DNx-PC-91x
User Manual

Board-Mounted Power Source
in the PowerDNA Cube or RACK Series Chassis

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PN Man-DNx-PC-91x

CE

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Specifications in this document are subject to change without notice. Check with UEI for current status.

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Chapter 1 Introduction

This document outlines the feature set and use of the DNx-PC-91x series power conversion boards. Information about the following boards is included:

- DNx-PC-910
- DNx-PC-911
- DNx-PC-911-828
- DNx-PC-912
- DNx-PC-913
- DNx-PC-914

DNx-PC-91x are power conversion boards that can provide a source of power for external devices. PC-91x power conversion boards can also provide power to other UEI boards requiring external power:

- For systems using the Cube chassis, the DNA-PC-91x boards can internally provide power to supported UEI boards installed in the same Cube chassis via an internal power bus only available with the Cube. PC-91x boards in a Cube chassis can also supply power externally via the DB-37 connector.
- For systems using a RACK chassis, the DNR-PC-91x or DNF-PC-91x boards can only provide power to other UEI boards in the same RACK chassis via external wiring through the DB-37 connector.

Chapter 1 contains the following sections:

- Organization of this Manual (Section 1.1)
- DNx-PC-91x Board Overview (Section 1.2)
- Features (Section 1.3)
- Indicators (Section 1.4)
- Specification (Section 1.5)
- Device Architecture (Section 1.6)
- Connectors and Wiring (pinouts) (Section 1.7)
- PowerDNA Explorer for PC-91x (Section 1.8)

1.1 Organization of this Manual

This PowerDNA PC-91x User Manual is organized as follows:

- **Introduction**
  Chapter 1 provides an overview of the DNx-PC-91x power conversion features, various models available, device architecture, connectivity and logic.
- **Programming with the High-Level API**
  This chapter provides an overview of the how to create a session, configure the session, and format relevant data with the Framework API.
- **Programming with the Low-Level API**
  Chapter 3 describes low-level API commands for configuring and using the DNx-PC-91x series boards.
- **Appendix A - Powering other UEI boards in a PowerDNA Chassis**
  This appendix describes how to use the PC-91x with various other types of UEI boards installed in the same Cube chassis.
- **Appendix B - Accessories**
  This appendix provides a list of accessories available for DNx-PC-91x board(s).
- **Appendix C - Example Test Results for PC-911/912 Testing**
  This appendix provides test procedures and results for initial PC-91x board testing.
- **Index**
  This is an alphabetical listing of the topics covered in this manual.

NOTE: A glossary of terms used with the PowerDNA Cube/RACK and I/O boards can be viewed or downloaded from www.ueidaq.com.

Manual Conventions

To help you get the most out of this manual and our products, please note that we use the following conventions:

Tips are designed to highlight quick ways to get the job done or to reveal good ideas you might not discover on your own.

NOTE: Notes alert you to important information.

CAUTION! *Caution advises you of precautions to take to avoid injury, data loss, and damage to your boards or a system crash.*

Text formatted in **bold** typeface generally represents text that should be entered verbatim. For instance, it can represent a command, as in the following example: “You can instruct users how to run setup using a command such as **setup.exe**.”

Bold typeface will also represent field or button names, as in “Click **Scan Network**.”

Text formatted in `fixed` typeface generally represents source code or other text that should be entered verbatim into the source code, initialization, or other file.

Examples of Manual Conventions

Before plugging any I/O connector into the Cube or RACKtangle, be sure to remove power from all field wiring. Failure to do so may cause severe damage to the equipment.

Usage of Terms

Throughout this manual, the term “Cube” refers to either a PowerDNA Cube product or to a PowerDNR RACKtangle™ rack mounted system, whichever is applicable. The term DNR is a specific reference to the RACKtangle, DNA to the PowerDNA I/O Cube, and DNx to refer to both.

1.2 DNx-PC-91x Board Overview

The DNx-PC-91x series boards provide signal conditioning and external power to various sensors and devices. For the Cube chassis only, the DNA-PC-91x boards may also be used to provide power to any DNA series I/O boards installed in the same Cube over an internal power bus unique to the Cube configuration. For the RACK chassis, DNR/F-PC-91x boards can supply power to other UEI DNR/F- boards through the external DB-37 connector only.

The DNA-PC-91x, DNR-PC-91x, and DNF-PC-91x boards are compatible with the UEI Cube, RACKtangle, and FLATRACK chassis respectively. All board versions are functionally identical but differ in the mounting hardware. The DNA version is designed to stack in a Cube chassis. The DNR/F versions are designed to plug into the backplane of a RACK chassis.

The DNx-PC-91x series is fully backward compatible with the DNx-PC-90x series boards. All connections are through a 37-pin D female connector. The pinout of this connector is identical to that of the earlier DNA-PC-90x series with the exception that pins designated as “NC” on the 90x series are now used as the connections to external power when used.

1.2.1 Input and Output Voltages

The DNx-PCx power conversion boards are designed to provide the output voltages as listed in **Table 1-1**. Refer to “Supply Voltages and Currents” on page 8 for a full list of voltages supported by each board.

Table 1-1 PC-91x Output Voltages

Product	Output Voltage
DNx-PC-910	±10 VDC
DNx-PC-911	±15 VDC
DNx-PC-911-828	±28 VDC
DNx-PC-912	±24 VDC
DNx-PC-913	±45 VDC
DNx-PC-914	±63 VDC

Input voltage to the board is provided by the internal Cube or RACK power supply by default, but an external power supply may alternatively be used to power the units. An external power supply is recommended when the total power drawn from all DNx-PC-91x series boards in a chassis exceeds 40 watts. By default, the PC-91x is designed to automatically detect the presence of an external supply and use power from it when available. The use of internal-only, external-only, or auto-detect is user-programmable.

Outputs may be turned on and off under software control (default is On). The boards also provide read-back capability of the PC-91x inputs, allowing an application to verify proper supply levels.

1.2.2 Software Support

The DNx-PC-91x series includes software drivers supporting all popular operating systems including Windows, Linux, QNX, VXWorks, RTX, and most other popular Real-Time Operating Systems. Windows users may program PC-91x boards using the UEIDAQ Framework, which provides a simple and complete software interface to all popular Windows programming languages and data acquisition and control applications, (e.g., LabVIEW, MATLAB).

1.3 Features

The PC-91x boards provide the following features:

- Isolated DC/DC converter
- Overload protection
- Over-temperature shutdown
- Software-controlled on/off switch
- Ability to read status of input lines: voltage/current within limits, overload.

1.4 Indicators

The DNx-PC-91x indicators are described in **Table 1-2** and illustrated in **Figure 1-1**.

Table 1-2 PC-91x Indicators

LED Name	Description
RDY	Indicates board is powered up and operational
STS	Indicates which mode the board is running in: • **OFF**: Configuration mode • **ON**: Operation mode, (i.e., supplying power to attached load)

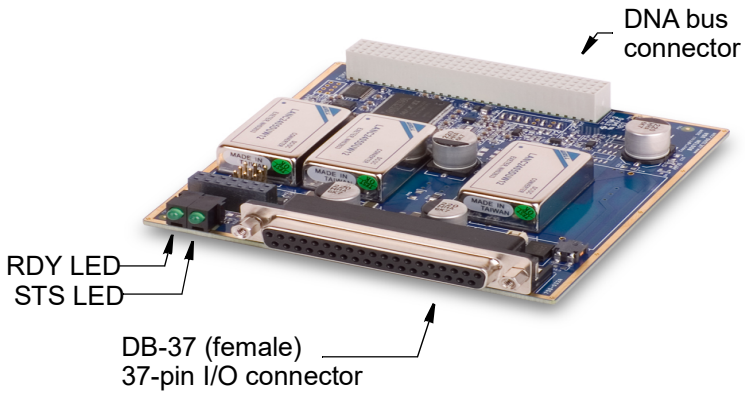


Figure 1-1 Photo of DNA-PC-911 Board

1.5 Specification

The technical specifications for DNx-PC-91x boards are listed in Table 1-3.

Table 1-3 DNx-PC-91x Technical Specifications

Input voltage	Uses the same 9 - 36V DC as chassis in which it is installed
Output voltage / rated current: DNx-PC-910 DNx-PC-911 DNx-PC-911-828 DNx-PC-912 DNx-PC-913 DNx-PC-914	(call for info on other voltages) ±10 V DC ±3% @ 1.5 A ±15 V DC ±3% @ 1.2 A +28 V DC ±3% @ 1.3 A +24 V DC ±3% @ 1.6 A ±45 V DC ±3% @ 0.4 A ±63 V DC ±3% @ 0.4 A
Output current temp derating	Derated 1.2% per °C above 40 °C
Output ripple voltage	<100 mV
Output enable/disable	Software controlled. Default condition is ON
Input Selection*	Power provided by internal bus or external connection. Default source is internal.
Input protection	5 A slow-blow fuse
Output protection	Short circuit protected, unlimited duration
Short circuit output current	150% of I_{max}
Output Isolation	350 Vrms, min
Input voltage readback accuracy	±1%
Temp measurement accuracy	±2 °C
Power supply efficiency	>75% at all currents
Power consumption	0.8 W (without load)
Operating temperature range	-40°C to +85°C (output current derated 1.2% per °C above 40 °C)
Operating humidity	95%, non-condensing
MTBF	150,000 hours

NOTE: *When the total power drawn from all DNx-PC-91x series boards in a single chassis exceeds 40 watts, the use of external power is recommended.

1.6 Device Architecture

As shown in the block diagram (**Figure 1-2**), each DNA-PC-91x board has an isolated DC/DC converter that outputs a DC voltage to external devices through the DB-37 connector on the front panel.

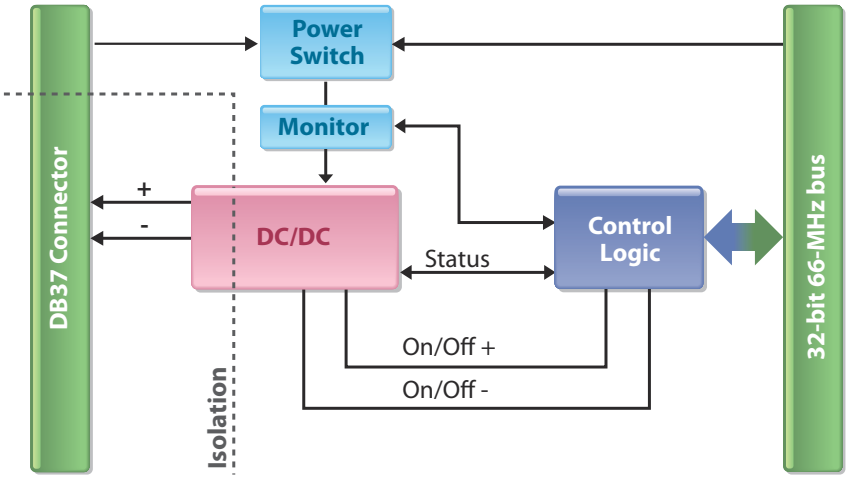


Figure 1-2 Block Diagram of DNx-PC-91x Board

1.6.1 Powering Boards in the Same Chassis

In a Cube chassis, the PC-91x DC/DC converter can be connected to one of two internal power buses that run between all installed board layers. By using the internal power bus, the PC-91x can internally supply power to other UEI DNA series boards installed in the same Cube. The DNA-PC-91x board, as well as the other UEI DNA series boards being powered by it, are configured to use the Cube's internal power bus by installing hardware jumpers on the boards. The jumpers connect board power to power buses that run through the JPOW1 connector. The JPOW1 connector provides access to two power buses, allowing up to two PC-91x boards in a single DNA Cube to drive internal loads via JPOW1 power buses.

For the RACK chassis, the PC-91x can supply power to other UEI DNR/F-boards externally via the DB-37 connector. The RACK systems do not support JPOW1 internal power busing.

Detailed information about powering boards in the same chassis is provided in Appendix A - Using a PC-91x in a Cube Chassis.

1.6.2 Supply Voltages and Currents

Each DNx-PC-91x board has an isolated DC/DC converter that outputs a specific DC voltage as shown in Table 1-4.

Table 1-4 DNx-PC-91x DC Output Voltages

Board Type	Input Voltage	Output Current at Specified Voltage	User Programmable Voltages / Board: -/+ Programmed Voltage (Actual)
PC-910	9-36 VDC	1.5 A at ±10 VDC	+10 V (+10 V) -10 V / +10 V (-10 V / +10 V) -10 V (-10 V)
PC-911*	9-36 VDC	1.2 A at ±15 VDC	-15 V / 0 V (-15 V / 0 V) -15 V / +15 V (-15 V / +15 V) 0 V / +15 V (0 V / +15 V)
PC-911-828	9-36 VDC	1.6 A at +24 VDC	+28 V (+28 V)
PC-912	9-36 VDC	1.6 A at +24 VDC	+12 V (+11.66 V) +24 V (+24 V)
PC-913	9-36 VDC	0.4 A at ±45 VDC	-15 V / +15 V (-14.33 V / +14.33 V) -30 V / +30 V (-29.66 V / +29.66 V) -45 V / +45 V (-45 V / +45 V) -15 V / +45 V (-14.33 V / +45 V) -45 V / +15 V (-45 V / +14.33 V)
PC-914	9-36 VDC	0.4 A at ±63 VDC	-15 V / +15 V (-14.33 V / +14.33 V) -48 V / +48 V (-47.66 V / +47.66 V) -63 V / +63 V (-62.33 V / +62.33 V) -15 V / +63 V (-14.33 V / +62.33 V) -63 V / +15 V (-62.33 V / +14.33 V)

NOTE: *The PC-911 board was manufactured as two revisions. All PC-911 revisions provide ±15V. The table above lists programmable voltages for rev 20x, the latest revision.

Information regarding programming voltage levels is provided in Section 2.4 on page 14 and Section 3.4 on page 18.

CAUTION: The PC-91x provides thermal-, short-, and overload- protected DC/DC. If the power consumption of the configured chassis exceeds about 15 watts, ensure that you specify a fan to dissipate heat away from the chassis. Otherwise, the automated protection system may be triggered to prevent damage to the board.

1.6.3 Diagnostic Readback Features

PC-91x boards are equipped with diagnostic capabilities, providing users the ability to read back power voltage levels, current, temperature, and status information.

Framework and low-level APIs allow users to read back any of the following:

- External Voltage
- Current
- Internal Voltage
- DC/DC Input Voltage
- Temperature
- Status bits: internally used power status, externally used power status, and external power present status

See Section 2.6 on page 15 or Section 3.2 on page 17 for example code and/or API descriptions for reading back diagnostic values.

1.7 Connectors and Wiring (pinouts)

The DNx-PC-91x boards each use a B-size 37-pin female D-Sub connector. Pinout diagrams with available voltages for each of the DNx-PC-91x boards are shown in **Figure 1-3**.

DNx-PC-910

Ext PWR Ret	37	19	Ext PWR Ret
DGND	36	18	–10V
DGND	35	17	–10V
DGND	34	16	–10V
DGND	33	15	–10V
DGND	32	14	–10V
DGND	31	13	–10V
DGND	30	12	–10V
DGND	29	11	N/C
DGND	28	10	N/C
DGND	27	9	N/C
DGND	26	8	+10V
DGND	25	7	+10V
DGND	24	6	+10V
DGND	23	5	+10V
DGND	22	4	+10V
DGND	21	3	+10V
Ext PWR+	20	2	+10V
		1	Ext PWR+

DNx-PC-911

Ext PWR Ret	37	19	Ext PWR Ret
DGND	36	18	–15V
DGND	35	17	–15V
DGND	34	16	–15V
DGND	33	15	–15V
DGND	32	14	–15V
DGND	31	13	–15V
DGND	30	12	–15V
DGND	29	11	N/C
DGND	28	10	N/C
DGND	27	9	N/C
DGND	26	8	+15V
DGND	25	7	+15V
DGND	24	6	+15V
DGND	23	5	+15V
DGND	22	4	+15V
DGND	21	3	+15V
Ext PWR+	20	2	+15V
		1	Ext PWR+

DNx-PC-911-828 28 VDC

Ext PWR Ret	37	19	Ext PWR Ret
DGND	36	18	28V
DGND	35	17	28V
DGND	34	16	28V
DGND	33	15	28V
DGND	32	14	28V
DGND	31	13	28V
DGND	30	12	28V
DGND	29	11	N/C
DGND	28	10	N/C
DGND	27	9	N/C
DGND	26	8	28V
DGND	25	7	28V
DGND	24	6	28V
DGND	23	5	28V
DGND	22	4	28V
DGND	21	3	28V
Ext PWR+	20	2	28V
		1	Ext PWR+

DNx-PC-912

Ext PWR Ret	37	19	Ext PWR Ret
DGND	36	18	DGND
DGND	35	17	DGND
DGND	34	16	DGND
DGND	33	15	DGND
DGND	32	14	DGND
DGND	31	13	DGND
DGND	30	12	DGND
DGND	29	11	N/C
DGND	28	10	N/C
DGND	27	9	N/C
DGND	26	8	+24V
DGND	25	7	+24V
DGND	24	6	+24V
DGND	23	5	+24V
DGND	22	4	+24V
DGND	21	3	+24V
Ext PWR+	20	2	+24V
		1	Ext PWR+

DNx-PC-913

Ext PWR Ret	37	19	Ext PWR Ret
DGND	36	18	–45V
DGND	35	17	–45V
DGND	34	16	–45V
DGND	33	15	–45V
DGND	32	14	–45V
DGND	31	13	–45V
DGND	30	12	–45V
DGND	29	11	N/C
DGND	28	10	N/C
DGND	27	9	N/C
DGND	26	8	+45V
DGND	25	7	+45V
DGND	24	6	+45V
DGND	23	5	+45V
DGND	22	4	+45V
DGND	21	3	+45V
Ext PWR+	20	2	+45V
		1	Ext PWR+

DNx-PC-914

Ext PWR Ret	37	19	Ext PWR Ret
DGND	36	18	–63V
DGND	35	17	–63V
DGND	34	16	–63V
DGND	33	15	–63V
DGND	32	14	–63V
DGND	31	13	–63V
DGND	30	12	–63V
DGND	29	11	N/C
DGND	28	10	N/C
DGND	27	9	N/C
DGND	26	8	+63V
DGND	25	7	+63V
DGND	24	6	+63V
DGND	23	5	+63V
DGND	22	4	+63V
DGND	21	3	+63V
Ext PWR+	20	2	+63V
		1	Ext PWR+

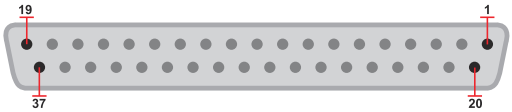


Figure 1-3 Pinouts of the DNA-PC-91x Power Conversion Boards

1.8 PowerDNA Explorer for PC-91x

PowerDNA Explorer is a GUI-based application for communicating with the Cube/RACK and any I/O boards installed in your system.

PowerDNA Explorer can be launched from the Windows startup menu:

- *Start » All Programs » UEI » PowerDNA » PowerDNA Explorer*

When using PowerDNA Explorer to configure PC-91x boards, resetting the IOM or changing the PC-91x configuration outside of PowerDNA Explorer (e.g., via C code or Labview) is not recommended; PowerDNA Explorer will not display changed parameters until **Scan Network** or **Reload Configuration** is clicked again (see **Figure 1-4** for button locations).

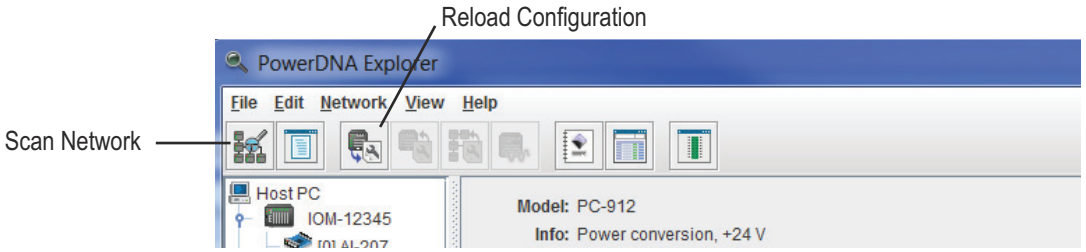


Figure 1-4. Reading Configurations with PowerDNA Explorer

1.8.1 Updating Control Parameters

The PC-91x display in PowerDNA Explorer provides controls for setting the following parameters:

- **Power Source**: Internal, External, or Auto-switch
- **Voltage**: Selections depend on board version
- **Initialization Mode Power**: Off/On value of **Voltage**
- **Operation Mode Power**: Off/On value of **Voltage**
- **Shutdown Mode Power**: Off/On value of **Voltage**

After adjusting control parameters, click **Store Configuration** to apply and store settings. Refer to **Figure 1-5**.

1.8.2 Storing Initialization Values

Initialization values are stored in non-volatile memory on the PC-91x board and are loaded at startup. You can change any of the factory default values and save them into the non-volatile memory on that specific PC-91x by clicking the **Store Configuration** button. Stored values will be retained if the PC-91x board is removed and installed into a different IOM (Cube or RACK).

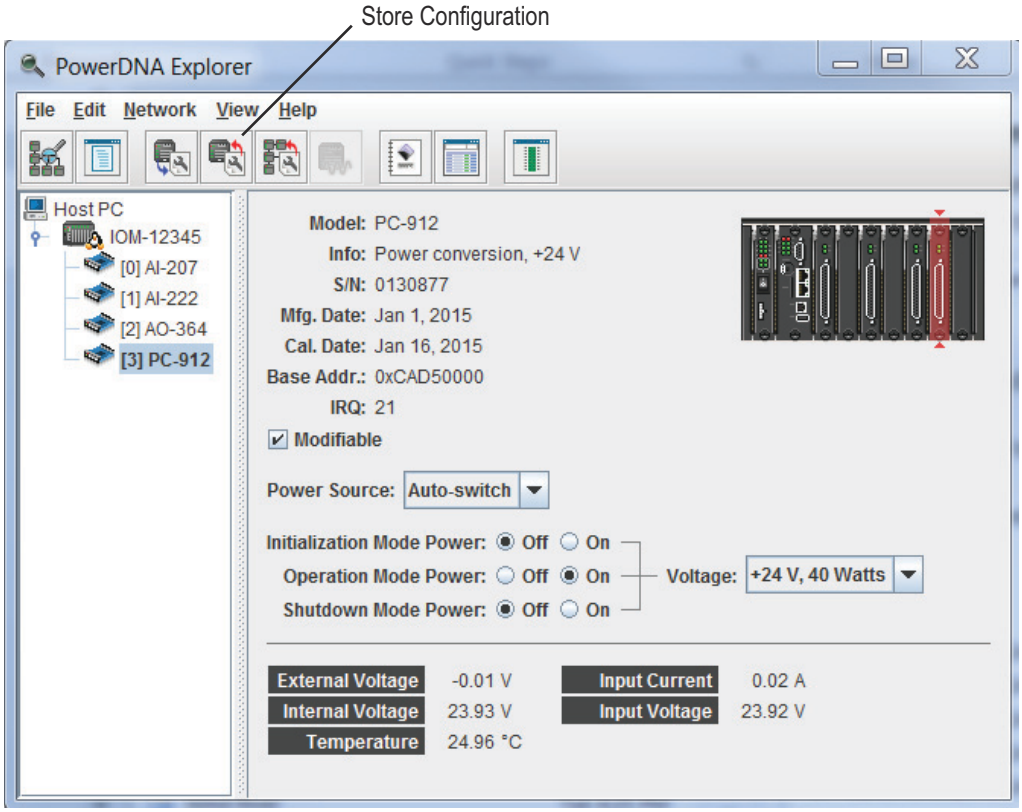


Figure 1-5. PowerDNA Explorer PC-91x Display

Chapter 2 Programming with the High-Level API

This chapter provides the following information about using the UeiDaq Framework high-level API to control the DNx-PC-91x:

- About the High-Level Framework (Section 2.1)
- Creating a Session (Section 2.2)
- Configuring Channels (Section 2.3)
- Programming the Power Output Level (Section 2.4)
- Configuring the Timing (Section 2.5)
- Reading Back Voltages, Currents, and Temperature (Section 2.6)
- Reading Status (Section 2.7)
- Cleaning up the Session (Section 2.8)

2.1 About the High-Level Framework

UeiDaq Framework is object oriented and its objects can be manipulated in the same manner from different development environments, such as Visual C++, Visual Basic, or LabVIEW.

UeiDaq Framework is bundled with examples for supported programming languages. Examples are located under the UEI programs group in:

- *Start » Programs » UEI » Framework » Examples*

The following sections focus on C++ API examples, but the concept is the same no matter what programming language you use.

Please refer to the “UeiDaq Framework User Manual” for more information on use of other programming languages.

2.2 Creating a Session

The Session object controls all operations on your PowerDNA device. Therefore, the first task is to create a session object:

```
CUeiSession session;
```

2.3 Configuring Channels

The PC-91x allows for reading back power voltage levels, current and temperature. Readback measurements are mapped to the following channels:

- Channel 0 (CH0): External Voltage
- Channel 1 (CH1): Current
- Channel 2 (CH2): Internal Voltage
- Channel 3 (CH3): DC/DC Input Voltage
- Channel 4 (CH4): Temperature

To access measurements, configure the channel list using the session's object method "CreateAIChannel".

```
// Configure PC-91x to read channels 0 to 4

session.CreateAIChannel("pdna://192.168.100.2/Dev0/
Ai0,1,2,3,4",-10, 10,UeiAIChannelInputModeSingleEnded);
```

The input range and input mode settings are not used on the PC-91x.

2.4 Programming the Power Output Level

The following example shows how to switch the output on or off with the custom property "source":

```
// Set source 0: internal power, 1: external power,
// 2: external power with automatic switch to internal

session.SetCustomProperty("source", 0);
```

The custom property "voltageselect" is used to set the output voltage level:

```
// Set voltage selection
// 0: Power off
// 1: -4.33V +4.33V 12W (911 rev 100 only)*
// 2: -9.66V +9.66V 24W (911 rev 100 only)*
// 3: -15V +15V 36W (911 rev 100 only)*
// 4: -4.33V +15V 24W (911 rev 100 only)*
// 5: -15V +4.33V 24W (911 rev 100 only)*
// 6: +11.66V 20W (912 only)
// 7: +24V 40W (912 only)
// 8: -14.33V +14.33V 12W (913 only)
// 9: -29.66V +29.66V 24W (913 only)
// 10: -45V +45V 36W (913 only)
// 11: -14.33V +45V 24W (913 only)
// 12: -45V +14.33V 24W (913 only)
// 13: +10V 15W (910 only)
// 14: -10V +10V 30W (910 only)
// 15: -10V 15W (910 only)
// 16:   0V +15V 20W (911 rev 20x only)*
// 17: -15V +15V 40W (911 rev 20x only)*
// 18: -15V   0V 20W (911 rev 20x only)*
// 19: -15V +15V 20W (914 only)
// 20: -48V +48V 40W (914 only)
// 21: -63V +63V 50W (914 only)
// 22: -15V +63V 30W (914 only)
// 23: -63V +15V 30W (914 only)
// 24: +28V 30W (911-828 only)

session.SetCustomProperty("voltageselect", 8);
```

*To verify available voltage selections associated with PC-91x boards installed in your system, you can view the **Voltage** selections parameter using PowerDNA Explorer (see Section 1.8).

2.5 Configuring the Timing

You can only configure the PC-91x to run in simple mode (point by point). Other timing modes are not supported.

In simple mode, the delay between samples is determined by software on the host computer.

The following sample shows how to configure the simple mode.

```
session.ConfigureTimingForSimpleIO();
```

2.6 Reading Back Voltages, Currents, and Temperature

Reading data from the PC-91x is done by using a reader object. Use the scaled reader object to read the voltage, current, and temperature readback values.

The following sample code shows how to create a scaled reader object and read samples.

```
// Create a reader and link it to the session's stream
CueiAnalogScaledReader reader(session.GetDataStream());

// read one scan, the buffer returned contains { v-external,
current, v-internal, v-dcdc-input, temperature }

double data[5];
reader.ReadSingleScan(data);
```

2.7 Reading Status

Reading the PC-91x status provides voltage source information. Status bits include the following:

- Bit 0: External Power Present status bit
  (1=Present; 0=No External Power)
- Bit 1: External Power Used status bit
  (1=External Power used (via DB-37); 0=External Power not used)
- Bit 2: Internal Power Used status bit
  (1=Internal Power used (main via chassis); 0=Internal Power not used)

The status value is read through a DI session.

The following sample code shows how to create a DI session, configure timing, and read the status value.

```
// The session object controls all operations on your PowerDNA
// device. The first step for reading the status is to create
// a DI session object.

CueiSession diSs;

// Configure PC-91x to read the status bit: The following
// example configures a resource string for reading status
// from device 3 (3rd board) in the IOM with an IP address of
// 192.168.100.2.

diSs.CreateDIChannel("pdna://192.168.100.2/Dev3/di0");
```

```
// Configure reading status information in
// simple mode (point-by-point).

diSs.ConfigureTimingForSimpleIO();


// Create a reader and link it to the session's stream

CUeiDigitalReader diReader(diSs.GetDataStream());


 // Read one scan. The return value provides the state of all
// the PC-91x status bits: External Power present status
// (bit0), External Source Used status (bit1), Internal Source
// Used status (bit2)

uInt32 status;
diReader.ReadSingleScan(&status);


// Stop the session
diSs.Stop();
```

2.8 Cleaning up the Session

The session object will clean itself up when it goes out of scope or when it is destroyed. However, you can manually clean up the session (to reuse the object with a different set of channels or parameters, for example).

```
session.CleanUp();
```

Chapter 3 Programming with the Low-Level API

This chapter provides the following information about programming the DNx-PC-91x using the low-level API:

- About the Low-level API (Section 3.1)
- Low-level Functions (Section 3.2)
- Low-level Programming Techniques (Section 3.3)
- Board Configuration (Section 3.4)

3.1 About the Low-level API

The low-level API provides direct access to the DAQBIOS protocol structure and registers in C. The low-level API is intended for speed-optimization, when programming unconventional functionality, or when programming under Linux or real-time operating systems.

When programming in Windows OS, however, we recommend that you use the UeiDaq Framework High-Level API (see **Chapter 2**). The Framework extends the low-level API with additional functionality that makes programming easier, faster, and less error-prone.

For additional information regarding low-level programming, refer to the "PowerDNA API Reference Manual" located in:

- On Linux systems:
  <PowerDNA-x.y.z>/doc
- On Windows systems:
  Start » All Programs » UEI » PowerDNA » Documentation

3.2 Low-level Functions

Low-level functions are described in detail in the PowerDNA API Reference Manual. Table 3-1 provides a summary of PC-91x-specific functions.

Table 3-1 Summary of Low-level API Functions for DNx-PC-91x

Function	Description
`DqAdv91xRead`	Returns status and ADC readings from the PC-91x boards, (e.g., voltages, currents, temperatures)
`DqAdv91xSetConfig`	Configures the operating state of the PC-91x board

3.3 Low-level Programming Techniques

Application developers are encouraged to explore existing source code examples when first programming the PC-91x. Sample code provided with the installation is self-documented and serves as a good starting point.

Code examples are located in the following directories:

- For Linux: <PowerDNA-x.y.z>/sdk/DAQLib_Samples
- For Windows: *Start » All Programs » UEI » PowerDNA » Examples*

3.4 Board Configuration

The PC-91x uses the low-level API, **`DqAdv91xSetConfig(),`** to configure the PC-91x board:

```
DqAdv91xSetConfig(
      int hd,           // Handle to IOM received from DqOpenIOM()
      int devn,         // Board device # inside the IOM chassis
      int src,          // Voltage source selector (see Table 3-2)
      int vsel,         // Voltage option selections,
                        //    or power removal (see Table 3-3)
);
```

Table 3-2 Voltage Source #define Values

Configuration #define Value	Description
DQ_91X_INTERNAL_POWER	Use internal power from DNx system
DQ_91X_EXT_JIO_POWER	Use power from DB-37 (JIO) connector
DQ_91X_EXT_JIO_AUTOSWITCH	Use power from DB-37 (JIO) connector but switch to internal power when JIO voltage is too low (approximately at 9V).

Table 3-3 Voltage Options

Part Number	#define Value for Voltage Option	Description
PC-91x	DQ_91X_POWER_OFF	Turns power off of board: use with any board type
PC-910	DQ_910_P10_15W	Sets power to +10 V 15 watts
PC-910	DQ_910_P10_N10_30W	Sets power to +-10 V 30 watts
PC-910	DQ_910_N10_15W	Sets power to -10 V 15 watts
PC-911* rev100	DQ_911_P5_N5_12W	Sets power to +-5 V 12 watts
PC-911* rev100	DQ_911_P10_N10_24W	Sets power to +-10 V 24 watts
PC-911* rev100	DQ_911_P15_N15_36W	Sets power to +-15 V 36 watts
PC-911* rev100	DQ_911_P15_N5_24W	Sets power to +15 V,-5 V 24 watts
PC-911* rev100	DQ_911_P5_N15_24W	Sets power to +5 V,-15 V 24 watts
PC-911* rev20x	DQ_911_P15_20W	Sets power to +15 V 20 watts
PC-911* rev20x	DQ_911_P15_N15_40W	Sets power to +-15 V 40 watts
PC-911* rev20x	DQ_911_N15_20W	Sets power to -15 V 20 watts
PC-911-828	DQ_911_828_P28_30W	Sets power to +28 V 30 watts
PC-912	DQ_912_P12_20W	Sets power to +12 V 20 watts
PC-912	DQ_912_P24_40W	Sets power to +24 V 40 watts
PC-913	DQ_913_P15_N15_12W	Sets power to +-15 V 12 watts

Table 3-3 Voltage Options (Cont.)

Part Number	#define Value for Voltage Option	Description
PC-913	DQ_913_P30_N30_24W	Sets power to +-30 V 24 watts
PC-913	DQ_913_P45_N45_36W	Sets power to +-45 V 36 watts
PC-913	DQ_913_P45_N15_24W	Sets power to +45 V,-15 V 24 watts
PC-913	DQ_913_P15_N45_24W	Sets power to +15 V,-45 V 24 watts
PC-914	DQ_914_P15_N15_20W	Sets power to +-15 V 20 watts
PC-914	DQ_914_P48_N48_40W	Sets power to +-48 V V 40 watts
PC-914	DQ_914_P63_N63_50W	Sets power to +-63 V 50 watts
PC-914	DQ_914_P63_N15_30W	Sets power to +63 V,-15 V 30 watts
PC-914	DQ_914_P15_N63_30W	Sets power to +15 V,-63 V 30 watts

*The PC-911 board was manufactured as two revisions. All PC-911 revisions provide ±15V. The #define values that support the +/-15V setting for each PC-911 revision (DQ_911_P15_N15_40W (rev 20x) or DQ_911_P15_N15_36W (rev 100)) are cross-compatible. For example, if your code uses DQ_911_P15_N15_36W for the newer PC-911 rev 20x boards, the firmware will still program the board to provide +/-15V.

Available voltage options can be verified for any power conversion board installed in your system by viewing the **Voltage** selections parameter using PowerDNA Explorer (see “PowerDNA Explorer for PC-91x” on page 11).

Appendix A - Using a PC-91x in a Cube Chassis

Using a DNx-PC-91x Power Conversion Board with Other Boards in a PowerDNA Cube Chassis

A.1 Overview

DNA-PC-91x power conversion boards can supply power to external devices through the DB-37 connector on the front panel.

On the Cube chassis, DNA-PC-91x power conversion boards can supply power internally via the JPOW1 connector to other UEI boards mounted within the same Cube. This function is not available with the RACKtangle or FLATRACK. With DNR/F- RACK version boards, all inter-board connections must be made using external connections to the DB-37 front panel connector.

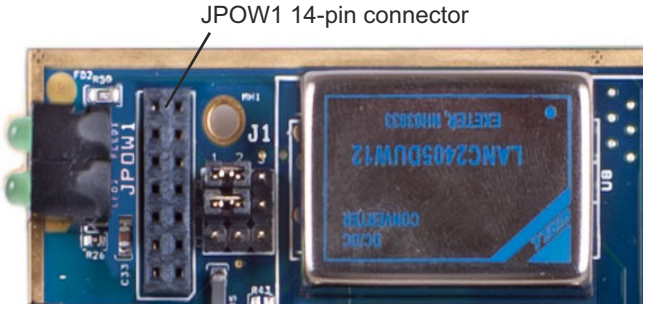


Figure A-1 PC-91x JPOW1 Connector for Power Busing in Cube Chassis

A.2 Connecting PC-91x Power to DNA- Boards within the Same Cube

DNA- versions of digital input/output boards (DIO-401/402/404/405/406) and/or analog output board (AO-308-353) in the same Cube as the PC-91x can be powered by the PC-91x via interlayer Bus 1 or Bus 2 on the JPOW1 connector.

When you order your system, if you specify that you want the PC-91x to supply power internally to other boards installed on your Cube, UEI will configure your system and install all appropriate jumpers for interlayer bus access.

If you need to change power busing on your system, you can send your system back to UEI for modifications or you can install the jumpers on appropriate board-level local connectors (J1 or J2) yourself, as described in Section A.3 thru Section A.6:

- Connecting a PC-91x to an Interlayer Power Connector (Section A.3)
- Connecting DIO-401/402/405 Digital I/O to Interlayer Bus/PC-912 (Section A.4)
- Connecting DIO-404/406 Digital I/O to Interlayer Bus/PC-912 (Section A.5)
- Connecting AO-308-353 Analog Output Board to Interlayer Bus/PC-913 (Section A.6)
- Connecting AO-308-354 Analog Output Board to Interlayer Bus/PC-914 (Section A.7)

A.3 Connecting a PC-91x to an Interlayer Power Connector

In a Cube chassis, power and ground from a DNA-PC-91x board may be connected to either of the two interlayer buses (Bus 1 or Bus 2) by installing jumpers on the board as shown in **Figure A-2**. Pin functions are described in **Table A-1**. **Figure A-3** shows pictures of the jumpers installed for Bus 1 and Bus 2.

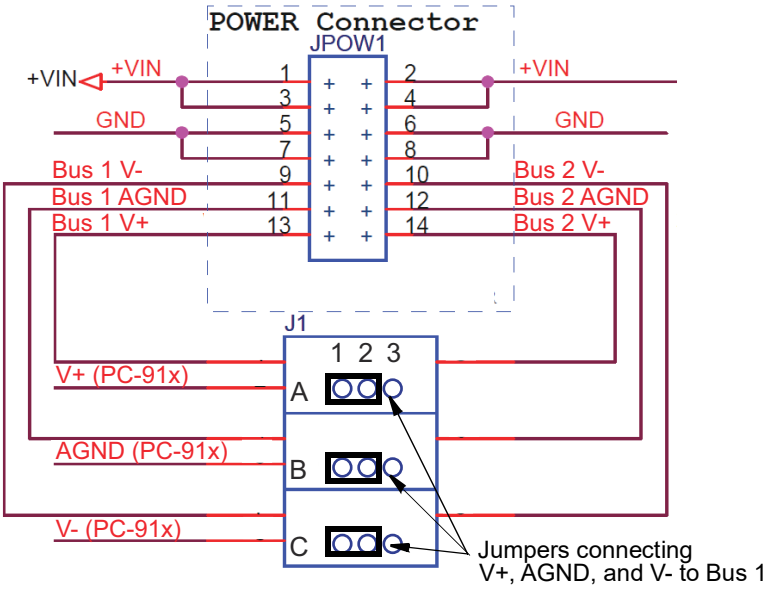
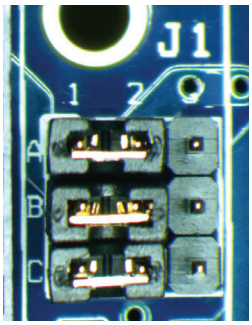


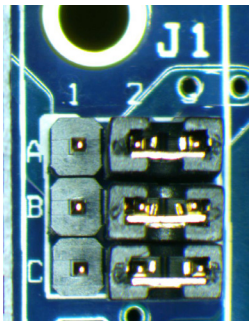
Figure A-2 Connecting PC-91x to Bus 1 via J1 Jumper Connector

Table A-1 J1 Pin Functions

J1 Pinout	1	2	3
A	Bus 1 V+	PC-91x V+	Bus 2 V+
B	Bus 1 AGND	PC-91x AGND	Bus 2 AGND
C	Bus 1 V-	PC-91x V-	Bus 2 V-



PC-91x Bus 1 Jumpers



PC-91x Bus 2 Jumpers

Figure A-3 Photo of PC-91x Connected to Bus 1 (left) and Bus 2 (right)

A.4 Connecting DIO-401/402/405 Digital I/O to Interlayer Bus/PC-912

The following procedure provides an example of configuring a power conversion board to supply power and ground to a digital input/output board within the same Cube. The digital input/output board images in this procedure correspond with DIO-401/402/405 boards.

The example configures the DNA-PC-912 to provide power and ground via Bus 1 to the DNA-DIO-401 board.

Connecting to power Bus 1 or Bus 2 is only available on a Cube chassis.

STEP 1: Determine the voltage required.

The DNA-DIO-401 data sheet specifies an external power source of 7-36 VDC, with +24 VDC listed as the nominal value. The DNA-PC-912 conversion board provides +24 VDC.

STEP 2: Determine which interlayer Bus (Bus 1 or Bus 2) you want to use for this board. For this example, we use Bus 1.

STEP 3: Install jumpers on the PC-912 board between pins A1-A2 and B1-B2 of the J1 jumper connector, as shown in **Figure A-4**. Refer to page 21 for J1 pinout.

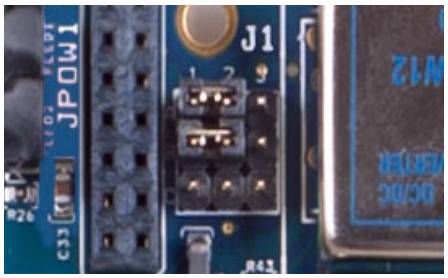


Figure A-4 Photo of PC-91x V+ Power and Ground Connected to Bus 1

NOTE: Alternatively, to use Bus 2 instead of Bus 1, jumpers would be installed between pins A2-A3 and B2-B3.

STEP 4: Install jumpers on the DIO-401 board between pins 1-2 and 4-5 of the J2 jumper connector to connect power and ground via interlayer Bus 1, as shown in **Figure A-5**.

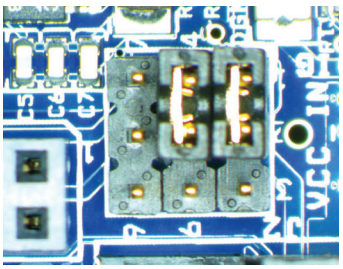


Figure A-5 Photo of DIO-401 V+ Power and Ground Connected to Bus 1

NOTE: Alternatively, to connect to Bus 2 instead of Bus 1, jumpers would be installed between pins 2-3 and 5-6.

The physical layout of the PC-912 and DIO-401 boards, showing locations of jumpers and bus connectors, is illustrated below in **Figure A-6**.

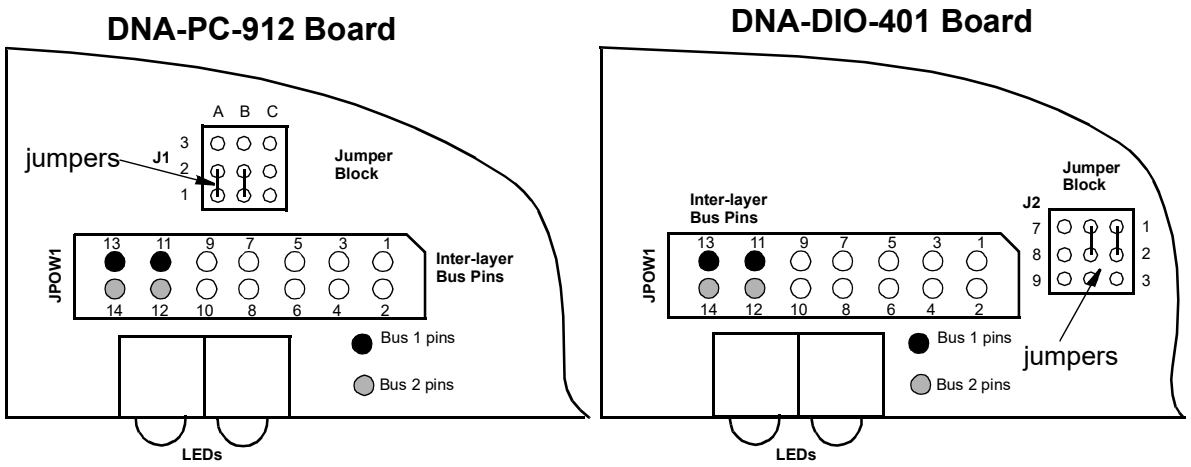


Figure A-6 Physical Layout of PC-912 and DIO-401 Boards

A.5 Connecting DIO-404/406 Digital I/O to Interlayer Bus/PC-912

The following procedure provides an example of configuring the DNA-PC-912 power conversion board to supply power and ground via Bus 1 to the DNA-DIO-404 board in the same Cube chassis. The digital input/output board images in this procedure correspond with DIO-404/406 boards.

Connecting to power Bus 1 or Bus 2 is only available on a Cube chassis.

STEP 1: Install jumpers on the PC-912 board between pins A1-A2 and B1-B2 of the J1 jumper connector to connect power and ground via interlayer Bus 1, as shown in **Figure A-4**. Refer to page 21 for J1 pinout.

NOTE: Alternatively, to use Bus 2 instead of Bus 1, jumpers would be installed between pins A2-A3 and B2-B3.

STEP 2: Install jumpers on the DIO-404 board between pins 1-2 and 4-5 of the J2 jumper connector to connect power and ground via interlayer Bus 1, as shown in **Figure A-7**.

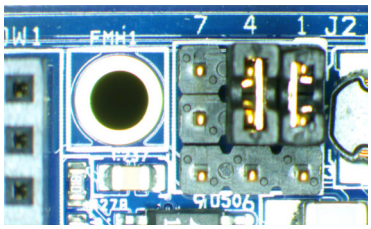


Figure A-7 Photo of DIO-404 V+ Power and Ground Connected to Bus 1

NOTE: Alternatively, to connect to Bus 2 instead of Bus 1, jumpers would be installed between pins 2-3 and 5-6.

The physical layout of the PC-912 and DIO-404 boards, showing locations of jumpers and bus connectors, is illustrated below in **Figure A-6**.

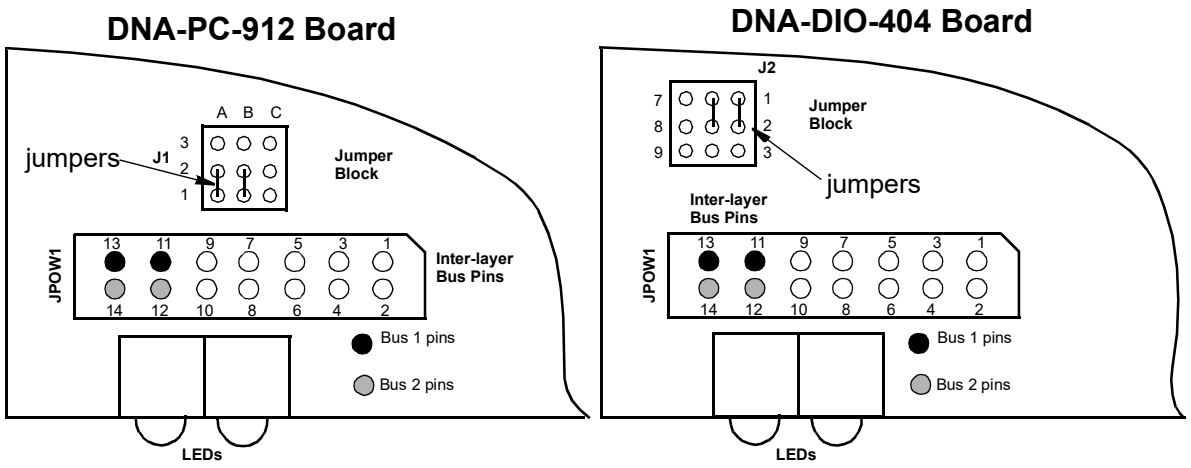


Figure A-8 Physical Layout of PC-912 and DIO-404 Boards

A.6 Connecting AO-308-353 Analog Output Board to Interlayer Bus/PC-913

The following procedure provides an example of configuring the DNA-PC-913 power conversion board to supply V+ and V- power and ground via Bus 1 to the DNA-AO-308-353 board in the same Cube chassis.

Connecting to power Bus 1 or Bus 2 is only available on a Cube chassis.

STEP 1: Install jumpers on the PC-913 board between pins A1-A2, B1-B2, and C1-C2 of the J1 jumper connector to connect V+, ground, and V- via interlayer Bus 1, as shown in **Figure A-9**. Refer to page 21 for J1 pinout.

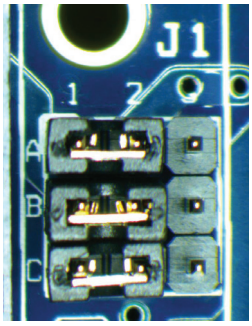


Figure A-9 Photo of PC-913 V+, Ground, and V- Connected to Bus 1

NOTE: Alternatively, to use Bus 2 instead of Bus 1, jumpers would be installed between pins A2-A3, B2-B3, and C2-C3.

STEP 2: Install jumpers on the AO-308-353 board between pins 2-3 on the J2 row, between pins 2-3 on the J3 row, and between pins 2-3 on the J4 row of the jumper connector to connect V+, ground, and V- via interlayer Bus 1, as shown in **Figure A-10**. (Refer to **Figure A-11** for board orientation.)

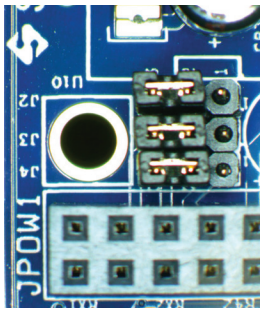


Figure A-10 Photo of AO-308-353 V+, Ground, and V- Connected to Bus 1

NOTE: Alternatively, to connect to Bus 2 instead of Bus 1, jumpers would be installed between pins 1-2 on the J2 row, between pins 1-2 on the J3 row, and between pins 1-2 on the J4 row.

The physical layout of the PC-913 and AO-308-353 boards, showing locations of jumpers and bus connectors, is illustrated below in **Figure A-11**.

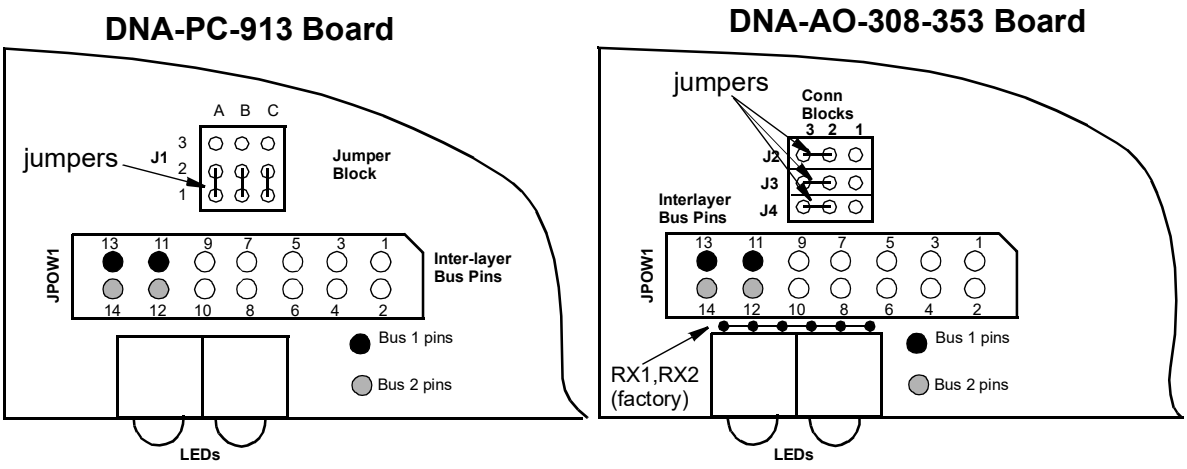


Figure A-11 Physical Location of DNA-PC-913 and AO-308-353 Jumpers

NOTE: Factory installed RX1 and RX2 resistors must be populated when powering the AO-308-353 internally from Bus 1 or Bus 2.

A.7 Connecting AO-308-354 Analog Output Board to Interlayer Bus/PC-914

The following procedure provides an example of configuring the DNA-PC-914 power conversion board to supply V+ and V- power and ground via Bus 1 to the DNA-AO-308-354 board in the same Cube chassis.

Connecting to power Bus 1 or Bus 2 is only available on a Cube chassis.

STEP 1: Install jumpers on the PC-914 board between pins A1-A2, B1-B2, and C1-C2 of the J1 jumper connector to connect V+, ground, and V- via interlayer Bus 1, as shown in **Figure A-12**. Refer to page 21 for J1 pinout.

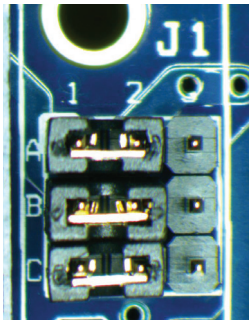


Figure A-12 Photo of PC-914 V+, Ground, and V- Connected to Bus 1

NOTE: Alternatively, to use Bus 2 instead of Bus 1, jumpers would be installed between pins A2-A3, B2-B3, and C2-C3.

STEP 2: Install jumpers on the AO-308-354 board between pins 2-3 on the J2 row, between pins 2-3 on the J3 row, and between pins 2-3 on the J4 row of the jumper connector to connect V+, ground, and V- via interlayer Bus 1, as shown in **Figure A-13**. (Refer to **Figure A-14** for board orientation.)

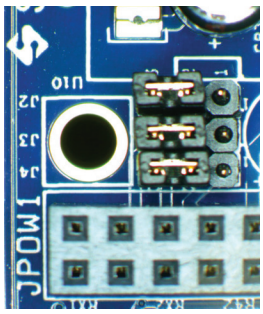


Figure A-13 Photo of AO-308-354 V+, Ground, and V- Connected to Bus 1

NOTE: Alternatively, to connect to Bus 2 instead of Bus 1, jumpers would be installed between pins 1-2 on the J2 row, between pins 1-2 on the J3 row, and between pins 1-2 on the J4 row.

The physical layout of the PC-914 and AO-308-354 boards, showing locations of jumpers and bus connectors, is illustrated below in **Figure A-14**.

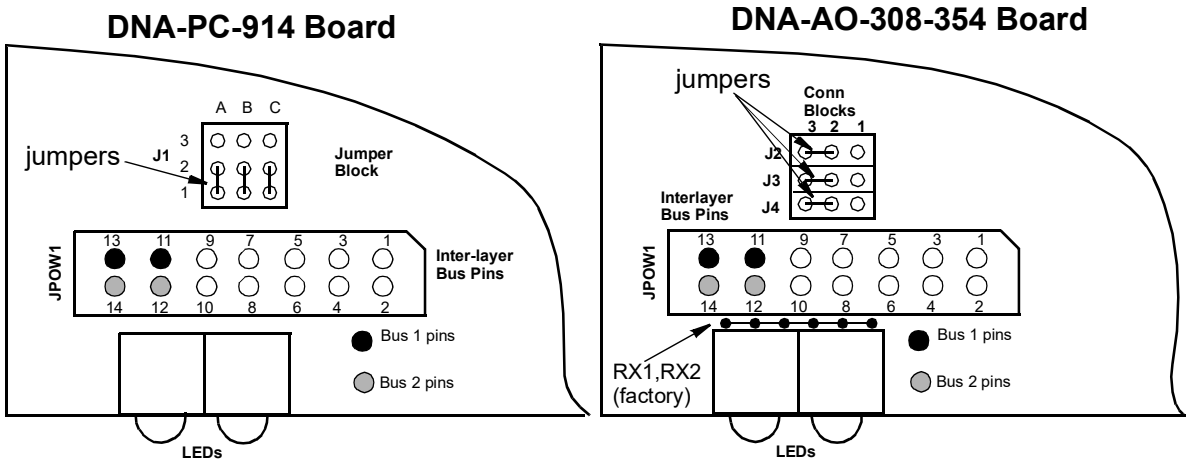


Figure A-14 Physical Location of DNA-PC-914 and AO-308-354 Jumpers

NOTE: Factory installed RX1 and RX2 resistors must be populated when powering the AO-308-354 internally from Bus 1 or Bus 2.

Appendix B - Accessories

B.1 Accessories

The following cables and STP boards are available for the PC-91x boards.

DNA-CBL-37

This is a 37-conductor flat ribbon cable with 37-pin male D-sub connectors on both ends. The length is 3ft and the weight is 3.4 ounces or 98 grams.

DNA-CBL-37S

This is a 37-conductor round shielded cable with 37-pin male D-sub connectors on both ends. It is made with round, heavy-shielded cable; 3 ft (90 cm) long, weight of 10 ounces or 282 grams; also available in 10ft and 20ft lengths.

DNA-STP-37

The DNA-STP-37 provides easy screw terminal connections for all DNx series I/O boards using the 37-pin connector scheme. The DNA-STP-37 is connected to the I/O board via either DNA-CBL-37 or DNA-CBL-37S cable. The dimensions of the STP-37 board are 4.2w x 2.8d x1.0h inch or 10.6 x 7.1 x 7.6 cm (with standoffs). The weight of the STP-37 board is 2.4 ounces or 69 grams.

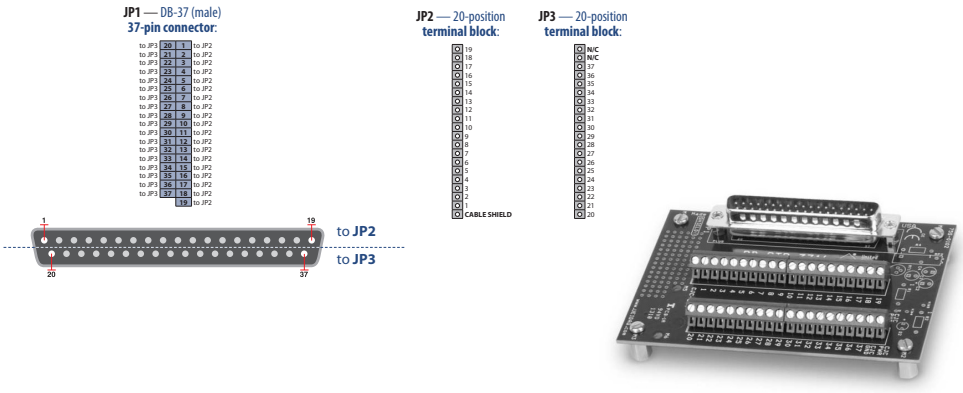


Figure B-1 Pinout and Photo of DNA-STP-37 Screw Terminal Panel

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