



## **DSP/BIOS™ Link**

### **Installation Guide**

1.65



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# Read This First

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## About This Manual

This document describes how to install and run samples for OMAPL138 DSP/BIOS™ Link.

## How to Use This Manual

This document includes the following chapters:

- [Chapter 1, \*Install Guide for OMAPL138\*](#) - describes the steps required to install and run samples for OMAPL138.

Please go through the Release Notes document available in the release package before starting the installation.

## Notation of information elements

The document may contain these additional elements:



### **Warning**

This is an example of warning message. It usually indicates a non-recoverable change.

---



### **Caution**

This is an example of caution message.

---



### **Important**

This is an example of important message.

---



### **Note**

This is an example of additional note. This usually indicates additional information in the current context.

---

**Tip**

This is an example of a useful tip.

---

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# Install Guide for OMAPL138

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## Abstract

This chapter describes how to install and run samples for OMAPL138 from the new DSP/BIOS™ Link.

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## 1.1. Introduction

### 1.1.1. Purpose and Scope

DSP/BIOS™ LINK is foundation software for the inter-processor communication across the GPP-DSP boundary. It provides a generic API that abstracts the characteristics of the physical link connecting GPP and DSP from the applications. It eliminates the need for customers to develop such link from scratch and allows them to focus more on application development.

This document provides the users necessary information to install DSP/BIOS™ LINK on the development host.

This document corresponds to the product release Version 1.65.

### 1.1.2. Terms and Abbreviations

CCS	Code Composer Studio
IPC	Inter Processor Communication
GPP	General Purpose e.g. ARM
DSP	Digital Signal Processor e.g. DM648
DSPLink	A generic term used for DSP/BIOS™ Link. It appears in italics in all usages
CGTools	Code Gen Tools, e.g. Compiler, Linker, Archiver

**Table 1.1. Terms and Abbreviations**

### 1.1.3. References

1	Documentation included with the OMAPL138 hardware.
2	Release notes and User Guide of DaVinci-PSP-SDK-03.20.00.11.tgz

**Table 1.2. References**

## 1.2. INSTALLATION

### 1.2.1. Basic Installation

The DSP/BIOS™ LINK is made available as a tar.gz file. To install the product follow the steps below:

- Unzip and untar the file dsplink\_linux\_1.65.00.03.tar.gz

**Note**

This document assumes the install path to be in the user home directory if working on a Linux PC. This path will be used in remainder of this document

---

**Note**

This document assumes the install path to be L:\dsplink if working on a Windows PC. This path will be used in remainder of this document.

---

**Note**

If the installation was done at different location, make appropriate changes to the commands listed in the document.

---

It is advisable to archive the released sources in a configuration management system. This will help in merging:

- The updates delivered in the newer releases of DSP/BIOS™ LINK.
- The changes to the product, if any, done by the users.

#### 1.2.1.1. Installing Standalone DSP/BIOS™ and CGTools

For compilation of DSP-side sources and applications, the CGTools version 6.1.2 can be used. This release has been validated with DSP/BIOS™ version 5\_33\_05.

The standalone DSP/BIOS™ and standalone CGTools are available for Linux platform as well. Refer to the URL mentioned below for getting the distribution of DSP/BIOS™ and the associated installation instructions

[DSP/BIOS™ and XDC](#)

The directory structure specified in Figure 1 is expected by the build system of DSP/BIOS™ LINK. If you install the tools to a different directory, you will also need to modify the make system and the scripts contained in the release package. You may need to copy the directories to create the structure expected for compiling sources. Refer to section on "Understanding The MAKE System" in the User Guide for details.

### 1.2.1.2. Installing GNU make 3.81

For compilation of DSPLINK sources the GNU make 3.81 can be used. Download the make 3.81 from the URL <http://ftp.gnu.org/pub/gnu/make/make-3.81.tar.gz>

The following are the installation steps required to install make on the development host machine.

- Cd to make-3.81 directory
- Copy and untar make-3.81.tar.gz to your home directory.
- Type './configure' and press enter to configure the package for your system. Running 'configure' takes awhile. By default, make package's files will be installed in '/usr/local/bin', '/usr/local/man', etc. You can specify an installation prefix other than '/usr/local' by giving 'configure' the option '--prefix=PREFIX'. For example, To install make at /usr/local/bin run the configure command like below.

```
./configure --prefix=/usr/local.
```

To install make at /usr/bin run the configure command like below.

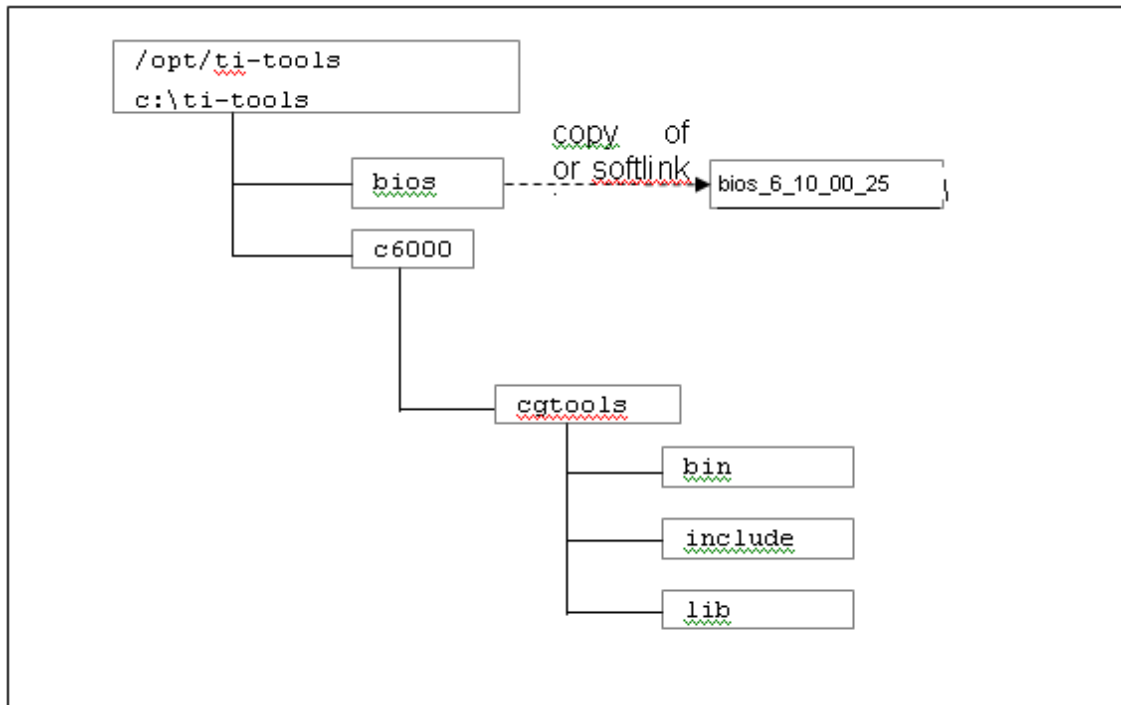
```
./configure --prefix=/usr
```

- Type 'make' and press enter to compile the package.
- Optionally, type './make check' and press enter to run any self-tests that come with the package.
- Type 'make install' and press enter to install the programs and any data files and documentation.
- For additional details refer to INSTALL file located under make-3.81 directory

### 1.2.2. Creating development workspace

This document and the scripts included in the release assume the following directory on your development host:




**Figure 1.1. Development Workspace**

**Note**

For Linux, the build system shipped with DSP/BIOS™ LINK assumes that the standalone DSP/BIOS™ is installed in the /opt/'ti-tools/' directory on the <ROOT-DRIVE> and CGTools and CSL are installed in the 'ti-tools/c6000' directory on the <ROOT-DRIVE>.


**Note**

For the Windows development host, the build system shipped with DSP/BIOS™ LINK assumes that the standalone DSP/BIOS™ is installed in the 'ti-tools' directory on the ROOT-DRIVE and CGTools and CSL are installed in the 'ti-tools\c6000' directory on the <ROOT-DRIVE>.


**Note**

To support multiple installations of DSP/BIOS with a single DSP/BIOS™ LINK DSP-side distribution file, a standard /opt/ti-tools/bios on Linux and c:\ti-tools\bios directory is used for the BIOS installation. This can be a soft link or copy to the actual DSP/BIOS installation directory

## 1.3. Setting up Linux Workstation

The description in this section is based on the following assumptions:

- The workstation is running on Red hat Fedora Core 7 (Kernel ver 2.6.21). [Fedora 7](#)
- Services telnetd, nfsd, ftpd are configured on this workstation.



### Note

The release package has been tested on Red hat Fedora Core 7 (Kernel ver 2.6.21) You may be able to build on a higher version depending on the compatibility of the build tools in your version with the tested version.



### Note

Ensure that kernel sources for Linux have also been installed on the workstation.

---

### 1.3.1. Creating target system

This release of DSP/BIOS™ LINK for OMAPL138 has validated on Linux kernel versions 2.6.18. It is recommended to use this version to use DSP/BIOS™ Link.

#### 1.3.1. Setting up to build the kernel

This step is not required if a ARM tool chain already available on your setup. This tool-chain required for building the LSP and DSPLink.

- The tool chain arm 2009q1-203 can be downloaded from <http://www.codesourcery.com/sgpp/lite/arm/portal/subscription3057> .Un tar the tool chain and add the tool chain directory in your path.
  - `$ tar -xjvf arm-2009q3-203 -arm-none-linux-gnueabi-i686-pc-linux-gnu.tar.tar`
  - `$ export PATH=$PATH:${HOME}/arm-2009q1-203/bin`

#### 1.3.2. Setting up the Linux PSP for OMAPL138

- Configure the kernel for the OMAPL138 platform. Further, DHCP should be enabled. Also ensure that you disable the CONFIG\_PREEMPT option if it is already selected and ensure that EABI option is selected. DSP/BIOS Link supports the following pre-emption mode



### Important

DSP/BIOS Link does not support Complete Preemption (Real-Time)

---

Steps to build the kernel:

Configure Linux for OMAPL138

```
$make ARCH=arm CROSS_COMPILE=arm-none-linux-gnueabi-  
da850_omapl138_defconfig
```

Create uImage for OMAPL138

```
$make ARCH=arm CROSS_COMPILE=arm-none-linux-gnueabi- uImage
```

The image for compressed kernel uImage is generated after successful completion of the build process in the arch/arm/boot directory.

### 1.3.3. Enable TFTP for downloading the kernel image to target

U-boot can be configured to download the kernel onto the target by various mechanisms:

- TFTP
- Serial Port

This section configures the Linux development host as a TFTP server. Modify the xinet.d/tftp file to enable TFTP:

- Make the following changes:

```
disable      = no  
server_args = -s /tftpboot
```

- Restart the network service

```
$ /etc/init.d/xinetd restart
```

The above configuration assumes that a directory tftpboot has been created at the root directory. The files in this directory are exposed through the TFTP protocol.

### 1.3.4. Create target file system and export through NFS

The target device needs a file system to boot from. The file system can be exported to the target through NFS.

- A directory on the development host can be setup and exported for this purpose.

```
PSP release contains the NFS file system (nfs.tar.bz).
```

- `tar xjvf nfs.tar.bz`

**Important**

Enter the command shown above in a single line. You need to be root to successfully execute this command. The file system can be copied to a different location. In such a case `~/OMAPL138/target` can be a soft link to the actual location.

- 
- The directory `~/OMAPL138/target` will be mounted as root directory on the target through NFS. To do so, add the following line to the file `/etc/exports`.

```
/home/user/OMAPL138/target *(rw,no_root_squash)
```

Replace the directory in the path above with the actual path of your home directory on the development workstation.

## 1.4. Configuring CCS

### 1.4.1. OMAPL138 EVM

To use CCS for debugging the DSP side application, you will need to configure CCS to use both ARM and DSP with the OMAPL138 EVM. The EVM must be configured to use the DSP self-boot mode.

**Note**

CCS can attach to only ARM in the beginning. It can attach to the DSP only after the ARM-side application releases it from reset through a call to `PROC_Start ()`.

---

## 1.5. WORKING ON TARGET PLATFORM

## 1.5. WORKING ON TARGET PLATFORM

### 1.5.1. OMAPL138 EVM

#### 1.5.1.1. Setting up Linux environment

Refer to the PSP Linux Release/User guide document for instructions on setting up the Linux execution environment for the OMAPL138 EVM.

```
DaVinci-PSP-SDK-03.20.00.11
```

#### 1.5.1.2. U-Boot boot-loader

Please refer the PSP Linux release/install to load the u-boot.bin to the target. DaVinci-PSP-SDK-03.20.00.01.tgz contains images for the Boot Loader, NFS File system.

```
/DaVinci-PSP-SDK-03.20.00.11/images/u-boot/u-boot.bin
```

```
/DaVinci-PSP-SDK-03.20.00.11/images/fs/nfs.tar.gz
```

#### 1.5.1.3. Configuring Kernel Parameters

DSP/BIOS™ LINK requires a few specific arguments to be passed to the Linux kernel during boot up. 2MB of memory is used by DSP/BIOS™ LINK for communication between GPP and DSP, and for DSP external memory. This must be reserved by specifying 2MB less as available for the Linux kernel for its usage.

#### 1.5.1.4. Configure the DSP/BIOS LINK

The build configuration command must be executed to configure DSPLink for the various parameters such as platform, GPP OS, build configuration etc.

```
perl dsplinkcfg.pl --platform=OMAPL138 --nodsp=1 --dspcfg_0=OMAPL138GEMSHMEM --  
dspos_0=DSPBIOS6XX --gppos=ARM --comps=ponslrmc
```

```
perl dsplinkcfg.pl --platform=OMAPL138 --nodsp=1 --dspcfg_0=OMAPL138GEMSHMEM --  
dspos_0=DSPBIOS6XX --gppos=OMAPL138LSPuc --comps=ponslrmc
```



#### **Important**

Enter the commands shown above in single line



#### **Important**

For details please refer user guide.

---

**Important**

To build the GPP side update the Kernel (KERNEL\_DIR) and toolchain (TOOL\_PATH) path in dsplink/gpp/src/Rules.mk file.

## 1.5.2. Running the sample applications

Eight sample applications are provided with DSPLINK for the OMAPL138 platform. All the sample applications are described in detail in the user guide. This section describes the way to execute the sample applications

The specific instructions shown below refer to the loop sample. However, similar instructions can be used for the other applications also.

### 1.5.2.1. Copying files to target file system

The generated binaries on the GPP side and DSP side and the data files must be copied to the target directory. The commands below demonstrate this for the 'loop' sample application as reference. Appropriate sample directory name must be used for other sample applications.

#### 1.5.2.1.1. GPP Side

For executing the DEBUG build, follow the steps below to copy the relevant binaries:

```
$ cd ~/dsplink
$ cp gpp/export/BIN/Linux/OMAPL138/DEBUG/loopgpp /opt/dsplink/samples/loop
$ cp gpp/export/BIN/Linux/OMAPL138/DEBUG/dsplinkk.* /opt/dsplink/
```

For executing the RELEASE build, follow the steps below to copy the relevant binaries:

```
$ cd ~/dsplink
$ cp gpp/export/BIN/Linux/OMAPL138/RELEASE/loopgpp /opt/dsplink/samples/loop
$ cp gpp/export/BIN/Linux/OMAPL138/RELEASE/dsplinkk.* /opt/dsplink/
```

**Important**

Enter the commands shown above in single line

#### 1.5.2.1.2. DSP Side

The DSP binaries can be built either on the Linux workstation or the Windows host.

After the binaries have been built, they must be copied into the target file system. If the binaries are generated on Windows PC, any FTP client can be used for transferring these to the target file system.

For executing the DEBUG build, follow the steps below to copy the relevant binaries:

```
$ cd ~/dsplink
```

```
$ cp dsp/export/BIN/DspBios/OMAPL138/OMAPL138GEM_x/DEBUG/loop.out /opt/dsplink/  
samples/loop
```

For executing the RELEASE build, follow the steps below to copy the relevant binaries:

```
$ cd ~/dsplink
```

```
$ cp dsp/export/BIN/DspBios/OMAPL138/OMAPL138GEM_x/RELEASE/loop.out /opt/  
dsplink/samples/loop
```

**Important**

Enter the commands shown above in single line

---

### 1.5.2.2. Loading the kernel module: dsplink.ko

To load the device driver, login as 'root' and enter following commands on the command prompt.

```
$ cd /opt/dsplink
```

```
$ mknod /dev/dsplink c 230 0
```

```
$ insmod dsplink.ko
```

This action generates a warning indicating that the kernel module does not contain the GPL license. This warning can be safely ignored.

### 1.5.2.3. Invoking the application

#### 1.5.2.3.1. Loop sample

To invoke the application enter the following commands:

```
$ cd /opt/dsplink/samples/loop
```

```
$ ./loopgpp loop.out <buffersize> <iterations> <processor identifier>
```

**Note**

Argument processor identifier is optional, if it not provided assumed as default processor (zero).

---

e.g.

```
$ ./loopgpp loop.out 1024 10000
```

#### 1.5.2.3.2. Message sample

```
$ cd /opt/dsplink/samples/message
```



```
$ ./messagegpp message.out <number of iterations> <processor identifier>
```

---

**Note**

Argument processor identifier is optional, if it not provided assumed as default processor (zero).

---

e.g.

```
$ ./messagegpp message.out
```

**1.5.2.3.3. Scale sample**

```
$ cd /opt/dsplink/samples/scale
```

```
$ ./scalegpp scale.out <buffer size> <iterations> <processor identifier>
```

---

**Note**

Argument processor identifier is optional, if it not provided assumed as default processor (zero).

---

e.g.

```
$ ./scalegpp scale.out 1024 10000
```

**1.5.2.3.4. Ring\_IO sample**

```
$ cd /opt/dsplink/samples/ring_io
```

```
$ ./ringiogpp ringio.out <RingIO data buffer size in bytes> <number of Bytes to transfer> <processor identifier>
```

---

**Note**

Argument processor identifier is optional, if it not provided assumed as default processor (zero).

---

e.g.

```
$ ./ringiogpp ringio.out 1024 10240
```

---

**Important**

By default Ring\_IO sample runs in multithread mode. To run the sample in multi process mode ,define RINGIO\_MULTI\_PROCESS flag in \$DSPLINK\gpp\src\samples\ring\_io \Linux\COMPONENT file and build the sample

---

**1.5.2.3.5. Readwrite sample**

```
$ cd /opt/dsplink/samples/readwrite
```

```
$ ./readwritegpp readwrite.out <DSP address> <buffer size> <iterations>  
<processor identifier>
```

**Note**

Argument processor identifier is optional, if it not provided assumed as default processor (zero).

e.g.

```
$ ./readwritegpp readwrite.out 0xC3F5B000 1024 1000
```

**1.5.2.3.6. MPCSXFER sample**

```
$ cd /opt/dsplink/samples/mpcsxfer
```

```
$ ./mpcsxfergpp mpcsxfer.out <buffer size> <iterations> <processor  
identifier>
```

**Note**

The sample can be executed for infinite iterations by specifying the number of iterations as 0.

**Note**

Argument processor identifier is optional, if it not provided assumed as default processor (zero).

e.g.

```
$ ./mpcsxfergpp mpcsxfer.out 1024 10000
```

**1.5.2.3.7. MP\_LIST sample**

```
$ cd /opt/dsplink/samples/mp_list
```

```
$ ./mplistgpp mplist.out <iterations> <number of elements> <processor  
identifier>
```

**Note**

The sample can be executed for infinite iterations by specifying the number of iterations as 0.

**Note**

Argument processor identifier is optional, if it not provided assumed as default processor (zero).

e.g.

```
$ ./mplistgpp mplist.out 1000 20
```

#### 1.5.2.3.8. MESSAGE\_MULTI sample

```
$ cd /opt/dsplink/samples/message_multi
```

```
$ ./messagemultigpp messagemulti.out <number of transfers> <Application instance  
number 1 -> MAX_APPS> <processor identifier>
```



#### Note

Argument processor identifier is optional, if it not provided assumed as default processor (zero).

e.g.

```
$ for i in 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16;  
do ./messagemultigpp messagemulti.out 10000 $i & done
```

#### 1.5.2.4. Unloading the kernel module: dsplink.ko

To unload the device driver, enter following commands on the command prompt.

```
$ cd /opt/dsplink
```

```
$ rmmod dsplinkk
```

```
$ rm /dev/dsplink
```

None.

