Installation Instructions

Original Instructions

Allen-Bradley
by ROCKWELL AUTOMATION

FLEX I/O Digital Sourcing Input and Sinking Output Modules

Catalog Numbers 1794-IV16, 1794-OV16, 1794-OV16P

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 Certifications	10
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Rockwell Automation

Environment and Enclosure

ATTENTION: This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in EN/IEC 60664-1), at altitudes up to 2000 m (6562 ft) without derating.
This equipment is not intended for use in residential environments and may not provide adequate protection to radio communication services in such environments.

This equipment is supplied as open-type equipment for indoor use. 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 enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA or be approved for the application if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain more information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1, for more installation requirements.
- NEMA Standard 250 and EN/IEC 60529, as applicable, for explanations of the degrees of protection provided by enclosures.

Prevent Electrostatic Discharge

ATTENTION: 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.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

UK and European Hazardous Location Approval

The following modules are UK and European Zone 2 approved: 1794-IV16, 1794-OV16, 1794-OV16P.

The following applies to products marked Ⓔx II 3 G:

- Are Equipment Group II, Equipment Category 3, and comply with the Essential Health and Safety Requirements relating to the design and construction of such equipment given in Schedule 1 of UKEX and Annex II of EU Directive 2014/34/EU. See the UKEx and EU Declaration of Conformity at rok.auto/certifications for details.
- The type of protection is Ex ec IIC T4 Gc (**1794-OV16, 1794-OV16P**) and Ex ec IIC T3 Gc (**1794-IV16**) according to EN IEC 60079-0:2018 and EN IEC 60079-7:2015+A1:2018.
- Comply with standards EN IEC 60079-0:2018 & EN IEC 60079-7:2015+A1:2018 reference certificate number DEMKO 14 ATEX 1342501X and UL22UKEX2378X.
- Are intended for use in areas in which explosive atmospheres caused by gases, vapors, mists, or air are unlikely to occur, or are likely to occur only infrequently and for short periods. Such locations correspond to Zone 2 classification according to UKEX regulation 2016 No. 1107 and ATEX directive 2014/34/EU.

IEC Hazardous Location Approval

The following applies to products with IECEx certification:

- Are intended for use in areas in which explosive atmospheres caused by gases, vapors, mists, or air are unlikely to occur, or are likely to occur only infrequently and for short periods. Such locations correspond to Zone 2 classification to IEC 60079-0.
- The type of protection is Ex ec IIC T4 Gc (**1794-OV16, 1794-OV16P**) and Ex ec IIC T3 Gc (**1794-IV16**) according to IEC 60079-0 and IEC 60079-7.
- Comply with Standards IEC 60079-0, Explosive atmospheres Part 0: Equipment - General requirements, Edition 7, Revision Date 2017, IEC 60079-7, 5.1 Edition revision date 2017, Explosive atmospheres - Part 7: Equipment protection by increased safety "e", reference IECEx certificate number IECEx UL 14.0066X.

WARNING: Special Conditions for Safe Use:

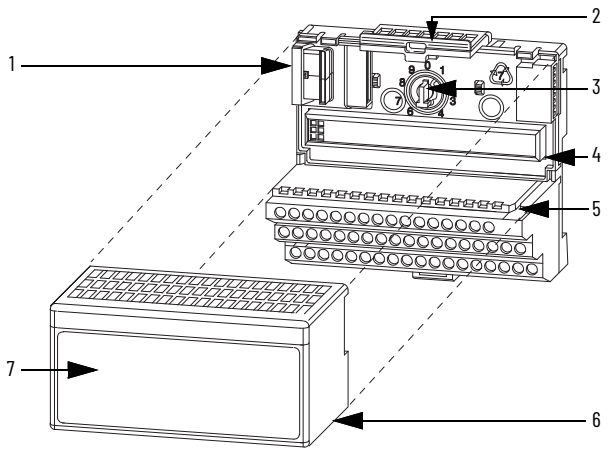
- This equipment shall be mounted in an UKEX/ATEX/IECEx Zone 2 certified enclosure with a minimum ingress protection rating of at least IP54 (in accordance with EN/IEC 60079-0) and used in an environment of not more than Pollution Degree 2 (as defined in EN/IEC 60664-1) when applied in Zone 2 environments. The enclosure must be accessible only by the use of a tool.
- This equipment shall be used within its specified ratings defined by Rockwell Automation.
- Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment.
- The instructions in the user manual shall be observed.
- This equipment must be used only with UKEX/ATEX/IECEx certified Rockwell Automation backplanes.
- Earthing is accomplished through mounting of modules on rail.

WARNING: Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.

WARNING: When you insert or remove the module while backplane power is on, an electric 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. Repeated electric arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

Overview

The FLEX™ I/O module mounts on 1794 terminal base.



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

Install Your Module

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

1. Rotate the keyswitch (3) on the terminal base (4) clockwise to position 9 as required for this type of module.
2. Make sure the Flexbus connector (1) is pushed all the way to the left to connect with the neighboring terminal base or adapter. **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.

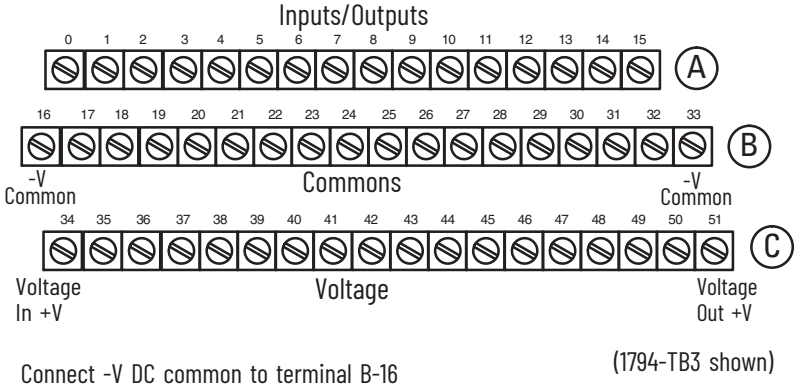
Connect Wiring for 1794-IV16, 1794-OV16, and 1794-OV16P

1. Connect individual input or output wiring to numbered terminals on the 0…15 row (A) as indicated in Table 1.
2. **For 1794-IV16** – Connect the associated input device common to the corresponding terminal on the 16…33 row. (B) for each input as indicated in Table 1. Commons are internally connected together. If using 3-wire input devices, also connect the associated input power lead to the corresponding terminal on the 34…51 row (C).

   For 1794-OV16, 1794-OV16P – Connect the associated +V DC power lead of the output device to the corresponding terminal on the 34…51 row (C) for each output as indicated in Table 1. The +V power terminals of row (C) are internally connected together.
3. Connect +24V DC power to terminal 34 on the 34…51 row (C).
4. Connect DC common to terminal 16 on the 16…33 row (B).
5. If daisy chaining power to the next terminal base, connect a jumper from terminal 51 (+V DC) on this base unit to terminal 34 on the next base unit.
6. If continuing DC common to the next base unit, connect a jumper from terminal 33 (common) on this base unit to terminal 16 on the next base unit.

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

Figure 1 - Connect Wiring for 1794-TB3 and 1794-TB3S



(1794-TB3 shown)

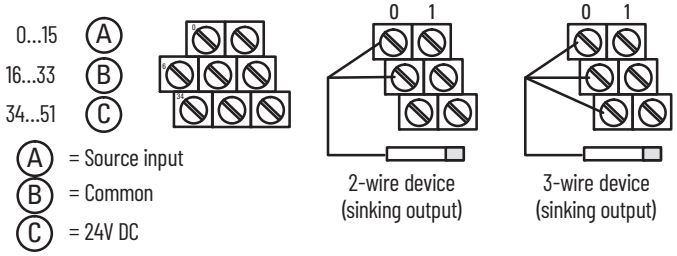
Connect -V DC common to terminal B-16
Connect +V DC power to terminal C-34
(Use B-33 and C-51 for daisy chaining to next terminal base unit)
Note: Terminals 35...50 are not used for the 1794-TB2 terminal base

Table 1 - Wiring Connections for the 1794-IV16, 1794-OV16, and 1794-OV16P Modules

Channel	Signal	Power Terminal	Common Terminal[1]
		1794-OV16, 1794-OV16P, 1794-IV16[1]	1794-IV16
0	A-0	C-35	B-17
1	A-1	C-36	B-18
2	A-2	C-37	B-19
3	A-3	C-38	B-20
4	A-4	C-39	B-21
5	A-5	C-40	B-22
6	A-6	C-41	B-23
7	A-7	C-42	B-24
8	A-8	C-43	B-25
9	A-9	C-44	B-26
10	A-10	C-45	B-27
11	A-11	C-46	B-28
12	A-12	C-47	B-29
13	A-13	C-48	B-30
14	A-14	C-49	B-31
15	A-15	C-50	B-32
+V DC	C-34...C-51 are internally connected together.		
Common	B-16...B-33 are internally connected together.		

(1) 2-wire sourcing input devices use the input and common terminals.
3-wire sourcing input devices use the input, common, and power terminals.

Figure 2 - 2-wire and 3-wire Input Wiring for 1794-IV16



Configure Your Input Module

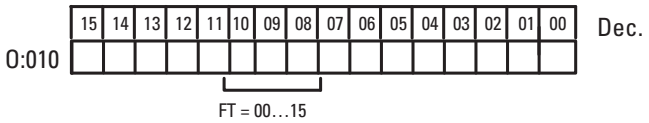
You configure your input module by setting bits in the configuration word (word 3).

Table 2 - Image Table Memory Map for 1794-IV16

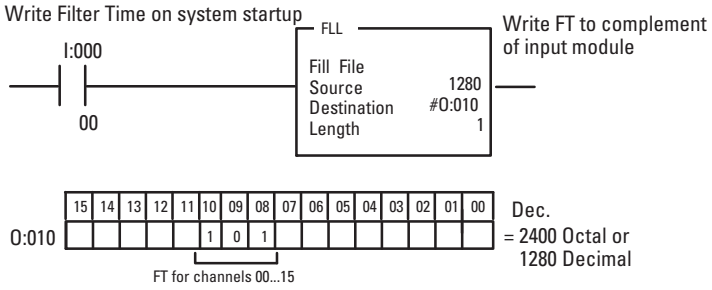
Dec	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Oct	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
Read 0	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1	I0
Read 1	C = Counter Input value of input 15															
Write 1	Not used		CF	CR	NU	Input Filter FT 0...15			Not used							
Where:	I = Input C = Counter value for input 15 FT = Input filter time CR = Counter reset CF = Counter fast - where 1 = Fast input (raw) data; 0 = Standard input filtered data NU = Not used Note: C, CR, and CF are not available when used with any series 1794-ASB or 1794-ASB2 remote I/O adapter.															

Set the Input Filter Time for the 1794-IV16 Module

To set the input filter time, set the associated bits in the output image (complementary word) for the module.



For example, to set a filter time of 8 milliseconds for a DC input module at address rack 1, module group 0, in configuration word 3, set bits 08, 09, and 10 as shown in Table 3.



See Table 3 for additional filter times.

Table 3 - Input Filter Time

Bits			Description	Selected Filter Time
10	09	08	Filter Time for inputs 00...15 (00...17)	
0	0	0	Filter Time 0 (Default)	0.25 ms
0	0	1	Filter Time 1	0.5 ms
0	1	0	Filter Time 2	1 ms
0	1	1	Filter Time 3	2 ms
1	0	0	Filter Time 4	4 ms
1	0	1	Filter Time 5	8 ms
1	1	0	Filter Time 6	16 ms
1	1	1	Filter Time 7	32 ms

Configure Your Output Module

You configure your output module by setting bits in word 1.

Table 4 - Image Table Memory Map for 1794-OV16 and 1794-OV16P

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 0	Not used															
Write 1	015	014	013	012	011	010	09	08	07	06	05	04	03	02	01	00
Where:	0 = Output															

Specifications

Input Specifications – 1794-IV16

Attribute	Value
Number of input	16, nonisolated, sourcing
On-state voltage, min	10V DC
On-state voltage, nom	24V DC
On-state voltage, max	31.2V DC
On-state current, min	2.0 mA
On-state current, nom	8.0 mA @ 24V DC
On-state current, max	11.0 mA
Off-state voltage, max	5V DC
Off-state current, min	1.5 mA
Input Impedance, max	4.7 kΩ
Isolation voltage	Tested @ 2121V DC for 1s between user and system No isolation between individual channels
Input filter time(1) Off to On On to Off	 0.25 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms 0.25 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms 0.25 ms default – Selectable using configuration word 3
Flexbus current	30 mA
Power dissipation, max	5.7 W @ 31.2V DC
Thermal dissipation, max	19.4 BTU/hr @ 31.2V DC
Indicators (field side indication, customer device driven)	16 yellow status indicators

(1) Input off-to-on filter time is the time from a valid input signal to recognition by the module. Input on-to-off filter time is the time from the input signal dropping below the valid level to recognition by the module

Output Specifications – 1794-OV16, 1794-OV16P

Attribute	Value
Number of outputs	16, nonisolated, sinking
On-state voltage, min	10V DC
On-state voltage, nom	24V DC
On-state voltage, max	31.2V DC
Output current rating	8.0 A (16 outputs @ 0.5 A)
Off-state voltage, max	31.2V DC
On-state current, min	1 mA per channel
On-state current, max	500 mA per channel
Surge current	2 A for 50 ms, repeatable every 2 s
Off-state leakage, max	0.5 mA
On-state voltage drop, max	0.2V DC
Isolation voltage	Tested @ 2121V DC for 1s between user and system No isolation between individual channels
Output signal delay(1) Off to On, max On to Off, max	 0.5 ms 1.0 ms
Flexbus current	80 mA
Power dissipation, max	4.2 W @ 31.2V DC

Output Specifications – 1794-OV16, 1794-OV16P (Continued)

Attribute	Value
Thermal dissipation, max	14.3 BTU/hr @ 31.2V DC
Indicators (field side indication, logic driven)	16 yellow status indicators
Fusing	Module outputs are not fused. Fusing is recommended. If fusing is desired, you must provide external fusing. Use SAN-O MQ4-800 800 mA fuses - **1794-OV16** Outputs are electronically protected - **1794-OV16P**

(1) The time from the receipt of an On or Off command to the output actually turning On or Off.

General Specifications

Attribute	Value
Recommended terminal base unit	1794-TB3, 1794-TB3K, 1794-TB3S, 1794-TB3SK
Terminal base screw torque	Determined by the installed terminal base
Keyswitch position	2
External DC power supply voltage, nom	24V DC
External DC power voltage range	10...31.2V DC (includes 5% AC ripple) See derating curve for 1794-IV16 (Figure 3)
External DC power supply current	49 mA @ 24V DC (21...65 mA) – **1794-OV16, 1794-OV16P**
Wiring category[1]	2
Wire size	Determined by the installed terminal base
Dimensions, approx. (H x W x D) (with module installed)	94 x 94 x 69 mm (3.7 x 3.7 x 2.7 in.)
Weight, approx.	90 g (3.17 oz.) – **1794-IV16** 77 g (2.72 oz.) – **1794-OV16** 81 g (2.86 oz.) – **1794-OV16P**
Enclosure type rating	None (open-style)
North American temp code	T3C – **1794-IV16** T4A – **1794-OV16, 1794-OV16P**
UKEX/ATEX temp code	T3 – **1794-IV16** T4 – **1794-OV16, 1794-OV16P**
IECEx temp code	T3 – **1794-IV16** T4 – **1794-OV16, 1794-OV16P**

(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...+55 °C (-4...+131 °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 Damp Heat): 5...95% noncondensing
Vibration	IEC 60068-2-6 (Test Fc, Operating): 5 g @ 10...500 Hz
Shock, operating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 30 g
Shock, nonoperating	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 50 g
Emissions	IEC 61000-6-4
ESD immunity	IEC 61000-4-2: 4 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...6000 MHz
EFT/B immunity	IEC 61000-4-4: ±2 kV at 5 kHz on signal ports
Surge transient immunity	IEC 61000-4-5: ±1kV line-earth(CM) on shielded ports ±1kV line-line(DM) and ±2kV line-earth(CM) on signal ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz on shielded signal ports

Certifications

Certifications (when product is marked)[1]	Value
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
UK and CE	UK Statutory Instrument 2016 No. 1091 and European Union 2014/30/EU EMC Directive, compliant with: EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61131-2; Programmable Controllers EN 61000-6-4; Industrial Emissions UK Statutory Instrument 2012 No. 3032 and European Union 2011/65/EU RoHS, compliant with: EN 63000; Technical documentation
Ex	UK Statutory Instrument 2016 No. 1107 and European Union 2014/34/EU ATEX Directive, compliant with: EN IEC 60079-0; General Requirements EN IEC 60079-7; Potentially Explosive Atmospheres, Protection "e" II 3 G Ex ec IIC T4 Gc – **1794-OV16, 1794-OV16P** II 3 G Ex ec IIC T3 Gc – **1794-IV16** DEMKO 14 ATEX 1342501X UL22UKEX2378X
IECEx	IECEx System, compliant with: IEC 60079-0; General Requirements IEC 60079-7; Explosive Atmospheres, Protection "e" Ex ec IIC T4 Gc – **1794-OV16, 1794-OV16P** Ex ec IIC T3 Gc – **1794-IV16** IECEx UL 14.0066X
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
Morocco	Arrêté ministériel n° 6404-15 du 29 ramadan 1436
CCC	CNCA-C23-01 强制性产品认证实施规则 防爆电气 CNCA-C23-01 CCC Implementation Rule Explosion-Proof Electrical Products 2020122309111829

(1) See the Product Certification link at rok.auto/certifications for Declaration of Conformity, Certificates, and other certification details.

Figure 3 - Derating Chart for 1794-IV16 Module