HPDI32-PRINT

High Performance 32-bit Digital I/O

PCI-HPDI32A-PRINT

Windows NT 4/2000/XP/XPE API Library Extension User Manual

Manual Revision: December 29, 2004

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Preface

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1. Introduction

This user manual is an addendum to the *HPDI32 Window NT 4/2000/XP/XPE Device Driver and API Library User Manual*. This manual applies to the October 23, 2003 version of that manual, which applies to package release version 4.0.0.7.

1.1. Purpose

The purpose of this document is to describe the software extension to the HPDI32 API Library made for the PCI-HPDI32A-PRINT, which is a variation of the standard HPDI32. In particular, this manual describes the extension as well as how the PRINT variation of the HPDI32 affects use of the API. Unless otherwise stated, the information given in this manual is in addition to that given in the above API user manual.

1.2. Acronyms

The following is a list of commonly occurring acronyms used throughout this document.

Acronyms	Description
PRINT	This is used to refer to the PCI-HPDI32A-PRINT variation of the HPDI32.

1.3. Software Overview

The software interface to the API is unchanged except for the set of available register. The GSC firmware registers defined in this extension replace those defined in the API for a standard HPDI32.

1.4. Hardware Overview

The PRINT board is custom variation of the standard HPDI32. This variation replaces the standard cable interface with one that is intended for controlling impact printer print head. This board includes transmit FIFOs only. In addition, many of the standard HPDI32 firmware registers have been modified and/or replaced with registers appropriate for impact printer print head control.

2. Installation

This extension is specific to the HPDI32 API Library, and is not compatible with any other HPDI32 drivers.

2.1. CPU Support

This extension is independent of the operating system.

2.2. Windows NT4/2000/XP

The following set of procedures is specific to installation under Window NT 4.0, Windows 2000 and Windows XP.

2.2.1. Installation

This installation procedure is for Windows NT 4.0, Windows 2000 and Windows XP. Install the extension and its related files following the below listed steps.

1. Install the API Library as described in the API Library User Manual.

2. Under the target directory specified during installation of the API Library manually create a subdirectory named "print".

3. Copy the PDF version of this user manual and the ZIP file to this directory.

4. Extract/decompress the ZIP file's content to this newly created directory.

2.2.2. Removal

This removal procedure is for Windows NT 4.0, Windows 2000 and Windows XP. Remove the extension and its related files following the below listed steps.

1. Terminate any applications using the extension or any of its associated files.

2. Manually remove the ".\print" directory and its contents.

3. Uninstall the API Library following the instructions given in the API Library User Manual.

2.2.3. The Extension

The following procedures are specific to Windows NT 4.0, Windows 2000 and Windows XP. The below table lists some of the files included in this release of the PRINT extension.

File	Description
hpdi32_api_print.h	This header defines the additional components to the HPDI32 API Library interface. This is the header that should be included by applications using the PRINT extension. This file is included in the below ZIP file.
hpdi32_print_plx.zip	This is the archive file that contains all of the PRINT related files, other than the PDF version of this manual.
hpdi32_print_plx_win32_user_manual.pdf	This is a PDF version of this user manual.
release_print.txt	This file includes extension release notes. This file is included in the above ZIP file.

2.2.3.1. Startup

Refer to the corresponding section given in the API Library User Manual.

2.2.3.2. Verification

Refer to the corresponding section given in the API Library User Manual.

2.2.3.3. Version

This extension does not include a version number. Refer to the corresponding section given in the API Library User Manual.

2.3. Windows XP Embedded

The extension contains no runtime components, so there are no Windows XP specific steps to take for the extension. The files included in this extension are placed only on the development host, not the embedded host. Refer to the corresponding section given in the API Library User Manual.

2.4. Component Version Data

The extension contains no version information. Refer to the corresponding section given in the API Library User Manual.

2.5. Extension Use

The extension is used at application compile time only. Compile time use has two requirements. The first is to include the header file `hpdi32_api_print.h` in each module referencing an API or extension component. The second requirement is to expand the include file search path to include the "`print`" directory created in the previously given manual installation procedures. There are additional usage requirements for the API library. Refer to the corresponding section given in the API Library User Manual.

2.6. Sample Applications

The sample application and its related files are installed during the manual installation process. The application is provided as Microsoft Visual C++ 6.0 projects.

2.6.1. API Library Sample Applications

While the sample applications provided with the API Library may be used with PRINT boards, this is not recommended. The PRINT boards are missing a large portion of the feature set found in standard HPDI32 boards. While using these applications with PRINT boards should not result in any harm to the boards or the host, the applications may hang or timeout while accessing the device. In addition, the absence of numerous features prevents the applications from performing intended operations successfully.

2.6.2. Sample Application 1 - Two Board Test (MVC++ 6.0)

This sample console application is menu driven and performs limited testing of a PRINT board. Running the application requires use of a specially modified standard HPDI32 board (the specifics are not covered in this document). The application can be used as the starting point for application development on top of the extension and API Library or used as a reference design. The installed files are given in the below table and are installed in the `print` directory under the destination directory specified during installation of the API Library. The application is provided as a Microsoft Visual C++ 6.0 project. The paragraphs that follow give additional information relating to the application and its files.

NOTE: When using this sample application the PRINT board and the companion test board are attached to one another via a standard HPDI32 pass-through cable. The data transfer test will fail if the cable is not attached.

File	Description
`hpdi32_print.c`	This is the application's source file.
`hpdi32_print.dsp`	This is a Microsoft Visual C++ 6.0 project file.
`hpdi32_print.dsw`	This is a Microsoft Visual C++ 6.0 workspace file.
`hpdi32_print.exe`	This is a pre-built version of the application.

2.6.2.1. Build

Follow the below steps to build the sample application.

1. Start the Microsoft Visual C++ 6.0 IDE. This can usually be done by selecting the menu item "Start | Programs | Microsoft Visual Studio 6.0 | Microsoft Visual C++ 6.0".

2. Load the project workspace file. The file name is "`hpdi32_print.dsw`" and the default location is "`c:\Program Files\General Standards Corporation\hpdi32.plx\print\`".

3. Build the sample application by selecting the menu item "Build | Rebuild All." Build progress and status messages will appear in the Build pane at the bottom of the MVC++ main window. No warnings or errors should appear.

4. Dismiss the MVC++ IDE by selecting the menu item "File | Exit."

2.6.2.2. Execute

NOTE: When using this sample application the PRINT board and the companion test board are attached to one another via a standard HPDI32 pass-through cable. The data transfer test will fail if the cable is not attached.

Follow the below steps to execute the sample application.

1. In a DOS window, change to the application's installation directory. The default location is `c:\Program Files\General Standards Corporation\hpdi32.plx\print`.

2. Start the sample application by issuing the command given below. The `index1` and `index2` arguments are optional. If given, they specify the indexes of the two boards to access. If not given, the application will select the first two installed boards.

   `hpdi32app2.exe <index1> <index2>`

3. Follow the menu prompts to access the listed test operations. Each operation will continue until either an error is encountered or the ESCAPE key is pressed. From the main menu, press the ESCAPE key to exit the application.

3. API Library Interface Extension

The purpose of this chapter is to describe changes to the API due to use of the PRINT boards and the accompanying extension. The extension interface is defined using a C language header that is C++ compatible. The header is described in the table below. The only header that need be included by PRINT applications is `hpdi32_api_print.h`. This header includes the other API headers. The header defines various items in addition to those described here. All software components specific to this extension begin with the prefix `HPDI32_PRINT`.

File Name	Description
`hpdi32_api_print.h`	This header contains the PRINT specific portion of the API. It includes the appropriate header from the HPDI32 API Library. All items defined here include the prefix "`HPDI32_PRINT`".

> **NOTE:** Contact General Standards Corporation if additional API functionality is required.

3.1. Overview

This extension alters neither the requirements for making use of the API Library nor the general procedures for using the API or an HPDI32. Refer to the corresponding section given in the API Library User Manual.

3.2. Macros

The extension interface includes the following macros. The header also contain various other utility type macros, which are provided without documentation.

3.2.1. Registers

The following table gives the complete set of PRINT specific registers. The API User Manual gives the entire set of registers provided by standard HPDI32 boards. This includes GSC Registers, PLX PCI Configuration Registers and PLX Feature Set Registers.

3.2.1.1. GSC Registers

The following table gives the complete set of PRINT specific registers. For detailed definitions of these registers refer to the applicable *HPDI32 User Manual*.

> **NOTE:** When accessing PRINT boards, applications must not use the GSC Register definitions given in `hpdi32_api.h`. Only those definitions given in `hpdi32_api_print.h` may be used.

Macros	Description
`HPDI32_PRINT_BCR`	Board Control Register (BCR)
`HPDI32_PRINT_BSR`	Board Status Register (BSR)
`HPDI32_PRINT_CPR`	Current Position Register (CPR)
`HPDI32_PRINT_ESR`	Edge Selector Register (ESR)
`HPDI32_PRINT_FDR`	FIFO Data Register (FDR)
`HPDI32_PRINT_FRR`	Firmware Revision Register (FRR)
`HPDI32_PRINT_H0FDR`	Head 0 Fire Delay Register (H0FDR)
`HPDI32_PRINT_H0FWR`	Head 0 Fire Width Register (H0FWR)
`HPDI32_PRINT_H1FDR`	Head 1 Fire Delay Register (H1FDR)
`HPDI32_PRINT_H1FWR`	Head 1 Fire Width Register (H1FWR)
`HPDI32_PRINT_H2FDR`	Head 2 Fire Delay Register (H2FDR)
`HPDI32_PRINT_H2FWR`	Head 2 Fire Width Register (H2FWR)

HPDI32_PRINT_H3FDR	Head 3 Fire Delay Register (H3FDR)
HPDI32_PRINT_H3FWR	Head 3 Fire Width Register (H3FWR)
HPDI32_PRINT_H4FDR	Head 4 Fire Delay Register (H4FDR)
HPDI32_PRINT_H4FWR	Head 4 Fire Width Register (H4FWR)
HPDI32_PRINT_H5FDR	Head 5 Fire Delay Register (H5FDR)
HPDI32_PRINT_H5FWR	Head 5 Fire Width Register (H5FWR)
HPDI32_PRINT_H6FDR	Head 6 Fire Delay Register (H6FDR)
HPDI32_PRINT_H6FWR	Head 6 Fire Width Register (H6FWR)
HPDI32_PRINT_H7FDR	Head 7 Fire Delay Register (H7FDR)
HPDI32_PRINT_H7FWR	Head 7 Fire Width Register (H7FWR)
HPDI32_PRINT_HDHR	Head Data Holdoff Register (HDHR)
HPDI32_PRINT_HSSR	Head Shift Size Register (HSSR)
HPDI32_PRINT_ICR	Interrupt Control Register (ICR)
HPDI32_PRINT_ISR	Interrupt Status Register (ISR)
HPDI32_PRINT_PCSR	Printing Control/Status Register (PCSR)
HPDI32_PRINT_QTDCR	Quadrature Transition Delay Count Register (QTDCR)
HPDI32_PRINT_STARTPR	Start Position Register (STARTPR)
HPDI32_PRINT_STOPPR	Stop Position Register (STOPPR)
HPDI32_PRINT_TAR	Tx Almost Register (TAR)

3.2.1.2. PLX PCI9080 PCI Configuration Registers

PRINT boards support the entire set of PCI Configuration Registers given in the API User Manual for 32-bit HPDI32 devices. Applications have only read access to these registers. PRINT boards identify themselves as HPDI32 boards with 32-bit PCI interfaces, which is described in the API User Manual.

3.2.1.3. PLX PCI9080 Feature Set Registers

PRINT boards support the entire set of PLX Feature Set Registers given in the API User Manual for 32-bit HPDI32 devices. Applications have only read access to these registers.

3.3. Data Types

The table below lists the API data structure that may be used when exercising the API. Access using any unlisted API data structure is discouraged since some of the underlying hardware features are either absent or have been redefined. With some of these structures applications must use caution to insure that only approved parameters are accessed since some of the underlying hardware is absent or has been redefined.

> **WARNING:** Attempts to access unsupported hardware features may result in unexpected behavior.

Approved Data Structures
gsc_version_data_t
hpdi32_callback_func_t
hpdi32_parm_config_t

3.4. Functions

The table below lists the API service calls that may be used when exercising the API. Access using any unlisted API service is discouraged since some of the underlying hardware features are either absent or have been redefined. With some of these services applications must use caution to insure that only approved parameters are accessed since some of the underlying hardware is absent or has been redefined.

WARNING: Attempts to access unsupported hardware features may result in unexpected behavior.

Approved API Services	Notes
hpdi32_api_status()	
hpdi32_board_count()	This service does not distinguish between PRINT and non-PRINT boards. The count returned refers to all HPDI32 devices and variations recognized.
hpdi32_close()	
hpdi32_init()	
hpdi32_io_wait()	
hpdi32_irq_wait()	
hpdi32_open()	This service does not distinguish between PRINT and non-PRINT boards. It is the application's responsibility to make the distinction.
hpdi32_parm_config()	
hpdi32_parm_config_st()	
hpdi32_reg_mod()	Applications must use the HPDI32_PRINT_XXX macros when accessing GSC firmware registers.
hpdi32_reg_read()	Applications must use the HPDI32_PRINT_XXX macros when accessing GSC firmware registers.
hpdi32_reg_write()	Applications must use the HPDI32_PRINT_XXX macros when accessing GSC firmware registers.
hpdi32_reset()	
hpdi32_version_get()	
hpdi32_write()	

3.5. Configuration Parameters

It is recommended that applications configure PRINT boards by accessing individual parameters one at a time. Attempting to use the category level services and structures is discouraged as some of the underlying hardware may be either absent or redefined.

WARNING: Attempts to access unsupported hardware features may result in unexpected behavior.

3.5.1. Cable Parameters

Application must not access the Cable Parameters since some of the underlying hardware features are either absent or have been redefined.

WARNING: Attempts to access unsupported hardware features may result in unexpected behavior.

3.5.2. FIFO Parameters

The following tables identify the FIFO Parameters and associated "which" bits that may be used. The macros may be used in any legitimate combination without additional limitations. Access using any unlisted parameter or "which" bit is discouraged since some of the underlying hardware features are either absent or have been redefined.

WARNING: Attempts to access unsupported hardware features may result in unexpected behavior.

Approved Parameters
HPDI32_FIFO_ALMOST_LEVEL
HPDI32_FIFO_RESET

HPDI32_FIFO_SIZE
HPDI32_FIFO_STATUS
HPDI32_FIFO_TRANSFER_SIZE

Approved Which Bits
HPDI32_WHICH_AE
HPDI32_WHICH_AF
HPDI32_WHICH_TX

3.5.3. I/O Parameters

The following tables identify the I/O Parameters and associated "which" bits that may be used. The macros may be used in any legitimate combination without additional limitations. Access using any unlisted parameter or "which" bit is discouraged since some of the underlying hardware features are either absent or have been redefined.

> **WARNING:** Attempts to access unsupported hardware features may result in unexpected behavior.

Approved Parameters
HPDI32_IO_ABORT
HPDI32_IO_ABORTED
HPDI32_IO_BUFFER_POINTER
HPDI32_IO_BUFFER_SIZE
HPDI32_IO_CALLBACK_ARG
HPDI32_IO_CALLBACK_FUNC
HPDI32_IO_DATA_SIZE
HPDI32_IO_DMA_CHANNEL_SEL
HPDI32_IO_DMA_CONTROL_MODE
HPDI32_IO_DMA_PRIORITY
HPDI32_IO_MODE
HPDI32_IO_OVERLAP_ENABLE
HPDI32_IO_PIO_THRESHOLD
HPDI32_IO_SINGLE_CYCLE
HPDI32_IO_STATUS
HPDI32_IO_TIMEOUT

Approved Which Bits
HPDI32_WHICH_AE
HPDI32_WHICH_AF
HPDI32_WHICH_TX

3.5.3.1. I/O Parameter: Single Cycle

PRINT applications must set the HPDI32_IO_SINGLE_CYCLE parameter to its PRESENT option when performing Demand Mode DMA based writes with 16-bit or 8-bit data. Using the ABSENT option in this case will reduce throughput and efficiency significantly. In all other I/O configuration circumstances this parameter can be ignored.

3.5.4. Interrupt Parameters

The following tables identify the Interrupt Parameters and associated "which" bits that may be used. The macros may be used in any legitimate combination without additional limitations. Access using any unlisted parameter or "which" bit is discouraged since some of the underlying hardware features are either absent or have been redefined.

WARNING: Do not enable any of the interrupts accessible from the Printing Control/Status Register. Doing so may result in a system lockup since the API Library includes no support for servicing these interrupts.

WARNING: Attempts to access unsupported hardware features may result in unexpected behavior.

Approved Parameters
HPDI32_IRQ_CALLBACK_ARG
HPDI32_IRQ_CALLBACK_FUNC
HPDI32_IRQ_ENABLE
HPDI32_IRQ_STATE

Approved Which Bits
HPDI32_WHICH_IRQ_TX_AE
HPDI32_WHICH_IRQ_TX_AF
HPDI32_WHICH_IRQ_TX_E
HPDI32_WHICH_IRQ_TX_F

3.5.5. Miscellaneous Parameters

The following table identifies the Miscellaneous Parameters that may be used. Access using any unlisted parameter is discouraged since some of the underlying hardware features are either absent or have been redefined.

WARNING: Attempts to access unsupported hardware features may result in unexpected behavior.

Approved Parameters
HPDI32_MISC_FAVOR_TX
HPDI32_MISC_FEATURES
HPDI32_MISC_MAP_GSC_REGS
HPDI32_MISC_MAP_GSC_REGS_PTR
HPDI32_MISC_MAP_PLX_REGS
HPDI32_MISC_PCI_BUS_WIDTH
HPDI32_MISC_STRICT_ARGUMENTS

3.5.6. Receiver Parameters

Application must not access these parameters since some of the underlying hardware features are either absent or have been redefined.

WARNING: Attempts to access unsupported hardware features may result in unexpected behavior.

3.5.7. Transmitter Parameters

The following table identifies the Transmit Parameters that may be used. Access using any unlisted parameter is discouraged since some of the underlying hardware features are either absent or have been redefined.

WARNING: Attempts to access unsupported hardware features may result in unexpected behavior.

Approved Parameters
HPDI32_TX_AUTO_START

HPDI32_TX_ENABLE
HPDI32_TX_FLOW_CONTROL
HPDI32_TX_STATE

Document History

Revision	Description
December 29, 2004	Some changes to file and directory names. Minor typo fixes. Updated to API release 4.0.0.7.
June 17, 2004	Added information on the I/O Single Cycle parameter.
November 14, 2003	Initial release.