



FLEX I/O Digital Input Modules

1794-IB8, -IB16, -IB16K and -IB32

(Modules with a K in the last position of the catalog number are conformally coated to meet noxious gas requirements of ISA/ANSI-71.040 1985 Class G3 Environment.)

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at <http://www.ab.com/manuals/gi>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

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.



IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:



- identify a hazard
- avoid a hazard
- recognize the consequence

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 enclosure. 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.

WARNING



When you insert or remove the module while 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.

ATTENTION



FLEX I/O is grounded through the DIN rail to chassis ground. Use zinc plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN rail materials (e.g. aluminum, plastic, etc.) that can corrode, oxidize, or are poor conductors, can result in improper or intermittent grounding.

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.

European Hazardous Location Approval

The following input modules are European Zone 2 approved: 1794-IB8, -IB16 and -IB16K.

European Zone 2 Certification (The following applies when the product bears the EEx Marking)

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

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.



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 when applied in Class I, Zone 2 environments.
- 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 shall be used within its specified ratings defined by Allen-Bradley.
- 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

North American Hazardous Location Approval

The following input modules are North American Hazardous Location approved: 1794-IB8, -IB16, -IB16K and -IB32.

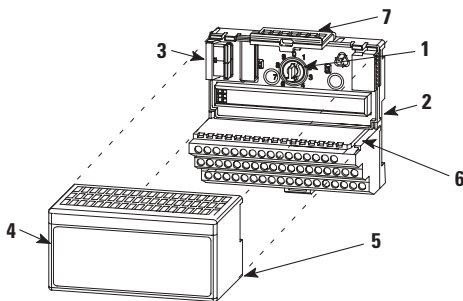
The following information applies when operating this equipment in hazardous locations:		Informations sur l'utilisation de cet équipement en environnements dangereux :	
<p>Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and 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>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>	
WARNING 	EXPLOSION HAZARD <ul style="list-style-type: none"> 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. 	AVERTISSEMENT 	RISQUE D'EXPLOSION <ul style="list-style-type: none"> 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 I, Division 2. S'assurer que l'environnement est classé non dangereux avant de changer les piles.

Compatibility

The following communication adapters are required to ensure compatibility with the 1794-IB32:

Remote I/O	1794-ASB series E or later 1794-ASB2 series D or later
ControlNet™	1794-ACN15 series C, firmware revision 4.1 or later 1794-ACNR15 series C, firmware revision 4.1 or later
Ethernet™	1794-AENT series A, firmware revision 2.4 or later
PROFIBUS™	1794-APB series A, version 1.1 of the GSD file (you can download the GSD file at www.ab.com/networks/gsd)
ControlLogix™ Family	RSLogix5000 programming software, version 11 or later

Installing Your Digital Input Module



The module mounts on a 1794 terminal base.

ATTENTION



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

1. Rotate the keyswitch (1) on the terminal base (2) clockwise to position 2 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 the pins on the bottom of the module are straight so they will align properly with the connector in the terminal base.

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.

Connecting Wiring for the 1794-IB8, -IB16 and -IB16K using a 1794-TB3 or -TB3S

1. Connect individual input wiring to numbered terminals on the 0-15 row (A) as indicated in the table below.
2. Connect the associated +V dc power lead of the input device to the corresponding terminal on the 34-51 row (C) for each input as indicated in the table below. (The +V power terminals of row (C) are internally connected together.)
3. Connect the associated input common (3-wire devices only) to the corresponding terminal on the 16-33 row (B) for each input as indicated in the table below. (Commons are internally connected together.)
4. Connect +V dc power to terminal 34 on the 34-51 row (C).
5. Connect dc common to terminal 16 on the 16-33 row (B).
6. 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.
7. 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.

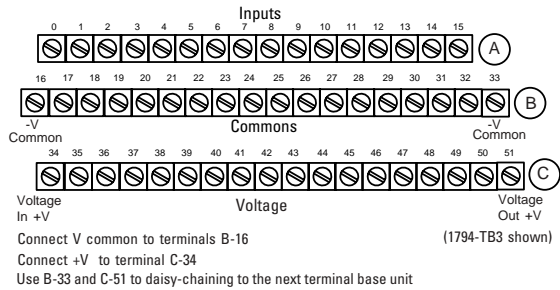
Wiring Connections for 1794-IB8, -IB16 and -IB16K (use with 1794-TB3 or -TB3S Terminal Base Units)

Input ¹	Input Terminal	Voltage Terminal	Common Terminal ²
Input 0	A-0	C-35	B-17
Input 1	A-1	C-36	B-18
Input 2	A-2	C-37	B-19
Input 3	A-3	C-38	B-20
Input 4	A-4	C-39	B-21
Input 5	A-5	C-40	B-22
Input 6	A-6	C-41	B-23
Input 7	A-7	C-42	B-24
Input 8	A-8	C-43	B-25
Input 9	A-9	C-44	B-26
Input 10	A-10	C-45	B-27
Input 11	A-11	C-46	B-28
Input 12	A-12	C-47	B-29
Input 13	A-13	C-48	B-30
Input 14	A-14	C-49	B-31
Input 15	A-15	C-50	B-32
+V dc	C-34 thru C-51		
Common	B-16 thru B-33		

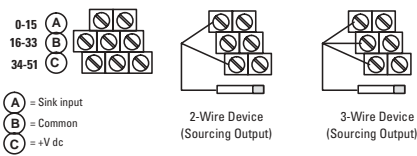
¹1794-IB8 - Inputs 0 thru 7; 1794-IB16, -IB16K - Inputs 0 thru 15

² 3-wire devices use input, supply and common; 2-wire devices use input and supply

1794-TB3 and -TB3S Terminal Base Wiring for 1794-IB8, -IB16 and -IB16K



2 and 3-Wire Input Wiring for 1794-IB8, -IB16 and -IB16K



Connecting Wiring for the 1794-IB32 using a 1794-TB32 or -TB32S

1. Connect individual input wiring (IN0 to IN15) to numbered terminals on the 0-15 row (A) as indicated in the table below.
2. Connect the associated power to the +V1 terminal (35, 37, 39 or 41) on the 34-51 row (C) as indicated in the table below.
3. Connect the associated common for IN0 to IN15 to COM1 (terminal 36, 38, 40 or 42) on the 34-51 row (C) as indicated in the table below.
4. Connect individual input wiring (IN16 to IN31) to numbered terminals on the 16-33 row (B) as indicated in the table below.
Do not connect to terminals 16 or 33.

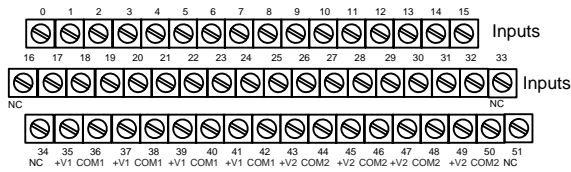
5. Connect the associated power to the +V2 terminal (43, 45, 47 or 49) on the 34-51 row (C) as indicated in the table below.
6. Connect the associated common for IN16 to IN31 to COM2 (terminal 44, 46, 48 or 50) on the 34-51 row (C).
7. If continuing input wiring power for IN0-IN15 to the next terminal base, connect a jumper from terminal 41 (+V1) on this terminal base unit to the power terminal on the next terminal base unit. (Refer to the installation instructions for the specific terminal base unit.
8. If continuing input wiring IN0-IN15 common to the next terminal base, connect a jumper from terminal 42 (COM1) on this terminal base unit to the common terminal on the next terminal base unit.
9. If continuing input wiring power for IN16-IN31 to the next terminal base, connect a jumper from terminal 49 (+V2) on this terminal base unit to the power terminal on the next terminal base unit. (Refer to the installation instructions for the specific terminal base unit.
10. If continuing input wiring IN16-IN31 common to the next terminal base, connect a jumper from terminal 50 (COM2) on this terminal base unit to the common terminal on the next terminal base unit.

Wiring for 1794-IB32 (use with 1794-TB32 or -TB32S Terminal Base Unit)

Input	Signal	Input	Signal
IN 0	A-0	IN 16	B-17
IN 1	A-1	IN 17	B-18
IN 2	A-2	IN 18	B-19
IN 3	A-3	IN 19	B-20
IN 4	A-4	IN 20	B-21
IN 5	A-5	IN 21	B-22
IN 6	A-6	IN 22	B-23
IN 7	A-7	IN 23	B-24
IN 8	A-8	IN 24	B-25
IN 9	A-9	IN 25	B-26
IN 10	A-10	IN 26	B-27
IN 11	A-11	IN 27	B-28
IN 12	A-12	IN 28	B-29
IN 13	A-13	IN 29	B-30
IN 14	A-14	IN 30	B-31
IN 15	A-15	IN 31	B-32
+V1 dc power ¹ (inputs IN0-IN15)	Power terminals 35, 37, 39 and 41 for IN0-IN15. +V1 connected to terminals 35, 37, 39 and 41		
Com1 dc Return (inputs IN0-IN15)	Common terminals 36, 38, 40 and 42 for IN0-IN15. V1 Return connected to terminals 36, 38, 40 and 42		
+V2 dc power (inputs IN16-IN31)	Power terminals 43, 45, 47 and 49 for IN16-IN31. +V2 connected to terminals 43, 45, 47 and 49		
Com2 dc Return (inputs IN16-IN31)	Common terminals 44, 46, 48 and 50 for IN16-IN31. V2 Return connected to terminals 44, 46, 48 and 50		

¹2-wire input devices use signal and supply terminals; 3-wire devices use signal, return and supply terminals

1794-TB32 or -TB32S Terminal Base Wiring for the 1794-IB32



+V1 = Terminals 35, 37, 39 and 41 (1794-TB32 shown)
 +V2 = Terminals 43, 45, 47 and 49
 COM1 = Terminals 36, 38, 40 and 42
 COM2 = Terminals 44, 46, 48 and 50
 NC = No connections (terminals 16, 33, 34 and 51)

Configuring Your Input Module

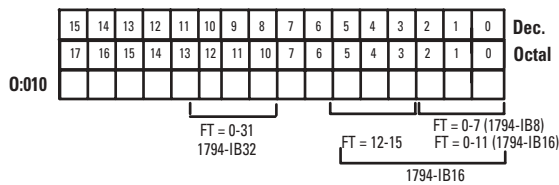
Configure your input module by setting bits in the configuration word (write word).

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 1 (-IB16, -IB32)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Read 1 (-IB8)	Not used								I	I	I	I	I	I	I	I
Read 2 (-IB16)	C = Counter Input value of input 15															
Read 2 (1794-IB32)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Write 1 (-IB8)	Not used								Input Filter 0-07							
Write 1 (-IB16)	Not used		CF	CR	Not used						Input Filter 12-15		Input Filter 0-11			
Write 1 (1794-IB32)	Not used				Input Filter FT 0-31				Not used							

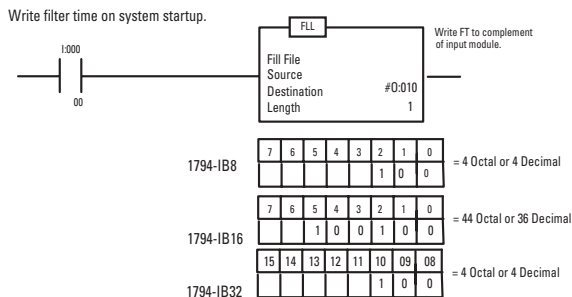
Where I = Input
 D = Diagnostic data (1794-IB8S only)
 C = Counter value for input 15
 FT = Input filter time
 CR = Counter reset
 CF = Counter fast - where 1 = fast input (raw data), 0 = standard input filtered data
 NOTE: C, CR and CF not available when used with any series 1794-ASB or 1794-ASB2 remote I/O adapter modules.

Setting the Input Filter Time

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



For example, to increase the off-to-on filter time to 4ms for all inputs at address rack 1, module group 0, (using 1794-IB32 as an example), set bits and program as shown below.



Refer to the Input Filter time chart below for other bit settings.

Input Filter Time

Bits	Description - Filter Time	Filter Time
02 01 00	Inputs 0 thru 07 (-IB8)	1794-IB8, -IB16, -IB16K, -IB32
02 01 00	Inputs 0 thru 11 (-IB16, -IB16K)	
05 04 03	Inputs 12 thru 15 (-IB16, -IB16K)	
10 09 08	Inputs 0 thru 31 (-IB32)	Off to On/On to Off
0 0 0	Filter time 0 (default)	0.25ms
0 0 1	Filter time 1	0.5ms
0 1 0	Filter time 2	1ms
0 1 1	Filter time 3	2ms
1 0 0	Filter time 4	4ms
1 0 1	Filter time 5	8ms
1 1 0	Filter time 6	16ms
1 1 1	Filter time 7	32ms

Specifications

Specifications - 24V dc 8 Input Module, Cat. No. 1794-IB8

Number of Inputs	8, nonisolated, sinking
Module Location	Cat. No. 1794-TB3, -TB3S Terminal Base Unit
On-state Voltage	10V dc minimum 24V dc nominal 31.2V dc maximum
On-state Current	2.0mA minimum 8.0mA nominal at 24V dc 12.0mA maximum
Off-state Voltage	5.0V dc maximum
Off-state Current	1.5mA minimum
Input Impedance	4.6K ohms
Isolation Voltage	Tested at 850V dc for 1s between user and system No isolation between individual channels
Flexbus Current	20mA
Power Dissipation	3.5W maximum @ 31.2V dc
Thermal Dissipation	Maximum 11.9 BTU/hr @ 31.2V dc

Specifications - 24V dc 16 Input Module, Cat. No. 1794-IB16 and 1794-IB16K

Number of Inputs	16 (1 group of 16), nonisolated, sinking
Module Location	Cat. No. 1794-TB3, -TB3S Terminal Base Unit
Mounting	Refer to the derating curve.
On-state Voltage	10V dc minimum 24V dc nominal 31.2V dc maximum
On-state Current	2.0mA minimum 8.0mA nominal at 24V dc 12.0mA maximum
Off-state Voltage	5.0V dc maximum
Off-state Current	1.5mA minimum
Input Impedance	4.6K ohms
Isolation Voltage	Tested at 850V dc for 1s between user and system No isolation between individual channels
Flexbus Current	30mA
Power Dissipation	6.1W maximum @ 31.2V dc
Thermal Dissipation	Maximum 20.8 BTU/hr @ 31.2V dc

Specifications - 24V dc 32 Input Module, Cat. No. 1794-IB32

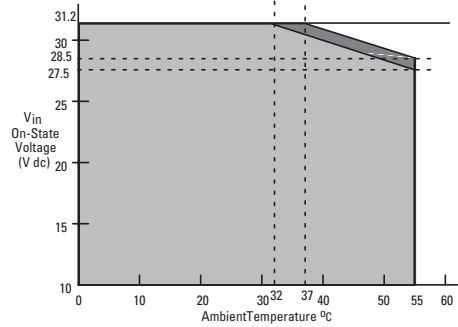
Number of Inputs	32 (2 groups of 16), nonisolated within groups, sinking
Module Location	Cat. No. 1794-TB32, -TB32S Terminal Base Unit
On-state Voltage	19.2V dc minimum 24V dc nominal 31.2V dc maximum
On-state Current	2.0mA minimum 4.1mA nominal at 24V dc 6.0mA maximum
Off-state Voltage	5.0V dc maximum
Off-state Current	1.5mA minimum
Input Impedance	6.0K ohms
Isolation Voltage	Tested to withstand 2121V dc for 1s between input and backplane
Flexbus Current	35mA
Power Dissipation	6.0W maximum @ 31.2V dc
Thermal Dissipation	Maximum 20.5 BTU/hr @ 31.2V dc

General Specifications

Input Filter Time ¹ Off to On On to Off	0.25ms, 0.5ms, 1ms, 2ms, 4ms, 8ms, 16ms, 32ms 0.25ms, 0.5ms, 1ms, 2ms, 4ms, 8ms, 16ms, 32ms 0.25ms default - Selectable using configuration word 3
Terminal Base Screw Torque	7 pound-inches (0.8Nm)
Dimensions (with module installed)	3.7H x 3.7W x 2.7D inches 94H x 94W x 69D mm
Indicators (field side indication, customer device driven)	1794-IB8 - 8 yellow status indicators 1794-IB16, -IB16K - 16 yellow status indicators 1794-IB32 - 32 yellow status indicators
External dc power Supply voltage Voltage range	24V dc nominal 1794-IB8, -IB16, -IB16K - 10 to 31.2V dc (includes 5% ac ripple) 1794-IB32 - 19.2 to 31.2V dc (includes 5% ac ripple)
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): 0 to 55°C (32 to 131°F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Un-packaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Un-packaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Un-packaged Non-operating Thermal Shock): -40 to 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Un-packaged Non-operating Damp Heat): 5 to 95% non-condensing
Vibration	IEC60068-2-6 (Test Fc, Operating): 5g @ 10-500Hz
Shock	IEC60068-2-27 (Test Ea, Unpackaged shock): Operating 30g Non-operating 50g
Emissions	CISPR 11: Group 1, Class A (with appropriate enclosure)
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
EFT/B Immunity	IEC 61000-4-4: ±2kV at 5kHz on signal ports
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: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 30MHz
Enclosure Type Rating	None (open-style)
Conductors Wire Size Category ²	12AWG (4mm ²) stranded copper wire rated at 75°C or higher 3/64 inch (1.2mm) insulation maximum 2
Certifications (when product is marked) ³	UL UL Listed Industrial Control Equipment (all) cULus UL Listed Industrial Control Equipment, certified for US and Canada (1794-IB32) cULus UL Listed for Class I, Division 2, Groups A, B, C and D Hazardous locations certified for US and Canada (1794-IB16, -IB16K, -IB32) CSA CSA certified for Class I, Division 2, Groups A, B, C and D Hazardous locations (1794-IB8, -IB16, -IB16K) EEx³ European Union 94/9/EEC ATEX Directive, compliant with: EN 50021; Potentially Explosive Atmospheres, Protection "n" (Zone 2) - (1794-IB8, -IB16, -IB16K) CE³ European Union 89/336/EEC EMC Directive, compliant with: EN 61000-6-4; Industrial Emissions EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity (all) C-Tick³ - Australian Radiocommunications Act compliant with AS/NZS CISPR 11, Industrial Emissions (all)

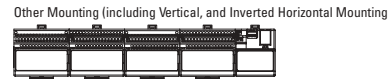
1 Input off-to-on filter time is the time from a valid input signal to recognition by the module. Input on-to-off filter time is time from the input signal dropping below the valid level to recognition by the module.
2 You use this category information for planning conductor routing as described in Allen-Bradley publication 1770-4.1, Industrial Automation Wiring and Grounding Guidelines.
3 For the latest up-to-date information, see the Product Certification link at www.ab.com for Declarations of Conformity, Certificates and other certification details. For notification of any additional release notes, refer to www.ab.com/manuals/.

Derating Chart for the 1794-IB16 and -IB16K



The area within the curve represents the safe operating range for the module under various conditions of user supplied 24V dc supply voltages and ambient temperature.

■ = Normal mounting safe operating range, (includes □).
□ = Other mounting positions (including inverted horizontal) safe operating range



Voltage (max.)	Temperature (max.)		Voltage (max.)	Temperature (max.)	
	Normal	Other		Normal	Other
31.2	37	32	29.0	51	45
30.5	41	36	28.5	48	48
30.0	45	39	28.0	55	51
29.5	48	42	27.5	55	55

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