia64 (192.168.1.60)
pong received from 192.168.1.60: msg_tag=0
pong received from 192.168.1.60: msg_tag=1
--- rmcpping debian-ia64 statistics ---
2 pings transmitted, 2 pongs received in time, 0.0% packet loss
debian-sid:~#
```

### 15.3 rmcpping known issues

It has been observed that some remote BMCs can get *confused* and delay packet responses if duplicate packets are sent in succession very quickly. For example, this could happen if the user repeatedly executes `rmcpping -c 1 destination` very quickly. There is no known way to cleanly deal with a *confused* BMC. The best option is to simply **wait awhile**.

## 16 Gratuitous ARP Daemon

“garpd” daemon broadcasts request based gratuitous ARP packets with IP and MAC Address mappings from a configuration file. GARP is particularly useful for IPMI BMCs (mBMC) which do not support Gratuitous ARP. However there are other uses for GARP like IP address conflicts, IP address take over, ARP updates in a clustered environment, NIC link status updates.

### 16.1 Gratuitous ARP Theory

Gratuitous ARP: Usually ARP works as follows. Host A sends out an ARP request for the hardware address of an IP address on host B. Host B sees the request and sends an ARP reply containing the hardware address for the interface with the IP address in question. Host A then records the hardware address in its ARP cache so it doesn't have to do an ARP request and wait for a reply each time it wants to send a packet. Entries in an ARP cache typically expire after about two minutes. For more information on ARP, please see RFC 826.

Request Based Gratuitous ARP: A gratuitous ARP request packet where the source and destination IP are both set to the IP of the machine issuing the packet and the destination MAC is the broadcast address ff:ff:ff:ff:ff:ff. Ordinarily, no reply packet will occur. And all hosts on the LAN will refresh their ARP caches using the source hardware address of this request.

Response Based Gratuitous ARP: A gratuitous ARP reply packet without any ARP request where the ARP reply is addressed to the broadcast hardware address. All hosts on the LAN will receive the ARP reply and refresh their ARP cache accordingly.

### 16.2 Command-line arguments

garpd [OPTIONS...]

The following options are available

- -b, -batch-delay=NUM  
Delay between batch of broadcasts.
- -c, -config-file=FILE  
Configuration file.
- -D, -no-daemon  
Do not become a daemon
- -i, -interval-delay=NUM  
Delay between every broadcast within in a batch. Set this to avoid network flooding effect.
- -o, -send-once=SPEC  
Send GARP broadcast once in no-daemon mode and exit. Multiple send-once arguments are allowed. Any meaningful entry in the config file can be used as “spec”. All Host/MAC pairs in the config file are ignored.
- -q, -quiet, -silent  
Inhibit usual output

- -v, -verbose  
Print more information
- -?, -help  
Give this help list
- -usage  
Give a short usage message

## 16.3 garpd configuration file

Example “garpd” configuration file.

```
# /usr/etc/garpd.conf: garpd configuration file.

# Set default interface to eth0.
default iface [eth0]
# Send broadcasts every 500 milli seconds.
batch-delay 500
# Delay 200 milli seconds between every broadcast.
interval-delay 200

# host and MAC mappings to be broadcasted as Gratuitous ARP.
host = node2 mac=aa:bb:cc:33:13:c2 iface=eth1
host = 1.2.3.4 mac= aa:1b:cc:33:13:c2  iface=[eth2 eth3 eth4]
host = 5.6.7.8 mac= aa:1b:cc:33:13:c2  iface = [ eth4 ]
# Use default iface.
host = 9.10.11.12 mac =aa:1b:cc:33:13:c2
```

## 17 Trouble-shooting

### 17.1 Fencing IPMI IP ports

```
Append the following to /etc/services:
# BMC IPMI/RMCP services
rmcp      623/udp      # Aux Bus Shunt (Primary RMCP Port)
rmcps     664/udp      # Secure Aux Bus (Secondary RMCP Port)
```

BMC internally (at hardware level) uses the above mentioned ports for sending RMCP/IPMI packets. To avoid any conflict with the BMC, Operating System should make sure no other applications or services uses these ports for communication. One easy way to do this is to start a simple daemon at the boot time that opens these ports but never uses them.

Most common victims to this issue are Remote-shell (rsh) and NIS services. You will notice “time out” errors under heavy load, when these services run over the BMC reserved ports.

Secure connections to BMC port 664 is not enabled on most BMC implementations by default.

Thanks to Anand Manian (GE Power Systems) for reporting this problem.

### 17.2 “Cat ate the fish” exception

fish throws exception if it encounters any error in its extension system. Most of the times, You will get a clear indicative message from the exception dump.

In this example, Fish throws an exception message, when a built-in primitive is misspelt as `fi-set-promt!` instead of `fi-set-prompt!`. Unbound-variable ‘tag’ and ‘throw args’ gives you the clue.

```
root@gnu:~/work/freeipmi# fish

>>--:> >>--:> >>--:> >>--:>
~ ~   Cat ate the fish!!  ~ ~
>>--:> >>--:> >>--:> >>--:>
Fish Exception (gh_standard_handler dump):
tag          : unbound-variable
throw args   : (#f Unbound variable: ~S (fi-set-promt!) #f)
data         : [/usr/etc/fish/fish.scm]
No backtrace available.

FreeIPMI Shell [fish-0.1.0]
Copyright (C) 2003-2004 FreeIPMI Core Team
This program is free software; you may redistribute it under the terms of
the GNU General Public License. This program has absolutely no warranty.
fish>

;; file: /usr/etc/fish/fish.scm (fish startup file)
(fi-set-promt! "fish# ")
      ^---<< Typo, Spell correctly as "fi-set-prompt!"
```

### 17.3 Non-unique IPC key

Drivers internally use the inode number of `/var/lib/freeipmi/ipckey` to obtain a system wide unique IPC key for locking and synchronization through `ftok` call. It is extremely rare (but possible) for more than one application to conflict with this IPC key, because `ftok` doesn't absolutely guarantee system wide uniqueness.

To regenerate a new system wide unique IPC key, you have to recreate `/var/lib/freeipmi/ipckey` with a new inode number.

Example: Recreating `/var/lib/freeipmi/ipckey` file.

```
debian-ia64:~# touch -f /var/lib/freeipmi/ipckey.new
debian-ia64:~# ls --inode /var/lib/freeipmi/ipckey
2289282 /var/lib/freeipmi/ipckey
debian-ia64:~# ls --inode /var/lib/freeipmi/ipckey.new
2289284 /var/lib/freeipmi/ipckey.new
debian-ia64:~# mv -f /var/lib/freeipmi/ipckey.new
/var/lib/freeipmi/ipckey
debian-ia64:~# ls --inode /var/lib/freeipmi/ipckey
2289284 /var/lib/freeipmi/ipckey
debian-ia64:~#
```

## 18 Contact us

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Version 2, June 1991

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```
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```

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```

```
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Ty Coon, President of Vice
```

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## 21 Glossary

BMC	[B]aseboard [M]anagement [C]ontroller.
FISH	[F]ree[I]PMI [SH]ell.
GNU	[G]NU's [N]ot [U]nix.
GPL	GNU [G]eneral [P]ublic [L]icense.
IP	[I]nternet [P]rotocol.
IPMI	[I]ntelligent [P]latform [M]anagement [I]nterface
NIS	[N]etwork [I]nformation [S]ervice. Also humerously known as [N]etwork [I]ntrusion [S]ervice :) .
RMCP	[R]empote [M]anagement [C]ontrol [P]rotocol.
RSH	[R]emote [SH]ell.

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