



ControlNet Modular Repeater Adapter

Catalog number 1786-RPA/B

What's in This Document?

Use this document to install a 1786-RPA/B ControlNet repeater adapter (series B). The 1786-RPA/B repeater adapter is a direct replacement for the 1786-RPA/A (series A) repeater adapter. No software or network modifications are necessary to replace a 1786-RPA/A repeater adapter with a 1786-RPA/B repeater adapter.

The 1786-RPA/B repeater adapter contains these enhancements over the 1786-RPA/A repeater adapter:

- the number of repeater adapters that can be placed in series has increased from 5 to 20
- the 24V dc power connector supplied with the 1786-RPA/B is now removable for easier installation

For information on this topic:	See page:
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Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. In no event will Rockwell Automation be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Rockwell Automation office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Reproduction of the contents of this copyrighted publication, in whole or part, without written permission of Rockwell Automation, is prohibited.

Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

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.
	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.
ATTENTION	
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

ATTENTION**Environment and Enclosure**

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters 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 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.

NOTE: See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosures. Also see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1 (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

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.

If available, use a static-safe workstation.

When not in use, store the equipment in appropriate static-safe packaging.

European Hazardous Location Approval

If you install the module in a European Zone 2 location, consider:

European Zone 2 Certification

This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC.

The LCIE (Laboratoire Central des Industries Electriques) certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in potentially explosive atmospheres, given in Annex II to this Directive. The examination and test results are recorded in confidential report No. 28 682 010.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 50021.

IMPORTANT

When using this product, also consider the following:

- This equipment is not resistant to sunlight or other sources of UV radiation.
 - The secondary of a current transformer shall not be open-circuited when applied in Class I, Zone 2 environments.
 - Equipment of lesser Enclosure Type Rating must be installed in an enclosure providing at least IP54 protection when applied in Class I, Zone 2 environments.
 - This equipment shall be used within its specified ratings defined by Allen-Bradley.
 - Provision shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40% when applied in Class I, Zone 2 environments.
-

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations:

Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.

Informations sur l'utilisation de cet équipement en environnements dangereux:

Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.

WARNING



EXPLOSION HAZARD

- Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
- Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
- Substitution of components may impair suitability for Class I, Division 2.
- If this product contains batteries, they must only be changed in an area known to be nonhazardous.

AVERTISSEMENT



RISQUE D'EXPLOSION

- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit.
- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

About the ControlNet Repeater Adapter

Use a repeater adapter (1786-RPA/B) with repeater modules (1786-RPCD, -RPFS, -RPFM, -RPFRL and -RPFRL) to build a ControlNet repeater. A repeater can be used to extend the length of the network, create a star or point topology, or perform network media conversion from copper to fiber, and vice versa.

TIP

If the 1786-RPA/B repeater adapter is used with the 1786-RPCD, -RPFS, and -RPFM repeater modules, you can attach as many as 4 repeaters to the repeater adapter.

If the 1786-RPA/B repeater adapter is used with the 1786-RPFRL and -RPFRL repeater modules, you can attach as many as 2 repeaters to the repeater adapter.

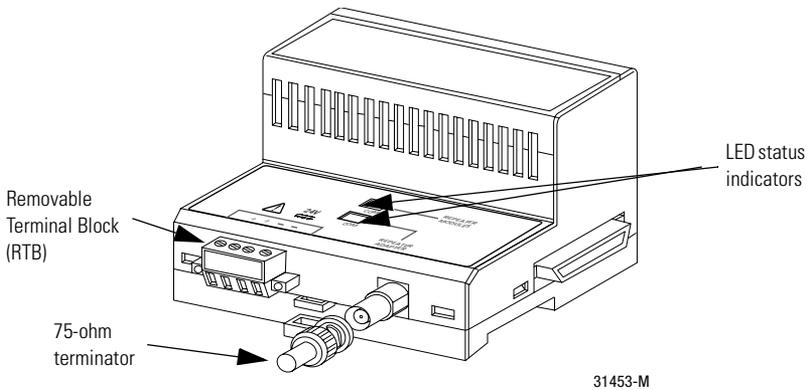
The repeater adapter provides:

- digital re-timing of ControlNet data
- power to repeater modules
- one coax channel
- LED indicators

The repeater adapter ships with the following items:

- one removable terminal block (power connector) attached to the repeater adapter
- one 75-ohm terminator for terminating an unused port
- two DIN rail locks
- this manual (publication 1786-IN013, ControlNet Modular Repeater Adapter Installation Instructions)

See the following figure for repeater adapter components.



Mounting the Repeater Adapter

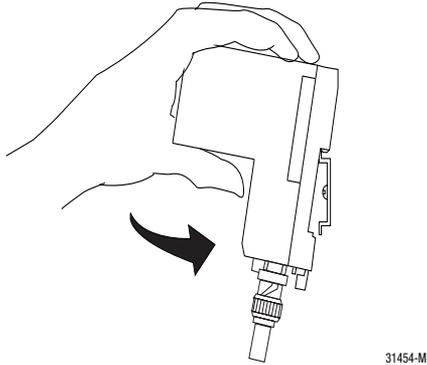
To mount the repeater adapter on the DIN rail:

ATTENTION

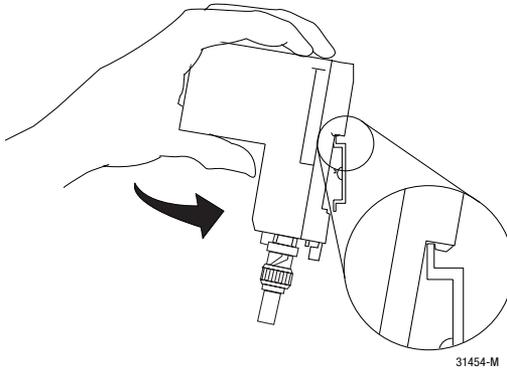


This product is grounded through the DIN rail to chassis ground. Use zinc plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN rail materials (e.g., aluminum, plastic, etc.) that can corrode, oxidize, or are poor conductors, can result in improper or intermittent grounding.

1. Position the repeater adapter on the 35 x 7.5mm DIN rail (A-B part number 199-DR1) at a 30° angle.

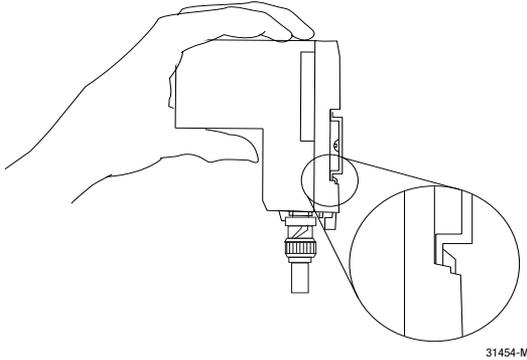


2. Hook the lip on the rear of the repeater adapter onto the top of the DIN rail, and rotate the repeater adapter onto the rail.

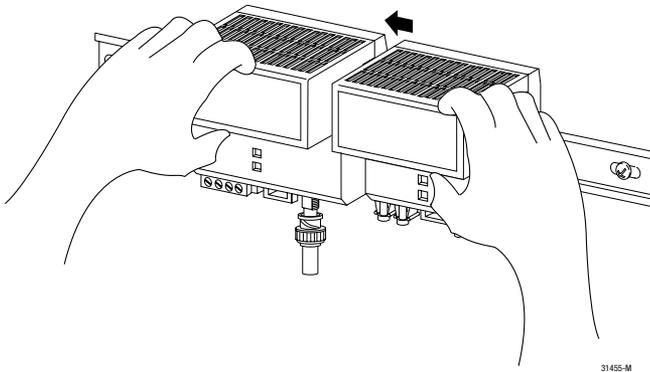


3. Press the repeater adapter down onto the DIN rail until flush. The locking tab should snap into position and lock the repeater adapter to the DIN rail.

4. If the repeater adapter does not snap into position, use a screwdriver or similar device to move the locking tab down while pressing the repeater adapter flush onto the DIN rail. Release the locking tab to lock the adapter in place. If necessary, push up on the locking tab to lock.



5. Once the repeater adapter is attached to the DIN rail, slide the repeater modules to the left to mate with the repeater adapter.

**IMPORTANT**

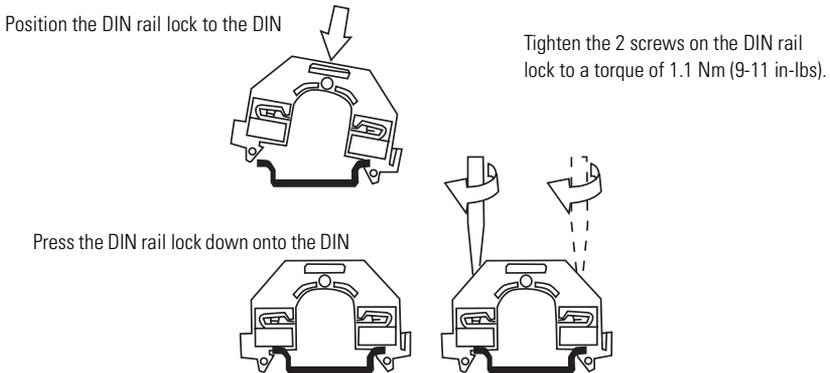
The total power consumption of all attached repeater modules cannot exceed 8W or 1.6A @ 5V.

IMPORTANT

Make certain that the repeater adapter and modules are secured together with DIN rail locks (cat. no. 1492-EA35) on either side.

Failure to do so may result in the loss of communications and/or cause damage to the modules.

6. Attach the DIN rail locks to the left side of the repeater adapter and the right side of the attached modules to lock the repeater adapter and modules in place.
7. Repeat the following steps for each of the two DIN rail locks.
 - a. Position the DIN rail lock on the 35 x 7.5mm DIN rail at a 30° angle.
 - b. Hook the lip on the back of the DIN rail lock onto the top of the DIN rail and rotate the DIN rail lock onto the rail.
 - c. Press the DIN rail lock down onto the DIN rail. The DIN rail lock should snap into position.
 - d. Tighten the two screws on the DIN rail lock to a torque of 1.1 Nm (9-11 in-lbs).



8. Wire the repeater adapter. Refer to *Wiring the Repeater Adapter* on page 10.
9. Terminate any unused coax ports by connecting a 75-ohm terminator to the unused BNC connector(s). One 75-ohm terminator is shipped with the repeater adapter.

Wiring the Repeater Adapter

WARNING



When you connect or disconnect the removable terminal block (RTB) with field side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

If you connect or disconnect the ControlNet cable with power applied to this module or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations.

TIP**Before you begin**

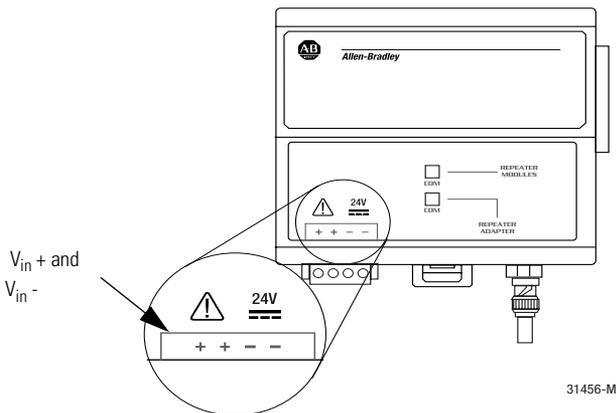
Make sure you have obtained the following items before you begin to wire the module:

- two lengths of 12 - 24 AWG wire
- a wire stripping tool
- a small, flat head screwdriver

1. Strip about 7 mm of insulation from the end of each wire.
2. Attach the $V_{in} +$ wire to one of the $V_{in} +$ terminals on the RTB. Tighten down the screws to 0.6-0.8 Nm (5-7 in-lbs).
3. Attach the $V_{in} -$ wire to one of the $V_{in} -$ terminals on the RTB. Tighten down the screws to 0.6-0.8 Nm (5-7 in-lbs).

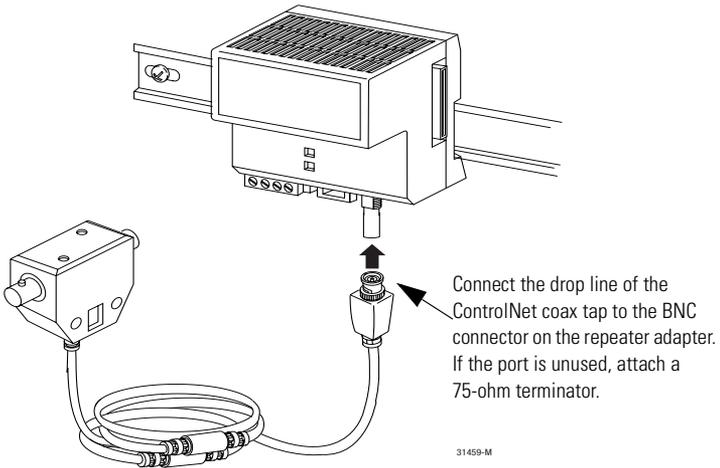
TIP

The unused $V_{in} +$ and $V_{in} -$ terminals can be used to supply power to other devices.



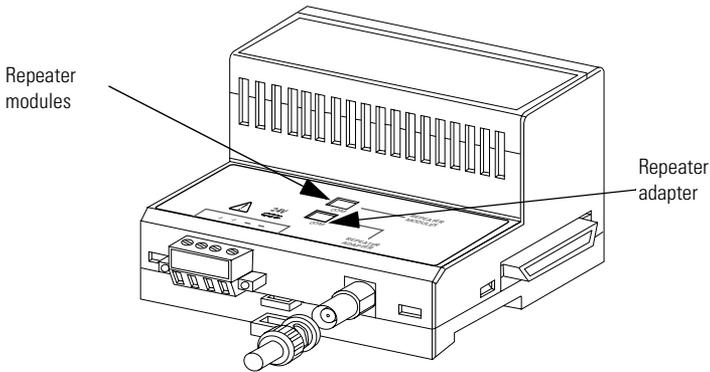
4. Install the RTB onto the repeater adapter. Tighten down the screws to 0.6-0.8 Nm (5-7 in-lbs).

5. Connect the repeater adapter to the ControlNet network by connecting the drop line of the coax tap to the BNC connector.



6. Terminate any unused coax ports by connecting a 75-ohm terminator to the unused BNC connector(s). One 75-ohm terminator is shipped with the repeater adapter.

Status Indicator LEDs



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The status indicator LEDs on the repeater adapter can be interpreted singly or together. The following three tables list different combinations of LEDs and their interpretations.

These status indicator LEDs and their interpretations ... are shown in

repeater adapter and repeater modules	Table 1
repeater adapter only	Table 2
repeater modules only	Table 3

IMPORTANT

The following are the only valid indicator combinations. Other combinations are not valid. For example, the combination of the repeater adapter indicator being solid green and the repeater modules indicator being solid red is not valid and probably indicates a defective module.

Table 1 Repeater adapter and modules indicators

If both are:	This means:	So you should:
Alternating red/green	The repeater adapter is being powered up or reset.	Do nothing. The repeater adapter is operating properly.
Solid red	A jabber condition has occurred. Another node or repeater on the network is transmitting constantly.	Check the network and components for proper operation.
Off	The repeater adapter is not powered or has failed.	Check the power input to the repeater adapter for correct voltage and polarity.

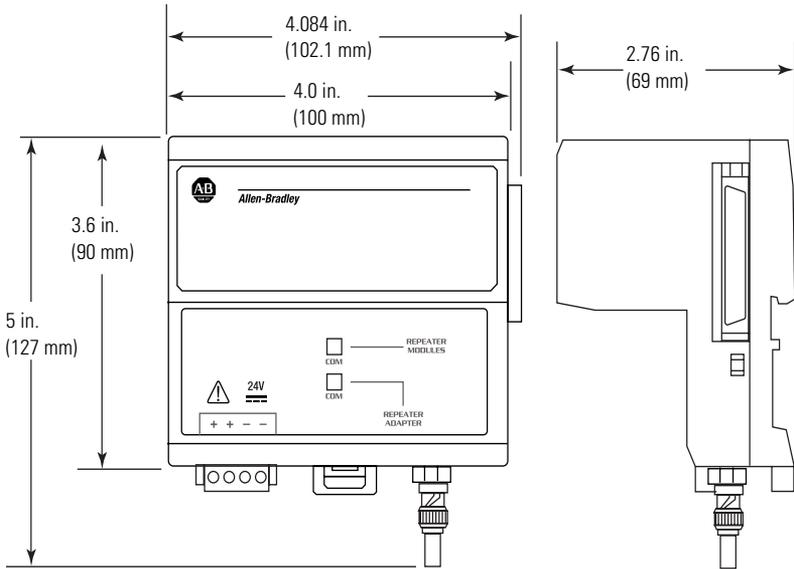
Table 2 Repeater adapter indicator

If the repeater adapter indicator is:	This means:	So you should:
Solid Green	Error-free data is being recovered at the coax port of the repeater adapter.	Do nothing. This is the normal operating mode.
Flashing green/off	Data with errors is occasionally being recovered at the coax port of the repeater adapter.	This situation will normally correct itself. If the situation persists check that: <ul style="list-style-type: none"> • all BNC connector pins are seated properly • all taps are Rockwell Automation taps • all terminators are 75Ω and are installed at both ends of all segments • the coax cable has not been grounded
Flashing red/off	Either no data is being received at the coax port of the repeater adapter, or data with a large number of errors is being received at the coax port of the repeater adapter.	Check for: <ul style="list-style-type: none"> • broken cables • broken taps • missing segment terminators

Table 3 Repeater modules indicator

If the Repeater modules indicator is:	This means:	So you should:
Solid Green	Error-free data is being recovered at all of the attached repeater modules.	Do nothing. This is the normal operating mode.
Flashing green/off	Data with errors is occasionally being recovered at some or all of the repeater modules.	<p>This situation will normally correct itself. If the situation persists check that:</p> <ul style="list-style-type: none"> • all BNC connector pins are seated properly. • all taps are Rockwell Automation taps. • all terminators are 75Ω and are installed at both ends of all segments • the coax cable has not been grounded. • fiber optic connectors are of the correct type and are correctly attached to the fiber optic cable. • fiber optic cable is of the correct type.
Flashing red/off	Either no data is being received at the any repeater modules, or the received data at some or all of the repeater modules has a high number of errors.	<p>Check for:</p> <ul style="list-style-type: none"> • broken cables • broken taps • missing segment terminators

Mounting Dimensions



31458-M

Specifications

Power Supply	<p>For applications within the US, use a power supply that is appropriately certified as “Class 2”, per the definitions in the National Electrical Code, ANSI/NFPA 70, Article 725.</p> <p>For applications outside the US, use a power supply with SELV or PELV output. A power supply with SELV (Safety Extra Low Voltage) or PELV (Protected Extra Low Voltage) output is built with appropriate isolation to withstand single fault conditions. The output cannot exceed 30V rms, 42.4V peak, or 60V dc under fault conditions.</p>
Input Voltage Rating	24V dc nominal
Input Voltage Range	18.0V to 36.0V dc
Repeater Backplane Output Current	1.6A maximum @5 V dc

Isolation Voltage	Qualification tested at 750V dc for 60 seconds between 24 V input and ControlNet
Power Consumption	700mA maximum from external 24V supply based on worst case module loading (16.8 W; 57.4 BTU/hr.)
Operational Temperature	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): 0 to 60°C (32 to 140°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat) IEC 60068-2-14 (Test Na, Un-packaged Non-operating Thermal Shock): -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Unpackaged Non-operating Damp Heat): 5 to 95% non-condensing
Operating Shock	IEC 60068-2-27 (Test Ea, Unpackaged shock): Operating 30g Non-operating 50g
Vibration	IEC 60068-2-6 (Test Fc, Operating): 2g @10-500Hz
Emissions	CISPR 11: Group 1, Class A
ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 30MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz
EFT/B Immunity	IEC-61000-4.4: ±4kV @ 2.5kHz on power ports ±4kV @ 2.5kHz on communications ports
Surge Transient Immunity	IEC 61000-4-5: ±1kV line-line (DM) and ±2kV line-earth (CM) on power ports ±2kV line-earth (CM) on shielded ports

Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Enclosure Type Rating	None (open-style)
Power Conductors	12 AWG (3.31 sq. mm) maximum, 24 AWG (0.205 sq. mm) minimum copper wire Category 2 ¹
ControlNet Conductors	Category 2 ^{1,2}
Mounting Orientation	Any mounting orientation
Minimum Enclosure	12 in. L x 7.75 in. W x 4 in. D
Accessories	ControlNet taps (1786-TPR, -TPY, -TPS) 35 x 7.5mm DIN rail (Rockwell Automation part number 199-DR1)
Certifications: (when product is marked)	<p>UL Listed Industrial Control Equipment</p> <p>CSA Certified Process Control Equipment</p> <p>CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations</p> <p>FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations</p> <p>CE³ European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions</p> <p>C-Tick³ Australian Radiocommunications Act, compliant with: AS/NZS CISPR11; Industrial Emissions</p> <p>EEx³ European Union 94/9/EC ATEX Directive, compliant with: EN 50021; Potentially Explosive Atmospheres, Protection "n" (Zone 2)</p> <p>CI ControlNet International conformance tested to ControlNet specifications</p>

¹ Use this conductor information for planning conductor routing. Refer to Allen-Bradley publication 1770-4.1 ("Industrial Automation Wiring and Grounding Guidelines") or appropriate System Level Installation Manual.

² Use this Conductor Category information for planning conductor routing as described in the appropriate System Level Installation Manual

³ See the Product certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our 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 our 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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