iDSC Product Safety and Compliance Manual

Safety Guidelines and Declaration of Conformity for iDSC Products

Version 1.01

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1. Introduction

This manual provides safety and maintenance information related to the Microstar Laboratories *iDSC* Data Acquisition Processor products. *DAP* is short for "Data Acquisition Processors," and is a trade name representing a family of interrelated products. The *iDSC* products share many features of *DAP* products, as will be discussed specifically in sections that follow. The *iDSC* products have been tested and found to be in conformance with international standards, and a declaration of conformity is included at the end of this manual.

Intended Use

The *iDSC* data acquisition products are boards operated as as plug-in components of a desktop, server, or workstation PC machine, through PCI interfaces of the host machine. This extends the capabilities of the host for capturing high-resolution measurements of signals, typically produced by sensor devices. The captured signals are converted to a digitized form compatible with digital computer processing, and these results are then delivered to the PC host system directly through its PCI data bus.

The *iDSC* boards specialize in capturing data on multiple channels in a carefully controlled manner, with a combination of low power amplifier hardware and dedicated signal processing DSP processor chips, avoiding a hazard known as *aliasing*. This phenomenon has no effect whatsoever on the device physical effects, but it can affect the way the resulting digitized data sets are interpreted.

Restrictions on use of *iDSC* boards are given in the *iDSC* board's manual.

iDSC products are not intended for any application for which its performance is critical to human life and safety. iDSC products cannot and do not guarantee the availability characteristics necessary for life-critical applications such as direct control of nuclear reactors, and they do not provide electrical isolation suitable for general medical applications.

Operating Environment

iDSC devices, when properly mounted into their PC host machines, are mostly isolated by the PC host equipment. There are three potential points of interaction with the environment external to the PC host.

1. Low power analog and digital signals are routed through signal connectors exposed on the back panel of the host machine.

2. There is an incremental power consumption drawn by the PC host equipment to support the operation of the DAP board.

3. There are increased digital interactions with the computer interface lines on the PC host PCI data bus.

Operation of the *iDSC* boards is inseparable from the operation of the host computer system. For the purposes of testing compliance with various international safety and emissions standards, compliant cable equipment is connected or disconnected from the external connectors, according to testing requirements for performing each test. DAPserver systems, which were proven compliant by separate testing, were used as the host computer systems during the tests. Generally speaking, the test criteria deem the *iDSC* board to comply with international emissions standards if the combined operation of the *iDSC* board and the PC host equipment is compliant.

Operating Instructions

After the *iDSC* equipment is properly installed according to the installation guide provided with the board, it is powered up automatically when its host computer system is powered up. Once started, the equipment is operated through software commands, sent from an application on the PC host via the internal PCI interface bus. There is no direct interaction with the board during operation, except my means of software messages under control of host system software. The installation guide for PCI-based DAP boards provides instructions on signal connectors, board installation in the host, and software setup. The installation guide is available on the DAPtools software CD (or the equivalent downloaded file system image) provided with each DAP unit, or from the Microstar Laboratories Web site at   http://www.mstarlabs.com.

2. Products Covered

There is only one *iDSC* product, the iDSC 1816. The number designation indicates hardware revisions, and it may be changed from time to time to indicate manufacture with functionally identical parts from different sources depending on component availability.

iDSC products share many features with other models of Data Acquisition Processors. All of these boards have been thoroughly tested for emissions. The power and voltage levels on the *iDSC* boards are so low that they fall below the threshold for devices that require exhaustive safety tests, according to international standards. In general terms, the functionality embodied in an *iDSC* includes the following:

- a mechanical assembly: circuit board, connectors, cabling

- an internally shielded, multilayer printed circuit board for internal signal interconnections

- power regulation to remove noise from the DC power provided by the computer host

- electronic clock signal generation for internal timing

- signal processing components for input signal detection and digitization

- electronic control logic devices for coordinating high-speed signal conversion activities

- a general-purpose microprocessor for data management and transfer.

This list very nearly matches the corresponding summary list for the *DAP a-Series* family boards. In fact, the *iDSC* products are derived by simplifying and recombining elements of *DAP a-Series* boards.

- The *iDSC* uses the same main processor CPU device and the same circuitry as low capacity DAP products, with the same timing rates for its data management section.

- The *iDSC* uses the same kind of board-edge connectors for all host and signal interfaces.

- The *iDSC* omits all digital input and output signal lines of DAP products.

- The *iDSC* uses an analog input amplifier section that is a much reduced version of the circuits used in DAP products, with functionality for signal multiplexing, differential input configurations, and configurable input gains removed. This simplified circuit is then replicated 8 times so that each input channel has separate dedicated electronics, eliminating switching noise emissions from the input circuits.

- The *iDSC* uses a different type of digitizer chips, though still comparable to the DAP family products in terms of low power draw and data rates.

- The *iDSC* uses on-board DSP devices to coordinate the conversion processes and apply digital filtering, substituting for some of the digital control logic and intermediate buffering chips that the DAP boards use.

- The DSP processing has a side effect of reducing signal data rates, so that net data transfer rates from an *iDSC* board, with 8 channels captured simultaneously, are essentially the same as the rates for a DAP family board capturing one sample value at a time. Consequently, digital activity on the host PCI interface bus is almost indistinguishable.

Specific information about hardware features available on the *iDSC* products are provided in the *iDSC* manual. Copies of the manual are available on the Microstar Laboratories Web site at: http://www.mstarlabs.com.

3. Specifications

Technical specifications

Technical specifications are provided for each *iDSC* product. These are available on the DAPtools software CD (or the equivalent downloaded file system image) provided with each *iDSC* unit, or from the Microstar Laboratories Web site at http://www.mstarlabs.com/.

Electrical Specifications

Electrical specifications are included within the *iDSC* manual. Most of these specifications relate to devices or connections that, in operation, are inaccessible on the interior of the PC host, or inaccessible because of the shielded provided by attached cables. Some general information related to safety is provided in this manual for completeness. For full information about electrical specifications, refer to the technical specifications sheet.

DAP products are operated by PC host machines, which determine the externally observable power requirements.

Physical specifications

The *iDSC* boards conform to size standards for PCI full-length boards, 10.5 cm wide including the PCI edge connector, and 31.0 cm long. Connectors mount flush on the panel strip at the end of the circuit board. That strip fits into a slot at one end and provides a mounting flange that can be locked into place by a screw on the other end, covering the opening in the back of the PC case. Once locked into place, the panel strip covers the rear panel slot, maintaining the integrity of the emissions shielding provided by the PC host back panel. The mounting hardware is no different than you would find on other kinds of PCI computer accessory boards, such as network adapters or video display drivers.

4. Operating Environment

There are typically no thermal hazards when computer host equipment is used as intended and with reasonable care. The air circulation fans provided by the PC equipment are usually sufficient for thermal control without any concern. However, take care when multiple *iDSC* units are installed in a PC host that nothing prevents circulated air from reaching the boards.

Cables are critical to successful *iDSC* device operation. Avoid crimping or straining the cables, which could break conductors or breach the cable shields and increase noise susceptibility. Be particularly careful when mounting cable connectors to *iDSC* board edge connectors, so that delicate pins are not broken or crimped to form a short circuit with neighboring pins. Avoid touching cable lines with fingers, which can deliver static discharges sometimes into the hundreds of volts, sufficient to seriously damage delicate input amplifier devices despite their low energy.

Always operate signals within the specified safe limits. Sustained or repeated stresses with signal voltages outside of the normal operating range are likely to result in damage, rendering the hardware channel inoperable.

It is essential to operate all attached equipment properly and safely, according to operating specifications. Particular caution is required when using high-power devices. For example, if you use the *iDSC* board to measure a high-power device like an electric motor, an inadvertently broken connection to the motor's power supply ground could result in high currents from the motor's high-voltage power source seeking to reach ground through the delicate signal ground connections intended for measurements. Computer equipment in general will not provide proper protection from serious power faults of this sort.

Be sure not to obstruct the fans, heat sinks, cooling plates and so forth that are provide for your host PC system. The maximum safe ambient temperature for DAP board operation, given in the technical specifications, is about 50 degrees Celsius. In general, ambient temperatures that are safe for humans are also safe for operating the PC host, and will be safe for operating the DAP boards as well, but sustained operation at relatively high ambient temperatures could accelerate degradation of materials in electronic components, thus impairing the product lifetime. Temperature extremes could have an impact on the absolute accuracy for the measurements captured under those conditions, primarily through subtle temporary changes in the effective value of the analog input components.

Take the normal and appropriate precautions to prevent liquids and other contaminants from getting into the equipment, as you would with any computing equipment.

5. Electrical Grounding

The ground connection from a *iDSC* board to the power system ground is through the ground connections provided on the host system PCI bus connectors. These, and the ground side of the PC system power supply, are in turn strongly connected to the equipment case, which is strongly connected to the external power system ground through the PC system power cord. Generally, this grounding strategy will provide a high degree of safety for desktop units, but for industrial equipment in a rack, beware that it can introduce unanticipated electrical ground connections through the case and rack. This could mean that stray currents using the rack as a bypass path could link stray effects between equipment. There is usually no danger from this, but there could be implications for how the affected equipment operates.

There are ground-reference pins on analog connectors, intended for equalizing small voltage differences that might exist between sensors and signal inputs. There are also ground-return pins on digital input and output connectors. If any of these are incorrectly connected to a low impedance source of power because of improper equipment wiring, it is possible that too much current will attempt to flow back to the power ground through the delicate ground reference connections. This would almost guarantee damage to the *iDSC* board.

Be particularly careful when wiring signals. It is best to have all systems turned off and unplugged from power sources when wiring. It is easy to short-circuit signal lines to pins or to the strongly grounded case accidentally, damaging the signal inputs, the sensors, or both. Signals lines that you think are not powered could pack a damaging level of static charge, so anti-static precautions are strongly advised.

6. Access and Maintenance

There are no user-maintainable components on *iDSC* boards.

Over long periods of time, it is possible that a *iDSC* unit will start to exhibit small offset and gain errors. Follow your organization's policies, and use good technical judgment, about how often to check the calibration of your equipment. Some organizations prefer to make calibration adjustments themselves – check the manual for your board to decide whether you want to try this, and follow the instructions. Other organizations prefer to have Microstar Laboratories perform the same kind of calibration process that is applied to new boards in production – contact Microstar Laboratories for assistance in making these arrangements.

In cases where it is necessary to ship boards to Microstar Laboratories for repairs or calibration, shut down the PC host and remove its power cord, remove the mounting screw from the cover strip that holds the board in place in the host system's back panel, and pull the board carefully out of the PCI slot. *iDSC* boards are highly sensitive to electrostatic damage, so be sure to take proper precautions for static control, and if possible, handle the *iDSC* board only at a grounded static-controlled workstation. Keep the *iDSC* board wrapped with conductive plastic material while they are out of the enclosure.

A. Appendix: Declarations of Conformity

iDSC products are intended to be used in an industrial or controlled laboratory environment. They are not intended to be used in residential or commercial environments.

Installations must provide 3-wire AC power with an earth ground to the computer system hosting the *iDSC* products, as discussed in Chapter 5 of this document, in order to meet the IEC61326 EMC requirements as set forth in the applicable EMC directives.

NOTE: iDSC products are used in combination with separate host computer equipment provided by the system user or system integrator. Testing of the *DAP a-Series* family was done using Microstar Laboratories DAPserver devices as the PC hosts. It is the responsibility of the system user or system integrator to ensure that any system using a DAP product is compliant to all relevant standards.

NOTE: This equipment was found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules (USA), and to ICES-003 (Canada). Cet appareil numérique de la classe A est conforme à la norme NMB-003 (du Canada). The class A limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used with the right computer equipment, in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area can cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

DECLARATION OF CONFORMITY

(According to ISO/IEC GUIDE 22 and EN 45014)

Manufacturer: Microstar Laboratories, Inc.
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DECLARES THAT THE PRODUCTS

Product Name: **iDSC**

Model Number: **iDSC 1816**

Year CE mark first applied: **1999**

CONFORM TO THE FOLLOWING EUROPEAN DIRECTIVES

EMC Directive: 2004 / 108 / EC

Test Protocols: EMC: *61326-1:2013 class A*

Signatory: Ian Lewis, Compliance Officer
               Microstar Laboratories, Inc.

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