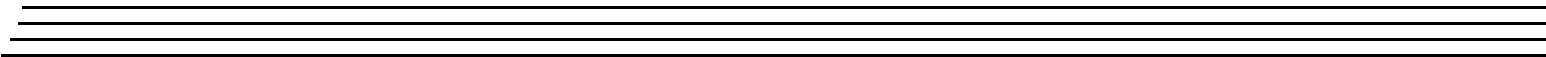
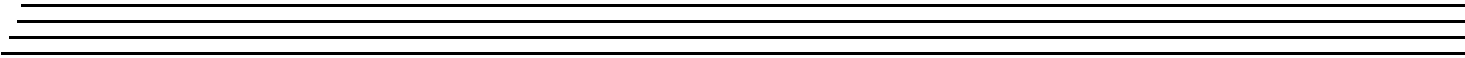
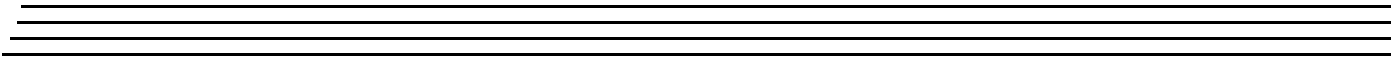


**DT330 Series
User's Manual**



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Radio and Television Interference

This equipment has been tested and found to comply with CISPR EN55022 Class A and EN50082-1 (CE) requirements and also with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Changes or modifications to this equipment not expressly approved by Data Translation could void your authority to operate the equipment under Part 15 of the FCC Rules.

Note: This product was verified to meet FCC requirements under test conditions that included use of shielded cables and connectors between system components. It is important that you use shielded cables and connectors to reduce the possibility of causing interference to radio, television, and other electronic devices.

Canadian Department of Communications Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

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About this Manual

This manual describes how to set up and install a DT330 Series board and related software, attach a screw terminal panel or paddle board to a DT330 Series board, wire signals to a screw terminal panel, and verify the board's operation using the Quick DataAcq application.

This manual also describes the features of the DT330 Series boards, the capabilities of the DT330 Series Device Driver, and how to program the DT330 Series boards using DT-Open Layers for .NET Class Library™ software. Troubleshooting and calibration information are also provided.

Note: For information on checking system requirements, installing the software, and viewing the documentation, refer to the README file on the OMNI CD.

For more information on the class library, refer to the *DT-Open Layers for .NET Class Library User's Manual*. If you are using the DataAcq SDK or a software application to program your device, refer to the documentation for that software for more information.

Intended Audience

This document is intended for engineers, scientists, technicians, or others responsible for using and/or programming the DT330 Series boards for data acquisition operations in Microsoft® Windows® XP, Windows Vista®, or Windows 7. It is assumed that you have some familiarity with data acquisition principles and that you understand your application.

How this Manual is Organized

This manual is organized as follows:

- [Chapter 1, "Overview,"](#) describes the major features of the DT330 Series hardware and software, and provides an overview of the DT330 Series getting started procedure.
- [Chapter 2, "Installing the Board and Loading the Device Driver,"](#) describes how to install the DT330 Series board and load the DT330 Series Device Driver.
- [Chapter 3, "Wiring Signals,"](#) describes recommendations for wiring, provides information on attaching and wiring to a screw terminal panel or paddle board, and describes how to wire signals to a screw terminal panel.
- [Chapter 4, "Verifying the Operation of a Board,"](#) describes how to verify the operation of a DT330 Series board with the Quick DataAcq application
- [Chapter 5, "Principles of Operation,"](#) describes all of the features of the DT330 Series boards and how to use them in your application.
- [Chapter 6, "Supported Device Driver Capabilities,"](#) lists the data acquisition subsystems and the associated features accessible using the DT330 Series Device Driver.

- [Chapter 7, “Calibration,”](#) describes how to calibrate the analog output circuitry of the boards.
- [Chapter 8, “Troubleshooting,”](#) provides information that you can use to resolve problems with the boards and the device driver, should they occur.
- [Appendix A, “Specifications,”](#) lists the specifications of the boards.
- [Appendix B, “Connector Pin Assignments,”](#) shows the pin assignments for the connectors on the boards and for the STP68, STP68-DIN, and DT758-C screw terminal panels, and the EP195 paddle board.
- [Appendix C, “Using Your Own Screw Terminal Panel,”](#) describes additional considerations to keep in mind when designing your own screw terminal panel for use with a DT330 Series board.
- An index completes this manual.

Conventions Used in this Manual

The following conventions are used in this manual:

- Notes provide useful information or information that requires special emphasis, cautions provide information to help you avoid losing data or damaging your equipment, and warnings provide information to help you avoid catastrophic damage to yourself or your equipment.
- Items that you select or type are shown in **bold**.

Related Information

Refer to the following documents for more information on using the DT330 Series boards:

- *Measure Foundry Manual* (UM-19298) and online help. These documents describe how to use Measure Foundry™ to build drag-and-drop test and measurement applications for Data Translation® data acquisition devices.
- *DT-Open Layers for .NET User’s Manual* (UM-22161). For programmers who are developing their own application programs using Visual C# or Visual Basic .NET, this manual describes how to use the DT-Open Layers for .NET Class Library to access the capabilities of Data Translation data acquisition devices.
- *DataAcq SDK User’s Manual* (UM-15943). For programmers who are developing their own application programs using the Microsoft C compiler, this manual describes how to use the DT-Open Layers DataAcq SDK™ to access the capabilities of Data Translation data acquisition boards. This manual is included on the Data Acquisition OMNI CD.
- *DTx-EZ Getting Started Manual* (UM-15428). This manual describes how to use the ActiveX controls provided in DTx-EZ™ to access the capabilities of Data Translation data acquisition boards in Microsoft® Visual Basic® or Visual C++®.
- *LV-Link Online Help*. This help file describes how to use LV-Link™ with the LabVIEW™ graphical programming language to access the capabilities of Data Translation data acquisition devices.

- *PCI Specification*: PCI Local Bus Specification, PCI Special Interest Group, Portland, OR. (Revision 2.1, June 1, 1995).
- Windows XP, Windows Vista, or Windows 7 documentation.

Where To Get Help

Should you run into problems installing or using a DT330 Series board, our Technical Support Department is available to provide technical assistance. Refer to [Chapter 8](#) starting on [page 77](#) for more information. If you are outside the U.S. or Canada, call your local distributor, whose number is listed on our web site (www.mccdaq.com).



Overview

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Features

The DT330 Series is a family of low-cost, analog output and digital I/O boards for the PCI bus. The DT330 Series consists of the following boards: DT331, DT332, DT333, DT334, DT335, and DT335-50. All DT330 Series boards share the following major features:

- Software calibration of the analog output circuitry if provided
- Four 8-bit digital ports programmable as inputs or outputs on a per-port basis
- Digital outputs capable of driving external solid-state relays (15 mA)
- Change on interrupt capability for one 8-bit digital port

[Table 1](#) lists the differences among the DT330 Series boards.

Table 1: Differences Among DT330 Series Boards

Board Type	Analog Output Channels	Analog Output Resolution
DT331	4	12 bit
DT332	8	12 bit
DT333	4	16 bit
DT334	8	16 bit
DT335 and DT335-50 ^a	0	Not applicable

a. The only difference between the DT335 and the DT335-50 is the user connector. The DT335 has a 68-pin connector and the DT335-50 has a 50-pin connector.

For more information on the board features, refer to [Chapter 5](#).

Supported Software

The following software is available for use with the DT330 Series boards and is provided on the Data Acquisition OMNI CD:

- **DT330 Series Device Driver** – The device driver is installed automatically when you install the software from the Data Acquisition OMNI CD. You need the device driver to use the DT330 Series board with any of the supported software packages or utilities.
- **The Quick DataAcq application** – This application provides a quick way to get a DT330 Series board up and running. Using the Quick DataAcq application, you can verify the subsystems of the board, display data on the screen, and save data to disk.
- **Calibration Utility** – The Calibration Utility allows you to calibrate the analog output circuitry of the DT331, DT332, DT333, and DT334 boards. Refer to [Chapter 7](#) for more information on this utility.
- **Measure Foundry** – An evaluation version of this software is included on the Data Acquisition OMNI CD. Measure Foundry is drag-and-drop test and measurement application builder designed to give you top performance with ease-of-use development. Order the full development version of this software package to develop your own application using real hardware.
- **DT-Open Layers for .NET Class Library** – Use this class library if you want to use Visual C# or Visual Basic for .NET to develop your own application software for the DT330 Series boards using Visual Studio 2003 or Visual Studio 2005; the class library complies with the DT-Open Layers standard.
- **DataAcq SDK** – Use the Data Acq SDK if you want to use Visual Studio 6.0 and Microsoft C or C++ to develop your own application software for the DT330 Series boards using Windows XP, Windows Vista, or Windows 7; the DataAcq SDK complies with the DT-Open Layers standard.
- **DTx-EZ** – DTx-EZ provides ActiveX controls, which allow you to access the capabilities of the DT330 Series boards using Microsoft Visual Basic or Visual C++; DTx-EZ complies with the DT-Open Layers standard.
- **DAQ Adaptor for MATLAB** – Data Translation's DAQ Adaptor provides an interface between the MATLAB Data Acquisition (DAQ) subsystem from The MathWorks and Data Translation's DT-Open Layers architecture.
- **LV-Link** – An evaluation version of LV-Link is included on the Data Acquisition OMNI CD. Use LV-Link if you want to use the LabVIEW graphical programming language to access the capabilities of the DT330 Series boards.

Refer to the Data Translation web site (www.mccdaq.com) for information about selecting the right software package for your needs.

Accessories

The following optional accessories are available for the DT330 Series boards:

- **STP68 screw terminal panel** – A generic, 68-pin screw terminal panel that has one connector to accommodate the analog output and digital I/O signals provided by the DT330 Series boards. This panel requires an EP305 cable.
- **STP68-DIN screw terminal panel** – A generic, 68-pin screw terminal panel that is DIN-rail mountable. This screw terminal panel has one connector to accommodate the analog output and digital I/O signals provided by the DT330 Series boards. This panel requires an EP305 cable.
- **DT758-C screw terminal panel** – A generic, 50-pin screw terminal panel that is DIN-rail mountable. This screw terminal panel has one connector to accommodate the digital I/O signals provided by the DT335-50 board. This panel requires an EP035-2 cable.
- **EP195 paddle board** – A board with three 50-pin connectors used to attach an DT335-50 board to two Opto 22 PB16A backplanes. This paddle board requires an EP035 cable and two EP036 cables.
- **EP305 cable** – A 2-meter, twisted-pair, shielded cable that connects the 68-pin connector (J1) on all DT330 Series boards except the DT335-50 to the J1 connector on the STP68 or STP68-DIN screw terminal panel.
- **EP035-2 cable** – A 1-meter, 50-conductor flat ribbon cable assembly with a female header that connects the 50-pin connector (J1) on the DT758-C screw terminal panel to the 50-pin connector (J1) on the DT335-50 board. The EP035-2 is shipped with the DT758-C screw terminal panel.
- **EP035 cable** – A 2.4-meter, 50-pin, flat ribbon cable with a female connector that connects the 50-pin connector (J1) on DT335-50 board to the 50-pin J1 connector on the EP195 paddle board.
- **EP036** – A 2.4-meter, 50-pin, flat ribbon cable that connects the 50-pin J2 or J3 connector of the EP195 to the 50-pin edge connector on the Opto 22 PB16A backplane. To connect two Opto 22 PB16A backplanes to the EP195 paddle board, two EP036 cables are required.

Getting Started Procedure

The flow diagram shown in [Figure 1](#) illustrates the steps needed to get started using a DT330 Series board. This diagram is repeated in each getting started chapter; the shaded area in the diagram shows you where you are in the getting started procedure.

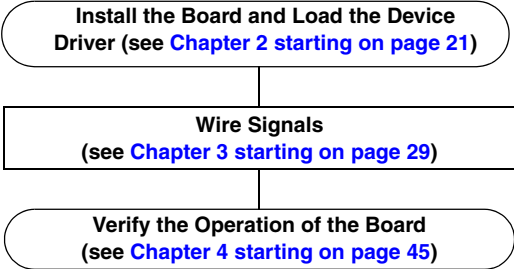


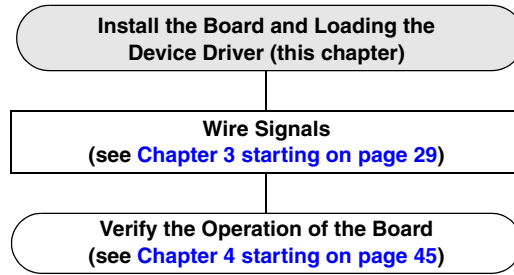
Figure 1: Getting Started Flow Diagram

Part 1: Getting Started



Installing the Board and Loading the Device Driver

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Note: All DT330 Series boards are factory-calibrated and require no further adjustment prior to installation. If you are using the DT330 Series board and decide later to recalibrate it, refer to [Chapter 7 starting on page 71](#) for instructions.

Unpacking

Open the shipping box and remove the wrapped DT330 Series board.

CAUTION:

Keep the board in its protective antistatic bag until you are ready to install it; this minimizes the likelihood of electrostatic damage.

Verify that the following items are present:

- DT330 Series data acquisition board
- Data Acquisition OMNI CD

If an item is missing or damaged, contact Data Translation. If you are in the United States, call the Customer Service Department at (508) 946-5100. An application engineer will guide you through the appropriate steps for replacing missing or damaged items. If you are located outside the United States, call your local distributor, listed on Data Translation's web site (www.mccdaq.com).

Setting up the Computer

CAUTION:

To prevent electrostatic damage that can occur when handling electronic equipment, use a ground strap or similar device when performing this installation procedure.

To set up the computer, do the following:

1. Install the software from the Data Acquisition OMNI CD or Data Translation web site.

Note: If you are using Windows 7, you **must** install the device driver before installing the board in the computer.

2. Turn off the computer
3. Turn off all peripherals (printer, modem, monitor, and so on) connected to the computer
4. Unplug the computer and all peripherals
5. Remove the cover from you computer. Refer to your computer's user manual for instructions

Setting up an Expansion Slot

Once you have set up the computer, set up an expansion slot by doing the following:

1. Select a 32-bit or 64-bit PCI expansion slot.

PCI slots are shorter than ISA or EISA slots and are usually white or ivory. Commonly, three PCI slots (one of which may be a shared ISA/PCI slot) are available. If an ISA board exists in the shared slot, you cannot use the slot for a PCI board; if a PCI board exists in the shared slot, you cannot use the slot for an ISA board.

2. Remove the cover plate from the selected expansion slot. Retain the screw that held it in place; you will use it later to install the board.

Inserting the Board into the Computer

Once you have set up an expansion slot, do the following to insert the DT330 Series board into the computer:

1. Discharge any 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 remove the antistatic packing material from the board. (It is recommended that you save the original packing material in the unlikely event that your board requires servicing in the future.)
3. Hold the board by its edges and do not touch any of the components on the board.
4. Position the board so that the cable connectors are facing the rear of the computer, as shown in [Figure 2](#).

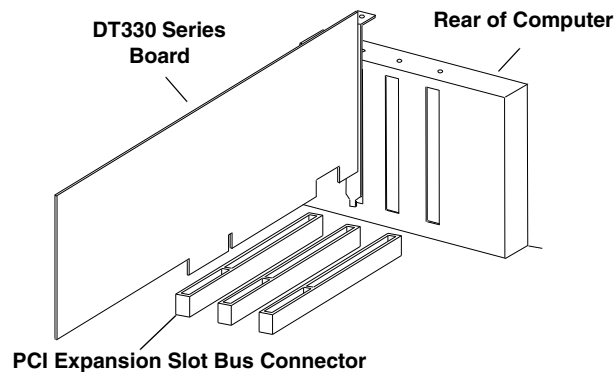


Figure 2: Inserting the DT330 Series Board in the Computer

5. Carefully lower the board into the PCI expansion slot using the card guide to properly align the board in the slot.
6. When the bottom of the board contacts the bus connector, gently press down on the board until it clicks into place.

CAUTION:

Do not force the board into place. Moving the board from side to side during installation may damage the bus connector. If you encounter resistance when inserting the board, remove the board and try again.

7. Secure the board in place at the rear panel of the system unit using the screw removed from the slot cover.
8. Power up the computer.
If you installed the DT330 Series software, the DT330 Series Device Driver is loaded automatically. If you have not installed the software, do so now.

Loading the Device Driver

To load the DT330 Series device driver in:

- Windows XP, follow the steps on [page 27](#).
- Windows Vista, follow the steps on [page 27](#).
- Windows 7, follow the steps on [page 28](#).

Windows XP

Once you have installed software from the Data Acquisition OMNI CD, installed a DT330 Series board, and powered up the host computer, the New Hardware Found dialog box appears. Do the following to load the device driver in Windows XP:

1. Click **Next**.
2. Click **Search for a suitable driver for my device (recommended)**.
3. Click **Specify a location**, and click **Next**.
4. Browse to Windows\Inf\DT330.Inf, and then click **Open**.
5. Click **OK**.
6. Click **Next**.
The files are copied.
7. Click **Finish**.
8. Open the Control Panel.
9. Double-click the **Open Layers Control Panel** icon.
10. Select the DT330 Series board to configure, and then click **Advanced**.
11. Select the appropriate boxes to enable interrupts for lines (bits) 0 to 7 on digital port D.
12. When you are finished, click **Close**.
13. If you wish to change the name of the board, click **Edit Name** and enter a new name for the board. Otherwise, exit from the Control Panel.

Once the driver is loaded, follow the instructions in [Chapter 3 starting on page 29](#) to wire signals to the board.

Windows Vista

Once you have installed software from the Data Acquisition OMNI CD, installed a DT330 Series board, and powered up the host computer, the New Hardware Found dialog box appears. Do the following to load the device driver in Windows Vista:

1. Click **Locate and install driver software (recommended)**.
The popup message "Windows needs your permission to continue" appears.
2. Click **Continue**.
The Windows Security dialog box appears.

3. Click **Install this driver software anyway**.
The driver files are installed.
4. Open the Control Panel.
5. Double-click the **Open Layers Control Panel** icon.
6. Select the DT330 Series board to configure, and then click **Advanced**.
7. Select the appropriate boxes to enable interrupts for lines (bits) 0 to 7 on digital port D.
8. When you are finished, click **Close**.
9. If you wish to change the name of the board, click **Edit Name** and enter a new name for the board. Otherwise, exit from the Control Panel.

Once the driver is loaded, follow the instructions in [Chapter 3 starting on page 29](#) to wire signals to the board.

Windows 7

Once you have installed the software from the Data Acquisition OMNI CD, installed a DT330 Series board, and powered up the host computer, the hardware is found automatically. Perform the following steps to configure the device driver.

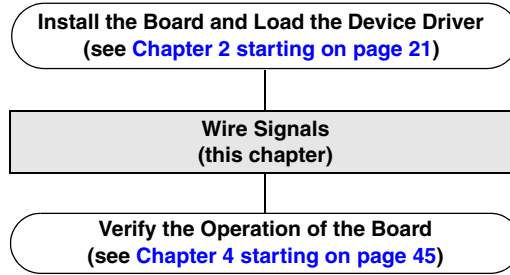
1. Open the Control Panel.
2. Double-click the **Open Layers Control Panel** icon.
3. Select the DT330 Series board to configure, and then click **Advanced**.
4. Select the appropriate boxes to enable interrupts for lines (bits) 0 to 7 on digital port D.
5. When you are finished, click **Close**.
6. If you wish to change the name of the board, click **Edit Name** and enter a new name for the board. Otherwise, exit from the Control Panel.

Once the driver is loaded, follow the instructions in [Chapter 3 starting on page 29](#) to wire signals to the board.



Wiring Signals

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Before Wiring

This section describes wiring recommendations and information about connecting a screw terminal panel or a paddle board to the DT330 Series board to make wiring easier.

Wiring Recommendations

Keep the following recommendations in mind when wiring signals to a screw terminal panel:

- Follow standard ESD procedures when wiring signals to the board.
- Use individually shielded twisted-pair wire (size 14 to 26 AWG) when using the DT330 Series board in a highly noisy electrical environment.
- Separate power and signal lines by using physically different wiring paths or conduits.
- To avoid noise, do not locate the screw terminal panel and cabling next to sources that produce high electromagnetic fields, such as large electric motors, power lines, solenoids, and electric arcs, unless the signals are enclosed in a mumetal shield.
- When first installing the board, it is recommended that you do the following:
 - Wire an oscilloscope or voltage meter to analog output channel 0.
 - Wire a digital input to digital I/O Port A.
 - If you have not done so already, install the DT330 Series software.
 - Run the Quick DataAcq application (described in [Chapter 4 starting on page 45](#)) to verify that the board is operating properly.
 - Once you have determined that the board is operating properly, wire the signals according to your application's requirements.

Attaching a Screw Terminal Panel/Paddle Board

The DT331, DT332, DT333, DT334, and DT335 boards provide a 68-pin user connector. To make wiring easier, you can use the EP305 cable from Data Translation to connect an STP68 or STP68-DIN screw terminal panel to the 68-pin connector of one of these boards. You can then wire your signals to the STP68 or STP68-DIN screw terminal panel.

The DT335-50 board provides a 50-pin user connector. To make wiring easier, you can use one of the following configurations:

- An EP035-2 cable that connects the 50-pin connector of the DT335-50 board to a DT758-C screw terminal panel. You can then wire your signals to the DT758-C screw terminal panel.
- An EP305 cable that connects the 50-pin connector of the DT335-50 board to an EP195 paddle board. The EP195 paddle board provides two 50-pin connectors that allow you to attach two Opto 22 PB16A backplanes using two EP036 cables.

This section describes provides more information on attaching a screw terminal panel or paddle board to the DT330 Series board and provides screw terminal and pin assignment information for each configuration.

Attaching an STP68 or STP68-DIN Screw Terminal Panel

Connector J1 on the STP68 and STP68-DIN attaches to connector J1 on the DT331, DT332, DT333, DT334, or DT335 board using an EP305 cable. [Figure 3](#) illustrates how to attach the STP68 or STP68-DIN screw terminal panel to the board.

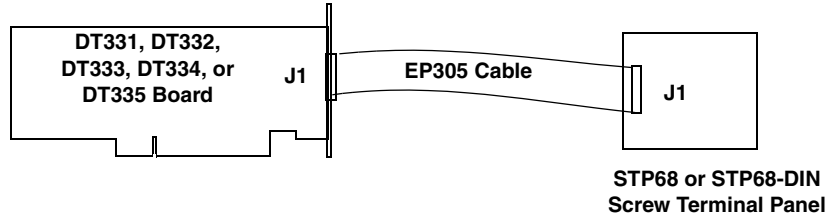


Figure 3: Attaching the STP68 or STP68-DIN Screw Terminal Panel to a DT331, DT332, DT333, DT334, or DT335 Board

[Figure 4](#) shows the layout of the STP68 and STP68-DIN screw terminal panels. The actual panel measures 3 15/16 inches by 3 15/16 inches (100 mm x 100 mm).

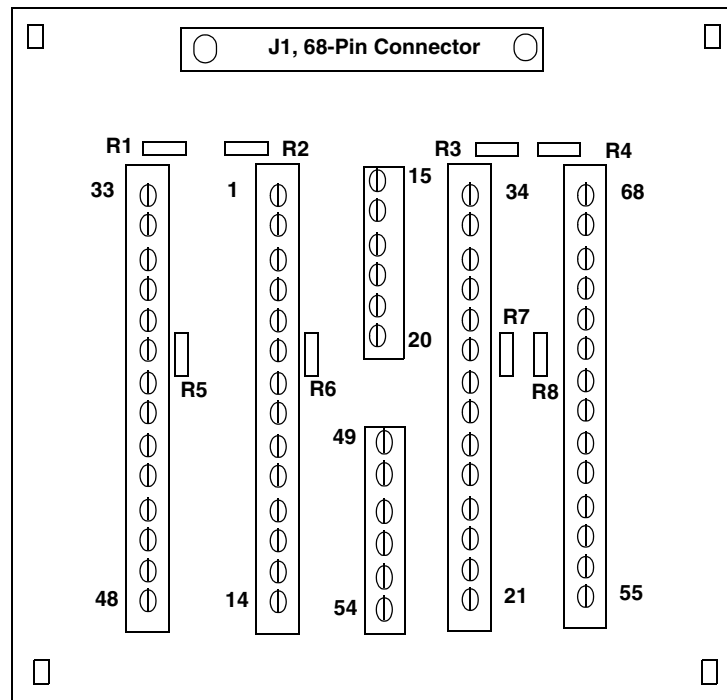


Figure 4: Layout of the STP68 and STP68-DIN Screw Terminal Panel

Connector J1 on the screw terminal panel brings out all of the signals from 68-pin connector on the DT331, DT332, DT333, DT334, or DT335 board.

Table 2 lists the screw terminal assignments for analog output and power connections on the STP68 and STP68-DIN screw terminal panels. The +5 V output signal (TB1) is provided for low current signal conditioning applications up to 1 A.

Table 2: Analog Output and Power Screw Terminal Assignments on the STP68 and STP68-DIN

Description	TB	J1 Pin	Description	TB	J1 Pin
+5 V Output	1	1	Power Ground	35	35
DAC0 Output	28	28	DAC0 Return	27	27
DAC1 Output	62	62	DAC1 Return	61	61
DAC2 Output	30	30	DAC2 Return	29	29
DAC3 Output	64	64	DAC3 Return	63	63
DAC4 Output	32	32	DAC4 Return	31	31
DAC5 Output	66	66	DAC5 Return	65	65
DAC6 Output	34	34	DAC6 Return	33	33
DAC7 Output	68	68	DAC7 Return	67	67

Table 3 lists the screw terminal assignments for digital I/O connections on the STP68 and STP68-DIN screw terminal panels.

Table 3: Digital I/O Screw Terminal Assignments on the STP68 and STP68-DIN

Description	TB	J1 Pin	Description	TB	J1 Pin
Digital Ground	57	57	Digital Ground	23	23
Digital I/O Port A, Line 0	56	56	Digital I/O Port A, Line 1	22	22
Digital I/O Port A, Line 2	55	55	Digital I/O Port A, Line 3	21	21
Digital I/O Port A, Line 4	54	54	Digital I/O Port A, Line 5	20	20
Digital I/O Port A, Line 6	53	53	Digital I/O Port A, Line 7	19	19
Digital Ground	52	52	Digital Ground	18	18
Digital I/O Port B, Line 0	51	51	Digital I/O Port B, Line 1	17	17
Digital I/O Port B, Line 2	50	50	Digital I/O Port B, Line 3	16	16
Digital I/O Port B, Line 4	49	49	Digital I/O Port B, Line 5	15	15
Digital I/O Port B, Line 6	48	48	Digital I/O Port B, Line 7	14	14
Digital Ground	47	47	Digital Ground	13	13
Digital I/O Port C, Line 0	46	46	Digital I/O Port C, Line 1	12	12

Table 3: Digital I/O Screw Terminal Assignments on the STP68 and STP68-DIN (cont.)

Description	TB	J1 Pin	Description	TB	J1 Pin
Digital I/O Port C, Line 2	45	45	Digital I/O Port C, Line 3	11	11
Digital I/O Port C, Line 4	44	44	Digital I/O Port C, Line 5	10	10
Digital I/O Port C, Line 6	43	43	Digital I/O Port C, Line 7	9	9
Digital Ground	42	42	Digital Ground	8	8
Digital I/O Port D, Line 0	41	41	Digital I/O Port D, Line 1	7	7
Digital I/O Port D, Line 2	40	40	Digital I/O Port D, Line 3	6	6
Digital I/O Port D, Line 4	39	39	Digital I/O Port D, Line 5	5	5
Digital I/O Port D, Line 6	38	38	Digital I/O Port D, Line 7	4	4
Digital Ground	37	37	Digital Ground	3	3

Attaching a DT758-C Screw Terminal Panel

Connector J1 on the DT758-C screw terminal panel attaches to connector J1 on the DT335-50 board using an EP035-2 cable. [Figure 5](#) illustrates how to attach the DT758-C screw terminal panel to the board.

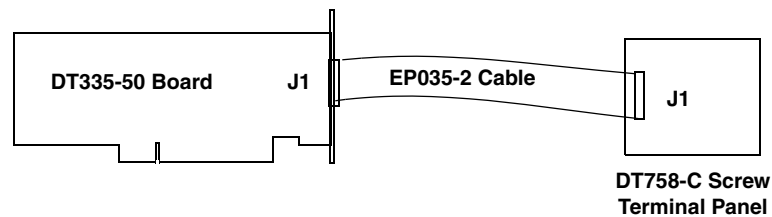


Figure 5: Attaching the DT758-C Screw Terminal Panel to a DT335-50 Board

[Figure 6](#) shows the layout of the DT758-C screw terminal panel. The actual panel measures 3.03 inches (height) by 5.31 inches (width) by 2.48 inches (depth).

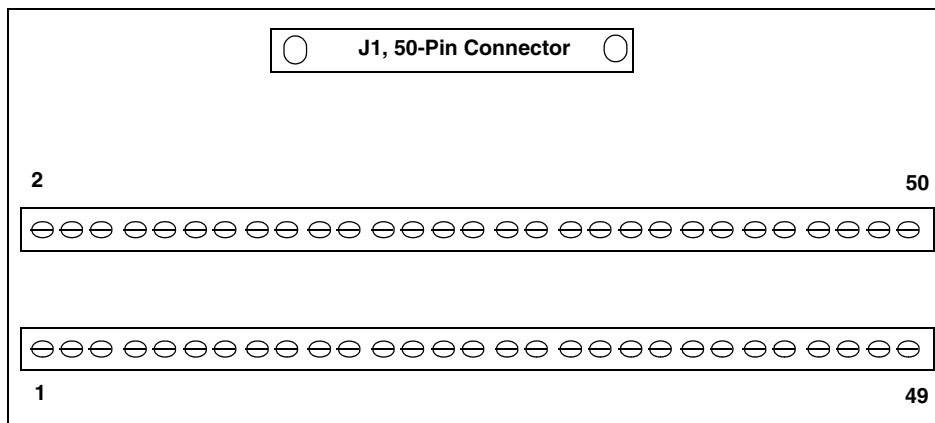


Figure 6: Layout of the DT758-C Screw Terminal Panel

Connector J1 on the screw terminal panel brings out all of the signals from 50-pin connector on the DT335-50 board.

[Table 4](#) lists the screw terminal assignments on the DT758-C screw terminal panel.

Table 4: DT758-C Screw Terminal Assignments

Screw Terminal	Signal Description	Screw Terminal	Signal Description
1	Digital Ground	2	Digital Ground
3	Port A, Line 0	4	Port B, Line 0
5	Port A, Line 1	6	Port B, Line 1
7	Port A, Line 2	8	Port B, Line 2
9	Port A, Line 3	10	Port B, Line 3
11	Port A, Line 4	12	Port B, Line 4
13	Port A, Line 5	14	Port B, Line 5
15	Port A, Line 6	16	Port B, Line 6
17	Port A, Line 7	18	Port B, Line 7
19	+5 V Out (1 A maximum) ^a	20	+5 V Out (1 A maximum) ^a
21	Digital Ground	22	Digital Ground
23	Digital Ground	24	Digital Ground
25	Digital Ground	26	Digital Ground
27	Digital Ground	28	Digital Ground
29	Digital Ground	30	Digital Ground

Table 4: DT758-C Screw Terminal Assignments (cont.)

Screw Terminal	Signal Description	Screw Terminal	Signal Description
31	+5 V Out (1 A maximum) ^a	32	+5 V Out (1 A maximum) ^a
33	Port C, Line 0	34	Port D, Line 0
35	Port C, Line 1	36	Port D, Line 1
37	Port C, Line 2	38	Port D, Line 2
39	Port C, Line 3	40	Port D, Line 3
41	Port C, Line 4	42	Port D, Line 4
43	Port C, Line 5	44	Port D, Line 5
45	Port C, Line 6	46	Port D, Line 6
47	Port C, Line 7	48	Port D, Line 7
49	Digital Ground	50	Digital Ground

a. Pins 19, 20, 31, and 32 have a combined current rating of 1 A maximum.

Attaching an EP195 Paddle Board

Connector J1 on the EP195 paddle board attaches to connector J1 on the DT335-50 board using an EP035 cable. Connector J2 on the EP195 brings out digital I/O ports A and B of the DT335-50 board and attaches to the 50-pin connector on an Opto 22 PB16A backplane using an EP036 cable.

Connector J3 on the EP195 brings out digital I/O ports C and D of the DT335-50 board and attaches to the 50-pin connector of an Opto 22 PB16A backplane using an EP036 cable.

Figure 7 illustrates how to attach the DT335-50 board to an EP195 paddle board, and how to attach the EP195 paddle board to two Opto 22 PB16A backplanes.

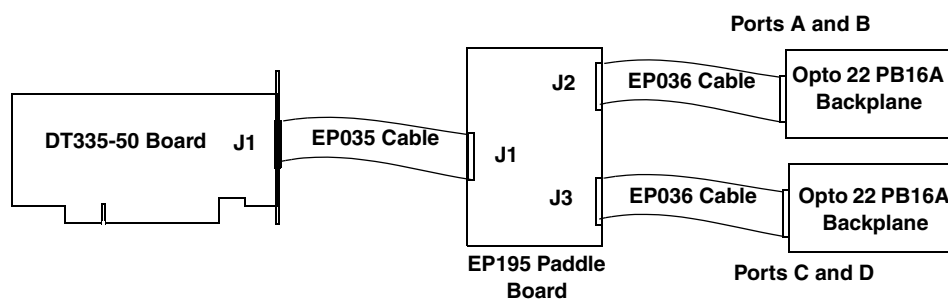


Figure 7: Attaching the EP195 Paddle Board to a DT335-50 Board

Figure 8 shows the layout of the EP195 paddle board.

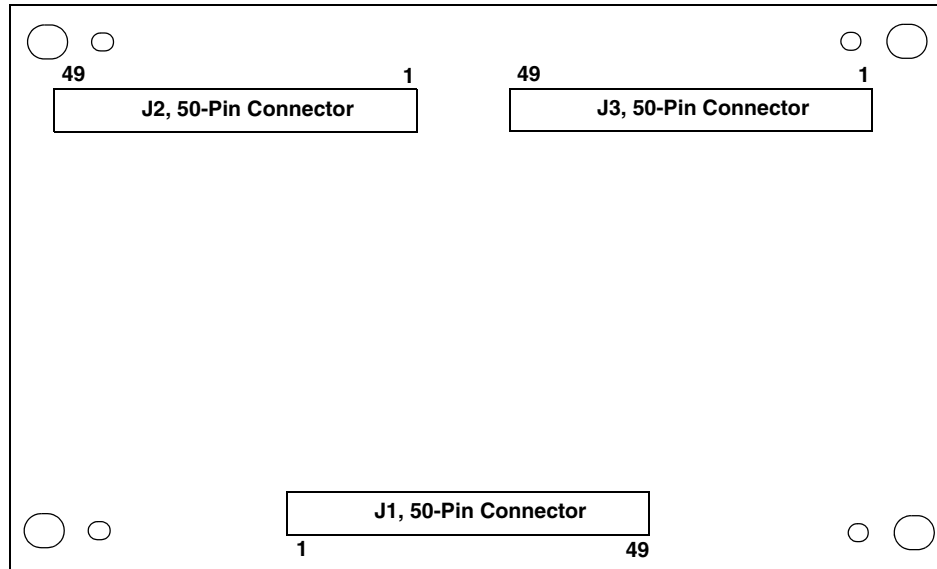


Figure 8: Layout of the EP195 Paddle Board

Table 5 lists pin assignments for connector J1 of the EP195 paddle board.

Table 5: EP195 Connector J1 Pin Assignments

Connector J1, Pin #	Signal Description	Connector J1, Pin #	Signal Description
1	Digital Ground	2	Digital Ground
3	Port A, Line 0	4	Port B, Line 0
5	Port A, Line 1	6	Port B, Line 1
7	Port A, Line 2	8	Port B, Line 2
9	Port A, Line 3	10	Port B, Line 3
11	Port A, Line 4	12	Port B, Line 4
13	Port A, Line 5	14	Port B, Line 5
15	Port A, Line 6	16	Port B, Line 6
17	Port A, Line 7	18	Port B, Line 7
19	+5 V Input	20	+5 V Input
21	Digital Ground	22	Digital Ground
23	Digital Ground	24	Digital Ground
25	Digital Ground	26	Digital Ground

Table 5: EP195 Connector J1 Pin Assignments (cont.)

Connector J1, Pin #	Signal Description	Connector J1, Pin #	Signal Description
27	Digital Ground	28	Digital Ground
29	Digital Ground	30	Digital Ground
31	+5 V Input	32	+5 V Input
33	Port C, Line 0	34	Port D, Line 0
35	Port C, Line 1	36	Port D, Line 1
37	Port C, Line 2	38	Port D, Line 2
39	Port C, Line 3	40	Port D, Line 3
41	Port C, Line 4	42	Port D, Line 4
43	Port C, Line 5	44	Port D, Line 5
45	Port C, Line 6	46	Port D, Line 6
47	Port C, Line 7	48	Port D, Line 7
49	Digital Ground	50	Digital Ground

Table 6 lists pin assignments for connector J2 of the EP195 paddle board.

Table 6: EP195 Connector J2 Pin Assignments

Connector J2, Pin #	Signal Description	Connector J2, Pin #	Signal Description
1	+5 V Out (1 A maximum) ^a	2	Digital Ground
3	No Connection	4	Digital Ground
5	No Connection	6	Digital Ground
7	No Connection	8	Digital Ground
9	No Connection	10	Digital Ground
11	No Connection	12	Digital Ground
13	No Connection	14	Digital Ground
15	No Connection	16	Digital Ground
17	Port B, Line 7	18	Digital Ground
19	Port B, Line 6	20	Digital Ground
21	Port B, Line 5	22	Digital Ground
23	Port B, Line 4	24	Digital Ground
25	Port B, Line 3	26	Digital Ground
27	Port B, Line 2	28	Digital Ground

Table 6: EP195 Connector J2 Pin Assignments (cont.)

Connector J2, Pin #	Signal Description	Connector J2, Pin #	Signal Description
29	Port B, Line 1	30	Digital Ground
31	Port B, Line 0	32	Digital Ground
33	Port A, Line 7	34	Digital Ground
35	Port A, Line 6	36	Digital Ground
37	Port A, Line 5	38	Digital Ground
39	Port A, Line 4	40	Digital Ground
41	Port A, Line 3	42	Digital Ground
43	Port A, Line 2	44	Digital Ground
45	Port A, Line 1	46	Digital Ground
47	Port A, Line 0	48	Digital Ground
49	+5 V Out (1 A maximum) ^a	50	Digital Ground

a. Pins 19, 20, 31, and 32 have a combined current rating of 1 A maximum.

[Table 7](#) lists pin assignments for connector J3 on the EP195 paddle board.

Table 7: EP195 Connector J3 Pin Assignments

Connector J3, Pin #	Signal Description	Connector J3, Pin #	Signal Description
1	+5 V Out (1 A maximum) ^a	2	Digital Ground
3	No Connection	4	Digital Ground
5	No Connection	6	Digital Ground
7	No Connection	8	Digital Ground
9	No Connection	10	Digital Ground
11	No Connection	12	Digital Ground
13	No Connection	14	Digital Ground
15	No Connection	16	Digital Ground
17	Port D, Line 7	18	Digital Ground
19	Port D, Line 6	20	Digital Ground
21	Port D, Line 5	22	Digital Ground
23	Port D, Line 4	24	Digital Ground
25	Port D, Line 3	26	Digital Ground
27	Port D, Line 2	28	Digital Ground

Table 7: EP195 Connector J3 Pin Assignments (cont.)

Connector J3, Pin #	Signal Description	Connector J3, Pin #	Signal Description
29	Port D, Line 1	30	Digital Ground
31	Port D, Line 0	32	Digital Ground
33	Port C, Line 7	34	Digital Ground
35	Port C, Line 6	36	Digital Ground
37	Port C, Line 5	38	Digital Ground
39	Port C, Line 4	40	Digital Ground
41	Port C, Line 3	42	Digital Ground
43	Port C, Line 2	44	Digital Ground
45	Port C, Line 1	46	Digital Ground
47	Port C, Line 0	48	Digital Ground
49	+5 V Out (1 A maximum) ^a	50	Digital Ground

a. Pins 19, 20, 31, and 32 have a combined current rating of 1 A maximum.

Connecting Analog Output Signals

Figure 9 shows how to connect an analog output voltage signal (channel 0, in this case) to the STP68 or STP68-DIN screw terminal panel.

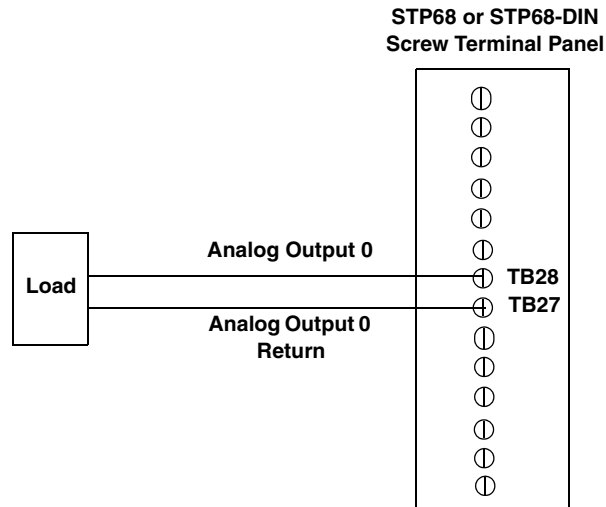


Figure 9: Connecting Analog Output Voltages to the STP68 or STP68-DIN (Shown for Channel 0)

Connecting Digital Input Signals

Figure 10 shows how to connect a digital input signal (lines 4 and 6 of digital Port A, in this case) to the STP68 or STP68-DIN screw terminal panel.

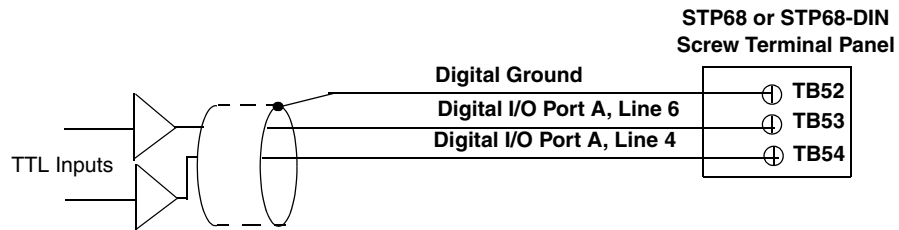


Figure 10: Connecting Digital Inputs to the STP68 or STP68-DIN Screw Terminal Panel (Lines 4 and 6, Port A Shown)

Figure 11 shows how to connect a digital input signal (lines 4 and 6 of digital Port A, in this case) to the DT758-C screw terminal panel.

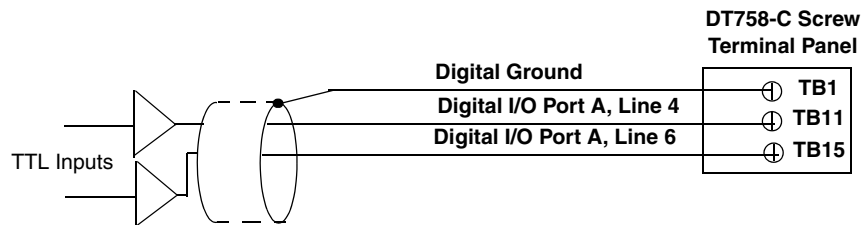


Figure 11: Connecting Digital Inputs to the DT758-C Screw Terminal Panel (Lines 4 and 6, Port A Shown)

For information on wiring to the Opto 22 PB16A backplane, refer to the documentation from Opto 22.

Connecting Digital Output Signals

Figure 12 shows how to connect a digital output signal (line 0 of digital Port B, in this case) to the STP68 or STP68-DIN screw terminal panel.

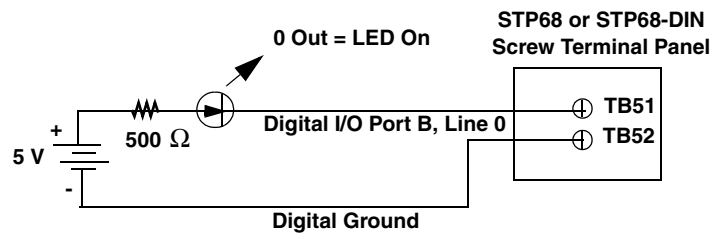


Figure 12: Connecting Digital Outputs to the STP68 or STP68-DIN Screw Terminal Panel (Line 0, Port B Shown)

Figure 13 shows how to connect a digital output signal (line 0 of digital Port B, in this case) to the DT758-C screw terminal panel.

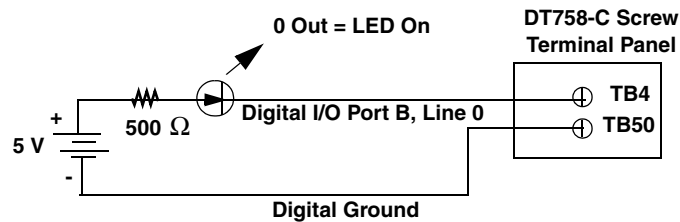


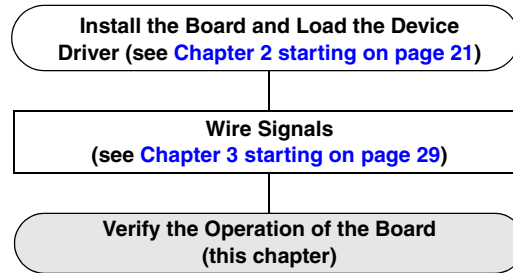
Figure 13: Connecting Digital Outputs to the DT758-C Screw Terminal Panel (Line 0, Port B Shown)

For information on wiring to the Opto 22 PB16A backplane, refer to the documentation from Opto 22.



Verifying the Operation of a Board

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Testing Single-Value Digital Output.....	50



You can verify the operation of a DT330 Series board using the Quick DataAcq application. Quick DataAcq lets you do the following:

- Acquire data from a single digital input port
- Output data from a single analog output channel or digital output port

This chapter describes how to install and run the Quick DataAcq application.

Running the Quick DataAcq Application

The Quick DataAcq application is installed automatically when you install the driver software.

To run the Quick DataAcq application, do the following:

1. If you have not already done so, power up your computer and any attached peripherals.
2. Click **Start** from the Task Bar.
3. Browse to **Programs | Data Translation, Inc | DT-Open Layers for Win32 | QuickDataAcq**.

The main menu appears.

Note: The Quick DataAcq application allows you to verify basic operations on the board; however, it may not support all of the board's features.

For information on each of the features provided, use the online help for the Quick DataAcq application by pressing F1 from any view or selecting the **Help** menu. If the system has trouble finding the help file, navigate to C:\Program Files\Data Translation\Win32\dtdataacq.hlp, where C: is the letter of your hard disk drive.

Testing Single-Value Analog Output

To verify that the board can output a single analog output value, do the following:

1. Connect an oscilloscope or voltmeter to DAC0 on the DT331, DT332, DT333, or DT334 board. Refer to [page 41](#) for an example of how to connect analog output signals.
2. In the Quick DataAcq application, choose **Single Analog Output** from the **Control** menu.
3. Select the appropriate DT330 Series board from the Board list box.
4. In the Channel list box, select analog output channel 0.
5. In the Range list box, select the output range of DAC0.
The default is ± 10 V.
6. Enter an output value, or use the slider to select a value to output from DAC0.
7. Click **Send** to output a single value from DAC0.
The application displays the output value on the screen in both text and graphical form.

Testing Single-Value Digital Input

To verify that the board can read a single digital input value, do the following:

1. Connect a digital input to digital input line 0 of port A on the DT330 Series board. Refer to [page 42](#) for an example of how to connect a digital input.
2. In the Quick DataAcq application, choose **Digital Input** from the **Acquisition** menu.
3. Select the appropriate DT330 Series board from the Board list box.
4. Select digital input port A by clicking **Port A**.
5. Click **Get**.

The application displays the value of each digital input line in port A on the screen in both text and graphical form.

Testing Single-Value Digital Output

To verify that the board can output a single digital output value, do the following:

1. Connect a digital output to digital output line 0 of port B on the DT330 Series board. Refer to [page 43](#) for an example of how to connect a digital output.
2. In the Quick DataAcq application, choose **Digital Output** from the **Control** menu.
3. Select the appropriate DT330 Series board from the Board list box.
4. Select digital output port B by clicking **Port B**.
5. Click the appropriate bits to select the digital output lines to write to. If the bit is selected, a high-level signal is output to the digital output line; if the bit is not selected, a low-level signal is output to the digital output line. Optionally, you can enter an output value in the Hex text box.
6. Click **Send**.

The application displays the value of each digital output line of digital port B on the screen in both text and graphical form.

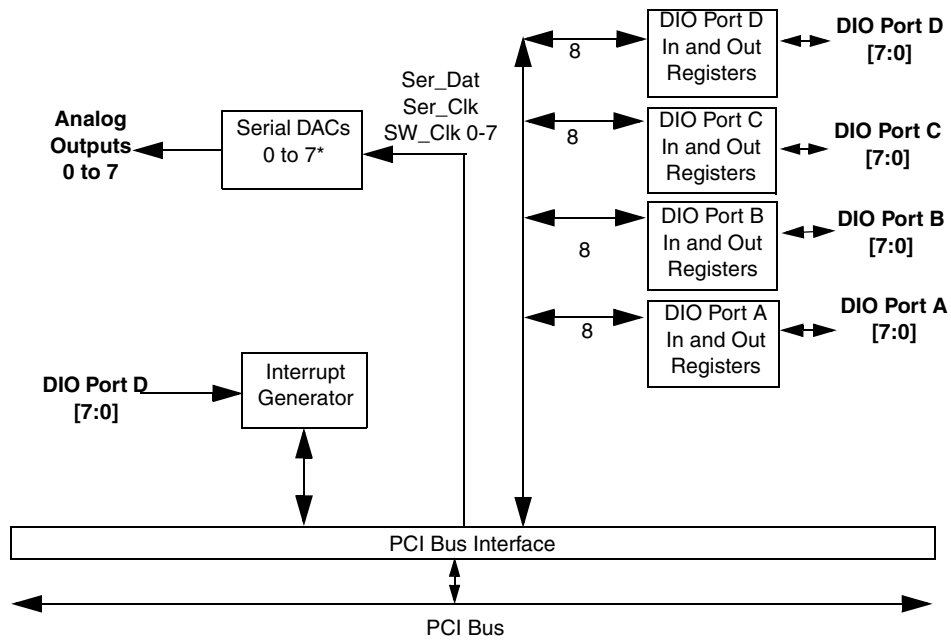
Part 2: Using Your Board



Principles of Operation

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Digital I/O Features.....	58

This chapter describes the analog output and digital I/O features of the DT330 Series boards. To frame the discussions, refer to the block diagram shown in [Figure 14](#). Note that bold entries indicate signals you can access.



*The DT331 and DT333 boards contain DACs 0 to 3 only. The DT331 and DT332 have 12-bit DACs; the DT333 and DT334 have 16-bit DACs. The DT335 and DT335-50 boards contains no DACs.

Figure 14: DT330 Series Block Diagram

Analog Output Features

Note: This section does not apply to the DT335 and DT335-50 boards, which have no analog output channels.

This section describes the following analog output features of the DT331, DT332, DT333, and DT334 boards:

- Resolution
- Analog output channels
- Ranges and gains
- Conversion mode
- Data format

Resolution

[Table 8](#) lists the output resolutions supported by the DT331, DT332, DT333, and DT334 boards. The resolution is fixed for each board type; therefore, it cannot be programmed in software.

Table 8: Supported Analog Output Resolutions

Board Type	Supported Resolution
DT331	12 bits
DT332	12 bits
DT333	16 bits
DT334	16 bits

Analog Output Channels

The DT331 and DT333 boards support four serial, multiplying, DC-level analog output channels (DAC0 to DAC3) through the D/A subsystem. The DT332 and DT334 boards support eight serial, multiplying, DC-level analog output channels (DAC0 to DAC7) through the D/A subsystem.

Refer to [page 41](#) for information on how to wire analog output signals to the board using the screw terminal panel. Using software, configure the channel type as differential.

Within each DAC, the digital data is double-buffered to prevent spurious outputs, then output as an analog signal. All DACs power up to a value of $0\text{ V} \pm 10\text{ mV}$. Resetting the board does not clear the values in the DACs.

DT331, DT332, DT333, and DT334 boards can output data from a single analog output channel only. Use software to specify the channel.

Ranges and Gains

DT331 and DT332 boards support the following ranges for each DAC: ± 10 V (the default), 0 to 10 V, ± 5 V, or 0 to 5 V. The DT333 and DT334 boards support the ± 10 V range only. Specify the range using software.

The gain for the D/A subsystem on the DT330 Series boards is always 1 (the default value).

Conversion Mode

DT331, DT332, DT333, and DT334 boards can perform single-value operations only. Use software to specify the value to output from the analog output channel, using the channel and range that you specified.

Single-value operations stop automatically when finished; you cannot stop a single-value operation.

Data Format

In software, you need to supply a code that corresponds to the analog output value you want the board to output. To convert a voltage to a code, use the following formulas:

$$LSB = \frac{FSR}{2^N}$$

$$Code = \frac{V_{out} - Offset}{LSB}$$

where,

- *LSB* is the least significant bit.
- *FSR* is the full-scale range. For the DT330 Series, the full-scale analog output range is 5 for the unipolar range of 0 to 5 V, 10 for the unipolar range of 0 to 10 V or the bipolar output range of ± 5 V, or 20 for the bipolar range or ± 10 V.
- *N* is the number of bits of the DAC. For the DT331 and DT332 boards, *N* is 12. For the DT333 and DT334 boards, *N* is 16.
- *Code* is the raw count used by the software to represent the voltage.
- *V_{out}* is the analog output voltage.
- *Offset* is the minus full-scale value. The minus full-scale value is 0.0 V for the unipolar ranges, -5 V for the ± 5 V range, or -10 V for the ± 10 V range.

For example, assume that you are using a DT331 board with a unipolar output range of 0 to 5 V. The minus full-scale value is 0 V. If you want to output a voltage of 4.7 V, determine the code value as follows:

$$\text{LSB} = \frac{5}{4096} = 0.001221 \text{ V}$$

$$\text{Code} = \frac{4.7 \text{ V} - 0 \text{ V}}{0.001221 \text{ V}}$$

$$\text{Code} = 3850 = 0F0Ah$$

Similarly, assume that you are using a DT333 board, which has a bipolar output range of ± 10 V. The minus full-scale value is -10 V. If you want to output a voltage of 4.7 V, determine the code value as follows:

$$\text{LSB} = \frac{20}{65536} = 0.000305 \text{ V}$$

$$\text{Code} = \frac{4.7 \text{ V} - (-10 \text{ V})}{0.000305 \text{ V}}$$

$$\text{Code} = 48169 = BC29h$$

Digital I/O Features

This section describes the following digital I/O features of the DT330 Series boards:

- Digital I/O lines
- Resolution
- Interrupts
- Operation modes

Digital I/O Lines

DT330 Series boards support 32 digital I/O lines through the digital input (DIN) and output (DOUT) subsystems; the DIN and DOUT subsystems use the same digital I/O lines.

These lines are divided into four ports of eight: Port A, lines 0 to 7; Port B, lines 0 to 7; Port C, lines 0 to 7; and Port D, lines 0 to 7. You can use each port for either input or output; all eight lines within a port have the same configuration. For example, if you use Port A for input, lines 0 to 7 of Port A are configured as inputs. Likewise, if you use Port B for output, lines 0 to 7 of Port B are configured as outputs.

Specify the digital I/O line to read or write in a single-value digital I/O operation or a continuous digital input operation; refer to [page 59](#) for more information on digital I/O operation modes.

On power up or reset, no digital data is output from the board.

Resolution

Using software, specify the number of digital I/O lines to read or write at once by specifying the resolution as 8, 16, 24, or 32. Choosing a resolution greater than 8 effectively combines the digital I/O ports.

[Table 9](#) shows the effect of resolution on the number of digital I/O lines available for each DIN or DOUT subsystem.

Table 9: Resolution, Digital I/O Lines, and Number of Subsystems

Resolution	Digital I/O Lines	DIN or DOUT Subsystem
8	Port A, lines 0 to 7	Element 0
	Port B, lines 0 to 7	Element 1
	Port C, lines 0 to 7	Element 2
	Port D, lines 0 to 7	Element 3

Table 9: Resolution, Digital I/O Lines, and Number of Subsystems

Resolution	Digital I/O Lines	DIN or DOUT Subsystem
16	Ports A and B, lines 0 to 15 combined	Element 0
	Ports C and D, lines 0 to 15 combined	Element 2
24 ^a	Ports A, B, and C, lines 0 to 23 combined	Element 0
32	Ports A, B, C, and D, lines 0 to 31 combined	Element 0

a. For 24-bit resolution, lines 24 to 31 are not used.

Note: When the resolution is greater than 8, the bit value represents the combined number of digital I/O lines. For example, if the resolution is 32, digital I/O lines 0 to 7 of Port A are represented as bits 0 to 7 of the digital value, digital I/O lines 0 to 7 of Port B are represented as bits 8 to 15 of the digital value, digital I/O lines 0 to 7 of Port C are represented as bits 16 to 23 of the digital value, and digital I/O lines 0 to 7 of Port D are represented as bits 24 to 31 of the digital value.

Interrupts

When using 8-bit resolution only, the DT330 Series boards can generate a PCI-bus interrupt when any of the eight digital I/O lines corresponding to digital Port D (DIN element 3) changes state. This feature is useful when you want to monitor critical signals or when you want to signal the host computer to transfer data to or from the board. You enable the interrupts on a line-by-line basis during DT330 driver configuration; refer to [page 27](#) for more information.

Use software to determine which digital line changed state; refer to [page 60](#) for more information.

Operation Modes

DT330 Series boards support the following digital I/O operation modes:

- **Single-value operations** – Use software to specify the DIN or DOUT subsystem, the resolution, and a gain of 1 (the gain is ignored). Data is then read from or written to the appropriate digital I/O lines.

Single-value operations stop automatically when finished; you cannot stop a single-value operation.

Note: Although single-value operations are the simplest to use, they do not allow you to check the interrupt status.

- **Continuous digital input operations** – Allow you to read digital input values and check the interrupt status of digital Port D only. You select the digital input lines to monitor for interrupt-on-change when you configure the device driver, described on [page 27](#).

Use software to specify DIN subsystem element 3, continuous mode, a resolution of 8, and the trigger source as software.

Once the operation is configured and started, an event is generated when one of the selected digital input lines changes state. You can then read the value of the digital input port and determine which digital input line changed state to cause the event.

Note: If you are using the DataAcq SDK to perform a continuous digital input operation, use the *lParam* parameter of the **oldaSetWndHandle** or **oldaSetNotificationProcedure** function to determine which digital input line changed state and the status of the digital input port when the interrupt occurred.

The low word of *lParam* contains the digital lines (bits) that changed state, where bit 0 corresponds to digital input line 0 and bit 7 corresponds to digital input line 0.

The high word of *lParam* contains the state of the digital input subsystem, where the bits represent the digital input lines.

The resolution reflects the number of significant bits in *lParam*.



Supported Device Driver Capabilities

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The DT330 Series Device Driver provides support for the analog output (D/A), digital input (DIN), and digital output (DOUT) subsystems. For information on how to configure the device driver, refer to [page 27](#).

Table 10: DT330 Series Subsystems

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Total Subsystems on Board	0	1 ^a	4 ^b	4 ^b	0	0

a. The DT335 board contains no D/A subsystems.

b. DIN and DOUT subsystems use the same DIO lines.

The tables in this chapter summarize the features available for use with the DT-Open Layers for .NET Class Library and the DT330 Series boards. The DT-Open Layers for .NET Class Library provides properties that return support information for specified subsystem capabilities.

The first row in each table lists the subsystem types. The first column in each table lists all possible subsystem capabilities. A description of each capability is followed by the property used to describe that capability in the DT-Open Layers for .NET Class Library.

Note: Blank fields represent unsupported options.

For more information, refer to the description of these properties in the DT-Open Layers for .NET Class Library online help or *DT-Open Layers for .NET Class Library User's Manual*.

Data Flow and Operation Options

Table 11: DT330 Series Data Flow and Operation Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Single-Value Operation Support SupportsSingleValue		Yes	Yes	Yes		
Simultaneous Single-Value Output Operations SupportsSetSingleValues						
Continuous Operation Support SupportsContinuous			Yes ^a			
Continuous Operation until Trigger SupportsContinuousPreTrigger						
Continuous Operation before & after Trigger SupportsContinuousPrePostTrigger						
Waveform Operations Using FIFO Only SupportsWaveformModeOnly						
Simultaneous Start List Support SupportsSimultaneousStart						
Supports Programmable Synchronization Modes SupportsSynchronization						
Synchronization Modes SynchronizationMode						
Interrupt Support SupportsInterruptOnChange			Yes ^b			
Output FIFO Size FifoSize						
Auto-Calibrate Support SupportsAutoCalibrate						

- a. Only Port D when configured for 8-bit resolution can operate in continuous digital input mode and only if you enabled interrupt usage for this port in the driver configuration dialog box. The software generates an event when a digital input line in this port changes state.
- b. When using 8-bit resolution only, the DT330 Series boards can generate a PCI-bus interrupt when any of the eight digital input lines corresponding to digital Port D (DIN element 3) changes state. This feature is useful when you want to monitor critical signals or when you want to signal the host computer to transfer data to or from the board. You enable the interrupts on a line-by-line basis during DT330 driver configuration; refer to [page 27](#) for more information on configuring the driver. If you are using the DataAcq SDK, refer to [page 59](#) for more information on determining which digital input lines changed state.

Buffering

Table 12: DT330 Series Buffering Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Buffer Support SupportsBuffering						
Single Buffer Wrap Mode Support SupportsWrapSingle						
Inprocess Buffer Flush Support SupportsInProcessFlush						

Triggered Scan Mode

Table 13: DT330 Series Triggered Scan Mode Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Triggered Scan Support SupportsTriggeredScan						
Maximum Number of CGL Scans per Trigger MaxMultiScanCount		0	0	0		
Maximum Retrigger Frequency MaxRetriggerFreq		0	0	0		
Minimum Retrigger Frequency MinRetriggerFreq		0	0	0		

Data Encoding

Table 14: DT330 Series Data Encoding Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Binary Encoding Support SupportsBinaryEncoding		Yes	Yes	Yes		
Twos Complement Support SupportsTwosCompEncoding						
Returns Floating-Point Values ReturnsFloats						

Channels

Table 15: DT330 Series Channel Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Number of Channels NumberOfChannels		0, 4, or 8 ^a	1	1		
SE Support SupportsSingleEnded						
SE Channels MaxSingleEndedChannels		0	0	0		
DI Support SupportsDifferential		Yes	Yes	Yes		
DI Channels MaxDifferentialChannels		0, 4, or 8 ^a	1	1		
Maximum Channel-Gain List Depth CGLDepth		1	0	0		
Simultaneous Sample-and-Hold Support SupportsSimultaneousSampleHold						
Channel-List Inhibit SupportsChannelListInhibit						

- a. DT331 and DT333 boards have four analog output channels; DT332 and DT334 boards have eight analog output channels; DT335 and DT335-50 boards have no analog output channels.

Gain

Table 16: DT330 Series Gain Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Programmable Gain Support SupportsProgrammableGain						
Number of Gains NumberOfSupportedGains		1	1	1		
Gains Available SupportedGains		1	1	1		

Ranges

Table 17: DT330 Series Range Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Number of Voltage Ranges NumberOfRanges		4 ^a	0	0		
Available Ranges SupportedVoltageRanges		±10 V, 0 to 10 V, ±5 V, 0 to 5 V ^a				
Current Output Support SupportsCurrentOutput						

- a. DT331 and DT332 boards support four output ranges, ±10 V, 0 to 10 V, ±5 V, and 0 to 5 V. DT333 and DT334 boards support an output range of ±10 V only. Analog output ranges are not applicable to DT335 and DT335-50 boards.

Resolution

Table 18: DT330 Series Resolution Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Software Programmable Resolution SupportsSoftwareResolution			Yes ^b	Yes ^b		
Number of Resolutions NumberOfResolutions		1 ^a	4 ^b	4 ^b		
Available Resolutions SupportedResolutions		12 or 16 ^a	8, 16, 24, 32 ^b	8, 16, 24, 32 ^b		

- a. DT331 and DT332 boards have a D/A resolution of 12 bits; DT333 and DT334 boards have a D/A resolution of 16 bits. D/A resolution is not applicable to DT335 and DT335-50 boards.
- b. When configured for 8 bits of resolution, element 0 uses bits 7 to 0 (Port A), element 1 uses bits 15 to 8 (Port B), element 2 uses bits 23 to 16 (Port C), and element 3 uses bits 31 to 24 (Port D). When configured for 16 bits of resolution, element 0 uses bits 15 to 0 (Ports A and B), and element 2 uses bits 31 to 15 (Ports C and D). When configured for 24 bits of resolution, element 0 uses bits 23 to 0 (Ports A, B, and C); bits 31 to 24 are not used. When configured for 32 bits of resolution, element 0 uses DIO bits 31 to 0 (Ports A, B, C, and D).

Thermocouple and RTD Support

Table 19: DT330 Series Thermocouple and RTD Support Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Thermocouple Support SupportsThernocouple						
RTD Support SupportsRTD						
Resistance Support ReturnsOhms						
Voltage Converted to Temperature in Hardware SupportsTemperatureDataInStream						
Supported Thermocouple Types ThermocoupleType						
Supported RTD Types RTDType						
Supports CJC Source Internally in Hardware SupportsCjcSourceInternal						
Supports CJC Channel SupportsCjcSourceChannel						
Available CJC Channels CjcChannel						
Supports Interleaved CJC Values in Data Stream SupportsInterleavedCjcTemperaturesInStream						
Supports Programmable Filters SupportsTemperatureFilters						
Programmable Filter Types TemperatureFilterType						

IEPE Support

Table 20: DT330 Series IEPE Support Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Software Programmable AC Coupling SupportsACCoupling						
Software Programmable DC Coupling SupportsDCCoupling						
Software Programmable External Excitation Current Source SupportsExternalExcitationCurrent Src						
Software Programmable Internal Excitation Current Source SupportsInternalExcitationCurrentSrc						
Available Excitation Current Source Values SupportedExcitationCurrentValues						

Triggers

Table 21: DT330 Series Trigger Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Software Trigger Support SupportsSoftwareTrigger		Yes				
External Positive TTL Trigger Support SupportsPosExternalTTLTrigger						
External Negative TTL Trigger Support SupportsNegExternalTTLTrigger						
External Positive TTL Trigger Support for Single-Value Operations SupportsSvPosExternalTTLTrigger						
External Negative TTL Trigger Support for Single-Value Operations SupportsSvNegExternalTTLTrigger						
Positive Threshold Trigger Support SupportsPosThresholdTrigger						
Negative Threshold Trigger Support SupportsNegThresholdTrigger						
Digital Event Trigger Support SupportsDigitalEventTrigger						

Clocks

Table 22: DT330 Series Clock Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Internal Clock Support SupportsInternalClock		Yes				
External Clock Support SupportsExternalClock						
Simultaneous Input/Output on a Single Clock Signal SupportsSimultaneousClocking						
Base Clock Frequency BaseClockFrequency		0	0	0		
Maximum Clock Divider MaxExtClockDivider		1.0	1.0	1.0		
Minimum Clock Divider MinExtClockDivider		1.0	1.0	1.0		
Maximum Frequency MaxFrequency		1.0	0	0		
Minimum Frequency MinFrequency		1.0	0	0		

Counter/Timers

Table 23: DT330 Series Counter/Timer Options

DT330 Series	A/D	D/A	DIN	DOUT	C/T	QUAD
Cascading Support SupportsCascading						
Event Count Mode Support SupportsCount						
Generate Rate Mode Support SupportsRateGenerate						
One-Shot Mode Support SupportsOneShot						
Repetitive One-Shot Mode Support SupportsOneShotRepeat						
Up/Down Counting Mode Support SupportsUpDown						
Edge-to-Edge Measurement Mode Support SupportsMeasure						
Continuous Edge-to-Edge Measurement Mode Support SupportsContinuousMeasure						
High to Low Output Pulse Support SupportsHighToLowPulse						
Low to High Output Pulse Support SupportsLowToHighPulse						
Variable Pulse Width Support SupportsVariablePulseWidth						
None (internal) Gate Type Support SupportsGateNone						
High Level Gate Type Support SupportsGateHighLevel						
Low Level Gate Type Support SupportsGateLowLevel						
High Edge Gate Type Support SupportsGateHighEdge						
Low Edge Gate Type Support SupportsGateLowEdge						
Level Change Gate Type Support SupportsGateLevel						
Clock-Falling Edge Type SupportsClockFalling						
Clock-Rising Edge Type SupportsClockRising						
Gate-Falling Edge Type SupportsGateFalling						
Gate-Rising Edge Type SupportsGateRising						
Interrupt-Driven Operations SupportsInterrupt						



Calibration

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The DT331, DT332, DT333, and DT334 boards are calibrated at the factory and should not require calibration for initial use. It is recommended that you check and, if necessary, readjust the calibration of the analog output circuitry every six months.

Note: Ensure that you installed the DT330 Series Device Driver prior to using the DT330 Series Calibration Utility.

Calibration is not supported by the DT335 and DT335-50 boards since these boards do not provide analog output channels.

This chapter describes how to run the DT330 Series Calibration Utility to calibrate the analog output circuitry of the DT331, DT332, DT333, and DT334 boards.

Running the Calibration Utility

To run the DT330 Series Calibration Utility, do the following:

1. Click **Start** from the Task Bar.
2. Browse to **Programs | Data Translation, Inc | Calibration | DT330 Calibration Utility**.
The main menu appears.

Once the calibration utility is running, connect an external meter to the STP68 or STP68-DIN screw terminal panel, as described in the next section.

Connecting an External Meter

To calibrate the analog output circuitry, use an external precision meter.

Connect each DAC as follows:

1. Connect the positive side of the analog output channel to the positive side of the precision voltage meter. (Refer to [Table 24](#) for screw terminal assignments.)
2. Connect the return side of the analog output channel to the negative side of the precision voltage meter. (Refer to [Table 24](#) for screw terminal assignments.)

Table 24: Calibration Connections

Analog Output Channel	STP68 or STP68-DIN Screw Terminal	Analog Output Return	STP68 or STP68-DIN Screw Terminal
DAC0 Output	TB28	DAC0 Return	TB27
DAC1 Output	TB62	DAC1 Return	TB61
DAC2 Output	TB30	DAC2 Return	TB29
DAC3 Output	TB64	DAC3 Return	TB63
DAC4 Output	TB32	DAC4 Return	TB31
DAC5 Output	TB66	DAC5 Return	TB65
DAC6 Output	TB34	DAC6 Return	TB33
DAC7 Output	TB68	DAC7 Return	TB67

When you finish connecting the external meter, calibrate the board, as described in the next section.

Calibrating a DT330 Series Board

Once the DT330 Series Calibration Utility is running and you have connected the required calibration signals to the STP68 or STP68-DIN screw terminal panel, do the following to calibrate the analog output subsystem of the DT331, DT332, DT333, or DT334 board:

1. From the main menu of the DT330 Series Calibration Utility, click **Configure**, then **Board**.
2. Select the name of the board to calibrate from the combo box, and then click **OK**.
3. From the main menu of the DT330 Series Calibration Utility, click **Calibrate**.
4. Select **DAC0**.
5. Click the increment or decrement arrows in the Manual Adjustment box until the display reads 0 V (within 0.0005 V).
6. Select **+FS** and verify that the display reads +9.9997 V (within ± 4.5 mV) for the DT333 and DT334 boards and +9.995 V (within ± 15 mV) for the DT331 and DT332 boards.
7. In the D/A box, select the next DAC to calibrate.
8. Repeat steps 5 to 7 until all the DACs on the board are calibrated.
9. Click **Quit** when you are finished calibrating the analog output circuitry.

Once you have finished this procedure, the analog output circuitry is calibrated. To close the calibration utility, click the close box in the upper, right corner of the window.



Troubleshooting

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General Checklist

Should you experience problems using a DT330 Series board, follow these steps:

1. Read all the documentation provided for your product. Make sure that you have added any “Read This First” information to your manual and that you have used this information.
2. Check the OMNI CD for any README files and ensure that you have used the latest installation and configuration information available.
3. Check that your system meets the requirements stated in the README file on the OMNI CD.
4. Check that you have installed your hardware properly.
5. Check that you have installed and configured the device driver properly.
6. Search the Knowledgebase in the Support section of the Data Translation web site (at www.mccdaq.com) for an answer to your problem.

If you still experience problems, try using the information in [Table 25](#) to isolate and solve the problem. If you cannot identify the problem, refer to [page 80](#).

Table 25: Troubleshooting Problems

Symptom	Possible Cause	Possible Solution
Board does not respond.	The board configuration is incorrect.	Check the configuration of your device driver to ensure that the board name and type are correct.
	The board is incorrectly aligned in a PCI expansion slot.	Check that the slot in which your DT330 Series board is located is a PCI slot and that the board is correctly seated in the slot.
	The board is damaged.	Contact Data Translation for technical support; refer to page 80 .
	The interrupt level is unacceptable.	<p>An interrupt conflict exists in your system. The most common interrupt conflict occurs with a PCI device and a device that is plugged into the ISA bus. To resolve this problem, change the interrupt setting (usually by changing a jumper) on the ISA device.</p> <p>An interrupt conflict can also occur if a PCI device was not designed to share interrupts. To resolve this problem, select a different interrupt for each PCI slot in the PCI BIOS. To do this, enter the system BIOS program; this is usually done by pressing the DEL key when rebooting your system. Once in the system BIOS, enter the PCI/PnP BIOS setup, and select a unique interrupt for each PCI slot. The PCI BIOS assigns the interrupt; the device on the PCI bus does not have control over the interrupt assignment.</p> <p>Some network devices do not share interrupts. If you still have an interrupt conflict, remove the network device, install the DT330 Series board, and reboot the system. Then, reinsert the network device.</p>

Table 25: Troubleshooting Problems (cont.)

Symptom	Possible Cause	Possible Solution
Intermittent operation.	Loose connections or vibrations exist.	Check your wiring and tighten any loose connections or cushion vibration sources.
	The board is overheating.	Check environmental and ambient temperature; consult the board's specifications on page 86 of this manual and the documentation provided by your computer manufacturer for more information.
	Electrical noise exists.	Check your wiring and either provide better shielding or reroute unshielded wiring.
Data appears to be invalid.	An open connection exists.	Check your wiring and fix any open connections.
Computer does not boot.	Board is not seated properly.	Check that the slot in which your DT330 Series board is located is a PCI slot, that the board is correctly seated in the slot, and that the board is secured in the slot with a screw.
	The power supply of the computer is too small to handle all the system resources.	Check the power requirements of your system resources and, if needed, get a larger power supply; consult the board's specifications on page 86 of this manual.
Board does not interrupt.	Digital I/O port is not configured properly.	Check the properties of the device driver configuration using the instructions in Chapter 2 .
System lockup.	Board is not seated properly.	Check that the slot in which your DT330 Series board is located is a PCI slot, that the board is correctly seated in the slot, and that the board is secured in the slot with a screw.
	Interrupt level is unacceptable.	<p>An interrupt conflict exists in your system. The most common interrupt conflict occurs with a PCI device and a device that is plugged into the ISA bus. To correct this problem, change the interrupt setting (usually by changing a jumper) on the ISA device.</p> <p>An interrupt conflict can also occur if a PCI device was not designed to share interrupts. To resolve this problem, select a different interrupt for each PCI slot in the PCI BIOS. To do this, enter the system BIOS program; this is usually done by pressing the DEL key when rebooting your system. Once in the system BIOS, enter the PCI/PnP BIOS setup, and select a unique interrupt for each PCI slot. The PCI BIOS assigns the interrupt; the device on the PCI bus does not have control over the interrupt assignment.</p> <p>Some network devices do not share interrupts. If you still have an interrupt conflict, remove the network device, install the DT330 Series board, and reboot the system. Then, reinsert the network device.</p>
Test button grayed out.	Vdtdad VxD is not installed.	Load the DT330 Series Support Software or the DataAcq SDK.

Technical Support

If you have difficulty using a DT330 Series board, Data Translation's Technical Support Department is available to provide technical assistance.

To request technical support, go to our web site at <http://www.mccdaq.com> and click on the Support link.

When requesting technical support, be prepared to provide the following information:

- Your product serial number
- The hardware/software product you need help on
- The version of the OMNI CD you are using
- Your contract number, if applicable

If you are located outside the USA, contact your local distributor; see our web site (www.mccdaq.com) for the name and telephone number of your nearest distributor.

If Your Board Needs Factory Service

Most hardware models can be functionally tested, evaluated for repairs (if needed), and calibrated to factory specifications. An RMA # must be obtained from Application Engineering in advance of sending any product back to Measurement Computing. Customers outside the USA must contact their local distributor for a return procedure. Calibration certificates for most analog models can be obtained for a fee (certificate must be requested at time of RMA # assignment).



Specifications

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Analog Output Specifications

Table 26 lists the analog output specifications for the DT331, DT332, DT333, and DT334 boards.

Table 26: Analog Output Specifications

Feature	Specifications
Number of analog output channels DT331: DT332: DT333: DT334:	4 8 4 8
Resolution DT331, DT332: DT333, DT334:	12 bits 16 bits
Data encoding (input)	Offset binary
Nonlinearity (integral) DT331, DT332: DT333, DT334:	±1 LSB ±4 LSB
Differential linearity DT331, DT332: DT333, DT334:	±0.5 LSB (monotonic) ±1 LSB (monotonic)
Output range (@ ±5 mA) DT331, DT332: DT333, DT334:	±10 V, 0 to 10 V, ±5 V, 0 to 5 V ±10 V only
Zero Error:	Software-adjustable to zero
Gain Error DT331, DT332: DT333, DT334:	±3 LSBs maximum; ±2 LSBs typical ±15 LSBs maximum; ±8 LSBs typical
Current output	±5 mA minimum (10 V/ 2 k _Ω)
Output impedance	0.3 Ω typical
Capacitive drive capability	0.001 μF minimum (no oscillations)
Protection	Short Circuit to Analog Common
Power-on voltage	0 V ±10 mV maximum
Settling time to 0.01% of FSR	50 μs, 20 V step; 10.0 μs, 100 mV step
Slew rate	2 V/μs

Digital I/O Specifications

Table 27 lists the digital input and digital output specifications for the DT330 Series boards.

Table 27: Digital Input and Digital Output Specifications

Feature	Ports A, B, and C Specifications	Port D Specifications
Number of lines	8 per port	8
Direction	bidirectional	
Termination	22 k Ω resistor pullup to +5 V; 22 Ω series resistor	
Inputs		
Input type:	Level sensitive	Level sensitive
Input load:	2 FCT2574 (TTL)	3 FCT2574 (TTL)
High-level input voltage:	2.0 V minimum	2.0 V minimum
Low-level input voltage:	0.8 V maximum	0.8 V maximum
High-level input current:	3 μ A	4.5 μ A
Low-level input current:	-3 μ A	4.5 μ A
Minimum Pulse Width		
High:	Not Applicable	66 ns (2 PCI clocks) ^a
Low:	Not Applicable	66 ns (2 PCI clocks) ^a
Outputs		
Output driver:	FCT2574 (TTL)	
Output driver high voltage:	2.4 V minimum (IOH = -15 mA);	
Output driver low voltage:	0.5 V maximum (IOL = 12 mA)	

a. The minimum pulse width applies only to interrupt-on-change detection. Pulses less than the minimum may not be detected as a change.

Power, Physical, and Environmental Specifications

Table 28 lists the power, physical, and environmental specifications for the DT330 Series boards.

Table 28: Power, Physical, and Environmental Specifications

Feature	Specifications
Power +5 V (± 0.25 V): -5 V: +12 V: -12 V:	800 mA nominal not used not used not used
Physical Dimensions: Weight:	8.5 inches (length) by 4.2 inches (width) 5.95 ounces (170 grams)
Environmental Operating temperature range: Storage temperature range: Relative humidity:	0° C to 70° C -25° C to 85° C To 95%, noncondensing

Connector Specifications

Table 29 lists the specifications for the 68-pin connector on the DT331, DT332, DT333, DT334, and DT335 boards.

Table 29: 68-Pin Connector Specifications

Feature	Specifications
Connector part number:	AMP 68-pin, 0.05 Subminiature D, #749621-7
Shielded enclosure with jack screws:	AMP 750752-1
Recommended shielded cable:	Madison, 28 GA, Twisted Pair, #68KDK00029

The mating connector for the 50-pin connector on the DT335-50 board is 3M, part number 3425.



Connector Pin Assignments

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Connector J1 on the DT331, DT332, DT333, DT334, and DT335 Boards

Table 30 lists the pin assignments of connector J1 on the DT331, DT332, DT333, DT334, and DT335 boards.

Table 30: Connector J1 Pin Assignments on the DT331, DT332, DT333, DT334, and DT335 Boards

Pin Number	Signal Description	Pin Number	Signal Description
1	+5 V Output	2	No Connect
3	Digital Ground	4	Digital I/O Port D, Line 7
5	Digital I/O Port D, Line 5	6	Digital I/O Port D, Line 3
7	Digital I/O Port D, Line 1	8	Digital Ground
9	Digital I/O Port C, Line 7	10	Digital I/O Port C, Line 5
11	Digital I/O Port C, Line 3	12	Digital I/O Port C, Line 1
13	Digital Ground	14	Digital I/O Port B, Line 7
15	Digital I/O Port B, Line 5	16	Digital I/O Port B, Line 3
17	Digital I/O Port B, Line 1	18	Digital Ground
19	Digital I/O Port A, Line 7	20	Digital I/O Port A, Line 5
21	Digital I/O Port A, Line 3	22	Digital I/O Port A, Line 1
23	Digital Ground	24	No Connect
25	No Connect	26	No Connect
27	DAC0 Return	28	DAC0 Output
29	DAC2 Return	30	DAC2 Output
31	DAC4 Return	32	DAC4 Output
33	DAC6 Return	34	DAC6 Output
35	Power Ground	36	No Connect
37	Digital Ground	38	Digital I/O Port D, Line 6
39	Digital I/O Port D, Line 4	40	Digital I/O Port D, Line 2
41	Digital I/O Port D, Line 0	42	Digital Ground
43	Digital I/O Port C, Line 6	44	Digital I/O Port C, Line 4
45	Digital I/O Port C, Line 2	46	Digital I/O Port C, Line 0
47	Digital Ground	48	Digital I/O Port B, Line 6
49	Digital I/O Port B, Line 4	50	Digital I/O Port B, Line 2
51	Digital I/O Port B, Line 0	52	Digital Ground

Table 30: Connector J1 Pin Assignments on the DT331, DT332, DT333, DT334, and DT335 Boards (cont.)

Pin Number	Signal Description	Pin Number	Signal Description
53	Digital I/O Port A, Line 6	54	Digital I/O Port A, Line 4
55	Digital I/O Port A, Line 2	56	Digital I/O Port A, Line 0
57	Digital Ground	58	No Connect
59	No Connect	60	No Connect
61	DAC1 Return	62	DAC1 Output
63	DAC3 Return	64	DAC3 Output
65	DAC5 Return	66	DAC5 Output
67	DAC7 Return	68	DAC7 Output

Connector J1 on the DT335-50 Board

Table 31 lists the pin assignments of connector J1 on the DT335-50 board.

Table 31: Connector J1 Pin Assignments on the DT335-50 Board

Pin Number	Signal Description	Pin Number	Signal Description
1	Digital Ground	2	Digital Ground
3	Port A, Line 0	4	Port B, Line 0
5	Port A, Line 1	6	Port B, Line 1
7	Port A, Line 2	8	Port B, Line 2
9	Port A, Line 3	10	Port B, Line 3
11	Port A, Line 4	12	Port B, Line 4
13	Port A, Line 5	14	Port B, Line 5
15	Port A, Line 6	16	Port B, Line 6
17	Port A, Line 7	18	Port B, Line 7
19	+5 V Out (1 A maximum) ^a	20	+5 V Out (1 A maximum) ^a
21	Digital Ground	22	Digital Ground
23	Digital Ground	24	Digital Ground
25	Digital Ground	26	Digital Ground
27	Digital Ground	28	Digital Ground
29	Digital Ground	30	Digital Ground
31	+5 V Out (1 A maximum) ^a	32	+5 V Out (1 A maximum) ^a
33	Port C, Line 0	34	Port D, Line 0
35	Port C, Line 1	36	Port D, Line 1
37	Port C, Line 2	38	Port D, Line 2
39	Port C, Line 3	40	Port D, Line 3
41	Port C, Line 4	42	Port D, Line 4
43	Port C, Line 5	44	Port D, Line 5
45	Port C, Line 6	46	Port D, Line 6
47	Port C, Line 7	48	Port D, Line 7
49	Digital Ground	50	Digital Ground

a. Pins 19, 20, 31, and 32 have a combined current rating of 1 A maximum.

Screw Terminal Assignments for the STP68 and STP68-DIN

Table 32 lists the screw terminal assignments for the STP68 and STP68-DIN screw terminal panels.

Table 32: Screw Terminal Assignments for the STP68 and STP68-DIN Screw Terminal Panels

TB #	J1 Pin #	Signal Description	TB #	J1 Pin #	Signal Description
1	1	+5 V Output	2	2	No Connect
3	3	Digital Ground	4	4	Digital I/O Port D, Line 7
5	5	Digital I/O Port D, Line 5	6	6	Digital I/O Port D, Line 3
7	7	Digital I/O Port D, Line 1	8	8	Digital Ground
9	9	Digital I/O Port C, Line 7	10	10	Digital I/O Port C, Line 5
11	11	Digital I/O Port C, Line 3	12	12	Digital I/O Port C, Line 1
13	13	Digital Ground	14	14	Digital I/O Port B, Line 7
15	15	Digital I/O Port B, Line 5	16	16	Digital I/O Port B, Line 3
17	17	Digital I/O Port B, Line 1	18	18	Digital Ground
19	19	Digital I/O Port A, Line 7	20	20	Digital I/O Port A, Line 5
21	21	Digital I/O Port A, Line 3	22	22	Digital I/O Port A, Line 1
23	23	Digital Ground	24	24	No Connect
25	25	No Connect	26	26	No Connect
27	27	DAC0 Return	28	28	DAC0 Output
29	29	DAC2 Return	30	30	DAC2 Output
31	31	DAC4 Return	32	32	DAC4 Output
33	33	DAC6 Return	34	34	DAC6 Output
35	35	Power Ground	36	36	No Connect
37	37	Digital Ground	38	38	Digital I/O Port D, Line 6
39	39	Digital I/O Port D, Line 4	40	40	Digital I/O Port D, Line 2
41	41	Digital I/O Port D, Line 0	42	42	Digital Ground
43	43	Digital I/O Port C, Line 6	44	44	Digital I/O Port C, Line 4
45	45	Digital I/O Port C, Line 2	46	46	Digital I/O Port C, Line 0
47	47	Digital Ground	48	48	Digital I/O Port B, Line 6
49	49	Digital I/O Port B, Line 4	50	50	Digital I/O Port B, Line 2
51	51	Digital I/O Port B, Line 0	52	52	Digital Ground

**Table 32: Screw Terminal Assignments for the
STP68 and STP68-DIN Screw Terminal Panels (cont.)**

TB #	J1 Pin #	Signal Description	TB #	J1 Pin #	Signal Description
53	53	Digital I/O Port A, Line 6	54	54	Digital I/O Port A, Line 4
55	55	Digital I/O Port A, Line 2	56	56	Digital I/O Port A, Line 0
57	57	Digital Ground	58	58	No Connect
59	59	No Connect	60	60	No Connect
61	61	DAC1 Return	62	62	DAC1 Output
63	63	DAC3 Return	64	64	DAC3 Output
65	65	DAC5 Return	66	66	DAC5 Output
67	67	DAC7 Return	68	68	DAC7 Output

Screw Terminal Assignments for the DT758-C

Table 33 lists the screw terminal assignments for the DT758-C screw terminal panel.

Table 33: DT758-C Screw Terminal Assignments

Screw Terminal	Signal Description	Screw Terminal	Signal Description
1	Digital Ground	2	Digital Ground
3	Port A, Line 0	4	Port B, Line 0
5	Port A, Line 1	6	Port B, Line 1
7	Port A, Line 2	8	Port B, Line 2
9	Port A, Line 3	10	Port B, Line 3
11	Port A, Line 4	12	Port B, Line 4
13	Port A, Line 5	14	Port B, Line 5
15	Port A, Line 6	16	Port B, Line 6
17	Port A, Line 7	18	Port B, Line 7
19	+5 V Out (1 A maximum) ^a	20	+5 V Out (1 A maximum) ^a
21	Digital Ground	22	Digital Ground
23	Digital Ground	24	Digital Ground
25	Digital Ground	26	Digital Ground
27	Digital Ground	28	Digital Ground
29	Digital Ground	30	Digital Ground
31	+5 V Out (1 A maximum) ^a	32	+5 V Out (1 A maximum) ^a
33	Port C, Line 0	34	Port D, Line 0
35	Port C, Line 1	36	Port D, Line 1
37	Port C, Line 2	38	Port D, Line 2
39	Port C, Line 3	40	Port D, Line 3
41	Port C, Line 4	42	Port D, Line 4
43	Port C, Line 5	44	Port D, Line 5
45	Port C, Line 6	46	Port D, Line 6
47	Port C, Line 7	48	Port D, Line 7
49	Digital Ground	50	Digital Ground

a. Pins 19, 20, 31, and 32 have a combined current rating of 1 A maximum.

Connector J1 on the EP195

Table 34 lists pin assignments for connector J1 of the EP195 paddle board.

Table 34: EP195 Connector J1 Pin Assignments

Connector J1, Pin #	Signal Description	Connector J1, Pin #	Signal Description
1	Digital Ground	2	Digital Ground
3	Port A, Line 0	4	Port B, Line 0
5	Port A, Line 1	6	Port B, Line 1
7	Port A, Line 2	8	Port B, Line 2
9	Port A, Line 3	10	Port B, Line 3
11	Port A, Line 4	12	Port B, Line 4
13	Port A, Line 5	14	Port B, Line 5
15	Port A, Line 6	16	Port B, Line 6
17	Port A, Line 7	18	Port B, Line 7
19	+5 V Input	20	+5 V Input
21	Digital Ground	22	Digital Ground
23	Digital Ground	24	Digital Ground
25	Digital Ground	26	Digital Ground
27	Digital Ground	28	Digital Ground
29	Digital Ground	30	Digital Ground
31	+5 V Input	32	+5 V Input
33	Port C, Line 0	34	Port D, Line 0
35	Port C, Line 1	36	Port D, Line 1
37	Port C, Line 2	38	Port D, Line 2
39	Port C, Line 3	40	Port D, Line 3
41	Port C, Line 4	42	Port D, Line 4
43	Port C, Line 5	44	Port D, Line 5
45	Port C, Line 6	46	Port D, Line 6
47	Port C, Line 7	48	Port D, Line 7
49	Digital Ground	50	Digital Ground

Connector J2 on the EP195

Table 35 lists pin assignments for connector J2 of the EP195 paddle board.

Table 35: EP195 Connector J2 Pin Assignments

Connector J2, Pin #	Signal Description	Connector J2, Pin #	Signal Description
1	+5 V Out (1 A maximum) ^a	2	Digital Ground
3	No Connection	4	Digital Ground
5	No Connection	6	Digital Ground
7	No Connection	8	Digital Ground
9	No Connection	10	Digital Ground
11	No Connection	12	Digital Ground
13	No Connection	14	Digital Ground
15	No Connection	16	Digital Ground
17	Port B, Line 7	18	Digital Ground
19	Port B, Line 6	20	Digital Ground
21	Port B, Line 5	22	Digital Ground
23	Port B, Line 4	24	Digital Ground
25	Port B, Line 3	26	Digital Ground
27	Port B, Line 2	28	Digital Ground
29	Port B, Line 1	30	Digital Ground
31	Port B, Line 0	32	Digital Ground
33	Port A, Line 7	34	Digital Ground
35	Port A, Line 6	36	Digital Ground
37	Port A, Line 5	38	Digital Ground
39	Port A, Line 4	40	Digital Ground
41	Port A, Line 3	42	Digital Ground
43	Port A, Line 2	44	Digital Ground
45	Port A, Line 1	46	Digital Ground
47	Port A, Line 0	48	Digital Ground
49	+5 V Out (1 A maximum) ^a	50	Digital Ground

a. Pins 19, 20, 31, and 32 have a combined current rating of 1 A maximum.

Connector J3 on the EP195

Table 36 lists pin assignments for connector J3 of the EP195 paddle board.

Table 36: EP195 Connector J3 Pin Assignments

Connector J3, Pin #	Signal Description	Connector J3, Pin #	Signal Description
1	+5 V Out (1 A maximum) ^a	2	Digital Ground
3	No Connection	4	Digital Ground
5	No Connection	6	Digital Ground
7	No Connection	8	Digital Ground
9	No Connection	10	Digital Ground
11	No Connection	12	Digital Ground
13	No Connection	14	Digital Ground
15	No Connection	16	Digital Ground
17	Port D, Line 7	18	Digital Ground
19	Port D, Line 6	20	Digital Ground
21	Port D, Line 5	22	Digital Ground
23	Port D, Line 4	24	Digital Ground
25	Port D, Line 3	26	Digital Ground
27	Port D, Line 2	28	Digital Ground
29	Port D, Line 1	30	Digital Ground
31	Port D, Line 0	32	Digital Ground
33	Port C, Line 7	34	Digital Ground
35	Port C, Line 6	36	Digital Ground
37	Port C, Line 5	38	Digital Ground
39	Port C, Line 4	40	Digital Ground
41	Port C, Line 3	42	Digital Ground
43	Port C, Line 2	44	Digital Ground
45	Port C, Line 1	46	Digital Ground
47	Port C, Line 0	48	Digital Ground
49	+5 V Out (1 A maximum) ^a	50	Digital Ground

a. Pins 19, 20, 31, and 32 have a combined current rating of 1 A maximum.



Using Your Own Screw Terminal Panel

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Data acquisition boards can perform only as well as the input connections and signal integrity you provide. If you choose not to use one of the accessory panels that Data Translation provides for the DT330 Series, consideration must be given to how the signals interact in the real world as well as how they interact with each other.

This appendix describes additional considerations to keep in mind when designing your own screw terminal panel for use with a DT330 Series board.

Analog Outputs

The analog output channels on DT331, DT332, DT333, and DT334 boards have a resolution of 12 or 16 bits (even though the accuracy may be less).

Data Translation ensures that the analog outputs do not break into a high frequency oscillation with high capacitance loads that may be experienced with long cables. Typically, the analog outputs drive 1,000 pF without degradation and bandwidth-limit with higher capacitive loads.

The grounds of most boards are optimized for analog inputs at the expense of some logic or high-frequency noise on the analog outputs. This is because the analog and digital grounds of the board are connected at the ADC's input.

The analog outputs are brought out as a high and a low signal, but the low side is the analog ground at the DAC's output buffer. To remove the high-frequency noise and smooth the glitch energy on the analog outputs, you can install a 15 kHz RC filter on the output, a 100 Ω resistor in series with the output, and a 0.1 μ F capacitor between the output side of the 100 Ω resistor and output low.

Digital Inputs

TTL-type inputs must have current limiting so that circuitry is not damaged when power is removed. On all Data Translation PCI boards, current limiting is used to prevent damage in this fault condition.

On high-speed clock inputs, a ground that is located in the connector next to the clock must be connected as a twisted pair with the high-speed clock input.

Digital Outputs

If you are using the high drive capability of any of the PCI boards, ensure that the load is returned to the digital ground provided in the connector next to the outputs.

If just eight of the digital outputs are switching 16 mA per output, then 128 mA of current flows. To minimize problems with ringing, loading, and EMI, a 22 Ω resistor is used in series with all digital outputs. You must consider this 22 Ω resistor if you are matching cable impedance to the far end.

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