Compact TTL Output Module

Catalog Number 1769-OG16

About This Publication

Use this document as a guide when installing a Compact TTL Output Module.

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 SGI-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.

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

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

Prevent Electrostatic Discharge

ATTENTION	Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle the module:
⚠️	– Touch a grounded object to discharge static potential. – Wear an approved wrist-strap grounding device. – Do not touch the bus connector or connector pins. – Do not touch circuit components inside the module. – If available, use a static-safe work station. – When not in use, keep the module in its static-shield box.

Remove Power

ATTENTION	Remove power before removing or inserting this module. When you remove or insert a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:
⚠️	– sending an erroneous signal to your system's field devices, causing unintended machine motion. – causing an explosion in a hazardous environment. Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or nonhazardous locations only. The following WARNING statement applies to use in hazardous locations.

WARNING

⚠️

Explosion Hazard

- Substitution of components may impair suitability for Class I, Division 2.
- Do not replace components or disconnect equipment unless power is switched off or the area is known to be nonhazardous.
- Do not connect or disconnect components unless power is switched off or the area is known to be nonhazardous.
- This product must be installed in an enclosure.
- All wiring must comply with N.E.C. article 501-4(b).

Environnements dangereux

Cet équipement est conçu pour être utilisé dans des environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à une utilisation dans des environnements dangereux.

AVERTISSEMENT

⚠️

Danger D'explosion

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe 1, Division 2.
- Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée et que l'environnement est classé non dangereux.
- Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée ou que l'environnement est classé non dangereux.
- Ce produit doit être installé dans une armoire.

About the 1769-OG16 Module

Compact I/O is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2[1]) and to circuits not exceeding Over Voltage Category II[2] (IEC 60664-1)[3].

Module Description
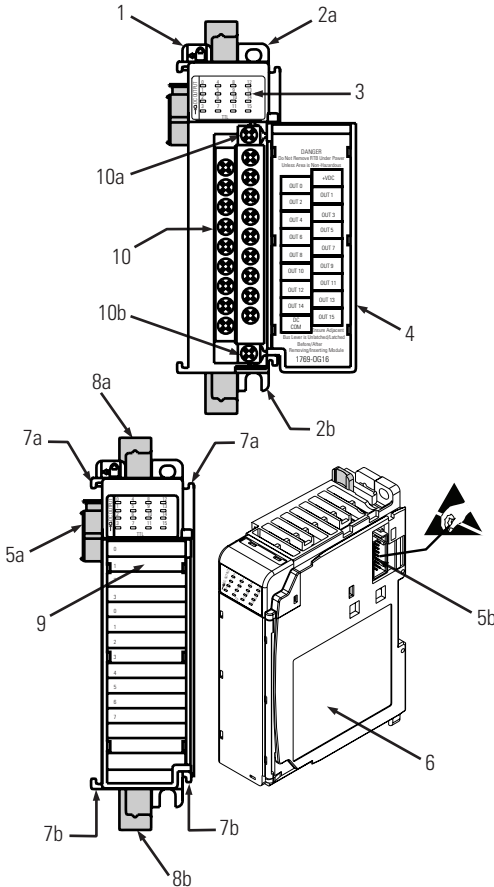
Labels

Item	Description
1	Bus lever (with locking function)
2a	Upper panel mounting tab
2b	Lower panel mounting tab
3	Module status LED
4	Module door with terminal identification label
5a	Movable bus connector with female pins
5b	Stationary bus connector with male pins
6	Nameplate label
7a	Upper tongue-and-groove slots
7b	Lower tongue-and-groove slots
8a	Upper DIN rail latch
8b	Lower DIN rail latch
9	Write-on label (user ID tag)
10	Removable terminal block (RTB) with finger-safe cover
10a	RTB upper retaining screw
10b	RTB lower retaining screw

[1] Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is expected.

[2] Over Voltage Category II is the load level section of the electrical distribution system. At this level, transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

[3] Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

Install the 1769-OG16 Module

Attach the module to the controller or an adjacent I/O module before or after mounting. For mounting instructions, see Mount Module to Panel Using the Dimensional Template, or Mount Module to DIN Rail. To work with a system that is already mounted, see Replace a Single Module Within a System.

The following procedure shows you how to assemble the Compact I/O system.

30536-M
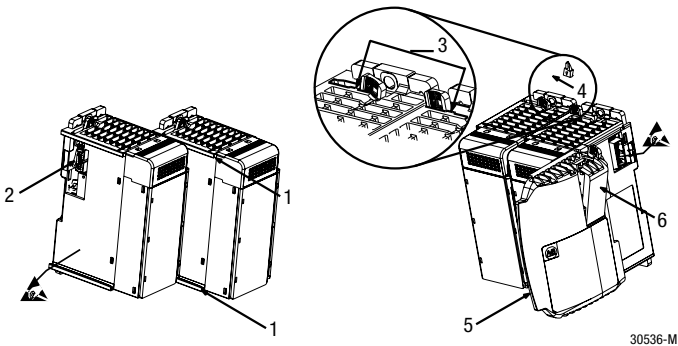
1. Disconnect power.

2. Check that the bus lever of the module to be installed is in the unlocked (fully-right) position.

3. Use the upper and lower tongue-and-groove slots (1) to secure the modules together (or to a controller).

4. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.

5. Use your fingers or a small screwdriver to push the bus lever back slightly to clear the positioning tab (3).

6. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks, making sure it is locked firmly in place.

ATTENTION	When attaching I/O modules, it is very important that the bus connectors are securely locked together to be sure of proper electrical connection.

7. Attach an end-cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.

8. Lock the end-cap bus terminator (6).

IMPORTANT	You must use a 1769-ECR or 1769-ECL right or left end cap to terminate the end of the serial communication bus.

Replace a Single Module Within a System

The module can be replaced while the system is mounted to a panel (or DIN rail).

1. Remove power.

Refer to Remove Power on page 3.

2. Remove the upper and lower mounting screws from the module (or open the DIN latches using a flat-blade or Phillips-style screwdriver).

3. Move the bus lever to the right to disconnect (unlock) the bus.

4. On the right-side adjacent module, move its bus lever to the right (unlock) to disconnect it from the module to be removed.

5. Gently slide the disconnected module forward.

If you feel excessive resistance, check that the module is disconnected from the bus and that both mounting screws are removed (or DIN latches opened).

TIP	It may be necessary to rock the module slightly from front to back to remove it, or, in a panel-mounted system, to loosen the screws of adjacent modules.

6. Be sure that the bus lever on the module and on the right-side adjacent module are in the unlocked (fully right) position before installing the replacement module.

7. Slide the replacement module into the open slot.

8. Connect the modules by locking (fully left) the bus levers on the replacement module and the right-side adjacent module.

9. Replace the mounting screws (or snap the module onto the DIN rail).

Mount Expansion I/O

ATTENTION

⚠

During panel or DIN rail mounting of all devices, be sure that all debris, including metal chips or wire strands, is kept from falling into the module. Debris that falls into the module could cause damage when cycling power.

Minimum Spacing

Maintain spacing from enclosure walls, wireways, or adjacent equipment. Allow 50 mm (2 in.) of space on all sides for adequate ventilation, as shown.
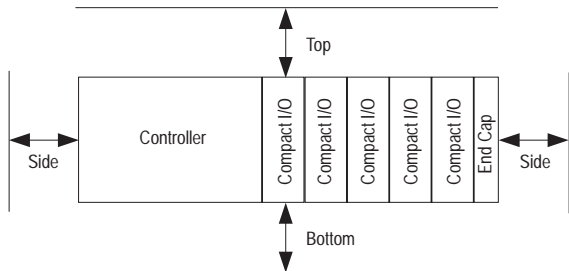
Mount Module to Panel

Mount the module to a panel using two screws per module. Use M4 or #8 panhead screws. Mounting screws are required on every module.

Mount Module to Panel Using the Dimensional Template

Spacing for single-wide modules 35mm (1.378 in.)
Spacing for one-and-a half-wide modules 52.5mm (2.067 in.)
Refer to host controller documentation for this dimension.

Host Controller

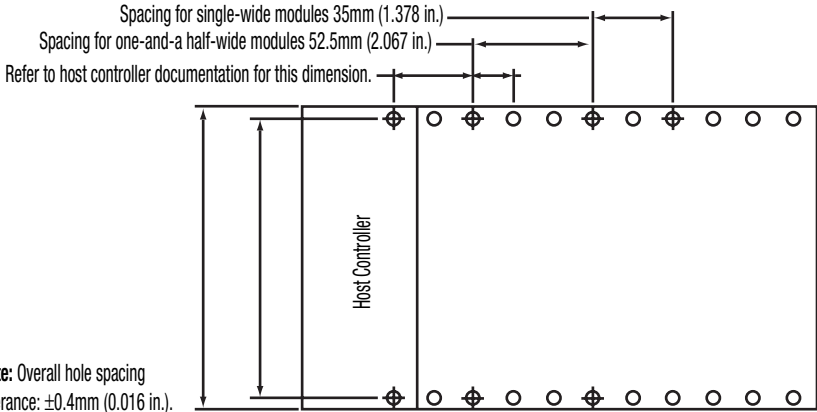**Note:** Overall hole spacing tolerance: ±0.4mm (0.016 in.).

Locate holes every 17.5 mm (0.689 in.) to allow for a mix of single-wide and one-and-a-half-wide modules (for example, the 1769-OA16 module).

Mount Module to Panel Procedure Using Modules as a Template

This procedure lets you use the assembled modules as a template for drilling holes in the panel. Due to module-mounting hole tolerance, it is important to follow this procedure.

Refer to Mount Module to Panel Using the Dimensional Template on page 9 if you have sophisticated panel-mounting equipment.

1. On a clean work surface, assemble no more than three modules.

2. Using the assembled modules as a template, carefully mark the center of all module-mounting holes on the panel.

3. Return the assembled modules to the clean work surface, including any previously mounted modules.

4. Drill and tap the mounting holes for the recommended M4 or #8 screws.

5. Place the modules back on the panel, and check for proper hole alignment.

6. Attach the modules to the panel using the mounting screws.

| **TIP** | If mounting more modules, mount only the last one of this group and put the others aside. This reduces the remounting time during drilling and tapping of the next group. |

7. Repeat steps 1 to 6 for any remaining modules.

Mount Module to DIN Rail

The module can be mounted using these DIN rails.

- 35 x 7.5 mm (EN 50 022 - 35 x 7.5)
- 35 x 15 mm (EN 50 022 - 35 x 15)

Before mounting the module on a DIN rail, close the DIN-rail latches. Press the DIN-rail mounting area of the module against the DIN rail. The latches will momentarily open and lock into place.

Wire the 1769-OG16 Module

Each terminal accepts as many as two wires with these restrictions.

Wire Restrictions

Wire Type		Wire Size	Terminal Screw Torque	Retaining Screw Torque
Solid	Cu-90 °C (194 °F)	2.08…0.34 mm^2 (14…22 AWG)	0.68 Nm (6 in-lb)	0.46 Nm (4.1 in-lb)
Stranded	Cu-90 °C (194 °F)	1.31…0.34 mm^2 (16…22 AWG)	0.68 Nm (6 in-lb)	0.46 Nm (4.1 in-lb)

Simplified Output Circuit Diagram
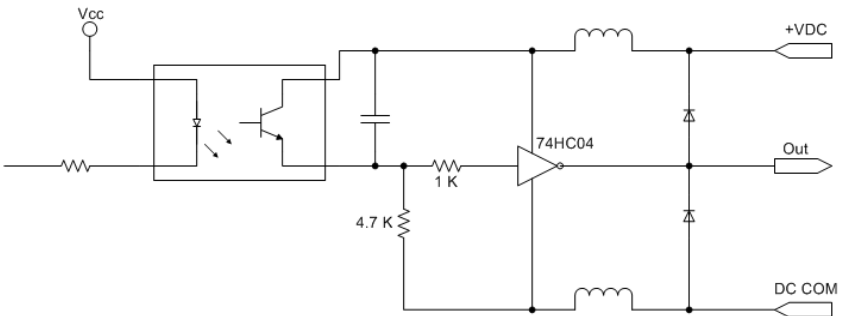
Output Wiring
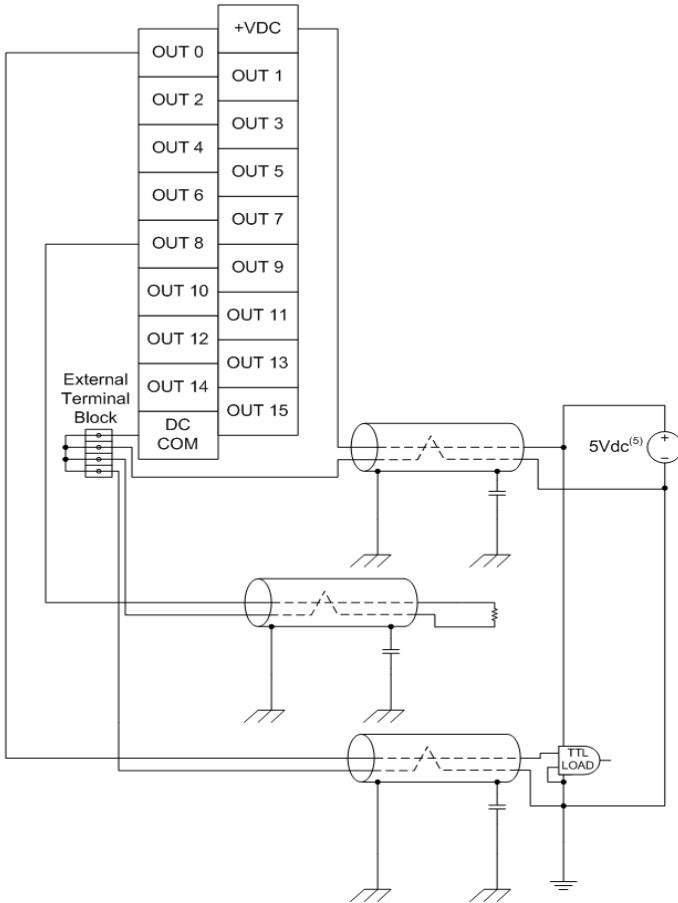
General Notes:

1. Use Belden 8761, or equivalent, shielded wire.
2. Do not connect more than 2 wires to any single terminal.
3. DC power cable and I/O cables should not exceed 30 ft (10 m) in length.
4. The capacitors shown above must be 0.01uF and rated for 2000 volts (minimum).
5. User power supply must be rated Class 2 with a 5V dc range of 4.5V to 5.5V dc.

Ground the 1769-OG16 Module

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail (if used) are not required unless the mounting surface cannot be grounded.

Refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1, for additional information.

A removable, write-on label is provided with the module. Remove the label from the door, mark the identification of each terminal with permanent ink, and slide the label back into the door. Your markings (ID tag) will be visible when the module door is closed.

Ground the Module

Upper Retaining Screw

Wire the finger-safe terminal block.

Lower Retaining Screw
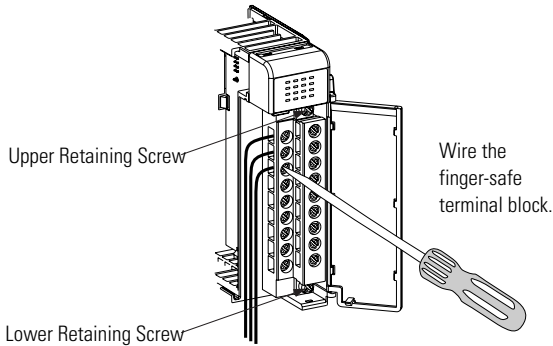
Remove the Finger-safe Terminal Block

To remove the terminal block, loosen the upper and lower retaining screws. The terminal block will back away from the module as you remove the screws. When replacing the terminal block, torque the retaining screws to 0.46 Nm (4.1 in-lbs).

Wire the Finger-safe Terminal Block

When wiring the terminal block, keep the finger-safe cover in place.

1. Loosen the terminal screws to be wired.

2. Route the wire under the terminal pressure plate.

You can use the bare wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.

TIP	The terminal screws are non-captive. Therefore, it is possible to use a ring lug [max 1/4 in. o.d. with a 0.139 in. minimum i.d. (M3.5)] with the module.

3. Tighten the terminal screw making sure the pressure plate secures the wire.

Recommended torque when tightening terminal screws is 0.68 Nm (6 in-lb).

TIP	If you need to remove the finger-safe cover, insert a screwdriver into one of the square, wiring holes and gently pry the cover off. If you wire the terminal block with the finger-safe cover removed, you will not be able to put it back on the terminal block because the wires will be in the way.

Configure the 1769-OG16 Module

The following I/O memory mapping lets you configure the 1769-OG16 module.

Output Data File

For each module, slot x, word 0 in the output data file contains the state of the module's output points. The module implements inverted logic on the TTL outputs. An Output Data File bit set to 1 results in a logic low output voltage on the corresponding output point. An Output Data File bit cleared to 0 results in a logic high output voltage on the corresponding output point.

Output Data File

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	w[1]	w	w	w	w	w	w	w	w	w	w	w	w	w	w	w

[1] w = write.

Input Data File

For each module, slot x, word 0 in the input data file contains the state of the module's output data file (output data echo). During normal operation, these input bits represent the logic state that the outputs are directed to by the control program. They are also dependent upon the:

- Program mode configuration (if supported by the controller).
- Fault mode configuration (if supported by the controller).

The module implements inverted logic on the TTL outputs. An Output Data File bit set to 1 directs a logic low output voltage on the corresponding output point. An Output Data File bit cleared to 0 directs a logic high output voltage on the corresponding output point.

Input Data File

Word	Bit Position															
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	r[(1)]	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r

(1)   r = read.

IMPORTANT   The output module's input data file reflects the output data echo of the module, not necessarily the electrical state of the output terminals. It does not reflect shorted or open outputs.

It is important to use this input word if the controller adapter supports the Program mode or Fault mode function, and if it is configured to use them.

Configuration File

The read/writable configuration data file allows the setup of the hold last state and user-defined safe state conditions.

The manipulation of the bits from this file is normally done with programming software (such as RSLogix 500 or RSNetworx for DeviceNet) during initial configuration of the system. In that case, graphical dialogs are provided via the programmer to simplify configuration. However, some systems (for example, 1769-ADN DeviceNet adapter) also allow the bits to be altered as part of the control program using communication rungs. In that case, it is necessary to understand the bit arrangement.

Configuration File

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	PFE
1	Program State for Output Array Word 0															
2	Program Value for Output Array Word 0															
3	Fault State for Output Array Word 0															
4	Fault Value for Output Array Word 0															

Program State Word

Word 1, the program state word, selects the hold last state or user-defined safe state condition for each individual output on a system transition from Run to Program.

Condition	Bit Setting
User-defined Safe State	0
Hold Last State	1

Program Value Word[1]

The program value word, word 2, is used to program the user-defined safe state value (0 = Off, 1 = On). Each output is individually configurable for on or off.

Value	Bit Setting
Off	0
On	1

[1] TTL outputs are inverted (On = 1 = logic low voltage = 0…0.4V dc; Off = 0 = logic high voltage = 4.5…5.5V dc). Use a NOT instruction in the ladder program to convert to traditional True = High logic.

Fault State Word

Word 3, the fault state word, selects the hold last state or user-defined safe state condition for each individual output on a system transition from Run to Fault.

Condition	Bit Setting
User-defined Safe State	0
Hold Last State	1

Fault Value Word[1]

The fault value word, word 4, is used to program the fault state value (0 = Off, 1 = On). Each output is individually configurable for on or off.

Value	Bit Setting
Off	0
On	1

Program to Fault Enable Bit (PFE)

Word 0, bit 0, allows the selection of which data value, the program or fault value, to apply to the output if a system in Program mode undergoes a system fault, resulting in a change to the Fault mode.

Value Applied	Bit Setting
Program	0
Fault	1

Module Default Condition[1]

The modules default condition is all zeros.

Programming Conditions

Word or Bit Affected		Condition Applied
Word 0, Bit 0	Program-to-fault Enable	Program Value
Word 1	Program State	User-defined Safe State
Word 2	Program Value	Off
Word 3	Fault State	User-defined Safe State
Word 4	Fault Value	Off

[1]   TTL outputs are inverted (On = 1 = logic low voltage = 0…0.4V dc; Off = 0 = logic high voltage = 4.5…5.5V dc). Use a NOT instruction in the ladder program to convert to traditional True = High logic.

Specifications

Compact TTL Output Module - 1769-OG16

Attribute	Value
Bus Current Draw, Max	200 mA at 5V dc
Heat Dissipation	1.2 Total Watts (The Watts per point, plus the minimum Watts, with all points energized.)
Power Supply Distance Rating	8 (The module may not be more than 8 modules away from the power supply or controller.)
Vendor I.D. Code	1
Product Type Code	7
Product Code	78 (decimal)
Input Data File Size	1 word
Output Data File Size	1 word
Configuration Data File Size	5 words
Dimensions (HxDxW), Approx.	118 x 87 x 35 mm (4.65 x 3.43 x 1.38 in.) Height including mounting tabs is 138 mm (5.43 in.)
Weight, Approx. (with carton)	250 g (0.55 lb)
Voltage Category	5V dc TTL output
Operating Voltage Range	4.5…5.5V dc 50 mV peak-to-peak ripple, max
Number of Outputs	16
Signal Delay, Max (resistive load)	Turn-on: 0.25 ms Turn-off: 0.50 ms
Off-state Voltage[1] (Typical)	4.5…5.5V dc
On-state Voltage[1]	0…0.4V dc
On-state Load Current, Min	0.15 mA
Continuous Current per Point, Max	24 mA
Output Point to Bus (CompactBus) Isolation	Verified by one of the following dielectric tests: 1200V ac for 2 s or 1697V dc for 2 s 75V dc working voltage (IEC Class 2 reinforced insulation)

[1]   TTL outputs are inverted (On = 1 = logic low voltage = 0…0.4V dc; Off = 0 = logic high voltage = 4.5…5.5V dc). Use a NOT instruction in the ladder program to convert to traditional True = High logic.

Environmental Specifications

Attribute	Value
Storage Temperature	-40…+85 °C (-40…+185°F)
Operating Temperature	0…60 °C (32…140 °F)
Operating Humidity	5…95% non-condensing
Operating Altitude	2000 m (6561 ft)
Vibration	Operating: 10…500 Hz, 5 g, 0.030 in. max peak-to-peak
Shock	Operating: 30 g panel mounted (20 g DIN-rail mounted) Non-operating: 40 g panel mounted (30 g DIN-rail mounted)
Radiated and Conducted Emissions	EN50081-2 Class A
Electrical /EMC	The module has passed testing at the following levels
ESD Immunity (IEC61000-4-2)	4 kV contact, 8 kV air, 4 kV indirect
Radiated Immunity (IEC61000-4-3)	10V/m, 80…1000 MHz, 80% amplitude
Fast Transient Burst (IEC61000-4-4)	2 kV, 5 kHz
Conducted Immunity (IEC61000-4-6)	10V, 0.15…80 MHz[1]

[1]   Conducted Immunity frequency range may be 150 kHz…30 MHz if the radiated immunity frequency range is 30…1000 MHz.

Certifications

Attribute	Value
Agency Certification	• C-UL certified (under CSA C22.2 No. 142) • UL 508 listed • CE compliant for all applicable directives
Hazardous Environment Class	Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL 1604, C-UL under CSA C22.2 No. 213)

Additional Resources

You can view or download publications at
http://literature.rockwellautomation.com. To order paper copies of technical
documentation, contact your local Rockwell Automation distributor or sales
representative.

Related Documentation

For	Refer to This Document	Pub. No.
A more detailed description of how to use your Compact I/O with MicroLogix 1200/1500 programmable controllers	MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Reference Manual	1764-RM001
A more detailed description of how to install and use your Compact I/O system with the 1769-ADN DeviceNet adapter	1769-ADN DeviceNet Adapter User Manual	1769-UM001
A more detailed description of how to install and use your Compact I/O system with the CompactLogix system	CompactLogix System User Manual	1769-UM007
More information on proper wiring and grounding techniques	Industrial Automation Wiring and Grounding Guidelines	1770-4.1

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	1.440.646.3223 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 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:

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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