

SMT8036E

User Manual



Certificate Number FM 55022

Revision History

Date	Comments	Engineer	Version
04/04/03	First release	PSR	1.0
13/06/03	Example code removed as part of package	PSR	1.1
19/10/05	Reflect changes made in the software	EW	1.2
11/01/08	Added Getting Started	CH	1.3
18/04/08	New pictures added	CH	1.4

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Contacting Sundance.

You can contact Sundance for additional information by sending email to support@sundance.com.

Notes.

- SHB stands for **Sundance High-speed Bus**.
- CommPort denotes an 8-bit communication port following the TI C4x standards.
- *SMT8036E* is a PCI system to be plugged in a PC. The only software requirement is to have 3L Diamond server installed.

Precautions

In order to guarantee that Sundance's boards function correctly and to protect the module from damage, the following precautions should be taken:

- They are static sensitive products and should be handled accordingly. Always place the modules in a static protective bag during storage and transition.
- When operated in a closed environment make sure that the heat generated by the system is extracted e.g. a fan extracting heat or blowing cool air.
- External Power via the connector is not strictly required, but can be recommended as some Motherboards has a Power limitation on it's PCI slots. If you think you are having this problem, please contact Sundance.

Outline description.

The *SMT8036E* is a C64xx-based module (*SMT365E*) combined with a dual high-speed ADC/DAC module (*SMT370*).

SMT365E characteristics:

- ⇒ TMS320C6416 rev1.1 processor running at 600MHz
- ⇒ Six 400Mbytes/s Sundance High-speed Bus ports (SHB).
- ⇒ Six 20MB/s communication ports (comm.-ports)
- ⇒ 256MB of SDRAM (100MHz)
- ⇒ 8MByte Flash ROM for boot code and FPGA programming
- ⇒ Global expansion connector on a double width module

SMT370 characteristics:

- ⇒ Two 14-bit ADCs ([AD6645-105](#)) sampling at up to 105MHz,
- ⇒ Dual 16-bit TxDAC ([AD9777](#)) sampling at up to 400MHz (interpolation),
- ⇒ Two **Sundance High-speed Bus** (SHB) connectors,
- ⇒ Two 20 MegaByte/s communication ports,
- ⇒ Low-jitter on-board system clock,
- ⇒ Xilinx Virtex-II FPGA,
- ⇒ 50-Ohm terminated analogue inputs and outputs, external triggers and clocks via MMBX (Huber and Suhner) connectors,
- ⇒ User defined pins for external connections,
- ⇒ Compatible with a wide range of Sundance *SHB* modules,
- ⇒ TIM standard compatible,
- ⇒ Default FPGA firmware implementing all the functions described along this documentation.

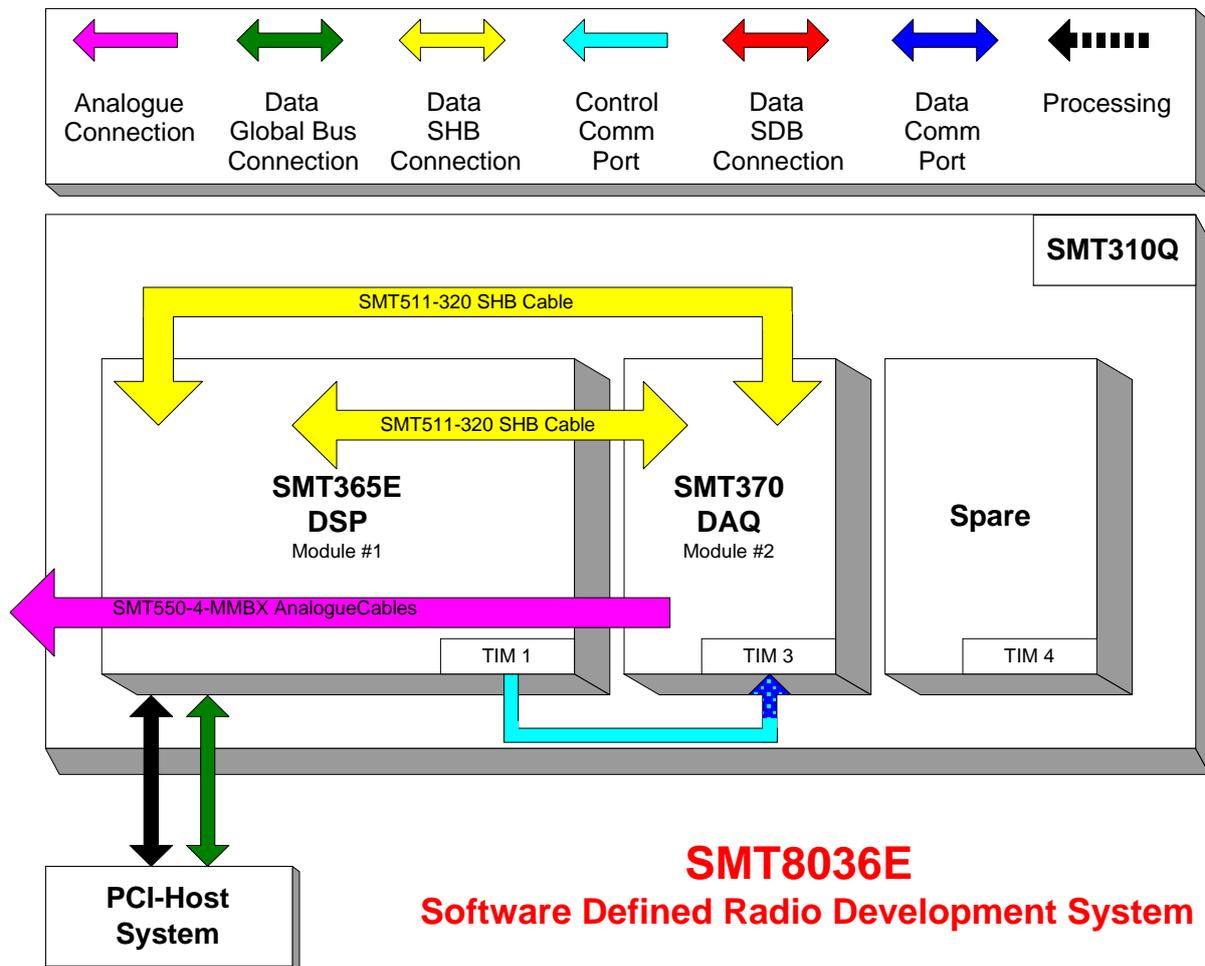
The *SMT8036E* is a demonstration system for the evaluation of the *SMT365E* and *SMT370* modules. It can be used for prototyping 3G (3rd generation) systems and high-speed data acquisition system with or without digital processor. This document is an installation guide for the *SMT8036E* demonstration system.

Documentation and source files are installed by the way of the SMT6600 package, which is the Sundance DAQ package. **Source and application files provided are to be run via the 3L Diamond Server only.**

The *SMT8036E* application causes the DSP on the *SMT365E* to configure the DAC of the *SMT370* to generate a continuous sine wave via a first SHB connection. DAC outputs are looped onto the ADCs inputs. The DSP grabs data from both channels and stores them into a file, which can be read by a Matlab application for data displaying and FFT processing. Sampling clocks (100MHz for the ADCs and 160MHz for the DAC) are generated by on-board clock synthesizers.

Architecture.

The following diagram shows the architecture of the *SMT8036E* system:



Hardware involved.

The *SMT8036E* is built around two main modules but also involves a carrier board and some cables to connect them and allow them to communicate with each other and to access the PC.

⇒ 1x **SMT310Q**: PCI carrier

⇒ 1x **SMT365E**: C64xx-based module; to be plugged on site 1 and 2 of *SMT310Q*.

⇒ 1x **SMT370**: Dual ADC/DAC module; to be plugged on site 3 of *SMT310Q*.

⇒ 1x long **FMS cable** (30cm): Comport FMS cable from TIM1-Comport2 (T1C2) to TIM3-Comport3 (T3C3)

⇒ 2x **SHB cable** (standard length):

- SHB cable connecting SHB0 on the *SMT365E* to SHB0 on the *SMT370*

- SHB cable connecting SHB1 on the *SMT365E* to SHB1 on the *SMT370*

⇒ 2x **MMBX to MMBX** cables to connect J10 to J12 and JJ9 to J13 on the *SMT370*.

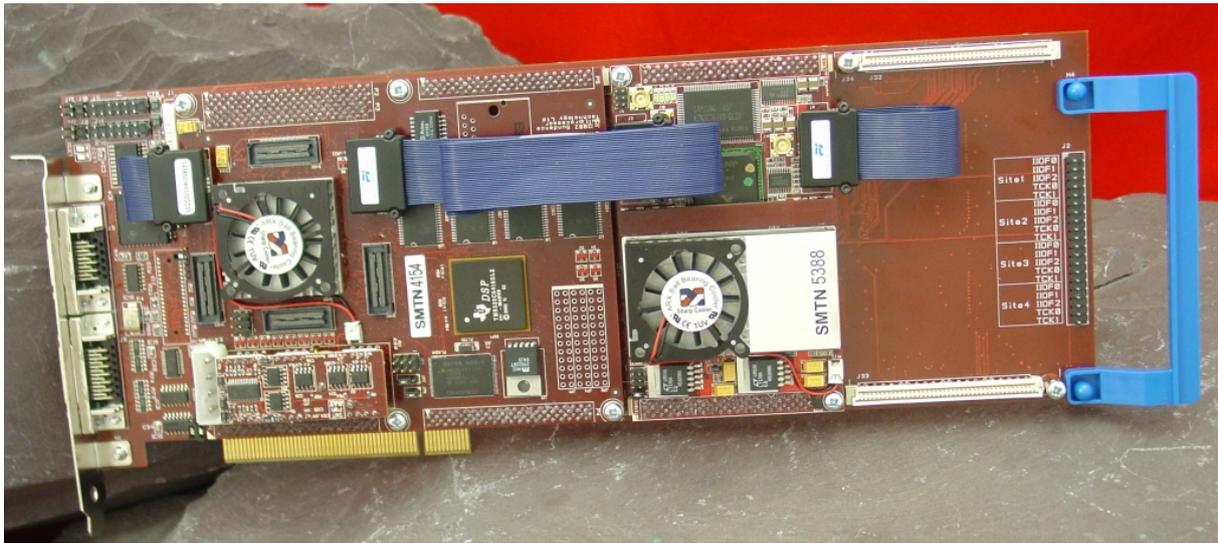
(For your system, you could have an *SMT509-PCB* replacing these MMBX cables)

Hardware installation.

Here are the steps to follow to install the *SMT8036* system.

1. Place the *SMT365E* on TIM sites 1&2 of the carrier board (*SMT310Q*).
2. Place the *SMT370* on TIM site 3 of the carrier board (*SMT310Q*).
3. Make sure that the boards are firmly seated, then provide the 3.3V to the boards by screwing down the modules through the mounting holes of the *SMT365E* and *SMT370*.
4. Connect the comport FMS cable from TIM1-Comport2 (T1C2) to TIM3-Comport3 (T3C3) on the back of the *SMT310Q*.
5. Connect one of the SHB cables between SHB0 on the *SMT365E* to SHB0 on the *SMT370*.
6. Connect the other SHB cable between SHB1 on the *SMT365E* to SHB1 on the *SMT370*.
7. Use the included analogue PCB (*SMT509-PCB*) to make a loopback connection or the analogue cables to acquire and send the signals from the outside.
(If cables were supplied, connected J9 to J13 and J10 to J12 of the *SMT370*)
8. Place the carrier board in the host system.

The following picture shows how connections are made at the top of the system:



The following picture shows the CommPort connection at the back of the SMT310Q. Note that the FMS are 'twisted', i.e. one end should be blue and the other should show silver pins.



Getting Started

This is a general guideline to help you get started with your new SDR Kit as soon as possible.

Please follow these steps and take your time to understand how our technology works.

Install all Sundance SW tools using the Sundance Wizard or Sundance CD

SW TOOLS PASSWORDS

You have to use different sets of passwords for the CD installation or the Web installation. Please request the passwords from us via email or on your reserved Sundance Forum.

Sundance Wizard Internet Edition:

<http://support.sundance.com/updates/Wizard/setup.exe>

CCS Installation:

CCS requires manual configuration.

You can find a general overview of the procedure here:

<http://support.sundance.com/viewtopic.php?p=13638#13638>

Please keep in mind these differences from the procedure above:

1. To properly set up the SMT310Q, you have to copy the I/O port address from the value shown by the SMT6300 SmtBoardInfo Utility.
2. **Do not** use any GEL files.
3. For the DSP processor type, make sure that you select the one called *SMT365E_11_DSP*.

Hardware Getting Started

The Kit comprises of these modules: SMT310Q + SMT365E + SMT370

Please read the following documentation:

SMT310Q User Manual:

<http://www.sundance.com/docs/SMT310Q%20User%20Manual.pdf>

SMT365E User Manual:

<http://www.sundance.com/docs/smt365e%20user%20manual.pdf>

SMT370 User Manual:

<http://www.sundance.com/docs/SMT370%20User%20Manual.pdf>

Sundance Help (general introduction to our technology):

<http://www.sundance.com/docs/Sundance.chm>

SMT6012 (Code Composer Studio drivers):

<http://www.sundance.com/docs/SMT6012.chm>

SMT6001 Help (all about Flash programming and bootloaders/bitstreams):

<http://www.sundance.com/docs/SMT6001.chm>

SMT6300 (general utilities and testing): documentation installed on your hard disk

Very Important:

The DSP on the SMT365E will take approximately 46 seconds to configure the FPGA following reset, assuming a 600MHz clock.

The external devices implemented in the FPGA (such as comports) must not be used during this configuration.

It is safest to wait for the configuration to complete.

Please note that comports will appear to be "not ready" until the FPGA has been configured.

When any Diamond application will be run (please refer to the following section) the *Diamond Server* will issue a board reset and then send the application to the host comport.

Since the transfer is not delayed, the SMT365E FPGA won't be ready to receive it, and the application will hang.

This can be avoided by using the Advanced Options available when selecting *Options* from the *View* menu of the Diamond Server, and then selecting the *Advanced* tab.

There, you will be able to either set a proper delay before running the application, or prevent the Diamond Server to issue a reset by ticking the checkbox called: "Do not issue a reset before running an application".

Software Getting Started

Your software includes:

Diamond DSP single proc and Diamond FPGA single proc

They form a unified development environment which takes care of the low-level details and let you concentrate on the hi-level tasks that make up your project.

We recommend you to browse carefully the following documents to get the most out of your Diamond Kit.

Basic concept:

http://www.3l.com/Diamond/Sundance/diamond_for_sundance.htm

Diamond User Guide:

<http://www.3l.com/Documents/Diamond%20Sundance%20C6000.pdf>

Diamond IDE User Guide:

<http://www.3l.com/Documents/IDE.pdf>

Diamond IDE live presentation (in English):

<http://www.3l.com/IDE/IDE%2520Demo.htm>

It is important that you both get proficient with the Diamond IDE and are able to build by yourself the basic 'Hello World' Diamond example.

SDR8036E demo package

We provide you with a Diamond IDE project with full source code to let you test your system.

This project can be used as a blueprint for further development on your part.

SDR8036E demo package:

ftp://ftp2.sundance.com/pub/Support_Files/Gabriele/8036e/package_sdr8036e.zip

Please read the included PDF file which explains how to import the archived sub-projects into a new workspace.

We recommend you to run this diamond application via the Diamond Server:

1. **Open the Diamond Server.**
2. **Select *Options* from the *View* menu of the Diamond Server, and then select the *Advanced* tab.**
3. **Tick the checkbox called: "Do not issue a reset before running an application". Click on *OK*.**

4. **Select *Application* from the *File* menu.**
If you have run the application previously, or the application doesn't seem to run correctly, press the reset button in the 3L server window to send a reset signal. After 46 seconds the board should be configured and you can try again.
5. **Locate and select the pre-compiled application you downloaded from here:**
ftp://ftp2.sundance.com/pub/Support_Files/Gabriele/8036e/com.sundance.example.sdr8036e.app

Please note that the SDR8036E demo requires various connections between the modules. The system is shipped with the right connections;

for your reference the required connections are:

- Comport FMS cable from TIM1-Comport2 (T1C2) to TIM3-Comport3 (T3C3)
- SHB cable connecting SHB0 on the SMT365E to SHB0 on the SMT370
- SHB cable connecting SHB1 on the SMT365E to SHB1 on the SMT370
- Use the included analogue PCB to make a loopback connection or the analogue cables to acquire and send the signals from the outside.

The dialogs that appear when the demo is run will let you fine-tune the acquisition.

SMT6025

The SMT6025 is a host-side software interface to Sundance hardware.

Apart from the Diamond Server, you can use the SMT6025 to develop stand-alone programs to send and receive data between your PC and the SMT8036E SDR Kit. The SMT6025 provides many examples and source code (both Host-side and DSP-side).

SMT6025 User Manual:

<http://www.sundance.com/docs/6025%20User%20Manual.pdf>