Installation Instructions

FLEX Ex Redundant ControlNet Barrier Module

Cat. No. 1797-BCNR

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://www.ab.com/manuals/gi) 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 we use notes to make you aware of safety considerations.

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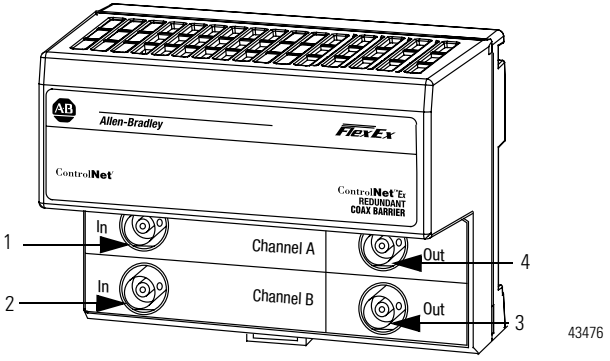
Publication 1797-5.35 - July 2004

Important User Information

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: • identify a hazard • avoid a hazard • recognize the consequence
SHOCK HAZARD 	Labels may be located on or inside the equipment to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be located on or inside the equipment to alert people that surfaces may be dangerous temperatures.



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 enclosure. 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.

Use the redundant ControlNet™ barrier module to interconnect between ControlNet and ControlNet Ex™ networks.

	Component Identification
1	ControlNet Channel A In
2	ControlNet Channel B In
3	ControlNet Ex Channel B Out
4	ControlNet Ex Channel A Out

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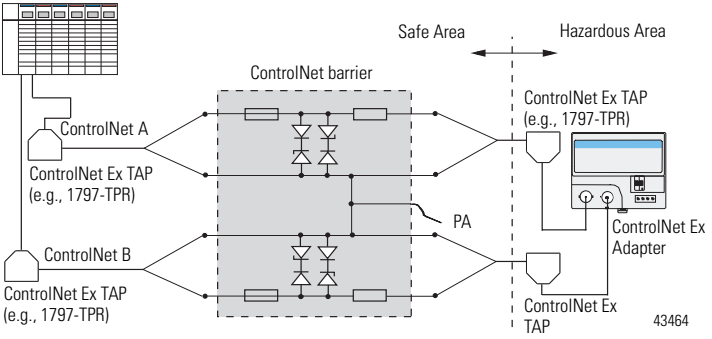
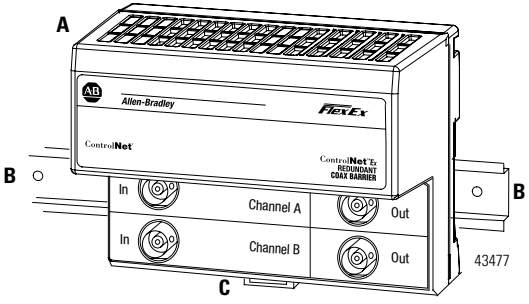
Product Features

- Provides for a direct connection to the ControlNet coax into hazardous areas
- Can be mounted in a nonhazardous (safe) area
- Supports up to 10 adapters at 250 meters or 2 adapters at 500 meters

A functional illustration of the FLEX Ex Barrier Module is shown below.



Mounting the Barrier on a DIN Rail Before Installing Modules



The 1797-BCNR module mounts on a DIN rail.

1. Position the ControlNet Ex barrier module (**A**) on a 35 x 7.5mm DIN rail (**B**) (A-B pt. no. 199-DR1) at a slight angle.
2. Hook the lip on the rear of the barrier (**A**) onto the top of the DIN rail (**B**), and rotate the module onto the rail.
3. Press the barrier module down onto the DIN rail until flush.
4. The locking tab (**C**) should snap into position and lock the barrier module to the DIN rail.
5. If the barrier module does not snap into position, use a screwdriver or similar device to move the locking tab down while pressing the barrier module flush onto the DIN rail. Release the locking tab to lock the module in place.
6. If necessary, push up on the locking tab to lock.
7. Make certain that you only connect the ControlNet Ex side of the 1797-BCNR to 1797 ControlNet taps with either a 1797-ACNR15 or a 1797-TCAP attched.

WARNING

The 1797-BCNR cannot be used in an intrinsically safe environment after the ControlNet Ex connections have been exposed to non-intrinsically safe signals.

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Installation in Zone 2

This 1797-BCNR must not be exposed to the environment. This barrier module has a protection factor of IP20. Mount the 1797-BCNR inside an enclosure with a protection class IP54.

Installation in Zone 22

When the 1797-BCNR is installed in Zone 22, the following cabinets must be used: IVK2-ISRPI-V16LC; IVK2-ISRPI-V8HYW; or IVK2-ISRPI-V8LC. These cabinets can be purchased from:

Pepperl+Fuchs GmbH
Konigsberger Allee 85-87, D-68307
Mannheim, Germany
Attn: PA Sales Dept.
Kirsten Becker
Telephone +49 776 1298
www.pepperl-fuchs.com

The IS-RPI cabinets (type IVK2-ISRPI-V8LC, IVK2-ISRPI-V8HYW, or IVK2-ISPRI-V16LC) ensures the basic protection for the intrinsically safe apparatus of the IS-RPI system for use in Zone 22. It corresponds with category 3D according to RL 94/9 EG and with the type label marked with the following information:

Pepperl+Fuchs GmbH
68301 Mannheim
IVK2-ISRPI-V8LC (or IVK2-ISRPI-V8HYW or
IVK2-ISRPI-V16LC)
⟨Ex⟩ II 3D IP54 T 70°C
CE
Serial (manufacturing) number
Model Year

Electrostatic Charge

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.

Protect the system against electrostatic charge. Post a sign near this barrier module: **Attention! Avoid electrostatic charge.** For your convenience, a sign which can be cut out is included at the end of this installation instruction.

European Community (EC) Directive Compliance

If this product has the CE mark it is approved for installation within the European Community or EEA regions. It has been designed and tested to meet the following directives.

These products are tested to meet the Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) as amended by 92/31/EC and 93/68/EEC, by applying the following standards:

- EN 61000-6-4:2001, Electromagnetic Compatibility (EMC) - Part 6-4: Generic Standard for Industrial Environments (Class A)
- EN 61000-6-2:2001, Electromagnetic Compatibility (EMC) - Part 6-2: Generic Standards - Immunity for Industrial Environments
- EN61326-1997 + A1-A2, Electrical Equipment For Measurement, Control, and Laboratory Use - Industrial EMC Requirements

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ATEX Directive

These products are tested in conjunction with associated I/O modules to meet the Council Directive 94/9/EC (ATEX) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres by applying the following standards:

- EN50014:1997 + A1-A2, Electrical Apparatus for Potentially Explosive Atmospheres
- EN50020:1994, Electrical Apparatus for Potentially Explosive Atmospheres - Intrinsic Safety "i"
- EN50021:1999, Electrical Apparatus for Potentially Explosive Atmospheres - Non-Sparking "n"

UL, C-UL Compliance

If this product has the UL/C-UL mark, it has been designed, evaluated, tested, and certified to meet the following relevant standards:

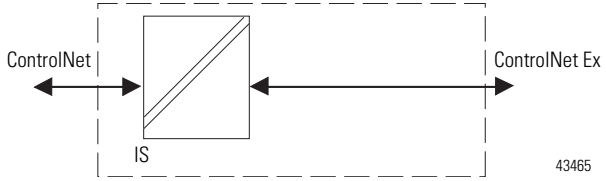
- UL 913, 1988, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations
- UL 1203, Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
- UL 2279, Electrical Equipment for Use in Class I, Zone 0, 1, and 2 Hazardous (Classified) Locations
- UL 508, Industrial Control Equipment
- CSA C22.2 No. 157-92, Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
- CSA C22.2 No. 30-M1986, Explosion-Proof Enclosures for Use in Class I Hazardous Locations
- CSA-E79-0-95, Electrical Apparatus for Explosive Gas Atmospheres, Part 0: General Requirements
- CSA-E79-11-95, Electrical Apparatus for Explosive Gas Atmospheres, Part 11: Intrinsic Safety "i"
- CSA C22.2 No. 14-95, Industrial Control Equipment

Inputs/Outputs

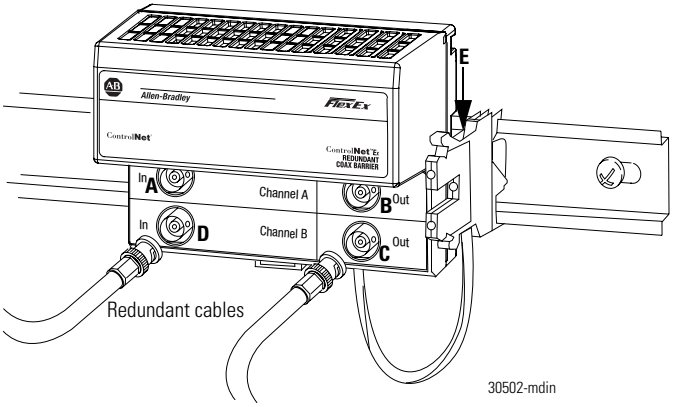
Do not apply any non-instrinsically safe signals to the FLEX Ex side of the 1797-BCNR.

When used as an associated apparatus according to EN50020, the European directives and regulations must be followed.

1797-BCNR



Wiring



1. Connect the ControlNet Ex trunk cable to connector, terminal **B** after removing the insulator boot.

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2. Connect the redundant ControlNet Ex trunk cable to connector **C** after removing the insulator boot.

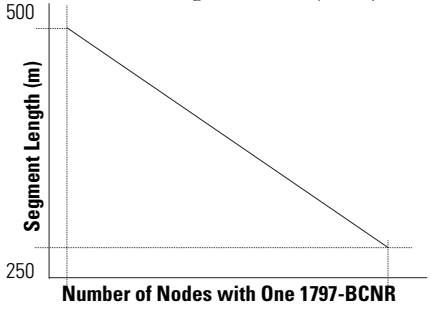
IMPORTANT Only remove the 1797-BCNR covers if the ControlNet Ex tap drop cable is installed.

3. Connect the ControlNet trunk cable to terminal **A**.
4. Connect the redundant ControlNet trunk cable to terminal **D**.
5. Install a direct ground wire with a minimum diameter of 4mm^2 between terminal **E** and the PA Ground (Equipotential System) in the hazardous area where the ControlNet Ex coax cable is installed.

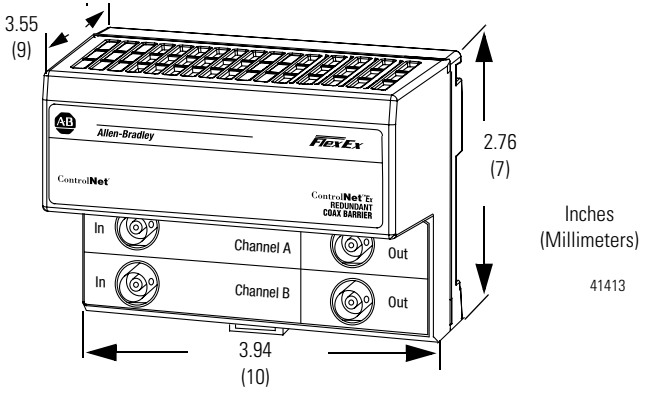
   Do not connect terminal **E** or the DIN rail to a standard earth ground connection in the safe area.

When using a 1797-BCNR, the total allowable length of a segment containing standard RG-6 quad shield cable depends upon the number of nodes in your segment. There is no minimum trunk-cable section length requirement. The maximum allowable length of a segment which contains a 1797-BCNR is 500m. (1640 ft.) with two nodes connected (one node on each side of the 1797-BCNR).

Each additional node decreases the maximum length of the segment according to the plot below. The maximum number of non-redundant media nodes allowed on a segment is 21 with a maximum length of 250m (820 ft.). Please note that the maximum number of redundant media nodes on a segment is 11 with a maximum length of 250m (820ft.).



Mounting Dimensions



Repair

The 1797-BCNR module is not field-repairable. Any attempt to open this 1797-BCNR module will void the warranty and the IS certification. If repair is necessary, return the 1797-BCNR module to the manufacturer.

Specifications

1797-BCNR Specifications	
Power Supply	No power supply needed
Galvanic Isolation	None
IS Module Type	EEx [ib] IIC
ControlNet Ex System	U_0 7V I_0 55mA @ 52KHz P_0 negligible
Non Ex ControlNet	Un 5V Um 253 VAC I not defined P not defined
Bus Non-EX side	ControlNet International Version 1.5
Bus Ex side	Ex version of ControlNet International Version 1.5

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1797-BCNR Specifications	
Transmission Rate	5 Mbit/s
Transmission Attenuation	-7.84dB
Weight	Approximately 200g
Dimensions	3.94 in.(w) x 3.55 in.(d) x 2.76 in.(h) 10cm(w) x 9cm(d) x 7 cm(h)
Operating 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): -20 to 70°C (-4 to 158°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): -20 to 100°C (-4 to 212°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Shock	IEC60068-2-27 (Test Ea, Unpackaged shock): Operating 30g Non-operating 50g
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
Emissions	CISPR 11: Group 1, Class A
ESD Immunity	IEC 61000-4-2: 8kV indirect 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: ±2kV at 5kHz on communications ports
Surge Transient Immunity	IEC 61000-4-5: ±2kV line-earth(CM) on shielded ports

1797-BCNR Specifications	
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Enclosure Type Rating	None (open-style)
Certifications[1] (When Product is Marked)	CENELEC DMT 99 ATEX EO65 X II (2) G[EEx ib] IIC II 3G EEx nA IIC T4 X
	CE European Union 89/336/EEC EMC Directive, compliant with: EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-4; Industrial Emissions EN 61000-6-2; Industrial Immunity
	cULus Provides intrinsically safe outputs for use in Class I, Division 1, Groups A, B, C, and D; Class II, Groups E, F, and G; Class III; Class 1, Zone 1 Group IIC
	C-Tick Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
	EEx European Union 94/9/EEC ATEX Directive, compliant with: EN 50014; Potentially Explosive Atmospheres General Requirements EN 50020; Potentially Explosive Atmospheres, Protection "i" EN 50021; Potentially Explosive Atmospheres, Protection "n" (Zone 2)

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

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Describing the ControlNet Ex System Diagrams

A maximum of 48 ControlNet Ex™ nodes may be connected together by 250m of coax cable and 48 taps. The distance increases to 1000m when you use only 2 taps. See the table below for more information.

The fiber media of the 1797-RPFM can be installed in a hazardous location (Zone 0, 1 or 2; Class I, Zones 0, 1, and 2; Class I, Division 1 and 2; Class II, Division 1 and 2; Class III, Division 1 and 2) to connect two 1797-RPFM modules or they can be installed through different locations into the non-hazardous location to connect the 1797-RPFM with any approved associated apparatus.

All cables and fiber media that are not light blue must be marked as IS using the 1797-EXMK marking kit or other locally approved IS identification and/or segregation method.

During the installation of the ControlNet Ex system, all metallic parts must be isolated to prevent an earth connection (high voltage withstanding of isolating material must be > 500V ac).

System Diagram Name	Catalog Number	Catalog Name	Description
1797-RPA	1797-RPA	ControlNet Ex Modular Repeater Adapter	Represents one ControlNet Ex node and must be connected to a coax trunk cable by 1797-TPx
1797-RPFM	1797-RPFM	ControlNet Ex Fiber Repeater Module, Medium Distance	Allows connection of a maximum of two devices per 1797-RPA and is powered directly by 1797-RPA
1797-ACNR15	1797-ACNR15	Redundant Media ControlNet Ex Adapter	Represents one ControlNet Ex node and must be connected to a coax trunk cable by 1797-TPx -each one with two redundant output channels that are connected to different ControlNet Ex networks (coax cables and 1797-TPx)

System Diagram Name	Catalog Number	Catalog Name	Description
1797-BCNR	1797-BCNR	ControlNet Ex Redundant Media Adapter	Allows connection between a ControlNet system and a ControlNet Ex system
CNet Ex Tap Trm	1797-TCAP	ControlNet Ex Tap (Dummy) Terminator	Represents one ControlNet Ex node and is a simple capacitor (56pF) with a coax connector
ControlNet Ex Tap	1797-TPx	ControlNet Ex Coax Tap	Four types of connections available: S (straight t-tap), R (right angle t-tap), YS (straight y-tap), and YR (right angle y-tap) - a maximum of 48 taps can be connected together by coax trunk cable
CNet Ex Trk Trm	1797-XT	ControlNet Ex Trunk Terminator	Simple resistor (75Ω) with coax connector that must be on each end of the ControlNet Ex coax trunk for termination
Coax Trunk Cable	1797-RG6	Quad-Shield, RG-6 75Ω Coax Trunk Cable	Maximum (functional) length between 2 1797-TPx is 3280ft (1000m) - each 1797-TPx reduces the (functional) coax cable length by 53.4ft (16.3m)
None	None	Standard Coax Trunk Cable BNC Couplers	Different standard cable couplers, 90^{o}, 180^{o}, etc.

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Certified Equivalent ControlNet Ex System Diagram Items

You may use these items as equivalents for the items shown on the system diagram.

System Diagram Name	Catalog Number	Source
1797-RPA	1797-RPA	Allen-Bradley
1797-RPFM	1797-RPFM	Allen-Bradley
1797-ACNR15	1797-ACNR15	Allen-Bradley
Coax Trunk Cable[1]	1797-RG6	Allen-Bradley
	3092A[2]	Belden Wire & Cable Co.
	3092A with blue jacket	Belden Wire & Cable Co.
ControlNet Ex Tap	1797-TPx	Allen-Bradley
CNet Ex Trk Trm	1797-XT	Allen-Bradley
CNet Ex Tap Trm	1797-TCAP	Allen-Bradley

1 In addition to these cable types, the following specification can be followed to allow additional types:
Cable Impedance = $75\Omega \pm 3\Omega$
Cable Capacitance = $\leq$6nF per 100m
Cable Resistance = $\geq 9.08\Omega$ per 100m

Cable Attenuation	0.2MHz $\geq$ 0.93dB/100m	5MHz $\geq$ 1.39dB/100m
(-20 to +70°C)	0.5MHz $\geq$ 0.95dB/100m	10MHz $\geq$ 1.86dB/100m
	1MHz $\geq$ 1.07dB/100m	20MHz $\geq$ 2.73dB/100m
	2MHz $\geq$ 1.16dB/100m	50MHz $\geq$ 4.33dB/100m

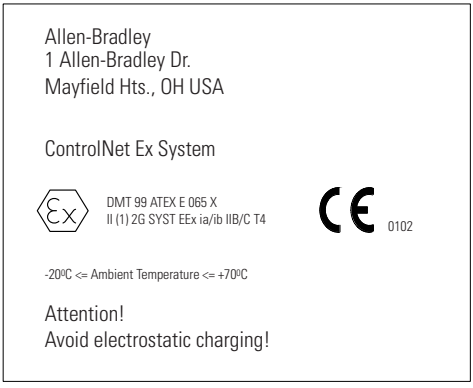
2 Belden Wire & Cable 1189A may be used, but with functional loss of communication distance and/or nodes.

Certification Specific ControlNet Ex System Diagrams

The following pages include certification specific ControlNet Ex system diagrams and notes pertaining to these diagrams. Select either CENELEC, UL, C-UL, or FM and follow the requirements of that diagram as you configure and install your system.

CENELEC Installation Label

A label with this system marking must be attached near the main components of the system. If the system is installed in a cabinet, this label must be fixed inside the cabinet.



CENELEC Information

The isolator type 1797-BCNR/* is an associated apparatus according to EN 50020. If the isolator is connected to intrinsically safe circuits the applicable national local construction, installation and operating regulations must be heeded (for example, Germany DIN EN 50020, DIN VDE 0165).

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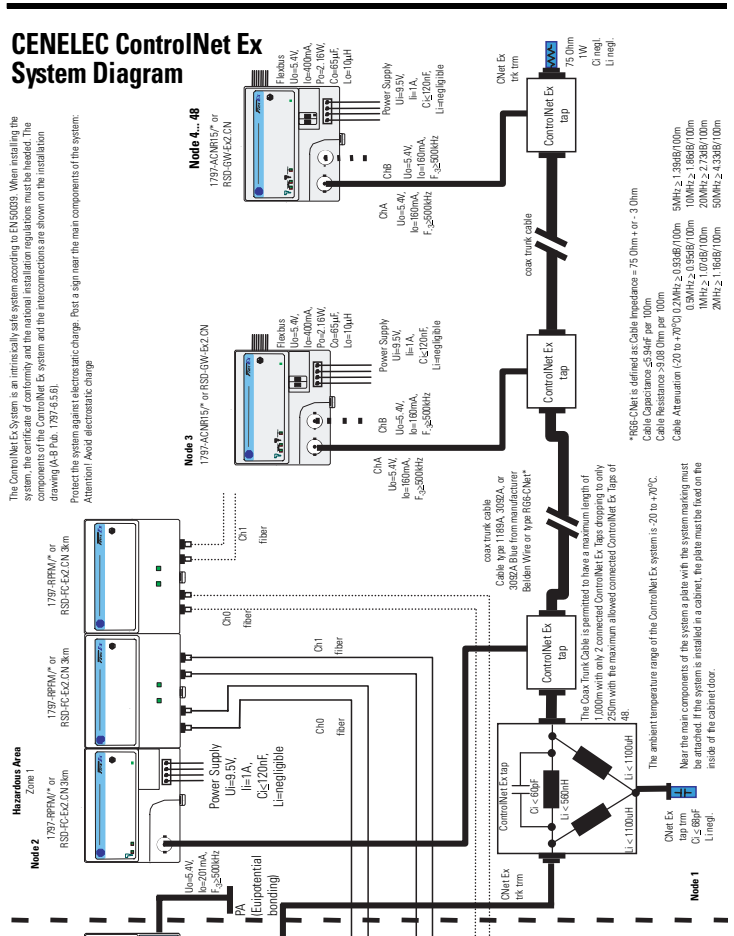
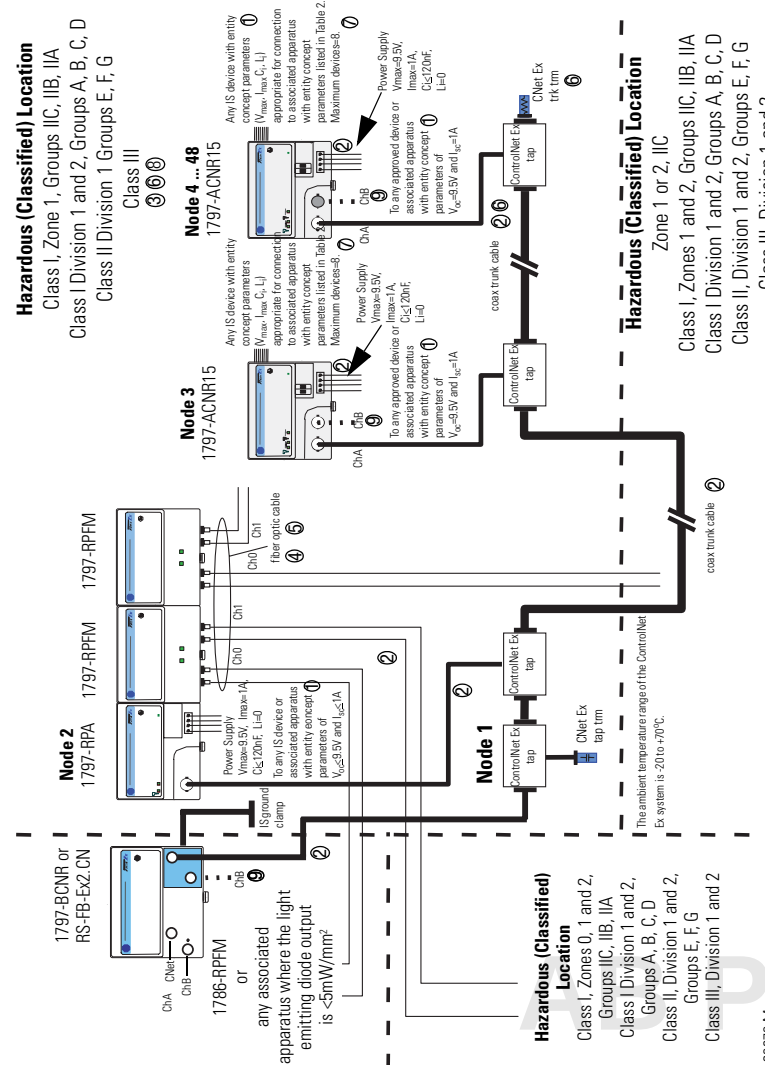

CENELEC ControlNet Ex System Diagram
The ControlNet Ex System is an intrinsically safe system according to EN50039. When installing the system, the certificate of conformity and the national installation regulations must be heeded. The components of the ControlNet Ex system and the interconnections are shown on the installation drawing (A-B Pub. 1797-6.5.6).
Protect the system against electrostatic charge. Post a sign near the main components of the system: Attention! Avoid electrostatic charge
Non Hazardous Location (Safe Area)
Hazardous Area Zone 1
Hazardous Area Zone 0
Node 1
Node 2
Node 3
Node 4... 48
1797-RPFM/* or RSI-FC-Ex2.CN 3km
1797-RPFA/* or RSI-FC-Ex2.CN 3km
1797-8CNR or RS-FB-Ex2.CN
1797-ACNR15/* or RSD-GW-Ex2.CN
Flexbus Uo=5.4V, Io=400mA, Po=2.16W, Co=65µF, Lo=10µH
Power Supply Ui=9.5V, Ii=1A, Ci≤120nF, Li=negligible
ChA Uo=5.4V, Io=160mA, F₋₃≥500kHz
ChB Uo=5.4V, Io=160mA, F₋₃≥500kHz
Ch0 fiber
Ch1 fiber
coax trunk cable
Cable type 1189A, 3092A, or 3092A blue from manufacturer Belden Wire or type RG6/U-wire*
ControlNet Ex tap
ControlNet Ex trk trm
Ci < 60pF
Li < 560nH
Li < 1100µH
75 Ohm 1% Ci negl. Li negl.
The Coax Trunk Cable is permitted to have a maximum length of 1,000m with only 2 connected ControlNet Ex taps dropping to only 250m with the maximum allowed connected ControlNet Ex taps of 48.
The ambient temperature range of the ControlNet Ex system is -20 to +70°C.
Near the main components of the system a plate with the system marking must be attached. If the system is installed in a cabinet, the plate must be fixed on the inside of the cabinet door.
*RG6-CNet is defined as: Cable Impedance = 75 Ohm +or - 3 Ohm
Cable Capacitance ≤ 5.34nF per 100m
Cable Resistance >9.08 Ohm per 100m
Cable Attenuation (-20 to +70°C) 0.2MHz ≥ 0.83dB/100m 5MHz ≥ 1.39dB/100m
0.5MHz ≥ 0.95dB/100m 10MHz ≥ 1.89dB/100m
1MHz ≥ 1.07dB/100m 20MHz ≥ 2.73dB/100m
2MHz ≥ 1.16dB/100m 50MHz ≥ 4.33dB/100m
For the transmittal between the safe area and the hazardous area only optical glass-fibers are permitted. The diameter of a single glass-fiber must be >8µm. The power density of the transmitter diode must be <5mW/mm² (i.e., HFBR 1312 from Hewlett-Packard manufacturer).
PA (Equipotential bonding)
30670-Mp

UL, C-UL ControlNet Ex System Diagram



UL, C-UL ControlNet Ex System Diagram Notes

① The entity concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of V_{oc} and I_{sc} or V_t and I_t of the associated apparatus are less than or equal to V_{max} and I_{max} of the intrinsically safe apparatus and the approved values of C_a and L_a of the associated apparatus are greater than $C_i + C_{cable}$ and $L_i + L_{cable}$ respectively for the intrinsically safe apparatus.

② Wiring methods must be in accordance with the National Electric Code, ANSI/NFPA 70, Article 504 and 505 or the Canadian Electric Code CSA C22.1, Part 1, Appendix F. For additional information refer to ANSI/ISA RP12.6.

③ WARNING: Substitution of components may impair intrinsic safety. AVERTISSEMENT: La substitution de composant peut compromettre la securite intrinseque.

④ If fiber optic cable is provided with a metal shield, it must be connected to a dedicated intrinsic safety ground in the non-hazardous location and tied back in the hazardous location or be connected to a ground in the hazardous location and tied back in the non-hazardous location.

⑤ The glass fiber must have a minimum diameter of 6µm.

⑥ For Class II, Division 1, Groups E, F, G and Class III, modules must be installed in a UL listed Type 4, 4X, 6, 6P, 9, 12, or 12K enclosure. (The power supply does not need to be put into an additional enclosure. Refer to the power supply section of this manual for more information.)

⑦ Any combination of up to eight FLEX Ex I/O modules may be connected. This includes using 1794-CE3, 1797-CE3, 1794-CE1, and 1797-CE1 cables.

⑧ The ambient temperature range (T_{amb}) for this system is -20°C to 70°C.

⑨ Channel B is intended for a redundant connection and is identical to the channel A configuration.

Application

The 1797-BCNR/* functions as a barrier for signals between ControlNet and ControlNet Ex. The 1797-BCNR must be installed in safe, Zone 2 or Division 2 areas.

Isolator Boot for ControlNet Ex

The isolator boot for the ControlNet Ex 1797-BCNR connectors can only be removed when a ControlNet Ex trunk cable is connected. Any unused connector on the ControlNet side must have its insulator boot installed. The ControlNet Ex connection must not be connected to any signals which exceed the intrinsically safe values of the ControlNet Ex network.

Attention: Avoid electrostatic charge.

IMPORTANT For detailed certification information, refer to the FLEX Ex System Certification Reference Manual, publication 1797-6.5.6.

ControlNet is a trademark of ControlNet International.
FLEX Ex and ControlNet Ex are trademarks of Rockwell Automation.

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Corporate Headquarters
Rockwell Automation, 777 East Wisconsin Avenue, Suite 1400, Milwaukee, WI, 53202-5302 USA, Tel: (1) 414.212.5200, Fax: (1) 414.212.5201

Headquarters for Allen-Bradley Products, Rockwell Software Products and Global Manufacturing Solutions
Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe: Rockwell Automation SA/NV, Vorsttaan/Boulevard du Souverain 36-BP 3A/B, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products
Americas: Rockwell Automation, 6040 Ponders Court, Greenville, SC 29615-4617 USA, Tel: (1) 864.297.4800, Fax: (1) 864.281.2433
Europe: Rockwell Automation, Brühlstraße 22, D-74834 Elztal-Dallau, Germany, Tel: (49) 6261 9410, Fax: (49) 6261 17741
Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 351 6723, Fax: (65) 355 1733

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