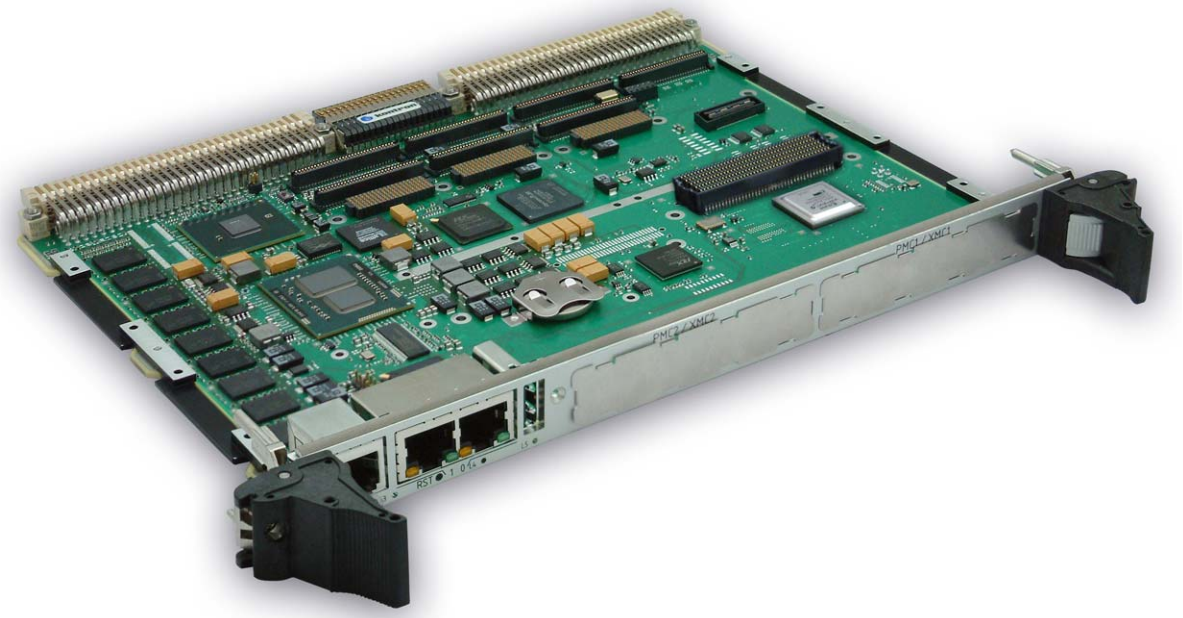
kontron

» VM6050 «



Wind River Linux 4.3 Release Notes

SD.DT.G21-0e - February 2013

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Conventions

This guide uses several types of notice: Note, Caution, ESD.

Note: this notice calls attention to important features or instructions.


Caution: this notice alert you to system damage, loss of data, or risk of personal injury.


ESD: This banner indicates an Electrostatic Sensitive Device.

All numbers are expressed in decimal, except addresses and memory or register data, which are expressed in hexadecimal. The prefix `0x' shows a hexadecimal number, following the `C' programming language convention.

The multipliers `k', `M' and `G' have their conventional scientific and engineering meanings of $*10^3$, $*10^6$ and $*10^9$ respectively. The only exception to this is in the description of the size of memory areas, when `K', `M' and `G' mean $*2^{10}$, $*2^{20}$ and $*2^{30}$ respectively.

When describing transfer rates, `k' `M' and `G' mean $*10^3$, $*10^6$ and $*10^9$ *not $*2^{10}$ $*2^{20}$ and $*2^{30}$.*

In PowerPC terminology, multiple bit fields are numbered from 0 to n, where 0 is the MSB and n is the LSB. PCI and CompactPCI terminology follows the more familiar convention that bit 0 is the LSB and n is the MSB.

Signal names ending with an asterisk (*) or a hash (#) denote active low signals; all other signals are active high.

Signal names follow the PICMG 2.0 R3.0 CompactPCI Specification and the PCI Local Bus 2.3 Specification.

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Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions


Warning!
All operations on this device must be carried out by sufficiently skilled personnel only.


Caution, Electric Shock!
Before installing a not hot-swappable Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions

ESD Sensitive Device!
Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.

Table Of Contents

Chapter 1 - Introduction

This delivery contains the Wind River Linux 4.3 layer supporting the VM6050 BSP, as well as a USB image for testing purposes.

The prerequesite to use this BSP is to install the Wind River Linux 4.3 for Intel platform target on a dedicated host server. Contact your Wind River representative to get more information about this distribution.

In this document, the term VM6050 is used for the VM6050 boards in standard or rugged conduction-cooled versions:

VM6050 Single-slot 6U VME board

- VM6050-SA Standard Commercial version
- VM6050-WA Extended Temperature version
- VM6050-RA Rugged Air-Cooled version
- VM6050-RC Rugged Conduction-Cooled version

and VM6050-RTM is associated to the VM6050 Rear Transition Module (RTM):

VM6050-RTM Rear Transition Module for the single-slot 6U VPX board

- PBV36-P0-VM6-00

Chapter 2 - Release Content

This release is made of:

> One CD-ROM :

Wind River Linux 4.3 BSP for VM6050

ID 12286

Chapter 3 - Associated Documentation

Kontron Documentation

- Hardware

  VM6050 6U VME SBC User's Guide CA.DT.A93

  VM6050 Hardware Release Notes CA.DT.A94

- Firmware

  VM6050 AMI-BIOS User Reference Manual SD.DT.F89

Wind River Linux Documentation

- Documentation is provided with the Wind River Linux 4.3 distribution.

Chapter 4 - Required Configuration

4.1 Hardware Requirements for VM6050 Board

- A Kontron VM6050 board.
- The Wind River 4.3 target image may be downloaded on one of the following bootable disks:
  - a SATA disk connected to the SATA connectors available on VM6050-RTM board.
  - Optional onboard USB Flash Disk.
- A console on serial line (text or VNC install).

For a graphic configuration on VM6050 a specific order code and a specific graphic module are required: VM6050-2SA34-12110 and MOD-GX-SA-00. The module provides two DisplayPorts and a VGA connector.

4.2 Firmware Requirements of VM6050 Board

The version of the BIOS firmware must be at least:

- 11332

This version is displayed in the BIOS Setup.

Chapter 5 - Installation

The prerequisite to the installation of this BSP is to install Wind River Linux 4.3 on a server host. Refer to the installation manual of Wind River Linux to get the related information. The following examples are using a host running a Linux distribution (make,...) and should be adapted to another Operating System if required.

This BSP CD-ROM provides also a USB image for testing purposes (section 5.1).

5.1 USB Image

Mount the BSP CD-ROM and save `usb.img.tar.bz2` in a directory.

You can decompress the image directly to a USB key (let's assume `/dev/sdb`):

```
bzcat usb.img.tar.bz2 > usb.img.tar
tar -xvf usb.img.tar
dd if=usb.img of=/dev/sdb
```

Insert the key in one of the USB ports on the VM6050 or a VM6050-RTM paired with it, either directly or via a hub and configure the board to boot from it using the `Boot->Hard Drive BBS Priorities` and `Boot->Boot OptionPriorities` menus of the BIOS (use legacy boot method, not UEFI).

The USB key image uses Syslinux (http://www.syslinux.org) as bootloader and will boot automatically after 5 seconds using COM1 as console. You can select the VGA console instead from the boot menu or hit TAB and edit the boot parameters.

The root password is "`root`".

For reference, this is the command used to configure the project:

```
/kontron/WindRiver/wrlinux-4/wrlinux/configure \
        --with-template=feature/icc \
        --with-template=feature/vtune-sep \
        --with-template=feature/ippALL \
             --enable-board=kontron-vm6050 \
             --with-layer=/kontron/wrll-kontron \
             --enable-rootfs=glibc_std \
             --enable-bootimage=usb
```

5.2 Wrll-Kontron BSP Layer

After installing Wind River Linux 4.3, decompress the `wrll-kontron.tar.gz` archive and configure a project as follows:

```
/kontron/WindRiver/wrlinux-4/wrlinux/configure \
        --enable-board=kontron-vm6050 \
        --with-layer=/kontron/wrll-kontron \
        --enable-rootfs=glibc_std \
        --enable-bootimage=usb
```

This assumes as an example that `WIND_HOME` is `/kontron/WindRiver` and the `wrll-kontron` layer archive was decompressed in `/kontron`.

Run the following commands in the project directory:

- `make all` to build the kernel and filesystem
- `make fs` to build just the filesystem
- `make usb-image-loop` to create a bootable usb image

See `templates/board/kontron-vm6050/README` in the `wrll-kontron` layer for further details.

Chapter 6 - BSP Features

6.1 Supported and Unsupported Hardware Features

The main features of the VM6050 board are supported: Ethernet, RTC, SATA, USB, Serial, USB Host, I2C, LEDs, GPIO, VME, Watchdog, LM73 sensors, EEPROM, VGA.

The F-RAM feature is not currently supported by this BSP release.

6.2 Boot Instructions

This BSP supports the USB boot method. BIOS must be set to boot accordingly.

In order to generate the USB image execute this command as root:

```
make usb-image-loop
```

You can change the size of the Linux partition to increase the available space and configure the root device as read/write, if you want.

The resulting image can be written to a USB disk:

```
dd if=export/usb.img of=/dev/sdX
```

and will boot automatically with a serial console.

6.3 Watchdog

The `cpld_wdt` driver is used instead of the standard kernel iTCO_wdt.

To load the module:

```
[root@lnx7]# modprobe cpld_wdt
```

To check that the driver is loaded:

```
[root@ki7]# lsmod | grep cpld_wdt
cpld_wdt 3138 0
...
```

This driver can be loaded with two options: timeout of the watchdog (timeout) and the mode (trigger_mode).

By default, timeout is 21s and the trigger_mode is reset mode which means that if the watchdog falls, the board is reset.

To start or service (restart) the watchdog :

```
[root@ki7]# echo > /dev/watchdog
```

To stop the watchdog :

```
[root@ki7]# echo V > /dev/watchdog
```

To change the timeout:

```
[root@ki7]# rmmod cpld_wdt
[root@ki7]# modprobe cpld_wdt timeout=11
```

Only odd timeout values are available.

To change the mode to get an interruption instead of a reset:

```
[root@ki7]# rmmod cpld_wdt
[root@ki7]# modprobe cpld_wdt timeout=11 trigger_mode=2
```

Then start the watchdog by writing to `/dev/watchdog` (echo), wait for the interrupt reading the watchdog (cat), and when the interrupt occurs disable the watchdog that is restarted by the termination of "cat" (close of the watchdog device):

```
[root@ki7]# echo > /dev/watchdog ; time cat /dev/watchdog ; echo V > /dev/watchdog
```

If no one is waiting on the interruption (no "cat"), an emergency reboot system call is run when the watchdog expires.

6.4 vpdtool

`vpdtool` command is used to display the Vital Product Data of the VM6050:

```
[root@lnx6 ~]# vpdtool
VM6050 detected
Board type        : VM6050-2SA35-00110
EC Level          : 02003
Serial Number     : 1811401030013
Variant           : 1000004280850000
Keylist           :
/PCB_B/SACLASS/P2GPIOOFF/BHQUAD/IOFPGAOFF/IBOMOFF/PCIEMUXGEN2/NOJTAGPCH/

XMC/COREI7LVKO/PWRMAGOFF/BATON/STD_EARTH/IRTC/XDPON/STDCLK/CK505REFOSC/XMCPWR12VOFF/4

 GB_DDR3_1333/POPWRMAGOFF/POUHM/SATAHDD/2RANK/VME/PXMC/1SLOT/FP422ON/FL/P80OFF/ITIN/
    I2CSTD/P5VOFF/NOFPIO/PMCON/JTAGON/
```

6.5 LEDs

The driver `leds_cpld` allows to deal with the front panel LEDs for a user mode.

The driver `leds_cpld` creates a list of special files and classes in `/sys`:

```
[root@ki7]# ls /sys/class/leds/
led2:amber led2:OFF led3:amber led3:OFF
led2:green led2:red led3:green led3:red
```

For each LED, there are three different colors available: green, red, amber that can be set by addressing the related file.

For each color (which are exclusive), there are four different modes:

- ON (echo 0, see following example)
- Low blinking (echo 1, see following example)
- Fast blinking (echo 2, see following example)
- OFF (echo 1, see following example)

Example, to set those different modes on the LED 2 in amber:

```
[root@ki7]# echo 0 > led2:amber/brightness The LED 2 is ON in AMBER
[root@ki7]# echo 1 > led2:amber/brightness The LED 2 blinks low in AMBER
[root@ki7]# echo 2 > led2:amber/brightness The LED 2 blinks fast in AMBER
[root@ki7]# echo 0 > led2:OFF/brightness The LED 2 is OFF
```

When setting `led2` or `led3`, both `led2` and `led3` are set to user mode.

To exit from this mode, set `led<n>`:OFF/brightness to a non null value; for example:

```
[root@ki7]# echo 1 > led2:OFF/brightness
```

- On VM6050: There are 4 users leds: L2 (led2), L3 (led3), L4 (led4), L5 (led5).
- The led1 (L1) is not manageable at user level, so no special file for led1 is available.

6.6 GPIOs

There are 8 GPIOs on VM6050.

When the GPIO driver is loaded (modprobe gpio), a collection of special sys files is created for each GPIO:

- `/sys/class/gpio/gpioX/direction` should be set to `in` or `out`:

```
[root@ki7]# echo out > /sys/class/gpio/gpio4/direction
[root@ki7]# cat /sys/class/gpio/gpio4/direction
out
```

- `/sys/class/gpio/gpioX/value` to get or set (depending on the direction) the value of the GPIO:

  1 or 0

```
[root@ki7]# echo 0 > /sys/class/gpio/gpio4/value
[root@ki7]# cat /sys/class/gpio/gpio3/value
1
```

- `/sys/class/gpio/gpioX/value_it` get or set the value. A read to this file is waiting for an interruption on the GPIOs (refer below).
- `/sys/class/gpio/gpioX/interrupt` enables or disables interruption on the GPIO: `on` or `off`

```
[root@ki7]# echo on > /sys/class/gpio/gpio3/interrupt
```

- `/sys/class/gpio/gpioX/polarity` to set the polarity of the interruption: `hi` (high level or rising edge) or `lo` (low level or falling edge).
- `/sys/class/gpio/gpioX/mode`: `edge` or `level` interruption mode.

```
[root@ki7]# cat /sys/class/gpio/gpio5/mode
edge
```

- `/sys/class/gpio/gpio3/toggle` set toggle mode means the interruption is raised when the GPIOs state changes.

```
[root@ki7]# echo on > /sys/class/gpio/gpio3/toggle
```

- `/sys/class/gpio/gpio3/intr_stat` is a counter of the interruption on that GPIOs.

```
[root@ki7]# cat /sys/class/gpio/gpio5/intr_stat
```

The GPIO2 is dual function because it is also a Masquable Reset. This is configurable through CPLD registers:

To set the GPIO2 as a standard GPIO (without issuing a local reset), set the bit 4 of register 0x70 of the CPLD to 0, under EFI shell of the BIOS:

```
VM6050> kpld -r 0x70
READ : @0x70 = 0x5D
VM6050> kpld -w 0x70 0x4D
VM6050> kpld -r 0x70
READ : @0x70 = 0x4D
```

Then boot the linux system.

6.7 Allocator Driver

Allocator is a module allowing the allocation of large contiguous memory areas. Allocator module is needed to map VME bus windows or to get big bunch of memory for DMA transfers.

Refer to the man page allocator to get detailed information about this module.

The allocator driver is not enabled automatically. You can control it with this command:

```
/etc/rc.d/init.d/allocator  {start|stop}
```

Or you can add a symlink in `/etc/rc.d/rcX.d/` in order to start and stop it automatically.

6.8 VME Driver

ALMA2f is the VME Bridge of the VM6050 boards.

The associated driver is `almavme`. Refer to the documentation of VME Toolkit at `wrll-kontron /templates/board/kontron-vm6050` (`almavme.txt` and `almavmechan.txt`) to get the API of the Driver.

The `almavmechan` command provides some way to manage master and slave VME channels from user space (through ioctls of the ALMA2f driver).

Other source codes samples are located at `wrll-kontron/dist/vmetools/src`.

» Example 1: Open a slave VME channel (VME->PCI)

Open a slave VME channel (VME->PCI) on the target decoded at 0x1000000 on the VME for all the AMs matching 0x2FF to access the local memory (8 MB size) at physical address given by `allocator`:

```
[root@ki7]# cat /proc/allocator
Info on Allocator module [0x19000000-0x1cffffff]
Partition 2ESSTIN [ 0x19000000-0x19ffffff ]
Partition VMEIN [ 0x1a000000-0x1affffff ]
Partition 2ESSTOUT [ 0x1b000000-0x1bffffff ]
Partition VMEOUT [ 0x1c000000-0x1cffffff ]
```

with a `/etc/init.d/allocator` setting: `OPTIONS='linsizemb=64 allocator_part="16M(2ESSTIN):16M(VMEIN):16M(2ESSTOUT):16M(VMEOUT)"'`

```
[root@ki7]# almavmechan -pcialloc TEST 0x10000000 0x1a000000 0x800000 0x2FF013
[root@ki7]# almavmechan -pciprint
  ------------------------------------------------------------------------------
VME to PCI CHANNELS
  ------------------------------------------------------------------------------
Num     Name        VMEaddr       addr      Space size(MB)        AM     Conv   WP  RH
  ------------------------------------------------------------------------------
0       TEST      0x10000000 0x1a000000 DRAM         0008        D-02-ff ADDR Yes Yes
  ------------------------------------------------------------------------------
```

On the VM6050, the VME bus should be locked before issuing a single VME access concurrently with VME DMA accesses. Refer to the option `-b` of `mbm3k` command, and to the ioctl `VMEIOCTL_GET_VME` and `VMEIOCTL_FREE_VME` of the ALMA2f driver. VME DMA transfers are preferred to single VME transfers.

Example 2: Open a master VME channel (PCI->VME)

Open a master VME channel (PCI->VME) to access a VME address at 0x20000000 in A32SData mode:

```
[root@ki7]# almavmechan -vmememalloc TEST2 0x20000000 0x800000 0x0
[root@ki7]# almavmechan -vmememprint
 ------------------------------------------------------------------------------
                            PCIMEM to VME CHANNELS
 ------------------------------------------------------------------------------
Name     CPUaddr         PCIaddr       VMEaddr        size(Mb)       AM      Conv   WP   RH
 ------------------------------------------------------------------------------
TEST2      0xc0800000 0x00800000 0x20000000            0008       A32SDATA ADDR No  No
 ------------------------------------------------------------------------------
```

Then the 0xc0800000 address can be remapped to access the VME window at 0x20000000 on the VME bus (with A32SDATA address modifier). Remapping may be done through the `mmap call of /dev/almavme`.

On the VM6050, the VME bus should be locked before issuing a single VME access concurrently with:

- VME DMA accesses. Refer to the option `-b` of `mbm3k` command, and to the `ioctl`
- VMEIOCTL_GET_VME and VMEIOCTL_FREE_VME of the ALMA2f driver. So VME DMA transfers are preferred to single VME transfers.

Example 3: `mbm3k` command

The `mbm3k` command may be used to exercise some VME DMA transfers. For example to run 100 loops of a DMA read in 2eSST mode at the VME address 0x10000000, VME block size is 128 and the global transfer size is 0x600000:

```
[root@ki7]# mbm3k dma2esst r 128 0x10000000 0x600000 100
```

Example 4: Open a slave 2eSST VME channel

Open a slave 2eSST VME channel at 0x10000000 on the VME bus. In that example and if the distant board is a VM6050 running this Linux distribution, the command `almavmechan` may be used to open such a slave 2eSST VME channel:

```
[root@ki7]# almavmechan -pcialloc 2ESST 0x10000000 0x0 0x800000 0x06000003
```

Example 5: Send and receive VME interrupts

Refer to the source examples delivered in `/usr/share/vmetools/src/intr/` directory.

Enter following commands to generate the `RECV_intr` and `GEN_intr` programs.

```
[root@ki7]# cd /usr/share/vmetools/src/intr
[root@ki7]# make
```

To test the VME interrupts; for example, using two VM6050 boards:

- on one VM6050 board, enter the next command to wait for the VME interrupt level 5 and vector 0xa0:

```
[root@ki7]# RECV_intr 0x5 0xa0
```

- on the other VM6050 board, enter the next command to generate the VME interrupt level 5 and vector 0xa0:

```
[root@ki7]# GEN_intr 0x5 0xa0
```

The VME bus must be locked during the acknowledgement the VME interrupts, this is done in the interrupt handler of the ALMA2f driver. The duration to lock/unlock of the VME bus depends on the VME bus load.

6.9 Graphics

The project should be configured with `xorg` and `dri` features as follows:

```
--enable-rootfs=glibc_std+xorg+dri
```

instead of

```
--enable-rootfs=glibc_std
```

This enables the features necessary to run the X server, with a minimal WM and some demo programs. Use "`startx`" or "`xinit`" to start the X server.

Chapter 7 - Wind River Performance Studio for Intel Architecture 4.0

The Wind River Performance Studio for Intel is an optional component for Wind River Linux containing ICC (Intel C++ Compiler), IPP (Intel Integrated Performance Primitives) and VTune (Intel VTune Amplifier).

After installing the component, the correct license and setting the environment with:

```
./wrenv.sh -p wrlinux-4
```

You can configure a project supporting it by adding the following parameters to the configure command:

```
        --with-template=feature/icc \
        --with-template=feature/vtune-sep \
        --with-template=feature/ippALL \
```

The `vtune-sep` feature can be replaced with `vtune` in order to have access to the full set of the VTune target tools. The `ippALL` feature can be replaced with a set of IPP features matching the exact requirements for the programs you intend to use.

The `wrll-kontron` layer contains the `ipp_bzip2` package, for demonstration purposes. This package depends on the actual installation of the Wind River Performance Studio and on the configuration of the project as described above. The package is not enabled by default. You can enable it and rebuild the filesystem image or install the RPM on a previously built image configured with IPP. The `ipp_bzip2` program included works just like `bzip2`, but faster.

Chapter 8 - Known Limitations

8.1 Compilation Errors when no Performance Studio for Intel Architecture 4.0 is installed

The lack of the packages of the Performance Studio (ICC and libIPP: refer to chapter 7 page 14) raises errors during the core2 compilation (for example during compilation of 32-bit applications).

To avoid those errors comment the line (adding a # at the beginning of the line):

```
#icclibs.core2
```

in the packages list:

`./templates/board/kontron-vm6050/rootfs/glibc_std/pkglist.add`

and

`./templates/board/kontron-vm6050/rootfs/glibc_small/pkglist.add`

of the BSP delivery.

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