United Electronic Industries

The High-Performance Alternative

DNA/DNR-DIO-452
12-channel Electromechanical Relay Output Layer
—
User Manual

12 Form C (NO/NC) SPDT Relays
switching voltages up to 30 VDC or 150 VAC,
2A @30VDC or .75 A @ 125 VAC

Release 4.6

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PN Man-DNx-DIO-452-0314

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Chapter 1 Introduction

This document outlines the feature set and use of the DNA/DNR-DIO-452 electromechanical relay output layer when used with the PowerDNA I/O Cube or RACKtangle chassis, respectively.

1.1 Organization of this Manual

This PowerDNA DNx-DIO-452 User Manual is organized as follows:

- **Introduction**
  This chapter provides an overview of PowerDNA DNx-DIO-452 Electromechanical Relay Drive Output board features, accessories, and software.
- **The DIO-452 Layer**
  This chapter provides an overview of the device architecture, connectivity, and logic of the DNx-DIO-452 layer**.**
- **Programming with the High-Level API**
  This chapter provides a general description of the how to create a session, configure the session for relay drive/output, and format relevant data.
- **Programming with the Low-Level API**
  This chapter describes Low-level API commands for configuring and using the DNx-DIO-452 layer.
- **Appendix – Accessories**
  This appendix describes the accessories available for use with the DNx-DIO-452 layer.
- **Index**
  This is an alphabetical listing of the topics covered in this manual.

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 reveal good ideas you might not discover on your own.

NOTE: Notes alert you to important information.

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 you 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**.”

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

1.2 The DIO-452 Layer

The DNx-DIO-452 is a 12-channel Electromechanical Relay Output Layer designed for driving solenoids, motors, or other inductive loads attached to a PowerDNA Cube or RACKtangle. The board is available in two versions, the DNA-DIO-452 for mounting in UEI Cube products, and DNR-DIO-452, for insertion into UEI RACKtangle and HalfRACK chassis.

The DNx-DIO-452 has 12 digital outputs that can be configured to provide output control for 12 channels (total). The maximum current drive is 2 A @ 30 VDC per channel (or 0.75A @ 125 VAC).

NOTE: Users who connect inductive loads to the DIO-452 must provide anti-kickback diodes on each such output.

The technical specifications for the DIO-452 layer are listed in **Table 1-1** below.

Table 1-1. DNx-DIO-452 Technical Specifications

Technical Specifications:

Number of Relays	12 Form C (SPDT)
Output current rating	2 A @ 30 VDC, 0.75 A @ 125 VAC (continuous)
Max switching voltage rating	100 VDC or 150 VAC
Output ON impedance	< 0.2 Ohm (not including cable)
Msrnsr ML tmjr_ec	: 2 . . k t > 0? &Imr g Iajsb g I e a_ `jc'
Output OFF impedance	> 100 Meg Ohm
Output OFF leakage	< 100 nA
Relay life expectancy	10 million operations at rated load
Output Throughput Rate	125 Hz max
Power up / reboot state	Off
Power dissipation	< 5 W, all relays energized
Isolation	350 Vrms
Operating Temp. Range	Tested -40 to +85 °C
Operating Humidity	95%, non-condensing
Vibration *IEC 60068-2-6* *IEC 60068-2-64*	5 g, 10-500 Hz, sinusoidal 5 g (rms), 10-500 Hz, broad-band random
Shock *IEC 60068-2-27*	50 g, 3 ms half sine, 18 shocks @ 6 orientations 30 g, 11 ms half sine, 18 shocks @ 6 orientations
MTBF	260,000 hours

NOTE: The DNx-DIO-452 is the same as the DNx-DIO-462 board except that the 452 does not have the Guardian monitoring features of the 462.

Figure 1-1 is a photo of the DNA-DIO-452 version of the DNx-DIO-452 board. The DNR version is functionally identical except that it is designed for insertion into a UEI rack-type backplane and chassis

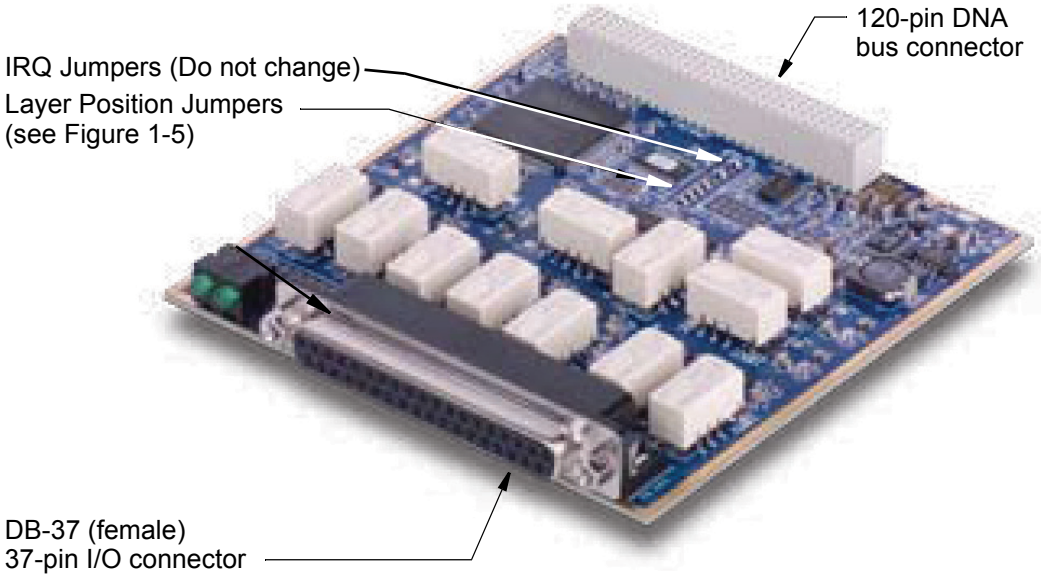

Figure 1-1. A DNA-DIO-452 Digital I/O Layer

1.3 Features

The main features of the PowerDNx DNA-DIO-452 Relay Drive Output Layer are:

- 12 Form C electromechanical relay outputs (total)
- 2A @ 30VDC or 0.75A @125 VAC continuous per channel maximum current rating
- 100 VDC or 150 VAC maximum switching voltage rating
- Ideal for driving solenoids, motors, or other inductive loads
- Output Throughput rate 125 updates per second max
- Guaranteed output OFF state on initial power-up, external power OFF, internal power OFF, and overload detected
- Output ON voltage <400 mV @ 2A (not including cable)
- Output ON impedance 200 mOhm (not including cable)
- Output OFF leakage <25 uA

1.4 Device Architecture

The DNx-DIO-452 Layer has 12 Form C relay outputs. A block diagram of the board is shown in **Figure 1-2**.

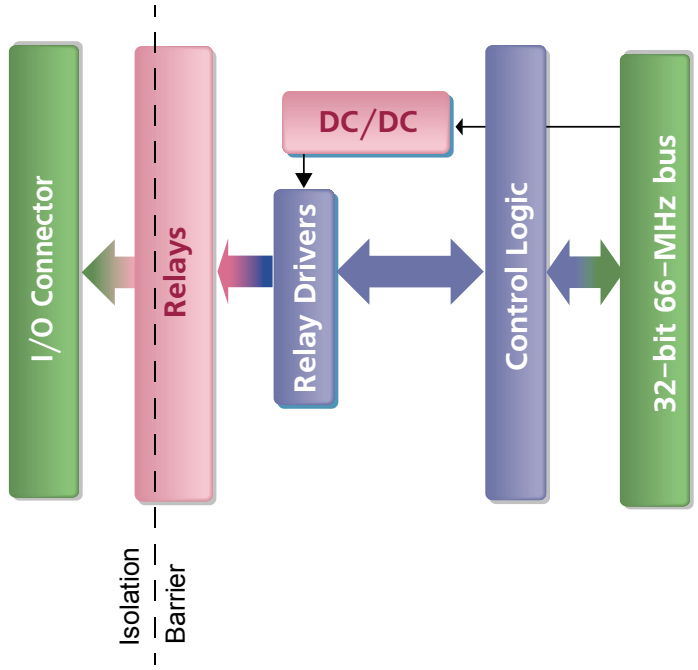

Figure 1-2. DNx-DIO-452 Device Architecture

Note that the I/O part of the layer is isolated from the logic interface.

1.5 Layer Connectors and Wiring

The pinout of the DB-37 37-pin female connector for the DNx-DIO-452 Layer board is shown in **Figure 1-3**.

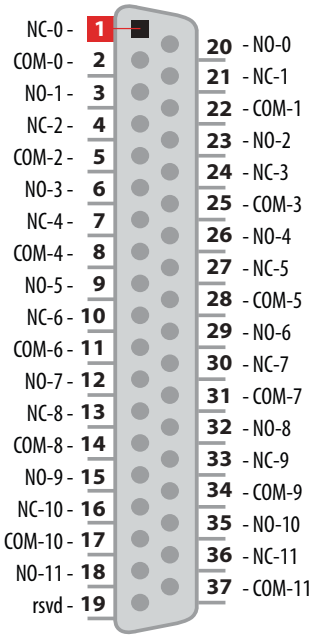

Figure 1-3. DB-37 I/O Connector Pinout

For software compatibility with other UEI DIO products, the 12 output groups of the DIO-452 are numbered from NO-0, NC-0, COM-0 through NO-11, NC-11, COM-11. Note that the output of each channel is a set of three pins for NC contacts, NO contacts, and COM.

When power is provided to the layer, the RDY LED on the PowerDNA Cube turns on. When no power is supplied, the RDY LED is off, and the DNx-DIO-452 layer cannot operate.

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

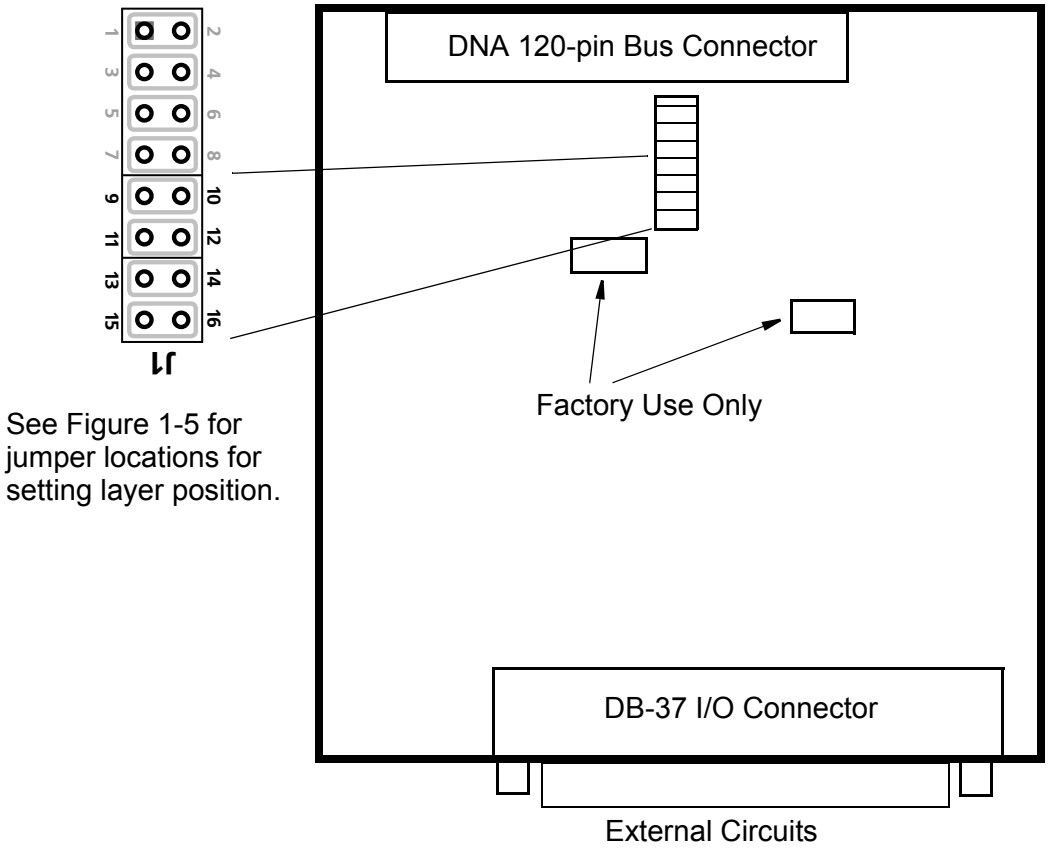

Figure 1-4. Physical Layout of DNA-DIO-452 Layer Board

1.5.1 Jumper Settings

A diagram of the jumper block is shown in **Figure 1-5**. To set the layer position jumpers, place jumpers as shown in **Figure 1-5**.

NOTE: Since all layers are assembled in Cubes before shipment to a customer, you should never have to change a jumper setting unless you change a layer from one position to another in the field.

		Layer's Position as marked on the Faceplate*					
		I/O **1**	I/O **2**	I/O **3**	I/O **4**	I/O **5**	I/O **6**
Jx Pins	9-10	● ●	○ ○	● ●	○ ○	● ●	○ ○
	11-12	● ●	● ●	○ ○	○ ○	● ●	● ●
	13-14	● ●	● ●	● ●	● ●	○ ○	○ ○
	15-16	● ●	● ●	● ●	● ●	● ●	● ●

* *All I/O Layers are sequentially enumerated from top to the bottom of the Cube*

○ ○ – **Open** ● ● – **Closed**

Figure 1-5. Diagram of DNA-DIO-452 Layer Position Jumper Settings

1.6 Anti-Kickback Diodes

CAUTION! *Use of the DIO-452 to drive inductive loads requires installation of anti-kickback diodes on each such output. Installation of these diodes is the responsibility of the user. Failure to provide these diodes can cause damage to components of the board.*

Chapter 2 Programming with the High Level API

This section describes how to control the DNx-DIO-452 using the UeiDaq Framework High Level API.

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.

The following section focuses on the C++ API, 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.

2.1 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;
```

2.1.1 Configuring the Resource String

UeiDaq Framework uses resource strings to select which device, subsystem and channels to use within a session. The resource string syntax is similar to a web URL:

```
<device class>://<IP address>/<Device Id>/<Subsystem><Channel list>
```

For PowerDNA, the device class is **pdna**.

For example, the following resource string selects digital output channels 0,1,2,3 on device 1 at IP address 192.168.100.2: "pdna://192.168.100.2/Dev1/Do0:3"

NOTE: In Framework, a digital channel corresponds to a physical port on the device. You cannot configure a session only to access a subset of lines within a digital port.

NOTE: Sessions are unidirectional. If your device has both input and output ports or has bidirectional ports, you need to configure two sessions: one for input and one for output.

The following call configures the digital output port of a DIO-452 set as device 1:

```
// Configure session to write to Port 0 on device 1
session.CreateDOChannel(“pdna://192.168.100.2/Dev1/Do0”);
```

2.1.2 Configuring the Timing

You can configure the DNA-DIO-452 to run in simple mode (point by point) only. Use of ACB mode is not currently 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. Please refer to the “UeiDaq Framework User’s Manual” to learn how to use the other timing modes.

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

2.1.3 Writing Data to the Output Port

Writing data is done using a writer object. The following sample shows how to create a writer object and write data.

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

// write one scan, the buffer must contain
// one value per channel
uInt32 data = 0xFEFE;
writer.WriteSingleScan(&data);
```

2.2 Cleaning-up the Session

The session object will clean itself up when it goes out of scope or when it is destroyed. To reuse the object with a different set of channels or parameters, you can manually clean up the session as follows:

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

Chapter 3 Programming with the Low-level API

The low-level API offers direct access to PowerDNA DAQBios protocol and allows you to directly access device registers.

Where possible, we recommend that you use the UeiDaq Framework (*see Chapter 2*), which is easier to use.

You should need to use the low-level API only if you are using an operating system other than Windows.

Please refer to the `API Reference Manual` document under:

Start » Programs » UEI » PowerDNA » Documentation

for pre-defined types, error codes, and functions for use with this layer.

Appendix

A. Accessories

The following cables and STP boards are available for the DIO-452 layer.

DNA-CBL-37

A 3ft, 37-way flat ribbon cable that connects the layer to a terminal panel.

DNA-STP-37

37-way screw terminal panel.

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