




SOFTWARE SDK

Rev 1.0

Dichiarazione di conformità Declaration of conformity	
La Ditta <i>The Company</i>	DIGITAL INSTRUMENTS S.r.l. Via Parco degli Scout, 13 20091 BRESSO (MI) ITALY
Dichiaro con la presente che il Prodotto <i>Herewith declares that the Product</i>	
Tipo / <i>Type</i>	SDK for custom user applications
Modello / <i>Model</i>	Software SDK
Serial Number	
Oggetto di questa dichiarazione è conforme ai seguenti standard o norme della Comunità Europea <i>Referred to by this declaration is in conformity with the following standards or normative documents of EC</i>	
Norme Europee Armonizzate <i>European Armonized Standards</i>	
CEI EN 61000-6-4:2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
CEI EN 61000-6-2:2006	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
CEI EN 55011:2011	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment
CEI EN 61000-4-2:2011	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
CEI EN 61000-4-3:2007+A1:2009+A2:2011	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
CEI EN 61000-4-4:2006+A1:2010	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
CEI EN 61000-4-5:2007	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
CEI EN 61000-4-6:2011	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
CEI EN 61000-4-8:1997+A1:2001	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test
CEI EN 61000-4-11:2010	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests
CEI EN 60204-1:2006+A1:2010	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
Bresso, Dicembre 2011	DIGITAL INSTRUMENTS S.r.l. Via Parco degli Scout, 13 20091 BRESSO (MI) ITALY <i>Marco Genova</i> <i>Quality Assurance Manager</i>

Istruzioni di sicurezza Safety Instructions

Il dispositivo è stato progettato, costruito e collaudato in conformità alle normative richiamate nel Certificato di Conformità ed è stato rilasciato dal costruttore completamente testato secondo gli standard di sicurezza. Per mantenere questa condizione e assicurare la sicurezza d'uso, l'utente deve osservare tutte le istruzioni e segnalazioni di pericolo descritte in questo manuale.

This unit has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standard. To maintain this condition and to ensure safe operation, the user must observe all the instructions and warnings given in this operating manual.

- **Prima di mettere in servizio il dispositivo, leggere attentamente ed integralmente le istruzioni per l'uso. Osservarle e seguirle in tutti i punti. Provvedere in modo che le istruzioni per l'uso siano sempre accessibili a tutti gli addetti.**

Prior to switching on the unit, please read carefully the instructions on the manual. Keep this manual available for all every user of this equipment.

- **Il terminale PE sul dispositivo deve essere connesso al conduttore PE prima di eseguire qualsiasi altra connessione. L'installazione ed il cablaggio devono essere eseguiti da personale tecnico qualificato.**

The PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made. Installation and cabling of the unit to be performed only by qualified technical personnel.

- **Lo strumento supporta alimentazione AC wide range da 95 Vac a 240 Vac e deve essere connesso tramite protezione con corrente nominale massima pari a 16A.**

This unit may be operate from wide range AC supply networks from 95 Vac to 240 Vac fused with max. 16A.

- **Lo strumento supporta alimentazione DC wide range da 20 Vdc a 50 Vdc e deve essere connesso tramite protezione con corrente nominale massima pari a 5A. Il circuito di protezione contro l'inversione di polarità è implementato a bordo.**

This unit may be operate from wide range DC supply networks from 20 Vdc to 50Vdc fused with max. 5A. Circuit against polarity inversion is also implemented.

Le condizioni di sicurezza vanno testate ad ogni sostituzione. Ispezione visiva dei cavi, stato dell'isolamento, corrente di dispersione, stato del connettore PE e test funzionale.

A safety test must be performed after each replacement of part. Visual inspections, PE conductor test, insulation resistance, leakage-current measurement, functional test.

- **Non interrompere il conduttore PE in nessun caso. Un'interruzione del cavo PE rende l'apparato elettricamente pericoloso.**

It is not permissible to interrupt PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit become electrically hazardous.

- **Ogni riparazione, manutenzione e sostituzione del dispositivo deve essere eseguita unicamente da personale autorizzato dalla Digital Instruments.**

Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized Digital Instruments technical personnel.





- **Assicurarsi che ogni collegamento con dispositivi informatici sia eseguito secondo IEC950/EN60950**

Ensure that the connections with information technology equipment comply with IEC950/EN60950

Simboli di sicurezza Safety Symbols

Sono presenti sul dispositivo e nella documentazione simboli utilizzati per la segnalazione di segnalazione conformi alle specifiche IEC61010-1 II.

Safety-related symbols used on equipment and documentation comply with IEC 61010-1 II.

	<ul style="list-style-type: none"> • SIMBOLO DIRECT CURRENT IEC 417, N°5031 Vdc may be used on rating labels
	<ul style="list-style-type: none"> • SIMBOLO ALTERNATING CURRENT IEC 417, N°5032 For rating labels, the symbol is typically replaced by V and Hz as in 230V, 50Hz.
	<ul style="list-style-type: none"> • SIMBOLO PROTECTIVE CONDUCTOR TERMINAL IEC 417, N°5019 This symbol is specifically reserved for the PROTECTIVE CONDUCTOR TERMINAL and no other. It is placed at the equipment earthing point and is mandatory for all grounded equipment
	<ul style="list-style-type: none"> • SIMBOLO CAUTION ISO 3864, N°B.3.1 used to direct the user to the instruction manual where it is necessary to follow certain specified instructions where safety is involved.

Changelog

Rev.	Note	Data
1.0	First review	22/03/2013

SOFTWARE SDK

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1.0 Summary

This manual provides information on how to install and operate the software SDK provided by Digital Instruments. Please note that it references tools by third parties¹, who own the respective copyrights.

In order to use this SDK the user should be comfortable with using a GNU/Linux distribution and with C programming.

No particular knowledge of the Xilinx tools or the Microblaze softcore is required.

By using this SDK the user is able to customize our products to suit its particular needs, to test additional features or to debug some particular embedded code on a real working product.

This document tries to be as much general as possible and may apply to different boards.

For specific documentation regarding a particular board (functionalities, register mapping, etc) please refer to the appropriate documents that can be found on the website.

2.0 Additional notes

Even if great effort has been made to prevent the board from accidentally bricking, the freedom the user is granted may also put the board in a non bootable condition, in the rare case of flash corruption.

It is usually sufficient to reload the pre-built flash image provided on our web-site, as per emergency firmware upgrade² by using a serial cable, a network connection and a simple TFTP server installed on a PC.

In other circumstances this solution is not viable due to the early stage boot-loader not working and a particular JTAG probe (to be purchased separately) to reprogram the internal FPGA is required.

<http://www.digilentinc.com/Products/Detail.cfm?Prod=JTAG-HS2>

If this is the case you are please asked to contact us for further details on how to restore the board to a working configuration.

Note



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¹ <http://www.xilinx.com/>

<http://www.petalogix.com/>

² Consult the product update document (e.g. ETS-EVO Update)

3.0 Installation

In order to install the Software SDK a few steps are required:

1. A free Xilinx account is required to continue
<https://secure.xilinx.com/webreg/createUser.do?>
2. This SDK is based on the PetaLinux SDK provided by Xilinx, so a good starting point for getting additional documentation is the following page:
<http://www.xilinx.com/tools/petalinux-sdk.htm>
3. Then is sufficient to go to the following web page
<http://www.xilinx.com/tools/petalinux-license.htm>
and click on the link **Download PetaLinux SDK** on the right
Login with the credentials acquired during step 1 and download the package **PetaLinux 12.12 installation archive for Zynq, MicroBlaze and PPC440**
4. Similarly a node locked license is required and can be requested for free by clicking the link **Get Evaluation License** and by generating a license for the software package **Petalinux SDK Evaluation License (No Support)**.
Please note that only one license is granted for each account, so be sure to request it for the PC that will be used for deployment.
5. Download the patch for the package PetaLinux 12.12 from our web site
6. Unpack the archives in the \$HOME folder

```
$ cd $HOME  
$ tar zxf petalinux-v12.12-final-full.tar.gz  
$ rm -fr petalinux-v12.12-final-full/tools/linux-i386/microblaze*  
$ tar zxf petalinux-v12.12-final-full-patch.tar.gz
```
7. Copy the Xilinx.lic license file generated in the step 4 in the \$HOME/.Xilinx folder (or add it by using xlicm if the Xilinx tools are already installed in the system)

```
$ mkdir $HOME/.Xilinx  
$ cp Xilinx.lic $HOME/.Xilinx
```
8. Activate the PetaLinux installation by sourcing the settings.sh file

```
$ cd $HOME/petalinux-v12.12-final-full  
$ source settings.sh
```
9. Insert the following lines in the \$HOME/.bashrc file in order to automate the procedure at every login

```
cd $HOME/petalinux-v12.12-final-full  
source ./settings.sh > /dev/null  
cd - > /dev/null
```
10. Link the /bin/sh shell to /bin/bash to avoid compilation failures

```
sudo rm /bin/sh  
sudo ln -s /bin/bash /bin/sh
```
11. Compile the GNU/Linux kernel

```
$ cd $HOME/petalinux-v12.12/software/petalinux-dist  
$ make menuconfig  
[select the Vendor/Product you wish to target]  
[the first time is also good practice to select Default all settings]  
$ make
```
12. Compile the user application

```
$ cd $HOME/petalinux-v12.12/software/user-apps/microref  
$ make
```

13. Transfer the user application to the board

```
$ putftp microref <board_ip>
```

14. Launch the user application on the board

```
$ telnet <board_ip>
usr: root
pwd: root
# cd /var/ftp
# chmod 755 microref
# ./microref
```


4.0 Additional notes

For additional notes, comments, requests and so on please directly ask us or consult our web page for updated informations.

Follows a few useful tricks that may be handy.

Console output

Our boards usually come out with a default IP address of 192.168.200.2 and they accept a telnet connection on the standard TCP port 23.

The serial port is usually allocated for particular signalling purposes, but may also used as an additional terminal.

A serial terminal program able to modify serial criteria must be used.

For example is possible to use the Bray Terminal program downloadable from the website

<https://sites.google.com/site/terminalbpp/>

Connect a serial cable to the device and set the criteria as follows:

```
DTR = ON
RTS = OFF
```

The booting messages should be now visible on the terminal and the login prompt should be available after the booting procedure ends.

Stopping the main process

After boot there is a user process that always starts and is responsible for board configuration, monitoring and functioning.

It usually consists of several threads that can be seen by issuing the command

```
# ps aux
```

To stop it is necessary to issue

```
# killall microref_loop
# killall microref
```

Process autostart

If you would like to put your process in auto-start after boot the executable must be copied in flash.

The flash partition is usually mounted at boot (**/mnt/flash**) and unmounted after the content has been copied to ram (**/var/tmp**).

To open it it should be mounted with the following command:

```
# mount -t jffs2 /dev/mtdblock5 /mnt/flash
```

Please make sure it has the executable flag set

```
# chmod 755 <executable>
```

At this point the executable can be copied to flash for permanent storage

```
# cp <executable> /mnt/flash
```

In order to make it automatically start a line should be added in the auto start script chain: **rc.local** or **rc.sp6** (better) by using the **vi** text editor.

```
# the following line starts the <executable> process at boot
/var/tmp/<executable> &
```

Please note that even if the executable has been copied to /mnt/flash it is being started from /var/tmp. This is just a design choice to copy the content of the flash to ram at boot, as already said.

Is now possible to umount the flash and eventually power cycle the board

```
# umount /mnt/flash
```

Board reboot

In order to reboot the board a particular program has to be used:

```
# /var/tmp/reboot
```

Working example

A working example has been provided in the software/user-apps/microref folder. It consists of a set of C source files and a small library that holds some minor proprietary code.

This skeleton can be used as a starting point for developing a custom application.

WEB interface

Our WEB interface has been developed with external tools that cannot be bundled in this SDK.

The user has the freedom of developing his own dynamic WEB pages (by looking at the http.c file) or may also ask us to customize the current WEB interface to suit his needs.