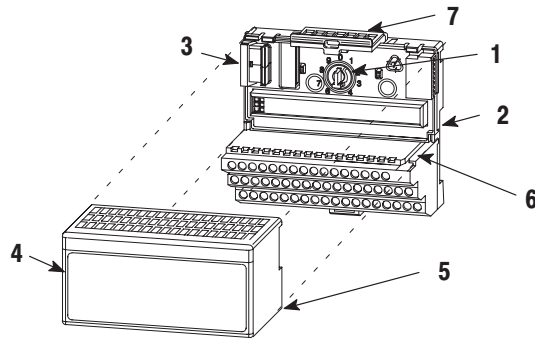




Installation Instructions

24V dc FLEX I/O 4 Output Analog Module (Cat. No. 1794-OE4 Series B)



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/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.

WARNING



If you remove or insert the module while the backplane power is on, 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.

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.

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 Allen-Bradley 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, Allen-Bradley 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 Application, Installation, and Maintenance of Solid-State Control (available from your local Allen-Bradley 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.

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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.

ATTENTION

Identifies information about practices or circumstances that can 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



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.

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, keep modules in appropriate static-safe packaging.

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.

Wiring to a 1794-TB2, -TB3, -TB3S, -TB3T or -TB3TS Terminal Base Unit

WARNING

If you connect or disconnect wiring while the field side power is on, 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.

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

IMPORTANT

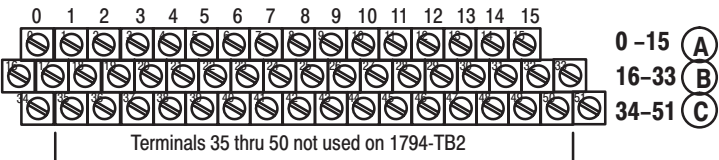
Connect only one current or one voltage signal per channel. Do not connect both current and voltage on one channel.

2. Connect the associated channel common to the corresponding terminal on the **same** row (**A**) for each analog channel.
 3. Connect any signal wiring shields to functional earth ground as near as possible to the module. **1794-TB3T or -TB3TS terminal bases only:** Connect to earth ground terminals C-39 thru C-46.
 4. Connect +V dc to terminal 34 on the **34-51** row (**C**), and –V common to terminal 16 on the **B** row.
-

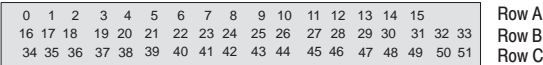
ATTENTION

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.

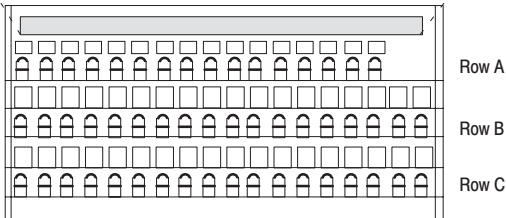
5. If daisy-chaining +V power to the next terminal base unit, connect a jumper from terminal 51 (+V) on this base unit to terminal 34 on the next base unit.
6. If daisy-chaining –V common to the next terminal base unit, connect a jumper from terminal 33 (–V common) on this base unit to terminal 16 on the next base unit.



1794-TB2, -TB3, and -TB3T



Label placed at top of wiring area.



1794-TB3S and -TB3TS

ATTENTION



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

Channel	Signal Type	1794-TB2, -TB3, -TB3S -TB3T, -TB3TS	1794-TB3T, -TB3TS
Channel	Signal Type	Output Terminals	Shield
0	Current Signal	A-0	C-39
	Current Common	A-1 ¹	C-39
	Voltage Signal	A-2	C-40
	Voltage Common	A-3 ¹	C-40
1	Current Signal	A-4	C-41
	Current Common	A-5 ¹	C-41
	Voltage Signal	A-6	C-42
	Voltage Common	A-7 ¹	C-42
2	Current Signal	A-8	C-43
	Current Common	A-9 ¹	C-43
	Voltage Signal	A-10	C-44
	Voltage Common	A-11 ¹	C-44
3	Current Signal	A-12	C-45
	Current Common	A-13 ¹	C-45
	Voltage Signal	A-14	C-46
	Voltage Common	A-15 ¹	C-46

+V dc for 1794-TB2: C-34 and C-51

+V dc for 1794-TB3 and -TB3S: : C-34 thru C-51

+V dc for 1794-TB3T and -TB3TS: : C-34, C-35, C-50 and C-51

V dc Common for 1794-TB2, -TB3 and -TB3S: B-16 thru B-33

V dc Common for 1794-TB3T and -TB3TS: B-16, 17, 19, 21, 23, 25, 27, 29, 31 and 33

¹ A-1, 3, 5, 7, 9, 11, 13 and 15 are internally connected to -V dc common.

Wiring to a 1794-TBN Terminal Base Unit

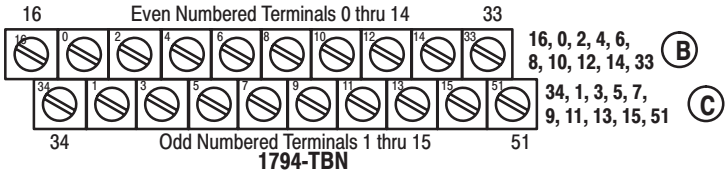
1. Connect individual output wiring to even numbered terminals on row (B) as indicated in the table below.
2. Connect the associated output common to the corresponding odd numbered terminal on row (C) for each output as indicated in the table below. (Commons are internally connected together.)
3. Connect the shield to functional earth ground as near as possible to the module.
4. Connect +V dc to terminal 34 on row (C).
5. Connect -V 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.

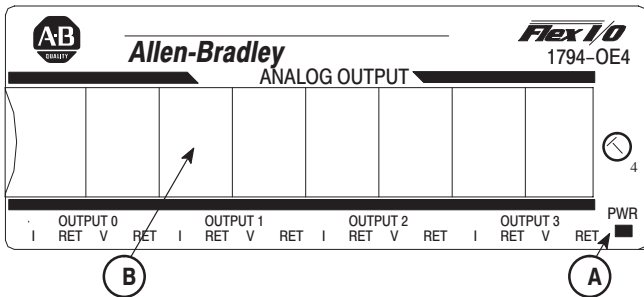
6. If daisy-chaining +V power to the next terminal base unit, connect a jumper from terminal 51 (+V) on this base unit to terminal 34 on the next base unit.
7. If daisy-chaining -V common to the next terminal base unit, connect a jumper from terminal 33 (-V common) on this base unit to terminal 16 on the next base unit.



		1794-TBN			1794-TBN
Channel	Type	Output Terminal	Channel	Type	Output Terminal
0	Current Signal	B-0	2	Current Signal	B-8
	Current Common	C-1 ¹		Current Common	C-9 ¹
	Voltage Signal	B-2		Voltage Signal	B-10
	Voltage Common	C-3 ¹		Voltage Common	C-11 ¹
1	Current Signal	B-4	3	Current Signal	B-12
	Current Common	C-5 ¹		Current Common	C-13 ¹
	Voltage Signal	B-6		Voltage Signal	B-14
	Voltage Common	C-7 ¹		Voltage Common	C-15 ¹
-V dc Common		B-16 and B-33			
+V dc		C-34, C-51			

¹ Terminals 1, 3, 5, 7, 9, 11, 13 and 15 are internally connected in the module to -V dc common.

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	P U	Not used – set to 0											W 3	W 2	W 1	W 0

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												M 3	M 2	M 1	M 0
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.

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, and 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.

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.

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

Les produits marqués CL I, DIV 2, GP A, B, C, D ne conviennent que 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.

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 1, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

Specifications - 1794-OE4 Analog Output Module

Number of Outputs	4 single-ended, non-isolated
Module Location	Cat. No. 1794-TB2, -TB3, -TB3S, -TB3T, -TB3TS, -TBN Terminal Base Unit
Resolution	12 bits plus sign
Voltage	2.56mV/cnt
Current	5.13 μ A/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 \pm 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 @ 24V; 15-300 @ 12V
Absolute Accuracy ¹	
Voltage Terminal	0.133% Full Scale @ 25°C
Current Terminal	0.425% Full Scale @ 25°C
Accuracy Drift with Temperature	
Voltage Terminal	0.0045% Full Scale/°C
Current Terminal	0.0069% Full Scale/°C
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	10.5 to 31.2V dc (includes 5% ac ripple)
Supply Current	70mA @ 24V dc (not including outputs) 150mA @ 12V dc (not including outputs)
Dimensions	Inches (Millimeters)
	1.8H x 3.7W x 2.1D (45.7 x 94.0 x 53.3)
Environmental Conditions	
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) 32 to 131°F (0 to 55°C)
Storage Temperature	IEC 60068-2-1 (Test Ab, Unpackaged, Nonoperating Cold) IEC 60068-2-2 (Test Bb, Unpackaged, Nonoperating Dry Heat) IEC 60068-2-14 (Test Na, Unpackaged, Nonoperating Thermal Shock) -40 to 185°F (-40 to 85°C)
Relative Humidity	IEC 60068-2-30 (Test Db, Unpackaged, Nonoperating Damp Heat) 5 to 95%, noncondensing
Shock	IEC 60068-2-27 (Test Ea, Unpackaged Shock)
Operating	30g
Nonoperating	50g
Vibration	IEC 60068-2-6 (Test Fc, Operating) 5g @ 10-500Hz
ESD Immunity	IEC 61000-4-2 4kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3 10V/m with 1kHz sine-wave 80% AM from 30MHz to 1000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900MHz
EFT/B Immunity	IEC 61000-4-4 ±2kV @ 5kHz on signal ports

Specifications continued on next page.

Specifications - 1794-OE4 Analog Output Module

Surge Transient Immunity	IEC 61000-4-5 ±1kV line-line (DM) and ±2kV line-earth (CM) on signal ports
Conducted RF Immunity	IEC 61000-4-6 10V rms with 1kHz sine wave 80% AM from 150kHz to 80MHz
Emissions	CISPR 11 Group 1, Class A (with appropriate enclosure)
Enclosure Type Rating	None (open-style)
Conductors Wire Size	12 gauge (4mm ²) stranded copper wire maximum rated at 75°C or greater
Category ²	3/64 inch (1.2mm) insulation maximum Established by installed module
Agency Certification (when product is marked)	<ul style="list-style-type: none"> UL UL Listed Industrial Control Equipment UL UL Listed for Class I, Division 2 Group A, B, C and D Hazardous Locations CSA CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, D Hazardous Locations EEx³ European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n” CE³ European Union 89/336/EEC EMC Directive, compliant with: EN 50081-2, Industrial Emissions EN 50082-2, Industrial Immunity EN 61326, Meas./Control/Lab., Industrial Requirements EN 61000-6-2, Industrial Immunity C-Tick³ Australian Radiocommunications Act, compliant with AS/NZS 2064, Industrial Emissions
User Manual	Publication 1794-6.5.2

¹ Includes offset, gain, nonlinearity and repeatability error terms
² You use this conductor category information for planning conductor routing as described in the system level installation manual.
³ See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates and other certification details

European Zone 2 Certification

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

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 (1999).

IMPORTANT

Observe the following additional Zone 2 certification requirements:

- This equipment is not resistant to sunlight or other sources of UV radiation.
 - The secondary of a current transformer shall not be open-circuited.
 - The marking "ALCR" is to be considered "as applicable" to individual products.
 - 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 must be powered by energy limited associated equipment as defined in EN 50021 when applied in Class I, Zone 2 environments.
 - 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.
-

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.



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