

**NAME**

**acpi\_ibm** - ThinkPad ACPI extras driver

**SYNOPSIS**

To compile this driver into the kernel, place the following line in your kernel configuration file:

```
device acpi_ibm
```

Alternatively, to load the driver as a module at boot time, place the following line in loader.conf(5):

```
acpi_ibm_load="YES"
```

**DESCRIPTION**

The **acpi\_ibm** driver provides support for hotkeys and other components of ThinkPad laptops. The main purpose of this driver is to provide an interface, accessible via `sysctl(8)` and `devd(8)`, through which applications can determine the status of various laptop components.

While the `sysctl(8)` interface is enabled automatically after loading the driver, the `devd(8)` interface has to be enabled explicitly, as it may alter the default action of certain keys. This is done by setting the `events` `sysctl` as described below. Specifying which keys should generate events is done by setting a bitmask, whereas each bit represents one key or key combination. This bitmask, accessible via the `eventmask` `sysctl`, is set to `availmask` by default, a value representing all possible keypress events on the specific ThinkPad model.

**devd(8) Events**

Hotkey events received by `devd(8)` provide the following information:

```
system      "ACPI"
subsystem   "IBM"
type        The source of the event in the ACPI namespace. The value depends on the model.
notify      Event code (see below).
```

Depending on the ThinkPad model, event codes may vary. On a ThinkPad T41p these are as follows:

```
0x01      Fn + F1
0x02      Fn + F2
0x03      Fn + F3 (LCD backlight)
0x04      Fn + F4 (Suspend to RAM)
0x05      Fn + F5 (Bluetooth)
0x06      Fn + F6
```

0x07	Fn + F7 (Screen expand)
0x08	Fn + F8
0x09	Fn + F9
0x0a	Fn + F10
0x0b	Fn + F11
0x0c	Fn + F12 (Suspend to disk)
0x0d	Fn + Backspace
0x0e	Fn + Insert
0x0f	Fn + Delete
0x10	Fn + Home (Brightness up)
0x11	Fn + End (Brightness down)
0x12	Fn + PageUp (ThinkLight)
0x13	Fn + PageDown
0x14	Fn + Space (Zoom)
0x15	Volume Up
0x16	Volume Down
0x17	Mute
0x18	Access IBM Button

#### led(4) Interface

The **acpi\_ibm** driver provides a led(4) interface for the ThinkLight. The ThinkLight can be made to blink by writing ASCII strings to the */dev/led/thinklight* device.

#### SYSCTL VARIABLES

The following sysctls are currently implemented:

*dev.acpi\_ibm.0.initialmask*

(read-only) Bitmask of ACPI events before the **acpi\_ibm** driver was loaded.

*dev.acpi\_ibm.0.availmask*

(read-only) Bitmask of all supported ACPI events.

*dev.acpi\_ibm.0.events*

Enable ACPI events and set the *eventmask* to *availmask*. Without the **acpi\_ibm** driver being loaded, only the Fn+F4 button generates an ACPI event.

*dev.acpi\_ibm.0.eventmask*

Sets the ACPI events which are reported to devd(8). Fn+F3, Fn+F4 and Fn+F12 always generate ACPI events, regardless which value *eventmask* has. Depending on the ThinkPad model, the meaning of different bits in the *eventmask* may vary. On a ThinkPad T41p this is a bitwise OR

of the following:

1	Fn + F1
2	Fn + F2
4	Fn + F3 (LCD backlight)
8	Fn + F4 (Suspend to RAM)
16	Fn + F5 (Bluetooth)
32	Fn + F6
64	Fn + F7 (Screen expand)
128	Fn + F8
256	Fn + F9
512	Fn + F10
1024	Fn + F11
2048	Fn + F12 (Suspend to disk)
4096	Fn + Backspace
8192	Fn + Insert
16384	Fn + Delete
32768	Fn + Home (Brightness up)
65536	Fn + End (Brightness down)
131072	Fn + PageUp (ThinkLight)
262144	Fn + PageDown
524288	Fn + Space (Zoom)
1048576	Volume Up
2097152	Volume Down
4194304	Mute
8388608	Access IBM Button

*dev.acpi\_ibm.0.hotkey*

(read-only) Status of several buttons. Every time a button is pressed, the respecting bit is toggled. It is a bitwise OR of the following:

1	Home Button
2	Search Button
4	Mail Button
8	Access IBM Button
16	Zoom
32	Wireless LAN Button
64	Video Button
128	Hibernate Button
256	ThinkLight Button

512	Screen Expand
1024	Brightness Up/Down Button
2048	Volume Up/Down/Mute Button

*dev.acpi\_ibm.0.lcd\_brightness*

Current brightness level of the display.

*dev.acpi\_ibm.0.volume*

Speaker volume.

*dev.acpi\_ibm.0.mute*

Indicates, whether the speakers are muted or not.

*dev.acpi\_ibm.0.mic\_mute*

Indicates, whether the microphone led (present on some model) is on or not. Note that this does not mean that the microphone input is muted.

*dev.acpi\_ibm.0.thinklight*

Indicates, whether the ThinkLight keyboard light is activated or not.

*dev.acpi\_ibm.0.bluetooth*

Toggle Bluetooth chip activity.

*dev.acpi\_ibm.0.wlan*

(read-only) Indicates whether the WLAN chip is active or not.

*dev.acpi\_ibm.0.fan*

Indicates whether the fan is in automatic (1) or manual (0) mode. Default is automatic mode. This sysctl should be used with extreme precaution, since disabling automatic fan control might overheat the ThinkPad and lead to permanent damage if the *fan\_level* is not set accordingly.

*dev.acpi\_ibm.0.fan\_level*

Indicates at what speed the fan should run when being in manual mode. Valid values range from 0 (off) to 7 (max) and 8. Level 8 is used by the driver to set the fan in unthrottled mode. In this mode, the fan is set to spin freely and will quickly reach a very high speed. Use this mode only if absolutely necessary, e.g., if the system has reached its critical temperature and it is about to shut down. The resulting speed differs from model to model. On a T41p this is as follows:

0	off
1, 2	~3000 RPM

3, 4, 5	~3600 RPM
6, 7	~4300 RPM
8	~6400 RPM (Full-speed, unthrottled)

*dev.acpi\_ibm.0.fan\_speed*

(read-only) Fan speed in rounds per minute. A few older ThinkPads report the fan speed in levels ranging from 0 (off) to 7 (max).

*dev.acpi\_ibm.0.thermal*

(read-only) Shows the readings of up to eight different temperature sensors. Most ThinkPads include six or more temperature sensors but only expose the CPU temperature through `acpi_thermal(4)`. Some ThinkPads have the below sensor layout which might vary depending on the specific model:

1. CPU
2. Mini PCI Module
3. HDD
4. GPU
5. Built-in battery
6. UltraBay battery
7. Built-in battery
8. UltraBay battery

*dev.acpi\_ibm.0.handlerevents*

`devd(8)` events handled by **acpi\_ibm** when *events* is set to 1. Events are specified as a whitespace-separated list of event code in hexadecimal or decimal form. Note that the event maybe handled twice (e.g., Brightness up/down) if ACPI BIOS already handled the event.

Defaults for these sysctls can be set in `sysctl.conf(5)`.

**FILES**

`/dev/led/thinklight` ThinkLight led(4) device node

**EXAMPLES**

The following can be added to `devd.conf(5)` in order to pass button events to a `/usr/local/sbin/acpi_oem_exec.sh` script:

```
notify 10 {
    match "system"      "ACPI";
    match "subsystem"   "IBM";
```

```

        action "/usr/local/sbin/acpi_oem_exec.sh $notify ibm";
    };

```

A possible `/usr/local/sbin/acpi_oem_exec.sh` script might look like:

```

#!/bin/sh
#
if [ "$1" = "" -o "$2" = "" ]
then
    echo "usage: $0 notify oem_name"
    exit 1
fi
NOTIFY='echo $1'
LOGGER="logger"
CALC="bc"
BC_PRECOMMANDS="scale=2"
ECHO="echo"
CUT="cut"
MAX_LCD_BRIGHTNESS=7
MAX_VOLUME=14
OEM=$2
DISPLAY_PIPE=/tmp/acpi_${OEM}_display

case ${NOTIFY} in
    0x05)
        LEVEL='sysctl -n dev.acpi_${OEM}.0.bluetooth'
        if [ "$LEVEL" = "1" ]
        then
            sysctl dev.acpi_${OEM}.0.bluetooth=0
            MESSAGE="bluetooth disabled"
        else
            sysctl dev.acpi_${OEM}.0.bluetooth=1
            MESSAGE="bluetooth enabled"
        fi
        ;;
    0x10|0x11)
        LEVEL='sysctl -n dev.acpi_${OEM}.0.lcd_brightness'
        PERCENT='${ECHO} "${BC_PRECOMMANDS} ; \
            ${LEVEL} / ${MAX_LCD_BRIGHTNESS} * 100" \
            ${CALC} | ${CUT} -d . -f 1'

```

```

MESSAGE="brightness level ${PERCENT}% "
;;
0x12)
LEVEL='sysctl -n dev.acpi_${OEM}.0.thinklight'
if [ "$LEVEL" = "1" ]
then
    MESSAGE="thinklight enabled"
else
    MESSAGE="thinklight disabled"
fi
;;
0x15|0x16)
LEVEL='sysctl -n dev.acpi_${OEM}.0.volume'
PERCENT='${ECHO} "${BC_PRECOMMANDS} ; \
    ${LEVEL} / ${MAX_VOLUME} * 100" | \
    ${CALC} | ${CUT} -d . -f 1'
MESSAGE="volume level ${PERCENT}% "
;;
0x17)
LEVEL='sysctl -n dev.acpi_${OEM}.0.mute'
if [ "$LEVEL" = "1" ]
then
    MESSAGE="volume muted"
else
    MESSAGE="volume unmuted"
fi
;;
0x1b)
LEVEL='sysctl -n dev.acpi_ibm.0.mic_led'
if [ $LEVEL -eq 0 ]; then
    sysctl dev.acpi_ibm.0.mic_led=1
    mixer rec.volume=0
fi
if [ $LEVEL -eq 1 ]; then
    sysctl dev.acpi_ibm.0.mic_led=0
    mixer rec.volume=30%
fi
;;
*)
;;

```

```
esac
${LOGGER} ${MESSAGE}
if [ -p ${DISPLAY_PIPE} ]
then
    ${ECHO} ${MESSAGE} >> ${DISPLAY_PIPE} &
fi
exit 0
```

The following example specify that event code 0x04 (Suspend to RAM), 0x10 (Brightness up) and 0x11 (Brightness down) are handled by **acpi\_ibm**.

```
sysctl dev.acpi_ibm.0.handlerevents='0x04 0x10 0x11'
```

in sysctl.conf(5):

```
dev.acpi_ibm.0.handlerevents=0x04\ 0x10\ 0x11
```

## SEE ALSO

acpi(4), led(4), sysctl.conf(5), devd(8), sysctl(8)

## HISTORY

The **acpi\_ibm** device driver first appeared in FreeBSD 6.0.

## AUTHORS

The **acpi\_ibm** driver was written by Takanori Watanabe <[takawata@FreeBSD.org](mailto:takawata@FreeBSD.org)> and later mostly rewritten by Markus Brueffer <[markus@FreeBSD.org](mailto:markus@FreeBSD.org)>. This manual page was written by Christian Brueffer <[brueffer@FreeBSD.org](mailto:brueffer@FreeBSD.org)> and Markus Brueffer <[markus@FreeBSD.org](mailto:markus@FreeBSD.org)>.