



## FLEX I/O DC Input, Output, and Input/Output Analog Modules

Catalog Numbers 1794-IE12, 1794-IE12K, 1794-OE12, 1794-IE8XOE4, 1794-IE8XOE4K



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### Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

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Updated figure 1794-TB3G, 1794-TB3GS, 1794-TB3GK, and 1794-TB3GSK Terminal Base Wiring	5
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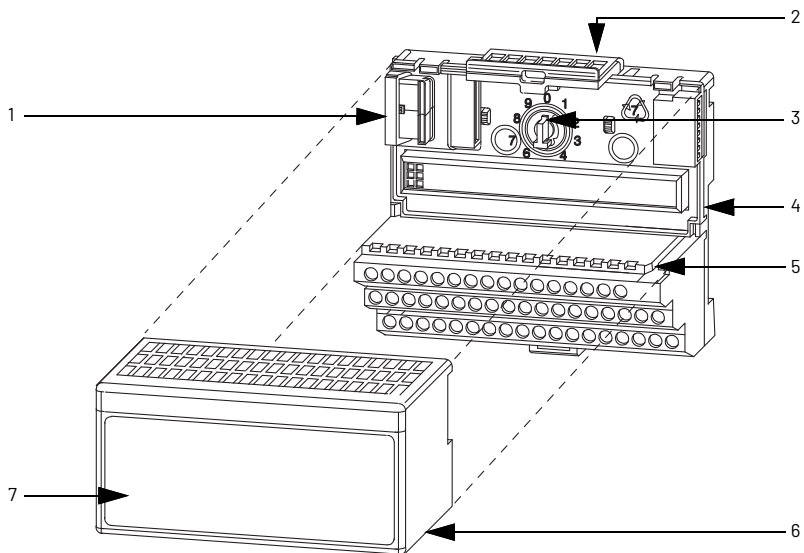
North American Hazardous Location Approval

<p><b>The following information applies when operating this equipment in hazardous locations.</b></p> <p>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.</p>	<p><b>Informations sur l'utilisation de cet équipement en environnements dangereux.</b></p> <p>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.</p>
<p> <b>WARNING: Explosion Hazard -</b></p> <ul style="list-style-type: none"> <li>Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.</li> <li>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.</li> <li>Substitution of components may impair suitability for Class I Division 2.</li> <li>If this product contains batteries, they must only be changed in an area known to be nonhazardous.</li> </ul>	<p> <b>AVERTISSEMENT: Risque d'Explosion -</b></p> <ul style="list-style-type: none"> <li>Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.</li> <li>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.</li> <li>La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I Division 2.</li> <li>S'assurer que l'environnement est classé non dangereux avant de changer les piles.</li> </ul>



**WARNING:** When used in a Class I Division 2, hazardous location, this equipment must be mounted in a suitable enclosure with proper wiring method that complies with the governing electrical codes.

Module Overview



	Description		Description
1	Flexbus connector	5	Groove
2	Latching mechanism	6	Alignment bar
3	Keyswitch	7	Module
4	Terminal base		

Install Your Module

The FLEX™ I/O analog input/output modules mount on a 1794-TB3G, 1794-TB3GS, 1794-TB3GK, or 1794-TB3GSK terminal base.

1. Rotate the keyswitch (3) on the terminal base (4) clockwise to position 3 (1794-IE12 and 1794-IE12K), 4 (1794-OE12), or 5 (1794-IE8XOE4 and 1794-IE8XOE4K) as required.

2. Make certain the Flexbus connector (1) 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 the pins on the bottom of the module are straight so they align properly with the connector in the terminal base.
4. Position the module (7) with its alignment bar (6) aligned with the groove (5) 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 (2) is locked into the module.

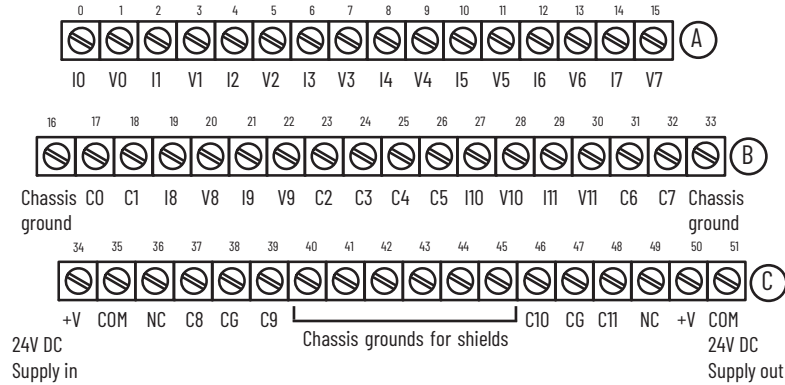


**ATTENTION:** During mounting of all devices, be sure that all debris (such as metal chips, and wire strands) is kept from falling into the module. Debris that falls into the module could cause damage on power up.

## Wiring Your Module

Connect the wiring for the 1794-TB3G, 1794-TB3GS, 1794-TB3GK, and 1794-TB3GSK terminal bases as shown in [Figure 1](#).

**Figure 1 - 1794-TB3G, 1794-TB3GS, 1794-TB3GK, and 1794-TB3GSK Terminal Base Wiring**



I = Current  
 V = Voltage  
 C-0...C-11 = Returns for I or V connections 0...11  
 +24V DC = Terminals C-34 and C-50  
 COM = Terminals C-35 and C-51  
 Chassis ground (CG) = Terminals B-16, B-33, C-38, C-40...C-45, C-47  
 No connection (NC) = Terminals C-36 and C-49  
 For daisy chaining: Supply in - C-34 (+) and C-35 (-),  
 Supply out - C-50 (+) and C-51 (-)

(1794-TB3G shown)



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



**ATTENTION:** Do not daisy-chain power or ground from this terminal base unit to any AC or DC digital module terminal base units.



**ATTENTION:** Do not exceed a length of 10 m (33 ft) for signal cabling.

**Table 1 - Wiring Connections for the 1794-IE12 and 1794-IE12K Analog Input Module**

Channel	Signal Type	Label Marking	1794-TB3G, 1794-TB3GS, 1794-TB3GK, 1794-TB3GSK	
			Input	Common Terminal
Input 0	Current	I0	A-0	B-17
	Voltage	V0	A-1	
Input 1	Current	I1	A-2	B-18
	Voltage	V1	A-3	
Input 2	Current	I2	A-4	B-23
	Voltage	V2	A-5	
Input 3	Current	I3	A-6	B-24
	Voltage	V3	A-7	

Table 1 - Wiring Connections for the 1794-IE12 and 1794-IE12K Analog Input Module (Continued)

Channel	Signal Type	Label Marking	1794-TB3G, 1794-TB3GS, 1794-TB3GK, 1794-TB3GSK	
			Input	Common Terminal
Input 4	Current	I4	A-8	B-25
	Voltage	V4	A-9	
Input 5	Current	I5	A-10	B-26
	Voltage	V5	A-11	
Input 6	Current	I6	A-12	B-31
	Voltage	V6	A-13	
Input 7	Current	I7	A-14	B-32
	Voltage	V7	A-15	
Input 8	Current	I8	B-19	C-37
	Voltage	V8	B-20	
Input 9	Current	I9	B-21	C-39
	Voltage	V9	B-22	
Input 10	Current	I10	B-27	C-46
	Voltage	V10	B-28	
Input 11	Current	I11	B-29	C-48
	Voltage	V11	B-30	
+V DC Power	Terminals C-34 and C-50 are internally connected in the terminal base unit.			
-V DC Common	Terminals C-35 and C-51 are internally connected in the terminal base unit.			
Chassis ground	Terminals B-16, B-33, C-38, C-40...C-45, and C-47 are internally connected to the chassis ground.			
No connection	Terminals C-36 and C-49			



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

Table 2 - Wiring Connections for the 1794-OE12 Analog Output Module

Channel	Signal Type	Label Marking	1794-TB3G, 1794-TB3GS, 1794-TB3GK, 1794-TB3GSK	
			Output	Common Terminal
Output 0	Current	I0	A-0	B-17
	Voltage	V0	A-1	
Output 1	Current	I1	A-2	B-18
	Voltage	V1	A-3	
Output 2	Current	I2	A-4	B-23
	Voltage	V2	A-5	
Output 3	Current	I3	A-6	B-24
	Voltage	V3	A-7	
Output 4	Current	I4	A-8	B-25
	Voltage	V4	A-9	
Output 5	Current	I5	A-10	B-26
	Voltage	V5	A-11	
Output 6	Current	I6	A-12	B-31
	Voltage	V6	A-13	
Output 7	Current	I7	A-14	B-32
	Voltage	V7	A-15	
Output 8	Current	I8	B-19	C-37
	Voltage	V8	B-20	
Output 9	Current	I9	B-21	C-39
	Voltage	V9	B-22	
Output 10	Current	I10	B-27	C-46
	Voltage	V10	B-28	
Output 11	Current	I11	B-29	C-48
	Voltage	V11	B-30	
+V DC Power	Terminals C-34 and C-50 are internally connected in the terminal base unit.			

## Configure Your Module

You configure your input, output, or input/output module by setting bits in the configuration word.

**Table 4 - Data Table - 1794-IE12 and 1794-IE12K**

Dec.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Oct.	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
Read Words																
0 - Input 0	Signed 2's Complement data Value of Channel 0															
1 - Input 1	Signed 2's Complement data Value of Channel 1															
2 - Input 2	Signed 2's Complement data Value of Channel 2															
3 - Input 3	Signed 2's Complement data Value of Channel 3															
4 - Input 4	Signed 2's Complement data Value of Channel 4															
5 - Input 5	Signed 2's Complement data Value of Channel 5															
6 - Input 6	Signed 2's Complement data Value of Channel 6															
7 - Input 7	Signed 2's Complement data Value of Channel 7															
8 - Input 8	Signed 2's Complement data Value of Channel 8															
9 - Input 9	Signed 2's Complement data Value of Channel 9															
10 - Input 10	Signed 2's Complement data Value of Channel 10															
11 - Input 11	Signed 2's Complement data Value of Channel 11															
12 - Status	PU	FP	GF	NU	RT1	R10	R9	R8	R7	R6	R5	R4	R3	R2	R1	R0
Write Words																
0 - Reserved	EN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 - Configuration	QS	0	0	0	CAB		C89		C67		C45		C23		C01	

Where:

- PU = Power up bit
- FP = Field power fault
- GF = General fault
- NU = Not used
- Rx = Out of range (x = associated channel)
- EN = Enable
- QS = Quick step bit - allows input filter to be reduced during rapid signal changes.
- Cxx = Configuration

**Table 5 - Range Selection Bits for the 1794-IE12, 1794-IE12K, 1794-0E12, 1794-IE8X0E4, and 1794-IE8X0E4K**

Range	Out of Range	Range Setting	Cxx <sup>(1)</sup> Channel Configuration
-10...+10V DC	< -10.0V or > +10.0V	Set bits for each channel pair 00 = Off 01 = 0...20 mA 10 = 4...20 mA 11 = ±10V	C01 for channels 0 and 1 C23 for channels 2 and 3 C45 for channels 4 and 5 C67 for channels 6 and 7 C89 for channels 8 and 9 CAB for channels 10 and 11
4...20 mA	< 4.0 mA or > 20.0 mA		
0...20 mA	< 0.0 mA or > 20.0 mA		

(1) xx = Associated channel pair

**Table 6 - Safe State Selection Bits for 1794-0E12, 1794-IE8X0E4, and 1794-IE8X0E4K**

When EN = 0, these bits designate the source of the safe state data for all outputs in the module

S1/S0 Safe State Select Source	Safe State Mode	Safe State Output Behavior
S1	S0	
0	0	Safe State value is in the output words Outputs will use Safe State value
0	1	Reserved (Safe State value is in the output words) Reserved (Outputs will use Safe State value)
1	0	Clear/Reset the outputs, based on range selected ±10V range - Output set to 0V 4...20 mA range - Output set to 4 mA 0...20 mA range - Output set to 0 mA
1	1	Hold output at its present level Outputs will Hold Last State

**Table 7 - Data Table - 1794-0E12**

Dec.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Oct.	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
Read Words																
0 - Status	PU	FP	GF	NU	WT1	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1	W0

## Specifications

### Input Specifications - 1794-IE12, 1794-IE12K, 1794-IE8XOE4, and 1794-IE8XOE4K

Attribute	1794-IE12, 1794-IE12K	1794-IE8XOE4, 1794-IE8XOE4K
Number of inputs	12 single-ended, nonisolated from channel to channel	8 single-ended, nonisolated from channel to channel
Input resolution	16 bits	
Voltage terminal	320 $\mu$ V/cnt	
Current terminal	0.641 $\mu$ A/cnt	
Data format	Left-justified, 16-bit	
Input conversion type	Successive approximation	
Input conversion rate	8.0 ms all channels	
Input voltage terminal	$\pm$ 10V (user configurable)	
Input current terminal	4...20 mA (user configurable)	
Specification	0...20 mA (user configurable)	
Certification		
Input impedance, nom	> 1 M $\Omega$	
Voltage terminal	< 100 $\Omega$ <sup>(1)</sup>	
Current terminal		
Normal mode rejection ratio	Voltage/current terminal: -3 dB @ 0.05 Hz; -20 dB/decade -52 dB @ 50 Hz; -54 dB @ 60 Hz  Voltage/current terminal with Quick Step: -3 dB @ 1.5 Hz; -20 dB/decade -29 dB @ 50 Hz; -31 dB @ 60 Hz	
Step response to 63% of full scale	Voltage/current terminal - 1.3 s Voltage/current terminal with Quick Step - 0.09 s	
Absolute accuracy <sup>(2)</sup>		
Voltage input	0.1% full scale @ 25 °C (77 °F)	
Current input	0.1% full scale @ 25 °C (77 °F)	
Accuracy drift with temperature		
Voltage terminal	0.004% full Scale/°C	
Current terminal	0.004% full Scale/°C	
Voltage overload, max	30V continuous, one channel at a time	
Current overload, max	32 mA continuous, one channel at a time	

(1) If 24V DC is removed from the module, input resistance is < 100  $\Omega$ . This is also true at 0 mA current input even if there is 24V DC. If there is an input current applied, input impedance is > 1 M $\Omega$ .

(2) Includes offset, gain, nonlinearity, and repeatability error terms.

### Output Specifications - 1794-OE12, 1794-OE12K, 1794-IE8XOE4, and 1794-IE8XOE4K

Attribute	1794-OE12	1794-IE8XOE4, 1794-IE8XOE4K
Number of outputs	12 single-ended, nonisolated	4 single-ended, nonisolated
Output voltage terminal	0V output until module is configured $\pm$ 10V (user configurable)	
Output current terminal	0 mA output until module is configured 4...20 mA (user configurable) 0...20 mA (user configurable)	
Output resolution	16 bits	
Voltage terminal	320 $\mu$ V/cnt	
Current terminal	0.641 $\mu$ A/cnt	
Data format	16-bit	
Output conversion type	Digital-to-analog converter	
Step response to 63% of full scale, output terminal	~70% first convert; 96% second convert; 100% third convert	
Absolute accuracy <sup>(1)</sup>		
Voltage terminal	0.1% full scale @ 25 °C (77 °F)	
Current terminal	0.1% full scale @ 25 °C (77 °F)	
Accuracy drift with temperature		
Voltage terminal	0.004% full scale/°C	
Current terminal	0.004% full scale/°C	
Load on output current	0...750 $\Omega$	
Load on voltage output, max	3.0 mA	

(1) Includes offset, gain, nonlinearity, and repeatability error terms.

**General Specifications**

Attribute	1794-IE12, 1794-IE12K	1794-OE12	1794-IE8X0E4, 1794-IE8X0E4K
Recommended terminal base unit	1794-TB3G, 1794-TB3GS, 1794-TB3GK, and 1794-TB3GSK		
Terminal base screw torque	0.8 N•m (7 lb•in)		
Indicators	1 red/green power/status indicator		
Keyswitch position	3	4	5
Isolation voltage	50V (continuous), Basic Insulation Type, No isolation between individual channels Type tested @ 850V AC for 60 s between field and system		
Flexbus current	80 mA		
Power dissipation, max	1.2 W @ 31.2V DC	7.68 W @ 24V DC	3.4 W @ 24V DC
Thermal dissipation, max	4.1 BTU/hr @ 31.2V DC	26.2 BTU/hr @ 24V DC	11.6 BTU/hr @ 24V DC
Dimensions, approx. (H x W x D) (with module installed)	46 x 94 x 54 mm (1.81 x 3.7 x 2.1 in.)		
Weight, approx.	97 g (3.4 oz.)	106 g (3.7 oz.)	102 g (3.6 oz.)
Wiring category <sup>(1)</sup>	2 - on signal ports 2 - on power ports		
Wire type	Shielded		
Wire size	Determined by the installed terminal base		
Enclosure type rating	None (open-style)		
North American temp code	T4A		

(1) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

**Environmental Specifications**

Attribute	Value
Temperature, operating	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...+60 °C (-4...+140 °F)
Temperature, nonoperating	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...+85 °C (-40...+185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat): 5...95% noncondensing
Vibration	IEC60068-2-6 (Test Fc, Operating): 5 g @ 10...500 Hz
Shock, operating	IEC60068-2-27 (Test Ea, Unpackaged shock): 30 g
Shock, nonoperating	IEC60068-2-27 (Test Ea, Unpackaged shock): 50 g
Emissions	IEC 61000-6-4
ESD immunity	IEC 61000-4-2: 6 kV contact discharges 8 kV air discharges
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 10V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz - 1794-IE12, 1794-IE12K, 1794-OE12 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz - 1794-IE8X0E4, 1794-IE8X0E4K
EFT/B immunity	IEC 61000-4-4: ±4 kV @ 5 kHz on power ports ±4 kV @ 5 kHz on shielded signal ports - 1794-IE12, 1794-IE12K, 1794-IE8X0E4, 1794-IE8X0E4K ±2 kV @ 5 kHz on shielded signal ports - 1794-OE12
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz