PC Engines

WRAP router platform

Versions WRAP.1C / .1D / .1E, WRAP.2B / .2C / .2D / .2E

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Federal Communications Commission Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio energy. If this equipment is not installed and used in accordance with the manufacturer's instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

This board is designed for installation in a shielded enclosure (metal or plastic with conductive coating). Shielded cables are required on LAN and serial ports to assure compliance with FCC regulations.

A copy of the test report will be provided on request.

CE Declaration of Conformity

We, PC Engines GmbH, declare that WRAP.1C / WRAP.1D, when installed in the PC Engines metal enclosure, is in conformance with:

- EN 61000-6-3 and EN 61000-6-4 (EMI emissions, residential and industrial)

- EN 61000-6-1 and EN 61000-6-2 (ESD, susceptibility, residential and industrial)

A copy of the test report will be provided on request.

Compliance information

For FCC, WRAP has been tested as a CPU board, installed in an enclosure, with the top cover removed. No further testing should be required if the board is used with other FCC tested modular components. Please see http://www.fcc.gov/oet/ for more details. The responsible party for FCC is the importer.

Testing for CE mark must be done at the level of the complete product, possibly including the wireless cards. Please contact PC Engines for assistance and documentation.

For satisfactory resistance to electrostatic discharge events (ESD), the WRAP board should be grounded (e.g. through the mounting holes, or the serial port connector).

Recycling / disposal
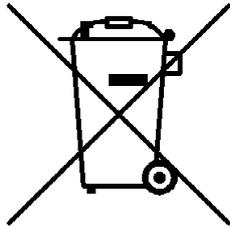
Do not discard electronic products in household trash !

All waste electronics equipment should be recycled properly. Actual procedures depend on your country.

Information for the recycler:

PC Engines enclosures are made of Aluminum.

Batteries, if present, should be cut off or removed from the socket and recycled separately.

PCB boards may include SnPb (tin-lead) solder and should be recycled properly.

Introduction / features

WRAP is a small single board computer optimized for wireless access and network routing applications.

- National SC1100 CPU, 233 or 266 MHz 5x86 CPU, 16KB cache
- 2 or 3 Ethernet channels (National DP83816); 1 channel on WRAP.2B
- 2 or 1 miniPCI sockets for 802.11 wireless cards and other expansion
- 64 MB SDRAM, 64 bit wide for high memory bandwidth
- 128 KB flash for tinyBIOS system BIOS.
- CompactFlash header for user's operating system and application
- 7 to 18V DC supply through DC jack or passive power over LAN 1 connector
- 1 serial port (DB9 male)
- Watchdog timer built into SC1100 CPU
- LM77 thermal monitor (not on WRAP.2D or WRAP.2E)
- Header for I2C bus (can be used for front panel interface)
- Header for LPC bus (can be used for I/O expansion)
- 3 LEDs and 1 pushbutton switch, freely programmable.

OEM options

The following accessories are available:

- CompactFlash cards
- Power over Ethernet injector POE.1A

The following options can be configured for larger orders:

- DRAM size (32 MB, 64 MB, 128 MB)
- 1 or 3 Ethernet channels (limit to 1 miniPCI if 3 Ethernet)
- 1 or 0 Serial ports
- Delete front panel LEDs and switch
- Custom BIOS adaptations as needed
- Full BIOS source can be licensed for adaptation by OEM
- USB port (no power over Ethernet, 5V DC supply only)
- Full custom board versions.

DESIGNED IN
SWITZERLAND
MADE IN CHINA

CompactFlash

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WRAP.1C

miniPCI 2

J6 miniPCI 1

COM1 J8
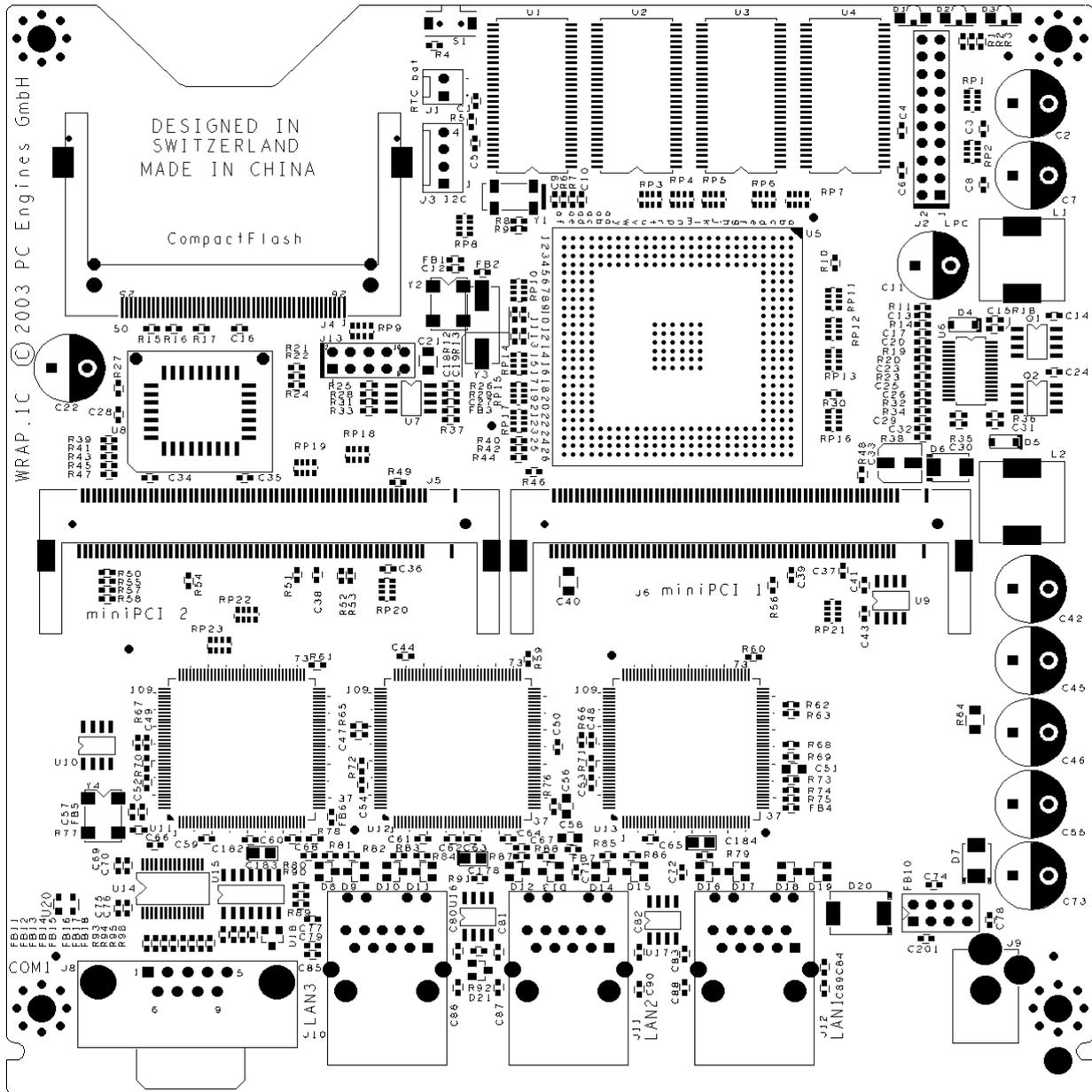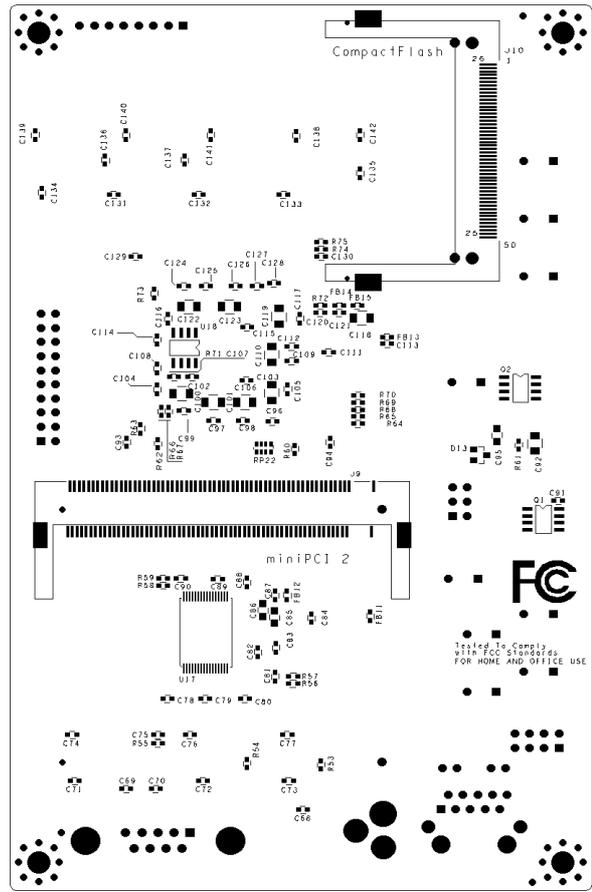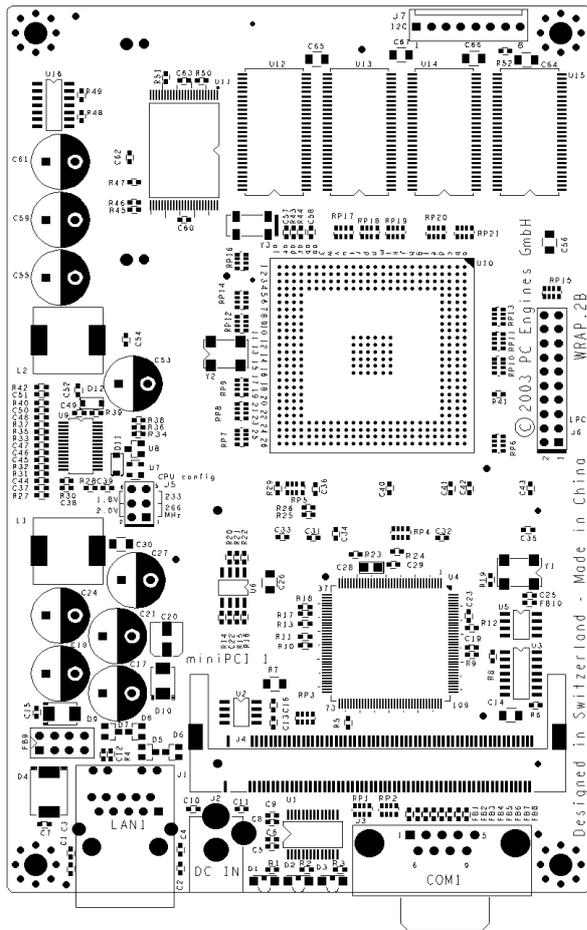
Technical data

Power supply	+12V DC, ~ 0.25A halt, ~ 0.4A active (excluding miniPCI cards) recommended range +7 to +18V DC, TVS limit at 20V ! Center pin = positive, sleeve = ground.
Temperature range	0 to 50°C. The temperature range may be extended by using a CPU heat sink (not included), and reducing CPU frequency to 233 MHz.
Dimensions	WRAP.1C = 6 x 6" (152.4 x 152.4 mm) WRAP.2B = 3.937" x 6.3" (100 x 160 mm)

Block diagram

Full schematics are available on the PC Engines web site.

802.11x 802.11x 10/100 Ethernet 10/100 Ethernet 10/100 Ethernet

passive power over Ethernet

25 MHz

Osc

7..20V

miniPCI	miniPCI (alternate to LAN3)	DP83816 LAN 3	DP83816 LAN 2	DP83816 LAN 1
3.3V 5	3.3V 5	3.3V 10	3.3V 9	3.3V 8

33MHz 33MHz 33 MHz 33 MHz 33 MHz

PCI bus

33MHz MA,RAS CAS,WE sub ISA

MD

DRAMCLK 66 to 100MHz

SDRAM PC-133 32 to 128 MB	National SC1100	IDE	Compact Flash	BIOS flash	DC-DC converter
3.3V 4	3.3V/1.8V 2,3		3.3V 6	3.3V 6	7

32768Hz 27MHz

+3.3V I/O voltage +1.8V SC1200 core

Getting started…

- Connect a DC power supply to the DC jack J9. 2.1 mm center pin = positive, sleeve = ground. Supply voltage should be between 7V and 18V (TVS on the input starts clamping around 20V). Power supply should be able to supply at least 7.5W, 15W suggested for more margin and reliability.

- Connect the serial console using a DB9 null modem cable. Default serial port parameters are 38400 8N1. Do NOT use a 1:1 connected serial cable, as the serial port may get damaged.

- While power is off, insert CompactFlash card with your operating system and application in CompactFlash header J4. Hot swap of CompactFlash cards is not supported !

- Power on…

You should see tinyBIOS startup messages, memory size, CF disk geometry on the serial console.

Setup options

Configure your terminal emulator for 38400 8N1 (default baud rate), no handshake. To enter setup, type S during the memory test. You should see somethink like the following:

```
PC Engines WRAP platform
tinyBIOS V1.4a (C)1997-2003 PC Engines

640 KB Base Memory
64512 KB Extended Memory

01F0 Master 848A HYPERSTONE FLASH DISK
Phys C/H/S 497/4/32 Log C/H/S 31/32/63

WRAP setup

(9) 9600 baud *3* 38400 baud
(C) CHS mode *L* LBA mode
(X) Xmodem upload (Q) Quit
```

The active options are marked by *, e.g. *3* means 38400 baud mode is active. Setup options are stored in a 4KB block of flash, not in RTC CMOS. The following options can be set:

- Baud rate 9600 baud (9) or 38400 baud (3). Default is 38400 baud.

- CompactFlash translation mode CHS (C) or LBA (L). Default is CHS.

- XMODEM upload of new firmware (X). Start transmission when prompted. 128 byte and 1024 byte packet sizes can be accepted, CRC mode only. Checksum mode is not supported as it is considered too risky for firmware upgrade.

  The actual flash update algorithm is included in the uploaded file. Flash programming takes about two seconds. If power fails during this time, the BIOS chip will need to be reprogrammed through other means.

- Quit (Q) – setup will ask whether it should write the new settings to flash (Y) or not (N).

OEMs can request a utility to insert their own sign-on message into the BIOS binary.

CompactFlash partitioning

tinyBIOS is set up to configure the CF card in CHS mode. CHS mode is dependent on the geometry of the CF card, but is more likely to work consistently across systems.

If using LBA mode, please make sure that the disk geometry on the system where the card is initialized matches that shown by the WRAP BIOS during startup. A mismatch will cause problems.

Another possible issue are cards with IDE DMA support – the DMA signals are a fairly recent addition to the CF spec, and are not supported by WRAP. If you experience problems with IDE access later in the boot process, try to disable IDE DMA in your operating system.

Thermal sensor

The thermal sensor will reset the system when the temperature exceeds a critical level (power on default = 80C). Reset will be released when the temperature goes back down.

The LM77 thermal sensor sits on the secondary I2C bus, at address 90h. DOS based sample code is available on request. National also has a Linux driver for the I2C, but this probably needs some work.

Front panel LEDs and switch

LED1 (D3)	GPIO2	write I/O port [GPIOBASE] bit 2	0 = light
LED2 (D2)	GPIO3	write I/O port [GPIOBASE] bit 3	0 = light
LED3 (D1)	GPIO18	write I/O port [GPIOBASE] bit 18	0 = light
Switch (S1)	GPIO40	read I/O port [GPIOBASE+20] bit 8	0 = pressed

With tinyBIOS, GPIOBASE is 0F400h. If you would like to write a more generic driver, use the SC1100 I/O base registers to determine GPIOBASE.

Format of X-Modem upload files

The uploaded file is stored starting at offset 1000:0. The first two bytes are a signature, and should be TB. Setup will do a far call to 1000:2 if the signature is detected. ES:DI points to the end of the uploaded file in memory.

Power over Ethernet

WRAP implements a passive power over Ethernet scheme, using the unused pairs of LAN1 for power. Power can be injected using a passive POE splitter such as PC Engines POE.1A.

When power is fed in through POE, it is possible to "steal" unregulated power through the DC jack. Please note that this port is not fused. The POE input diode is rated for a current of 3A. Please keep in mind that any EMI energy injected on this port will go out through the Ethernet cable without further filtering.

Real-Time Clock

WRAP does not include a battery backup for the real-time clock (RTC).

The A3 stepping of the SC1100 CPU had a problem with the 32768 Hz oscillator, leading to potential RTC inaccuracy. This version also was sensitive to ESD on the battery voltage pin.

A backup battery can be connected as follows:

WRAP.1C / .1D: Add a 100 ohm, 0603 resistor in location R5, replace the 0 ohm resistor in location C105 (bottom side) with a 0.1uF 0603 capacitor, install a 2 pin header in location J1. Connect 3V Lithium battery to J1, observing the polarity marks.

WRAP.2B / .2C: Connect 3V battery to J7 pin 7 (positive) and pin 8 (negative).

SC1100 is specified for a battery voltage of 2.4 to 3.6V, drain current 7 to 30 µA. At 30µA, a CR2032 Lithium coin cell will last only about a year – please consider a larger CR123 Lithium (often used in cameras).

Known issues

Reset may not work reliably on very short power interruptions. Please make sure that power remains off for at least a second.

WRAP.1D / WRAP.1E revision changes

The following changes were made going from revision 1D to revision 1E:

pd 050101	3	Change R97 to 1.5K (ECN009).
	6	Add optional buzzer (e.g. Hycom HY-05) in place of C22.
	6	Add optional soldered battery.
	6	Add IDE DMA support.
	6	Change to TSOP flash (to make space for soldered battery + commonality with WRAP.2C).
	7	Add 2.2nF capacitor on OVERTMP# net (ECN009).
	7	Delete MIC8115 alternative reset.
	7	Add BAS40-06 dual diode as alternative to MBR0520L.
	PCB	Reroute OVERTMP# to avoid surge coupling.
	PCB	Change 4.7uF capacitors to 0805 package.

WRAP.1C / WRAP.1D revision changes

The following changes were made going from revision 1C (China) to revision 1D (Taiwan):

pd 040512	5	Change J5 miniPCI (optional) to REQ3, GNT3.
		Change J6 miniPCI (always populated) to REQ0, GNT0.
	6	Serial port -> disable auto power down (ONLINE# = FORCEON high).
	10	Change LAN3 to REQ3, GNT3.
	PCB	Change silk screen to "Assembled in Taiwan".

WRAP.2B / WRAP.2C revision changes

The following changes were made going from revision 2B (China) to revision 2C (Taiwan):

| pd 040520 | 5 | Change miniPCI socket from REQ3/GNT3 -> REQ2 / GNT2. |
| pd 040512 | PCB | Change silk screen to "Assembled in Taiwan". |

Support

Please email pdornier@pcengines.ch.

FreeBSD

A ready-to-boot firewall configuration is available at http://www.m0n0.ch/wall/

The default FreeBSD boot sector expects a keyboard controller to be present. This will hang on the WRAP board.

Modify src/sys/boot/i386/boot2/boot1.s to skip this routine (e.g. patch in a ret instruction).

```
//
// Enable A20 so we can access memory above 1 meg.
//
seta20:   cli                    // Disable interrupts
seta20.1: inb $0x64,%al          // Get status
          testb $0x2,%al         // Busy?
          jnz seta20.1           // Yes
          movb $0xd1,%al         // Command: Write
          outb %al,$0x64         //  output port
seta20.2: inb $0x64,%al          // Get status
          testb $0x2,%al         // Busy?
          jnz seta20.2           // Yes
          movb $0xdf,%al         // Enable
          outb %al,$0x60         //  A20
          sti                    // Enable interrupts
          retw                   // To caller
```

(courtesy of Larry Baird) The following lines added to cpu_reset_real() in sys/i386/i386/vm_machdep.c will allow a WRAP board to reboot when running freeBSD:

```
outl( 0xCF8, 0x80009044UL );  // reset control (SC1100 data
                              // sheet, page 170
outb( 0xCFC, 0x0F );          // system wide reset
```

WRAP support is included in FreeBSD release 5.3 – disable KBD and VGA and recompile the kernel.

Linux

The kernel should be configured not to look for a keyboard controller to avoid error messages.

A driver for the SC1100 watchdog can be found at http://www.conman.org/software/wd1100 , or at http://www.sk-tech.net/support/soekris.html .

(courtesy of Erich Titl) Linux needs a patch to pc_keyb.c to avoid the keyboard jammed message at start up. The patch is written by Randy Dunlap and is somewhat difficult to find. A copy can be found at http://cvs.sourceforge.net/viewcvs.py/leaf/devel/etitl/kernel/kbc_option_2420.patch .

Old versions of the GRUB boot loader has broken A20 gate code, and may have problems in 8250 / 16550 detection. The UART has the FIFO, detection can be skipped.

Another way (A.J.T. Toorman): change pc_keyb.c (in Linux kernel file /drivers/char) file as follows:

```
#define kbd_controller_present() 0
```

Reboot through the non-existing keyboard controller will not work. For LRP / Bering, edit syslinux.cfg:

```
default linux rw reboot=bios initrd=initrd.lrp init=/linuxrc ...
```

Direct hardware reset:

```
mov  eax,080009044h        ;reset control,
mov  dx,0cf8h              ;SC1100 data sheet page 170
out  dx,eax
mov  al,0f                 ;system wide reset
mov  dl,0fch
out  dx,al
```

LED access (contributed by Josef Liška, used LRP Bering 2.2.2):

```
#led3on
echo "A" | dd of=/dev/port bs=1 count=1 seek=62466
#led3off
echo "L" | dd of=/dev/port bs=1 count=1 seek=62466
#led12on
echo "A" | dd of=/dev/port bs=1 count=1 seek=62464
#led12off
echo "L" | dd of=/dev/port bs=1 count=1 seek=62464
#led1on 2off
echo "H" | dd of=/dev/port bs=1 count=1 seek=62464
#led 1off 2on
echo "D" | dd of=/dev/port bs=1 count=1 seek=62464
```

I2C: The stock linux kernel driver (scx200_acb) looks for the two ACCESS.bus interfaces at addresses 0x820 and 0x840, while tinyBIOS configures then at 0x810 and 0x820. Load the driver as follows:

```
modprobe scx200_acb base=0x810,0x820
```

MikroTik RouterOS

Please request the latest BIOS version from PC Engines when using RouterOS.

RouterOS is *very* picky about CompactFlash cards, do extensive torture tests including repeated configuration and shutdown cycles before qualifying for production use.

WRAP does not include a keyboard controller. To ensure clean restart, please install the package

        routerboard.npk
from

        http://www.mikrotik.com/download.html#v2   -> all_packages.zip

The package is designed for MikroTik's RouterBOARD, but will also work for WRAP. Source: MikroTik technical support.

RouterBOARD, RouterOS and MikroTik are trademarks of MikroTik.

NetBSD

For USB support, please add the following to the kernel config file:

```
options    PCIBIOS             # PCI BIOS support
options    PCIBIOSVERBOSE      # PCI BIOS verbose info
options    PCIBIOS_ADDR_FIXUP  # fixup PCI I/O addresses
options    PCIBIOS_BUS_FIXUP   # fixup PCI bus numbering
options    PCIBIOS_INTR_FIXUP  # fixup PCI interrupt routing
```

OpenBSD

WRAP support is included in OpenBSD 3.5. To read and write the GPIO pins, the gpioctl program included with this package can be used:

```
Quick start for the PC Engines WRAP.1C users:
# gpioctl 40
This will read the state of the button (0 means pressed).

# gpioctl -c 2 pp out
This will turn the first led on, to turn off write 1 to the pin,
it's reversed. For the second and the third leds use pins 3 and
18.
```

Even more WRAP support in OpenBSD 3.6:

- New gscpcib(4) driver for National Semiconductor Geode SC1100 PCI-ISA bridges.

- New iic(4) driver for Inter IC (I2C) master/slave buses.

- New lmtemp(4) driver for National Semiconductor LM75/LM77 temperature sensors.

- New gscsio(4) driver for National Semiconductor Geode SC1100 Super I/O chips.

- New gpio(4) driver and accompanying gpioctl(8) utility for supporting General Purpose Input/Output.

RxDOS

RxDOS is a free DOS-compatible operating system written by Michael Podanoffsky. RxDOS can be used for functional testing.

RxDOS seems to be badly behaved on the serial console, though.

Full A386 source code and binary can be found at http://os.drake3d.com/

Recommended procedure to install on a CompactFlash card:

1. Select translation mode for the CF card to be LBA.

2. Clear partition sector using a disk editor if necessary.

3. Create partition with FDISK. If the CompactFlash card is drive C, make partition active.

4. Reboot, then FORMAT partition.

5. If the CompactFlash is drive D, use the partition editor EDPART (download from Simtel) to make the partition active.

6. Modify mk_boot.bat (RxDOS bin directory) as needed, execute it:

```
makerxd_boot -1 -s d
copy ..\rxdosbio\rxdosbio.sys d:
copy ..\rxdos\rxdos.sys d:
copy ..\rxdoscmd\rxdoscmd.com d:
copy autobat d:\autoexec.bat
```

WRAP.1C connector pinouts

J1   RTC battery

This connector is depopulated on current versions. Contact PC Engines for details if RTC is required !

1	VBAT	battery + (3V Lithium battery)
2	GND	battery -

J2   LPC expansion

The LPC port can be used to connect a super I/O device, or for an alternate flash EPROM to start with a corrupted or blank flash EPROM on board. These pins can also be reprogrammed as GPIO (not tested): Clear PMR pin multiplex register (I/O 09030h) bit 14 and 16, then set correct GPIO direction (input / output). Please see the SC1100 data sheet for details.

1	PCLK2	LPC clock (33 MHz)	
2	GND	ground	
3	LAD0	LPC data 0	(GPIO32)
4	GND	ground	
5	LAD1	LPC data 1	(GPIO33)
6	GND	ground	
7	LAD2	LPC data 2	(GPIO34)
8	GND	ground	
9	LAD3	LPC data 3	(GPIO35)
10	GND	ground	
11	LFRAME#	LPC frame	(GPIO37)
12	GND	ground	
13	PCIRST#	reset (active low)	
14	NC	reserved	
15	LPCISP	high to use LPC flash, low to use on-board flash, pulled low by resistor	
16	NC	reserved	
17	GND	ground	
18	V3	+3.3V supply	
19	SERIRQ	serial interrupt	(GPIO39)
20	LDRQ#	LPC DMA request	(GPIO36)

J3   I2C header

This header can be used to connect user specific hardware, e.g. a front panel microcontroller, or for a licensing dongle.

1	+3.3V	power supply
2	SCL1	I2C clock
3	SDA1	I2C data
4	GND	ground

J4   CompactFlash

The CompactFlash card is used in True IDE mode. Hot insertion is not supported – please power off the unit before inserting a CF card.

1	GND	ground
2	D3	IDE data

3	D4	IDE data
4	D5	IDE data
5	D6	IDE data
6	D7	IDE data
7	CS0#	IDE decode (1F0..1F7)
8	A10	ground
9	ATASEL#	ground to select true IDE mode
10	A9	ground
11	A8	ground
12	A7	ground
13	VCC	+3.3V power supply
14	A6	ground
15	A5	ground
16	A4	ground
17	A3	ground
18	A2	IDE address
19	A1	IDE address
20	A0	IDE address
21	D0	IDE data
22	D1	IDE data
23	D2	IDE data
24	IO16#	16 bit decode, not connected
25	CD2#	card detect, not connected
26	CD1#	card detect. not connected
27	D11	IDE data
28	D12	IDE data
29	D13	IDE data
30	D14	IDE data
31	D15	IDE data
32	CS1#	IDE decode (3F6..3F7)
33	VS1#	not connected
34	IOR#	IDE read strobe
35	IOW#	IDE write strobe
36	WE#	connected to +3.3V
37	IRQ	IDE interrupt
38	VCC	+3.3V power supply
39	CSEL#	cable select, ground = master
40	VS2#	not connected
41	RESET#	IDE reset, active low
42	IORDY	IDE ready
43	INPACK#	not connected
44	REG#	connected to +3.3V
45	DASP#	pulled up
46	PDIAG#	pulled up
47	D8	IDE data
48	D9	IDE data
49	D10	IDE data
50	GND	ground

The CompactFlash specification can be found at www.compactflash.org.

J5, J6 miniPCI sockets

These sockets implement the miniPCI interface.

Please note that the current available from the +5V supply is very limited, and generated very inefficiently (linear regulator from input supply). +5V should be used as a bias voltage only, not to power a wireless radio !

J8   Console serial port

The standard PC pinout is used. To connect to a PC, use a null modem or "Laplink" cable.

1	DCD	data carrier detect (input)
2	RXD#	receive data (input)
3	TXD#	transmit data (output)
4	DTR	data terminal ready (output)
5	GND	ground
6	DSR	data set ready (input)
7	RTS	ready to send (output)
8	CTS	clear to send (input)
9	RI	ring indicator (input)

J9   DC power jack

This is a generic DC jack connector with a 2.1mm center pin. Recommended input voltage is +7 to +20V. Supply current is about 0.45A at 12V, without any miniPCI adapters.

center	VIN	Positive input voltage
sleeve	GND	Ground

J12   Ethernet port 1

A RJ45 connector with integrated magnetics is used. This port implements a passive power over Ethernet scheme over the two unused pairs.

1	TX+	transmit positive
2	TX-	transmit negative
3	RX+	receive positive
4	VCC	power supply (nominal 7 to 20V)
5	VCC	"
6	RX-	receive negative
7	GND	power return
8	GND	"

J10, J11 Ethernet ports 2, 3

A RJ45 connector with integrated magnetics is used. J11 is optional, for the third Ethernet port. These ports do NOT support power over Ethernet.

|		
1	TX+	transmit positive
2	TX-	transmit negative
3	RX+	receive positive
4	NC	not connected
5	NC	not connected
6	RX-	receive negative
7	NC	not connected
8	NC	not connected

J13   USB option

This header is not populated. To use USB, WRAP.1C must be modified for 5V input through the DC jack (POE not possible). A BIOS update is also required. The USB adapter board connected to this port should include USB filtering and a current limiter such as a Polyfuse. Please contact PC Engines for details if required.

1	VCC	+5V supply
2	VCC	+5V supply
3	USB3-	USB channel 3, negative
4	USB1-	USB channel 1, negative
5	USB3+	USB channel 3, positive
6	USB1+	USB channel 1, positive
7	GND	ground
8	GND	ground
9	USBOVR#	overcurrent (can be left open, pulled up by 10K resistor)
10	GND	ground

WRAP.1C mechanical dimensions

All dimensions in units of 0.001" (0.0254 mm). The lowest 0.3" are a break-off strip.
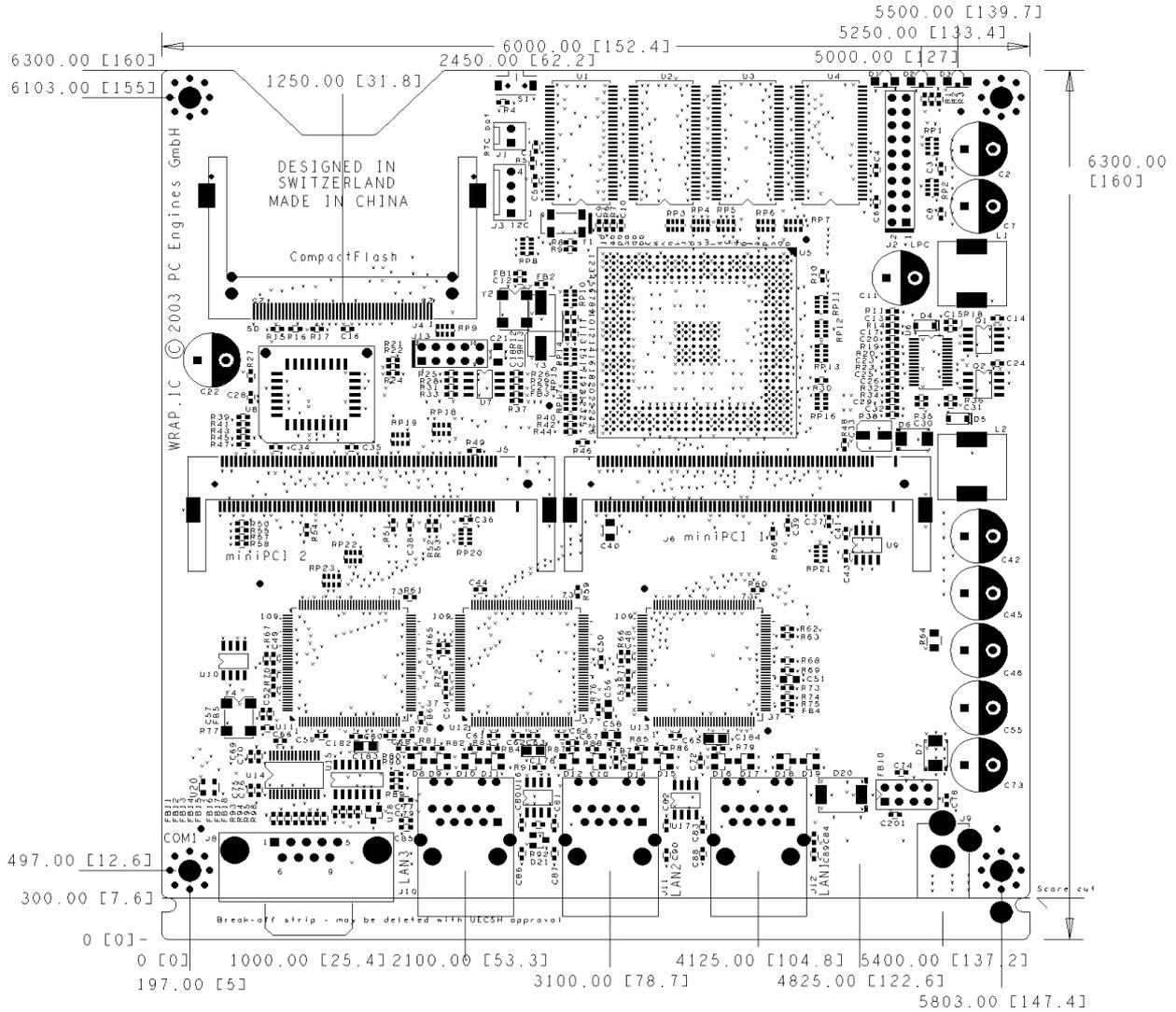
WRAP.2B connector pinouts

J1   Ethernet port 1

Same as WRAP.1C.

J2   DC power jack

Same as WRAP.1C.

J3   Console serial port

Same as WRAP.1C.

J4, J9   miniPCI sockets

Same as WRAP.1C.

J5   Clock & core voltage selection jumper

CPU speed and core voltage can be configured by shunt jumper. Recommended settings are 233 MHz / 1.8V and 266 MHz / 2.0V.

1-3	266 MHz	3-5	233 MHz CPU speed
2-4	2.0V	4-6	1.8V core voltage

J6   LPC expansion

Same as WRAP.1C.

J7   I2C / battery / watchdog header

This header can be used to connect user specific hardware, e.g. a front panel microcontroller, or for a licensing dongle.

1	+3.3V	power supply
2	SCL1	I2C clock
3	SDA1	I2C data
4	GND	ground
5	DOGFOOD	interface pin for watchdog, connected to CPU GPIO G14.
6	OVERTMP#	overtemperature signal from thermal sensor. If this is pulled low, the CPU will be reset.
7	VBAT	RTC battery voltage, connect to +3V Lithium battery
8	GND	ground

J10   CompactFlash

Same as WRAP.1C. WRAP.2B has optional support for on-board NAND flash. Please contact PC Engines for details.

WRAP.2B mechanical dimensions

All dimensions in units of 0.001" (0.0254 mm).
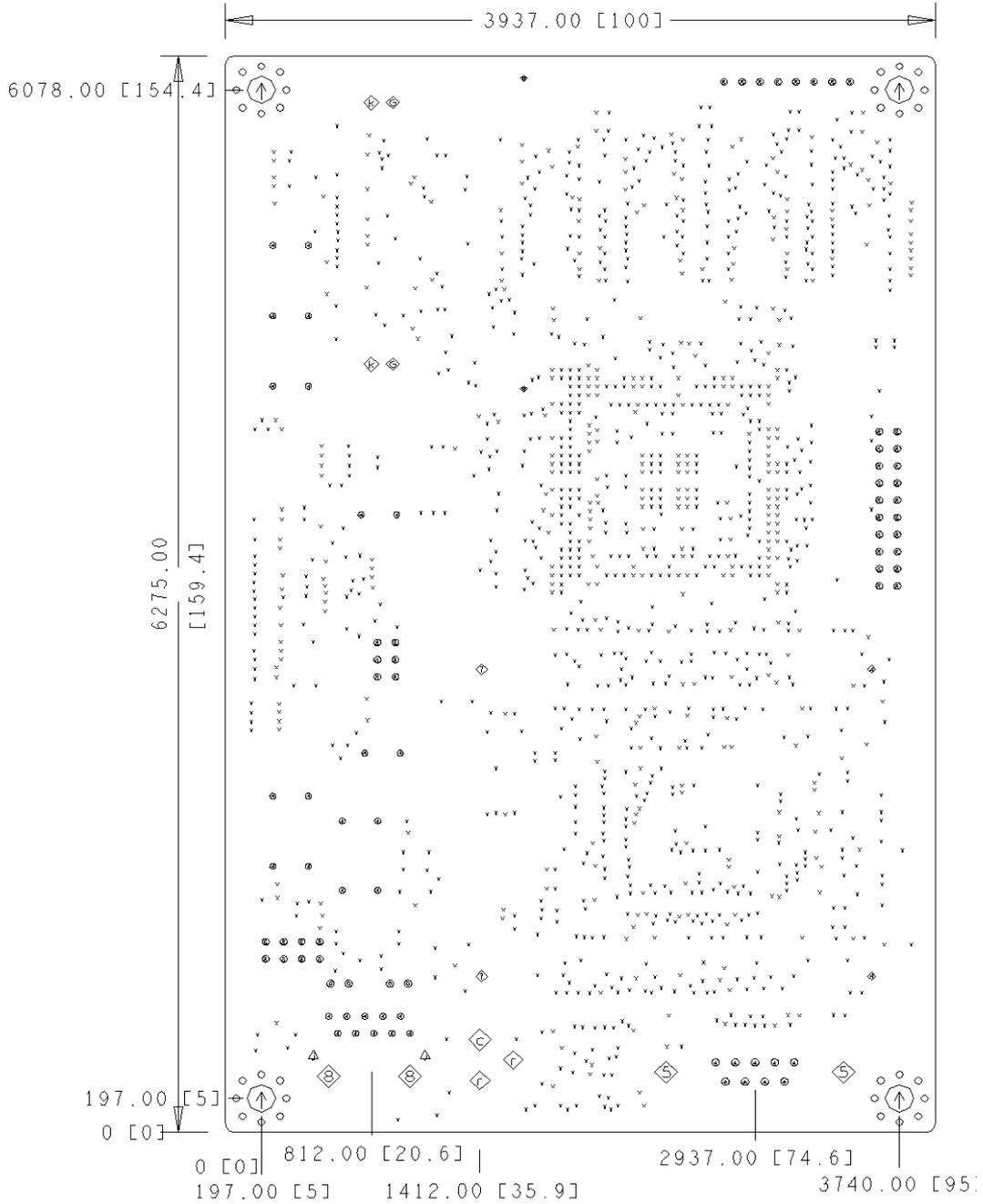
POST codes

tinyBIOS writes POST / diagnostic codes to port 80h. To make these codes visible, use a miniPCI POST card such as PC Engines POST.5A. POST codes are:

01	reset entry
02	chipset initialization
03	detect base memory size
04	initialize shadow RAM
05	init mono video
06	disable PCI devices
07	test low 64KB of DRAM
08	initialize stack
09	BIOS checksum
0a	super I/O initialization
0b	RTC test
0c	refresh / 8254 test
0d	speed-dependent chipset regs
0e	test 8237 DMA
0f	test DMA page registers
10	test 8254 registers
11	test keyboard controller
12	init timer, DMA, 8259...
13	test 8259 mask registers
14	test low 640KB
15	init vectors
16	PCI plug & play
17	shadow video BIOS
18	look for VGA BIOS
19	sign-on prompt
1a	second keyboard test
1b	extended memory test
1c	enable interrupts
1d	test / init RTC
1e	init floppy disk
1f	option ROM scan
20	test parallel ports
21	test serial ports
22	enable coprocessor
23	floppy init
24	hard disk init
25	PS/2 mouse detect
26	timer/RTC check
27	OEM boot decision point
00	boot
33	NMI
F7	low 64KB memory test failed

Resources

Tools

POST cards, CompactFlash adapters, CompactFlash cards and other accessories are accessible from PC Engines. Visit www.pcengines.ch for information.

tinyBIOS

The tinyBIOS manual can be found at www.pcengines.ch/tinybios.htm

Please note that the BIOS core used on this board has a few extra features. Full BIOS source code can be licensed from PC Engines.

Literature

Please see www.pcengines.ch/resource.htm for pointers to literature and standards.