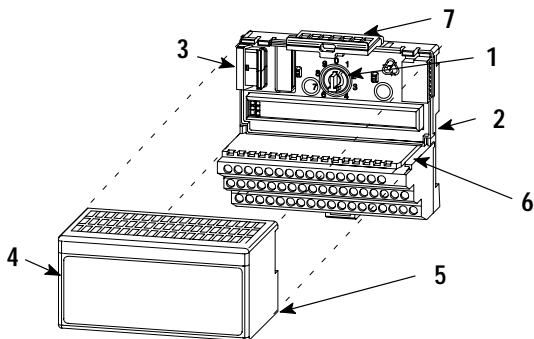




Installation Instructions

English

24V dc FLEX I/O 2 Input/2 Output Isolated Analog Module (Cat. No. 1794-IF2XOF2I)



Module Installation

This module mounts on a 1794 terminal base unit.

1. Rotate keyswitch (1) on terminal base unit (2) clockwise to position 5 as required for this type of module.
2. Make certain the flexbus connector (3) is pushed all the way to the left to connect with the neighboring terminal base/adaptor. **You cannot install the module unless the connector is fully extended.**
3. Make sure that the pins on the bottom of the module are straight so they will align properly with the connector in the terminal base unit.
4. Position the module (4) with its alignment bar (5) aligned with the groove (6) on the terminal base.
5. Press firmly and evenly to seat the module in the terminal base unit. The module is seated when the latching mechanism (7) is locked into the module.



ATTENTION: Remove field-side power before removing or inserting this module. This module is designed so you can **remove and insert it under backplane power**. When you remove or insert a module with field-side 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

Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

European Union Directive Compliance

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

EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the following Allen-Bradley publications:

- Industrial Automation Wiring and Grounding Guidelines For Noise Immunity, publication 1770-4.1
- Automation Systems Catalog, publication B111

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

Connect the Wiring for Analog Inputs and Outputs to a 1794-TB3, -TB3S or 1794-TB3T and -TB3TS Terminal Bases

1. Connect the individual signal wiring to numbered terminals on the **0–15** row (**A**) on the terminal base unit. (Use Belden 8761 cable for signal wiring.)
2. Connect channel common/return to the associated terminal on row **A** (1794-TB3, -TB3S, -TB3T).

NOTE: Connect only one current or one voltage signal per channel. Do not connect both current and voltage on one channel.

3. Connect +24V dc to terminal 34 on the **34–51** row (**C**), and 24V common to terminal 16 on the **B** row.



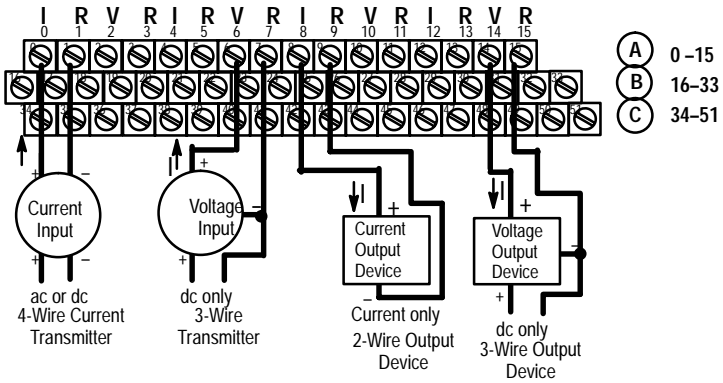
ATTENTION: To reduce susceptibility to noise, power analog modules and digital modules from separate power supplies. Do not exceed a length of 33 ft (10m) for dc power cabling.

4. If daisy-chaining +24V dc to the next terminal base, connect a jumper from terminal 51 on this base unit to terminal 34 on the next base unit.
5. If daisy-chaining 24V dc common to the next terminal base, connect a jumper from terminal 33 on this base unit to terminal 16 on the next base unit.
6. Connect the shield to functional earth ground as near as possible to the module.
7. 1794-TB3T only: connect the shield to screw terminals 39 through 46 (earth ground).

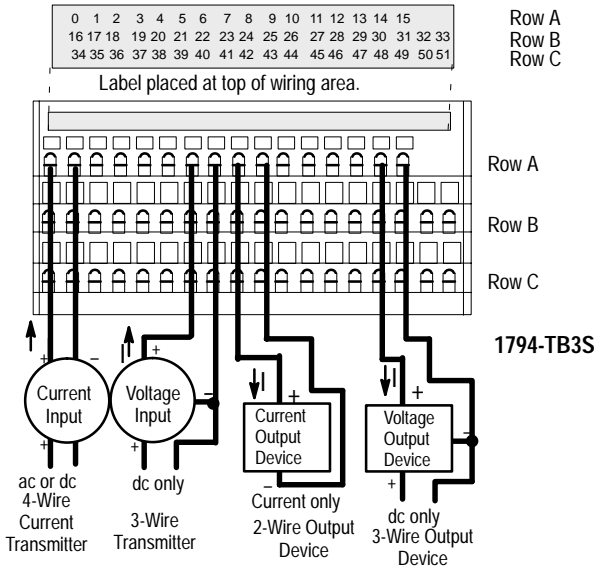


ATTENTION: Total current draw through the terminal base unit is limited to 10A. Separate power connections to the terminal base unit may be necessary.

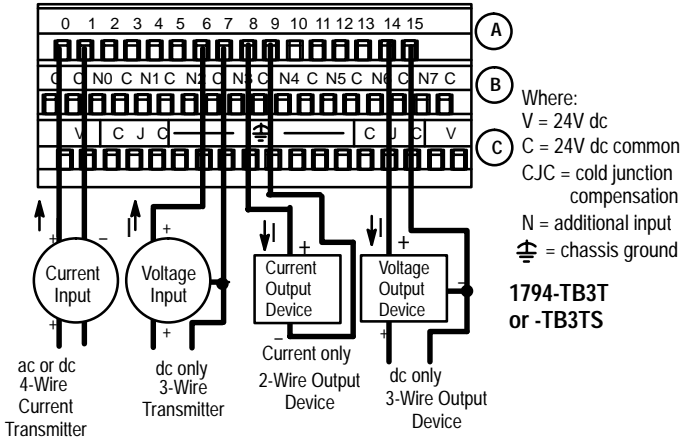
Examples of Input/Output Wiring for 1794-TB3 Base Units



Examples of Input/Output Wiring for 1794-TB3S Base Units



Examples of Input/Output Wiring for 1794-TB3T and -TB3TS Base Units



Connect the Wiring for Analog Inputs and Outputs to a 1794-TBN or -TBNF Terminal Base



ATTENTION: To reduce susceptibility to noise, power analog modules and digital modules from separate power supplies. Do not exceed a length of 33 ft (10m) for dc power cabling.

1. Connect individual input/output wiring to even numbered terminals on row (B) as indicated in the above table.
2. Connect the associated common/return to the corresponding odd numbered terminal on row (B) for each output as indicated in the above table.

NOTE: Connect only one current or one voltage signal per channel. Do not connect both current and voltage on one channel.

3. Connect 24V dc (+) to terminal 34 on row (C).
4. Connect 24V dc common/return (-) to terminal 16 on row (B).
5. If continuing power to the next terminal base unit, connect a jumper from terminal 51 (24V dc power) on this base unit to terminal 34 on the next base unit.

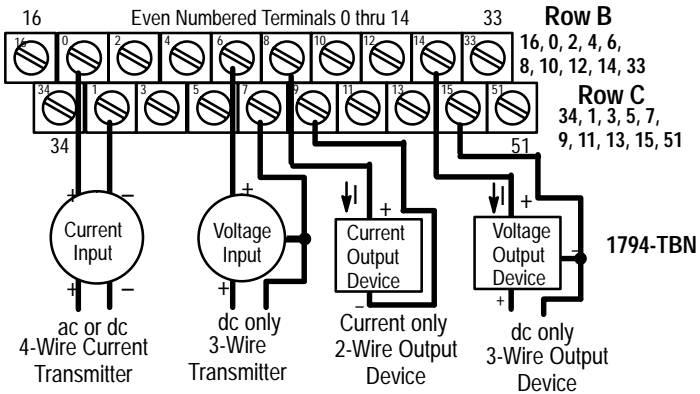
6 24V dc FLEX I/O 2 Input/2 Output Isolated Analog Module

- If continuing common to the next terminal base unit, connect a jumper from terminal 33 (24V dc common) on this base unit to terminal 16 on the next base unit.



ATTENTION: Total current draw through the terminal base unit is limited to 10A. Separate power connections to the terminal base unit may be necessary.

Examples of Input/output Wiring for 1794-TBN or -TBNF Base Units

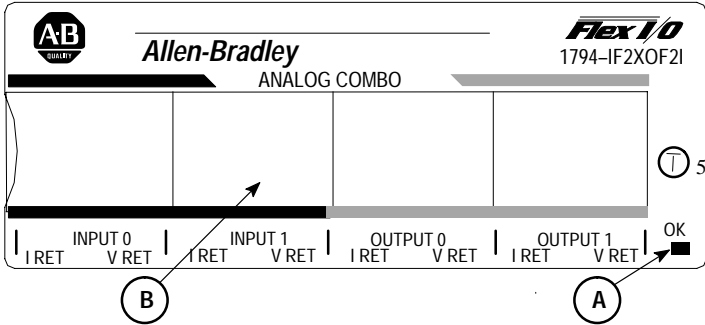


Channel	Signal Type	Label Markings	1794-TB3 ¹ , 1794-TB3S ¹ , 1794-TB3T ² , and -TB3TS ² 1794-TBN, and -TBNF	
			Signal Terminal	Signal Return
Input 0	Current	I0	0	
	Current	I0 Ret		1
	Voltage	V0	2	
	Voltage	V0 Ret		3
Input 1	Current	I1	4	
	Current	I1 Ret		5
	Voltage	V1	6	
	Voltage	V Ret		7
Output 0	Current	I2	8	
	Current	I2 Ret		9
	Voltage	V2	10	
	Voltage	V2 Ret		11
Output 1	Current	I3	12	
	Current	I3 Ret		13
	Voltage	V3	14	
	Voltage	V3 Ret		15
	24V dc Common		16 thru 33 ¹	
	+24V dc power		34 thru 51	

¹ Terminals 16 thru 33 are internally connected in the terminal base unit

² 1794-TB3T and -TB3TS only: Terminals 39 thru 46 are directly tied to chassis ground.

Indicators



A = Power/Status Indicator – indicates power applied to module and status of module.

B = Insertable label for writing individual input or output designations.

Input Map

Dec. Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	
Octal Bit	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00	
Word 0	Analog Value Input Channel 0																
Word 1	Analog Value Input Channel 1																
Word 2	Read Back Output Channel 0																
Word 3	Read Back Output Channel 1																
Word 4	0	Real Time Sample															
Word 5	PU	FP	CF	0	Reserved				0	0	0	0	0	0	BD	DN	0
Word 6	0	0	0	0	P1	P0	0	0	0	0	V1	V0	W1	W0	U1	U0	

Where:

- PU = Power up unconfigured state
- FP = Field power off
- CF = In configuration mode
- BD = Calibration bad
- DN = Calibration done
- U = Under range for specified channel
- W = Wire off current loop status for output channels 0 and 1
- V = Overrange for specified channel
- P = Outputs holding in response to Q0 and Q1

Output Map

Dec. Bit	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Octal Bit	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Word 0	EN	S1	S0	0	0	0	0	0	0	0	0	0	0	0	0	0
Word 1	Output Data Channel 0															
Word 2	Output Data Channel 1															
Word 3	0	0	0	0	0	0	0	0	Input Channel 1 Filter				Input Channel 0 Filter			
Word 4	Output Channel 1 Configuration				Output Channel 0 Configuration				Input Channel 1 Configuration				Input Channel 0 Configuration			
Word 5	0	Real Time Sample Programmed Interval														
Word 6	IC	1	TR	IT	Q1	Q0	0	0	RV	QK	CK	GO	Channel Number			

Where:

- EN = Output enable bit
- S0 and S1 = Safe state source bits
- TR = Transparent bit
- IT = Interrupt toggle bit
- IC = Initiate configuration bit
- Q0 and Q1 = Requests for outputs to hold
- RV = Revert to defaults bit
- QK = Quick calibration
- CK = Calibration clock
- GO = Gain offset select

Configuring Your Input Channels

Input Channel Configuration							
03	02	01	00	Set these bits for Channel 0			
07	06	05	04	Set these bits for Channel 1			
Bit Settings				Input Values	Data Format	% Underrange/ % Overrange	Input Range
0	0	0	0	Channel not configured			
0	0	0	1	4–20mA	signed 2's complement	4% Under, 4% Over	<0000–7878>
0	0	1	0	±10V	signed 2's complement	2% Under, 2% Over	<831F–7CE1>
0	0	1	1	±5V	signed 2's complement	4% Under, 4% Over	<8618–79E8>
0	1	0	0	0–20mA	signed 2's complement %	0% Under, 4% Over	0–10000>
0	1	0	1	4–20mA	signed 2's complement %	4% Under, 4% Over	<0–10000>
0	1	1	0	0–10V	signed 2's complement %	0% Under, 2% Over	0–10000>
0	1	1	1	±10V	signed 2's complement %	2% Under, 2% Over	<–10000–10000>
1	0	0	0	0–20mA	binary	0% Under, 4% Over	0000–F3CF>
1	0	0	1	4–20mA ¹	binary	4% Under, 4% Over	0000–F0F1>
1	0	1	0	0–10V	binary	0% Under, 2% Over	0000–F9C2>
1	0	1	1	0–5V	binary	0% Under, 4% Over	0000–F3CF>
1	1	0	0	±20mA	offset binary, 8000H = 0mA	4% Under, 4% Over	<0618–F9E8>
1	1	0	1	4–20mA	offset binary, 8000H = 4mA	4% Under, 4% Over	<8000–F878>
1	1	1	0	±10V	offset binary, 8000H = 0V	2% Under, 2% Over	<031F–FCE1>
1	1	1	1	±5V	offset binary, 8000H = 0V	4% Under, 4% Over	<0618–F9E8>

¹ Underrange for 4–20mA occurs in the blind area below 0 (3.2mA).

Input Update Rate for Real Time Sample Interval = 0

Configuration Bits				Input Nominal Ranges	Channel Update Rate ¹ RTSI = 0 and No Low Pass Filter	Channel Update Rate ¹ RTSI and Filter = 0 IT bit = 1
MSD			LSD			
0	0	0	1	4–20mA	7.5ms	5.0ms
0	0	1	0	±10V	2.5ms	2.5ms
0	0	1	1	±5V	2.5ms	2.5ms
0	1	0	0	0–20mA	7.5ms	5.0ms
0	1	0	1	4–20mA	7.5ms	5.0ms
0	1	1	0	0–10V	5.0ms	5.0ms
0	1	1	1	±10V	5.0ms	5.0ms
1	0	0	0	0–20mA	2.5ms	2.5ms
1	0	0	1	4–20mA	7.5ms	5.0ms
1	0	1	0	0–10V	2.5ms	2.5ms
1	0	1	1	0–5V	2.5ms	2.5ms
1	1	0	0	±20mA	2.5ms	2.5ms
1	1	0	1	4–20mA	7.5ms	5.0ms
1	1	1	0	±10V	2.5ms	2.5ms
1	1	1	1	±5V	2.5ms	2.5ms

¹ When IT = 1, the channel update rate for all channels is determined by the slowest channel.

Output Range Selection and Update Rate

Configuration Bits				Nominal Range	Data Type	Output Values	Module Update Rate
MSD			LSD				
0	0	0	1	4-20mA	2's complement	<0000-7878>	5.0ms
0	0	1	0	±10V	2's complement	<8618-79E8>	2.5ms
0	0	1	1	±5V	2's complement	<8618-79E8>	2.5ms
0	1	0	0	0-20mA	2's complement %	0-10000>	5.0ms
0	1	0	1	4-20mA	2's complement %	<0-10000>	5.0ms
0	1	1	0	0-10V	2's complement %	0-10000>	5.0ms
0	1	1	1	±10V	2's complement %	<-10000-10000>	5.0ms
1	0	0	0	0-20mA	binary	0000-F3CF>	2.5ms
1	0	0	1	4-20mA	binary	0000-F0F1>	5.0ms
1	0	1	0	0-10V	binary	0000-F3CF>	2.5ms
1	0	1	1	0-5V	binary	0000-F3CF>	2.5ms
1	1	0	0	±20mA	offset binary	8000-F9E8>	2.5ms
1	1	0	1	4-20mA	offset binary	8000-F878>	5.0ms
1	1	1	0	±10V	offset binary	<0618-F9E8>	2.5ms
1	1	1	1	±5V	offset binary	<0618-F9E8>	2.5ms

Setting the Input Filters

Input Channel Filter					
Bits				Channel	
03	02	01	00	Input 0	
07	06	05	04	Input 1	
				A/D Conversion Rate	Low Pass Filter
0	0	0	0	1200Hz	No low pass
0	0	0	1	1200Hz	100ms low pass
0	0	1	0	1200Hz	500ms low pass
0	0	1	1	1200Hz	1000ms low pass
0	1	0	0	600Hz	No low pass
0	1	0	1	600Hz	100ms low pass
0	1	1	0	600Hz	500ms low pass
0	1	1	1	600Hz	1000ms low pass
1	0	0	0	300Hz	No low pass
1	0	0	1	300Hz	100ms low pass
1	0	1	0	300Hz	500ms low pass
1	0	1	1	300Hz	1000ms low pass
1	1	0	0	150Hz	No low pass
1	1	0	1	150Hz	100ms low pass
1	1	1	0	150Hz	500ms low pass
1	1	1	1	150Hz	1000ms low pass

Specifications – 1794-IF2XOF2I 2 Input/2 Output Isolated Analog Module

Input Specifications

Number of Inputs	2 isolated
Resolution Voltage Current	16 bits - unipolar; 15 bits plus sign - bipolar 0.156mV/cnt unipolar; 0.313mV/cnt bipolar 0.320µA/cnt unipolar; 0.640µA/cnt bipolar
Data Format	2's complement 2's complement percent binary offset binary
Conversion Type	Sigma delta
Update Rate	2.5/5.0/7.5ms all channels
Input Current Terminal	4-20mA (user configurable) 0-20mA (user configurable) ±20mA (user configurable)
Input Voltage Terminal	±10V (user configurable) 0-10V (user configurable) ±5V (user configurable) 0-5V (user configurable)
Normal Mode Rejection Ratio Voltage Terminal Current Terminal	-3db @ 12Hz; 300Hz convert rate -80dB @ 50Hz, 300Hz convert rate -3db @ 6Hz; 150Hz convert rate -80dB @ 60Hz, 150Hz convert rate
Common Mode Rejection Ratio	-120dB @ 50/60Hz
Step Response to 63% Voltage Terminal or Current Terminal	1200Hz convert rate = 0.6ms 600Hz convert rate = 06.7ms 300Hz convert rate = 13.4ms 150Hz convert rate = 26.7ms
Input Resistance Voltage Terminal Current Terminal	>10 megohms <100 ohms ¹
Absolute Accuracy ² Voltage Terminal Current Terminal	0.1% Full Scale @ 25°C 0.1% Full Scale @ 25°C

Specifications continued on next page.

Specifications – 1794-IF2XOF2I 2 Input/2 Output Isolated Analog Module

Accuracy Drift with Temperature Voltage Terminal Current Terminal	0.0028% Full Scale/°C 0.0038% Full Scale/°C
Maximum Overload	30V continuous or 32mA continuous, one channel at a time
Output Specifications	
Number of Outputs	2 isolated
Resolution Voltage Current	15 bits plus sign 0.320mV/cnt 0.656µA/cnt
Data Format	2's complement 2's complement % binary offset binary
Conversion Type	digital to analog converter
Update Rate	2.5/5.0ms
Output Current Terminal	0mA output until module is configured 4-20mA user configurable 0-20mA user configurable
Output Voltage Terminal	0V output until module is configured ±10V user configurable 0-10V user configurable ±5V (user configurable) 0-5V (user configurable)
Step Response to 63% of FS	<25µs
Current Load on Voltage Output	3mA maximum
Resistive Load on mA Output	0 - 750 ohms
Absolute Accuracy ² Voltage Terminal Current Terminal	0.1% Full Scale @ 25°C 0.1% Full Scale @ 25°C

Specifications continued on next page.

Specifications – 1794-IF2XOF2I 2 Input/2 Output Isolated Analog Module

Accuracy Drift with Temperature Voltage Terminal Current Terminal	0.0012% Full Scale/°C 0.0025% Full Scale/°C
--	--

General Specifications

Module Location	Cat. No. 1794-TB3, -TB3S, -TB3T, -TB3TS, -TBN or -TBNF Terminal Base
Flexbus Current	50mA
Power Dissipation	3.3W maximum @ 31.2V dc
Thermal Dissipation	Maximum 11.3 BTU/hr @ 31.2V dc
Keyswitch Position	5
Calibration	Factory calibrated for 150, 300, and 600Hz
Indicators	1 green power/status indicator
Isolation Voltage	120V ac continuous (when used with 1794-TB3, -TB3S or -TB3T) 250V ac continuous (when used with 1794-TBN) Module is 100% tested to 2550V dc for 1s between channel to channel, channel to user power, channel to system, and user power to system
External dc Power Supply Voltage Voltage Range Supply Current	24V dc nominal 19.2 to 31.2V dc (includes 5% ac ripple) 150mA @ 24V dc
Dimensions Inches (Millimeters)	1.8H x 3.7W x 2.1D (45.7 x 94.0 x 53.3)
Environmental Conditions Operational Temperature Storage Temperature Relative Humidity Shock Operating Non-operating Vibration	0 to 55°C (32 to 131°F) -40 to 85°C (-40 to 185°F) 5 to 95% noncondensing (operating) 5 to 80% noncondensing (nonoperating) 30 g peak acceleration, 11(±1)ms pulse width 50 g peak acceleration, 11(±1)ms pulse width Tested 5 g @ 10–500Hz per IEC 68-2-6

Specifications continued on next page.



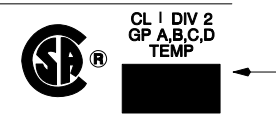

Specifications – 1794-IF2XOF2I 2 Input/2 Output Isolated Analog Module



Conductors Wire Size	12 gauge (4mm ²) stranded maximum 3/64 inch (1.2mm) insulation maximum
Category	2 ³
Agency Certification (when product or packaging is marked)	<ul style="list-style-type: none"> • CSA certified • CSA Class I, Division 2 Groups A, B, C, D certified • UL listed • CE marked for all applicable directives
User Manual	Publication 1794-6.5.8

¹ If the 24V dc power is removed from the module, input resistance = 10k ohms

² Includes offset, gain, non-linearity and repeatability error terms.

³ Use this conductor category information for planning conductor routing . Refer to publication 1770-4.1, "Industrial Automation Wiring and Grounding Guidelines for Noise Immunity."

<p>CSA Hazardous Location Approval</p>	<p>Approbation d'utilisation dans des emplacements dangereux par la CSA</p>
<p>CSA® certifies products for general use as well as for use in hazardous locations. Actual CSA certification is indicated by the product label as shown below, and not by statements in any user documentation.</p>	<p>La CSA® certifie les produits d'utilisation générale aussi bien que ceux qui s'utilisent dans des emplacements dangereux. La certification CSA en vigueur est indiquée par l'étiquette du produit et non par des affirmations dans la documentation à l'usage des utilisateurs.</p>
<p>Example of the CSA certification product label</p> 	<p>Exemple d'étiquette de certification d'un produit par la CSA</p> 
<p>To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for CSA-certified Allen-Bradley industrial control products.</p> <ul style="list-style-type: none"> • This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only. • The products having the appropriate CSA markings (that is, Class I Division 2, Groups A, B, C, D), are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction. 	<p>Pour satisfaire à la certification de la CSA dans des endroits dangereux, les informations suivantes font partie intégrante de la documentation des produits industriels de contrôle Allen-Bradley certifiés par la CSA.</p> <ul style="list-style-type: none"> • Cet équipement convient à l'utilisation dans des emplacements de Classe I, Division 2, Groupes A, B, C, D, ou ne convient qu'à l'utilisation dans des endroits non dangereux. • Les produits portant le marquage approprié de la CSA (c'est à dire, Classe I, Division 2, Groupes A, B, C, D) sont certifiés à l'utilisation pour d'autres équipements où la convenance de combinaison (application ou utilisation) est déterminée par la CSA ou le bureau local d'inspection qualifié.
<p>Important: Due to the modular nature of a PLC® control system, the product with the highest temperature rating determines the overall temperature code rating of a PLC control system in a Class I, Division 2 location. The temperature code rating is marked on the product label as shown.</p>	<p>Important: Par suite de la nature modulaire du système de contrôle PLC®, le produit ayant le taux le plus élevé de température détermine le taux d'ensemble du code de température du système de contrôle d'un PLC dans un emplacement de Classe I, Division 2. Le taux du code de température est indiqué sur l'étiquette du produit.</p>
<p>Temperature code rating</p>  <p>Look for temperature code rating here</p>	<p>Taux du code de température</p>  <p>Le taux du code de température est indiqué ici</p>
<p>The following warnings apply to products having CSA certification for use in hazardous locations.</p>	<p>Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour leur utilisation dans des emplacements dangereux.</p>

CSA Hazardous Location Approval	Approbation d'utilisation dans des emplacements dangereux par la CSA
 <p>ATTENTION: Explosion hazard —</p> <ul style="list-style-type: none"> • Substitution of components may impair suitability for Class I, Division 2. • Do not replace components unless power has been switched off or the area is known to be non-hazardous. • Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous. • Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on an Allen-Bradley product using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lb.) separating force applied for a minimum of one minute. 	 <p>AVERTISSEMENT: Risque d'explosion —</p> <ul style="list-style-type: none"> • La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2. • Couper le courant ou s'assurer que l'emplacement est désigné non dangereux avant de remplacer les composants. • Avant de débrancher l'équipement, couper le courant ou s'assurer que l'emplacement est désigné non dangereux. • Avant de débrancher les connecteurs, couper le courant ou s'assurer que l'emplacement est reconnu non dangereux. Attacher tous connecteurs fournis par l'utilisateur et reliés aux circuits externes d'un appareil Allen-Bradley à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens permettant aux connexions de résister à une force de séparation de 15 newtons (3,4 lb. - 1,5 kg) appliquée pendant au moins une minute.

Le sigle CSA est la marque déposée de l'Association des Standards pour le Canada.

PLC est une marque déposée de Allen-Bradley Company, Inc.

CSA logo is a registered trademark of the Canadian Standards Association

PLC is a registered trademark of Allen-Bradley Company, Inc.

User Manuals

Thank you for purchasing this product. This product has a user manual associated with it. If you would like a manual, you can:

- download a free electronic version from the internet:
www.ab.com/manuals or
www.theautomationbookstore.com
- purchase a printed manual by:
 - contacting your local distributor or Rockwell Automation representative,
 - visiting www.theautomationbookstore.com and placing your order
 - calling 1.800.963.9548 (USA/Canada) or 001.330.725.1574 (Outside USA/Canada)

The publication number of the user manual for your product is listed under "Specifications" in this installation instruction.



Allen-Bradley

With major offices worldwide. 

World Headquarters,
Allen-Bradley,
1201 South Second Street,
Milwaukee, WI 53204 USA,
Tel: (1) 414 382-2000 Fax: (1) 414 382-4444