

# SMT8090\_365

## User Manual



Certificate Number FM 55022

## Revision History

<b>Date</b>	<b>Comments</b>	<b>Engineer</b>	<b>Version</b>
08/07/04	First release	PSR	1.0
20/08/04	Corrections added to Hardware Installation	PSR	1.1
24/08/05	Updated section about serial number. Microcontroller des not read a serial number anymore	E.P	1.2
25/10/05	Reflect changes in the software	E.W	1.3

## Table of Contents

Revision History.....	2
Table of Contents .....	3
Contacting Sundance. ....	4
Notes.....	4
Precautions.....	4
Outline description.....	5
Architecture. ....	6
Hardware involved.....	7
Hardware installation. ....	8
Software applications. ....	11
3L application.....	11
Description of the functions in the test software (Run8090.c).....	11
“Configuring FPGA - Full configuration - Loading keys and bitstream”.....	11
“Configuring FPGA - FPGA Already configured - Loading END key only”.....	11
“Pulse on Config Line - for FPGA reconfiguring”: void CPLDReset(void).....	11
“Configuring internal Registers”: void SetADCConfig(void).....	11
“Reading-back internal registers”: void GetADCConfig(void).....	12
“Temperature Updates”: void UpDateTemp(void).....	12
“Serial Numbers Read Back”: void ReadSN(void).....	12
“Capturing data”: unsigned int DoCapture(unsigned int SDB16BIT).....	12
Matlab application.....	12

## Contacting Sundance.

You can contact Sundance for additional information by sending email to [support@sundance.com](mailto:support@sundance.com).

## Notes.

- SHB stands for **Sundance High-speed Bus**.
- CommPort denotes an 8-bit communication port following the TI C4x standards.

## 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 operating, make sure that the heat generated by the system is extracted e.g. a fan extracting heat or air blower. It is vital for the SMT390 daughter module.

## Outline description.

The *SMT8090\_365* is a single-C6416 based module (*SMT365*) combined with a dual high-speed ADC module (*SMT390-VP* composed of *SMT338-VP* and *SMT390*).

*SMT365* characteristics:

- ⇒ single TMS320C6416 processor running at 600MHz (64 bits)
- ⇒ Six 20MB/s communication ports (comm.-ports)
- ⇒ up to 16MBytes of ZBTRAM (133MHz)
- ⇒ 8MByte Flash ROM for boot code and FPGA programming
- ⇒ Global expansion connector
- ⇒ General purpose I/O connector
- ⇒ High bandwidth data I/O via 2 Sundance High-speed Buses (SHB).

*SMT390-VP* characteristics:

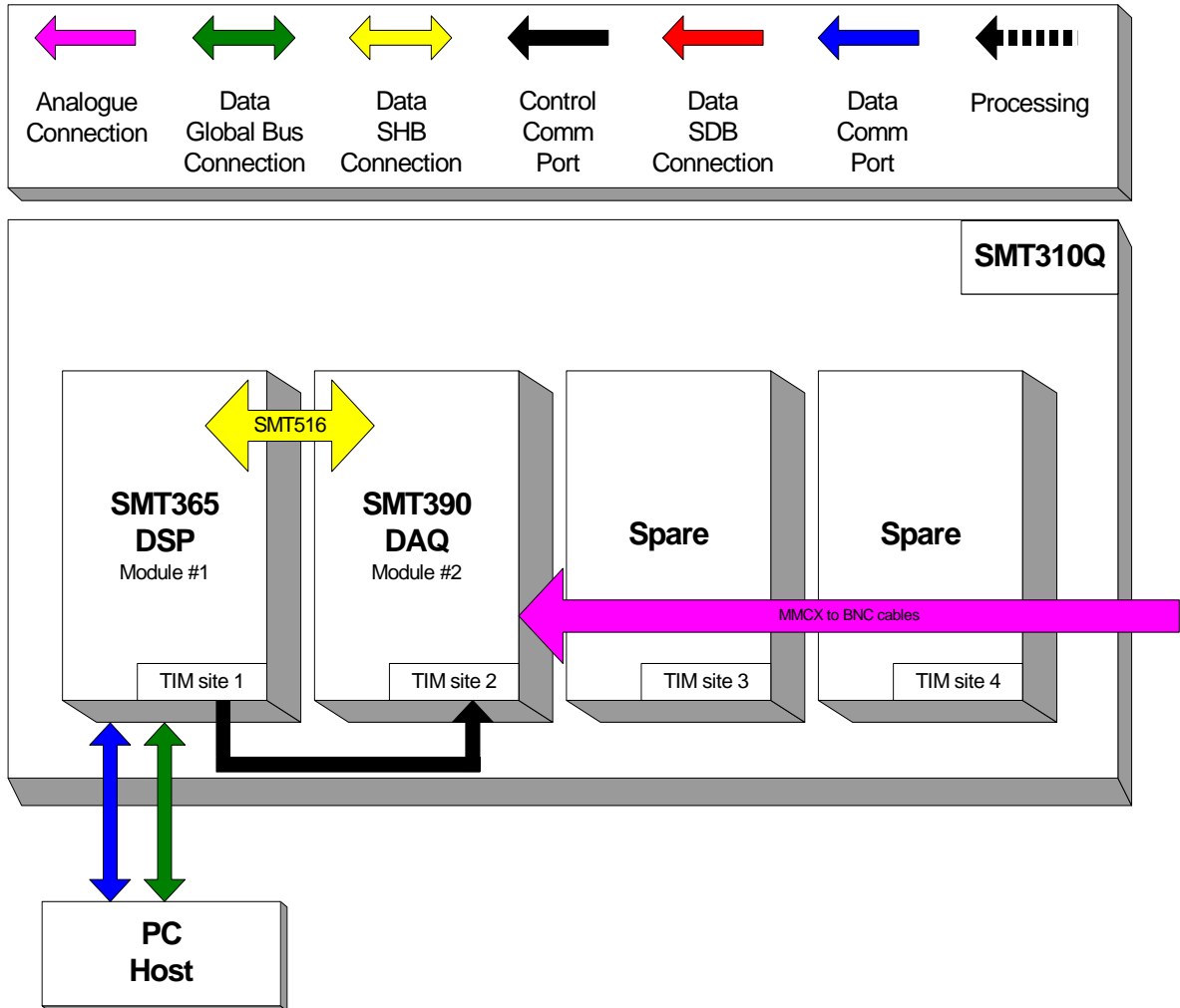
- ⇒ Two 12-bit ADCs ([AD9430-210](#)) sampling at up to 210MHz via LVDS bus ([SLB](#)),
- ⇒ Two **Sundance High-speed Bus** (SHB) connectors,
- ⇒ Two 4-channel Rocket Serial Link ([RSL](#)) connector – 2.5Gbits/second each,
- ⇒ Two 20 MegaByte/s communication ports,
- ⇒ Low-jitter on-board system clock,
- ⇒ Xilinx Virtex-II Pro FPGA (VP30-6),
- ⇒ 50-Ohm terminated analogue inputs and outputs, external triggers and clocks via MMCX or MMBX(Huber and Suhner) connectors,
- ⇒ User defined pins for external connections,
- ⇒ Compatible with a wide range of Sundance *SHB* modules,
- ⇒ TIM standard compatible.

The *SMT8090\_365* is a demonstration software for the evaluation of the *SMT365* and *SMT390-VP* modules. It can be used for prototyping 3G (3<sup>rd</sup> generation) systems and high-speed data acquisition system with or without digital processor. This document is an installation guide for the *SMT8090\_365* demonstration system.

The *SMT8090\_365* application gets the DSP on the *SMT365* to configure the *SMT390\_VP* FPGA and control clock frequencies, clock routings, data format and data capture. The DSP grabs data from both channels and stores them into a file for further processing, like display and FFT.

## Architecture.

The following diagram shows the architecture of the *SMT8090* system:



## Hardware involved.

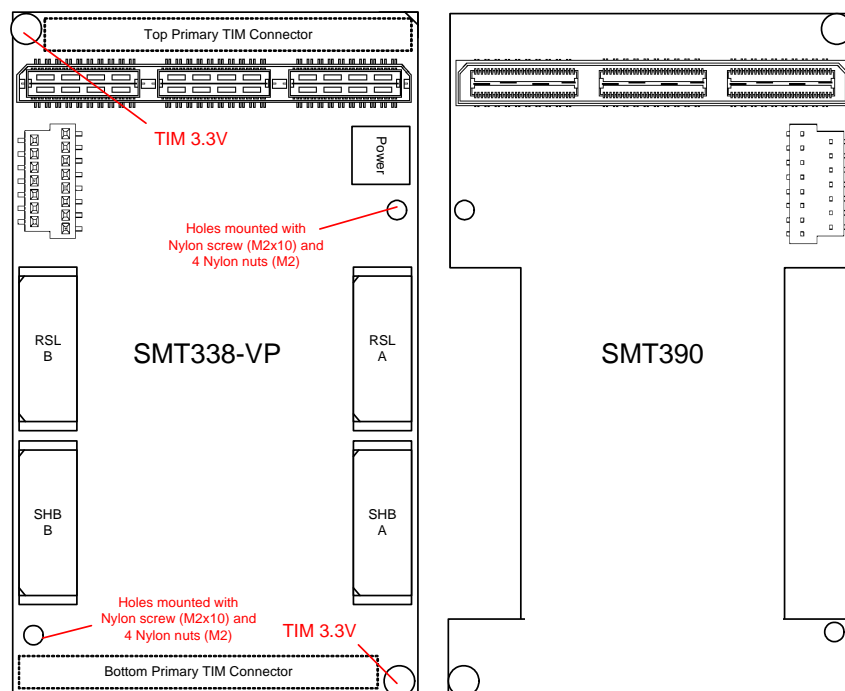
The *SMT8090\_365* is built around two main modules but also involves a carrier board and some cables to interconnect them and allow them to communicate with each other and to access the PC.

- ⇒ 1x **SMT310Q**: PCI carrier
- ⇒ 1x **SMT365**: Single-C6416 based module; to be plugged on site 1 of *SMT310Q*.
- ⇒ 1x **SMT390-VP**: Dual-ADC module; to be plugged on site 2 of *SMT310Q*.
- ⇒ 1x **FMS cable** (20cm): to connect **T1C0** to **T2C3** at the back of the *SMT310Q*.
- ⇒ 1x **SMT516** (SHB to SHB PCB): to connect SHBA (*SMT365*) to SHBA (*SMT390*).
- ⇒ 1x **SMT511** (SHB to SHB cable): to connect SHBB (*SMT365*) to SHBB (*SMT390*).
- ⇒ 4x **MMCX to BNC** cables to connect an external analogue signal source to J1 to J4 and an external clock source (when using external sampling clock) to J5 and J6.

## Hardware installation.

Here are the steps to follow to install the *SMT8090\_365* system.

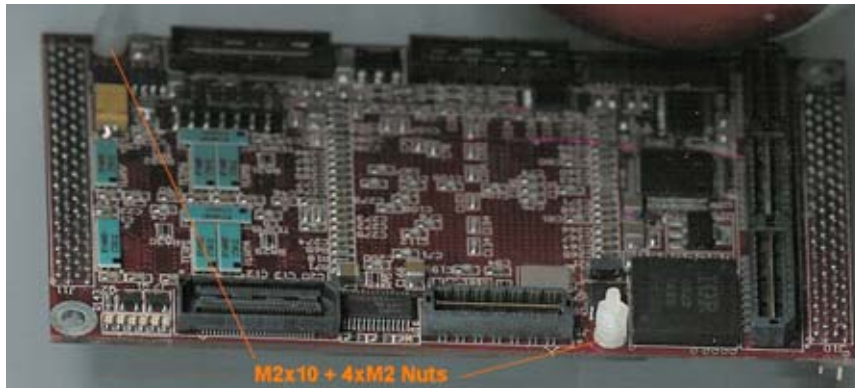
- 1 – Place the *SMT365* on TIM site 1 of the carrier board (*SMT310Q*).
- 2 – The following are then required to mount *SMT338-VP+390* on the *SMT310Q*:



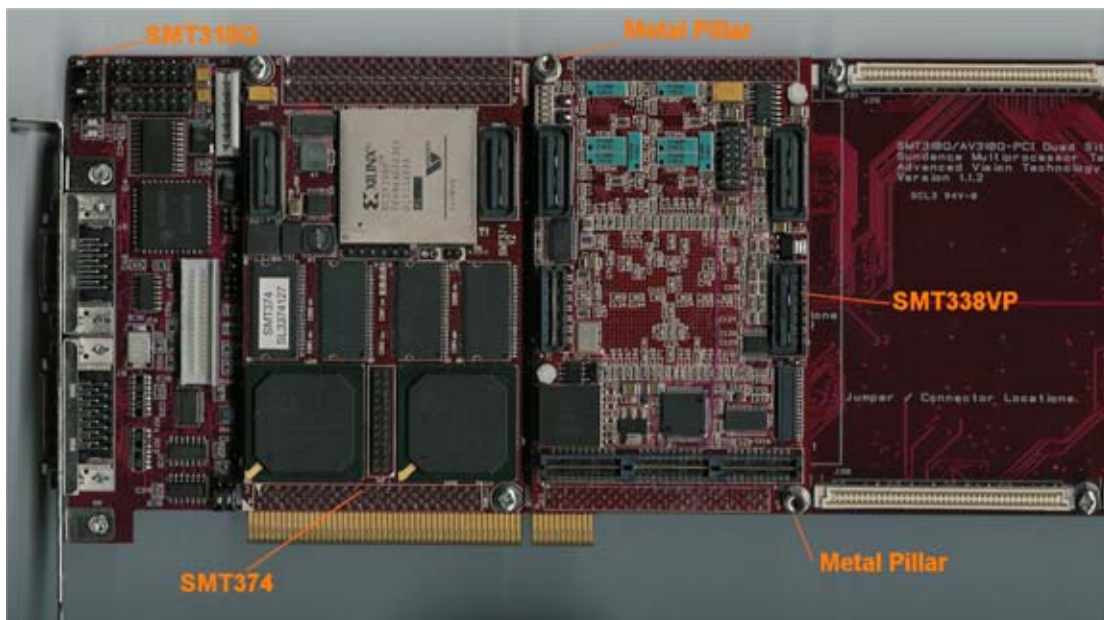
- a – First, fit two Nylon screws (M2x10), pointing out (the head of the screws on bottom side).



b – Then fit four M2 nuts on each screw.



c – Place the SMT338 on the second site (SMT365 already on first site) on the SMT310Q and fit two metal pillars (3.3 Volts).



d – Place the SMT390 on top of the SMT338-VP. Make sure that both modules fit firmly.

e – Fit two M2 nuts on the Nylon screws and two M3x4 screws in the 3.3V pillars.

3 – Connect CommPort 0 of the SMT365 to CommPort 3 of the SMT390 (T1C0 to T2C3) via an FMS cable at the back of the SMT310Q.

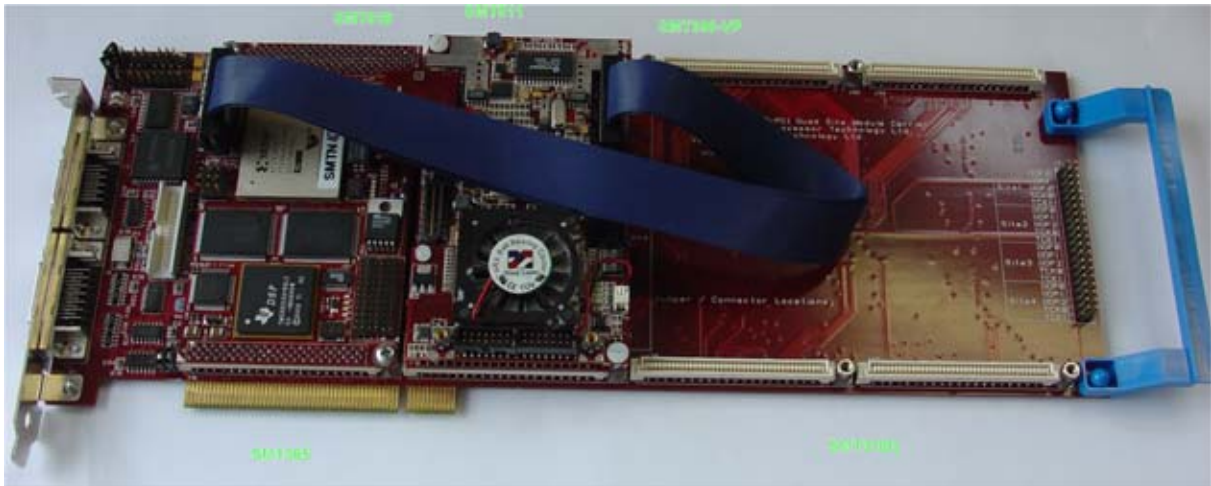
4 – Connect SHBA on the SMT365 to SHBA on the SMT390-VP via the SMT516 (SHB to SHB PCB).

5 – Connect SHBB on the *SMT365* to SHBB on the *SMT390-VP* via the *SMT511* (*SHB to SHB cable*).

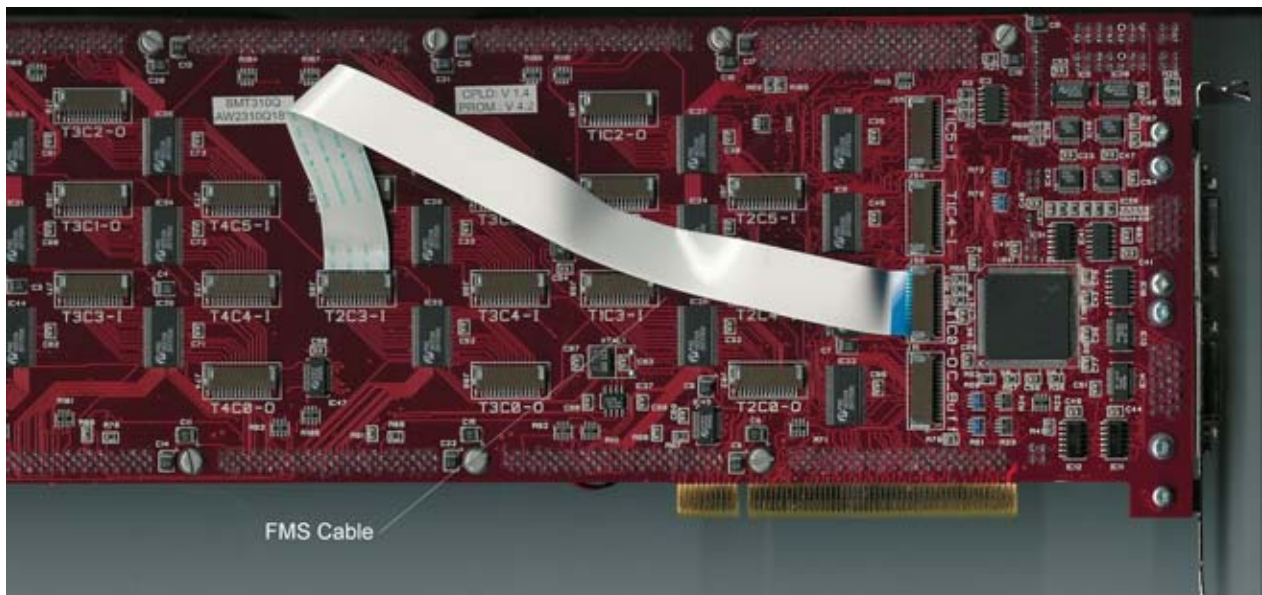
6 – Connect external sources to J1, J4, J5 and J6 via MMCX-BNC cables. Make sure that the external signal meet the input characteristics of the *SMT390-VP* described in the *SMT390-VP User Manual*.

7 – 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.



## Software applications.

### **3L application.**

In a sub-folder labelled 3L (directory SMT6600\System\SMT8090\_365), you will find a C (*Test365.c*), a configuration (*Test365.cfg*) and a make (*makefile*) files. Make sure the SMT365 has been configured with the 32-bit version of the firmware.

In a DOS prompt window, simply type *nmake* to generate the 3L application file, which can be loaded into the *SMT365* by using the 3L Server (3L Diamond needs to be installed first).

This application executes the following steps:

- Configure FPGA
- Configure Internal registers
- Read back ADC registers
- Set clock frequency
- Updates temperature
- Capture data

### **Description of the functions in the test software (*Run8090.c*).**

The *Run8090.c* file provides functions to interact with the SMT390VP. Those functions can be reused in other software.

#### “Configuring FPGA - Full configuration - Loading keys and bitstream”

This command loads the bitstream contained in the directory where the application is running from as well as the Start and End.

#### “Configuring FPGA - FPGA Already configured - Loading END key only”

In the case where the FPGA has already been configured, by simply sending an End Key, the FPGA retrieves its configuration. It saves time.

#### “Pulse on Config Line - for FPGA reconfiguring”: `void CPLDReset(void)`

By toggling the Config line, it is possible to reload the FPGA with a different bitstream.

#### “Configuring internal Registers”: `void SetADCConfig(void)`

Sets up the internal registers with values defined at the beginning of the application.

“Reading-back internal registers”: `void GetADCConfig(void)`

Reads-back all the registers (Clock selection, frequency, sample format, scale, etc) that can be read-back.

“Temperature Updates”: `void UpDateTemp(void)`

Once internal registers are configured, it is possible to read temperatures on the 338-VP and 390.

“Serial Numbers Read Back”: `void ReadSN(void)`

The serial number read back is not available anymore on systems shipped after 25/03/2005. The feature is removed due to recoding of the microcontroller.

A serial number is still present on a sticker on the modules.

This function still works but the serial number values read-then back have no meaning.

“Capturing data”: `unsigned int DoCapture(unsigned int SDB16BIT)`

This function captures data from both channels, one after the other (not simultaneously). Data are then stored into two separate files into the directory where the application has been started. Files are called ChannelA.txt and ChannelB.txt.

Note that without configuring the FPGA followed by its internal registers, none of the other options will work.

### ***Matlab application.***

The *SMT8090\_365* is also provided with a matlab application (3L folder – test.m), which displays raw data captured with 3L application as well as the FFT.