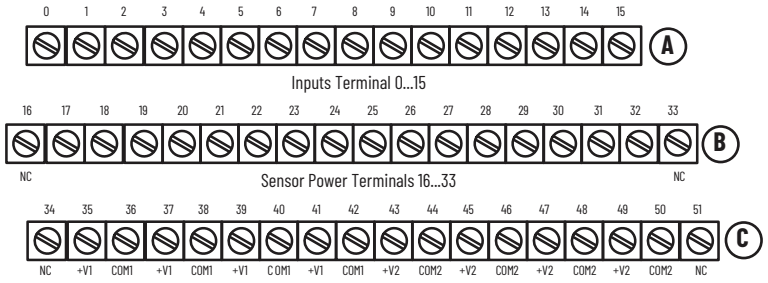
Connect Wiring for the 1794-IB16D and 1794-IB16DK Modules

1. Connect individual input wiring to numbered terminals on the 0…15 row (A) as indicated in Table 1.
2. Connect the associated channel sensor power wiring to numbered terminals on the 16…33 row (B) as indicated in Table 1.
3. Connect the associated sensor common (3-wire devices only) to the corresponding terminal on the 34…51 row (C) as indicated in Table 1.
4. Connect the user power (+) voltage to the +V2 DC power lead terminal on the 34…51 row (C) as indicated in Table 1.
   The +V2 DC power terminals of row (C) are internally connected together.
5. Connect the user common to the associated COM terminal on the 34…51 row (C) as indicated in Table 1.
6. If daisy chaining input wiring power to the next terminal base, connect a jumper from terminal 49 (+V2 DC) on this base unit to the power terminal on the next base unit.
7. If continuing input wiring common to the next base unit, connect a jumper from terminal 50 (common) on this base unit to the common terminal on the next base unit.
8. COM1 and COM2 terminals on the 34…51 row (C) are connected together in the 1794-IB16D and 1794-IB16DK modules.
9. +V1 terminals on the 34…51 row (C) are not used in the 1794-IB16D and 1794-IB16DK modules.

1794-TB32, 1794-TB32K, 1794-TB32S, and 1794-TB32SK Terminal Base Wiring for 1794-IB16D and 1794-IB16DK



(1794-TB32 shown)

COM1 = Terminals C-36, C-38, C-40, and C-42
COM2 = Terminals C-44, C-46, C-48, and C-50
NC = No connections (terminals B-16, B-33, C-34, and C-51)
+V1 = Terminals C-35, C-37, C-39, and C-41
+V2 = Terminals C-43, C-45, C-47, and C-49
Voltage applied to Inputs (terminals A-0…A-15) and Sensor power (terminals B-16…B-33)

Table 1 - Wiring Connections for the 1794-IB16D and 1794-IB16DK Input Modules

Input	Input Terminal	Sensor Power Terminal
IN 00	A-0	B-17
IN 01	A-1	B-18
IN 02	A-2	B-19
IN 03	A-3	B-20
IN 04	A-4	B-21
IN 05	A-5	B-22
IN 06	A-6	B-23
IN 07	A-7	B-24
IN 08	A-8	B-25
IN 09	A-9	B-26
IN 10	A-10	B-27
IN 11	A-11	B-28
IN 12	A-12	B-29
IN 13	A-13	B-30
IN 14	A-14	B-31
IN 15	A-15	B-32
+V1 DC power	Power terminals C-35, C-37, C-39, and C-41 (power terminals are internally connected together in the module)	
+V2 DC power	Power terminals C-43, C-45, C-47, and C-49 (power terminals are internally connected together in the module)	
COM1 DC return	Common terminals C-36, C-38, C-40, and C-42 (common terminals are internally connected together in the module)	
COM2 DC return	Common terminals C-44, C-46, C-48, and C-50 (common terminals are internally connected together in the module)	

Diagnostics

See the following configuration for the location of diagnostic bits.

Note: Each unused sensor port requires a dummy resistor to mask the channel diagnostic function.

Table 3 - Diagnostic Functions for 1794-IB16D and 1794-IB16DK

Ext. Power	Wiring	Input Status	Channel LED Status	Open Wire Error Bit	Short Error Bit	Rev. Error Bit	Module Error Bit/LED
OFF	Open	Off	Off	0	0	0	0/OFF
		On	Off	0	0	0	0/OFF
	Short	Off	Off	0	0	0	0/OFF
		On	Off	0	0	0	0/OFF
	Normal	Off	Off	0	0	0	0/OFF
		On	Off	0	0	0	0/OFF
ON	Open	Off	RED	1	0	0	1/RED
		On	RED/YEL	1	0	0	1/RED
	Short	Off	RED	0	1	0	1/RED
		On	RED/YEL	0	1	0	1/RED
	Normal	Off	Off	0	0	0	0/OFF
		On	YEL	0	0	0	0/OFF
REV	Open	Off	Off	0	0	1	1/RED
		On	Off	0	0	1	1/RED
	Short	Off	Off	0	0	1	1/RED
		On	Off	0	0	1	1/RED
	Normal	Off	Off	0	0	1	1/RED
		On	Off	0	0	1	1/RED

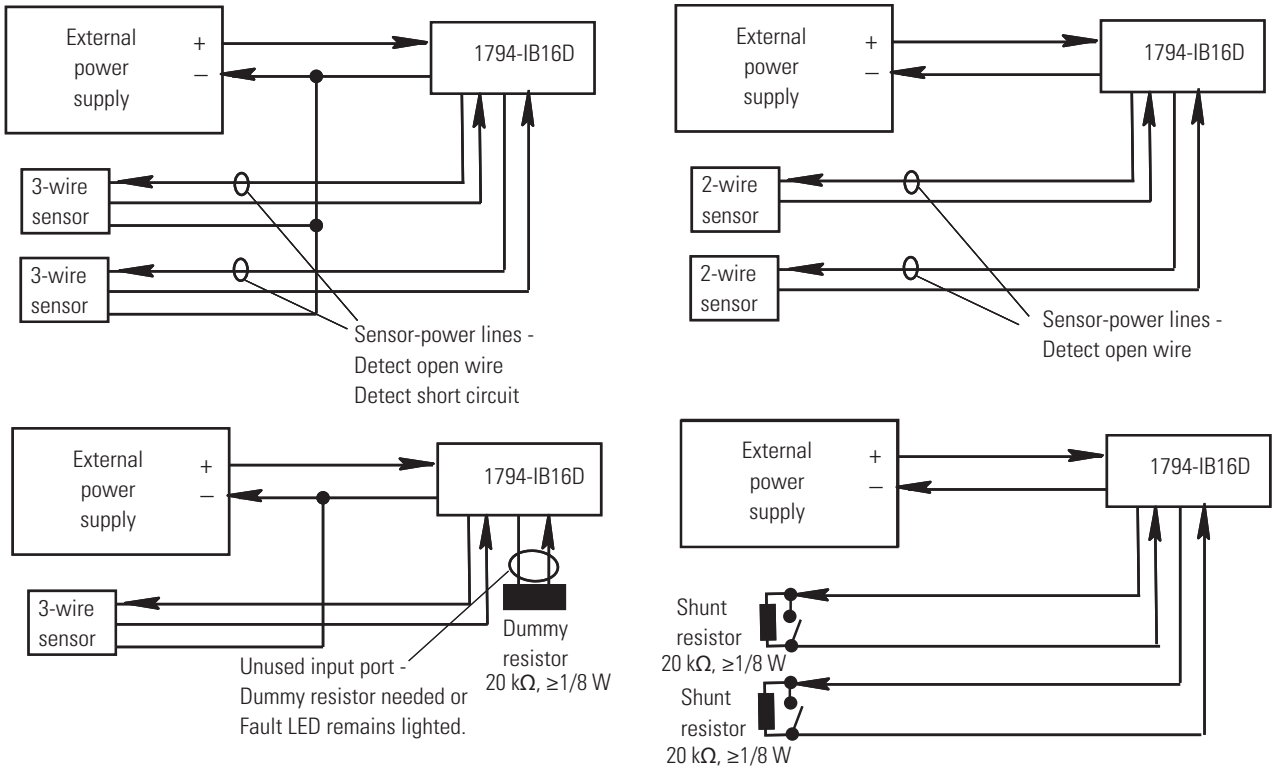
The module monitors each sensor-power port for current and voltage. It turns on the channel red LED and sets (1) the error bit when the module detects a short circuit (no voltage at the sensor-port), and the module detects an open wire (no current at the sensor-port).

Table 4 - Diagnostic Functions for the 1794-OB16D

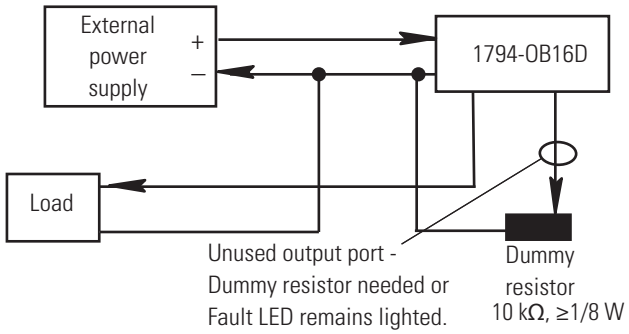
Ext. Power	Wiring	Input Status	Channel LED Status	Open Wire Error Bit	Short Error Bit	Rev. Error Bit	Module Error Bit/LED
OFF	Open	Off	Off	0	0	0	0/OFF
		On	Off	0	0	0	0/OFF
	Short	Off	Off	0	0	0	0/OFF
		On	Off	0	0	0	0/OFF
	Normal	Off	Off	0	0	0	0/OFF
		On	Off	0	0	0	0/OFF
ON	Open	Off	RED	1	0	0	1/RED
		On	YEL	0	0	0	0/OFF
	Short	Off	Off	0	0	0	0/OFF
		On	RED	0	1	0	1/RED
	Normal	Off	Off	0	0	0	0/OFF
		On	YEL	0	0	0	0/OFF
REV	Open	Off	Off	0	0	1	1/RED
		On	Off	0	0	1	1/RED
	Short	Off	Off	0	0	1	1/RED
		On	Off	0	0	1	1/RED
	Normal	Off	Off	0	0	1	1/RED
		On	Off	0	0	1	1/RED

The module monitors each output channel. It turns on the channel red LED and sets (1) the error bit when the module detects a short circuit (the output signal is active at a channel and the corresponding output voltage is low), and the module detects an open wire (the output signal is inactive at a channel and the corresponding output voltage is high).

Sensor Diagram for the 1794-IB16D and 1794-IB16DK Input Modules



Sensor Diagram for the 1794-OB16D Output Module



Configuration

Configuring Your 1794-IB16D and 1794-IB16DK Input Modules

Configure your FLEX™ I/O digital input modules by setting bits in the configuration word (Word 3). These modules are compatible with the remote I/O network with 1794-ASB series E or later, DeviceNet® network, ControlNet® network, and EtherNet/IP™ network. You must use the Module Connection when used in a ControlNet system.

Table 5 - Image Table Memory Map for 1794-IB16D and 1794-IB16DK Modules

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	I15	I14	I13	I12	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1	I0
Read 2													Read Diagnostic Status			
Write 3	Not used					Input Filter FT 0...15			Not used							
Where:	I = Input status FT = Filter Time															
Diagnostic Status	Bit 00 = Module error Bit 01 = External power reverse polarity error Bit 02 = Sensor power short error Bit 03 = Sensor power open wire error															

Setting the Input Filter Time

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

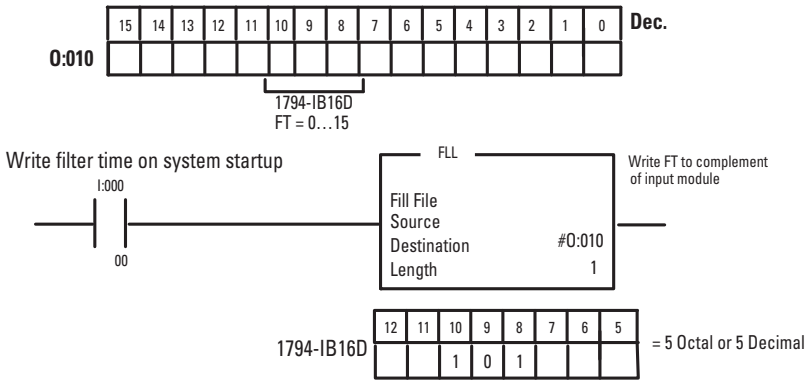


Table 6 - Input Filter Time

Bits			Description	Filter Time
10	**09**	**08**	**Filter Time for inputs 0...15**	**Off-to-On/On-to-Off**
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	1	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

Configuring Your 1794-OB16D Output Module

Configure your output module by setting bits in the configuration word (Word 3). This module is compatible with the remote I/O network, with 1794-ASB, series D or later, DeviceNet network, ControlNet network, and EtherNet/IP network. You can use the Module Connection or Rack Connection when used in a ControlNet system.

Table 7 - Image Table Memory Map for the 1794-OB16D Module

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	Not used												Read Diagnostic Status			
Write 2	015	014	013	012	011	010	09	08	07	06	05	04	03	02	01	00
Where:	0 = Output															
Diagnostic Status	Bit 00 = Module error Bit 01 = External power reverse polarity error Bit 02 = Output short error Bit 03 = Output open wire error															

Specifications

Specifications – 16 Input Module with Diagnostics, 1794-IB16D and 1794-IB16DK
Meets IEC 3 24V DC input specifications

Attribute	Value
Number of inputs	16, current, sinking
Recommended terminal base unit	1794-TB32, 1794-TB32K, 1794-TB32S, 1794-TB32SK
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, max	12.1 mA
Off-state voltage, max	5.0V DC
Off-state current, max	1.5 mA
Nominal input impedance	3.1 kΩ
Isolation voltage	50V (continuous), Basic Insulation Type type tested @ 2121V DC for 2 s, between field side and system No isolation between individual channels
Input filter time(1) Off-to-On On-to-Off	See Setting the Input Filter Time table
Flexbus current	30 mA @ 5V DC
Power dissipation, max	8.5 W @ 31.2V DC
Thermal dissipation, max	29 BTU/hr @ 31.2V DC
Sensor power, voltage drop, max	2.2V DC
Sensor power, current, max	50 mA
Sensor power line, short detect circuit, min	1.0 A (in 10 s)
Sensor power line, open wire detect, max	50 µA
Detect reverse polarity voltage	Min 10V: The module must detect if the reverse polarity external power supply voltage is greater than the value.

(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.

Specifications – 16 Output Module with Diagnostics, 1794-OB16D

Attribute	Value
Number of outputs	16, current, sourcing
Recommended terminal base unit	1794-TB2, 1794-TB2K, 1794-TB3, 1794-TB3K, 1794-TB3S, 1794-TB3SK
Output voltage, min	10V DC
Output voltage, nom	24V DC
Output voltage, max	31.2V DC
Output current rating	8.0 A (16 outputs @ 0.5 A)
On-state current, min	1.0 mA per channel
On-state current, max	500 mA per channel
Surge current	2 A for 50 ms each, repeatable every 2 s
Off-state leakage, max	0.5 mA
Isolation voltage	50V (continuous), Basic Insulation Type type tested at 850V DC for 60 s, between field side and system No isolation between individual channels
Output signal delay(1) Off-to-On On-to-Off	 0.5 ms 0.5 ms
Flexbus current	60 mA @ 5V DC
Power dissipation, max	4.8 W @ 31.2V DC
Thermal dissipation, max	16.4 BTU/hr @ 31.2V DC
Short circuit protect and detection	Thermal shutdown (auto reset) Detection condition: When external power is active, output signal is active, and output port voltage is less than 2V.
Open wire detect off-state leakage current	0.1 mA – When external power is active and output signal is inactive.
Detect reverse polarity voltage	Min 10V: The module must detect if the reverse polarity external power supply voltage is greater than the value.

(1) Delay time is the time from the receipt of an output on or off command to the output actually turning on or off.

General Specifications

Attribute	Value
Terminal base screw torque	Determined by the installed terminal base
Dimensions, approx. (H x W x D)	45.7 x 94 x 53.3 mm (1.8 x 3.7 x 2.1 in.) – 1794-IB16D, 1794-IB16DK 94 x 94 x 91 mm (3.7 x 3.7 x 3.6 in.) – 1794-OB16D
Weight, approx.	90 g (3.17 oz.) – 1794-IB16D, 1794-IB16DK 95 g (3.35 oz.) – 1794-OB16D
Indicators (field side)	16 yellow ON/OFF status indicators 16 red diagnostic status indicators 1 red module fault indicator
External DC power supply voltage, nom	24V DC
External DC power voltage range	10...31.2V DC (includes 5% AC ripple)
North American temp code	T3C
Keyswitch position	2
Enclosure type rating	None (open-style)
Wire size	Determined by the installed terminal base
Wiring category[1]	2 - on signal ports

(1) Use this conductor category information for planning conductor routing as described in Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications

Attribute	Value
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 °C ≤ Ta ≤ 55 °C (32 °F ≤ Ta ≤ 131 °F)
Temperature, surrounding air, max	55 °C (131 °F)
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...+85 °C (-40...+185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged 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 1V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity	IEC 61000-4-4: ±2 kV @ 5 kHz on power ports ±2 kV @ 5 kHz on signal ports
Surge transient immunity	IEC 61000-4-5: ±1 kV line-line(DM) and ±2 kV 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

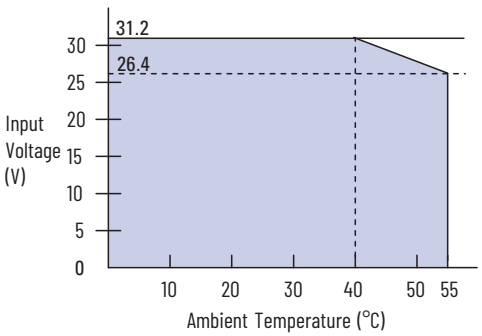
Certifications

Certifications (when product is marked)[1]	Value
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E322657. UL Listed for Class I Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E334470.
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 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) UK Statutory Instrument 2012 No. 3032 and European Union 2011/65/EU RoHS, compliant with: EN 63000; Technical documentation
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
RCM	Australian Radiocommunications Act, compliant with: EN 61000-6-4; Industrial Emissions
Morocco	Arrêté ministériel n° 6404-15 du 29 ramadan 1436

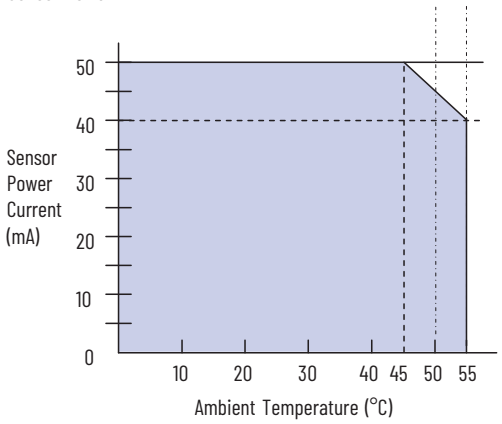
(1) See the Product Certification link at rok.auto/certifications for Declarations of Conformity, Certificates, and other certification details.

Derating Curves

1794-IB16D and 1794-IB16DK Input Voltage



Sensor Power



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.

Additional Resources

For more information on the products that are described in this publication, use these resources. You can view or download publications at rok.auto/literature.

Resources	Description
FLEX I/O and FLEX I/O-XT Selection Guide, publication 1794-SG002	Provides information on how to select FLEX I/O and FLEX I/O-XT™ adapters, terminal bases, I/O modules, and accessories.
FLEX I/O Diagnostic Modules User Manual, publication 1794-UM061	Provides information on installation, setting, and reading your diagnostics on the 1794-IB16D and the 1794-OB16D diagnostic modules.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.