

SCUBA-2 PCI Card Application

pcidiag – PCI card diagnostic application

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1. Introduction

Applications can be downloaded to the PCI card's DSP to enable specific specialised functionality out-with the normal operation of the card. Such applications are downloaded to the DSP via a series of PCI "write_memory" commands, and are executed with the PCI "start_application" command. Typically a script would be employed to download and execute an application.

This document describes the PCI diagnostic application, which is utilised to test the core activities of the PCI card. As such it indicates if the installed PCI card is fully functional. It is not an application to diagnose data acquisition errors.

The downloadable application file is called "PCI_APPL_diagnostics.lod". The script employed to download and execute the application is called "pcidiag".

2. Diagnostic Application Description

2.1 Script “pcidiag” Operation

The diagnostic application for the PCI card is run with the script “pcidiag”. This script carries out the following tasks:

1. Check standard command/reply handshaking and report to screen. This tests interrupts over the PCI bus from card to host and vice versa. It also tests PCI reads and writes as bus slave.
2. Download the application “PCI_APPL_diagnostics.lod”.
3. Execute the application and interrogate the returned status word HEALTH. Report to screen the significance of the returned status word, which provides information on DSP memory corruption and the fibre optic circuitry.
4. Issue an MCE GO command, which is handled internally by the PCI card (while the application is still running the PCI card is in ‘self-test mode’). Here, rather than forward the command to the MCE, the PCI card auto-generates a known frame of data and writes it to host memory as bus master.
5. Interrogate the auto-generated frame of data for corruption and report.
6. Terminate the application to return the PCI card to normal behaviour.

2.2 Test Detail

Specifically, running the “pcidiag” scripts verifies the following:

1. **Interrupts over PCI bus from host to PCI card are functional.**
2. **PCI reads as bus slave are functional.**
3. **Interrupts over PCI bus from PCI card to host are functional**
4. **PCI writes as bus slave are functional.**

These first four tests are carried out using standard pci command/reply handshaking.

5. **There is no corruption of the boot program residing in the DSP’s P memory.**

Here a checksum is calculated on the program code and compared against an expected stored result.

6. **There are no corrupt memory locations in parameter space (X memory)**

Here X memory is tested by writing/reading the values 0x000000, 0xFFFFFFFF, 0x555555, 0xAAAAAA to all used memory locations.

7. **There are no corrupt memory locations in packet buffer space (Y memory)**

Here Y memory is tested by writing/reading the values 0x000000, 0xFFFFFFFF, 0x555555, 0xAAAAAA to all used memory locations.

8. **The Fibre Optic Circuitry is functional.**

A pseudo-random sequence of characters is looped back from the fibre transmitter to fibre receiver. The sequence received is checked against that sent. Any data corruption, or loss is reported. This test requires that a single fibre optic cable connect the PCI card’s transmitter and receiver.

9. **PCI reads as bus master are functional.**
10. **PCI writes as bus master are functional.**

Tests 9 and 10 are carried out by issuing an MCE GO command (return data) while the PCI card application is still running. Here the MCE command is retrieved from host memory (as bus master), but rather than being forwarded to the MCE it is handled internally. The DSP auto-generates a reply to the MCE GO command, and also a pseudo random data packet, both of which are written to host memory. The data packet is compared against a saved packet to check for data corruption.

The results of all the tests are printed to screen.

3. Running the Diagnostic Application

To run the diagnostic application carry out the following:

1. Loop an optical fibre from the PCI card's fibre transmitter to it receiver.
2. Execute the script "pcidiag".
3. Read on-screen report.

The script automatically terminates the application, returning he PCI card to normal operation.