

Installation Instructions

16 Input/16 Output Digital Embedded I/O Boards

Catalog Numbers 1799-D16U16V, 1799-D16U16VL, 1799-D16U16B,
1799-D16U16BL

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Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication [SGL-1.1](#) available from your local Rockwell Automation sales office or online at <http://literature.rockwellautomation.com>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.





In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

<p>WARNING</p> 	<p>Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.</p>
<p>IMPORTANT</p>	<p>Identifies information that is critical for successful application and understanding of the product.</p>
<p>ATTENTION</p> 	<p>Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard and recognize the consequences.</p>
<p>SHOCK HAZARD</p> 	<p>Labels may be on or inside the equipment (for example, drive or motor) to alert people that dangerous voltage may be present.</p>
<p>BURN HAZARD</p> 	<p>Labels may be on or inside the equipment (for example, drive or motor) to alert people that surfaces may reach dangerous temperatures.</p>

Environment and Enclosure

ATTENTION

This equipment is intended for use in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters (6562 feet) without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA, V2, V1, V0 (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see:

- Industrial Automation Wiring and Grounding Guidelines, for additional installation requirements, Allen-Bradley publication [1770-4.1](#).
- NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.

ATTENTION

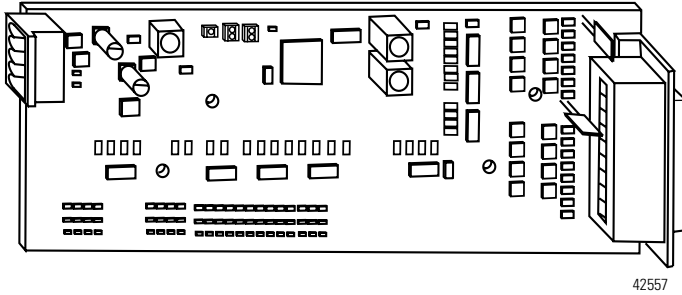
Preventing Electrostatic Discharge

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
 - Wear an approved grounding wriststrap.
 - Do not touch connectors or pins on component boards.
 - Do not touch circuit components inside the equipment.
 - Use a static-safe workstation, if available.
 - Store the equipment in appropriate static-safe packaging when not in use.
-

About the Board

The board is a 32-point I/O board that communicates via a DeviceNet network. This board has 16 inputs and 16 outputs. Inputs are 24V dc sourcing or sinking. Outputs are self-protected 24V dc sourcing (1799-D16U16B, 1799-D16U16BL) or sinking (1799-D16U16V, 1799-D16U16VL).



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Parts List

Your package contains:

- one 1799 I/O board.
- these installation instructions.

Optional Hardware

All mating connectors and mounting hardware must be ordered separately. This table identifies the different connector and hardware options.

Option	Catalog Number	Third-party Supplier & Part Number
2 DIN rail brackets (4 screws)	1799-BRKD	N/A
Clear plastic cover (4 stand-offs, 4 screws)	1799-COV32	N/A
Mounting plate (4 screws)	1799-MP32	N/A
Five-position, open-style plug for DeviceNet network (2 locking screws)	1799-DNETSCON	DeviceNet Buyer's Guide at http://www.odva.org
50-pin, D-sub I/O mating connector - solder cup	1799-DSSCON	Amphenol Corp. - 777DF-D50P ITT Cannon - DDM50PK127
50-pin, D-sub I/O mating connector - header and crimp pins	1799-DSCCON	Tyco Electronics - 205212-1 (header) Tyco Electronics - 66506-4 (pins) EBY Co. - DR50-P02-0S (header only)

Install the Board

To install the board:

- set the node address.
- mount the board (brackets, mounting plate, plastic cover).
- connect the board (DeviceNet network, I/O).
- communicate with your board.
- configure the parameters.

More detailed information about each of these steps is in the following procedures.

Set the Node Address

Valid node addresses are **00...63**.

Set the node address by using the rotary switches or a DeviceNet configuration tool such as RSNetWorx for DeviceNet software. Setting the switches between **64** and **99** allows the software to have address control.

Each board is shipped with the node address set to **63** in the board's memory. The rotary switches are set for position **99** at shipment. The switches are located near the center of the board. The two switches are:

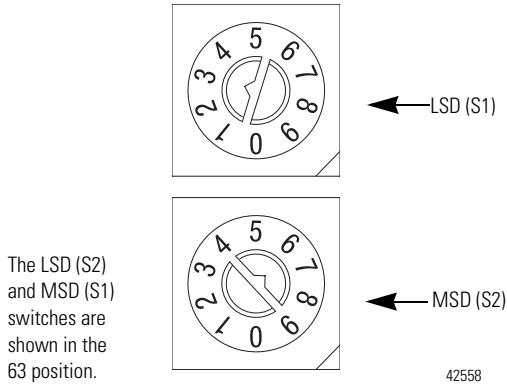
- MSD (most significant digit).
- LSD (least significant digit).

To reset the node address, use a screwdriver to rotate the switches. Line up the small arrow on the switch with the number setting you wish to use.

The rotary switches are read only when you apply power to the board. Settings between 64 and 99 cause the board to use the last valid node address stored in the board's memory.

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For example, the last setting in memory is 40. If a change is made to 68, and then you apply power to the board, the address will default to 40.



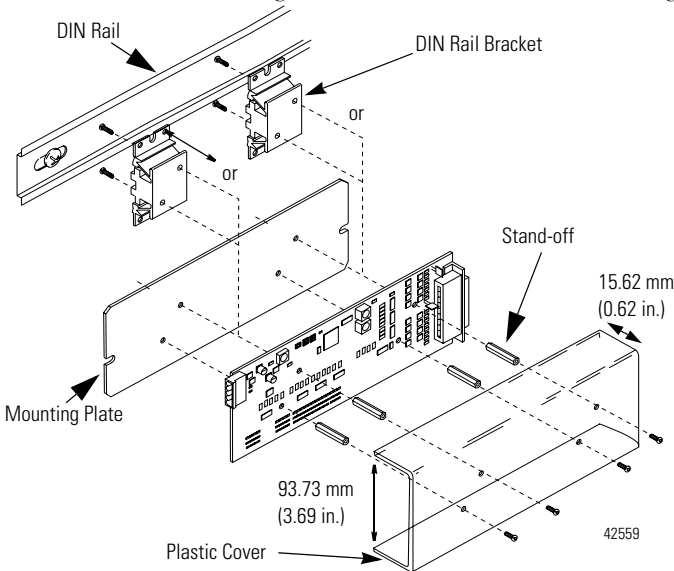
The board is equipped with AutoBaud detect. AutoBaud allows the board to detect the communication rate on your DeviceNet network and automatically adjusts to that rate.

The board is shipped with AutoBaud enabled.

Mount the Board and Optional Cover

You can mount the board to a DIN rail by using DIN-rail brackets (catalog number 1799-BRKD) or to a mounting plate (catalog number 1799-MP32). For clear plastic covers (catalog number 1799-COV32), reference the following instructions.

1. Place the four stand-offs onto the mounting screws and tighten.
2. Align the holes on the cover with the stand-offs.
3. Place the screws through the cover into the stand-offs and tighten.



You can also mount the board in an enclosure with pre-tapped holes, which accommodate M3 x 0.5mm screws.

IMPORTANT

With the addition of the cover, the width of the board increases from 77.98 mm to 93.73 mm (3.07 in. to 3.69 in.) and the height increases from 19.05 mm to 35.05 mm (0.75 in. to 1.38 in.).

ATTENTION

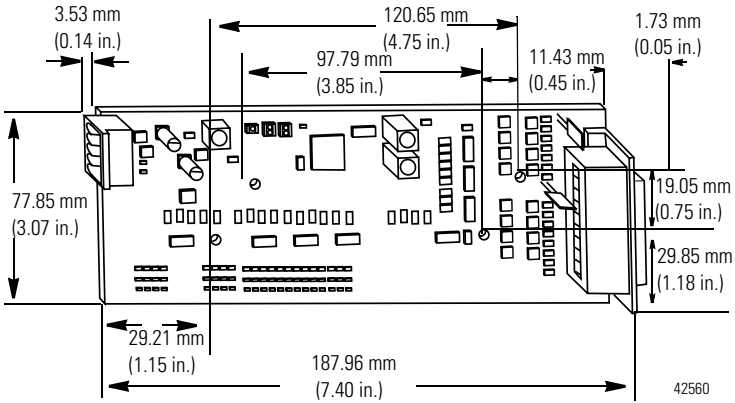


Turn off the system power before conducting maintenance or inspection on an open board, or in an area where an open board is installed.

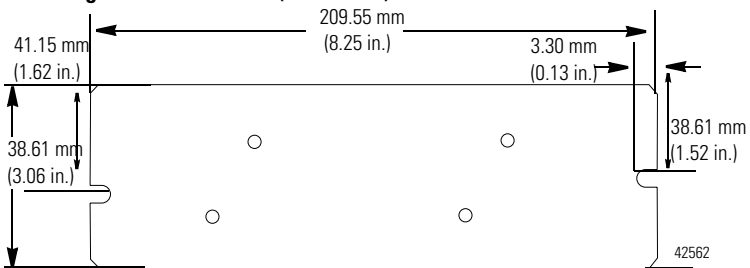
If powering down the system is not feasible, ensure that any open boards are covered during maintenance or inspection to prevent any direct exposure of a directed light source to open boards.

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Board Dimensions

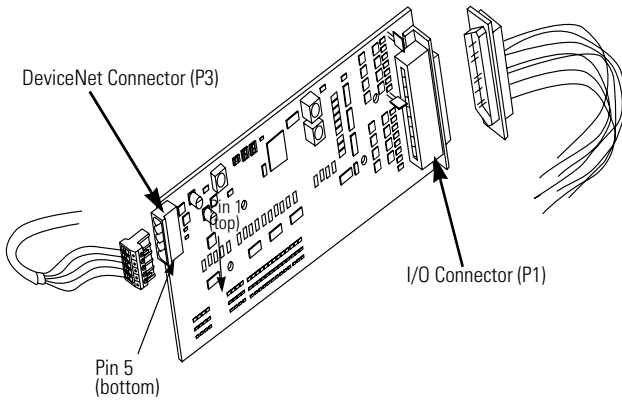


Mounting Plate Dimensions (front view)



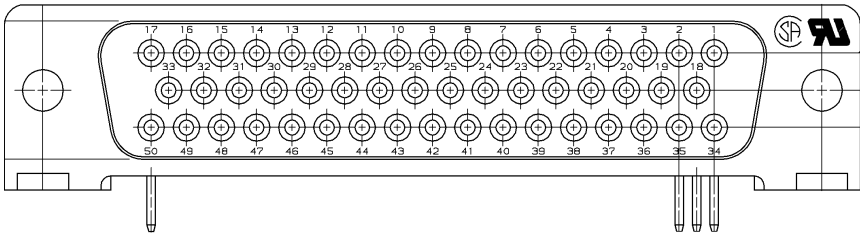
Connect the Board

Use these illustrations and tables to help you connect the DeviceNet connectors and I/O connectors to the board.



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This illustration shows the pin number assignments of the I/O connector (P1).



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This table identifies the signal for each 1799-D16U16B and 1799-D16U16BL pin number on the I/O connector.

P1 1799-D16U16B and 1799-D16U16BL I/O Connector

Pin	Signal	Pin	Signal	Pin	Signal
1	Output 15	18	Output 13	34	Output 12
2	Output 9	19	Output 8	35	Output 14
3	Output 11	20	Output 10	36	GRP 1 Return
4	+24V dc-GRP 1	21	Input 1	37	Input 0
5	+24V dc-GRP 1	22	Common In GRP 0	38	Input 2
6	Input 3	23	Input 6	39	Input 4
7	Input 5	24	Not Used	40	Input 7
8	GRP 0 Return	25	Input 11	41	Input 10
9	Output 4	26	Input 9	42	Input 8
10	+24V dc-GRP 0	27	Input 14	43	Common In GRP 1
11	Output 5	28	Input 12	44	Input 13
12	Output 7	29	Output 6	45	Input 15
13	Output 0	30	Not Used	46	Not Used
14	Output 1	31	Not Used	47	Not Used
15	+24V dc-GRP 0	32	Not Used	48	Not Used
16	Output 2	33	Not Used	49	Not Used
17	Output 3			50	Not Used

This table identifies the signal for each 1799-D16U16V and 1799-D16U16VL pin number on the I/O connector.

P1 1799-D16U16V and 1799-D16U16VL I/O Connector

Pin	Signal	Pin	Signal	Pin	Signal
1	Output 15	18	Output 13	34	Output 12
2	Output 9	19	Output 8	35	Output 14
3	Output 11	20	Output 10	36	Common Return
4	+24V dc-GRP 1	21	Input 1	37	Input 0
5	+24V dc-GRP 1	22	Common In GRP 0	38	Input 2
6	Input 3	23	Input 6	39	Input 4
7	Input 5	24	Common Return	40	Input 7

P1 1799-D16U16V and -D16U16VL I/O Connector

Pin	Signal	Pin	Signal	Pin	Signal
8	Common Return	25	Input 11	41	Input 10
9	Output 4	26	Input 9	42	Input 8
10	+24V dc-GRP 0	27	Input 14	43	Common In GRP 1
11	Output 5	28	Input 12	44	Input 13
12	Output 7	29	Output 6	45	Input 15
13	Output 0	30	Not Used	46	Not Used
14	Output 1	31	Not Used	47	Not Used
15	+24V dc-GRP 0	32	Not Used	48	Not Used
16	Output 2	33	Not Used	49	Not Used
17	Output 3			50	Not Used

The DeviceNet wire insulation colors are shown below.

P3 DeviceNet Connector

Pin	Insulation Colors
1	Black
2	Blue
3	Shield
4	White
5	Red

Auxiliary Power Specifications**ATTENTION**

To comply with the CE Low Voltage Directive (LVD), this equipment and all connected I/O must be powered from a source compliant with the following:

- Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

To comply with UL restrictions, this equipment and all connected I/O must be powered from a source compliant with the following:

- 10...30V dc Class 2 Power Supply or a 10...30V dc UL Listed or Recognized Power Supply with isolated outputs limited to 200VA in each ungrounded output line. This equipment and its power source must be mounted in a suitable enclosure with proper spacings maintained.

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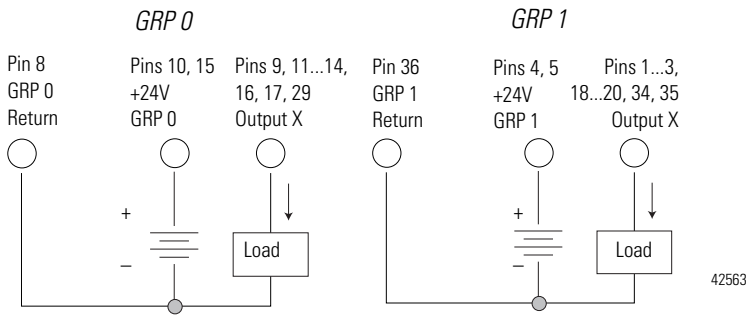
Connect the Field Output Device to the I/O Connector (P1)

The 1799-D16U16B and 1799-D16U16BL boards have outputs that supply current to your field output device (sourcing outputs).

The outputs on these boards are isolated in two groups of eight, with each group requiring 24V dc power and 24V dc ground. Outputs 0...7 are powered from +24V GRP 0 and return power via GRP 0 Return. Outputs 8...15 are powered from +24V GRP 1 and return power via GRP 1 Return.

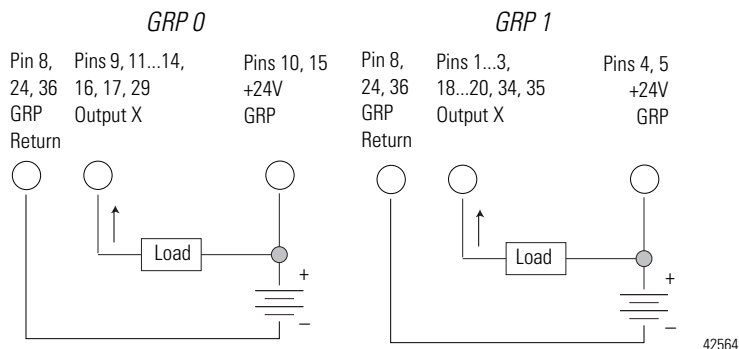
Use these wiring diagrams to connect both groups of outputs on these boards.

1799-D16U16B and 1799-D16U16BL Outputs (sourcing)



The 1799-D16U16V and 1799-D16U16VL boards have outputs that receive current from your field output device (sinking outputs). The outputs on these boards are in two groups of eight, with each group requiring 24V dc power and 24V dc ground.

1799-D16U16V and 1799-D16U16VL Outputs (sinking)



Connect the Field Input Device to the I/O Connector (P1)

The inputs on these boards are isolated in two groups of eight, with each group providing a separate common signal. Inputs 0 to 7 share the Common In GRP 0 signal. Inputs 8 to 15 share the Common In GRP 1 signal.

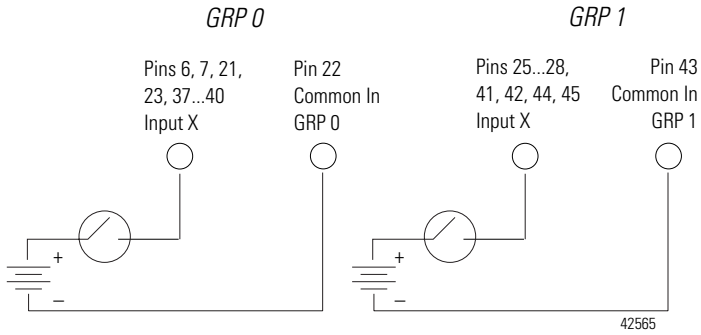
The 1799-D16U16B, 1799-D16U16BL, 1799-D16U16V, and 1799-D16U16VL boards have universal inputs that allow operation with either sourcing or sinking input devices. The universal feature lets you configure the inputs as either sinking or sourcing. Use these wiring diagrams to connect each group of inputs on the boards.

IMPORTANT

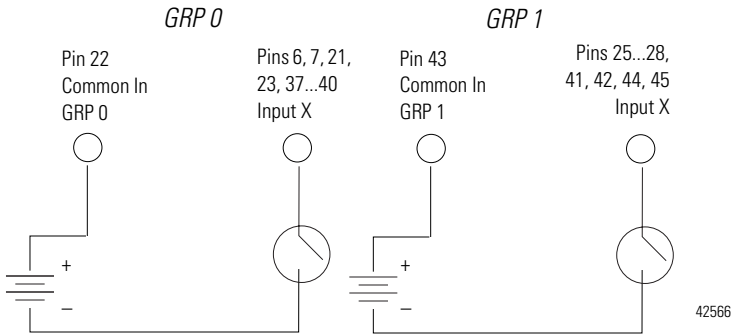
All field input devices in each group of eight must be of the same type, either sinking or sourcing. The board will not operate if the types are mixed.

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Inputs (sourcing)



Inputs (sinking)



Communicate With Your Board

This board exchanges I/O with the master on the DeviceNet network through a cyclic, polled, or change-of-state connection.

The 1799-D16U16B and 1799-D16U16BL boards consume and produce I/O data as follows.

I/O Connection Type	Consumes	Produces
Cyclic	2 bytes	3 bytes
Polled	2 bytes	3 bytes
Change-of-state	2 bytes	3 bytes

The 1799-D16U16V and 1799-D16U16VL boards consumes and produces I/O data as follows.

I/O Connection Type	Consumes	Produces
Cyclic	2 bytes	2 bytes
Polled	2 bytes	2 bytes
Change-of-state	2 bytes	2 bytes

Cyclic — the board produces and consumes its I/O cyclically at the rate configured by the master on the DeviceNet network.

Polled — the master initiates communication by sending its polled I/O message to the board. The board consumes the message, updates any outputs, and produces a response containing the input data.

Change-of-state — a production occurs when an input changes. A heartbeat production occurs if no input condition change occurs within the expected packet rate. This heartbeat production tells the master that the board is ready to communicate. Consumption occurs when data changes and the master produces new output data to the board.

Refer to this table for the word and bit definitions for the 1799-D16U16B and 1799-D16U16BL boards.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Produced 0	I7	I6	I5	I4	I3	I2	I1	I0
Produced 1	I15	I14	I13	I12	I11	I10	I9	I8
Produced 2	Reserved						OFLT 1	OFLT 0
Consumed 0	O7	O6	O5	O4	O3	O2	O1	O0
Consumed 1	O15	O14	O13	O12	O11	O10	O9	O8

Where: I = Input, O = Output, OFLT 0 = Output Fault on one or more outputs in GRP 0,
OFLT 1 = Output Fault on one or more outputs in GRP 1

Refer to this table for the word and bit definitions for the 1799-D16U16V and 1799-D16U16VL boards.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Produced 0	I7	I6	I5	I4	I3	I2	I1	I0
Produced 1	I15	I14	I13	I12	I11	I10	I9	I8
Consumed 0	O7	O6	O5	O4	O3	O2	O1	O0
Consumed 1	O15	O14	O13	O12	O11	O10	O9	O8

Where: I = Input, O = Output

Configure the Parameters

The 1799 I/O boards have eight parameters that are configurable through a DeviceNet configuration tool such as RSNetWorx for DeviceNet software. The DeviceNet configuration tools require an electronic data sheet (EDS) for the 1799 I/O boards to configure the module's parameters. Find the EDS files at <http://www.odva.org>.

Use the descriptions in this table to help you configure the parameters.

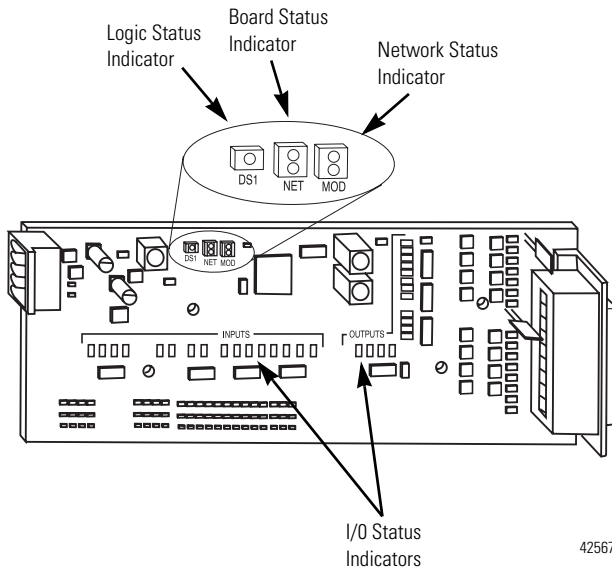
Parameter	Description
Baud Rate	Controls the board's communication rate.
Auto-Baud	Enables the board to match the network's communication rate. When enabled, Baud Rate parameter is ignored.
Input Off-to-On Filter Time	Controls the amount of time the input must be in the on state before the board reports the input as on.
Input On-to-Off Filter Time	Controls the amount of time the input must be in the off state before the board reports the input as off.
Output Idle State	Controls the state of each output when the DeviceNet master is in an idle state.
Output Fault State	Controls the state of each output when the board loses communication with the DeviceNet master.
Output Idle Value	Controls the value that outputs will have when the output idle state is set to use idle value.
Output Fault Value	Controls the value that outputs will have when the output fault state is set to use fault value.

The DeviceLogix capable boards, 1799-D16U16BL and 1799-D16U16VL, have additional parameters, which are described in the DeviceLogix User Manual, publication ACIG-UM001, and in the Embedded I/O for DeviceNet Technical Data, publication 1799-TD001.

Troubleshoot the I/O Boards

This board has the following status indicators.

- Board
- Network
- Logic
- I/O



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Board Status Indicator (labeled MOD)

Indication	Status
None	No power
Green Blinking Solid	Needs commissioning Device operational
Red Blinking Solid	Minor fault Critical fault

Network Status Indicator (labeled NET)

Indication	Status
None	Not online
Green Blinking Solid	Online/no connections Online/connected
Red Blinking Solid	Connection timed out Failed communication: a duplicate node address exists or module is at the wrong communication rate

DeviceLogix Status Indicator (labeled DS1)

Indication	Status
None	Logic disabled
Green Solid Blinking	Logic enabled Local forces applied and local logic enabled

I/O Status Indicators (labeled Inputs and Outputs)

Indication	Status
None	Input or output point off
Yellow	Input or output point on

Technical Support

For additional troubleshooting information on the 1799 Embedded I/O Boards, access Rockwell Automation's technical support services at 440.646.5800 or at <http://www.ab.com>.

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Specifications

16 Input/16 Output Boards - 1799-D16U16B, 1799-D16U16BL, 1799-D16U16V, 1799-D16U16VL

Attribute	Value
Input Specifications	
Inputs per block	16 sinking or sourcing, Type 1 + compatible
Off-state voltage	5V dc max
Off-state current	1.5 mA max
On-state voltage	10...30V dc
On-state current	2...6 mA
Output Specifications	
Outputs per block	16 sinking or sourcing, 0.5A, short circuit protected, pilot duty
Output auxiliary voltage	10...30V
On-state voltage drop	250 mV max
On-state current	0.5 A max
Off-state leakage	65 μ A max
Board current (all outputs on)	8.0 A max
Surge current - for 10ms, repeatable Every 2 s (individual outputs)	1.0 A

General

Attribute	Value
DeviceNet voltage range	11...25V dc
DeviceNet current	125 mA max
DeviceNet power circuit type	Class 2
Auxiliary power voltage range	10...30V dc UL Listed or recognized power supply
Auxiliary power current outputs on	8 A max
Auxiliary power current outputs off	30 mA
Auxiliary supply power/current ratings	Isolated outputs limited to 200VA in each ungrounded output line
Status indicators	Board - red/green Network - red/green DeviceLogix - green Input Point - yellow Output Point - yellow

General

Attribute	Value
Dimensions (H x W x D), approx.	19.05 x 77.85 x 189.33 mm (0.75 x 3.07 x 7.45 in.)
Weight, approx.	0.10 kg (0.22 lb)
Enclosure type rating	None (open-style)
Pilot duty rating	NEMA DC-14
Isolation voltage	1799-D16U16B and 1799-D16U16BL modules: 50V (continuous), Basic Insulation Type Type tested at 750V dc for 60 seconds, I/O to Network, I/O Group to Group, and I/O (AUX) power to Network No isolation between individual channels 1799-D16U16V and 1799-D16U16VL modules: 50V (continuous), Basic Insulation Type Type tested at 2300V dc for 60 seconds, I/O to Network, I/O Group to Group, and I/O (AUX) power to Network No isolation between individual channels
Power dissipation	5 W max @ IO 30.0V dc DeviceNet 25V dc (whole board)
Thermal dissipation	17 BTU/hr max @ IO 30.0V dc DeviceNet 25V dc (whole board)
I/O and auxiliary power wire size	0.52...2.1 mm ² (24...20 AWG) solid or stranded copper wire rated at 80 °C (176 °F) or greater, 1.2 mm (3/64 in.) insulation max.
DeviceNet wire size	0.25...2.5 mm ² (22...14 AWG) solid or stranded copper wire rated at 80 °C (176 °F) or greater Refer to DeviceNet Media Design Installation Guide, publication DNET-UM072.
Wiring category ⁽¹⁾	2 - on signal ports 2 - on power ports 2 - on communication ports

⁽¹⁾ Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental

Attribute	Value
Temperature, operating	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -10...80 °C (14...176° F)
Temperature, storage	IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock): -40...85 °C (-40...185 ° F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5...95% noncondensing
Vibration	IEC 60068-2-6 (Test Fc, Operating): 5 g @ 10...500 Hz
Shock, operating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 30 g
Shock, nonoperating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity	IEC 61000-4-2: 6 kV indirect contact discharges
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 1V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental

Attribute	Value
EFT/B immunity	IEC 61000-4-4: ±2 kV at 5 kHz on power ports ±2 kV at 5 kHz on signal ports ±2 kV at 5 kHz on communication ports
Surge transient immunity	IEC 61000-4-5: ±500V line-line (DM) and ±1 kV line-earth (CM) on dc power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on communication ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80%AM from 150 kHz...80 MHz

Certifications

Certification (when product is marked)⁽¹⁾	Value
c-UR-us	UL Recognized Component Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CE	European Union 2004/108/EC EMC Directive, compliant with: EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
ODVA	ODVA conformance tested to DeviceNet specifications

⁽¹⁾ See the Product Certification link at <http://www.ab.com> for Declaration of Conformity, Certificates, and other certification details.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3434 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

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