CONTEC

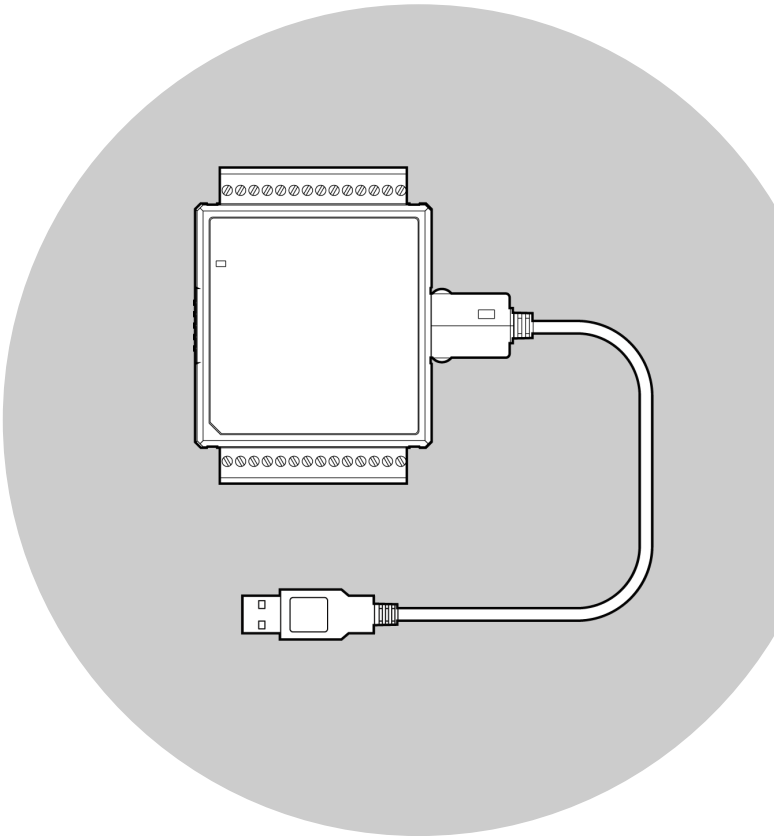
PC-HELPER Series

Reference Manual

Isolated Digital I/O Terminal for USB2.0

DIO-0808LY-USB

CONTENTS



CONTEC CO., LTD.

Table of Contents

Table of Contents

Introduction

This section provides necessary information of the product such as the outline, bundled items and manuals before actual use.

1.Related Manuals

The manuals related to the product are listed below.

Read them as necessary along with this document.

◆ Must Read the Followings.

Name	Purpose	Contents	How to get
Please read the following	Must read this after opening the package.	This introduces related materials that are made available on the CONTEC website, such as those for the included items, manuals, and software.	Included in the package (Printed matter)
Reference Manual (This Document)	Read this when operating the product.	This describes the hardware aspects such as functions and settings.	Download from the Contec website (PDF)

◆ Download Manuals

Download the manuals accordingly from the following URL.

Download https://www.contec.com/download/

2.About the Product

This product is a USB 2.0 compliant terminal that extends the digital signal I/O functions of a PC.

This product can input and output digital signals at 12 - 24VDC.

This product features 8 opto-coupler isolated inputs (for current sinking output) and 8 optocoupler isolated open-collector outputs (current sinking type).

In addition, output transistor protection circuit (surge voltage protection and overcurrent protection).

Windows/Linux device driver is supported with this product.

3.Features

■ Opto-coupler isolated input (supporting current sink output) and opto-coupler isolated open-collector output (current sink type)

This product has the 8ch of opto-coupler isolated input (supporting current sink output) and 8ch of opto-coupler isolated open-collector output (current sink type) whose response time is 300µsec. Common terminal provided per 8channels, capable of supporting a different external power supply. Supporting driver voltages of 12 - 24 VDC for I/O.

■ Compatible to USB2.0/USB1.1 and not necessary to power this product externally as the bus power is used

Compatible to USB2.0/USB1.1 and capable to achieve high speed transfer at High Speed (480 Mbps). Not necessary to power this product externally as the bus power of USB is used.

■ Opto-coupler bus isolation

As the USB (PC) is isolated from the input and output interfaces by opto-couplers, this product has excellent noise performance.

■ Zener diode for surge voltage protection and the circuit for overcurrent protection

Zener diodes are connected to the output circuits to protect against surge voltages. In addition, the output circuit, it attaches the overcurrent protection circuit at the output 8-channel unit. The output rating is max. 35VDC, 100mA per channel.

■ Easy-to-wire terminal connector adopted

Adoption of terminal connector (with screws) enables to achieve easy wiring.

■ Windows/Linux support device driver

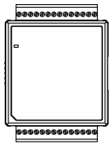
Using the device driver API-TOOL makes it possible to create applications of Windows/Linux. In addition, a diagnostic program by which the operations of hardware can be checked is provided.

4.Product Configuration List

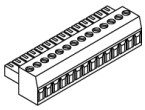
The product consists of the items listed below.

Check, with the following list, that your package is complete.

If you discover damaged or missing items, contact your retailer.



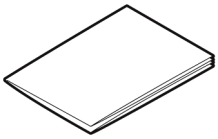
Product…1



Interface Connector Plugs…2

USB Cable (1.8m) …1

USB Cable Attachment…1



Please read the following…1

5.Support Software

You can use CONTEC support software according to your purpose and development environment.

For more details on the supported OS, applicable languages, or to download the latest version of software, visit the CONTEC Web site.

Name	Contents	How to get
Windows Version Digital I/O Driver software API-DIO(WDM)	The Windows device driver is provided as a form of Windows API functions. Various sample programs such as C# and Visual Basic .NET , Visual C++, Python etc. and diagnostic program useful for checking operation is provided.	Download from the CONTEC website *1
Linux Version Digital I/O Driver software API-DIO(LNX)	The Linux device driver is provided as a shared library. The software includes various sample programs such as gcc (C, C++) and Python programs, as well as a configuration tool to configure the device settings.	Download from the CONTEC website *1
Software Development Tool Kits (SDK) and Support Software	In addition to the device drivers, we offer many software programs for using CONTEC devices in an easier manner.	Download from the CONTEC website *2

*1 Download the files from the following URL.

Download https://www.contec.com/download/

*2 For supported software, search the CONTEC website for this product and view the product page.

Website https://www.contec.com/

6.Optional Products

Optional product items are as follows:

Use these items with the main product as necessary.

Product Name	Model type	Description
14pin Screw Terminal Connector Set	CN6-Y14	6 pieces
Bracket for USB I/O Terminal products	BRK-USB-Y	

Visit the CONTEC website for the latest optional products.

Website https://www.contec.com/

Safety Precautions

Understand the following definitions and precautions to use the product safely.
Never fail to read them before using the product.

1.Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources.

Understand the meanings of these labels to operate the equipment safely.

⚠DANGER	Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

2.Handling Precautions

⚠ DANGER

- Do not use the product in locations exposed to a flammable or corrosive gas.
  It may cause explosion, fire, electrical shock, or malfunction.

⚠ CAUTION

- There are switches and jumpers on this product that need to be set in advance. Be sure to check these before installing this product.
- Only set the switches and jumpers on this product to the specified settings. Otherwise, this product may malfunction, overheat, or cause a failure.
- Do not strike or bend this product. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- This product contains precision electronic elements and must not be used or store in locations subject to physical shock or strong vibration. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not use or store this product in high temperature or low temperature surroundings, or do not expose it to extreme temperature changes. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not use or store this device where it is exposed to direct sunlight or near stoves or other sources of heat. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not use or store the product in the vicinity of devices that generate strong magnetic force or noise. Otherwise, this product may malfunction, overheat, cause a failure or breakage.
- Do not touch the converter's pin parts (USB connector) with your hands.
  Otherwise, the converter may malfunction, overheat, or cause a failure.
  If the pin parts are touched by someone's hands, clean the parts with industrial alcohol.
- As this product contains components that are designed to operate at high temperature, please do not touch this product when it is in use.
- Do not plug or unplug the cables which are connected to this product while the PC is still turned on. Otherwise, this product may malfunction, overheat, or cause a failure. Be sure that the personal computer power is turned off.
- Do not touch the external connector (14 pin plug header) when the power is on. Otherwise, this may malfunction, cause a failure due to static electricity.
- Make sure that your PC can supply ample power to all the products installed. Insufficiently energized products could malfunction, overheat, or cause a failure.
- The specifications of this product are subject to change without notice for enhancement and quality improvement. Even when using the product continuously, be sure to read the manual on the website and understand the contents.

- Do not modify the product. CONTEC will bear no responsibility for any problems, etc., resulting from modifying the product.
- Regardless of the foregoing statements, CONTEC is not liable for any damages whatsoever (Including damages for loss of business profits) arising out of the use or inability to use this CONTEC product or the information contained herein.
- It may cause a trouble in recognizing and operating the device according to the kind of USB hub. If you use the USB hub, we encourage you to take advantage of the CONTEC's product loan service to confirm operation before purchasing.

1. FCC PART 15 Class A Notice

NOTE

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

FCC WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3.Environment

Use this product in the following environment. If used in an unauthorized environment, this product may overheat, malfunction, or cause a failure.

Operating temperature

0 - 50ºC

Humidity

10 - 90%RH (No condensation)

Corrosive gases

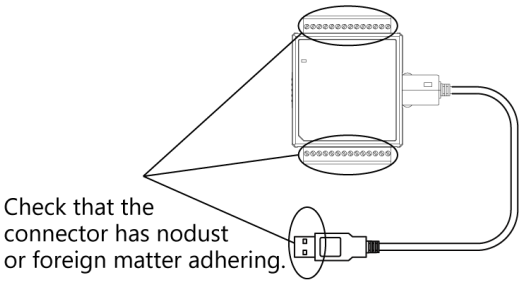
None

Floating dust particles

Not to be excessive

4.Inspection

Inspect the product periodically as follows to use it safely.



5.Storage

When storing this product, keep it in its original packing form.

- Put this product in the storage bag.
- Wrap it in the packing material, and then put it in the box.
- Store the package at room temperature at a place free from direct sunlight, moisture, shock, vibration, magnetism, and static electricity.

6.Disposal

When disposing of the product, follow the disposal procedures stipulated under the relevant laws and municipal ordinances.

Setup

This section explains how to set up this product.

1.What is Setup?

Setup means a series of steps to take before the product can be used.
Different steps are required for device driver and hardware.

The setup procedure will depend on your combination of OS and device driver. For details, refer to the help for the device driver you will use. This section describes the procedure to start the application program development using the Windows version of the device driver API-DIO(WDM).

The basic procedure is also the same when using the Linux device driver API-DIO(LNX). However, the installation procedure for the device driver and some other steps are different. For details, refer to "Driver Environment Construction" and "Tutorial" in the API-DIO(LNX) help.

Online Help [API-DIO(LNX)]
https://help.contec.com/link/drv/lnx/dio/en/

1. Setup Instructions

Taking the following steps sets up the device driver. You can use the diagnosis program later to check whether the setup function normally.

Step 1 Device driver Installation (page18)
Step 2 Hardware Setting (page19)
Step 3 Hardware Installation (page19)
Step 4 Device driver Initialization (page21)
Step 5 Operation Check (page22)

If Setup fails to be performed properly, see the "**Setup Troubleshooting (page23)**" section at the end of this chapter.

2.Device driver Installation

This manual describes how to install the Windows device driver.
Before connecting this product to a PC, install the device driver.

Download the "Device driver API-DIO(WDM)" from the CONTEC website.

Download https://www.contec.com/download/

For the device driver installation procedure, refer to the help included in the development environment package you downloaded from the CONTEC website or “Installing Device Driver” in the online help made available on the CONTEC website.

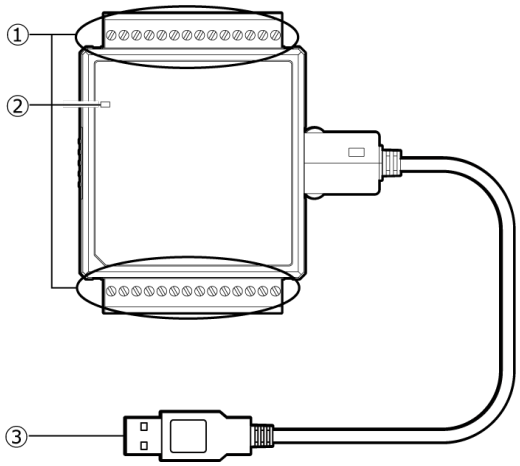
Online Help [Installing Device Driver]
https://help.contec.com/link/drv/wdm/install/en/

3.Hardware Setting

This section describes how to set up the product and how to connect it to a PC.

1. Nomenclature of Product Components

Component names of the product are shown in the figure below.



No.	Name	No.	Name
1	Interface Connector (Page24)	3	USB Type-A connector
2	LINK Status		

2. LINK Status

Various communication statuses can be checked.

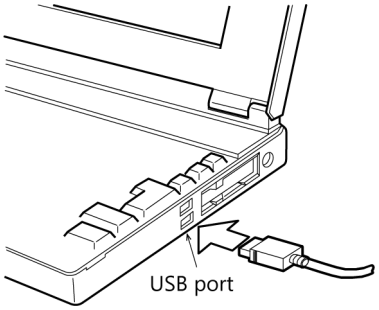
Name	Function	Indicator color	LED indicator
LINK Status	USB communication status	GREEN	ON : Communication established
			OFF : Communication unestablished
	PC connection status		ON : PC communication established
			OFF : PC communication unestablished

4.Hardware installation

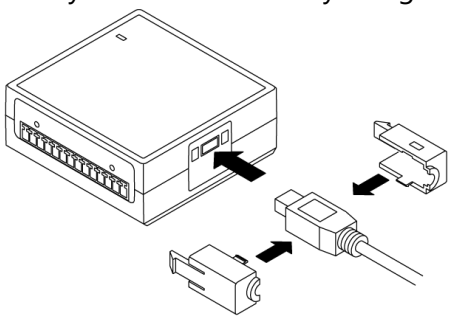
On a PC in a Windows environment, the peripherals need to be recognized by the OS. This is called hardware installation. **When using multiple products, install one product at a time. Complete the setup of the product before starting to install the next one.**

1 Turn on the power to the PC before connecting the product.

2 When the PC has been up and running, plug the USB interface connector to a USB port in the PC. The converter can also be connected to the PC via a USB hub.



3 USB cable can be attached firmly to the main unit by using a USB cable attachment.



4 **After connecting the unit, the hardware will be automatically identified and the hardware installation will be complete.**

⚠CAUTION

- Do not touch the product's terminals (USB connector) with your hands.
  Otherwise, the product may malfunction, overheat, or cause a failure.
  If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
- Do not install or remove the product to while the computer's power is turned on. Otherwise, the product may malfunction, overheat, or cause a failure.
  Doing so could cause trouble. Be sure that the personal computer power is turned off.
- It may cause a trouble in recognizing and operating the device according to the kind of USB hub. If you use the USB hub, we encourage you to take advantage of the CONTEC's product loan service to confirm operation before purchasing.
- The USB cable attachment cannot be used excluding an attached cable.

5.Device driver Initialization

Setting the device name is required to use the device driver. It is called the device driver initialization.

The device name will be assigned automatically during hardware installation. Therefore, if you want to use it, you can skip the setting procedure described below.

How to check the device name and change the device name, refer to the help included in the development environment package you downloaded from the CONTEC website or “Setting and Confirming Device Name” in the online help made available on the CONTEC website.

Online Help [Setting and Confirming Device Name]

https://help.contec.com/link/drv/wdm/devicename/en/

6.Operation Check

You must make sure that this product and device driver operate properly. By taking this step, you can be certain that this product has been set up appropriately. Check operation by using the diagnosis program when the confirmation device is connected. When connecting the product to the actual device to be used, use caution so that malfunctions do not occur during the input/output test.

1. Connection Method

Connect the product to an external target device to test the communication and check the execution environment.

To connect an external target device, see "**Connecting to an External Device (page25)**".

2. Using the Diagnosis Program

◆ Starting the Diagnosis Program

Click [Diagnosis] on the Properties page to start the diagnosis program.

The diagnosis program allows you to check the digital inputs/outputs and to output a diagnosis report.

How to use the diagnostic program and how to output a diagnostic report, refer to the help included in the development environment package you downloaded from the CONTEC website or "Diagnosis Program" in the online help made available on the CONTEC website.

Online Help [Diagnosis Program]

https://help.contec.com/link/drv/wdm/dio/diagnostic/en/

7.Setup Troubleshooting

1. Examples and Solution

◆ The diagnostic program works properly but the application program does not.

The diagnostic program uses the API-DIO(WDM) functions. If the diagnostic program works properly, other applications should also work properly. If you have a problem, recheck your program taking note of the following points.

- Check the return values of the API functions.
- Refer to the source code for the sample programs.

◆ The OS won't normally get started or detect the device.

Refer to the device driver HELP.

◆ If your problem cannot be resolved

Contact your retailer with diagnostic report that outputted by diagnostic programs.

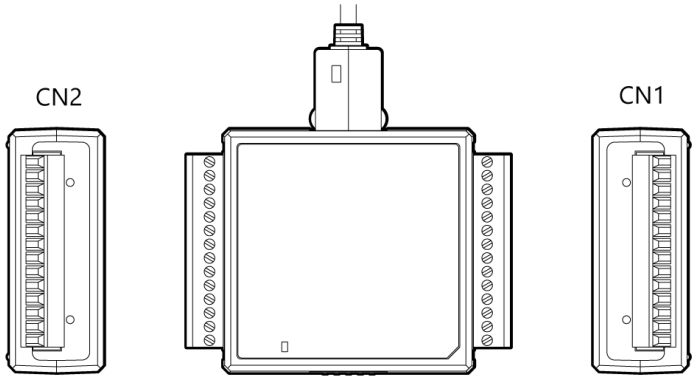
Connection

This section describes how to connect to an external device with a cable.

1.Connecting to an External Device

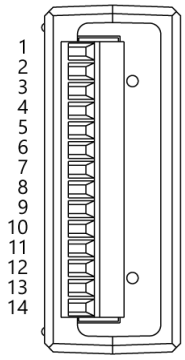
1. Connecting an Interface Connector

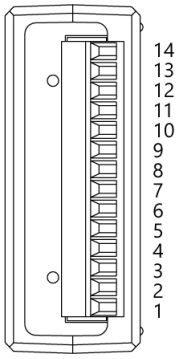
To connect an external device to this product, plug the cable from the device into the interface connector (CN1, CN2) shown below.



2. Signal Layout of DIO-0808LY-USB Interface Connector

◆ Layout on the Interface Connector(CN1, CN2)

CN2		
N.C.	1	
N.C.	2	
N.C.	3	
I-07	4	
I-06	5	
I-05	6	
I-04	7	
I-03	8	
I-02	9	
I-01	10	
I-00	11	
N.C.	12	
I-PC	13	
I-PC	14	

CN1		
	14	O-PC
	13	O-PC
	12	N.C.
	11	O-00
	10	O-01
	9	O-02
	8	O-03
	7	O-04
	6	O-05
	5	O-06
	4	O-07
	3	N.C.
	2	O-NC
	1	O-NC

Signal name	Description
I-00 - I-07	8 input signal pins. Connect output signals from the external device to these pins.
O-00 - O-07	8 output signal pins. Connect these pins to the input signal pins of the external device.
I-PC	Connect the positive side of the external power supply. These pins are common to 8 input signal pins.
O-PC	Connect the positive side of the external power supply. These pins are common to 8 output signal pins.
O-NC	Connect the negative side of the external power supply. These pins are common to 8 output signal pins.
N.C.	These pins are left unconnected.

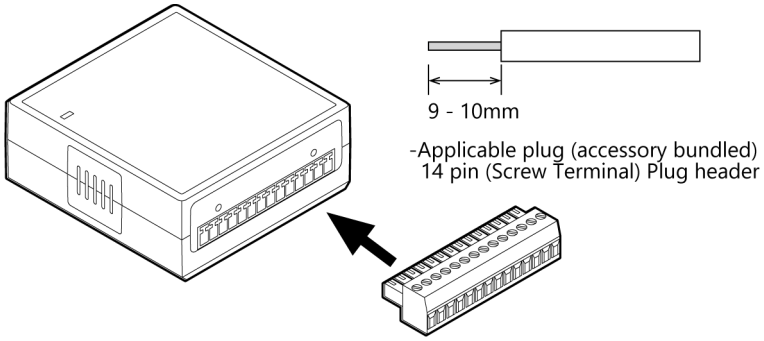
⚠CAUTION

To perform input/output using this product with the CONTEC device driver, specify logical ports and logical bits when calling each function. For details, refer to the **"Relationships between API-TOOL Logical Ports/Bits and Connector Signal Pins (Page34)"**.

3. Cable connection

When connecting the product to an external device, you can use the supplied connector plug.

For wiring, strip off approximately 9 - 10mm of the covered part of a wire rod and then insert it to the opening. After the insertion, secure the wire rod with screws. Compatible wires are AWG 28 - 16.



⚠ CAUTION

Removing the connector plug by grasping the cable can break the wire.

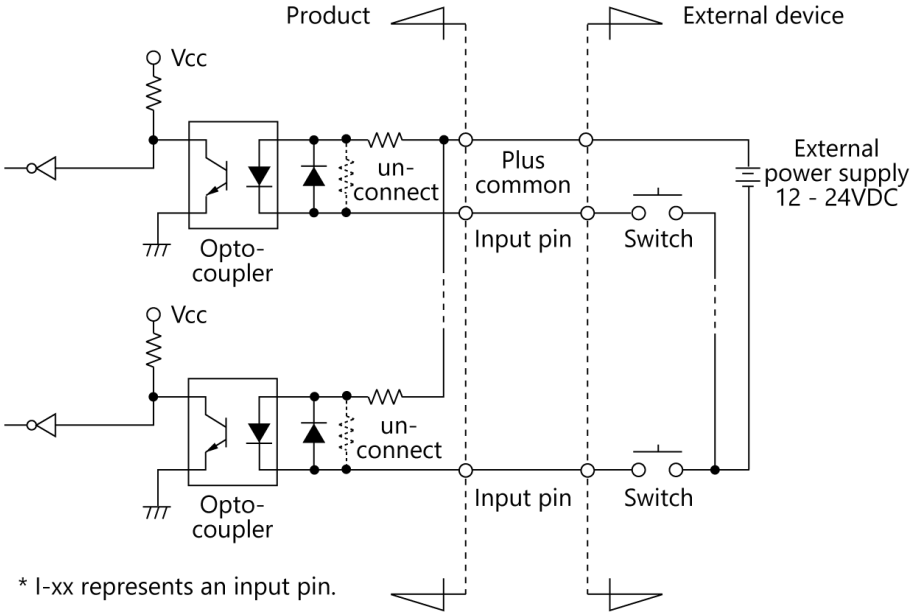
2.Connecting Input and Output Signals

1. Input Circuit

Connect the input signals to a device which can be current-driven, such as a switch or transistor output device.

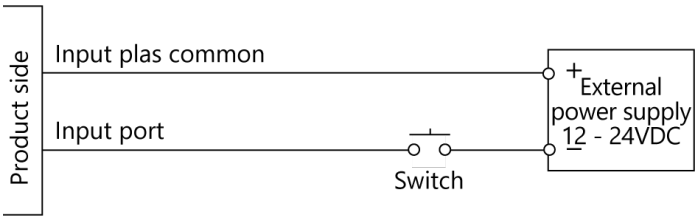
The connection requires an external power supply to feed currents.

The product inputs the ON/OFF state of the current-driven device as a digital value.



The signal inputs are isolated by opto-couplers (ready to accept current sinking output signals). The product therefore requires an external power supply to drive the inputs. The power requirement for each input pin is about 5.1 mA at 24 VDC (about 2.6 mA at 12 VDC).

Connecting a Switch



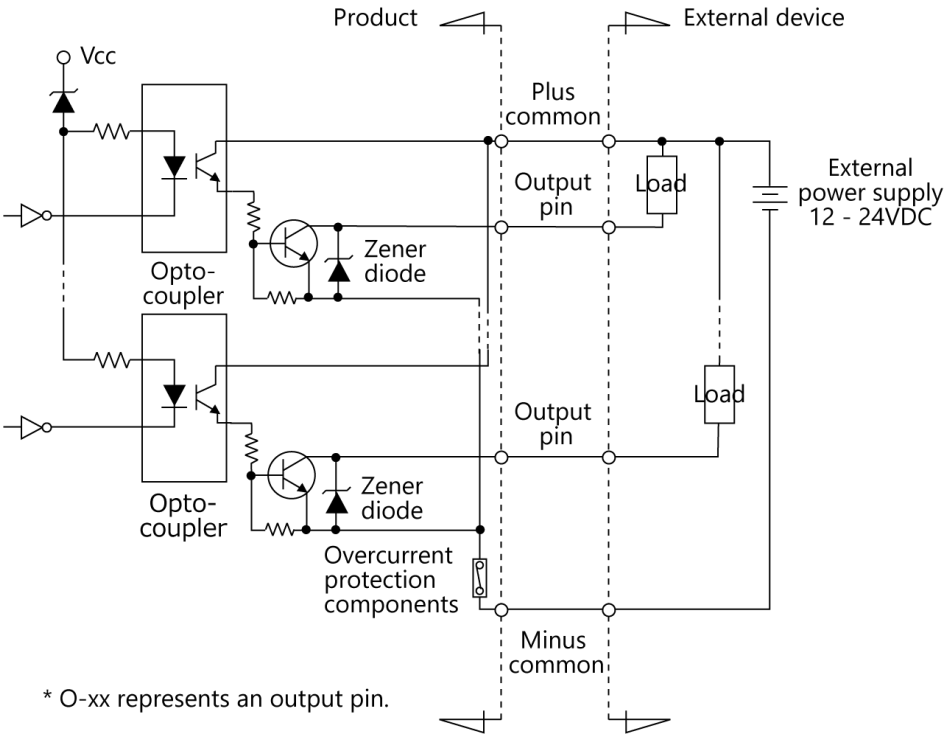
When the switch is ON, the corresponding bit contains 1.
When the switch is OFF, by contrast, the bit contains 0.

2. Output Circuit

Connect the output signals to a current-driven controlled device such as a relay or LED.

The connection requires an external power supply to feed currents.

The product controls turning on/off the current-driven controlled device using a digital value.



The signal output section is an opto-coupler isolated, open-collector output (current sink type). This product therefore requires the external power supply to drive the output section of this product.

The rated output current per channel is 100mA at maximum. The output section can also be connected to a TTL level input as it uses a low-saturated transistor for output.

The residual voltage (low-level voltage) between the collector and emitter with the output on is 0.5V or less at an output current within 50mA or at most 1.0V at an output current within 100mA.

A zener diode is connected to the output transistor for protection from surge voltages.

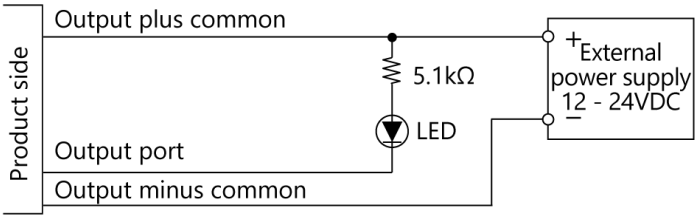
An overcurrent protection component is provided for every 8 output transistors.

When the over-current protector works, the output section of the product is temporarily disabled. If this is the case, turn of the power to the PC and the external power supply and wait for a few minutes, then turn them on back.

⚠ CAUTION

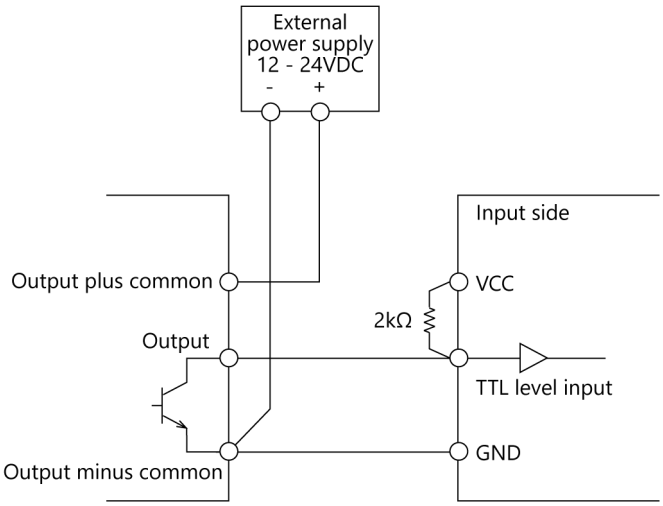
When the PC is turned on, all outputs are reset to OFF.

Connection to the LED



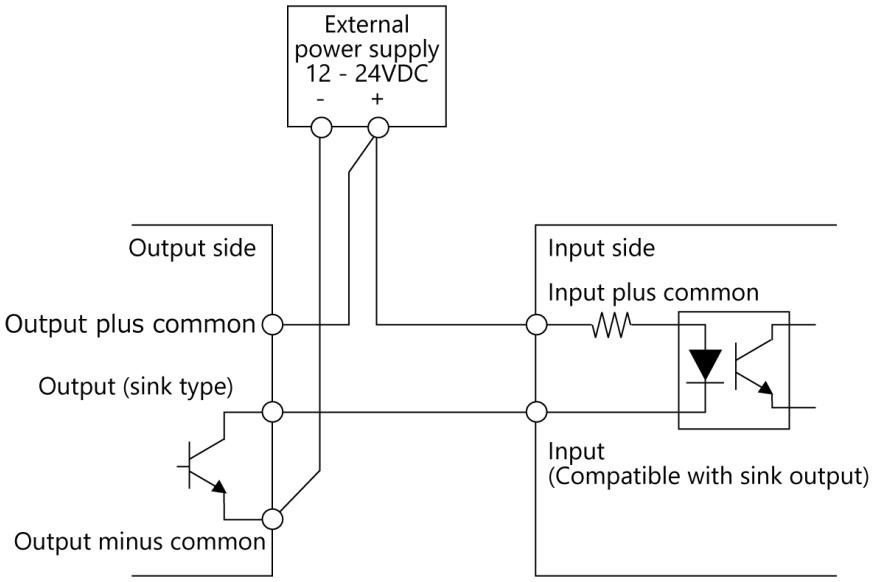
When "1" is output to a relevant bit, the corresponding LED comes on.
When "0" is output to the bit, in contrast, the LED goes out.

Example of Connection to TTL Level Input



3. Connecting the Sink Type Output and Sink Output Support Input

The following example shows a connection between a sink type output (output side) and a sink output support input (input side). Refer to this connection example when you connect such products to each other.



Function

This section describes the features achieved by combining hardware and device driver functions. These features can be implemented by calling the API functions provided by the device driver. For the functions and the features to use, refer to the help for the device driver.

1.Data I/O Function

1. Data Input

When input data is "ON" (Low level), "1" is input to the relevant bit.

When the input data is "OFF" (High level), in contrast, "0" is input to the relevant bit.

2. Data Output

When "1" is output to the relevant bit, the corresponding transistor is set to "ON" (Output is Low level).

When "0" is output to the relevant bit, in contrast, the corresponding transistor is set to "OFF" (Output is High level).

⚠ CAUTION

When the PC is turned on, all outputs are reset to 0 (OFF).

3. Relationships between API-TOOL Logical Ports/Bits and Connector Signal Pins

To perform input/output using this product with the CONTEC device driver, specify logical ports and logical bits when calling each function.

The notation for input/output bits used in input/output with a CONTEC product is different for each product. For this reason, the inputs and the outputs are both renumbered into logical ports and logical bits from bit 0 to eliminate confusion about the layout of ports and bits and to make programming easier. The relationship between the logical port numbers, the logical bit numbers, and the signal pin assignments of the various connectors (pages 26) is shown in the following table. CONTEC products are defined in a format in which eight signals are assigned to one port.

Input logical port	Input logical bit	Input signal
0	0	I-00
	1	I-01
	2	I-02
	3	I-03
	4	I-04
	5	I-05
	6	I-06
	7	I-07

Output logical port	Output logical bit	Output signal
0	0	O-00
	1	O-01
	2	O-02
	3	O-03
	4	O-04
	5	O-05
	6	O-06
	7	O-07

Appendix

This section lists the specifications and the physical dimensions of the product.

1.Hardware Specification

Function Specifications

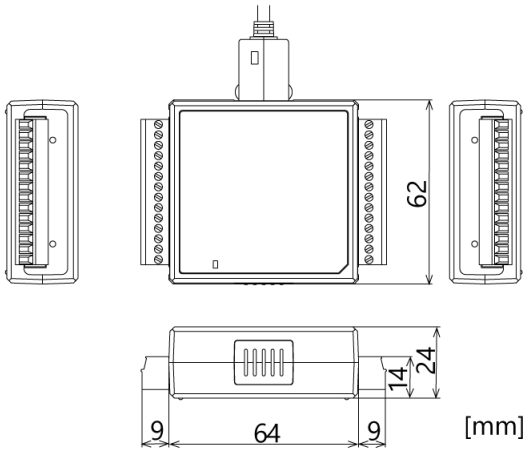
Item		Specifications
Input	Type	Opto-isolated input (Compatible with current sink output) (Negative logic *1)
	Number of Channels	8 points (1 common)
	Input resistance	4.7 kΩ
	Input ON current	2.0mA or more
	Input OFF current	0.16mA or less
	Response time	300μsec within *2
Output	Type	Opto-isolated open collector output (current sink type) (Negative logic*1)
	Number of Channels	8 points (1 common)
	Output rated voltage	35VDC (Max.)
	Output rated current	100mA (per point) (Max.)
	Residual voltage with output on	0.5V or less (Output current≤50mA), 1.0V or less (Output current≤100mA)
	Surge protector	Zener diode RD47FM(Renesas) or equivalent
	Response time	300μsec within *2
USB	Bus specification	USB Specification 2.0/1.1 standard
	USB transfer rate	12Mbps (Full-speed), 480Mbps (High-speed) *3
	Power supply	Bus power
Common	Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
	Number of terminals used at the same time	127 terminals (Max.) *4
	Dielectric strength	1000Vrms
	External circuit power supply	12 - 24VDC (±10%)
	Current consumption	5VDC 250mA (Max.)
	Physical dimensions (mm)	64(W) x 62(D) x 24(H) (exclusive of protrusions)
	Weight	70g (Not including the USB cable, attachment)
	Attached cable	USB cable 1.8m
	Compatible wires	AWG28 - 16

*1 Data “0” and “1” correspond to the High and Low levels, respectively.
*2 The opto-coupler's response time comes.
*3 This depends on the host PC environment used (OS and USB host controller).
*4 As a USB hub is also counted as one device, you cannot just connect 127 USB terminals.

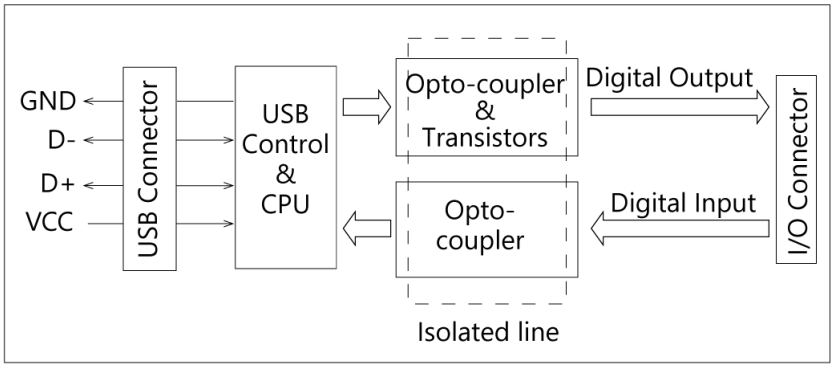
Installation Environment Requirements

Item	Specifications
Operating ambient temperature	0 - 50°C
Operating ambient humidity	10 - 90%RH (No condensation)
Floating dust particles	Not to be excessive
Corrosive gases	None
Standard	VCCI Class A, CE Marking (EMC Directive Class A, RoHS Directive), UKCA

2.Physical Dimensions



3.Circuit Block Diagram



Customer Support and Inquiry

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably.

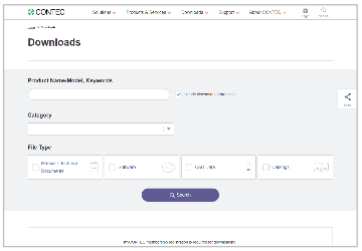
1.Services

CONTEC offers the useful information including product manuals that can be downloaded through the CONTEC website.

Download

https://www.contec.com/download/

You can download updated device driver, firmware, and differential manuals in several languages. Membership registration (myCONTEC) is required to use the services.



Revision History

MONTH YEAR	Summary of Changes
March 2006	The First Edition.
April 2024	Changed the layout of the manual.

CONTEC CO., LTD. 3-9-31, Himesato, Nishiyodogawa-ku, Osaka 555-0025, Japan

https://www.contec.com/

DIO-0808LY-USB Reference Manual

A-51-075 (LYFZ697) 04262024_rev9 [03102006] April 2024 Edition