

# GNU FreeIPMI User's Guide

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Free Intelligent Platform Management System  
Version 0.1.3 updated on 9 December 2004

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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 0.1.3 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

### 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
```

### 2.3 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:

```
debian-ia64:~# bmc-info
Device ID:          20
Device Revision:    1
                   [SDR Support]
Firmware Revision: 0.27
                   [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: 157h
Product ID: 100h
Aux Firmware Revision Info: Boot Code v00.13, PIA v01.27
debian-ia64:~#
```

If you don't get the expected response from `bmc-info` command, please refer to [Chapter 13 \[Trouble-shooting\]](#), 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 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.

### 4.1 Command-line arguments to fish

- `—brief`  
Shorten output.
- `-q, —quiet, —silent`  
Inhibit usual output.
- `—driver-poll-interval=usec`  
User *usec* driver poll interval.
- `-s, —script-file=script-file`  
Load and execute given *script-file*.
- `—sms-io-base=sms-io-base`  
System Interface Driver SMS IO base address.
- `-v, —verbose`  
Print more information.
- `-?, —help`  
Give this help list.
- `—usage`  
Give a short usage message.
- `-V, —version`  
Print program version.

### 4.2 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"))
;   ))
```

## 4.3 Invoking fish

### 4.3.1 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.

```
fish# debian-ia64:~# fish
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# help sensors
sensors --version --usage --help --verbose --sdr-info --flush-cache
--list-groups --group=GROUP-NAME --sensors "SENSORS-LIST"
        Display IPMI Sensors.

fish# quit
debian-ia64:~#
```

### 4.3.2 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: 0.27
                  [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:  157h
Product ID:       100h
Aux Firmware Revision Info: Boot Code v00.13, PIA v01.27
bmc-info exited with 0 status
debian-ia64:~#

```

### 4.3.3 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#

```



```

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:~#

```

## 5.3 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
```

## 5.4 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.

## 5.5 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:~#
```

## 5.6 bmc-config known issues

### 5.6.1 Auth\_Type\_None conflict

‘XXXXXXXX\_Auth\_Type\_None’ cannot be ‘Yes’ when ever any of the ‘XXXXXXXX\_Auth\_Type\_{Md2|Md5|Straight\_Pa} are set to ‘Yes’.

### 5.6.1.1 Bad configuration

'XXXXXXX\_Auth\_Type\_None' *should be* set to 'No'.

```

Section LAN_Conf_Auth
## Possible values: Yes/No
Admin_Enable_Auth_Type_None                Yes
## 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
EndSection

```

### 5.6.1.2 Good configuration

```

Section LAN_Conf_Auth
## 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
EndSection

```

### 5.6.1.3 Good configuration

```

Section LAN_Conf_Auth
## Possible values: Yes/No
Admin_Enable_Auth_Type_None                Yes
## Possible values: Yes/No
Admin_Enable_Auth_Type_Md2                 No
## Possible values: Yes/No
Admin_Enable_Auth_Type_Md5                 No
## Possible values: Yes/No
Admin_Enable_Auth_Type_Straight_Password   No
## Possible values: Yes/No
Admin_Enable_Auth_Type_Oem_Proprietary     No
EndSection

```

### 5.6.1.4 Good configuration

```

Section LAN_Conf_Auth
## 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  Yes
EndSection
```

## 6 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.

### 6.1 Command-line options

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

### 6.2 Example

```
debian-ia64:~# bmc-info
Device ID:          20
Device Revision:    1
                   [SDR Support]
Firmware Revision: 0.27
                   [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:   157h
Product ID:        100h
Aux Firmware Revision Info: Boot Code v00.13, PIA v01.27
debian-ia64:~#
```

## 7 sensors

`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.

### 7.1 command-line arguments

- `-u, --usage`  
Usage message.
- `-h, --help`  
Show help.
- `-V, --version`  
Show version information.
- `-v, --verbose`  
Verbose sensor output.
- `-vv`  
Very verbose sensor output.
- `-a, --all`  
Display all sensors, override ignore list.
- `-i, --sdr-info`  
Show SDR Info.
- `-f, --flush-cache`  
Flush sensor cache.
- `-l, --list-groups` List the sensor groups.
- `-p, --prof` Profile system interface driver polling.
- `-g group-name, --group=group-name` List sensors from group.
- `-s sensors-list, --sensors=sensors-list` List the given sensors.

### 7.2 Setting default startup options

Example `sensors-conf.scm` file:

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

;; 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"))
))
```

## 7.3 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.

### 7.3.1 Sample sensors output

```
debian-ia64:~# sensors
1: I/O Bd +1.3V (Voltage): 1.33 V (low=1.23/nom=1.30/high=1.36) [OK]
2: I/O Bd +1.5V (Voltage): 1.53 V (low=1.42/nom=1.50/high=1.57) [OK]
3: I/O Bd +1.8V (Voltage): 1.82 V (low=1.70/nom=1.80/high=1.88) [OK]
4: I/O Bd +3.3V SB (Voltage): 3.26 V (low=3.13/nom=3.30/high=3.45) [OK]
5: I/O Bd +3.3V_A (Voltage): 3.38 V (low=3.06/nom=3.30/high=3.52) [OK]
6: I/O Bd +3.3V_B (Voltage): 3.38 V (low=3.12/nom=3.30/high=3.46) [OK]
7: IORISER CMOS Bat (Voltage): 3.22 V (low=2.40/nom=2.99/high=3.60) [OK]
8: I/O Bd +5V_A (Voltage): 4.99 V (low=4.73/nom=4.99/high=5.23) [OK]
9: I/O Bd +5V_B (Voltage): 5.03 V (low=4.74/nom=5.00/high=5.23) [OK]
10: I/O Bd +12V (Voltage): 11.97 V (low=11.28/nom=11.90/high=12.46) [OK]
11: I/O Bd -12V (Voltage): -11.99 V (low=-12.64/nom=-12.06/high=-11.49) [OK]
12: Proc Bd +1.2V (Voltage): 1.21 V (low=1.18/nom=1.20/high=1.21) [OK]
13: MEM Bd 1 +1.25V (Voltage): 1.28 V (low=1.18/nom=1.25/high=1.31) [OK]
14: MEM Bd 2 +1.25V (Voltage): 1.28 V (low=1.18/nom=1.25/high=1.31) [OK]
15: Proc Bd +1.3V (Voltage): 1.32 V (low=1.22/nom=1.30/high=1.36) [OK]
16: Proc Bd +1.5V (Voltage): 1.52 V (low=1.45/nom=1.50/high=1.54) [OK]
17: Proc Bd +1.8V (Voltage): 1.82 V (low=1.73/nom=1.80/high=1.87) [OK]
18: Proc Bd +3.3V SB (Voltage): 3.27 V (low=3.13/nom=3.29/high=3.46) [OK]
19: Proc Bd +3.3V (Voltage): 3.30 V (low=3.13/nom=3.29/high=3.46) [OK]
20: IORISER +12V SB (Voltage): 12.33 V (low=11.21/nom=11.80/high=12.39) [OK]
21: IORISER +2.5V (Voltage): 2.50 V (low=2.35/nom=2.47/high=2.60) [OK]
22: IORISER +1.5V SB (Voltage): 1.52 V (low=1.42/nom=1.50/high=1.57) [OK]
23: IORISER +1.5V (Voltage): 1.52 V (low=1.42/nom=1.50/high=1.57) [OK]
24: IORISER +5V SB (Voltage): 4.96 V (low=4.67/nom=4.93/high=5.16) [OK]
25: I/O Bd SCSI +5V (Voltage): 5.04 V (low=4.63/nom=4.99/high=5.33) [OK]
26: Mem Bd 1 Temp (Temperature): 29.00 C (low=10.00/nom=33.00/high=45.00) [OK]
27: Mem Bd 2 Temp (Temperature): 30.00 C (low=10.00/nom=33.00/high=45.00) [OK]
28: I/O Bd Temp 1 (Temperature): 28.00 C (low=10.00/nom=46.00/high=54.00) [OK]
29: I/O Bd SIOH Temp (Temperature): 39.00 C (low=10.00/nom=55.00/high=95.00) [OK]
30: I/O Bd Temp 3 (Temperature): 27.00 C (low=10.00/nom=49.00/high=57.00) [OK]
31: Proc Bd Amb Temp (Temperature): 21.00 C (low=10.00/nom=25.00/high=38.00) [OK]
32: Proc Bd SNC Temp (Temperature): 41.00 C (low=10.00/nom=55.00/high=95.00) [OK]
33: F38 Tach Fan 1 (Fan): 2600.00 RPM (low=2260.00/nom=2600.00/high=2880.00) [OK]
34: F38 Tach Fan 2 (Fan): 2620.00 RPM (low=2260.00/nom=2600.00/high=2880.00) [OK]
35: F25 Tach Fan 3 (Fan): 2480.00 RPM (low=2160.00/nom=2500.00/high=2780.00) [OK]
36: F25 Tach Fan 4 (Fan): 2480.00 RPM (low=2260.00/nom=2620.00/high=2900.00) [OK]
```

37: Mem Bd 1 FanBst (OEM Reserved): 29.00 C (low=10.00/nom=33.00/high=45.00) [OK]  
38: Mem Bd 2 FanBst (OEM Reserved): 30.00 C (low=10.00/nom=33.00/high=45.00) [OK]  
39: I/O Bd FanBst 1 (OEM Reserved): 28.00 C (low=10.00/nom=46.00/high=54.00) [OK]  
40: IOBd SIOH FanBst (OEM Reserved): 39.00 C (low=10.00/nom=55.00/high=95.00) [OK]  
41: I/O Bd FanBst 3 (OEM Reserved): 27.00 C (low=10.00/nom=49.00/high=57.00) [OK]  
42: Proc Bd Amb FanB (OEM Reserved): 21.00 C (low=10.00/nom=25.00/high=29.00) [OK]  
43: Proc Bd SNC FanB (OEM Reserved): 41.00 C (low=10.00/nom=55.00/high=95.00) [OK]  
44: Proc 1 Temp (Temperature): 38.00 C (low=15.00/nom=70.00/high=98.00) [OK]  
45: Proc 2 Temp (Temperature): N/A (low=15.00/nom=70.00/high=98.00) [Unknown]  
46: Proc 3 Temp (Temperature): N/A (low=15.00/nom=70.00/high=98.00) [Unknown]  
47: Proc 4 Temp (Temperature): N/A (low=15.00/nom=70.00/high=98.00) [Unknown]  
48: Proc 1 FanBst (OEM Reserved): 38.00 C (low=10.00/nom=70.00/high=100.00) [OK]  
49: Proc 2 FanBst (OEM Reserved): N/A (low=10.00/nom=70.00/high=100.00) [Unknown]  
50: Proc 3 FanBst (OEM Reserved): N/A (low=10.00/nom=70.00/high=100.00) [Unknown]  
51: Proc 4 FanBst (OEM Reserved): N/A (low=10.00/nom=70.00/high=100.00) [Unknown]  
53: Pwr Unit Status (Power Unit): [OK]  
54: Pwr Unit Redund (Power Unit): [OK]  
55: Watchdog (Watchdog 2): [OK]  
56: ScrtY Violation (Platform Security Violation): [OK]  
57: Physical ScrtY (Platform Chassis Intrusion): [OK]  
58: POST Error (System Firmware): [OK]  
59: Crit Int Status (Critical Interrupt): [OK]  
60: EVT Log Disabled (Event Logging Disabled): [OK]  
61: System Event (System Event): [OK]  
62: Int SCSI TERMV0 (Voltage): [Performance Met]  
63: Int SCSI TERMV1 (Voltage): [Performance Met]  
64: Int SCSI TERMV2 (Voltage): [Performance Met]  
65: Ext SCSI TERMV0 (Voltage): [Performance Met]  
66: Ext SCSI TERMV1 (Voltage): [Performance Met]  
67: Ext SCSI TERMV2 (Voltage): [Performance Met]  
68: Pwr Supply 1 (Power Supply): [OK]  
69: Pwr Supply 2 (Power Supply): [OK]  
70: IO Bd 3.3V D2D 3 (Power Supply): [OK]  
71: IO Bd 3.3V D2D 4 (Power Supply): [OK]  
72: IO Bd 5V D2D 1 (Power Supply): [OK]  
73: IO Bd 5V D2D 2 (Power Supply): [OK]  
74: ProcBd 3.3V D2D1 (Power Supply): [OK]  
75: ProcBd 2.5V D2D1 (Power Supply): [OK]  
76: ProcBd 2.5V D2D2 (Power Supply): [OK]  
77: MemBd1 1.25V D2D (Power Supply): [OK]  
78: MemBd2 1.25V D2D (Power Supply): [OK]  
79: Proc 12V SB PwGd (Voltage): [Performance Met]  
80: Node PwrGd (Voltage): [Performance Met]  
81: Mem Bd1 Pres (Board): [Device Inserted/Device Present]  
82: Mem Bd2 Pres (Board): [Device Inserted/Device Present]  
83: Fan 1 Present (Fan): [Device Inserted/Device Present]  
84: Fan 2 Present (Fan): [Device Inserted/Device Present]

```

85: Fan 3 Present (Fan): [Device Inserted/Device Present]
86: Fan 4 Present (Fan): [Device Inserted/Device Present]
87: IO Bd Interlock (Board): [Device Inserted/Device Present]
88: IORISER Interlck (Board): [Device Inserted/Device Present]
89: Proc Bd Interlck (Board): [Device Inserted/Device Present]
90: SCSI Interlock (Board): [Device Inserted/Device Present]
91: INIT State (OEM Reserved): [State Deasserted]
92: Proc 1 Status (Processor): [OK]
93: Proc 2 Status (Processor): [Unknown]
94: Proc 3 Status (Processor): [Unknown]
95: Proc 4 Status (Processor): [Unknown]
96: Proc 1 PwrGd (Voltage): [Performance Met]
97: Proc 2 PwrGd (Voltage): [Unknown]
98: Proc 3 PwrGd (Voltage): [Unknown]
99: Proc 4 PwrGd (Voltage): [Unknown]
100: PCI HP Slot 1 (Slot Connector): [OK]
101: PCI HP Slot 2 (Slot Connector): [OK]
102: PCI HP Slot 3 (Slot Connector): [OK]
103: PCI HP Slot 4 (Slot Connector): [OK]
104: PCI HP Slot 5 (Slot Connector): [OK]
105: PCI HP Slot 6 (Slot Connector): [OK]
106: PCI HP Slot 7 (Slot Connector): [OK]
107: PCI HP Slot 8 (Slot Connector): [OK]
debian-ia64:~#

```

### 7.3.2 Sample very-verbose output

```

debian-ia64:~# sensors -vv
Record ID: 1
Sensor type: I/O Bd +1.3V (Voltage)
Sensor number: #16
Event/Reading type code: 01h
Lower non-recoverable threshold: 0.00 Volts
Upper non-recoverable threshold: 0.00 Volts
Lower Critical threshold: 1.20 Volts
Upper Critical threshold: 1.39 Volts
Lower non-critical threshold: 0.00 Volts
Upper non-critical threshold: 0.00 Volts
Sensor min. reading: 0.00 Volts
Sensor max. reading: 2.55 Volts
Normal min: 1.23 Volts
Nominal reading: 1.30 Volts
Normal max: 1.36 Volts
Sensor reading: 1.33 Volts
Sensor status: OK

Record ID: 2
Sensor type: I/O Bd +1.5V (Voltage)

```

Sensor number: #17  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.38 Volts  
Upper Critical threshold: 1.61 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 2.55 Volts  
Normal min: 1.42 Volts  
Nominal reading: 1.50 Volts  
Normal max: 1.57 Volts  
Sensor reading: 1.53 Volts  
Sensor status: OK

Record ID: 3  
Sensor type: I/O Bd +1.8V (Voltage)  
Sensor number: #18  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.66 Volts  
Upper Critical threshold: 1.93 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 3.06 Volts  
Normal min: 1.70 Volts  
Nominal reading: 1.80 Volts  
Normal max: 1.88 Volts  
Sensor reading: 1.82 Volts  
Sensor status: OK

Record ID: 4  
Sensor type: I/O Bd +3.3V SB (Voltage)  
Sensor number: #21  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 3.04 Volts  
Upper Critical threshold: 3.54 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 4.33 Volts  
Normal min: 3.13 Volts

Nominal reading: 3.30 Volts  
Normal max: 3.45 Volts  
Sensor reading: 3.26 Volts  
Sensor status: OK

Record ID: 5  
Sensor type: I/O Bd +3.3V\_A (Voltage)  
Sensor number: #22  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 2.94 Volts  
Upper Critical threshold: 3.60 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 5.10 Volts  
Normal min: 3.06 Volts  
Nominal reading: 3.30 Volts  
Normal max: 3.52 Volts  
Sensor reading: 3.38 Volts  
Sensor status: OK

Record ID: 6  
Sensor type: I/O Bd +3.3V\_B (Voltage)  
Sensor number: #23  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 3.04 Volts  
Upper Critical threshold: 3.54 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 4.08 Volts  
Normal min: 3.12 Volts  
Nominal reading: 3.30 Volts  
Normal max: 3.46 Volts  
Sensor reading: 3.38 Volts  
Sensor status: OK

Record ID: 7  
Sensor type: IORISER CMOS Bat (Voltage)  
Sensor number: #24  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts

Lower Critical threshold: 2.30 Volts  
Upper Critical threshold: 3.68 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 4.08 Volts  
Normal min: 2.40 Volts  
Nominal reading: 2.99 Volts  
Normal max: 3.60 Volts  
Sensor reading: 3.22 Volts  
Sensor status: OK

Record ID: 8  
Sensor type: I/O Bd +5V\_A (Voltage)  
Sensor number: #25  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 4.60 Volts  
Upper Critical threshold: 5.36 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 6.63 Volts  
Normal min: 4.73 Volts  
Nominal reading: 4.99 Volts  
Normal max: 5.23 Volts  
Sensor reading: 4.99 Volts  
Sensor status: OK

Record ID: 9  
Sensor type: I/O Bd +5V\_B (Voltage)  
Sensor number: #26  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.01 Volts  
Upper non-recoverable threshold: 0.01 Volts  
Lower Critical threshold: 4.61 Volts  
Upper Critical threshold: 5.36 Volts  
Lower non-critical threshold: 0.01 Volts  
Upper non-critical threshold: 0.01 Volts  
Sensor min. reading: 0.01 Volts  
Sensor max. reading: 6.64 Volts  
Normal min: 4.74 Volts  
Nominal reading: 5.00 Volts  
Normal max: 5.23 Volts  
Sensor reading: 5.03 Volts  
Sensor status: OK

Record ID: 10  
Sensor type: I/O Bd +12V (Voltage)  
Sensor number: #27  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 10.97 Volts  
Upper Critical threshold: 12.77 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 15.81 Volts  
Normal min: 11.28 Volts  
Nominal reading: 11.90 Volts  
Normal max: 12.46 Volts  
Sensor reading: 11.97 Volts  
Sensor status: OK

Record ID: 11  
Sensor type: I/O Bd -12V (Voltage)  
Sensor number: #28  
Event/Reading type code: 01h  
Lower non-recoverable threshold: -16.60 Volts  
Upper non-recoverable threshold: -16.60 Volts  
Lower Critical threshold: -13.00 Volts  
Upper Critical threshold: -11.20 Volts  
Lower non-critical threshold: -16.60 Volts  
Upper non-critical threshold: -16.60 Volts  
Sensor min. reading: -16.60 Volts  
Sensor max. reading: 1.76 Volts  
Normal min: -12.64 Volts  
Nominal reading: -12.06 Volts  
Normal max: -11.49 Volts  
Sensor reading: -11.99 Volts  
Sensor status: OK

Record ID: 12  
Sensor type: Proc Bd +1.2V (Voltage)  
Sensor number: #29  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.08 Volts  
Upper Critical threshold: 1.31 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts

Sensor min. reading: 0.00 Volts  
Sensor max. reading: 3.06 Volts  
Normal min: 1.18 Volts  
Nominal reading: 1.20 Volts  
Normal max: 1.21 Volts  
Sensor reading: 1.21 Volts  
Sensor status: OK

Record ID: 13  
Sensor type: MEM Bd 1 +1.25V (Voltage)  
Sensor number: #30  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.15 Volts  
Upper Critical threshold: 1.33 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 3.06 Volts  
Normal min: 1.18 Volts  
Nominal reading: 1.25 Volts  
Normal max: 1.31 Volts  
Sensor reading: 1.28 Volts  
Sensor status: OK

Record ID: 14  
Sensor type: MEM Bd 2 +1.25V (Voltage)  
Sensor number: #31  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.15 Volts  
Upper Critical threshold: 1.33 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 3.06 Volts  
Normal min: 1.18 Volts  
Nominal reading: 1.25 Volts  
Normal max: 1.31 Volts  
Sensor reading: 1.28 Volts  
Sensor status: OK

Record ID: 15  
Sensor type: Proc Bd +1.3V (Voltage)  
Sensor number: #32

Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.16 Volts  
Upper Critical threshold: 1.43 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 3.06 Volts  
Normal min: 1.22 Volts  
Nominal reading: 1.30 Volts  
Normal max: 1.36 Volts  
Sensor reading: 1.32 Volts  
Sensor status: OK

Record ID: 16  
Sensor type: Proc Bd +1.5V (Voltage)  
Sensor number: #33  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.34 Volts  
Upper Critical threshold: 1.64 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 3.06 Volts  
Normal min: 1.45 Volts  
Nominal reading: 1.50 Volts  
Normal max: 1.54 Volts  
Sensor reading: 1.52 Volts  
Sensor status: OK

Record ID: 17  
Sensor type: Proc Bd +1.8V (Voltage)  
Sensor number: #34  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.62 Volts  
Upper Critical threshold: 1.98 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 3.06 Volts  
Normal min: 1.73 Volts  
Nominal reading: 1.80 Volts

Normal max: 1.87 Volts  
Sensor reading: 1.82 Volts  
Sensor status: OK

Record ID: 18  
Sensor type: Proc Bd +3.3V SB (Voltage)  
Sensor number: #35  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 2.99 Volts  
Upper Critical threshold: 3.59 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 4.39 Volts  
Normal min: 3.13 Volts  
Nominal reading: 3.29 Volts  
Normal max: 3.46 Volts  
Sensor reading: 3.27 Volts  
Sensor status: OK

Record ID: 19  
Sensor type: Proc Bd +3.3V (Voltage)  
Sensor number: #36  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 2.99 Volts  
Upper Critical threshold: 3.59 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 4.39 Volts  
Normal min: 3.13 Volts  
Nominal reading: 3.29 Volts  
Normal max: 3.46 Volts  
Sensor reading: 3.30 Volts  
Sensor status: OK

Record ID: 20  
Sensor type: IORISER +12V SB (Voltage)  
Sensor number: #37  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 10.80 Volts

Upper Critical threshold: 12.80 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 15.04 Volts  
Normal min: 11.21 Volts  
Nominal reading: 11.80 Volts  
Normal max: 12.39 Volts  
Sensor reading: 12.33 Volts  
Sensor status: OK

Record ID: 21  
Sensor type: IORISER +2.5V (Voltage)  
Sensor number: #38  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 2.26 Volts  
Upper Critical threshold: 2.69 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 3.75 Volts  
Normal min: 2.35 Volts  
Nominal reading: 2.47 Volts  
Normal max: 2.60 Volts  
Sensor reading: 2.50 Volts  
Sensor status: OK

Record ID: 22  
Sensor type: IORISER +1.5V SB (Voltage)  
Sensor number: #39  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.37 Volts  
Upper Critical threshold: 1.63 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 2.50 Volts  
Normal min: 1.42 Volts  
Nominal reading: 1.50 Volts  
Normal max: 1.57 Volts  
Sensor reading: 1.52 Volts  
Sensor status: OK

Record ID: 23  
Sensor type: IORISER +1.5V (Voltage)  
Sensor number: #40  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 1.37 Volts  
Upper Critical threshold: 1.63 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 2.50 Volts  
Normal min: 1.42 Volts  
Nominal reading: 1.50 Volts  
Normal max: 1.57 Volts  
Sensor reading: 1.51 Volts  
Sensor status: OK

Record ID: 24  
Sensor type: IORISER +5V SB (Voltage)  
Sensor number: #41  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 4.50 Volts  
Upper Critical threshold: 5.34 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts  
Sensor max. reading: 7.40 Volts  
Normal min: 4.67 Volts  
Nominal reading: 4.93 Volts  
Normal max: 5.16 Volts  
Sensor reading: 4.93 Volts  
Sensor status: OK

Record ID: 25  
Sensor type: I/O Bd SCSI +5V (Voltage)  
Sensor number: #42  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Volts  
Upper non-recoverable threshold: 0.00 Volts  
Lower Critical threshold: 4.51 Volts  
Upper Critical threshold: 5.47 Volts  
Lower non-critical threshold: 0.00 Volts  
Upper non-critical threshold: 0.00 Volts  
Sensor min. reading: 0.00 Volts

Sensor max. reading: 6.12 Volts  
Normal min: 4.63 Volts  
Nominal reading: 4.99 Volts  
Normal max: 5.33 Volts  
Sensor reading: 5.04 Volts  
Sensor status: OK

Record ID: 26  
Sensor type: Mem Bd 1 Temp (Temperature)  
Sensor number: #48  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 5.00 Degrees C  
Upper Critical threshold: 53.00 Degrees C  
Lower non-critical threshold: 9.00 Degrees C  
Upper non-critical threshold: 50.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 33.00 Degrees C  
Normal max: 45.00 Degrees C  
Sensor reading: 29.00 Degrees C  
Sensor status: OK

Record ID: 27  
Sensor type: Mem Bd 2 Temp (Temperature)  
Sensor number: #49  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 5.00 Degrees C  
Upper Critical threshold: 53.00 Degrees C  
Lower non-critical threshold: 9.00 Degrees C  
Upper non-critical threshold: 50.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 33.00 Degrees C  
Normal max: 45.00 Degrees C  
Sensor reading: 30.00 Degrees C  
Sensor status: OK

Record ID: 28  
Sensor type: I/O Bd Temp 1 (Temperature)  
Sensor number: #50  
Event/Reading type code: 01h

Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 5.00 Degrees C  
Upper Critical threshold: 61.00 Degrees C  
Lower non-critical threshold: 9.00 Degrees C  
Upper non-critical threshold: 58.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 46.00 Degrees C  
Normal max: 54.00 Degrees C  
Sensor reading: 28.00 Degrees C  
Sensor status: OK

Record ID: 29  
Sensor type: I/O Bd SIOH Temp (Temperature)  
Sensor number: #51  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 5.00 Degrees C  
Upper Critical threshold: 105.00 Degrees C  
Lower non-critical threshold: 9.00 Degrees C  
Upper non-critical threshold: 100.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 55.00 Degrees C  
Normal max: 95.00 Degrees C  
Sensor reading: 39.00 Degrees C  
Sensor status: OK

Record ID: 30  
Sensor type: I/O Bd Temp 3 (Temperature)  
Sensor number: #52  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 5.00 Degrees C  
Upper Critical threshold: 64.00 Degrees C  
Lower non-critical threshold: 9.00 Degrees C  
Upper non-critical threshold: 61.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 49.00 Degrees C  
Normal max: 57.00 Degrees C

Sensor reading: 27.00 Degrees C  
Sensor status: OK

Record ID: 31  
Sensor type: Proc Bd Amb Temp (Temperature)  
Sensor number: #53  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 5.00 Degrees C  
Upper Critical threshold: 44.00 Degrees C  
Lower non-critical threshold: 9.00 Degrees C  
Upper non-critical threshold: 40.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 25.00 Degrees C  
Normal max: 38.00 Degrees C  
Sensor reading: 21.00 Degrees C  
Sensor status: OK

Record ID: 32  
Sensor type: Proc Bd SNC Temp (Temperature)  
Sensor number: #54  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 5.00 Degrees C  
Upper Critical threshold: 105.00 Degrees C  
Lower non-critical threshold: 9.00 Degrees C  
Upper non-critical threshold: 100.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 55.00 Degrees C  
Normal max: 95.00 Degrees C  
Sensor reading: 40.00 Degrees C  
Sensor status: OK

Record ID: 33  
Sensor type: F38 Tach Fan 1 (Fan)  
Sensor number: #64  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 RPM  
Upper non-recoverable threshold: 0.00 RPM  
Lower Critical threshold: 2100.00 RPM  
Upper Critical threshold: 0.00 RPM

Lower non-critical threshold: 0.00 RPM  
Upper non-critical threshold: 0.00 RPM  
Sensor min. reading: 0.00 RPM  
Sensor max. reading: 5100.00 RPM  
Normal min: 2260.00 RPM  
Nominal reading: 2600.00 RPM  
Normal max: 2880.00 RPM  
Sensor reading: 2620.00 RPM  
Sensor status: OK

Record ID: 34  
Sensor type: F38 Tach Fan 2 (Fan)  
Sensor number: #65  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 RPM  
Upper non-recoverable threshold: 0.00 RPM  
Lower Critical threshold: 2100.00 RPM  
Upper Critical threshold: 0.00 RPM  
Lower non-critical threshold: 0.00 RPM  
Upper non-critical threshold: 0.00 RPM  
Sensor min. reading: 0.00 RPM  
Sensor max. reading: 5100.00 RPM  
Normal min: 2260.00 RPM  
Nominal reading: 2600.00 RPM  
Normal max: 2880.00 RPM  
Sensor reading: 2600.00 RPM  
Sensor status: OK

Record ID: 35  
Sensor type: F25 Tach Fan 3 (Fan)  
Sensor number: #66  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 RPM  
Upper non-recoverable threshold: 0.00 RPM  
Lower Critical threshold: 2000.00 RPM  
Upper Critical threshold: 0.00 RPM  
Lower non-critical threshold: 0.00 RPM  
Upper non-critical threshold: 0.00 RPM  
Sensor min. reading: 0.00 RPM  
Sensor max. reading: 5100.00 RPM  
Normal min: 2160.00 RPM  
Nominal reading: 2500.00 RPM  
Normal max: 2780.00 RPM  
Sensor reading: 2480.00 RPM  
Sensor status: OK

Record ID: 36

Sensor type: F25 Tach Fan 4 (Fan)  
Sensor number: #67  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 RPM  
Upper non-recoverable threshold: 0.00 RPM  
Lower Critical threshold: 2100.00 RPM  
Upper Critical threshold: 0.00 RPM  
Lower non-critical threshold: 0.00 RPM  
Upper non-critical threshold: 0.00 RPM  
Sensor min. reading: 0.00 RPM  
Sensor max. reading: 5100.00 RPM  
Normal min: 2260.00 RPM  
Nominal reading: 2620.00 RPM  
Normal max: 2900.00 RPM  
Sensor reading: 2500.00 RPM  
Sensor status: OK

Record ID: 37  
Sensor type: Mem Bd 1 FanBst (OEM Reserved)  
Sensor number: #80  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 47.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 33.00 Degrees C  
Normal max: 45.00 Degrees C  
Sensor reading: 29.00 Degrees C  
Sensor status: OK

Record ID: 38  
Sensor type: Mem Bd 2 FanBst (OEM Reserved)  
Sensor number: #81  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 47.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C

Normal min: 10.00 Degrees C  
Nominal reading: 33.00 Degrees C  
Normal max: 45.00 Degrees C  
Sensor reading: 30.00 Degrees C  
Sensor status: OK

Record ID: 39  
Sensor type: I/O Bd FanBst 1 (OEM Reserved)  
Sensor number: #82  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 56.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 46.00 Degrees C  
Normal max: 54.00 Degrees C  
Sensor reading: 28.00 Degrees C  
Sensor status: OK

Record ID: 40  
Sensor type: IOBd SIOH FanBst (OEM Reserved)  
Sensor number: #83  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 97.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 55.00 Degrees C  
Normal max: 95.00 Degrees C  
Sensor reading: 39.00 Degrees C  
Sensor status: OK

Record ID: 41  
Sensor type: I/O Bd FanBst 3 (OEM Reserved)  
Sensor number: #84  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C

Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 59.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 49.00 Degrees C  
Normal max: 57.00 Degrees C  
Sensor reading: 27.00 Degrees C  
Sensor status: OK

Record ID: 42  
Sensor type: Proc Bd Amb FanB (OEM Reserved)  
Sensor number: #85  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 30.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 25.00 Degrees C  
Normal max: 29.00 Degrees C  
Sensor reading: 21.00 Degrees C  
Sensor status: OK

Record ID: 43  
Sensor type: Proc Bd SNC FanB (OEM Reserved)  
Sensor number: #86  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 97.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 55.00 Degrees C  
Normal max: 95.00 Degrees C  
Sensor reading: 40.00 Degrees C

Sensor status: OK

Record ID: 44

Sensor type: Proc 1 Temp (Temperature)

Sensor number: #152

Event/Reading type code: 01h

Lower non-recoverable threshold: 0.00 Degrees C

Upper non-recoverable threshold: 0.00 Degrees C

Lower Critical threshold: 2.00 Degrees C

Upper Critical threshold: 112.00 Degrees C

Lower non-critical threshold: 9.00 Degrees C

Upper non-critical threshold: 105.00 Degrees C

Sensor min. reading: -128.00 Degrees C

Sensor max. reading: 127.00 Degrees C

Normal min: 15.00 Degrees C

Nominal reading: 70.00 Degrees C

Normal max: 98.00 Degrees C

Sensor reading: 39.00 Degrees C

Sensor status: OK

Record ID: 45

Sensor type: Proc 2 Temp (Temperature)

Sensor number: #153

Event/Reading type code: 01h

Lower non-recoverable threshold: 0.00 Degrees C

Upper non-recoverable threshold: 0.00 Degrees C

Lower Critical threshold: 2.00 Degrees C

Upper Critical threshold: 112.00 Degrees C

Lower non-critical threshold: 9.00 Degrees C

Upper non-critical threshold: 105.00 Degrees C

Sensor min. reading: -128.00 Degrees C

Sensor max. reading: 127.00 Degrees C

Normal min: 15.00 Degrees C

Nominal reading: 70.00 Degrees C

Normal max: 98.00 Degrees C

Sensor reading: N/A

Sensor status: Unknown

Record ID: 46

Sensor type: Proc 3 Temp (Temperature)

Sensor number: #154

Event/Reading type code: 01h

Lower non-recoverable threshold: 0.00 Degrees C

Upper non-recoverable threshold: 0.00 Degrees C

Lower Critical threshold: 2.00 Degrees C

Upper Critical threshold: 112.00 Degrees C

Lower non-critical threshold: 9.00 Degrees C

Upper non-critical threshold: 105.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 15.00 Degrees C  
Nominal reading: 70.00 Degrees C  
Normal max: 98.00 Degrees C  
Sensor reading: N/A  
Sensor status: Unknown

Record ID: 47  
Sensor type: Proc 4 Temp (Temperature)  
Sensor number: #155  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 2.00 Degrees C  
Upper Critical threshold: 112.00 Degrees C  
Lower non-critical threshold: 9.00 Degrees C  
Upper non-critical threshold: 105.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 15.00 Degrees C  
Nominal reading: 70.00 Degrees C  
Normal max: 98.00 Degrees C  
Sensor reading: N/A  
Sensor status: Unknown

Record ID: 48  
Sensor type: Proc 1 FanBst (OEM Reserved)  
Sensor number: #160  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 103.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 70.00 Degrees C  
Normal max: 100.00 Degrees C  
Sensor reading: 39.00 Degrees C  
Sensor status: OK

Record ID: 49  
Sensor type: Proc 2 FanBst (OEM Reserved)

Sensor number: #161  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 103.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 70.00 Degrees C  
Normal max: 100.00 Degrees C  
Sensor reading: N/A  
Sensor status: Unknown

Record ID: 50  
Sensor type: Proc 3 FanBst (OEM Reserved)  
Sensor number: #162  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 103.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C  
Nominal reading: 70.00 Degrees C  
Normal max: 100.00 Degrees C  
Sensor reading: N/A  
Sensor status: Unknown

Record ID: 51  
Sensor type: Proc 4 FanBst (OEM Reserved)  
Sensor number: #163  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 0.00 Degrees C  
Upper Critical threshold: 0.00 Degrees C  
Lower non-critical threshold: 0.00 Degrees C  
Upper non-critical threshold: 103.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 10.00 Degrees C

Nominal reading: 70.00 Degrees C  
Normal max: 100.00 Degrees C  
Sensor reading: N/A  
Sensor status: Unknown

Record ID: 52  
Sensor type: HSC SCSI BP Temp (Temperature)  
Sensor number: #1  
Event/Reading type code: 01h  
Lower non-recoverable threshold: 0.00 Degrees C  
Upper non-recoverable threshold: 0.00 Degrees C  
Lower Critical threshold: 5.00 Degrees C  
Upper Critical threshold: 43.00 Degrees C  
Lower non-critical threshold: 10.00 Degrees C  
Upper non-critical threshold: 39.00 Degrees C  
Sensor min. reading: -128.00 Degrees C  
Sensor max. reading: 127.00 Degrees C  
Normal min: 12.00 Degrees C  
Nominal reading: 28.00 Degrees C  
Normal max: 38.00 Degrees C  
Sensor reading: 0.00 Degrees C  
Sensor status: OK

Record ID: 53  
Sensor type: Pwr Unit Status (Power Unit)  
Sensor number: #1  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Power Off/Power Down: [OK]  
Power Cycle: [OK]  
240VA Power Down: [OK]  
Interlock Power Down: [OK]  
AC lost: [OK]  
Soft Power Control Failure: [OK]  
Power Unit Failure detected: [OK]  
Predictive Failure: [OK]

Record ID: 54  
Sensor type: Pwr Unit Redund (Power Unit)  
Sensor number: #2  
Event/Reading type code: 0Bh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [OK]

Record ID: 55

Sensor type: Watchdog (Watchdog 2)  
Sensor number: #3  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Timer expired, status only (no action, no interrupt): [OK]  
Hard Reset: [OK]  
Power Down: [OK]  
Power Cycle: [OK]  
Timer interrupt: [OK]

Record ID: 56  
Sensor type: Scrtty Violation (Platform Security Violation)  
Sensor number: #4  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Secure Mode (Front Panel Lockout) Violation attempt: [OK]  
Pre-boot Password Violation - user password: [OK]  
Pre-boot Password Violation attempt - setup password: [OK]  
Pre-boot Password Violation - network boot password: [OK]  
Other pre-boot Password Violation: [OK]  
Out-of-band Access Password Violation: [OK]

Record ID: 57  
Sensor type: Physical Scrtty (Platform Chassis Intrusion)  
Sensor number: #5  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
General Chassis Intrusion: [OK]  
Drive Bay intrusion: [OK]  
I/O Card area intrusion: [OK]  
Processor area intrusion: [OK]  
LAN Leash Lost (system is unplugged from LAN): [OK]  
Unauthorized dock/undock: [OK]  
FAN area intrusion: [OK]

Record ID: 58  
Sensor type: POST Error (System Firmware)  
Sensor number: #6  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
System Firmware Error (POST Error): [OK]  
System Firmware Hang: [OK]  
System Firmware Progress: [OK]

Record ID: 59  
Sensor type: Crit Int Status (Critical Interrupt)  
Sensor number: #7  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Front Panel NMI/Diagnostic Interrupt: [OK]  
Bus Timeout: [OK]  
I/O channel check NMI: [OK]  
Software NMI: [OK]  
PCI PERR: [OK]  
PCI SERR: [OK]  
EISA Fail Safe Timeout: [OK]  
Bus Correctable Error: [OK]  
Bus Uncorrectable Error: [OK]  
Fatal NMI (port 61h, bit 7): [OK]

Record ID: 60  
Sensor type: EVT Log Disabled (Event Logging Disabled)  
Sensor number: #9  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Correctable Memory Error Logging Disabled: [OK]  
Event 'Type' Logging Disabled: [OK]  
Log Area Reset/Cleared: [OK]  
All Event Logging Disabled: [OK]  
SEL Full: [OK]  
SEL Almost Full: [OK]

Record ID: 61  
Sensor type: System Event (System Event)  
Sensor number: #10  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
System Reconfigured: [OK]  
OEM System Boot Event: [OK]  
Undetermined system hardware failure: [OK]  
Entry added to Auxiliary Log: [OK]  
PEF Action: [OK]

Record ID: 62  
Sensor type: Int SCSI TERMVO (Voltage)  
Sensor number: #96  
Event/Reading type code: 06h

Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 63  
Sensor type: Int SCSI TERMV1 (Voltage)  
Sensor number: #97  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 64  
Sensor type: Int SCSI TERMV2 (Voltage)  
Sensor number: #98  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 65  
Sensor type: Ext SCSI TERMV0 (Voltage)  
Sensor number: #99  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 66  
Sensor type: Ext SCSI TERMV1 (Voltage)  
Sensor number: #100  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 67  
Sensor type: Ext SCSI TERMV2 (Voltage)  
Sensor number: #101  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 68  
Sensor type: Pwr Supply 1 (Power Supply)  
Sensor number: #112

Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 69  
Sensor type: Pwr Supply 2 (Power Supply)  
Sensor number: #113  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 70  
Sensor type: IO Bd 3.3V D2D 3 (Power Supply)  
Sensor number: #116  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 71  
Sensor type: IO Bd 3.3V D2D 4 (Power Supply)  
Sensor number: #117  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]

Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 72  
Sensor type: IO Bd 5V D2D 1 (Power Supply)  
Sensor number: #118  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 73  
Sensor type: IO Bd 5V D2D 2 (Power Supply)  
Sensor number: #119  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 74  
Sensor type: ProcBd 3.3V D2D1 (Power Supply)  
Sensor number: #120  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 75  
Sensor type: ProcBd 2.5V D2D1 (Power Supply)  
Sensor number: #121  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 76  
Sensor type: ProcBd 2.5V D2D2 (Power Supply)  
Sensor number: #122  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 77  
Sensor type: MemBd1 1.25V D2D (Power Supply)  
Sensor number: #123  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 78  
Sensor type: MemBd2 1.25V D2D (Power Supply)  
Sensor number: #124  
Event/Reading type code: 6Fh

Hysteresis +ve: 0  
Hysteresis -ve: 0  
Presence detected: [OK]  
Power Supply Failure detected: [OK]  
Predictive Failure: [OK]  
Power Supply AC input lost: [OK]  
Power Supply input AC lost or out-of-range: [OK]  
Power Supply input AC out-of-range, but present: [OK]  
Configuration error: [OK]

Record ID: 79  
Sensor type: Proc 12V SB PwGd (Voltage)  
Sensor number: #126  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 80  
Sensor type: Node PwrGd (Voltage)  
Sensor number: #127  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 81  
Sensor type: Mem Bd1 Pres (Board)  
Sensor number: #128  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 82  
Sensor type: Mem Bd2 Pres (Board)  
Sensor number: #129  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 83  
Sensor type: Fan 1 Present (Fan)  
Sensor number: #130  
Event/Reading type code: 08h  
Hysteresis +ve: 0

Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 84  
Sensor type: Fan 2 Present (Fan)  
Sensor number: #131  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 85  
Sensor type: Fan 3 Present (Fan)  
Sensor number: #132  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 86  
Sensor type: Fan 4 Present (Fan)  
Sensor number: #133  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 87  
Sensor type: IO Bd Interlock (Board)  
Sensor number: #134  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 88  
Sensor type: IORISER Interlck (Board)  
Sensor number: #135  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 89  
Sensor type: Proc Bd Interlck (Board)  
Sensor number: #136  
Event/Reading type code: 08h

Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 90  
Sensor type: SCSI Interlock (Board)  
Sensor number: #137  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Device Inserted/Device Present]

Record ID: 91  
Sensor type: INIT State (OEM Reserved)  
Sensor number: #138  
Event/Reading type code: 03h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [State Deasserted]

Record ID: 92  
Sensor type: Proc 1 Status (Processor)  
Sensor number: #144  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
IERR: [OK]  
Thermal Trip: [OK]  
FRB1/BIST failure: [OK]  
FRB2/Hang in POST failure: [OK]  
FRB3/Processor Startup/Initialization failure: [OK]  
Configuration Error: [OK]  
SM BIOS 'Uncorrectable CPU-complex Error': [OK]  
Processor Presence detected: [OK]  
Processor disabled: [OK]  
Terminator Presence Detected: [Unknown]  
Processor Automatically Throttled: [OK]

Record ID: 93  
Sensor type: Proc 2 Status (Processor)  
Sensor number: #145  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
IERR: [OK]  
Thermal Trip: [OK]  
FRB1/BIST failure: [OK]

FRB2/Hang in POST failure: [OK]  
FRB3/Processor Startup/Initialization failure: [OK]  
Configuration Error: [OK]  
SM BIOS 'Uncorrectable CPU-complex Error': [OK]  
Processor Presence detected: [Unknown]  
Processor disabled: [OK]  
Terminator Presence Detected: [Unknown]  
Processor Automatically Throttled: [OK]

Record ID: 94  
Sensor type: Proc 3 Status (Processor)  
Sensor number: #146  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
IERR: [OK]  
Thermal Trip: [OK]  
FRB1/BIST failure: [OK]  
FRB2/Hang in POST failure: [OK]  
FRB3/Processor Startup/Initialization failure: [OK]  
Configuration Error: [OK]  
SM BIOS 'Uncorrectable CPU-complex Error': [OK]  
Processor Presence detected: [Unknown]  
Processor disabled: [OK]  
Terminator Presence Detected: [Unknown]  
Processor Automatically Throttled: [OK]

Record ID: 95  
Sensor type: Proc 4 Status (Processor)  
Sensor number: #147  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
IERR: [OK]  
Thermal Trip: [OK]  
FRB1/BIST failure: [OK]  
FRB2/Hang in POST failure: [OK]  
FRB3/Processor Startup/Initialization failure: [OK]  
Configuration Error: [OK]  
SM BIOS 'Uncorrectable CPU-complex Error': [OK]  
Processor Presence detected: [Unknown]  
Processor disabled: [OK]  
Terminator Presence Detected: [Unknown]  
Processor Automatically Throttled: [OK]

Record ID: 96  
Sensor type: Proc 1 PwrGd (Voltage)

Sensor number: #164  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Performance Met]

Record ID: 97  
Sensor type: Proc 2 PwrGd (Voltage)  
Sensor number: #165  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Unknown]

Record ID: 98  
Sensor type: Proc 3 PwrGd (Voltage)  
Sensor number: #166  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Unknown]

Record ID: 99  
Sensor type: Proc 4 PwrGd (Voltage)  
Sensor number: #167  
Event/Reading type code: 06h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Unknown]

Record ID: 100  
Sensor type: PCI HP Slot 1 (Slot Connector)  
Sensor number: #224  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Fault Status asserted: [OK]  
Identify Status asserted: [OK]  
Slot/Connector Device installed/attached: [Unknown]  
Slot/Connector Ready for Device Installation: [OK]  
Slot/Connector Ready for Device Removal: [OK]  
Slot Power is Off: [Unknown]  
Slot/Connector Device Removal Request: [OK]  
Interlock asserted: [OK]  
Slot is Disabled: [OK]  
Slot holds spare device: [OK]

Record ID: 101  
Sensor type: PCI HP Slot 2 (Slot Connector)  
Sensor number: #225  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Fault Status asserted: [OK]  
Identify Status asserted: [OK]  
Slot/Connector Device installed/attached: [Unknown]  
Slot/Connector Ready for Device Installation: [OK]  
Slot/Connector Ready for Device Removal: [OK]  
Slot Power is Off: [Unknown]  
Slot/Connector Device Removal Request: [OK]  
Interlock asserted: [OK]  
Slot is Disabled: [OK]  
Slot holds spare device: [OK]

Record ID: 102  
Sensor type: PCI HP Slot 3 (Slot Connector)  
Sensor number: #226  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Fault Status asserted: [OK]  
Identify Status asserted: [OK]  
Slot/Connector Device installed/attached: [Unknown]  
Slot/Connector Ready for Device Installation: [OK]  
Slot/Connector Ready for Device Removal: [OK]  
Slot Power is Off: [Unknown]  
Slot/Connector Device Removal Request: [OK]  
Interlock asserted: [OK]  
Slot is Disabled: [OK]  
Slot holds spare device: [OK]

Record ID: 103  
Sensor type: PCI HP Slot 4 (Slot Connector)  
Sensor number: #227  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Fault Status asserted: [OK]  
Identify Status asserted: [OK]  
Slot/Connector Device installed/attached: [Unknown]  
Slot/Connector Ready for Device Installation: [OK]  
Slot/Connector Ready for Device Removal: [OK]  
Slot Power is Off: [Unknown]  
Slot/Connector Device Removal Request: [OK]

Interlock asserted: [OK]  
Slot is Disabled: [OK]  
Slot holds spare device: [OK]

Record ID: 104  
Sensor type: PCI HP Slot 5 (Slot Connector)  
Sensor number: #228  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Fault Status asserted: [OK]  
Identify Status asserted: [OK]  
Slot/Connector Device installed/attached: [Unknown]  
Slot/Connector Ready for Device Installation: [OK]  
Slot/Connector Ready for Device Removal: [OK]  
Slot Power is Off: [Unknown]  
Slot/Connector Device Removal Request: [OK]  
Interlock asserted: [OK]  
Slot is Disabled: [OK]  
Slot holds spare device: [OK]

Record ID: 105  
Sensor type: PCI HP Slot 6 (Slot Connector)  
Sensor number: #229  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Fault Status asserted: [OK]  
Identify Status asserted: [OK]  
Slot/Connector Device installed/attached: [Unknown]  
Slot/Connector Ready for Device Installation: [OK]  
Slot/Connector Ready for Device Removal: [OK]  
Slot Power is Off: [Unknown]  
Slot/Connector Device Removal Request: [OK]  
Interlock asserted: [OK]  
Slot is Disabled: [OK]  
Slot holds spare device: [OK]

Record ID: 106  
Sensor type: PCI HP Slot 7 (Slot Connector)  
Sensor number: #230  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Fault Status asserted: [OK]  
Identify Status asserted: [OK]  
Slot/Connector Device installed/attached: [Unknown]

Slot/Connector Ready for Device Installation: [OK]  
Slot/Connector Ready for Device Removal: [OK]  
Slot Power is Off: [Unknown]  
Slot/Connector Device Removal Request: [OK]  
Interlock asserted: [OK]  
Slot is Disabled: [OK]  
Slot holds spare device: [OK]

Record ID: 107  
Sensor type: PCI HP Slot 8 (Slot Connector)  
Sensor number: #231  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Fault Status asserted: [OK]  
Identify Status asserted: [OK]  
Slot/Connector Device installed/attached: [Unknown]  
Slot/Connector Ready for Device Installation: [OK]  
Slot/Connector Ready for Device Removal: [OK]  
Slot Power is Off: [Unknown]  
Slot/Connector Device Removal Request: [OK]  
Interlock asserted: [OK]  
Slot is Disabled: [OK]  
Slot holds spare device: [OK]

Record ID: 108  
Sensor type: HSC Drv 1 Status (Drive Slot)  
Sensor number: #2  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0

Record ID: 109  
Sensor type: HSC Drv 2 Status (Drive Slot)  
Sensor number: #3  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0

Record ID: 110  
Sensor type: HSC Drv 3 Status (Drive Slot)  
Sensor number: #4  
Event/Reading type code: 6Fh  
Hysteresis +ve: 0  
Hysteresis -ve: 0

Record ID: 111

Sensor type: HSC Drv 1 Pres (Drive Slot)  
Sensor number: #9  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [OK]

Record ID: 112  
Sensor type: HSC Drv 2 Pres (Drive Slot)  
Sensor number: #10  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [OK]

Record ID: 113  
Sensor type: HSC Drv 3 Pres (Drive Slot)  
Sensor number: #11  
Event/Reading type code: 08h  
Hysteresis +ve: 0  
Hysteresis -ve: 0  
Sensor status: [Unknown]

Record ID: 114  
Sensor Number: NONE  
Container entity ID: 13h  
Container entity instance: 01h

Record ID: 115  
Sensor Number: NONE  
Device type: 09h  
Device type modifier: 03h  
FRU entity ID: 03h  
FRU entity instance: 01h  
Device name: Proc 1 INFO FRU

Record ID: 116  
Sensor Number: NONE  
Device type: 09h  
Device type modifier: 03h  
FRU entity ID: 03h  
FRU entity instance: 02h  
Device name: Proc 2 INFO FRU

Record ID: 117  
Sensor Number: NONE  
Device type: 09h

Device type modifier: 03h  
FRU entity ID: 03h  
FRU entity instance: 03h  
Device name: Proc 3 INFO FRU

Record ID: 118  
Sensor Number: NONE  
Device type: 09h  
Device type modifier: 03h  
FRU entity ID: 03h  
FRU entity instance: 04h  
Device name: Proc 4 INFO FRU

Record ID: 119  
Sensor Number: NONE  
Device type: 09h  
Device type modifier: 02h  
FRU entity ID: 03h  
FRU entity instance: 05h  
Device name: Proc 1 OEM FRU

Record ID: 120  
Sensor Number: NONE  
Device type: 09h  
Device type modifier: 02h  
FRU entity ID: 03h  
FRU entity instance: 06h  
Device name: Proc 2 OEM FRU

Record ID: 121  
Sensor Number: NONE  
Device type: 09h  
Device type modifier: 02h  
FRU entity ID: 03h  
FRU entity instance: 07h  
Device name: Proc 3 OEM FRU

Record ID: 122  
Sensor Number: NONE  
Device type: 09h  
Device type modifier: 02h  
FRU entity ID: 03h  
FRU entity instance: 08h  
Device name: Proc 4 OEM FRU

Record ID: 123  
Sensor Number: NONE

Device type: 09h  
Device type modifier: 02h  
FRU entity ID: 0Ah  
FRU entity instance: 01h  
Device name: Pwr Supply 1 FRU

Record ID: 124  
Sensor Number: NONE  
Device type: 09h  
Device type modifier: 02h  
FRU entity ID: 0Ah  
FRU entity instance: 02h  
Device name: Pwr Supply 2 FRU

Record ID: 125  
Sensor Number: NONE  
Device type: 02h  
Device type modifier: 00h  
FRU entity ID: 12h  
FRU entity instance: 01h  
Device name: Proc Bd FRU

Record ID: 126  
Sensor Number: NONE  
Device type: 02h  
Device type modifier: 00h  
FRU entity ID: 08h  
FRU entity instance: 01h  
Device name: Mem Bd1 FRU

Record ID: 127  
Sensor Number: NONE  
Device type: 02h  
Device type modifier: 00h  
FRU entity ID: 08h  
FRU entity instance: 02h  
Device name: Mem Bd2 FRU

Record ID: 128  
Sensor Number: NONE  
Device type: 05h  
Device type modifier: 05h  
FRU entity ID: 10h  
FRU entity instance: 01h  
Device name: I/O Bd FRU

Record ID: 129

Sensor Number: NONE  
Entity ID: 07h  
Entity instance: 01h  
Device name: Basebrd Mgt Ctlr

Record ID: 130  
Sensor Number: NONE  
Entity ID: 0Fh  
Entity instance: 01h  
Device name: Hot Swap Ctlr

Record ID: 131  
Sensor Number: NONE  
Entity ID: 07h  
Entity instance: 02h  
Device name: Chs Bridge Ctlr

Record ID: 132  
Sensor Number: NONE  
Manufacturer ID: 000157h  
OEM Data: 02 02 00 01 70 71

Record ID: 133  
Sensor Number: NONE  
Manufacturer ID: 000157h  
OEM Data: 03 90 40 FC

Record ID: 134  
Sensor Number: NONE  
Manufacturer ID: 000157h  
OEM Data: 54 00 00 50 00 50 00 50 01 07 D0 07 D0 07 D0 02 00 00 00 00 00 00

Record ID: 135  
Sensor Number: NONE  
Manufacturer ID: 000157h  
OEM Data: 53 44 52 20 56 65 72 73 69 6F 6E 20 30 2E 31 38

Record ID: 136  
Sensor Number: NONE  
Manufacturer ID: 000157h  
OEM Data: 53 44 52 20 50 6B 67 2E 20 56 65 72 20 32 2E 30 2E 31 38

debian-ia64:~#

## 8 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 a the processor(s) are disabled because of a failure. Sel utility helps you view and manage system event log.

### 8.1 command-line arguments

- -u, `—usage`  
Usage message.
- -h, `—help`  
Show help information.
- -V, `—version`  
Show version information.
- -i, `—info`  
Show SEL header information.
- -x *file*, `—hex-dump=file`  
Output raw SEL data in ASCII hex format beginning with the SEL header info.
- -c, `—delete-all`  
Delete all records in the SEL.
- -d REC-LIST, `—delete=rec-list`  
Delete this specific list of *rec-list* records in the SEL.

### 8.2 sel sample output

```

debian-ia64:~# sel
4:30-Dec-2003 00:20:24:Event Logging Disabled #9:Log Area Reset/Cleared:SMI Handler
24:30-Dec-2003 00:23:21:Power Unit #1:Power Unit Failure detected:SMI Handler
124:14-Jan-2004 23:13:11:System Firmware #6:System Firmware Error (POST Error):SMI Han
144:14-Jan-2004 23:13:13:System Event #8:OEM System Boot Event:BIOS
164:16-Jan-2004 18:41:40:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
244:16-Jan-2004 22:18:50:System Firmware #6:System Firmware Error (POST Error):SMI Han
264:16-Jan-2004 22:18:52:System Event #8:OEM System Boot Event:BIOS
284:17-Jan-2004 00:26:49:System Firmware #6:System Firmware Error (POST Error):SMI Han
304:17-Jan-2004 00:26:50:System Event #8:OEM System Boot Event:BIOS
324:16-Jan-2004 09:53:17:System Firmware #6:System Firmware Error (POST Error):SMI Han
344:16-Jan-2004 09:53:19:System Event #8:OEM System Boot Event:BIOS
364:23-Jan-2004 05:43:43:Platform Chassis Intrusion #5:LAN Leash Lost (system is unplug
384:23-Jan-2004 05:44:06:Power Supply #113:Power Supply AC input lost:SMI Handler
1944:26-May-2004 06:03:53:System Event #8:OEM System Boot Event:BIOS
1964:26-May-2004 06:09:40:Power Unit #1:Power Unit Failure detected:SMI Handler
1984:26-May-2004 06:09:59:Power Unit #1:Soft Power Control Failure:SMI Handler
2124:26-May-2004 06:19:26:Voltage #23:Lower Critical - going low:SMI Handler
2144:26-May-2004 06:20:36:System Event #8:OEM System Boot Event:BIOS
2164:26-May-2004 06:21:15:Power Unit #1:Power Unit Failure detected:SMI Handler
2184:26-May-2004 06:21:30:Power Unit #1:Power Unit Failure detected:SMI Handler

```

```
2344:26-May-2004 07:39:37:System Event #8:OEM System Boot Event:BIOS
2424:26-May-2004 08:43:19:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2444:26-May-2004 08:43:23:System Event #8:OEM System Boot Event:BIOS
2464:26-May-2004 08:49:43:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2484:26-May-2004 08:49:46:System Event #8:OEM System Boot Event:BIOS
2664:26-May-2004 08:59:35:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2684:26-May-2004 08:59:38:System Event #8:OEM System Boot Event:BIOS
2704:26-May-2004 09:08:42:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2724:26-May-2004 09:08:46:System Event #8:OEM System Boot Event:BIOS
2744:26-May-2004 09:13:33:Board #136:Device Removed/Device Absent:SMI Handler
2824:26-May-2004 09:18:29:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2844:26-May-2004 09:18:33:System Event #8:OEM System Boot Event:BIOS
2884:26-May-2004 09:30:38:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2904:26-May-2004 09:30:42:System Event #8:OEM System Boot Event:BIOS
2924:26-May-2004 09:36:17:System Firmware #6:System Firmware Error (POST Error):SMI Ha
2944:26-May-2004 09:36:20:System Event #8:OEM System Boot Event:BIOS
2964:26-May-2004 09:49:59:Power Supply #112:Power Supply AC input lost:SMI Handler
3004:26-May-2004 10:05:37:System Firmware #6:System Firmware Error (POST Error):SMI Ha
3024:26-May-2004 10:05:40:System Event #8:OEM System Boot Event:BIOS
3064:26-May-2004 10:19:50:System Firmware #6:System Firmware Error (POST Error):SMI Ha
3084:26-May-2004 10:19:54:System Event #8:OEM System Boot Event:BIOS
3124:26-May-2004 10:27:36:System Firmware #6:System Firmware Error (POST Error):SMI Ha
3144:26-May-2004 10:27:39:System Event #8:OEM System Boot Event:BIOS
3164:27-May-2004 02:58:23:Power Supply #113:Power Supply AC input lost:SMI Handler
3224:30-Jun-2004 07:13:20:System Event #8:OEM System Boot Event:BIOS
3244:30-Jun-2004 07:13:49:Fan #65:Lower Critical - going low:SMI Handler
3264:30-Jun-2004 07:13:50:Fan #131:Device Removed/Device Absent:SMI Handler
3284:30-Jun-2004 07:13:53:Fan #131:Device Inserted/Device Present:SMI Handler
3304:30-Jun-2004 07:14:01:Fan #65:Lower Critical - going low:SMI Handler
3324:30-Jun-2004 07:14:01:Fan #67:Lower Critical - going low:SMI Handler
3344:30-Jun-2004 07:14:05:Fan #132:Device Removed/Device Absent:SMI Handler
3364:30-Jun-2004 07:14:08:Fan #132:Device Inserted/Device Present:SMI Handler
3384:30-Jun-2004 07:14:13:Fan #67:Lower Critical - going low:SMI Handler
3404:30-Jun-2004 07:14:23:Fan #130:Device Removed/Device Absent:SMI Handler
3424:30-Jun-2004 07:14:25:Fan #64:Lower Critical - going low:SMI Handler
3444:30-Jun-2004 07:14:25:Fan #65:Lower Critical - going low:SMI Handler
3464:30-Jun-2004 07:14:26:Fan #131:Device Removed/Device Absent:SMI Handler
3484:30-Jun-2004 07:14:32:Fan #130:Device Inserted/Device Present:SMI Handler
3504:30-Jun-2004 07:14:37:Fan #64:Lower Critical - going low:SMI Handler
3524:30-Jun-2004 07:15:02:Fan #131:Device Inserted/Device Present:SMI Handler
3544:30-Jun-2004 07:15:11:Fan #132:Device Removed/Device Absent:SMI Handler
3564:30-Jun-2004 07:15:13:Fan #65:Lower Critical - going low:SMI Handler
3584:30-Jun-2004 07:15:14:Fan #132:Device Inserted/Device Present:SMI Handler
3604:30-Jun-2004 07:15:20:Fan #132:Device Removed/Device Absent:SMI Handler
3624:30-Jun-2004 07:15:23:Fan #132:Device Inserted/Device Present:SMI Handler
3644:30-Jun-2004 07:15:25:Fan #67:Lower Critical - going low:SMI Handler
3664:30-Jun-2004 07:15:26:Fan #133:Device Removed/Device Absent:SMI Handler
```

```
3684:30-Jun-2004 07:15:29:Fan #132:Device Removed/Device Absent:SMI Handler
3704:30-Jun-2004 07:15:31:Fan #66:Lower Critical - going low:SMI Handler
3724:30-Jun-2004 07:15:41:Fan #132:Device Inserted/Device Present:SMI Handler
3744:30-Jun-2004 07:15:47:Fan #133:Device Inserted/Device Present:SMI Handler
3764:30-Jun-2004 07:15:49:Fan #66:Lower Critical - going low:SMI Handler
3784:30-Jun-2004 07:15:55:Fan #67:Lower Critical - going low:SMI Handler
3804:30-Jun-2004 07:17:00:Power Supply #113:Power Supply AC input lost:SMI Handler
3844:30-Jun-2004 07:21:46:System Firmware #6:System Firmware Error (POST Error):SMI Ha
3864:30-Jun-2004 07:21:48:System Event #8:OEM System Boot Event:BIOS
3884:30-Jun-2004 07:21:57:Power Supply #113:Power Supply AC input lost:SMI Handler
3904:30-Jun-2004 08:29:18:System Event #8:OEM System Boot Event:BIOS
3924:06-Jul-2004 08:54:35:System Event #8:OEM System Boot Event:BIOS
3944:06-Jul-2004 09:02:38:Power Unit #1:Power Unit Failure detected:SMI Handler
3964:31-Dec-1969 16:00:05:Power Unit #1:AC lost:SMI Handler
3984:06-Jul-2004 09:04:03:System Event #8:OEM System Boot Event:BIOS
4004:06-Jul-2004 09:09:07:Power Unit #1:Power Unit Failure detected:SMI Handler
4044:06-Jul-2004 09:10:35:System Event #8:OEM System Boot Event:BIOS
4064:21-Jul-2004 01:15:59:Board #137:Device Removed/Device Absent:SMI Handler
4084:21-Jul-2004 01:16:18:Board #137:Device Inserted/Device Present:SMI Handler
4104:23-Jul-2004 02:51:10:Power Supply #112:Power Supply Failure detected:SMI Handler
4144:23-Jul-2004 02:54:40:System Event #8:OEM System Boot Event:BIOS
4424:25-Aug-2004 10:49:41:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
4444:25-Aug-2004 10:50:19:Power Unit #1:Power Unit Failure detected:SMI Handler
4484:25-Aug-2004 10:53:57:System Event #8:OEM System Boot Event:BIOS
4504:25-Aug-2004 14:14:09:System Event #8:OEM System Boot Event:BIOS
4524:25-Aug-2004 14:26:28:Power Supply #112:Power Supply AC input lost:SMI Handler
4584:26-Aug-2004 13:58:50:System Event #8:OEM System Boot Event:BIOS
4604:27-Aug-2004 15:12:55:Power Supply #113:Power Supply AC input lost:SMI Handler
4644:27-Aug-2004 15:17:45:System Event #8:OEM System Boot Event:BIOS
4684:27-Aug-2004 16:33:03:System Event #8:OEM System Boot Event:BIOS
4704:27-Aug-2004 19:11:41:Power Supply #113:Power Supply AC input lost:SMI Handler
4724:27-Aug-2004 19:11:41:Power Unit #1:Power Unit Failure detected:SMI Handler
4784:27-Aug-2004 19:14:42:System Event #8:OEM System Boot Event:BIOS
4804:30-Aug-2004 12:54:01:System Event #8:OEM System Boot Event:BIOS
4824:07-Sep-2004 13:09:39:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
4844:07-Sep-2004 13:10:33:Platform Chassis Intrusion #5:LAN Leash Lost (system is unpl
4864:13-Sep-2004 10:00:49:System Firmware #6:System Firmware Error (POST Error):SMI Ha
4884:13-Sep-2004 10:00:51:System Event #8:OEM System Boot Event:BIOS
4904:13-Sep-2004 11:59:02:Power Unit #1:Power Unit Failure detected:SMI Handler
4944:13-Sep-2004 13:22:20:System Firmware #6:System Firmware Error (POST Error):SMI Ha
4964:13-Sep-2004 13:22:22:System Event #8:OEM System Boot Event:BIOS
4984:13-Sep-2004 13:24:56:Power Unit #1:Power Unit Failure detected:SMI Handler
5024:13-Sep-2004 13:29:43:System Firmware #6:System Firmware Error (POST Error):SMI Ha
5044:13-Sep-2004 13:29:45:System Event #8:OEM System Boot Event:BIOS
debian-ia64:~#
```

## 9 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`.

### 9.1 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.

### 9.2 command-line arguments

#### 9.2.1 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`.

## 9.2.2 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 9.2.3 \[bmc-watchdog set options\]](#), page 64. 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 9.2.5 \[bmc-watchdog daemon options\]](#), page 66. 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.

## 9.2.3 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.

### 9.2.4 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.

### 9.2.5 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.

### 9.3 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:~#

```

### 9.4 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.

## 10 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 10.1.1 \[ipmipower basic options\]](#), page 68 section.

### 10.1 Command-line arguments

#### 10.1.1 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 10.4 \[Host ranges\]](#), page 74 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.

### 10.1.2 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.

### 10.1.3 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'.

## 10.2 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 10.7 \[ipmipower known issues\]](#), page 75 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.

### 10.2.1 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 10.4 \[Host ranges\]](#), page 74 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 10 \[ipmipower\], page 68](#) 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*.

### 10.3 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.

## 10.4 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.

## 10.5 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:~#
```

## 10.6 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.

## 10.7 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.

## 11 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'.

### 11.1 command-line arguments

#### 11.1.1 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.

### 11.2 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:~#
```

### 11.3 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**.

## 12 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'.

### 12.1 Command-line arguments

#### 12.1.1 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.

### 12.2 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:~#
```

### 12.3 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**.

## 13 Trouble-shooting

### 13.1 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.

### 13.2 “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!"
```

### 13.3 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:~#
```

## 14 Contact us

- Homepage: <http://www.gnu.org/software/freeipmi>
- Project Main: <https://savannah.gnu.org/projects/freeipmi/>
- Download: <https://savannah.gnu.org/files/?group=freeipmi>
- Mailing List: <https://savannah.gnu.org/mail/?group=freeipmi>
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- CVS: <https://savannah.gnu.org/cvs/?group=freeipmi>

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## 16 Copying

### 16.1 GNU FreeIPMI license

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## 17 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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