

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

USB-DIO24/37

24-Channel Digital I/O USB Device

User's Guide

May 2019. Rev 4
© Measurement Computing Corporation

MEASUREMENT COMPUTING™

Trademark and Copyright Information

Measurement Computing Corporation, InstaCal, Universal Library, and the Measurement Computing logo are either trademarks or registered trademarks of Measurement Computing Corporation. Refer to the Copyrights & Trademarks section on mccdaq.com/legal for more information about Measurement Computing trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies.

© 2019 Measurement Computing Corporation. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form by any means, electronic, mechanical, by photocopying, recording, or otherwise without the prior written permission of Measurement Computing Corporation.

Notice

Measurement Computing Corporation does not authorize any Measurement Computing Corporation product for use in life support systems and/or devices without prior written consent from Measurement Computing Corporation. Life support devices/systems are devices or systems that, a) are intended for surgical implantation into the body, or b) support or sustain life and whose failure to perform can be reasonably expected to result in injury. Measurement Computing Corporation products are not designed with the components required, and are not subject to the testing required to ensure a level of reliability suitable for the treatment and diagnosis of people.

Table of Contents

Preface
About this User's Guide 4
What you will learn from this user's guide 4
Conventions in this user's guide 4
Where to find more information 4

Chapter 1
Introducing the USB-DIO24/37 5
Overview: USB-DIO24/37 features 5
Functional block diagram 5

Chapter 2
Installing the USB-DIO24/37 6
Unpacking 6
Installing the software 6
Installing the hardware 6
Connecting the board for I/O operations 6
Connectors and cables 6
Field wiring, signal termination and conditioning 7

Chapter 3
Functional Details 8
Components 8
37-pin I/O connector 8
USB connector 9
LED 9
Pull-up resistors 9
Power consumption 9
Mechanical Drawings 10

Chapter 4
Specifications 11
Digital input/output 11
Counter 11
Data transfer rates 12
Power 12
General 12
Environmental 12
Mechanical 13
Main connector and pinout 13

Declaration of Conformity 14

About this User's Guide

What you will learn from this user's guide

This user's guide explains how to install, configure and use the USB-DIO24/37 digital I/O board. This user's guide also refers you to related documents available on our web site and to technical support resources.

Conventions in this user's guide

For more information

Text presented in a box signifies additional information and helpful hints related to the subject matter you are reading.

Caution! Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.

bold text — **Bold** text is used for the names of objects on the screen, such as buttons, text boxes, and check boxes.

italic text — *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase.

Where to find more information

Additional information about USB-201 hardware is available on our website at www.mccdaq.com. You can also contact Measurement Computing Corporation with specific questions.

- Knowledgebase: kb.mccdaq.com
- Tech support form: www.mccdaq.com/support/support_form.aspx
- Email: techsupport@mccdaq.com
- Phone: 508-946-5100 and follow the instructions for reaching Tech Support

For international customers, contact your local distributor. Refer to the International Distributors section on our website at www.mccdaq.com/International.

Introducing the USB-DIO24/37

Overview: USB-DIO24/37 features

This manual explains how to install, configure and use the USB-DIO24/37 digital I/O board. You can use this board in a variety of digital applications to control logic devices such as switches, gauges, relays, pumps, and sensors.

The USB-DIO24/37 is a USB 2.0 low-speed device supported under popular Microsoft® Windows® operating systems. It is designed for USB 1.1 ports and is fully compatible with both USB 1.1 and USB 2.0 ports.

The USB-DIO24/37 features 24 bits of digital I/O and one 32-bit external event counter. The device is powered by the +5 volt USB supply. No external power is required. All I/O connections are made to a 37-pin connector. Digital channels are pulled up to +5V with 47 kΩ resistors.

An on-board industry standard 82C55 programmable peripheral interface chip provides the 24 discrete digital I/O lines in four ports. You configure each digital port independently for either input or output.

The USB-DIO24/37 board is completely plug-and-play, with no jumpers or switches to set. All board addresses are set by the system's plug-and-play software.

Functional block diagram

USB-DIO24/37 functions are illustrated in the block diagram shown here.

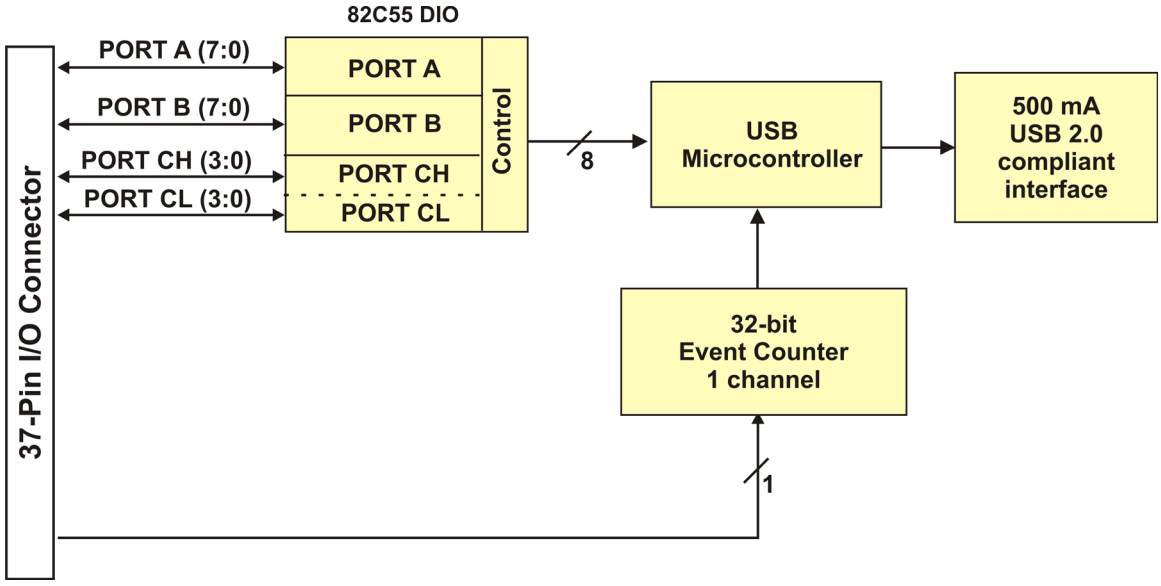


Figure 1. USB-DIO24/37 functional block diagram

Installing the USB-DIO24/37

Unpacking

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the device from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

Contact us immediately if any components are missing or damaged.

Installing the software

Refer to the *MCC DAQ Quick Start* and the USB-DIO24/37 product page on our website for information about the software supported by the USB-DIO24/37.

Install the software before you install your device

The driver needed to run the USB-DIO24/37 is installed with the software. Therefore, you need to install the software package you plan to use before you install the hardware.

Installing the hardware

To connect the USB-DIO24/37 to the system, connect the USB cable to an available USB port on the computer or to an external USB hub connected to the computer.

When you connect the USB-DIO24/37 for the first time, multiple **Found New Hardware** popup balloons open when the operating system detects the device. When installation is complete, the **USB LED** should flash and then remain on. This indicates that communication is established between the USB-DIO24/37 and your computer.

If the USB LED turns off

If the USB LED is on but then turns off, the computer has lost communication with the USB-DIO24/37. To restore communication, disconnect the USB cable from the computer, and then reconnect it. This should restore communication, and the USB LED should turn back on.

Caution! Do not disconnect **any** device from the USB bus while the computer is communicating with the USB-DIO24/37, or you may lose data and/or your ability to communicate with the USB-DIO24/37.

Connecting the board for I/O operations

Connectors and cables

The table below lists the board I/O connector type and compatible cables for use with the USB-DIO24/37.

Board connectors, cables, and accessory equipment

Connector type	37-pin D-type connector
Compatible cables	C37FF-x unshielded ribbon cable. x = length in feet

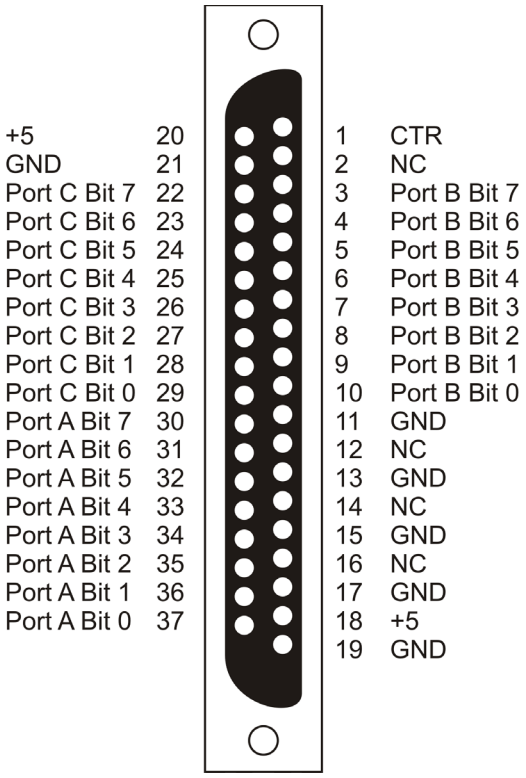


Figure 2. Connector pinout

Information on signal connections

General information regarding signal connection and configuration is available in the *Guide to DAQ Signal Connections* (available for download from www.mccdaq.com/support/DAQ-Signal-Connections.aspx.)

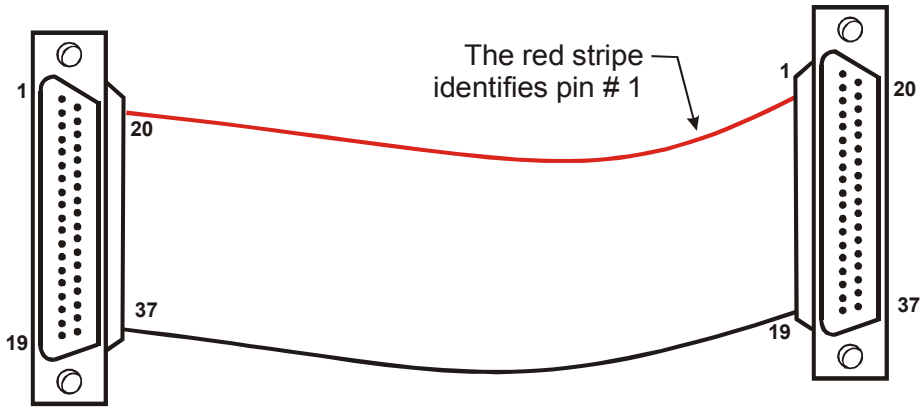


Figure 3. C37FF-x cable

Field wiring, signal termination and conditioning

Refer to the product page at www.mccdaq.com/usb-data-acquisition/USB-DIO24-Series.aspx for compatible products to use with the USB-DIO24/37.

Functional Details

Components

The USB-DIO24/37 has the following components, as shown in Figure 5.

- 37-pin I/O connector
- USB connector
- LED

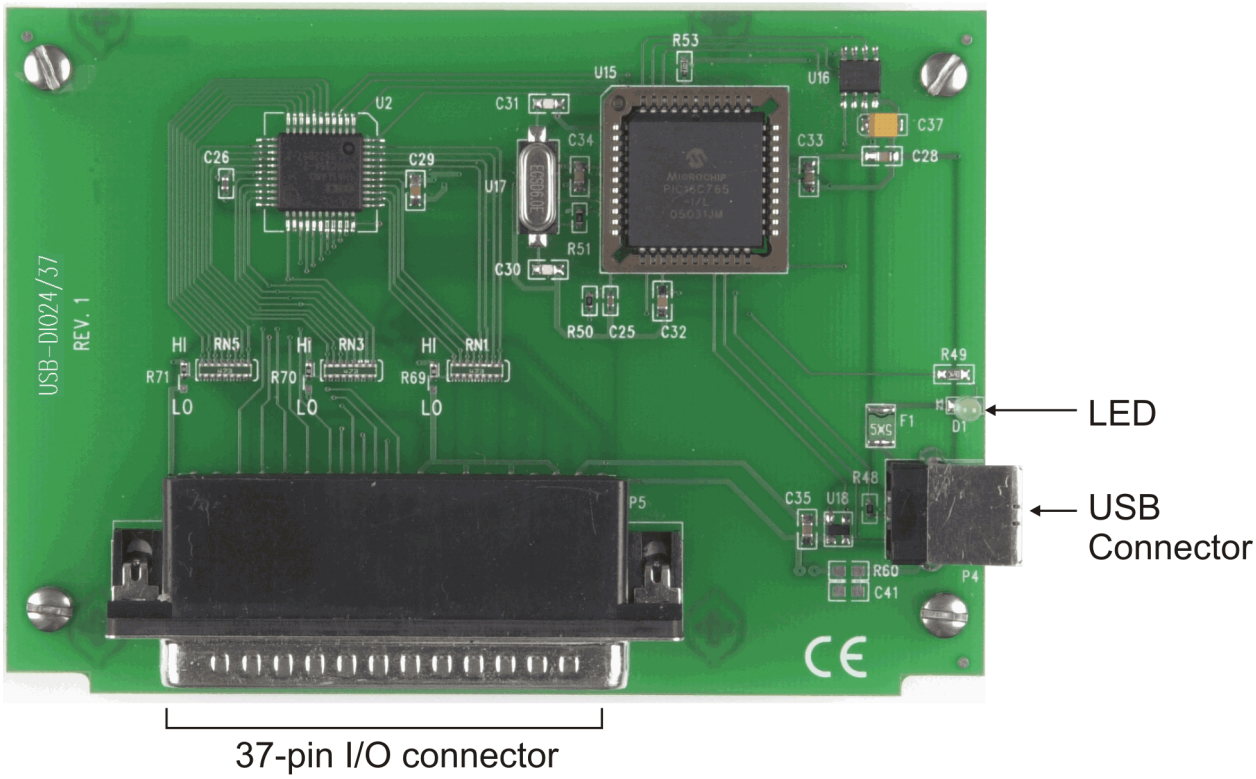


Figure 4. USB-DIO24/37 components

37-pin I/O connector

The 37-pin connector provides 24 digital I/O, one counter, six ground, and two 5V power connections.

- The digital I/O is configured as two 8-bit and two 4-bit ports based on the 82C55 specification. Configure each port independently for input (default) or output.
- The CTR signal is the input to the 32-bit external event counter. The internal counter increments when the digital input level transitions from low to high and can count frequencies of up to 1 MHz.
- The six ground (**GND**) connections are identical and provide a common ground for all device functions.
- The two power connections draw power from the USB connector. The +5 pin is a +5 volt output that is supplied by the computer.

Caution! The +5 V pin is an output. Do not connect to an external power supply or you may damage the USB-DIO24/37 and possibly the computer

USB connector

The USB connector provides +5 V power and communication. The voltage supplied through the USB connector is system-dependent, and may be less than 5 V. No external power supply is required.

LED

The LED indicates the communication status of the USB-DIO24/37. It uses up to 5 mA of current and cannot be disabled. The table below explains the function of the USB-DIO24/37 LED.

LED Illumination

LED status	Description
Steady green	The USB-DIO24/37 is connected to a computer or external USB hub.
Blinks continuously	Data is being transferred.
Blinks three times	Initial communication is established between the USB-DIO24/37 and the computer.

Pull-up resistors

Each digital port has an internal 47 kΩ pull-up resistor network. All digital pins are pulled up to +5 V (high logic level) on power up and reset.

Power consumption

The maximum total output current that can be drawn from all USB-DIO24/37 connections (power and digital outputs) is 500 mA. This maximum applies to most personal computers and self-powered USB hubs. Bus-powered hubs and notebook computers may limit the maximum available output current to 100 mA.

Once you start running applications with the USB-DIO24/37, each DIO bit can draw up to 2.5 mA. The maximum amount of +5V current available for external use, over and above that required by the USB-DIO24/37, is the difference between the *total current requirement* of the USB-DIO24/37 (based on the application), and the *allowed current draw* of the PC platform (500 mA for desktop PCs and self-powered hubs, or 100 mA for bus-powered hubs and notebook computers).

With all outputs at their maximum output current, you can calculate the total current requirement of the USB-DIO24/37 +5 V as follows:

(USB-DIO24/37 @ 40 mA) + (24 DIO @ 2.5 mA ea) = 100 mA

For an application running on a PC or powered hub, this value yields a maximum user current of 500 mA−100 mA = 400 mA. This number is the total maximum available current at the +5 output pins. Measurement Computing highly recommends that you figure in a safety factor of 20% below this maximum current loading for your applications. A conservative, safe user maximum in this case would be 320 mA.

Since laptop computers typically allow up to 100 mA, the USB-DIO24/37 in a fully-loaded configuration may be above that allowed by the computer. In this case, you must determine the per-pin loading in the application to ensure that the maximum loading criteria is met. The per-pin loading is calculated by simply dividing the +5 V by the load impedance of the pin in question.

Mechanical Drawings

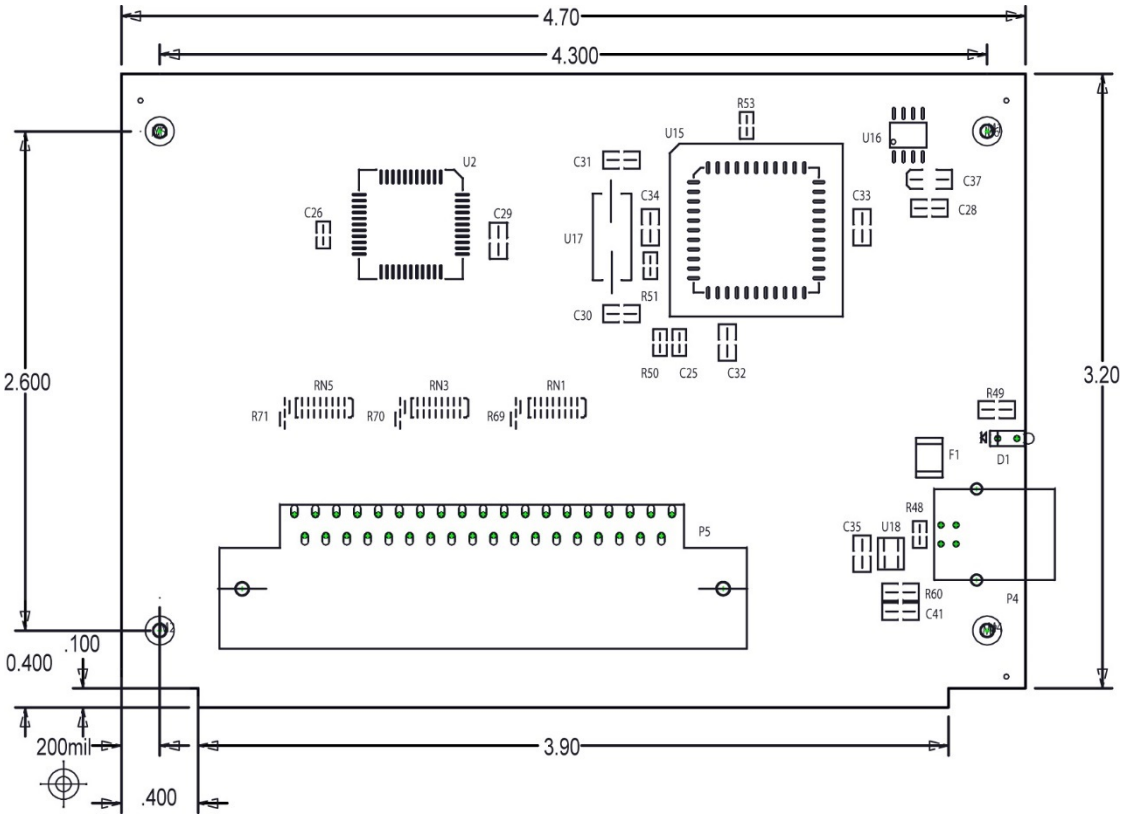


Figure 5. Circuit board dimensions

Specifications

All specifications are subject to change without notice.
Typical for 25 °C unless otherwise specified.
Specifications in *italic text* are guaranteed by design.

Digital input/output

Table 1. Digital I/O specifications

Parameter	Specification
Digital type	82C55
Number of I/O	24 (Port A Bit 0 through Port C Bit7)
Configuration	2 banks of 8 and 2 banks of 4, or 3 banks of 8
Pull up/pull-down configuration	All pins pulled up to Vs via 47 kΩ resistors (default). Selection available for pull down to ground. Hardware selectable via zero Ω resistor.
Input high voltage	2.0 V min, 5.5 V absolute max
Input low voltage	0.8 V max, –0.5 V absolute min
Output high voltage (IOH = –2.5 mA)	3.0 V min
Output low voltage (IOH = –2.5mA)	0.4V max
Power up / reset state	Input mode

Counter

Table 2. Counter specifications

Parameter	Specification
Pin name (Note 1)	CTR
Counter type	Event counter
Number of channels	1
Input type	TTL, rising edge triggered
Input source	*CTR screw terminal*
Resolution	32 bits
Schmidt trigger hysteresis	*20 mV to 100 mV*
Input leakage current	*±1 µA*
Maximum input frequency	1 MHz
High pulse width	*500 ns min*
Low pulse width	*500 ns min*
Input low voltage	0 V min, 1.0 V max
Input high voltage	4.0 V min, 15.0 V max

Note 1: CTR is a Schmitt trigger input

Data transfer rates

Table 3. Data transfer rate specifications

Parameter	Specification
Digital I/O transfer rates (software paced)	
Digital input	62 port reads or single bit reads per second typ
Digital output	125port writes or single bit writes per second typ
Counter/timer read/write rates (software paced)	
Counter read	62 port reads per second typ
Counter clear	125 port writes per second typ

Power

Table 4 . Power specifications

Parameter	Conditions	Specification
Supply current (Note 2)		20 mA typ, 40 mA max
+5V USB power available (Note3)	Connected to self-powered hub	4.5 V min, 5.25 V max
	Connected to bus-powered hub	4.1 V min, 5.25 V max
Output current (Note 4)	Connected to self-powered hub	460 mA max
	Connected to bus-powered hub	60 mA max

Note 2: This is the total current requirement for the USB-DIO24/37which includes up to 5 mA for the status LED.

Note 3: Self-powered refers to USB hubs and hosts with a power supply. Bus-powered refers to USB hubs and hosts without their own power supply.

Note 4: This refers to the total amount of current that can be sourced from the USB +5V and digital outputs.

General

Table 5. General specifications

Parameter	Conditions	Specification
USB controller clock error	*25 °C*	*±30 ppm max*
	0 to 70 °C	*±50 ppm max*
Device type		USB 1.1 low-speed
Device compatibility		USB 1.1, USB 2.0

Environmental

Table 6. Environmental specifications

Parameter	Specification
Operating temperature range	0 to 70 °C
Storage temperature range	–40 to 85 °C
Humidity	0 to 90% non-condensing

Mechanical

Table 7. Mechanical specifications

Parameter	Specification
Dimensions (L × W × H)	119 mm × 84 mm × 14 mm (4.69 × 3.31 × 0.55 in.)
USB cable length	3 m (9.84 ft) max
USB cable type	*A-B cable, UL type AWM 2527 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D-)*

Main connector and pinout

Table 8. Connector specifications

Parameter	Specification
Connector type	37-pin D-type
Compatible cables	C37FF-x unshielded ribbon cable. x = length in feet.

Table 9. Connector pinout

Pin	Signal Name	Pin	Signal Name
1	CTR	20	+5
2	NC	21	GND
3	Port B Bit 7	22	Port C Bit 7
4	Port B Bit 6	23	Port C Bit 6
5	Port B Bit 5	24	Port C Bit 5
6	Port B Bit 4	25	Port C Bit 4
7	Port B Bit 3	26	Port C Bit 3
8	Port B Bit 2	27	Port C Bit 2
9	Port B Bit 1	28	Port C Bit 1
10	Port B Bit 0	29	Port C Bit 0
11	GND	30	Port A Bit 7
12	NC	31	Port A Bit 6
13	GND	32	Port A Bit 5
14	NC	33	Port A Bit 4
15	GND	34	Port A Bit 3
16	NC	35	Port A Bit 2
17	GND	36	Port A Bit 1
18	+5	37	Port A Bit 0
19	GND		

CE Declaration of Conformity

Manufacturer: Measurement Computing Corporation
Address: 10 Commerce Way
Norton, MA 02766
USA

Category: Electrical equipment for measurement, control and laboratory use.

Measurement Computing Corporation declares under sole responsibility that the product

USB-DIO24/37

to which this declaration relates is in conformity with the relevant provisions of the following standards or other documents:

EU EMC Directive 89/336/EEC: Electromagnetic Compatibility, EN 61326 (1997) Amendment 1 (1998)

Emissions: Group 1, Class A

- EN 55011 (1990)/CISPR 11: Radiated and Conducted emissions.

Immunity: EN61326, Annex A

- IEC 61000-4-2 (1995): Electrostatic Discharge immunity, Criteria C.
- IEC 61000-4-3 (1995): Radiated Electromagnetic Field immunity Criteria A.
- IEC 61000-4-8 (1994): Power Frequency Magnetic Field immunity Criteria A.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in February, 2006. Test records are outlined in Chomerics Test Report #EMI4445.06.

We hereby declare that the equipment specified conforms to the above Directives and Standards.



Carl Haapaoja, Director of Quality Assurance

Measurement Computing Corporation
10 Commerce Way
Norton, Massachusetts 02766
(508) 946-5100
Fax: (508) 946-9500
E-mail: info@mccdaq.com
www.mccdaq.com

NI Hungary Kft
H-4031 Debrecen, Hátar út 1/A, Hungary
Phone: +36 (52) 515400
Fax: +36 (52) 515414
http://hungary.ni.com/debrecen

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP