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UM-17416-P

DT330 Series
User's Manual

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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.

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Table of Contents

About this Manual 9
Intended Audience 9
How this Manual is Organized 9
Conventions Used in this Manual 10
Related Information 10
Where To Get Help 11

Chapter 1: Overview 13
Features 14
Supported Software 15
Accessories 16
Getting Started Procedure 17

Part 1: Getting Started 19

Chapter 2: Installing the Board and Loading the Device Driver 21
Unpacking 23
Setting up the Computer 24
Setting up an Expansion Slot 25
Inserting the Board into the Computer 26
Loading the Device Driver 27
Windows XP 27
Windows Vista 27
Windows 7 28

Chapter 3: Wiring Signals 29
Before Wiring 31
Wiring Recommendations 31
Attaching a Screw Terminal Panel/Paddle Board 31
Attaching an STP68 or STP68-DIN Screw Terminal Panel 32
Attaching a DT758-C Screw Terminal Panel 34
Attaching an EP195 Paddle Board 36
Connecting Analog Output Signals 41
Connecting Digital Input Signals 42
Connecting Digital Output Signals 43

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Chapter 4: Verifying the Operation of a Board 45
Running the Quick DataAcq Application 47
Testing Single-Value Analog Output 48
Testing Single-Value Digital Input 49
Testing Single-Value Digital Output 50

Part 2: Using Your Board 51

Chapter 5: Principles of Operation 53
Analog Output Features 55
Resolution 55
Analog Output Channels 55
Ranges and Gains 56
Conversion Mode 56
Data Format 56
Digital I/O Features 58
Digital I/O Lines 58
Resolution 58
Interrupts 59
Operation Modes 59

Chapter 6: Supported Device Driver Capabilities 61
Data Flow and Operation Options 63
Buffering 64
Triggered Scan Mode 64
Data Encoding 64
Channels 65
Gain 65
Ranges 66
Resolution 66
Thermocouple and RTD Support 67
IEPE Support 67
Triggers 68
Clocks 68
Counter/Timers 69

Chapter 7: Calibration 71
Running the Calibration Utility 73
Connecting an External Meter 74
Calibrating a DT330 Series Board 75

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Chapter 8: Troubleshooting 77
General Checklist 78
Technical Support 80
If Your Board Needs Factory Service 81

Appendix A: Specifications 83
Analog Output Specifications. 84
Digital I/O Specifications 85
Power, Physical, and Environmental Specifications 86
Connector Specifications 87

Appendix B: Connector Pin Assignments 89
Connector J1 on the DT331, DT332, DT333, DT334, and DT335 Boards 90
Connector J1 on the DT335-50 Board. 92
Screw Terminal Assignments for the STP68 and STP68-DIN 93
Screw Terminal Assignments for the DT758-C 95
Connector J1 on the EP195 96
Connector J2 on the EP195 97
Connector J3 on the EP195 98

Appendix C: Using Your Own Screw Terminal Panel 99
Analog Outputs 101
Digital Inputs 102
Digital Outputs 103

Index 105

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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.

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- 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.

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- *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).

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Overview

Features 14
Supported Software 15
Accessories 16
Getting Started Procedure 17

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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.

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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.

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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.

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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.

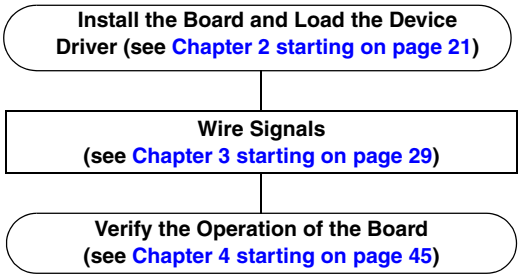


Figure 1: Getting Started Flow Diagram

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Part 1: Getting Started

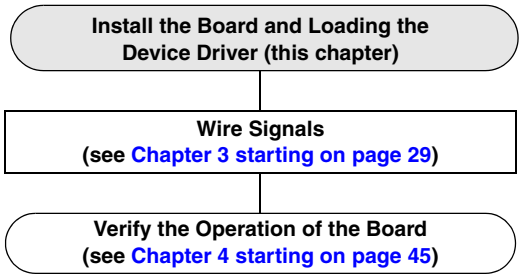
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Installing the Board and Loading the Device Driver

Unpacking 23
Setting up the Computer 24
Setting up an Expansion Slot 25
Inserting the Board into the Computer 26
Loading the Device Driver 27

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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.

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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).

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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

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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.

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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.

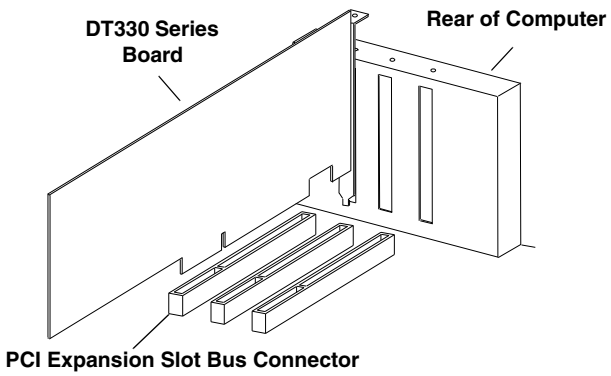


Figure 2: Inserting the DT330 Series Board in the Computer

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.

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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.

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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.

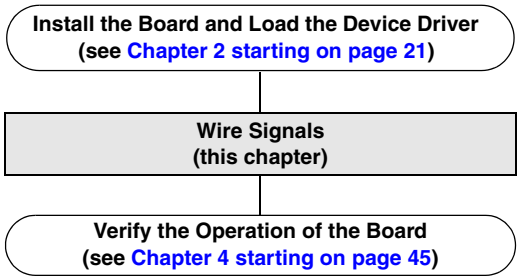
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Wiring Signals

Before Wiring 31
Connecting Analog Output Signals 41
Connecting Digital Input Signals 42
Connecting Digital Output Signals 43

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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 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.

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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.

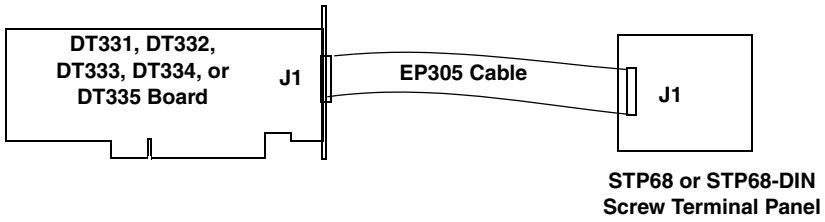


Figure 3: Attaching the STP68 or STP68-DIN Screw Terminal Panel to a DT331, DT332, DT333, DT334, or DT335 Board

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).

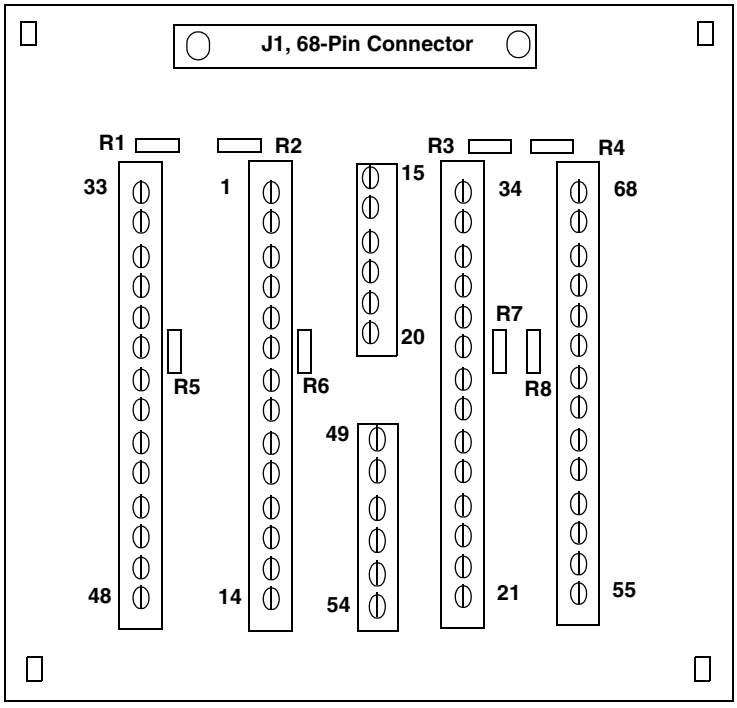


Figure 4: Layout of the STP68 and STP68-DIN Screw Terminal Panel

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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

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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.

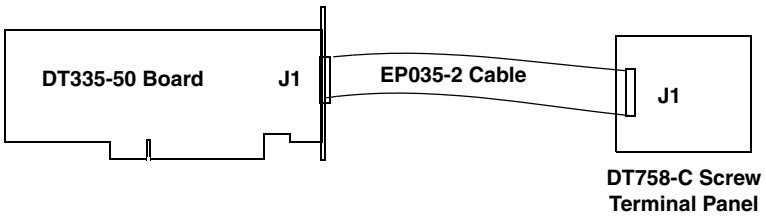


Figure 5: Attaching the DT758-C Screw Terminal Panel to a DT335-50 Board

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).

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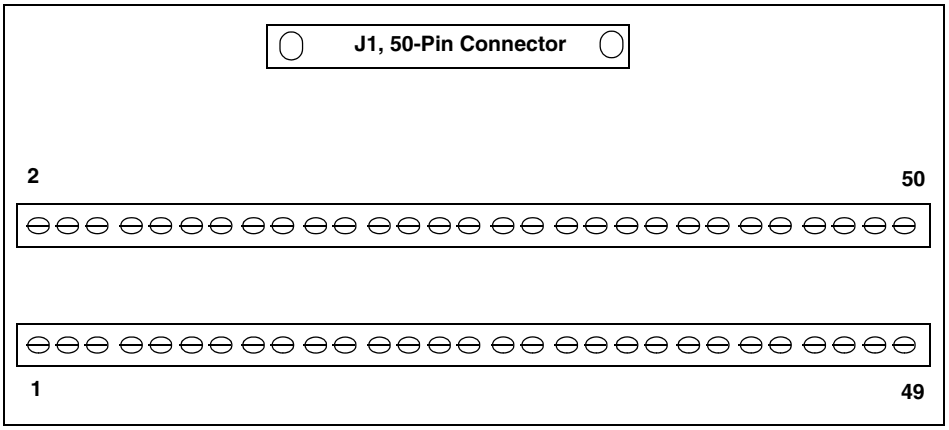


Figure 6: Layout of the DT758-C Screw Terminal Panel

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, Line2	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

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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.

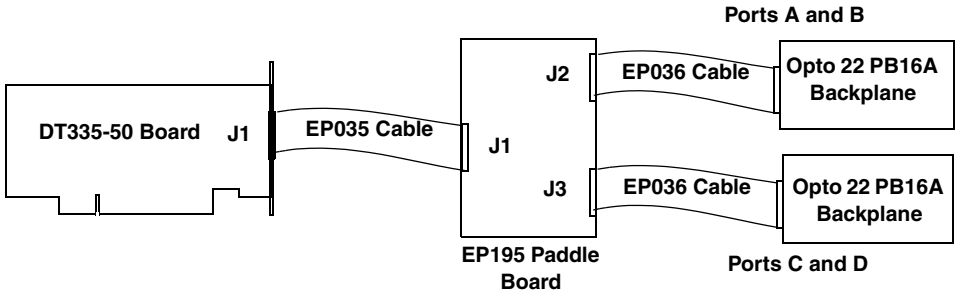


Figure 7: Attaching the EP195 Paddle Board to a DT335-50 Board

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Figure 8 shows the layout of the EP195 paddle board.

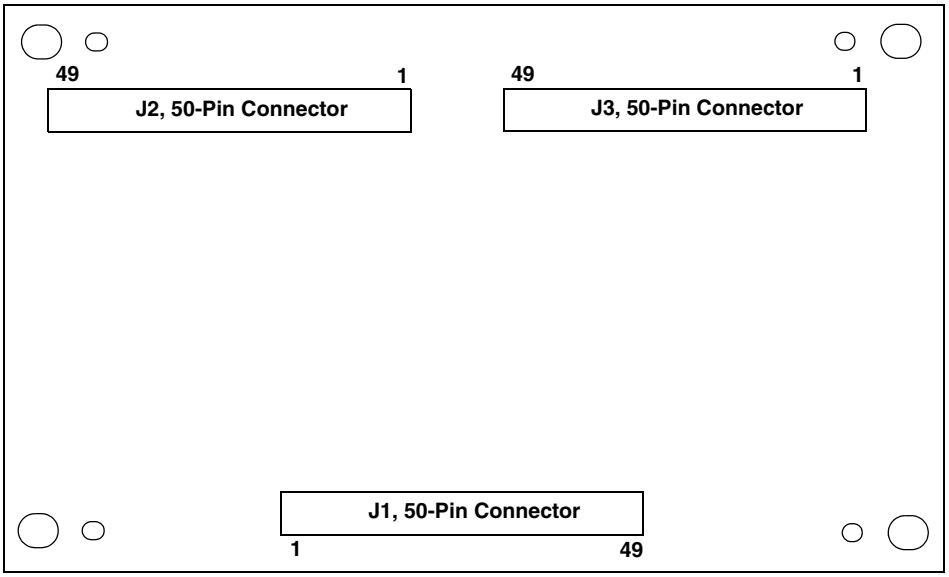


Figure 8: Layout of the EP195 Paddle Board

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

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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

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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

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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.

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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.

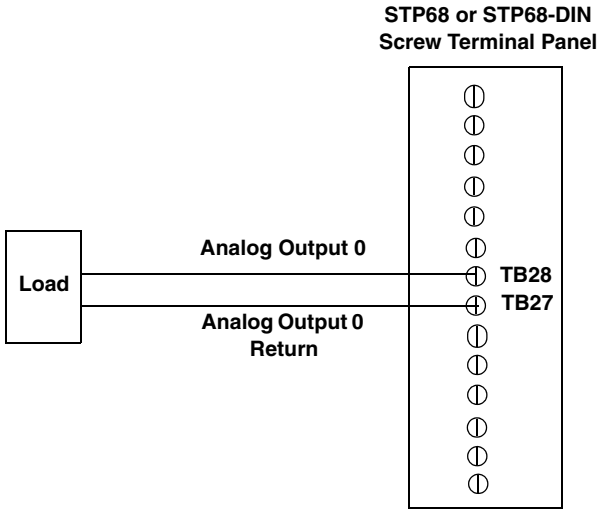


Figure 9: Connecting Analog Output Voltages to the STP68 or STP68-DIN (Shown for Channel 0)

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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.

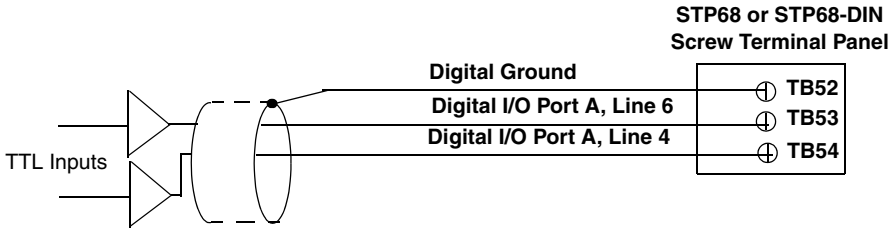


Figure 10: Connecting Digital Inputs to the STP68 or STP68-DIN Screw Terminal Panel (Lines 4 and 6, Port A Shown)

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.

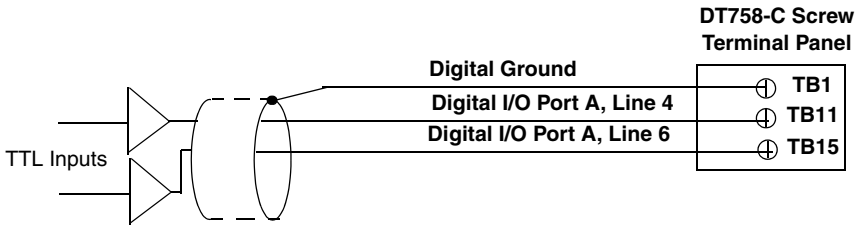


Figure 11: Connecting Digital Inputs to the DT758-C Screw Terminal Panel (Lines 4 and 6, Port A Shown)

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

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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 STP68or STP68-DIN screw terminal panel.

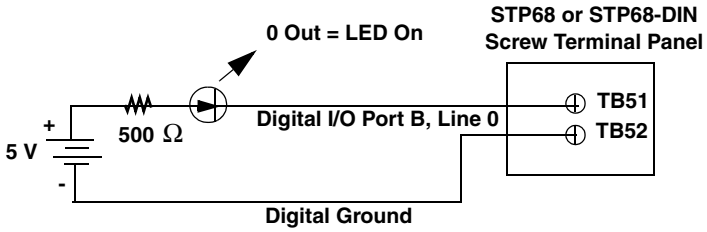


Figure 12: Connecting Digital Outputs to the STP68 or STP68-DIN Screw Terminal Panel (Line 0, Port B Shown)

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.

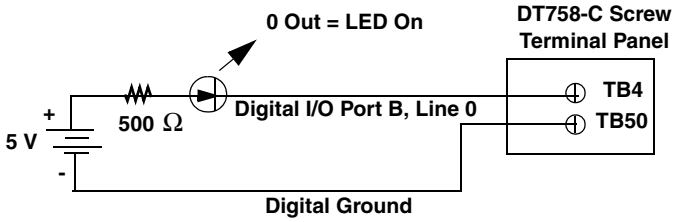


Figure 13: Connecting Digital Outputs to the DT758-C Screw Terminal Panel (Line 0, Port B Shown)

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

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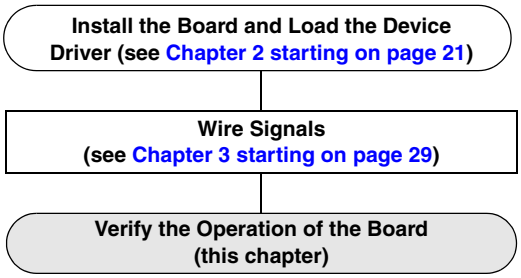
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4

Verifying the Operation of a Board

Running the Quick DataAcq Application. 47
Testing Single-Value Analog Output. 48
Testing Single-Value Digital Input. 49
Testing Single-Value Digital Output 50

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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.

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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.

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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.

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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.

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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.

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Part 2: Using Your Board

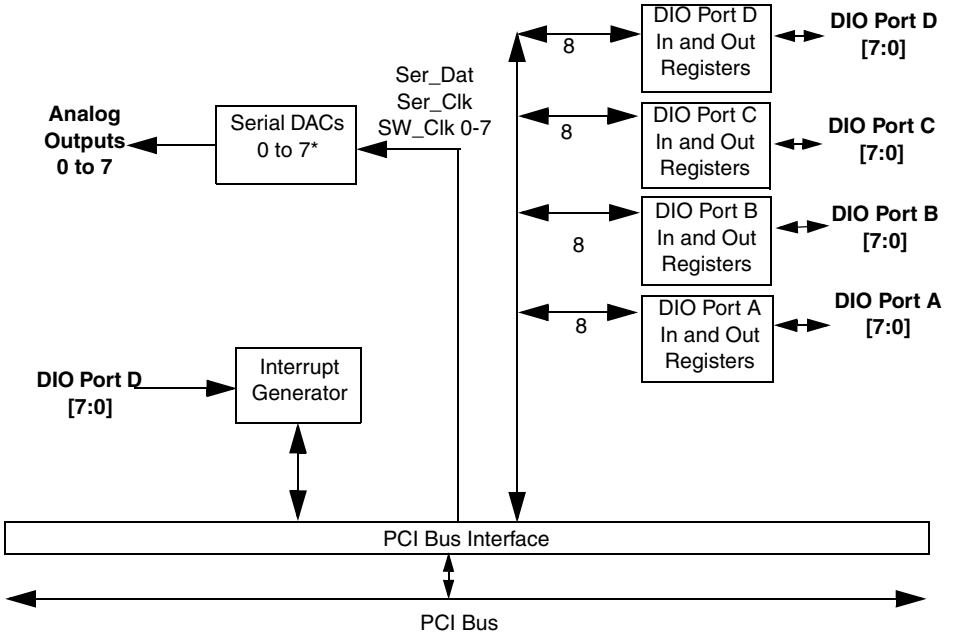


Principles of Operation

Analog Output Features 55
Digital I/O Features 58

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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

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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 V ±10 mV. Resetting the board does not clear the values in the DACs.

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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:

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

$$Code = \frac{Vout - Offset}{LSB}$$

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.
- *Vout* 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.

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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:

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

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

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:

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

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

Code = 48169 = BC29h

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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

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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.

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- **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.*

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Supported Device Driver Capabilities

Data Flow and Operation Options 63
Buffering 64
Triggered Scan Mode 64
Gain 65
Channels 65
Ranges 66
Resolution 66
Thermocouple and RTD Support 67
IEPE Support 67
Triggers 68
Clocks 68
Counter/Timers 69

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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*.

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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 27for 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.

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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**						

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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		

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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).

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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**						

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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		

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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**						

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7

Calibration

Running the Calibration Utility 73
Connecting an External Meter 74
Calibrating a DT330 Series Board 75

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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.

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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.

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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.

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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.

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Troubleshooting

General Checklist 78
Technical Support 80
If Your Board Needs Factory Service 81

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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.	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.
		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.
		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.

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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.	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. 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. 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.
Test button grayed out.	Vdtdad VxD is not installed.	Load the DT330 Series Support Software or the DataAcq SDK.

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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.

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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).

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Specifications

Analog Output Specifications 84
Digital I/O Specifications 85
Power, Physical, and Environmental Specifications 86
Connector Specifications 87

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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

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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 kΩ resistor pullup to +5 V; 22 Ω series resistor	
Inputs Input type: Input load: High-level input voltage: Low-level input voltage: High-level input current: Low-level input current:	 Level sensitive 2 FCT2574 (TTL) 2.0 V minimum 0.8 V maximum 3 µA –3 µA	 Level sensitive 3 FCT2574 (TTL) 2.0 V minimum 0.8 V maximum 4.5 µA 4.5 µA
Minimum Pulse Width High: Low:	 Not Applicable Not Applicable	 66 ns (2 PCI clocks)[a] 66 ns (2 PCI clocks)[a]
Outputs Output driver: Output driver high voltage: Output driver low voltage:	 FCT2574 (TTL) 2.4 V minimum (IOH = –15 mA); 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.

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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

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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.

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B

Connector Pin Assignments

Connector J1 on the DT331, DT332, DT333, DT334, and DT335 Boards 90
Connector J1 on the DT335-50 Board. 92
Screw Terminal Assignments for the STP68 and STP68-DIN 93
Screw Terminal Assignments for the DT758-C 95
Connector J1 on the EP195 96
Connector J2 on the EP195 97
Connector J3 on the EP195 98

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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

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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

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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, Line2	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.

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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

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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

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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, Line2	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.

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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

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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.

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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.

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Using Your Own Screw Terminal Panel

Analog Outputs 101
Digital Inputs 102
Digital Outputs 103

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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.

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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 µF capacitor between the output side of the 100 Ω resistor and output low.

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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.

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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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Index

A

accessories 16
analog output 55
  calibrating 75
  channels 55
  conversion modes 56
  data format 56
  gain 56
  output ranges 56
  resolution 55
  screw terminal assignments, STP68 or STP68-DIN 33
  specifications 84
  when not using the STP68 or STP68-DIN 101
  wiring 41
application wiring
  analog outputs 41
  digital inputs 42
  digital outputs 43
attaching a screw terminal panel
  DT758-C 34
  STP68 or STP68-DIN 32
attaching an EP195 paddle board 36

B

base clock frequency 68
BaseClockFrequency 68
binary data encoding 64
block diagram 54
board specifications 86

C

C/C++ programs 15
cables
  EP035 16
  EP035-2 16
  EP036 16
  EP305 16
calibration 15
  running the utility 73
  using the utility 75
CGLDepth 65
channel type, differential 65
channel-gain list depth 65
channels
  analog output 55
  digital I/O 58
  number of 65
clocks
  base frequency 68
  internal 68
  maximum external clock divider 68
  maximum throughput 68
  minimum external clock divider 68
  minimum throughput 68
connecting an external meter 74
connecting signals
  analog outputs 41
  digital inputs 42
  digital outputs 43
connector specifications 87
continuous digital input 60, 63
conversion modes, single-value analog output 56
customer service 81

D

D/A subsystem 55
  specifications 84
DAQ Adaptor for MATLAB 15
data encoding 64
data flow modes
  continuous 60, 63
  single-value 56, 59, 63
data format, analog output 56
DataAcq SDK 15
description of the functional subsystems
  D/A 55
  DIN and DOUT 58
device driver 15
differential channels 65
digital I/O 58
  interrupts 59
  lines 58
  operation modes 59
  pin assignments, EP195 37, 38, 39
  resolution 58
  screw terminal assignments, DT758-C 35
  screw terminal assignments, STP68 or STP68-DIN 33
  specifications 85

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when not using the STP68, STP68-DIN, or DT758-C 102, 103
wiring inputs 42
wiring outputs 43
dimensions, board 86
DIN subsystem 58
specifications 85
DOUT subsystem 58
specifications 85
DT330 Series Device Driver 15
DT758-C 16
layout 35
screw terminal assignments 35
wiring digital input signals 42
wiring digital output signals 43
DT-Open Layers for .NET Class Library 15
DTx-EZ 15

E

environmental specifications 86
EP035 16
EP035-2 cable 16
EP036 16
EP195 36
attaching to a DT335-50 board 36
connector J1 pin assignments 37
connector J2 pin assignments 38
connector J3 pin assignments 39
layout 37
EP195 paddle board 16
EP305 cable 16
expansion slot selection 25
external clock divider
maximum 68
minimum 68

F

factory service 81
features 14
formatting data, analog output 56
frequency 68
base clock 68
internal retrigger clock 64

G

gain 56
number of 65

H

help 77
help, online 47

I

inserting the board 26
internal clock 68
interrupt-on-change 63
interrupts 59

J

J1 connector pin assignments
DT331 board 90
DT332 board 90
DT333 board 90
DT334 board 90
DT335 board 90
DT335-50 board 92
EP195 paddle board 96
STP68 panel 93
J1 connector pin assignments, EP195 paddle board 37
J2 connector pin assignments, EP195 paddle board 38, 97
J3 connector pin assignments, EP195 paddle board 39, 98

L

LabVIEW 15
lines, digital I/O 58
loading the device driver
Windows 7 28
Windows Vista 27
Windows XP 27
LV-Link 15

M

MaxDifferentialChannels 65
MaxExtClockDivider 68
MaxFrequency 68
MaxMultiScanCount 64
MaxRetriggerFreq 64
MaxSingleEndedChannels 65
Measure Foundry 15
MinExtClockDivider 68
MinFrequency 68
MinRetriggerFreq 64

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N

number of
  differential channels 65
  gains 65
  I/O channels 65
  resolutions 66
  scans per trigger 64
  single-ended channels 65
  voltage ranges 66
NumberOfChannels 65
NumberOfRanges 66
NumberOfResolutions 66
NumberOfSupportedGains 65

O

online help 47
operation modes
  continuous digital input 60
  single-value analog output 56
  single-value digital I/O 59
Opto 22 PB16A backplane 16, 31, 36
output ranges 56

P

paddle board, EP195 16
PB16A Opto 22 backplane 16, 31, 36
physical specifications 86
pin assignments
  DT331 J1 connector 90
  DT332 J1 connector 90
  DT333 J1 connector 90
  DT334 J1 connector 90
  DT335 J1 connector 90
  DT335-50 J1 connector 92
  EP195 J1 connector 96
  EP195 J2 connector 97
  EP195 J3 connector 98
  EP195, J1 connector 37
  EP195, J2 connector 38
  EP195, J3 connector 39
  STP68 J1 connector 93
ports 58
power screw terminal assignments, STP68 or STP68-DIN 33
power specifications 86

Q

Quick DataAcq 15
  running 47
  single-value analog output operations 48
  single-value digital input operations 49
  single-value digital output operations 50

R

ranges 56
  number of 66
resolution
  analog output 55
  available 66
  digital I/O 58
  number of 66
  programmable 66
retrigger clock frequency 64
returning boards to the factory 81
RMA 81
running the Quick DataAcq application 47

S

screw terminal assignments
  DT758-C 35, 95
  STP68 or STP68-DIN 33
screw terminal panel 16
  DT758-C 34, 35
  STP68 or STP68-DIN 32
SDK 15
selecting an expansion slot 25
service and support procedure 80
setting up the computer 24
single-ended channels 65
single-value operations 59, 63
size, board 86
slot selection 25
software packages 15
software supported 15
software trigger 68
specifications 83
  analog output 84
  connector 87
  digital I/O 85
  environmental 86
  physical 86
  power 86
STP68 16
  analog output assignments 33
  digital I/O assignments 33

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layout 32
power assignments 33
wiring analog output signals 41
wiring digital input signals 42
wiring digital output signals 43
STP68-DIN 16
analog output assignments 33
digital I/O assignments 33
layout 32
power assignments 33
wiring analog output signals 41
wiring digital input signals 42
wiring digital output signals 43
subsystem descriptions
D/A 55
DIN and DOUT 58
SupportedResolutions 66
SupportedVoltageRanges 66
SupportsBinaryEncoding 64
SupportsContinuous 63
SupportsDifferential 65
SupportsInternalClock 68
SupportsInterruptOnChange 63
SupportsSingleValue 63
SupportsSoftwareResolution 66
SupportsSoftwareTrigger 68

T

technical support 80
throughput
maximum 68
minimum 68
triggered scan
number of scans per trigger 64
retrigger frequency 64
triggers 68
troubleshooting
procedure 78
service and support procedure 80
troubleshooting table 78

U

unpacking 23
using your own screw terminal panel 99

V

Visual Basic for .NET programs 15
Visual Basic programs 15
Visual C# programs 15
Visual C++ programs 15
voltage ranges 66
number of 66

W

Windows 7, loading the device driver 28
Windows Vista, loading the device driver 27
Windows XP, loading the device driver 27
wiring recommendations 31
wiring signals
analog outputs 41
digital inputs 42
digital outputs 43
writing programs in
C/C++ 15
Visual Basic 15
Visual Basic .NET 15
Visual C# 15
Visual C++ 15

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