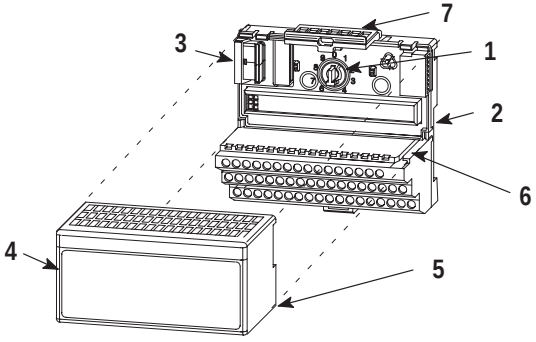
Installation Instructions

24V dc FLEX I/O 4 Output Analog Module

(Cat. No. 1794-OE4 Series B)

English



Module Installation

This module mounts on a 1794 terminal base unit.

1. Rotate keyswitch (1) on terminal base unit (2) clockwise to position 4 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/adapter. **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.

Publication 1794-5.5 – April 1999

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.

Wiring to a 1794-TB3 or -TB3S Terminal Base Unit

1. Connect the individualanalog channel signal wiring to numbered terminals on the **0–15** row **(A)** on the terminal base unit. (Use Belden 8761 cable for signal wiring.)

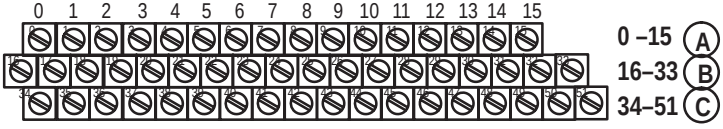
   NOTE: Connect only one current or one voltage signal per channel. Do not connect both current and voltage on one channel.

2. Connect the associated channel common to the corresponding terminal on the **same** row (A) for each analog channel.
3. Connect +24V dc to terminal 34 on the **34-51** row **(C)**, and 24V common to terminal 16 on the **B** row.

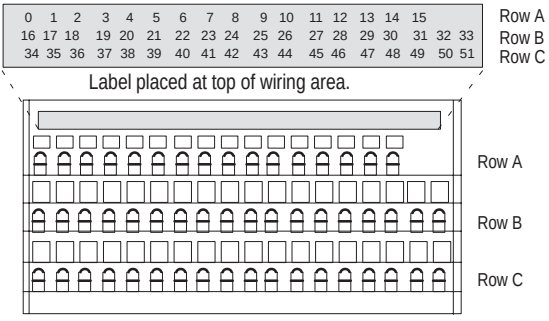
ATTENTION: To reduce susceptibility to noise, power analog modules and digital modules from separate power supplies. Do not exceed a length of 33 ft (10m) for dc power cabling.

4. Connect jumper from terminal 51 to terminal 34 on the next analog base unit.
5. Connect the shield to functional earth ground as near as possible to the module.

ATTENTION: When connecting an output to a low impedance device, such as a panel meter, connect a 100Ω, 25W or greater, resistor in series with the load. Failure to do so can result in damage to the module's output circuitry.



1794-TB3



1794-TB3S

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

Wiring to a 1794-TBN or -TBNF Terminal Base Unit

1. Connect individual output wiring to even numbered terminals on row **(**B**)** as indicated in the table below.
2. Connect the associated output common to the corresponding odd numbered terminal on row **(C)** for each output as indicated in the table below. (Commons are internally connected together.)
3. Connect 24V dc to terminal 34 on row **(C)**.
4. Connect 24V dc common to terminal 16 on row **(B)**.

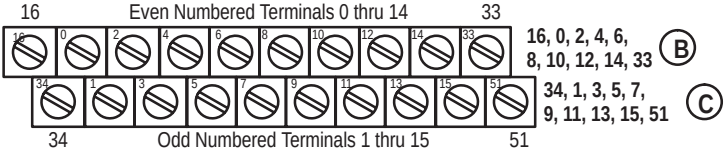
ATTENTION: To reduce susceptibility to noise, power analog modules and digital modules from separate power supplies. Do not exceed a length of 33 ft (10m) for dc power cabling.

5. Connect the shield to functional earth ground as near as possible to the module.

6. If continuing power to the next terminal base unit, connect a jumper from terminal 51 (24V dc) on this base unit to terminal 34 on the next base unit.

7. 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: When connecting an output to a low impedance device, such as a panel meter, connect a 100Ω, 25W or greater, resistor in series with the device. Failure to do so can result in damage to the module's output circuitry.

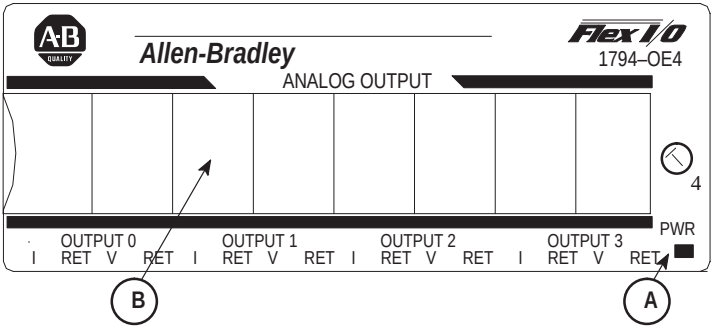


1794-TBN, -TBNF

		1794-TB2, -TB3			1794-TBN, -TBNF	
Channel	**Type**	**Label Marking**	**Signal Terminal**	**Common Terminal**	**Signal Terminal**	**Common Terminal**
0	Current Signal	I	0	17	0	
	Current Common	RET	1[1]	18		1[1]
	Voltage Signal	V	2	19	2	
	Voltage Common	RET	3[1]	20		3[1]
1	Current Signal	I	4	21	4	
	Current Common	RET	5[1]	22		5[1]
	Voltage Signal	V	6	23	6	
	Voltage Common	RET	7[1]	24		7[1]
2	Current Signal	I	8	25	8	
	Current Common	RET	9[1]	26		9[1]
	Voltage Signal	V	10	27	10	
	Voltage Common	RET	11[1]	28		11[1]
3	Current Signal	I	12	29	12	
	Current Common	RET	13[1]	30		13[1]
	Voltage Signal	V	14	31	14	
	Voltage Common	RET	15[1]	32		15[1]
	24V dc Common		16 thru 33[2]		16 and 33[2]	
	+24V dc		1794-TB2 – 34 and 51 1794-TB3 – 34 thru 51		34 and 51	

[1] Terminals 1, 3, 5, 7, 9, 11, 13 and 15 are internally connected in the module to 24V dc common.
[2] Terminals 16 and 33 are internally connected together in the terminal base unit.

Indicators



A = Status Indicator – indicates power applied to module.

B = Insertable label for writing individual output designations.

Input Map

Bit⇒ Word⇓	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	PU	Not used – set to 0											W3	W2	W1	W0

Where: W = Diagnostic bits for current output wire broken or load resistance high. (Not used on voltage outputs.)
PU = Power up bit

Output Map

Bit⇒ Word⇓	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	S	Analog Data – Channel 0														
1	S	Analog Data – Channel 1														
2	S	Analog Data – Channel 2														
3	S	Analog Data – Channel 3														
4	Not used – set to 0												M3	M2	M1	M0
5	Not used – set to 0				C3	C2	C1	C0	Not used – set to 0				F3	F2	F1	F0
6–9	Not used – set to 0															
10	S	Safe state value for channel 0														
11	S	Safe state value for channel 1														
12	S	Safe state value for channel 2														
13	S	Safe state value for channel 3														

Where: S = Sign bit (in 2's complement)
M = Multiplex control bit
C = Configure select bit
F = Full range bit

Range Selection Bits

Channel No.	Ch. 0		Ch. 1		Ch. 2		Ch. 3	
	F0	C0	F1	C1	F2	C2	F3	C3
Decimal Bits	**00**	**08**	**01**	**09**	**02**	**10**	**03**	**11**
0–10V dc/0–20mA	1	0	1	0	1	0	1	0
4–20mA	0	1	0	1	0	1	0	1
-10 to +10V dc	1	1	1	1	1	1	1	1
Off[1]	0	0	0	0	0	0	0	0

C = Configure select bit
F = Full range bit
[1] When configured to Off, individual channels will drive 0V/0mA.

CSA Hazardous Location Approval

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.

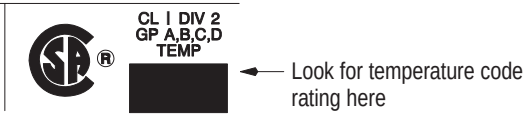
Example of the CSA certification product label

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.

- 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.

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.

Temperature code rating



The following warnings apply to products having CSA certification for use in hazardous locations.

CSA Hazardous Location Approval

ATTENTION: Explosion hazard —

- 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.

Approbation d'utilisation dans des emplacements dangereux par la CSA

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.

Exemple d'étiquette de certification d'un produit par la CSA

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.

- 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.

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.

CSA Hazardous Location Approval

Approbation d'utilisation dans des emplacements dangereux par la CSA

Taux du code de température

Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour leur utilisation dans des emplacements dangereux.

AVERTISSEMENT: Risque d'explosion —

- La substitution de composants peut rendre ce matériel inacceptable pour lesemplacements de Classe I, Division 2.
- Couper le courant ou s'assurer quel'emplacement est désigné non dangereux avant de remplacer lescomposants.
- 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.

Specifications – 1794-OE4 Analog Output Module	
Number of Outputs	4 single-ended, non-isolated
Module Location	Cat. No. 1794-TB2, -TB3 Terminal Base Unit
Resolution Voltage Current	12 bits plus sign 2.56mV/cnt 5.13µA/cnt
Data Format	left justified 16-bit 2's complement
Conversion Type	Pulse Width Modulation
Conversion Rate	1.024ms maximum all channels
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
Step Response to 63% of FS	24ms
Current Load on Voltage Output	3mA maximum
Resistive Load on mA Output	15 - 750 ohms
Absolute Accuracy[1] Voltage Terminal Current Terminal	 0.133% Full Scale @ 25ºC 0.425% Full Scale @ 25ºC
Accuracy Drift with Temperature Voltage Terminal Current Terminal	 0.0045% Full Scale/ºC 0.0069% Full Scale/ºC
Calibration	None Required
Isolation Voltage	Tested at 850V dc for 1s between user and system No isolation between individual channels
Indicators	1 green power indicator
Flexbus Current	20mA
Power Dissipation	4.5W maximum @ 31.2V dc
Thermal Dissipation	Maximum 15.3 BTU/hr @ 31.2V dc
Keyswitch Position	4
Specifications continued on next page.	

Specifications – 1794-OE4 Analog Output Module

General Specifications

External dc Power		
	Supply Voltage	24V dc nominal
	Voltage Range	19.2 to 31.2V dc (includes 5% ac ripple)
	Supply Current	70mA @ 24V dc (not including outputs)
Dimensions	Inches	1.8H x 3.7W x 2.1D
	(Millimeters)	(45.7 x 94.0 x 53.3)
Environmental Conditions		
Operational Temperature		0 to 55°C (32 to 131°F)
Storage Temperature		–40 to 85°C (–40 to 185°F)
Relative Humidity		5 to 95% noncondensing (operating) 5 to 80% noncondensing (nonoperating)
Shock	Operating	30 g peak acceleration, 11(±1)ms pulse width
	Non-operating	50 g peak acceleration, 11(±1)ms pulse width
Vibration		Tested 5 g @ 10–500Hz per IEC 68-2-6
Conductors	Wire Size	12 gauge ($4mm^2$) stranded maximum 3/64 inch (1.2mm) insulation maximum
	Category	2[2]
Agency Certification (when product is marked)		• CSA certified • CSA Class I, Division 2 Groups A, B, C, D certified • UL listed • CE marked for all applicable directives
User Manual		Publication 1794-6.5.2

1 Includes offset, gain, non-linearity and repeatability error terms.
2 Use this conductor category information for planning conductor routing as described in the system level installation manual.

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.

Rockwell Automation
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

Publication 1794-5.5 – April 1999
Supersedes publication 1794-5.5 – December 1995
PN955123–16A