DAP PCI Installation Manual

Installation Guide for PCI-based Data Acquisition Processors

Version 1.04

Microstar Laboratories, Inc.

Part Number DAPHWINSTM104

Contents

1. Introduction

The Data Acquisition Processor from Microstar Laboratories is a complete data acquisition system that resides in a PCI connector on a host PC. Data Acquisition Processors are suitable for a wide range of applications in laboratory and industrial data acquisition and control.

Manuals and Documents

This manual covers the process of installing a Data Acquisition Processor, from unwrapping, until it is up and running in a minimal configuration. From that point, you will want to continue by connecting signal lines and configuring your processing applications. Related manuals that you might also need are:

- The DAP hardware manual, specific to the model of DAP you have

- The DAPstudio Manual, which explains how to configure applications

- The DAPL Manual, which contains a complete DAPL command reference

- The Applications Manual, which provides configuration examples

If you reconfigure your analog hardware section, you might also need TN224, the technical note that explains using the DAPcal calibration program. All of the manuals are available on the DAPtools CD, along with all of the software you need.

Handling Precautions

To be extremely fast and responsive, the electronic devices on a Data Acquisition Processor are sensitive to very small amounts of electrical charge. Because of this sensitivity, many of the high-speed analog and digital components on a Data Acquisition Processor are easily damaged or destroyed by accidental static discharge. Some of the problems that might result:

- Oscillations

- Increased settling time

- Reduced slew rate

- Calibration drift

- Conversion inaccuracy

- Inoperable signal lines

Measures to control static are advisable when handling any electronic equipment, but even more important when handling a Data Acquisition Processor. Here are some things you should do to avoid damage:

- Make sure the PC host power cord is disconnected for safety.

- If possible, work at a static-controlled station, where the PC chassis and Data Acquisition Processor are both placed on a grounded, low-resistance work surface.

- Wear a grounding strap that attaches your wrist to the grounded work surface or to the PC chassis.

- Handle the board only by the metal-free edges or the panel mounting bracket.

- Leave the Data Acquisition Processor in the conductive bag until you are ready to install it. If you must put it down during the installation, place it either on a grounded work surface, OR on top of a conductive bag that is touching the PC host chassis.

- Avoid moving your feet as you install the DAP. Friction with the ground is the most common way of building static charge.

- If you do not have a wrist strap, keep one hand in contact with the metal chassis at all times while you handle the DAP, until you have the DAP firmly seated.

- Continue to be very careful about touching anything until the PC host is closed.

- If it is necessary to transport the Data Acquisition Processor outside of the PC, do this in its conductive plastic bag. If the conductive bag is not available, shield the Data Acquisition Processor by wrapping it loosely but completely in aluminum foil, not allowing exposed pins to break through.

- Never ship or store a Data Acquisition Processor in foam "shipping peanuts" without the conductive bag or foil protection.

Power Requirements

Data Acquisition Processors draw power from the +5V and +12V PC host power supplies through the PCI bus. If your PCI slots must support multiple Data Acquisition Processors and various other accessory boards, check your DAP hardware manual for its power requirements, and verify that your power supply is rated to sustain the combined load. A system with overloaded power supply can fail to boot or otherwise act erratically after the Data Acquisition Processor is installed.

System Requirements and Limitations

Data Acquisition Processors are compatible with universal 3V-5V 32-bit PCI Bus slots that support bus-mastering. Most PC hosts that support the Intel family of processors or compatible processors, and that are compatible with versions of the Windows operating system, will support Data Acquisition Processors.

There are some constraints on the PCI bus and bus drivers that can limit the number of Data Acquisition Processor boards that operate simultaneously in one PC host.

- The number of available PCI slots in the PC is limited, typically 4 to 8 slots.

- For some Data Acquisition Processor board models, a large heat sink is necessary to remove heat from the main processor chip. This heat sink partially covers the adjacent PCI slot, which then cannot be used for another Data Acquisition Processor board.

- The total volume of acquired data can increase in proportion to the number of DAP boards, but the ability of the PCI bus to accept the data does not increase proportionally to the number of slots filled. This can limit the number of samples that can be transferred out of the Data Acquisition Processors.

- The drivers managed by the *DAPcell* software can support up to 14 Data Acquisition Processor boards in one PC. (If you have a special hardware configuration that has more slots than this, contact the Sales Group at Microstar Laboratories about obtaining a customized software configuration that can support the additional slots.)

2. Installation Sequence

Installing a Data Acquisition Processor involves the following steps:

1. Configure Data Acquisition Processor hardware.

2. Obtain the latest software version.

3. Install the DAP Software.

4. Select a suitable mounting slot.

5. Install the DAP into the host PC.

6. Run your system to verify the installation.

For a Linux system, the steps similar, except that the DAP hardware is installed before the software, so that the install scripts can auto-detect the hardware configuration.

Configure Hardware Options

Data Acquisition Processors have some hardware configuration options. You must check the hardware configuration manual for your particular model of Data Acquisition Processor. Among the options that you might need to configure:

- Analog input voltage range

- Input bipolar or unipolar range

- Analog output voltage range

- Initial state of digital outputs

Every Data Acquisition Processor is fully calibrated by Microstar Laboratories as part of the manufacturing process. Any configuration changes to the analog input or output settings will necessitate recalibration. Failing to recalibrate does not harm the Data Acquisition Processor, but it will result in persistent small measurement errors. See the Recalibration section of this manual for information about recalibration. Perhaps your best strategy is to request a voltage range configuration at the time of

purchase. The DAP boards arrive calibrated in the desired configuration and ready to run. It is still a good idea to verify the jumper settings, however.

Obtain the Latest Software Version

The software releases available on the DAPtools CD that you receive with your Data Acquisition Processor might not be the latest version. You can visit the Microstar Laboratories web site at http://www.mstarlabs.com/ to see if a more current version is available. You can find downloadable versions of the Linux software on the Products | Software | Linux page. You can update software for the Windows system from the Products | Software | Downloads page. Look for the "*Current Customers*" section.

Install DAP Software

Software is installed on the host PC. Anything that runs on the Data Acquisition Processor is downloaded later.

The DAPtools CD has detailed instructions for installing DAP software under various operating systems. In the launcher application, select the Documentation link, and locate DAPtools Basic | DAPcell Basic | Installation.

When you install the *DAPcell* software, all other necessary software is installed with it. The software includes of the following:

1. *DAPcell* software. This is the software system that provides data acquisition services to applications, controls low-level device drivers, and accesses networked data acquisition stations.

2. Low-level drivers. With the Channel Architecture, the low-level drivers in the host system work with all PCI Data Acquisition Processor models. The installer will select a driver set compatible with the host operating system.

3. DAPL operating system image. This downloadable code is specific to your Data Acquisition Processor model.

Installing for a Windows Operating System

These instructions apply to the Windows operating system from Windows 2000 service pack 4 onward. Shut down all other applications, including control panel applications. The DAP software will be installed before the DAP hardware. If your system is configured with auto-detection enabled, the Microstar Laboratories Setup Launcher runs automatically when you insert your DAPtools CD. Otherwise, execute the SETUP.EXE program from the CD root directory.

The Launcher application that you see will offer a list of install options. You will need just a few of these for a basic DAP installation. Select the Getting Started link from the Launcher to obtain complete instructions for installing DAP software.

The server software must be installed first. Depending on which version of the DAPtools CD you have, select the *DAPcell* server variant from the list below:

- DAPcell Basic Server
  Basic local access but no extended application services or networking.

- DAPcell Local Server
  Basic local access plus application server features for local machine only.

- DAPcell Server
  Full server and client access to the local DAP and remote DAPs.

- DAPcell Client
  Client access to remote DAPs when the host has no local DAP.
  Be careful, this link is close to the "Server" link and is easy to miss.

There is a sequence of dialogs that you will see during the server installation process.

- The installer program will detect the version of your operating system and make appropriate adjustments to the low-level driver configuration.

- The installer program will display a dialog asking where to install the software. The source directory will point to a location on the CD and you will not need to change this. The software is installed by default as a sub-folder under the Program Files folder on the local C: drive, with the server software in a sub-folder. If necessary, you can change the software install locations, but the support software must be placed on the local PC disk drive.

- Next, you will see a dialog offering the option to Install or Uninstall. Select the Install option to install or reinstall the server software. (Select Uninstall if you want to remove the server software and disable any DAP present on the system.) Then click Next.

- In the next dialog, quickly verify that the install information is correct. Click Next to install the software and activate the server. You might see additional messages about re-enumerating Data Acquisition Processors or installing USB devices as the installer determines which DAP devices are present in your system

- After the software is installed, a dialog might ask whether you want the DOS Accel Driver stub installed. If you will be running DOS emulation for legacy 16-bit software on a 32-bit system, you should check this box before you continue. Most applications do not need this, and if you are not sure, leave this option unselected. Click Finish to complete the software install.

- After the installation is finished, you will be asked to verify that all DAP devices were recognized. Do this by running the Data Acquisition control panel application. Go to the *Browser* tab, and click on the "*local host*" icon with address \\. and you should see all of your DAPs listed. If so, you are ready to run. If you don't, reboot your system after you finish the installation process, and then check again whether all of your DAPs are listed.

After the preceding steps have installed the DAP software, you will be returned to the Setup Launcher window. Exit and close this window.

Go next to the instructions in the *Select A Mounting Slot* and *Install the Data Acquisition Processor* sections of this chapter to install the DAP hardware and complete your installation.

Installing for a Linux Operating System

These instructions apply to the Linux operating system. The Linux versions will run on the same class of PC host machines that can support the Windows operating system. Before installing the software, follow the instruction in the *Select A Mounting Slot* and *Install the Data Acquisition Processor* sections of this chapter. The installation scripts will need the Data Acquisition Processor hardware present in the system to auto-detect its configuration.

Unlike the Windows systems, Linux systems are subject to improvement without notice. Kernel features necessary for supporting the loadable kernel module can be mandatory in one maintenance release and gone in the next, making support for multiple kernel releases and distributions difficult, hence support is limited. The install process for Data Acquisition Processor software is manually initiated and only partially automated.

- Microstar will only support a limited number of kernel versions. Other Linux kernel releases not listed probably can be made to work also, but you must do any necessary system reconfigurations on your own for those versions, without support. Releases that worked with past versions of the Linux kernel are available for download, and should continue to work as before, but they are *not supported*, so you are on your own if you make any system changes.

- Various Linux distributions provide modified versions of the kernel, and these may not be compatible for various reasons. Only a few of the more popular distributions are supported. Other distributions might be compatible, but if you need changes you must make them on your own.

If you want to be sure you get a working configuration, go to the Microstar Laboratories web site software pages, download the latest version, and obtain a Linux distribution to match. Parts of the installation are in binary and parts are in source code form, so you need to configure your system with all of the development tools and code for compiling the kernel. You also need bash shell scripting, so make sure the bash shell is installed and available to run.

The basic steps of the installation are as follows:

- Obtain administrator access to the root for installing new software.

- Obtain the Accel32 release by downloading from the Microstar web site. Or, you can obtain the DAPtools Basic CD, locate the Linux files there, mount the CD, and copy the files.

- Use the tar program to uncompress and unpack the accel32 distribution file contents. The distribution files are already unpacked on the DAPtools CD.

- Review the notes in the README file.

- Use the tar program to extract the contents from the distribution and set up a directory structure with all of the source, binary and documentation files.

- Look in the DOC directory. There you will find the accel32.txt file with full detailed installation instructions.

- Locate the INSTALL bash script and run it. If your system is compatible and the system tools are properly set up, the script will invoke the compiler to build the executable code for your system configuration and install it.

- Locate the dap/dapl2000/ directory on the CD-rom and find the HWDIF.HTM file there. Near the end of this file, find a list telling you which DAPL system file image you will need for your model of DAP. Copy the required DAPL system file to the dapl subdirectory of your install directory.

- Each time your system is restarted, you must load the driver module by running the accel32 loader program. You can modify your system initialization scripts if you wish, so that this loading is done automatically.

After your DAP software is installed, you will want to verify DAP operation as described in the **"Verifying the DAP Installation"** chapter.

Select a Mounting Slot

Caution: Insufficient air flow can damage the Data Acquisition Processor.

Select a PCI mounting slot in which bus mastering is supported and in which the Data Acquisition Processor has good air flow for adequate cooling.

Cooling of the main processor is important, particularly with faster main processors. Some DAP models require a tall heat sink, which forces the board to occupy the space for two PCI boards. If the host's air circulation fan does not operate properly, or if air flow is diverted away from the chip and heat sink, the CPU device can go into a thermal shutdown state, and permanent damage is possible.

A half-length PCI card can be installed in the adjacent slot if it does not interfere with a tall heat sink or with air flow. If you are using the MSCBL 076 digital adapter panel to connect to the digital port lines, that assembly can fit into the partly-obstructed slot.

Install the Data Acquisition Processor

Caution: Do not install the Data Acquisition Processor while the PC power is on.

Basic Configuration, No Digital I/O or Digital Expansion

Follow this sequence if your configuration does not require the use of digital I/O ports.

1. Turn off and unplug the host PC.

2. Remove the PC's cover.

3. Follow the static discharge prevention guidelines.

4. Carefully unwrap the Data Acquisition Processor. Insert the Data Acquisition Processor into the selected PCI bus slot, pressing firmly and with a slight rocking motion until the card is firmly seated.

5. Screw down the back panel bracket of the Data Acquisition Processor to the external mounting panel of the PC host.

6. Replace the cover and reconnect the power cord.

Using Digital I/O or Digital Expansion

When using digital input lines, digital output lines, or digital expansion, the hardware installation procedure is almost the same, but you must mount the MSCBL 076 digital port adapter at the same time that you mount the Data Acquisition Processor. More information about the MSCBL 076 adapter is available in the TN 213 technical note that ships with the adapter. That technical note is also available on the DAPtools CD.

1. Turn off and unplug the host PC.

2. Remove the PC's cover.

3. Follow the static discharge prevention guidelines.

4. Carefully unwrap the Data Acquisition Processor and place it upon its anti-static wrapper or the grounded work surface. Install the digital port connector of the MSCBL 076 into the mating digital port connector on the Data Acquisition Processor board.

5. Lift the Data Acquisition Processor and the MSCBL 076 assembly together. Approximately position the DAP and the MSCBL 076 so that connectors on

both mounting brackets clear the mounting panel slots, and so that the bus connectors approximately align with the selected PCI slots.

6. Seat the two cards into their PCI slots, one at a time, pressing firmly and with a slight rocking motion until each card is firmly seated.

7. Screw down the back panel brackets of the Data Acquisition Processor and the MSCBL 076 to the mounting panel of the PC host.

8. Replace the cover and reconnect the power cord.

You can now restart your system. The Windows system will report that it has detected new hardware. Follow the instructions to complete the new hardware installation. After that, your Data Acquisition Processor is installed and ready to run.

3. Verifying the DAP Installation

Verifying the installation for Windows

One of the features loaded onto your system during the software installation is a control panel application. You can access the Windows control panel in various ways depending on your version of the Windows system. Find the control panel, and run the `Data Acquisition` application. It will show a dialog window with heading `Data Acquisition Processors` and five tabbed pages. Initially, the `Control tab` page will be active.

Control tab. In the top "Service Status" panel, the message `DAPcell Service is Running` should appear. If it does not, click the `Start` button in the lower right corner of this panel. The default configuration starts the DAPcell service each time the system starts, but you can change this, if you wish, in the center "Startup" panel.

Browser tab. When you click this tab, you will see a graphics panel displaying a "tree" of connected Data Acquisition Processor devices, with the special address `\\.` representing your local host. Click on the "plus icon" to expand one tree level. Observe that your DAP device is displayed there. Expand one more tree level and verify that the default communications links and loadable command modules are present for your DAP device. (A default configuration will show at least four communications pipes and at least two modules.) If you click on the DAPL module name, you can see the identification details of the running DAPL system.

All information displayed in the control panel application is obtained from the DAPL system and the command modules. If the displays are valid, the DAPL system is running, and the modules are loaded and ready.

Verifying the installation for Linux

On a Linux system, you can use the `tail` or `less` commands from a shell to list the contents of the system message file `/var/log/messages,` and locate the message from the Accel32 server listing the Data Acquisition Processor devices that were initialized.

Another option is to install the *DAPlog* Xwindows application and directly test DAP operation. *DAPlog* is a self-contained application that configures the Data Acquisition Processor and logs measurement data. The detailed installation

instructions indicate that *DAPlog* is intended for older versions of the Linux kernel, but it is compatible with current versions also. If you have problems, it is likely because of differences in your Linux distribution, and you might need to try a different version of the GUI runtime library modules.

To install *DAPlog*:

- Copy the *DAPlog* installation files from the Linux | DAPlog directory on your CD image to a temporary directory. Alternatively, obtain the latest versions from the Products | Software section of the Microstar Laboratories web site, and uncompress the contents in a temporary directory.

- Review the README notes.

- Use the tar program to uncompress and extract the files from the *DAPLOG* file into the temporary directory.

- In the temporary directory, run the bash installation script. It will install the required files and prompt for an install location. Specify the daplog subdirectory under the install directory of your DAP software.

- Verify that the runtime library files are stored correctly. There are some redistributable files for the Qt toolset used by Kylix applications. These libraries must be located in the lib subdirectory of the install directory for your DAP software. If you are updating a previous installation, check the README file and make sure you have the correct library file versions.

- A startdaplog shell script should be found in the bin subdirectory of the DAP software installation. You can examine this script to determine how to set up a desktop icon for invoking *DAPlog* from a GUI environment.

4. Troubleshooting

Installation from the DAPtools CD that comes with your Data Acquisition Processor should be automatic. However, if your installation fails, you should check the following.

1. Verify that the user account under which you are installing has full administrative rights for installing software. If the installer fails because it cannot write files or directory entries, you might see the message "Could not create DAP key structure."

2. Before trying a re-install, run the Launcher program from the DAPtools CD, and select the Server installer (*Accel 32*, *DAPcell Local Server* or *DAPcell Server*). In the dialog that follows after selecting the install folders, when it asks "Do you want Setup to detect your DAP hardware?" select the "Unregister" option to clean up fragments from previous install attempts.

3. Verify in the hardware manual for your PC host that the PCI slot you selected supports bus-mastering. Some BIOS versions have a bus mastering option; if so, verify that it is enabled. Sometimes this feature is available in some slots but not available in others, so you can try installing into another PCI slot.

4. If you see the messages "Service terminated with error" and "Could not stop the DAP service," these indicate that something is using DAP services and the installation process could not proceed. Stop any running applications, including control panel applications, and try the installation again.

5. Power down your PC host. Verify that the Data Acquisition Processor is firmly and correctly seated in the PCI slot.

6. Use a registry editor to seek and manually delete registry entries under "Microstar Laboratories" to remove stale or corrupted information. Be sure to make a backup copy of the registry files before changing them, just in case of problems.

7. If you get a message that there are "no free interrupts," try disabling unused chipset features on the motherboard (games controller, network interface, sound digitizer, RS-232 serial ports, etc.)

8. Look for an Acom.ini file left over from an earlier installation or installation attempt. If you find one, delete it.

9. If you are unable to access networked DAP boards, verify that all the DAP boards have working *DAPcell Server* software, and try reinstalling your *DAPcell* client software again. If you can access remote DAP boards but not the local DAP, try installing again, making sure that you select the *DAPcell Server* link rather than the *DAPcell Client* link (they are part of the same line) in the Launcher application.

10. If the *DAPcell* services report the message *"AcomS warning: could not download DAPL to Dapxxxx - DAPL file is not compatible with the target DAP",* this indicates that the DAPL system files are corrupted or left over from a previous installation or attempt. Verify that the DAPL system files are not write protected, and you have administrative privileges to replace them. Apply the cleanup measures listed above and try installing again. If the installation asks, allow it to overwrite existing files.

11. If the *DAPcell* services report the message *"AcomS error: unable to initialize AcomK.Sys; [various messages from DAPL system] – insufficient system resources exist to complete the requested service",* this usually indicates that a Data Acquisition Processor installed at an earlier time is no longer present in the host system. Verify that all Data Acquisition Processor boards are present and properly installed. Run the installer sequence again to detect the Data Acquisition Processor and update the install configuration.

12. If you observe peculiar board behaviors and suspect that a Data Acquisition Processor has been affected by static discharge, return it to Microstar Laboratories for testing, repair, and quality control verification. Contact the Microstar Sales department for delivery arrangements.

5. Recalibration

Each Data Acquisition Processor is burned in and then calibrated by Microstar Laboratories as part of the manufacturing process.

The accuracy of a calibration is affected by three factors:

- The operating temperature of the Data Acquisition Processor

- Drift in the Data Acquisition Processor circuitry

- Analog voltage range selection.

You have two options for board calibration. A complete calibration is available from Microstar Laboratories for a fee plus shipping costs. Alternatively, you can follow the instructions given in TN224 for the DAPcal program. TN224 is also available for download on the Microstar Laboratories web site at http://www.mstarlabs.com/, and is provided along with the DAPcal software on the DAPtools CD.

Index