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KEITHLEY

PDISO-8

User's Guide



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PDISO-8
User's Guide

Revision E - April 2001
Part Number: 70850

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Safety Precautions

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product. Refer to the manual for complete product specifications.

If the product is used in a manner not specified, the protection provided by the product may be impaired.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating properly, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

Keithley products are designed for use with electrical signals that are rated Installation Category I and Installation Category II, as described in the International Electrotechnical Commission (IEC) Standard IEC 60664. Most measurement, control, and data I/O signals are Installation Category I and must not be directly connected to mains voltage or to voltage sources with high transient over-voltages. Installation Category II connections require protection for high transient over-voltages often associated with local AC mains connections. Assume all measurement, control, and data I/O connections are for connection to Category I sources unless otherwise marked or described in the Manual.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. **A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.**

Operators of this product must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, **no conductive part of the circuit may be exposed.**

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, make sure the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

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When installing equipment where access to the main power cord is restricted, such as rack mounting, a separate main input power disconnect device must be provided, in close proximity to the equipment and within easy reach of the operator.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

If  or  is present, connect it to safety earth ground using the wire recommended in the user documentation.

The  symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The  symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The **WARNING** heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits, including the power transformer, test leads, and input jacks, must be purchased from Keithley Instruments. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be purchased from other suppliers as long as they are equivalent to the original component. (Note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product.) If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, use a damp cloth or mild, water based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

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Table of Contents

Preface

1 Overview

Features and Applications 1-1
Supporting Software 1-2
Accessories 1-3

2 Functional Description

3 Installation

Important Safety Instructions 3-2
Inventorying Required Installation Resources 3-2
Installing DriverLINX Software and Documentation 3-3
Configuring Your Installation 3-6
Preparing and Installing Your Board 3-7
Unwrapping and Inspecting the Board 3-7
Setting the Board Address and Response Switches 3-8
Installing the Board 3-11
Checking Your Installation 3-11
I/O Bit Tests 3-12
General Information 3-12
Output Set Test 3-16
Input Read Test 3-20

4 Cabling and Wiring

Attaching an STA-U or STP-37/FC 4-2
Attaching an STC-37 4-3
Usage Information 4-5
Using Relay Outputs 4-5
Using Isolated Control Inputs 4-6

5 Programming

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6 Troubleshooting
Problem Isolation 6-1
Testing the I/O 6-1
I/O Bit Tests 6-2
General Information 6-2
Output Set Test 6-6
Input Read Test 6-10
Testing the Board and Host Computer 6-11
Testing the Accessory Slot and I/O Connections 6-11
Technical Support 6-12

A Specifications

B Connector Pin Assignments

C Register Maps
Relay Output Register Data Format C-2
Isolated Control Input Register Data Format C-3

Index

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List of Figures

Figure 2-1 Block Diagram of the PDISO-8 2-1
Figure 3-1 Switch Locations 3-8
Figure 3-2 8-Position Response Switch 3-10
Figure 3-3 An AIO Panel example 3-12
Figure 3-4 DIO channel tab example 3-13
Figure 3-5 Configuring the digital I/O channels as inputs and outputs 3-15
Figure 3-6 Configuring channel 0 for output bit pattern A 3-15
Figure 3-7 An AIO Panel example 3-17
Figure 3-8 Configuring the digital I/O channels as inputs and outputs 3-18
Figure 3-9 Configuring channel 0 for output bit pattern A 3-18
Figure 3-10 Configuring channel 0 for output bit pattern B 3-19
Figure 4-1 Pin Assignments for the Main I/O Connector . . 4-1
Figure 4-2 Attaching an STA-U or STP-37/FC to a PDISO-8 Board 4-2
Figure 4-3 Layout of STC-37 Screw Terminal Connector Panel 4-3
Figure 4-4 Attaching an STC-37 Accessory 4-4
Figure 4-5 Adding a Snubber Network Across Relay Contacts 4-5
Figure 4-6 Equivalent Circuit of an Isolated Control Input 4-6
Figure 4-7 Unfiltered Opto-Isolator Output with AC Input 4-7
Figure 6-1 An AIO Panel example 6-2
Figure 6-2 DIO channel tab example 6-3
Figure 6-3 Configuring the digital I/O channels as inputs and outputs 6-5
Figure 6-4 Configuring channel 0 for output bit pattern A . 6-5
Figure 6-5 An AIO Panel example 6-7
Figure 6-6 Configuring the digital I/O channels as inputs and outputs 6-8
Figure 6-7 Configuring channel 0 for output bit pattern A . 6-8
Figure 6-8 Configuring channel 0 for output bit pattern B . 6-9
Figure B-1 Main I/O Connector Pin Assignments B-1

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List of Tables

Table 3-1 Values of Base Address Switch Positions 3-9
Table A-1 Output Specifications A-1
Table A-2 Isolated Control Input Specifications A-2
Table A-3 General Environmental Specifications A-2
Table A-4 Power Consumption Specifications A-2
Table C-1 I/O Map and Functions C-2
Table C-2 Relay Addresses in the Relay Output Register . . C-2
Table C-3 Input Addresses in the Isolated Control Input Register C-3

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Preface

The *PDISO-8 User's Guide* is intended to help you understand the installation, functions, and operation of the PDISO-8 board. This guide describes board capabilities, board setup and installation, use of wiring accessories, included-software characteristics and installation, and combined board and software configuration. There are also sections on usage and troubleshooting.

To follow the information and instructions contained in this manual, you must be familiar with data acquisition principles, with the Windows® 95/98/NT operating system, and with your application.

The *PDISO-8 User's Guide* is organized as follows:

- Section 1 describes board features, supporting software, and accessories.
- Section 2 summarizes functional information about the board. This section contains a block diagram and brief descriptions of I/O.
- Section 3 describes important safety information, how to install the DriverLINX software and documentation, how to unpack, set up, and install the board, and how to configure and check the installation.
- Section 4 shows the preferred methods for making I/O (input/output) connections, using the available accessories and cables. This section also contains usage notes.
- Section 5 briefly describes the need to program through the DriverLINX interface provided with your board, and tells how to access the extensive DriverLINX documentation.
- Section 6 contains information on testing the inputs and relays and for isolating and determining the source of operating problems. This section also contains instructions for obtaining technical support.

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- Appendix A contains specifications for the PDISO-8.
- Appendix B contains pin assignments for the main I/O connector of the PDISO-8.
- Appendix C provides register maps, for background reference only (you program the PDISO-8 board through the DriverLINX interface, not at the register level).
- An index completes the manual.

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1

Overview

The PDISO-8 is a low-cost, 8-channel, isolated input/output, interface board for control and sensing operations. The combined board and supplied software installs and runs in any IBM PC-compatible computer that runs the Microsoft Windows® 95/98/NT operating system (Pentium®-series processor recommended). This section lists PDISO-8 features and applications, summarizes features of the DriverLINX software that is supplied with the board, and describes available PDISO-8 accessories.

Features and Applications

Features of the PDISO-8 are as follows:

- Eight optically isolated inputs
- Eight electromechanical relay outputs
- 3A contact ratings

Typical applications for the PDISO-8 are as follows:

- Energy management
- Product test
- Security control
- Annunciation
- Laboratory automation
- Factory automation

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Supporting Software

DriverLINX software is supplied by Keithley with the PDISO-8 board. DriverLINX provides convenient interfaces to configure and set I/O bits without register-level programming.

Most importantly, however, DriverLINX supports those programmers who wish to create custom applications using Visual C/C++, Visual Basic, or Delphi. DriverLINX accomplishes foreground and background tasks to perform data acquisition. The software includes memory and data buffer management, event triggering, extensive error checking, and context sensitive online help.

More specifically, DriverLINX provides application developers a standardized interface to over 100 services for creating foreground and background tasks for the following:

- Analog input and output
- Digital input and output
- Time and frequency measurement
- Event counting
- Pulse output
- Period measurement

In addition to basic I/O support, DriverLINX also provides:

- Built-in capabilities to handle memory and data buffer management
- A selection of starting and stopping trigger events, including pre-triggering, mid-point triggering and post-triggering protocols
- Extensive error checking
- Context-sensitive on-line help system

DriverLINX is essentially hardware independent, because its portable APIs work across various operating systems. This capability eliminates unnecessary programming when changing operating system platforms.

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Accessories

The following accessories are available for use with PDISO-8 boards **at voltages up to 30V RMS, 42.4V peak, or 60VDC:**

- **STA-U** — screw terminal panel. This accessory connects to the main I/O connector of a PDISO-8 through a C1800 cable to connect all I/O lines to labeled screw terminals.
- **STC-37** — screw terminal connector panel. This accessory connects directly the main I/O connector of a PDISO-8 to provide general-purpose, screw-terminal connections in a compact form factor.
- **STP-37/FC** — screw terminal panel with a female DB-37 connector. This accessory connects to the main I/O connector of a PDISO-8 through a C-1800/M cable. The printed-circuit area of this accessory is covered to provide extra protection against personal or tool contact with signals.
- **C1800** — cable. The C1800 is an 18-inch ribbon cable terminated at each end with a 37-pin, D-type connector.
- **C-1800/M** — cable. The C-1800/M is an 18-inch ribbon cable terminated at one end with a connector to fit the main I/O connector of a board and terminated at the other end with a connector to fit the I/O connector of an STP-37/FC accessory.

Refer to Section 4 for information on connecting these accessories to PDISO-8 boards.

Warning



Do not use the STA-U, STP-37/FC, C1800, and C-1800/M accessories at voltages above 30V RMS, 42.4V peak, or 60VDC. These accessories are rated for 30V RMS, 42.4V peak, or 60VDC maximum. Use at higher voltages may result in shock hazard.

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2

Functional Description

This section describes the features of the PDISO-8 board to familiarize you with the operating options and to enable you to make the best use of your board. Figure 2-1 shows a block diagram of the PDISO-8 board.

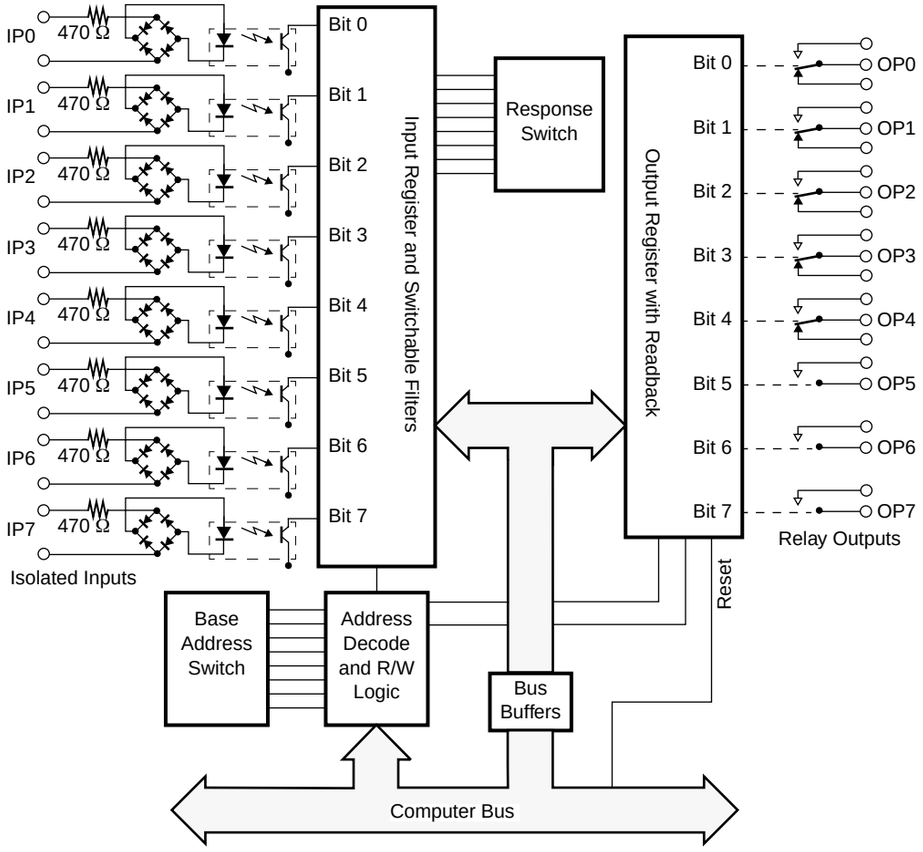


Figure 2-1. Block Diagram of the PDISO-8

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The eight electro-mechanical relay outputs (contact closures) are addressed as a single I/O byte. Five of these relays are Form C (SPDT) contacts, and three of the relays are Form A (SPST and normally open). The relay contacts are silver alloy and are rated at 3A at 125VAC or 28VDC with a resistive load. The state of the relays can be determined by reading back the data from the same I/O port.

The eight individual, optically isolated inputs can be read as a single I/O port byte. Inputs are not polarity-sensitive and can be driven from DC or AC (50 to 1000Hz) control voltages in the range of 5 to 24V_{rms}. Each input includes a switchable, slow/fast filter with a time constant of 5ms. For AC input voltages, you must switch in the filter. For DC input voltages, you can switch out the filter to obtain response speeds of less than 50µs, or you can switch in the filter for maximum noise suppression or contact debouncing. You can also mix inputs of AC and DC voltages, and you can drive inputs from standard 12/24VAC control transformers.

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3

Installation

This section describes installation and configuration of the PDISO-8 board and software. Read this section before you attempt to install and use your PDISO-8 board.

After discussing important safety instructions for the PDISO-8 board, this section contains the following procedures, in the order in which they are to be performed:

- Inventorying installation resources
- Installing the DriverLINX software needed to operate your PDISO-8 board
- Configuring the installation in software
- Unpacking and inspecting the board, setting the base address and response filters of the board, and installing the board in your computer
- Checking the installation

If you encounter any problems with the installation, refer to Section 6 for troubleshooting information.

Note: Install the DriverLINX software before installing the PDISO-8 board. Otherwise, the device drivers will be more difficult to install.

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Important Safety Instructions

PDISO-8 boards are prominently labeled to warn of shock hazard. Before you install your PDISO-8 board, perform the following steps:

1. Read the warnings in this section.
2. When installing, cabling, and wiring your board, pay close attention to the warnings on the board labels.
3. When using the board, do not exceed the ratings specified in Appendix A.

Warning



Because you can connect the relay contacts of a PDISO-8 board to high voltage, you can turn some areas of the board surface into a shock hazard. A shock hazard can exist on those board areas even when your computer is powered off. To protect you from exposure to areas of shock hazard, Keithley furnishes PDISO-8 boards only with fully installed protective covers (front and rear), attached to the board on each side by nylon screws. While you can remove the covers to service a PDISO-8 board, **you must never use this board with its covers removed!** In addition, you must disconnect all cables and wiring before servicing this board.

The procedures in the section are intended for qualified service personnel. Do not perform these procedures unless you are qualified to do so.

Inventorying Required Installation Resources

Before installing DriverLINX and the board, do the following:

1. Inventory your PDISO-8 board's configuration settings.
2. Determine the resources your PDISO-8 board requires.
3. Inventory your computer's resources already allocated to other installed devices.
4. Determine whether your computer has sufficient resources for your PDISO-8 board.

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5. Determine whether your PDISO-8 board can use your computer's free resources.
6. Continue with the next section, "Installing DriverLINX Software and Documentation."

Note: *The DriverLINX Installation and Configuration Guide*, Section 1, amplifies the inventory process in checklist items 1-5. (Disregard the rest of the checklist items for now.) To display this manual from your DriverLINX PIO Series CD-ROM, open the Windows Explorer, then double click on **X:\Drvlinx4\Docs\Instconf.pdf**, where **X** = the letter of the CD-ROM drive. Acrobat Reader must already be installed on the other system. If necessary, you can first install Acrobat Reader directly from the CD-ROM by double clicking **X:\Acrobat\setup.exe**.

Installing DriverLINX Software and Documentation

Note: Even if DriverLINX versions other than the PIO Series version are already installed on your system, you must also install the PIO Series DriverLINX version. In the process, some DriverLINX capabilities shared by all boards may be upgraded (test utilities, for example).

This section discusses installation of drivers, interfaces, and documentation. The component installation options provided by the DriverLINX setup program are as follows:

- **Install Drivers** — This required component installs only the files you need for configuring your hardware and running third-party data-acquisition applications that require DriverLINX.
- **Install Interfaces** — This optional component installs the files and example programs that you will need to develop custom applications for DriverLINX using C/C++, Visual Basic, and Delphi.
- **Install Documentation** — This optional component installs electronic documentation for DriverLINX that you can read, search, and print using the Adobe Acrobat Reader.
- **Install Acrobat** — This optional component installs the Adobe Acrobat Reader for the DriverLINX electronic documentation.

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Install the DriverLINX software and board as follows:

1. Place the DriverLINX PIO Series CD-ROM in your drive and wait a few seconds. On most systems, setup starts automatically. If not, run the setup.exe file, found in the root directory of the CD-ROM.

   A DriverLINX Browser Introduction screen appears. Thereafter, the DriverLINX CD Navigator screen appears automatically after waiting a few seconds or after clicking **Next**.

Note: On the DriverLINX CD Navigator and other DriverLINX Browser screens, place the cursor over a menu item to see an explanation. A star next to a menu item means that it was selected previously.

Before continuing with this installation, Keithley suggests clicking **Read Me First** on the DriverLINX CD Navigator and reviewing the brief information that appears.

---

2. On the DriverLINX CD Navigator screen, click **Install DriverLINX**. An Install These DriverLINX Components screen appears.
3. Click **Install Drivers**, and then follow the series of on-screen instructions. When done, the Install These DriverLINX Components screen reappears.
4. If you do not plan to develop custom application software for your PDISO-8 board, then skip to step 5. If you do plan to develop custom application software, you must install DriverLINX interfaces before writing the software. Install them now by clicking **Install Interfaces** and following the series of on-screen instructions. When done, the Install These DriverLINX Components screen reappears.
5. Click **Install Documentation** and follow the series of on-screen instructions. This step installs the manuals. When done, the Install These DriverLINX Components screen reappears.
6. If Acrobat Reader is not already installed on your system, install it now. You need Acrobat Reader to read the manuals, a section of which you must access in step 9. Click on **Install Acrobat** and follow the series of on-screen instructions. When done, the Install These DriverLINX Components screen reappears.

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7. Click **Exit.** Then, on the screen that appears saying "Thank you for using DriverLINX," click **Done**. The System Settings Changed dialog box appears.
8. On the System Settings Changed dialog box, click **No**. (The system will be rebooted and configured later under "Configuring Your Installation" on page 3-6.) The screen returns to the Windows desktop.
9. Print out one section of a DriverLINX manual that you will briefly review later during system configuration. Proceed as follows:
    a. In the **Start** menu under **Programs** → **DriverLINX,** click **On-line Manuals.** A menu document appears.
    b. In the menu document, scroll until you find the major category **Configuration**.
    c. Under **Configuration** click **Hardware References**. A list of documents appears.
    d. In the list of documents, click **Keithley PIO Series**. Acrobat Reader opens and the manual entitled *Using DriverLINX with Your Hardware—Keithley PIO Series* appears.
    e. Print the following section from the *Using DriverLINX with Your Hardware—Keithley PIO Series* manual: "Configuring the PIO Series."

Note: If your data acquisition system is not connected to a printer, you can display and print the *Using DriverLINX with Your Hardware—Keithley PIO Series* manual sections from another system, directly from the CD-ROM (without installing anything). To display the manual, open the Windows Explorer, then double click on **X:\Drvlinx4\Docs\Notes\kmbpio.pdf**, where **X** = the letter of the CD-ROM drive. Acrobat Reader must already be installed on the other system. If necessary, you can first install Acrobat Reader directly from the CD-ROM by double clicking **X:\Acrobat\setup.exe**.

---

10. Continue with the next section, "Configuring Your Installation."

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Configure the installation as follows:

1. Locate and briefly review the DriverLINX manual section, "Configuring the PIO Series," that you printed earlier during step 9 of "Installing DriverLINX Software and Documentation." Reviewing this section will help prepare you to input information and select options when configuring your installation.

Note: Be sure to note and follow all configuration differences between installations for Windows NT and Windows 95/98.

---

2. Reboot your computer. The DriverLINX Plug and Play Wizard appears on your screen automatically at the end of the boot cycle.

Note: If you do not run the DriverLINX Plug and Play Wizard now, it will not reappear during the current computer session, although it may appear after a subsequent reboot. If you wish to configure your board sometime later, you can start the Plug and Play Wizard manually from a batch file. In the Windows Explorer, double click **X:\Drvlinx4\Help\kmbpio.bat**, where **X** is the letter of the drive on which DriverLINX is installed.

---

3. On the Plug and Play Wizard, click **Wizard** and follow the series of on-screen instructions that appear. The wizard will first lead you through the steps of installing your hardware—from a software viewpoint—and configuring it.

Note: If your operating system is Windows NT, use Windows NT Diagnostics to find the free resources that the Plug and Play Wizard asks you to assign. However, if your board requires an interrupt, to reliably find a free ISA interrupt you may need to: 1) configure your computer as having a non-Plug and Play operating system, using BIOS setup, and then 2) individually assign the interrupt to the ISA bus.

---

4. Continue with the next section, "Preparing and Installing Your Board."

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Caution: Ensure that the computer is turned OFF before installing or removing a board. Installing or removing a board while power is on can damage your computer, the board, or both.

Handle the board in a static-controlled workstation; wear a grounded wrist strap. Discharge static voltage differences between the wrapped board and the handling environment before removing the board from its protective wrapper. Failure to discharge static electricity before and during handling may damage semiconductor circuits on the board.

Handle the board using the mounting bracket. Do not touch the circuit traces or connector contacts when handling the board.

Unwrapping and Inspecting the Board

Caution: Your computer must be turned OFF and grounded before performing the following procedure.

After you remove the wrapped board from its outer shipping carton, proceed as follows:

1. The board is packaged at the factory in an anti-static wrapper that must not be removed until you have discharged any static electricity by either of the following methods:
   - If you are equipped with a grounded wrist strap, you discharge static electricity as soon as you hold the wrapped board.
   - If you are not equipped with a grounded wrist strap, you can discharge static electricity by holding the wrapped board in one hand while placing your other hand firmly on a metal portion of the computer chassis.
2. Carefully unwrap the board from its anti-static wrapping material. (You may wish to store the wrapping material for future use.)

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3. Inspect the board for signs of damage. If damage is apparent, arrange to return the board to the factory (see “Technical Support” on page 6-12).
4. Check the remaining contents of your package against the packing list to be sure your order is complete. Report any missing items, immediately.
5. Continue with the next procedure, “Setting the Board Address and Response Switches.”

Setting the Board Address and Response Switches

To physically configure the PDISO-8 board, you must set two 8-position DIP switches: the base address switch and the response switch. These two switches are located as shown in Figure 3-1.

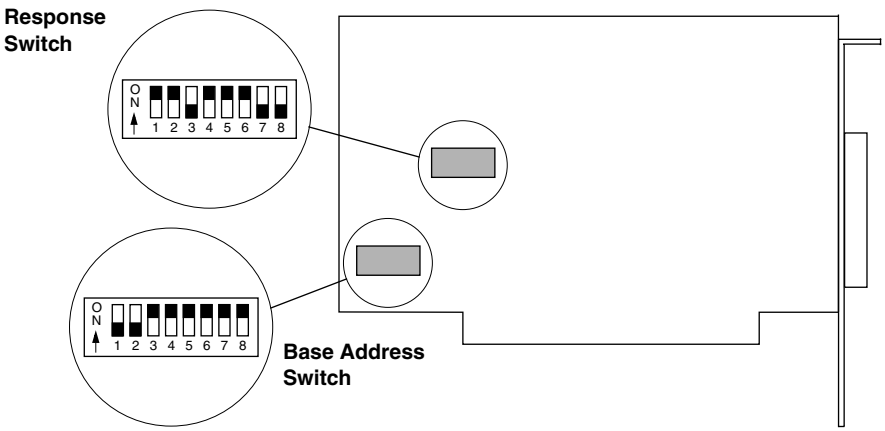


Figure 3-1. Switch Locations

The following subsections describe the settings for these switches.

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Setting the Base Address Switch

The base address switch is preset at the factory for 300h (see Figure 3-1). If 300h was also assigned to the board when you ran the DriverLINX Plug and Play Wizard, you do not need to reset the address switch. Otherwise, reset the base address switch to conform to the base address assigned when you ran the Wizard.

The PDISO-8 requires four consecutive I/O addresses, but only two are used: one is for output/readback and the other is for input. You can set the base address on any 4-byte boundary using the Base Address DIP switch. If you install additional PDISO-8 boards, you must set a different base address for each board.

Note: When a position of the base address switch is set in the ON direction, it has zero value. For example, Figure 3-1 shows the switch positions set for a value of 300h or 768 decimal.

Table 3-1 lists the values for each position of the base address switch.

Table 3-1. Values of Base Address Switch Positions

Switch Position	Address Line	Value When Switch Is Off	
		Decimal	Hexadecimal
1	9	512	200
2	8	256	100
3	7	128	80
4	6	64	40
5	5	32	20
6	4	16	10
7	3	8	8
8	2	4	4

Note: Switch positions, as shown in Table 3-1, are marked on the switch while corresponding address-line numbers are marked on the board and just above the switch.

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The address you specify must be within the range of 200 to 3FCh (512 to 1020 decimal) and on a 4-byte boundary.

Continue with the next procedure, “Setting the Response Switch.”

Setting the Response Switch

Each digital input channel includes a switchable, single-pole, RC filter with a time constant of 5ms. The response switch contains a separate position for each of the digital input channels, allowing you to switch the filters individually in or out. Refer to Figure 3-2 to see which response switch positions correspond to which digital channel.

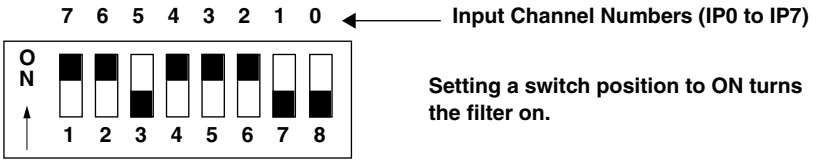


Figure 3-2. 8-Position Response Switch

Note: Switch positions are marked on the switch while corresponding input-channel numbers (corresponding to channel numbers IP0 to IP7) are marked on the board and just above the switch.

If you are using AC input signals for certain channels, you must set the filter switch to ON for each of those channels. A channel filter fills in the portions of time that the AC input is at or close to zero voltage, putting the signal read from the board at a continuous logic high when the input is energized.

If you are using DC input signals, use of the filter is optional. If you require a fast response (less than 50µs), turn the filter off. If you want a slow response (about 5 to 10ms) for rejecting spurious noise or contact bouncing, turn the filter on.

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Installing the Board

Caution: Installing or removing a board while power is on can damage your computer.

Use the following steps to install a PDISO-8 board in an accessory slot of your computer:

1. Turn off power to the computer and all attached equipment.
2. Remove the computer chassis cover.
3. Select an unoccupied accessory slot, and remove the corresponding blank plate from the I/O connector panel.
4. Insert and secure the PDISO-8 in the selected slot.
5. Replace the computer cover.
6. Continue with the next section, "Checking Your Installation."

Checking Your Installation

The ability to start the DriverLINX AIO Panel utility, which is available after you install DriverLINX, verifies that DriverLINX and the board are installed and configured satisfactorily.

You can also test the functions of the PDISO-8 board, without needing to write an application program, by connecting appropriate digital signals and observing the responses with the DriverLINX AIO Panel. Before connecting signals, first read the next Section, "Cabling and Wiring."

To access the AIO Panel, do the following:

1. Click the Windows 95/98/NT **Start** tab.
2. In the **Start** menu, click **Programs**.
3. Find the **DriverLINX** → **Test Panels** entry, under which you should find the **AIO Panel** entry.
4. Click on the **AIO Panel** entry. The **Analog I/O Panel** should appear.

After you configure and check your installation, you can attach accessories as needed and wire the external signals to the board. Refer to Section 4, "Cabling and Wiring," for instructions.

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General Information

1. Start the AIO Panel as follows:
   a. In the **Start** menu, click **Programs**.
   b. Find the **DriverLINX ▸ Test Panels** folder, under which you should find the **AIO Panel** entry.
   c. Click on the **AIO Panel** entry. The **Analog I/O Panel** should appear, similar to the example in Figure 3-3. (If you have other DriverLINX devices installed in addition to the digital input/output card you are testing, they will also be listed. In that case, select the desired digital I/O card and the proper device number before proceeding.)

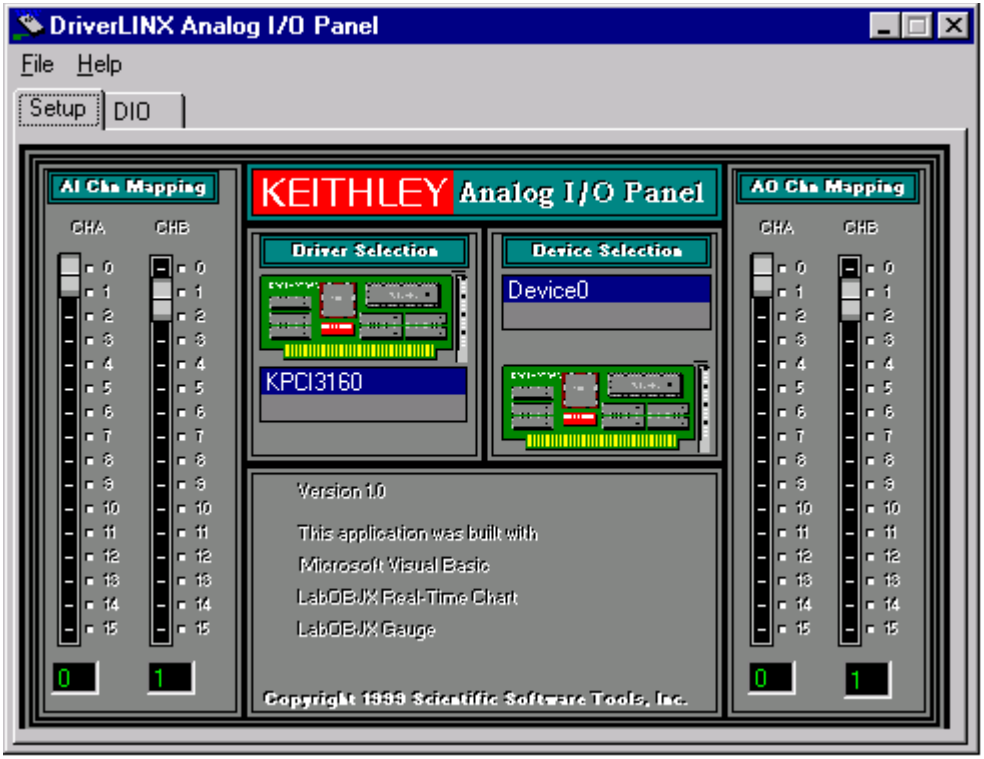


Figure 3-3. An AIO Panel example

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Note: The “Driver Selection” column will show the actual DriverLINX driver(s) you have installed.

2. On the **AIO Control Panel**, click the **DIO** tab.

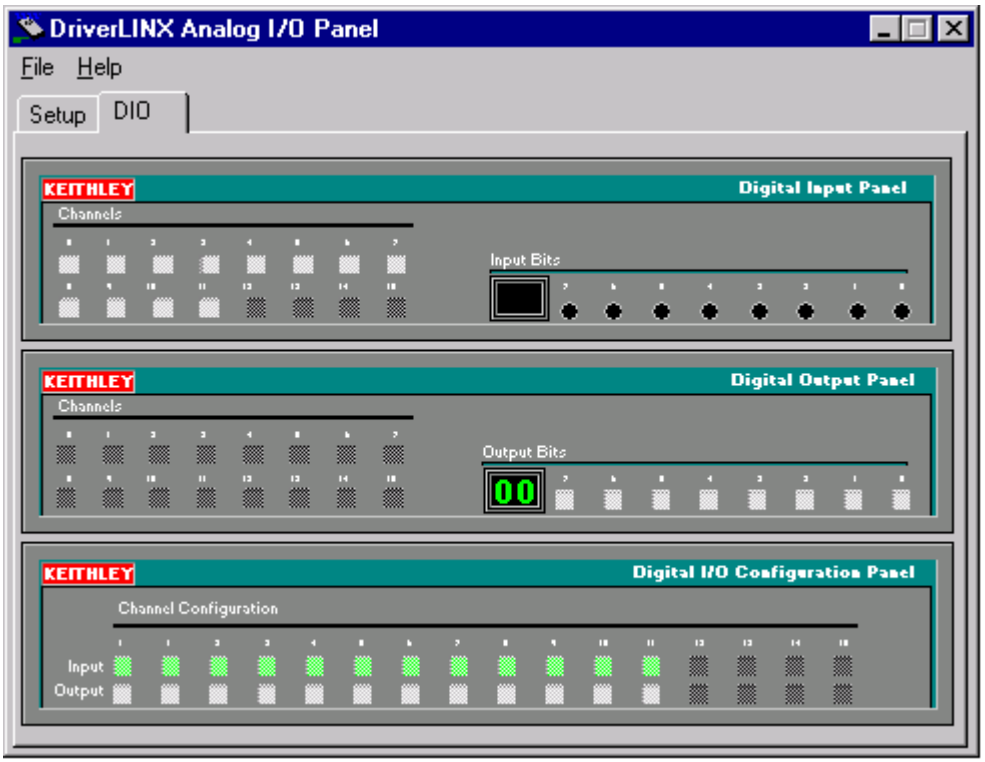


Figure 3-4. DIO channel tab example

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Note: The on-screen digital I/O controller works as follows:

- Channels 0 to 15 refer to the 8-bit general-purpose registers of your digital input-output card. (Depending on which card is used, the number of valid 8-bit registers will vary.) Bits displayed on the **Digital Input Panel** and the **Digital Output Panel** are numbered 0-7 for every channel. Refer elsewhere in this manual for a description of the available ports and their direction.
- Invalid channels and settings appear as dark gray squares. For example:
  - Non-existent channels always appear as dark gray squares.
  - Channels configured as inputs will appear as dark gray squares on the output panel.
- Valid channels and settings appear as white squares when OFF and green squares when ON. (When the manual is printed in black and white, valid channels and settings appear as white squares when OFF and as light gray squares when ON.)
- The two-digit numeric displays under **Input Bits** and **Output Bits** show the hexadecimal values of the adjacent bit patterns.
- To configure a valid channel either for input or output, use the **Digital Channel Configuration Panel**. Click on either the **Input** or **Output** square below the channel number. Note: this selection will be disabled for channels which are fixed as input or output by hardware design.
- To turn ON output-channel bits, use the **Digital Output Panel**. First select the channel number of the bits to be turned on by clicking on the appropriate square under **Channels**. Then, turn ON a bit by clicking the appropriate square under **Output Bits**. Turn OFF a bit in the same way.
- To read an input-channel bit, use the **Digital Input Panel**. First select the channel number to be checked by clicking the appropriate square under **Channels**. Then, read the numbered bit under **Input Bits**. OFF input bits appear as black dots and ON input bits appear as green dots. (When the manual is printed in black and white, OFF input bits appear as black dots and ON input bits appear as light gray dots.)

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3. Under **Digital I/O Configuration Panel**, configure channels as shown in Figure 3-5. (Actual channels available will vary according to your hardware.)

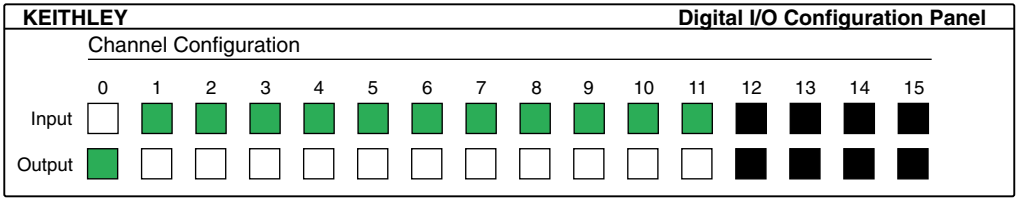


Figure 3-5. Configuring the digital I/O channels as inputs and outputs

Note: For clarity when the manual is printed in black and white, the control colors in Figure 3-5 and subsequent drawings will be shown as follows:

Illustration	Color on Actual Panel	Function
BLACK	DARK GRAY	Invalid
WHITE	LIGHT GRAY	OFF
GRAY	GREEN	ON

4. In the **Digital Output Panel** under **Channels**, click on a channel (here, channel **0**) as shown in Figure 3-6.

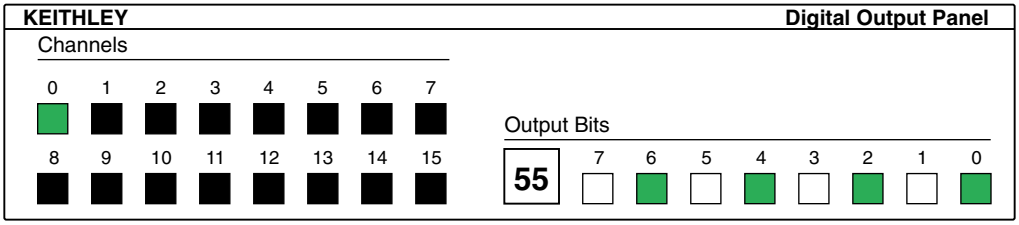


Figure 3-6. Configuring channel 0 for output bit pattern A

5. In the **Digital Output Panel** under **Output Bits**, set the bits of the channel as desired as shown in Figure 3-6. (Click on each bit position to turn it ON or OFF.)
6. In the **Digital Input Panel** under **Channels**, click on a channel to select it and display the logical state of its input lines.

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Output Set Test

The output set test checks whether logic levels measured at all output pins agree with output bit patterns set by software, using a DriverLINX graphical interface (AIO Panel).

Note: This test is performed without user circuits being connected to the outputs.

Perform the output set test as follows:

1. Ready the following equipment:
   - A digital voltmeter (DVM) or a digital multimeter (DMM) set to measure voltages, or a logic probe capable of reading TTL logic levels.
   - A suitable accessory and cable for the board being tested.
2. Turn OFF the host computer.
3. Connect the cable and accessory to your board.
4. Turn ON the host computer and boot Windows 95/98/NT.
5. Click the Windows 95/98/NT **Start** tab.
6. Start the AIO Panel as follows:
   a. In the **Start** menu, click **Programs**.
   b. Find the **DriverLINX ▸ Test Panels** folder, under which you should find the **AIO Panel** entry.
   c. Click on the **AIO Panel** entry. The **Analog I/O Panel** should appear, similar to the example in Figure 3-7. (If you have other DriverLINX devices installed in addition to the digital input/output card you are testing, they will also be listed. In that case, select the desired digital I/O card and the proper device number before proceeding.)

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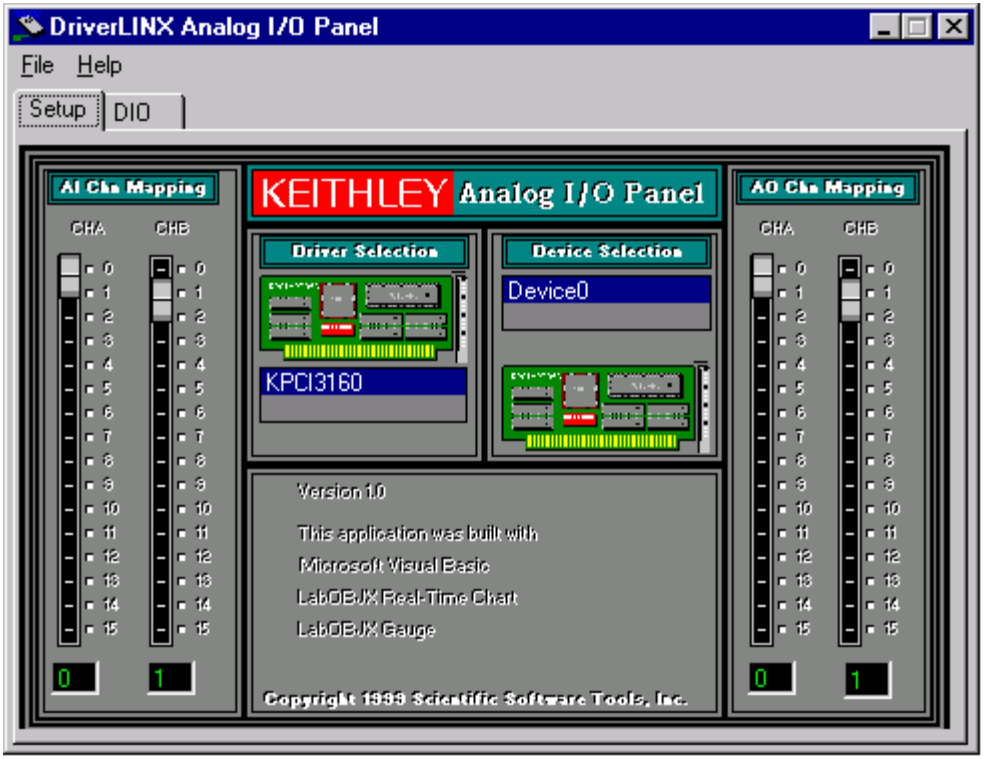


Figure 3-7. An AIO Panel example

7. On the **AIO Panel**, click the **DIO** tab.

Note: To read an input-channel bit, use the **Digital Input Panel**. First, select the channel number to be checked by clicking the appropriate square under **Channels**. Then, read the numbered bit under **Input Bits**. OFF input bits appear as black dots and ON input bits appear as green dots. (When the manual is printed in black and white, OFF input bits appear as black dots and ON input bits appear as light gray dots.) Further information about this panel, how to make changes, and how to interpret displays, is given in “I/O Bit Tests” of this section.

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8. Under **Digital I/O Configuration Panel**, configure the output channels to be tested as shown in Figure 3-8. (Actual output channels available will vary according to your hardware.)

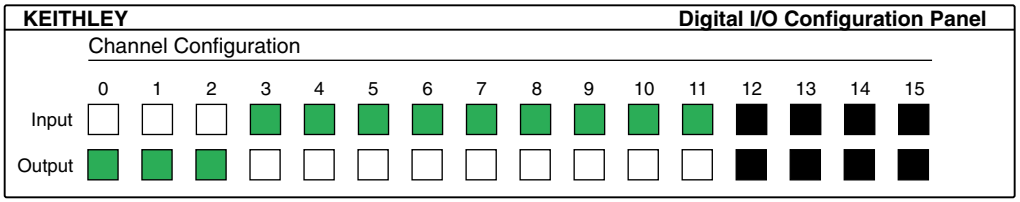


Figure 3-8. Configuring the digital I/O channels as inputs and outputs

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Note: In Figure 3-8 and subsequent drawings of digital I/O controller panels, the squares below invalid channels are colored black instead of dark gray—for clarity when the manual is printed in black and white.

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9. In the **Digital Output Panel** under **Channels**, click on an output channel (channel **0** in this example) as shown in Figure 3-9.

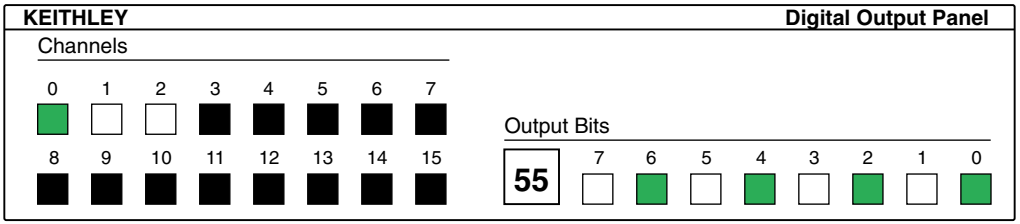


Figure 3-9. Configuring channel 0 for output bit pattern A

10. In the **Digital Output Panel** under **Output Bits**, set the bits of channel **0** for bit pattern A as shown in Figure 3-9.
11. Measure the voltage between signal ground and each bit of the output port with a DMM or DVM. Make measurements at the cabled mating connector of your accessory.

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12. Each bit set to ON in the **AIO Panel** should output a logic-high signal at the corresponding I/O terminal, reading typically about 4 volts (minimum of 2.2 volts) at a DMM/DVM. Each bit set to OFF in the **AIO Panel** should output a logic-low signal at the corresponding I/O terminal, reading typically about 0 volts (maximum of 0.8 volts) at a DMM/DVM. Do one of the following:

Note: The typical values shown are valid for boards with TTL compatible outputs. For boards with relay outputs (REL-16, PDISO-8, and PIO-32) the output will be a relay contact closure. For boards with open collector outputs (PIO-HV) use a pull up resistor to an appropriate voltage to detect output state. Refer to the hardware description in this user's guide for more details on the output's electrical specification.

- If the bit patterns set on the **AIO Panel** do not agree with the logic levels measured at the I/O terminals, the board is not functioning properly. Stop here, and determine why.
- If the bit patterns set on the **AIO Panel** agree with the logic levels measured at the I/O terminals, then repeat steps 9, 10, and 11 for remaining output channels.

13. In the **Digital Output Panel** under **Channels**, click on the output channel to test (channel **0** in this example) as shown in Figure 3-10.

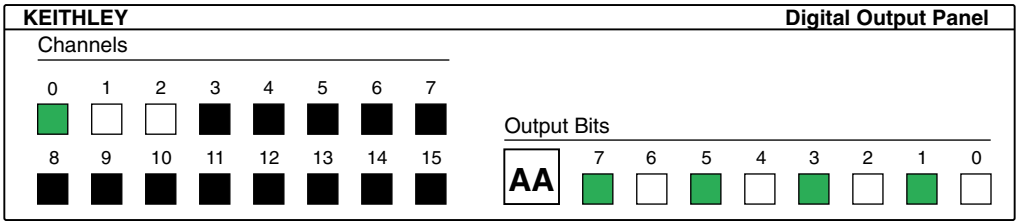


Figure 3-10. Configuring channel 0 for output bit pattern B

14. In the **Digital Output Panel** under **Output Bits**, set the bits of channel **0** for bit pattern B as shown in Figure 3-10.
15. Measure the voltage between signal ground and each bit of the output port with a DMM or DVM. Make measurements at the STA-50 terminals or the cabled mating connector that is connected to the selected CONN-3160-D1 50-pin connector.

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16. Again, each bit set to ON in the **AIO Panel** should output a logic-high signal at the corresponding I/O terminal, reading typically about 4 volts (minimum of 2.2 volts) at a DMM/DVM. Each bit set to OFF in the **AIO Panel** should output a logic-low signal at the corresponding I/O terminal, reading typically about 0 volts (maximum of 0.8 volts) at a DMM/DVM.

Note: The typical values shown are valid for boards with TTL compatible outputs. For boards with relay outputs (REL-16, PDISO-8, and PIO-32) the output will be a relay contact closure. For boards with open collector outputs (PIO-HV) use a pull up resistor to an appropriate voltage to detect output state. Refer to the hardware description in this user's guide for more details on the output's electrical specification.

- If the bit patterns set on the **AIO Panel** do not agree with the logic levels measured at the I/O terminals, the board is not functioning properly. Stop here, and determine why.
- If the bit patterns set on the **AIO Panel** do agree with the logic levels measured at the I/O terminals, and you have performed an output set test for all ports, the board is functioning properly.

17. Repeat steps 13, 14, and 15 for additional output channels.

Input Read Test

A similar test of input circuitry can be performed by applying an input signal of suitable type to each input line and verifying that the appropriate input indicator changes state. Refer to the hardware description in this user's guide for more details on the input's electrical specifications.

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4

Cabling and Wiring

Warning



The procedures in the section are intended for qualified service personnel. Do not perform these procedures unless you are qualified to do so.

Users of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product users in these circumstances must be trained to protect themselves from the risk of electric shock.

This section shows the cabling and connections required for attaching accessories and I/O lines to the main I/O connector of your PDISO-8 boards. The main I/O connector is a male, 37-pin, D-type. Pin assignments for this connector are shown in Figure 4-1.

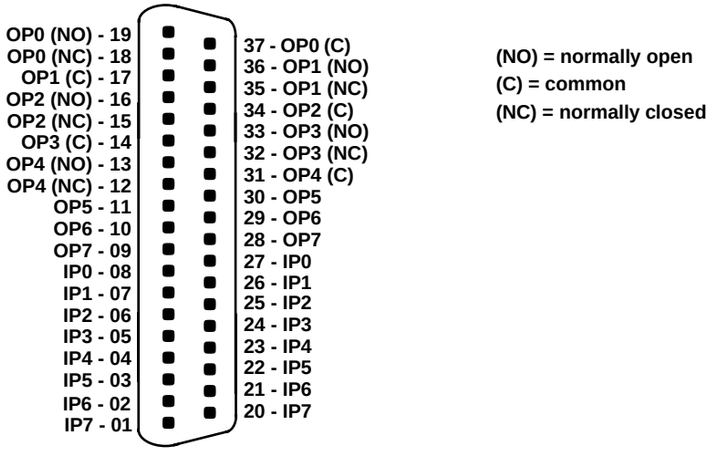


Figure 4-1. Pin Assignments for the Main I/O Connector

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Caution: To avoid electrical damage, turn off power to the computer and any attached accessories before making connections to PDISO-8 boards.

Attaching an STA-U or STP-37/FC

Warning



Do not use the STA-U, STP-37/FC, C1800, and C-1800/M accessories at voltages above 30V RMS, 42.4V peak, or 60VDC. These accessories are rated for 30V RMS, 42.4V peak, or 60VDC maximum. Use at higher voltages may result in shock hazard.

When connecting voltages up to 30V RMS, 42.4V peak, or 60VDC, only, you may attach the PDISO-8 board to an STA-U or STP-37/FC screw terminal accessory as follows:

- When attaching an STA-U accessory, use a C1800 cable.
- When attaching an STP-37/FC accessory, use a C-1800/M cable.

You make these connections as shown in Figure 4-2.

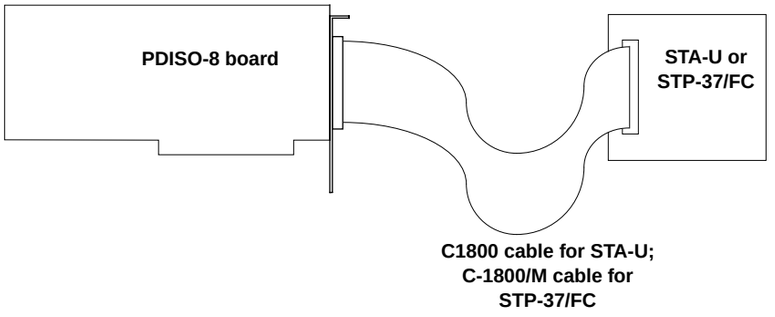


Figure 4-2. Attaching an STA-U or STP-37/FC to a PDISO-8 Board

Note: Use the STP-37/FC accessory with a C-1800/M cable for extra protection against the possibility of personal or tool contact with signals. All traces on these accessories are covered.

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Attaching an STC-37

Warning Do not use the STC-37 accessory at voltages above 30V RMS, 42.4V peak, or 60VDC. This accessory is rated for 30V RMS, 42.4V peak, or 60VDC maximum. Use at higher voltages may result in shock hazard.



The STC-37 is a screw terminal panel, as shown in Figure 4-3. The STC-37 is intended for use at voltages up to 30V RMS, 42.4V peak, or 60VDC.

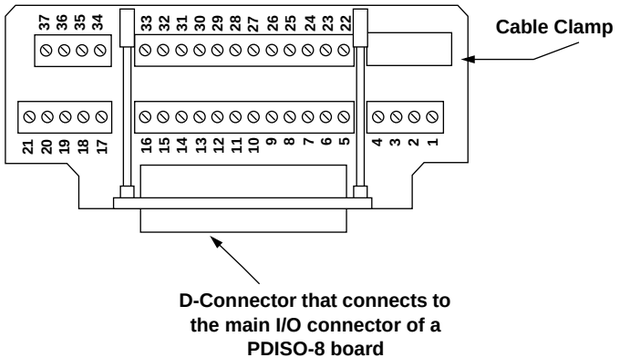


Figure 4-3. Layout of STC-37 Screw Terminal Connector Panel

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The STC-37 connects to the main I/O connector on an PDISO-8 board as shown in Figure 4-4. The screw terminal numbers of the STC-37 correspond to the pin numbers of the main I/O connector.

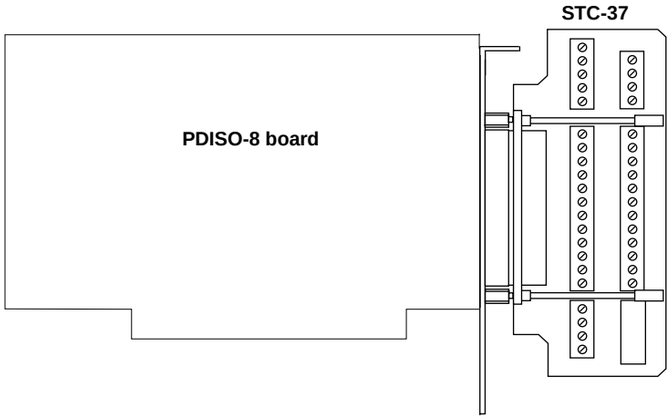


Figure 4-4. Attaching an STC-37 Accessory

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Usage Information

This section describes how to obtain the safest and most reliable use of the PDISO-8 with certain applications.

Using Relay Outputs

The relay output contacts are rated for a maximum of 3A at 28VDC or 125VAC (resistive). You should reduce these ratings for inductive loads. If switching currents are approaching maximum ratings, add a snubber network to minimize arcing and extend contact life. Figure 4-5 shows a snubber network across a relay contact.

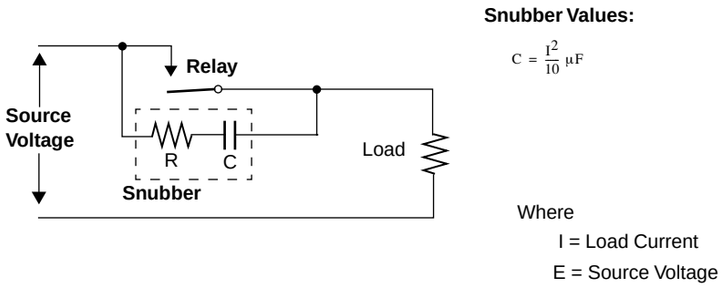


Figure 4-5. Adding a Snubber Network Across Relay Contacts

Five outputs are organized as Form C (change over) contacts. The remaining three outputs are plain Form A (normally open) contacts. Although high voltage can be switched directly by the PDISO-8 installed in your computer, you are urged to do high-voltage switching only with a complete understanding of the risks and hazards involved. These risks include electric shock from accidental contact with the board inside the computer, and possible damage to the computer through inadvertent shorts between live circuitry to the system board (caused by foreign objects or screw drivers, and so on). If you cannot be absolutely certain of avoiding these situations, you are safer limiting the relay outputs of the PDISO-8 to switching control voltage circuits (5 to 24V slave relays or contactors for switching line power circuits).

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Powering up the computer or asserting the PC bus RESET line clears the Relay Output register, de-energizing all relays. This event provides a defined state at power up. A soft boot of the computer ([Ctrl] + [Alt] + [Delete]) does not produce a hardware reset of the PDISO-8; thus, the state of the relays is unchanged by soft booting the computer.

Using Isolated Control Inputs

The PDISO-8 contains eight identical opto-isolated control input channels. The equivalent circuit of a channel is shown in Figure 4-6. Note that the input is first routed through a bridge rectifier, so that the connections are not polarity sensitive whether used on AC or DC voltages.

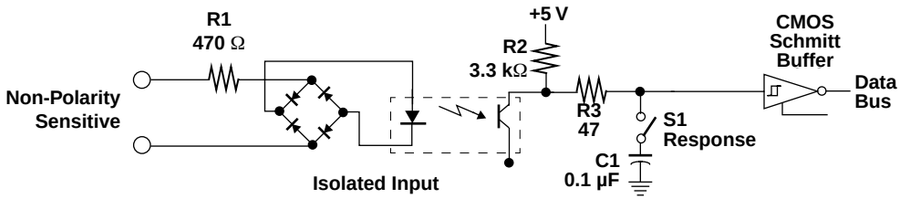


Figure 4-6. Equivalent Circuit of an Isolated Control Input

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Each input channel is provided with a switchable response filter. This is a single-pole filter with a time constant of about 5ms. You must use this filter when handling AC inputs, as these inputs periodically pass through zero at the voltage crossings, and the logic output is not sustained at these instants, as shown in Figure 4-7.

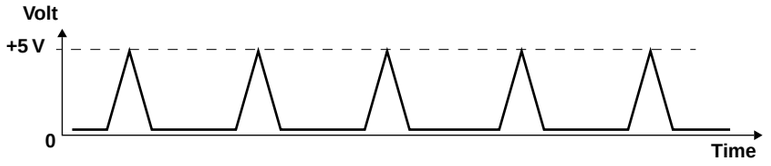


Figure 4-7. Unfiltered Opto-Isolator Output with AC Input

The filter “holds” the output long enough to prevent discontinuous logic readings from occurring at the zero crossings of an AC signal. With DC signals, the use of the filter is optional and can provide a useful amount of noise rejection (for spikes or contact debouncing) at the expense of response speed. Expect a 5 to 10ms delay when the relay turns on and off. If the filter is not used, the channel has a response controlled mainly by the delays in the opto-isolator; expect a “fast” response with a turn on/off delay of around 50µs.

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5

Programming

You do not program the registers of your PDISO-8 board directly through Windows 95/98/NT. Instead, you program register changes through the application programming interface (API) of DriverLINX. DriverLINX is provided on the CD-ROM that comes with your board and should now be installed on your system. (Refer to Section 3, “Installation.”) Using DriverLINX, you can program the board in Visual C/C++, Visual Basic, and Delphi.

DriverLINX features are summarized in Section 1. For detailed information about DriverLINX in general and about programming with DriverLINX specifically, refer to your DriverLINX documentation.

Note: To access the DriverLINX documents on-line, Acrobat Reader (version 3.0 or greater) must be installed on your computer.

To access the DriverLINX documentation after you have installed it on your computer, do the following:

1. Click the Windows 95/98/NT **Start** tab.
2. In the **Start** menu, click **Programs**.
3. Find the **DriverLINX** entry, under which you should find the **On-line Manuals** entry.
4. Click on the **On-line Manuals** entry. The DriverLINX Printable Documentation table of contents opens via Acrobat Reader.
5. Scroll through the DriverLINX Printable Documentation table of contents and find the document or document category that you want.

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6. Click on the wanted document or document category. Either the selected document appears or a list of documents that fit the selected category appears.

7. If a list appears, click on the title of the document that you want. The desired document appears.

To access the DriverLINX documentation from the CD-ROM that came with your board, do the following

1. In Windows Explorer, double click on **X:\Drvlinx4\Docs\Toc.pdf**, where **X** is the drive letter of your CD-ROM drive. The DriverLINX Printable Documentation table of contents opens via Acrobat Reader.

2. Scroll through the DriverLINX Printable Documentation table of contents and find the document or document category that you want.

3. Click on the wanted document or document category. Either the selected document appears or a list of documents that fit the selected category appears.

4. If a list appears, click on the title of the document that you want. The desired document appears.

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6

Troubleshooting

Warning



The procedures in the section are intended for qualified service personnel. Do not perform these procedures unless you are qualified to do so.

If your PDISO-8 board is not operating properly, use the information in this section to isolate the problem. If the problem appears serious enough to warrant technical support, refer to “Technical Support” on page 6-12 for information on how to contact an applications engineer.

Problem Isolation

If you encounter a problem with a PDISO-8 board, use the instructions in this section to isolate the cause of the problem before calling Keithley Hardware Applications Engineering.

Testing the I/O

If your PDISO-8 board appears not to work properly in general, skip to the next section, “Testing the Board and Host Computer.”

However, if your PDISO-8 board seems to work in general, but not all of the I/O bits appear to respond appropriately, you can test them without special hardware or software. You can use the DriverLINX AIO Panel to set the status of the relay outputs and then use an ohmmeter to check operation of the relay outputs. You can use a low voltage power supply to set the status of the isolated inputs and then use the DriverLINX AIO Panel to read the inputs.

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General Information

1. Start the AIO Panel as follows:
   a. In the **Start** menu, click **Programs**.
   b. Find the **DriverLINX ▸ Test Panels** folder, under which you should find the **AIO Panel** entry.
   c. Click on the **AIO Panel** entry. The **Analog I/O Panel** should appear, similar to the example in Figure 6-1. (If you have other DriverLINX devices installed in addition to the digital input/output card you are testing, they will also be listed. In that case, select the desired digital I/O card and the proper device number before proceeding.)

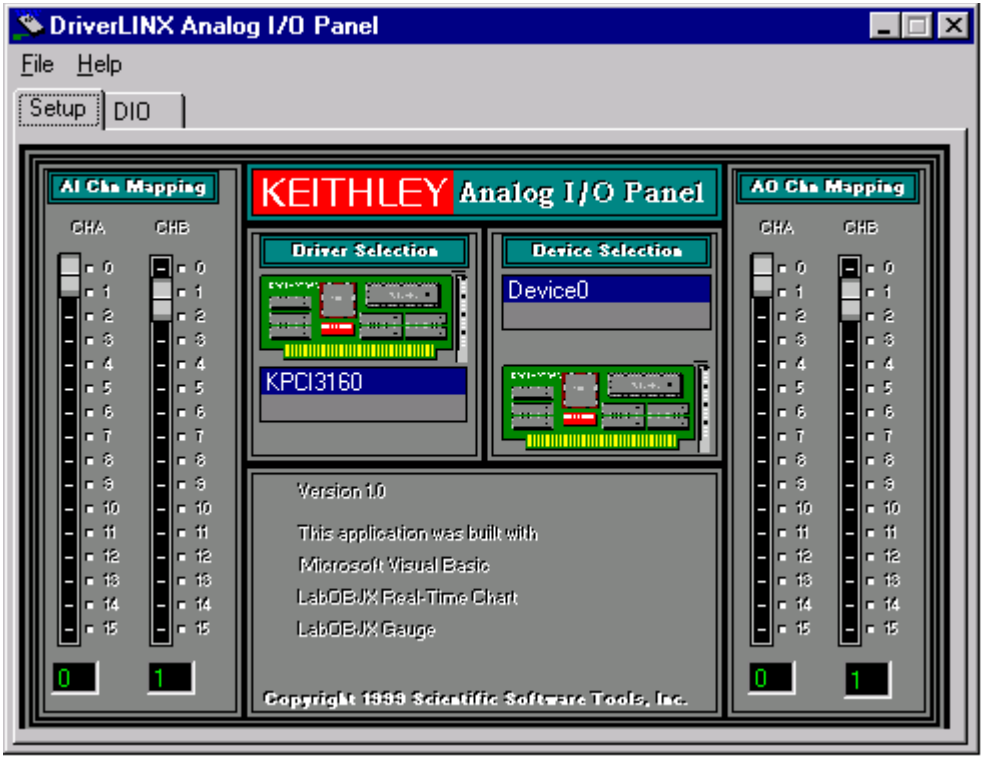


Figure 6-1. An AIO Panel example

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Note: The “Driver Selection” column will show the actual DriverLINX driver(s) you have installed.

2. On the **AIO Control Panel**, click the **DIO** tab.

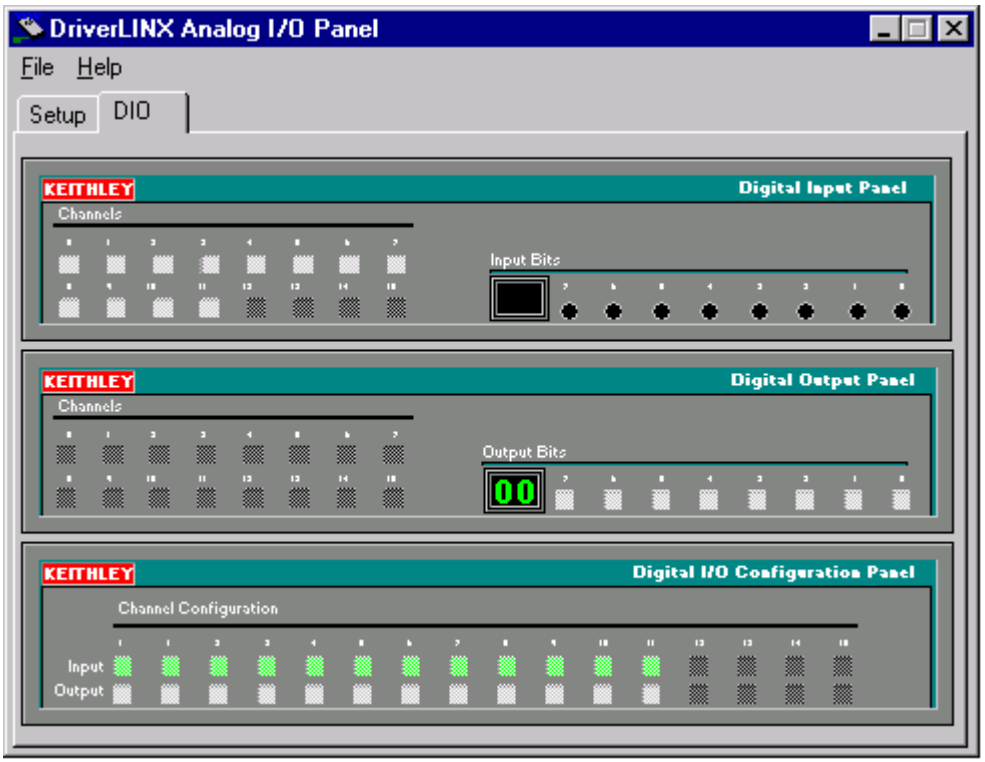


Figure 6-2. DIO channel tab example

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Note: The on-screen digital I/O controller works as follows:

- Channels 0 to 15 refer to the 8-bit general-purpose registers of your digital input-output card. (Depending on which card is used, the number of valid 8-bit registers will vary.) Bits displayed on the **Digital Input Panel** and the **Digital Output Panel** are numbered 0-7 for every channel. Refer elsewhere in this manual for a description of the available ports and their direction.
- Invalid channels and settings appear as dark gray squares. For example:
  - Non-existent channels always appear as dark gray squares.
  - Channels configured as inputs will appear as dark gray squares on the output panel.
- Valid channels and settings appear as white squares when OFF and green squares when ON. (When the manual is printed in black and white, valid channels and settings appear as white squares when OFF and as light gray squares when ON.)
- The two-digit numeric displays under **Input Bits** and **Output Bits** show the hexadecimal values of the adjacent bit patterns.
- To configure a valid channel either for input or output, use the **Digital Channel Configuration Panel**. Click on either the **Input** or **Output** square below the channel number. Note: this selection will be disabled for channels which are fixed as input or output by hardware design.
- To turn ON output-channel bits, use the **Digital Output Panel**. First select the channel number of the bits to be turned on by clicking on the appropriate square under **Channels**. Then, turn ON a bit by clicking the appropriate square under **Output Bits**. Turn OFF a bit in the same way.
- To read an input-channel bit, use the **Digital Input Panel**. First select the channel number to be checked by clicking the appropriate square under **Channels**. Then, read the numbered bit under **Input Bits**. OFF input bits appear as black dots and ON input bits appear as green dots. (When the manual is printed in black and white, OFF input bits appear as black dots and ON input bits appear as light gray dots.)

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3. Under **Digital I/O Configuration Panel**, configure channels as shown in Figure 6-3. (Actual channels available will vary according to your hardware.)

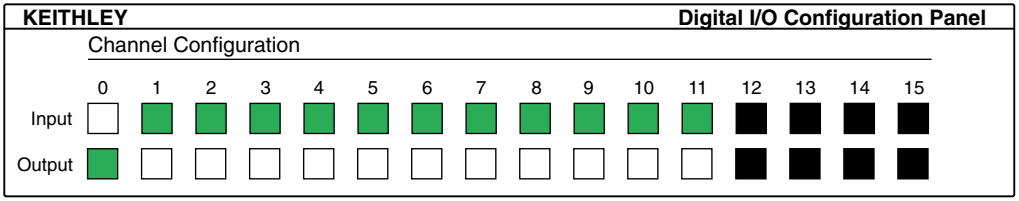


Figure 6-3. Configuring the digital I/O channels as inputs and outputs

Note: For clarity when the manual is printed in black and white, the control colors in Figure 6-3 and subsequent drawings will be shown as follows:

Illustration	Color on Actual Panel	Function
BLACK	DARK GRAY	Invalid
WHITE	LIGHT GRAY	OFF
GRAY	GREEN	ON

4. In the **Digital Output Panel** under **Channels**, click on a channel (here, channel **0**) as shown in Figure 6-4.

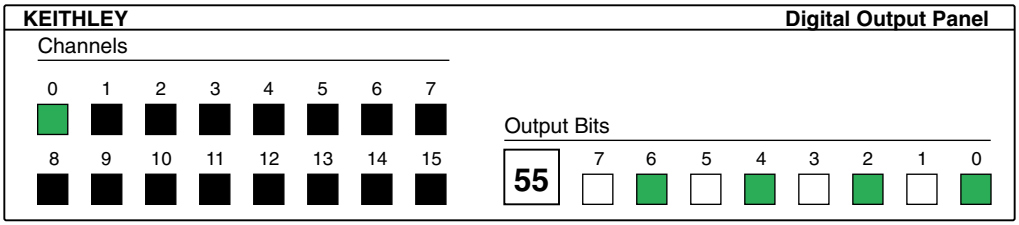


Figure 6-4. Configuring channel 0 for output bit pattern A

5. In the **Digital Output Panel** under **Output Bits**, set the bits of the channel as desired as shown in Figure 6-4. (Click on each bit position to turn it ON or OFF.)
6. In the **Digital Input Panel** under **Channels**, click on a channel to select it and display the logical state of its input lines.

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Output Set Test

The output set test checks whether logic levels measured at all output pins agree with output bit patterns set by software, using a DriverLINX graphical interface (AIO Panel).

Note: This test is performed without user circuits being connected to the outputs.

Perform the output set test as follows:

1. Ready the following equipment:
   - A digital voltmeter (DVM) or a digital multimeter (DMM) set to measure voltages, or a logic probe capable of reading TTL logic levels.
   - A suitable accessory and cable for the board being tested.
2. Turn OFF the host computer.
3. Connect the cable and accessory to your board.
4. Turn ON the host computer and boot Windows 95/98/NT.
5. Click the Windows 95/98/NT **Start** tab.
6. Start the AIO Panel as follows:
   a. In the **Start** menu, click **Programs**.
   b. Find the **DriverLINX ▸ Test Panels** folder, under which you should find the **AIO Panel** entry.
   c. Click on the **AIO Panel** entry. The **Analog I/O Panel** should appear, similar to the example in Figure 6-5. (If you have other DriverLINX devices installed in addition to the digital input/output card you are testing, they will also be listed. In that case, select the desired digital I/O card and the proper device number before proceeding.)

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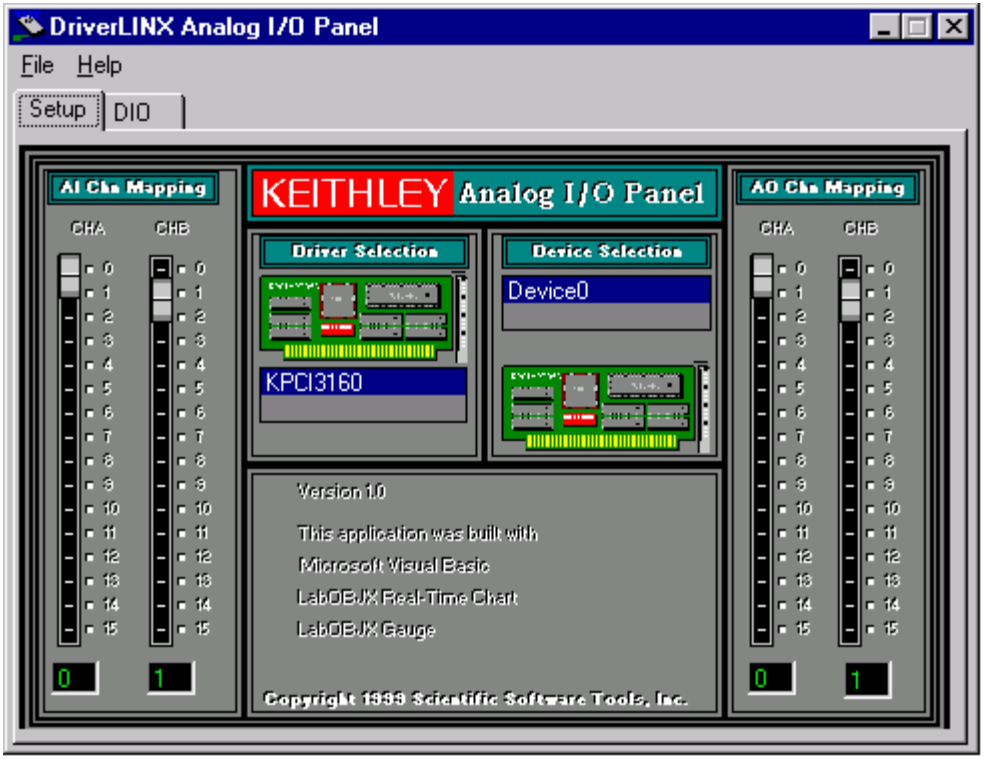


Figure 6-5. An AIO Panel example

7. On the **AIO Panel**, click the **DIO** tab.

Note: To read an input-channel bit, use the **Digital Input Panel**. First, select the channel number to be checked by clicking the appropriate square under **Channels**. Then, read the numbered bit under **Input Bits**. OFF input bits appear as black dots and ON input bits appear as green dots. (When the manual is printed in black and white, OFF input bits appear as black dots and ON input bits appear as light gray dots.) Further information about this panel, how to make changes, and how to interpret displays, is given in “I/O Bit Tests” of this section.

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8. Under **Digital I/O Configuration Panel**, configure the output channels to be tested as shown in Figure 6-6. (Actual output channels available will vary according to your hardware.)

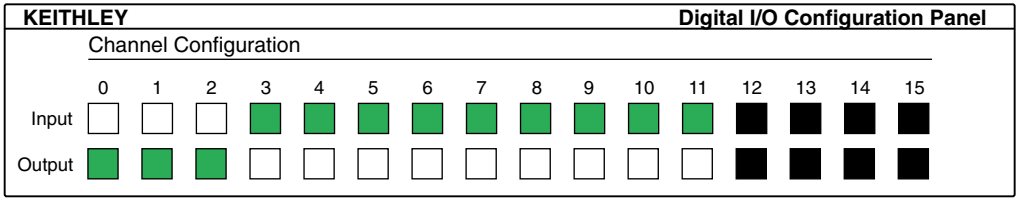


Figure 6-6. Configuring the digital I/O channels as inputs and outputs

Note: In Figure 6-6 and subsequent drawings of digital I/O controller panels, the squares below invalid channels are colored black instead of dark gray—for clarity when the manual is printed in black and white.

9. In the **Digital Output Panel** under **Channels**, click on an output channel (channel **0** in this example) as shown in Figure 6-7.

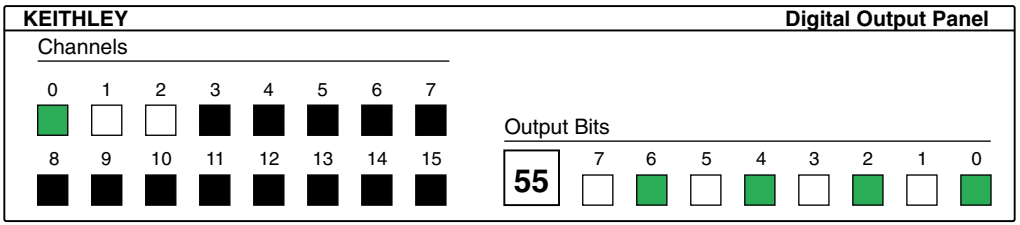


Figure 6-7. Configuring channel 0 for output bit pattern A

10. In the **Digital Output Panel** under **Output Bits**, set the bits of channel **0** for bit pattern A as shown in Figure 6-7.
11. Measure the voltage between signal ground and each bit of the output port with a DMM or DVM. Make measurements at the cabled mating connector of your accessory.

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12. Each bit set to ON in the **AIO Panel** should output a logic-high signal at the corresponding I/O terminal, reading typically about 4 volts (minimum of 2.2 volts) at a DMM/DVM. Each bit set to OFF in the **AIO Panel** should output a logic-low signal at the corresponding I/O terminal, reading typically about 0 volts (maximum of 0.8 volts) at a DMM/DVM. Do one of the following:

Note: The typical values shown are valid for boards with TTL compatible outputs. For boards with relay outputs (REL-16, PDISO-8, and PIO-32) the output will be a relay contact closure. For boards with open collector outputs (PIO-HV) use a pull up resistor to an appropriate voltage to detect output state. Refer to the hardware description in this user's guide for more details on the output's electrical specification.

- If the bit patterns set on the **AIO Panel** do not agree with the logic levels measured at the I/O terminals, the board is not functioning properly. Stop here, and determine why.
- If the bit patterns set on the **AIO Panel** agree with the logic levels measured at the I/O terminals, then repeat steps 9, 10, and 11 for remaining output channels.

13. In the **Digital Output Panel** under **Channels**, click on the output channel to test (channel **0** in this example) as shown in Figure 6-8.

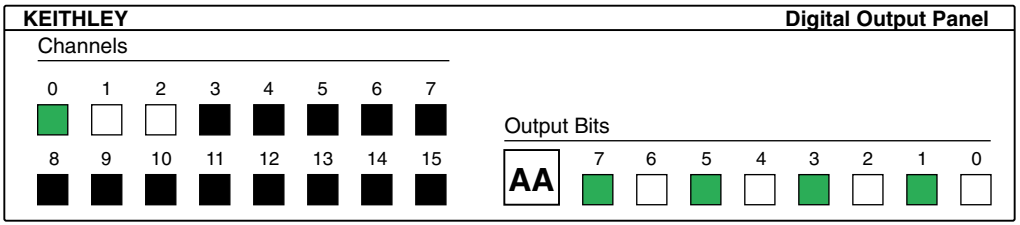


Figure 6-8. Configuring channel 0 for output bit pattern B

14. In the **Digital Output Panel** under **Output Bits**, set the bits of channel **0** for bit pattern B as shown in Figure 6-8.
15. Measure the voltage between signal ground and each bit of the output port with a DMM or DVM. Make measurements at the STA-50 terminals or the cabled mating connector that is connected to the selected CONN-3160-D1 50-pin connector.

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16. Again, each bit set to ON in the **AIO Panel** should output a logic-high signal at the corresponding I/O terminal, reading typically about 4 volts (minimum of 2.2 volts) at a DMM/DVM. Each bit set to OFF in the **AIO Panel** should output a logic-low signal at the corresponding I/O terminal, reading typically about 0 volts (maximum of 0.8 volts) at a DMM/DVM.

Note: The typical values shown are valid for boards with TTL compatible outputs. For boards with relay outputs (REL-16, PDISO-8, and PIO-32) the output will be a relay contact closure. For boards with open collector outputs (PIO-HV) use a pull up resistor to an appropriate voltage to detect output state. Refer to the hardware description in this user's guide for more details on the output's electrical specification.

- If the bit patterns set on the **AIO Panel** do not agree with the logic levels measured at the I/O terminals, the board is not functioning properly. Stop here, and determine why.
- If the bit patterns set on the **AIO Panel** do agree with the logic levels measured at the I/O terminals, and you have performed an output set test for all ports, the board is functioning properly.

17. Repeat steps 13, 14, and 15 for additional output channels.

Input Read Test

A similar test of input circuitry can be performed by applying an input signal of suitable type to each input line and verifying that the appropriate input indicator changes state. Refer to the hardware description in this user's guide for more details on the input's electrical specifications.

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Testing the Board and Host Computer

To isolate the problem to the PDISO-8 board or to the host computer, use the following steps:

1. Turn the power to the host computer OFF, and remove power connections to the computer.

Caution: Removing a board with the power ON can cause damage to your board and/or computer.

---

2. While keeping connections to any accessory board intact, unplug the accessory connector or cable from the PDISO-8 board.
3. Remove the PDISO-8 board from the computer and visually check for damage. If a board is obviously damaged, refer to "Technical Support" on page 6-12 for information on returning the board.
4. With the PDISO-8 board out of the computer, check the computer for proper operation. Power up the computer and perform any necessary diagnostics.

At this point, if you have another PDISO-8 board that is functional, you can test the slot and I/O connections using the instructions in the next section. If you do not have another board, refer to the instructions on page 6-12 before calling Keithley Applications Engineering.

Testing the Accessory Slot and I/O Connections

When you are sure that the computer is operating properly, test the computer accessory slot and I/O connections using another PDISO-8 that is functional. To test the computer accessory slot and the I/O connections, follow these steps:

1. Remove computer power again, and install a PDISO-8 board that is functional. Do not make any I/O connections.
2. Turn computer power ON and check operation with the functional board in place. This test checks the computer accessory slot. If you were using more than one PDISO-8 board when the problem occurred, use the functional board to test the other slot, as well.

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3. If the accessory slots are functional, use the functional board to check the I/O connections. Reconnect and check the operation of the I/O connections, one at a time.
4. If operation fails for an I/O connection, check the individual inputs one at a time for shorts and opens.
5. If operation remains normal to this point, the problem is in the PDISO-8 board(s) originally in the computer. If you were using more than one board, try each board one at a time in the computer to determine which is faulty.
6. If you cannot isolate the problem, refer to the next section for instructions on obtaining assistance.

Technical Support

Before returning any equipment for repair, call the Keithley Hardware Applications Engineering Department at:

1-888-KEITHLEY
Monday - Friday, 8:00 a.m. - 5:00 p.m., Eastern Time

An applications engineer will help you diagnose and resolve your problem over the telephone. Please make sure that you have the following information available before you call:

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PDISO-8 Board Configuration	Model	_____
	Serial #	_____
	Revision code	_____
	Base address setting	_____
	Response switch setting	_____
Computer	Manufacturer	_____
	CPU type	_____
	Clock speed (MHz)	_____
	MB of RAM	_____
	Video system	_____
	BIOS type	_____
Operating System	Windows version	_____
Any Special Software	Name	_____
	Version	_____
		_____
		_____
Compiler (if applicable)	Language	_____
	Manufacturer	_____
	Version	_____
Accessories	Type	_____
	Type	_____
	Type	_____

If a telephone resolution is not possible, the applications engineer will issue you a Return Material Authorization (RMA) number and ask you to return the equipment. Include the RMA number with any documentation regarding the equipment.

When returning equipment for repair, include the following information:

- Your name, address, and telephone number.
- The invoice or order number and date of equipment purchase.
- A description of the problem or its symptoms.
- The RMA number on the **outside** of the package.

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Repackage the equipment, using the original anti-static wrapping, if possible, and handling it with ground protection. Ship the equipment to:

ATTN: RMA #_____
Repair Department
Keithley Instruments, Inc.
28775 Aurora Road
Cleveland, Ohio 44139

Telephone 1-888-KEITHLEY
FAX (440) 248-6168

Notes: If you are submitting your equipment for repair under warranty, you must include the invoice number and date of purchase.

To enable Keithley to respond as quickly as possible, you must include the RMA number on the outside of the package.

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A

Specifications

Tables A-1 to A-4 list the specifications for the PDISO-8 board.

Table A-1. Output Specifications

Feature	Specification
Contact rating	3A @ 125VAC or 28VDC resistive, Installation Category I*
Contact type	Silver alloy
Contact resistance	100mΩ maximum (initial)
Contact arrangement	Channels OP0 to OP4 are SPDT (Form C changeover) Channels OP5 to OP7 are SPST (Form A normally open)
Operate time	20ms maximum
Release time	10ms maximum
Life expectancy	Mechanical: 10 million operations minimum Electrical: 100,000 operations minimum @ full load

*Voltage source must be isolated from the mains by a transformer.

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Table A-2. Isolated Control Input Specifications

Feature	Specification
Type	Nonpolarized, opto-isolated (inputs are not TTL/CMOS compatible), Installation Category I*
Number	Eight lines
Input voltage range	5 to 24VDC or AC (50 to 1000Hz)
Input resistance	470Ω minimum
Response time	50µs (typical) without filter 10ms (typical) with filter

*Voltage source must be isolated from the mains by a transformer.

Table A-3. General Environmental Specifications

Feature	Specification
Operating temperature range	0 to 50˚C
Storage temperature range	–20 to +70˚C
Humidity	0 to 90% non-condensing
Weight	7.5 oz (213 gm)

Table A-4. Power Consumption Specifications

Feature	Specification
+5V supply	0.3A typical all relays off 1.0A typical/1.3A maximum all relays on
+12V supply	Not used
–12V supply	Not used
Power dissipation	5W typical

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B

Connector Pin Assignments

The connection between an external I/O device and a PDISO-8 board is made at the main I/O connector, which is a standard 37-pin, D-type male connector. The mating connector is a 37-pin, D-type female connector (part# SFC-37). Figure B-1 illustrates pin assignments of the main I/O connector.

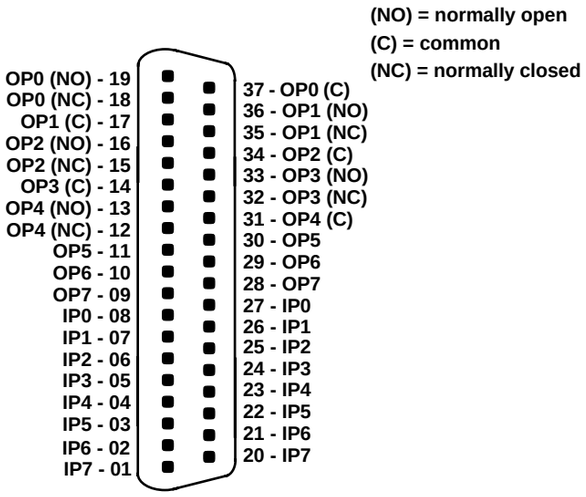


Figure B-1. Main I/O Connector Pin Assignments

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C

Register Maps

Note: Address maps are provided here only for background reference purposes. You do not program registers directly in Windows 95/98/NT. Instead, you program register changes through the application programming interface (API) of DriverLINX, which is provided on the CD-ROM that comes with your board. Refer to the DriverLINX documentation that is installed on your system. (If is not yet installed, you can find it on the CD-ROM in the X:\DrvLINX4\Docs and X:\DrvLINX4\Docs\Notes folders, where X is the drive letter of the CD-ROM drive.)

In some cases the base address is chosen automatically by Windows. Check the difference in addressing for Windows 95/98 and Windows NT. Refer to "Configuring the PIO Series" in *Using DriverLINX with Your Hardware—Keithley PIO Series* manual, which you printed in step 9 of "Installing DriverLINX Software and Documentation" on page 3-3.

A PDISO-8 board occupies four consecutive addresses in the computer's I/O space; only the first two of these addresses are actually used. The base address automatically falls on a 4-byte boundary.

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The I/O map and functions of the four addresses are shown in Table C-1.

Table C-1. I/O Map and Functions

I/O Address	Function	Read/Write
Base address +0h	Relay outputs	R/W
Base address +1h	Isolated control inputs	R
Base address +2h	Not used	—
Base address +3h	Not used	—

All ports are 8-bits (1-byte) wide and require byte-oriented, read/write operations rather than word (16-bit) operations.

Relay Output Register Data Format

Data are written to all eight relays as a single byte. Each of the eight bits within a byte controls a single relay. A high bit (equal to 1) energizes (closes the contacts of) a relay while a low bit (equal to 0) turns the relay off.

This register is read to determine the state of the relays. A high bit indicates that a relay is energized while a low bit indicates that the relay is off.

Relay Output register bits are assigned as shown in Table C-2.

Table C-2. Relay Addresses in the Relay Output Register

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Base Address +0h	OP7	OP6	OP5	OP4	OP3	OP2	OP1	OP0

For example, to energize the relay controlling OP4 of a PDISO-8 board at a base address of 300h, 00010000 binary (10h) is written to I/O address 300h.

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Isolated Control Input Register Data Format

The digital control input states are read as a single byte from the port at base address +1h. Each of the eight bits within the byte corresponds to a particular digital input so that a high bit (equal to 1) energizes an input while a low bit (equal to 0) de-energizes the input. Register bits are assigned as shown in Table C-3.

Table C-3. Input Addresses in the Isolated Control Input Register

Address	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Base Address +1h	IP7	IP6	IP5	IP4	IP3	IP2	IP1	IP0

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Index

A

accessory
  STA-U 1-3, 4-2
  STC-37 1-3, 4-3
  STP-37/FC 1-3, 4-2
AIO Panel
  checking installation with 3-11
  starting 3-11
anti-static wrapper 3-7
Applications Engineering 6-12
applications, PDISO-8 1-1
attaching
  STA-U 4-2
  STC-37 accessory 4-3

B

base address switch 3-8, 3-9, C-1
block diagram, PDISO-8 2-1
board
  grounding during handling to protect 3-7
  handling 3-7

C

cable
  C1800 1-3, 4-2
  C-1800/M 1-3, 4-2
cabling and wiring 4-1
checking the installation 3-11
computer I/O space C-1
computer resources
  determination for installation 3-2
configuration 3-8
configuring
  DriverLINX 3-6
  installation 3-6
connector pin assignments B-1
connector, main I/O 4-1, B-1
contact life, extending 4-5
contacts
  Form A 2-2, 4-5
  Form C 2-2, 4-5

D

data format
  isolated control input register C-3
  relay output register C-2
diagram
  isolated control input 4-6
  opto-isolator output 4-7
  PDISO-8 2-1
documentation, DriverLINX
  accessing 3-5, 5-1
  installing 3-3
documentation, this manual, installing 3-3
DriverLINX
  configuring 3-6
  description 1-2
  documentation, accessing 3-5, 5-1
  documentation, installing 3-3
  installing 3-3
  programming 5-1

E

extend contact life 4-5

F

features, PDISO-8 1-1
filter, response 2-2

G

grounding
  handling to protect board 3-7
  to protect board 3-7

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I

I/O bit tests 3-12, 6-2
    general information 3-12, 6-2
    input read test 3-20, 6-10
    output set test 3-16, 6-6
I/O map C-2
I/O testing 6-1
installation
    checking 3-11
    configuring 3-6
    resource inventory 3-2
installing
    board 3-11
    documentation 3-3
    software, DriverLINX 3-3
instructions, safety 3-2
interfaces
    installing for applications 3-3

M

main I/O connector B-1
manuals, DriverLINX
    accessing 3-5, 5-1
    installing 3-3
map, I/O C-2
maps, register C-1

P

PDISO-8 testing 6-1
pin assignments, main I/O 4-1
polarity-sensitive 2-2
precautions, installation
    board 3-7
    DriverLINX before board 3-1
problem isolation 6-1
programming
    DriverLINX 5-1
    overview 1-2
    registers 5-1

R

registers
    maps C-1
    programming 5-1
repairs, warranty 6-14
resources, installation, inventory 3-2
response filter 2-2
response switch 3-8, 3-10
returning equipment 6-13
RMA number 6-13

S

safety instructions 3-2
software, DriverLINX
    description 1-2
    installing 3-3
    programming 5-1
SPDT contacts 2-2
specifications
    general environment A-2
    isolated control input A-2
    power consumption A-2
    relay A-1
SPST contacts 2-2
STA-U accessory 1-3
STA-U, attaching 4-2
STC-37 accessory 1-3
STC-37, attaching 4-3
STP-37/FC accessory 1-3
STP-37/FC, attaching 4-2
switch
    base address 3-8, 3-9
    response 3-8, 3-10

T

technical support 6-12

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U

usage information 4-5

W

warranty repairs 6-14
wrapper, anti-static 3-7

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