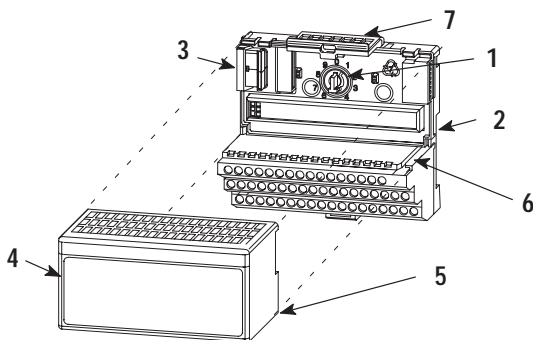




Installation Instructions

24V dc FLEX I/O 2 Channel Very High Speed Counter Module Cat. No. 1794-VHSC



English

Note: This module must be used with 1794-ACN15 or 1794-ACNR15 series B or later ControlNet adapters in ControlNet systems.

Module Installation

This module mounts on a 1794 terminal base unit.

1. Rotate keyswitch (1) on terminal base unit (2) clockwise to position 1 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/adapter. **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.
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.



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.

European Union Directive Compliance

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2 EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the following Allen-Bradley publications:

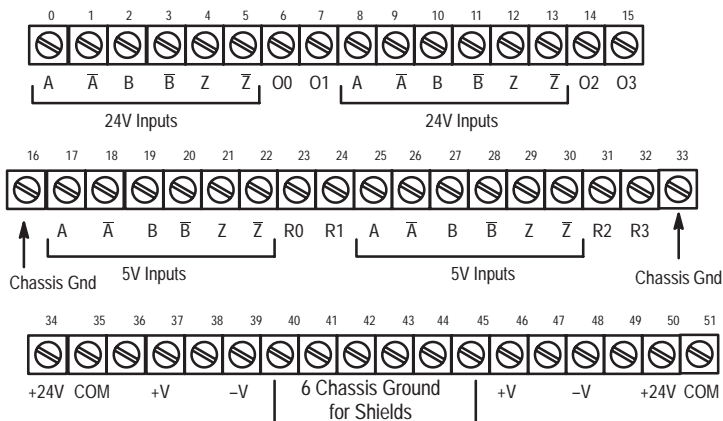
- Industrial Automation Wiring and Grounding Guidelines For Noise Immunity, publication 1770-4.1
- Automation Systems Catalog, publication B111

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

Connecting Wiring to a 1794-TB3G or 1794-TB3GS Terminal Base

Connect wiring to the terminal base as shown below.

Connections for Terminal Base 1794-TB3G shown



Where:

- A, \bar{A} – incremental encoder input A (+5 or +24V dc)
- B, \bar{B} – incremental encoder input B (+5 or +24V dc)
- Z, \bar{Z} – incremental encoder input Z (+5 or +24V dc)
- O = sourcing outputs
- R = returns for sourcing outputs
- +V = +5 or +24V dc isolated power externally supplied for outputs (1A max.)
- V = negative isolated power connection (1A max.)
- +24V dc = 24V dc terminal base power for module
- COM = return for +24V dc terminal base power for module
- Chassis Gnd = chassis ground for input or output cable shields



ATTENTION: To reduce susceptibility to noise, power the high speed counter module and digital modules from separate power supplies. Do not exceed a length of 33 ft (10m) for dc power cabling.

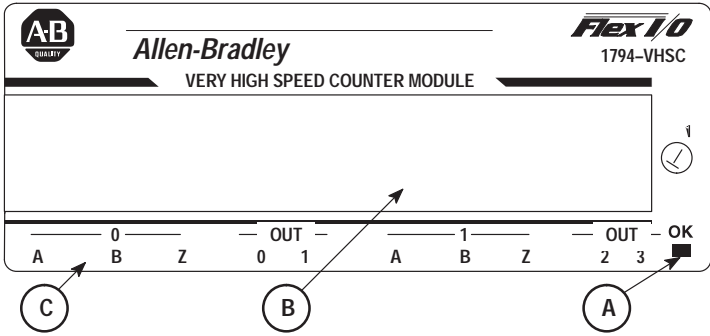


ATTENTION: Do not daisy chain power or ground from this terminal base unit to any ac or dc digital module terminal base units.



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

Indicators



A = Power/status indicator – indicates power applied to module and status of module.

B = Insertable label for writing individual I/O assignments.

C = Status Indicators –

A = Status of input A

B = Status of input B

Z = Status of gate input Z

OUT = Status of individual output

Input Image

Bit→	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word↓	Read															
0	Channel 0 Current Count (least significant word)															
1	Channel 0 Current Count (most significant word)															
2	Channel 1 Current Count (least significant word)															
3	Channel 1 Current Count (most significant word)															
4	Channel 0 Stored/Accumulated Count (least significant word)															
5	Channel 0 Stored/Accumulated Count (most significant word)															
6	Channel 1 Stored/Accumulated Count (least significant word)															
7	Channel 1 Stored/Accumulated Count (most significant word)															
8	PE	FP	NR	TF	OS ₃	OS ₂	OS ₁	OS ₀	C1	C0	ZF	ZS	C1	C0	ZF	ZS

Where: PE = Programming error (error code in bits 11:0)

FP = Field power (24V dc power lost)

NR = Not ready (configuring field programmable gate array FPGA)

TF = Test fail flag = 1 (indicating failure during powerup) red indicator on.

Code in bits 2:0 indicate fail code (1 = RAM; 2 = ROM; 3 = EEPROM; 4 = FPGA)

Test flag = 1 with red indicator blinking, upper byte of counter control word is non-zero
– in production test mode.

OS = Output status (current state of output)

C1, C0 = Stored data count

ZF = Zero frequency detected

ZS = Z input status

Output Image

Bit⇒	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word↓	Write															
0	Reserved for Test								0	VR	CP	CR	0	VR	CP	CR
									1	1	1		0	0	0	0
1	0	LC	OE	FO	0	LC	OE	FO	0	LC	OE	FO	0	LC	OE	FO
		3	3	3		2	2	2		1	1	1		0	0	0
2	Channel 0 PWM Output Value (0-95.00%)															
3	Channel 1 PWM Output Value (0-95.00%)															

Where: VR☐ = Value reset of stored/accumulated count (channel)
 CP☐ = Counter preset (channel)
 CR☐ = Counter reset (channel)
 LC☐ = Local control (channel) – outputs remain under control when flexbus is unpowered
 – 1 = enabled.
 OE☐ = Output enable (channel) – permitting output to be turned on from FO, compare
 match or PWM – 1 = enabled
 FO☐ = Force output (channel) – 1 = on
 PWM = Pulse width modulation (0-9500 decimal)

Configuration Image

Bit⇒	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word↓	Write															
0	Counter Configuration															
1	Filter Selection															
2	Time Base Value/PWM Period															
3	Channel 0 Gate Interval															
4	Channel 1 Gate Interval															
5	Reserved															
6	Channel 0 Rollover Value (least significant word)															
7	Channel 0 Rollover Value (most significant word)															
8	Channel 1 Rollover Value (least significant word)															
9	Channel 1 Rollover Value (most significant word)															
10	Channel 0 Preset Value (least significant word)															
11	Channel 0 Preset Value (most significant word)															
12	Channel 1 Preset Value (least significant word)															
13	Channel 1 Preset Value (most significant word)															

Bit→	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word↓	Write															
14	Channel 0 Scaler															
15	Channel 1 Scaler															
16	0	0	0	0	0	0	0	0	S4	S3	S2	S1	F4	F3	F2	F1
17	0	0	0	0	0	0	0	0	S4	S3	S2	S1	F4	F3	F2	F1
18	0	0	0	0	0	0	0	0	S4	S3	S2	S1	F4	F3	F2	F1
19	0	0	0	0	0	0	0	0	S4	S3	S2	S1	F4	F3	F2	F1
20	First Counter 1st ON Value (least significant word)															
21	First Counter 1st ON Value (most significant word)															
22	First Counter 1st OFF Value (least significant word)															
23	First Counter 1st OFF Value (most significant word)															
24	First Counter 2nd ON Value (least significant word)															
25	First Counter 2nd ON Value (most significant word)															
26	First Counter 2nd OFF Value (least significant word)															
27	First Counter 2nd OFF Value (most significant word)															
28	First Counter 3rd ON Value (least significant word)															
29	First Counter 3rd ON Value (most significant word)															
30	First Counter 3rd OFF Value (least significant word)															
31	First Counter 3rd OFF Value (most significant word)															
32	First Counter 4th ON Value (least significant word)															
33	First Counter 4th ON Value (most significant word)															
34	First Counter 4th OFF Value (least significant word)															
35	First Counter 4th OFF Value (most significant word)															
36	Second Counter 1st ON Value (least significant word)															
37	Second Counter 1st ON Value (most significant word)															
38	Second Counter 1st OFF Value (least significant word)															
39	Second Counter 1st OFF Value (most significant word)															
40	Second Counter 2nd ON Value (least significant word)															
41	Second Counter 2nd ON Value (most significant word)															
41	Second Counter 2nd OFF Value (least significant word)															
43	Second Counter 2nd OFF Value (most significant word)															
44	Second Counter 3rd ON Value (least significant word)															

8 24V dc FLEX I/O 2 Channel Very High Speed Counter Module

Bit⇒	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word⇓	Write															
45	Second Counter 3rd ON Value (most significant word)															
46	Second Counter 3rd OFF Value (least significant word)															
47	Second Counter 3rd OFF Value (most significant word)															
48	Second Counter 4th ON Value (least significant word)															
49	Second Counter 4th ON Value (most significant word)															
50	Second Counter 4th OFF Value (least significant word)															
51	Second Counter 4th OFF Value (most significant word)															
52	Counter Control Safe State															
53	Output Control Safe State															
54	Channel 0 PWM Safe State															
55	Channel 1 PWM Safe State															

Counter Configuration/Mode (Configuration Word 0)

Bit⇒	7	6	5	4	3	2	1	0	Counter 0
Bit⇒	15	14	13	12	11	10	9	8	Counter 1
	Mode				Configuration				Description
					0	0	0	0	Counter
					0	0	0	1	Encoder X1
					0	0	1	0	Encoder X2
					0	0	1	1	PWM
					0	1	0	0	Encoder X4
					0	1	0	1	Period/Rate
					0	1	1	0	Continuous/Rate
					0	1	1	1	Rate Measurement
		0	0	0					Store count disabled
		0	0	1					Mode 1 – Store/Continue
		0	1	0					Mode 2 – Store;Wait/Resume
		0	1	1					Mode 3 – Store;Reset/Wait/Start
		1	0	0					Mode 4 – Store;Reset/Start
	110 and 111								Reserved
	0								Z input NOT inverted
	1								Z input inverted

Filter Selection (Configuration Word 1)

Bit⇒	7	6	5	4	3	2	1	0	Counter 0
Bit⇒	15	14	13	12	11	10	9	8	Counter 1
	0	ZF	BF	AF	Filter				Description
					0	0	0	0	No Filter
					0	0	0	1	50kHz (10μs + 0μs/-1.6μs)
					0	0	1	0	5kHz (100μs + 0μs/-13.2μs)
					0	1	0	0	500Hz (1.0ms + 0ms/-125μs)
					1	0	0	0	50Hz (10.0ms + 0ms/-1.25ms)
				0					A input not filtered
				1					A input filtered
			0						B input not filtered
			1						B input filtered
		0							Z input not filtered
		1							Z input filtered

Specifications – 1794-VHSC Very High Speed Counter Module**Input Specifications**

Number of Counters	2
Number of Inputs per Counter	2 groups of A/\bar{A} , B/\bar{B} , and Z/\bar{Z} pairs with 5V dc or 15-24V dc terminations
Input Voltage	5V dc or 15-24V dc (determined on terminal base terminations)
Input Current (typical)	5V dc terminations: 19.1mA @ 5V dc 25.7mA @ 6V dc 15-24V dc terminations: 6.1mA @ 15V dc 10.2mA @ 24V dc
Input Off-State Voltage	5V dc terminations: $\leq 1.25V$ dc 15-24V dc terminations: $\leq 1.8V$ dc
Input Off-State Current	$\leq 0.250mA$
Input On-State Voltage	5V dc terminations: $\geq 2.6V$ dc 15-24V dc terminations: $\geq 12.5V$ dc
Input On-State Current	$\geq 5mA$
On-State Voltage Maximum	5V dc terminations: $\pm 6V$ 15-24V dc terminations: Refer to derating curve below.
Input Frequency Maximum	1.0MHz counter and encoder X1 (no filters) 500kHz encoder X2 (no filters) 250kHz encoder X4 (no filters)
Input Filter Selections	5: Off, 10 μ s, 100 μ s, 1.0ms, 10.0ms per A/B/Z group

Specifications continued on the next page.

Specifications – 1794-VHSC Very High Speed Counter Module**Output Specifications**

Number of Outputs	2 isolated groups of 2 (0.5A max. @ 5V dc; 1.0A max. @ 12–24V dc)
Output Control	Outputs can be tied to 8 compare windows
Output Supply Voltage Range	5-7V dc; 10-31V dc
Off-State Leakage Current	≤0.3mA
On-State Voltage Drop	5V dc terminations: 0.9V dc @ 0.5A 12-24V dc terminations: 0.9V dc @ 1.0A
On-State Current Maximum	5V dc terminations: 0.5A 12-24V dc terminations: 1.0A
Maximum Current per Output pair	5V dc terminations: 0.5A 12-24V dc terminations: 1.0A
Short Circuit Current	5V dc terminations: 0.9A 12-24V dc terminations: 4.0A Outputs are short circuit protected and turn off until power is cycled.
Delay Time	Off to On On to Off
	25μs (load dependent) 150μs (load dependent)
Isolation Voltage	100% tested @ 850V dc for 1s between six isolated areas, including; flexbus module 24V dc power A0/B0/Z0 inputs A1/B1/Z1 inputs O0/O1 and output power supply 1 O2/O3 and output power supply 2
Flexbus Current	75mA @ 5V dc (with terminal base power off)
Power Dissipation	5W maximum @ 31.2V dc
Thermal Dissipation	Maximum 17.1 BTU/hr @ 31.2V dc
Indicators	1 green/red power/status indicator 6 yellow input status indicators – logic side 4 yellow output status – logic side
Keyswitch Position	1

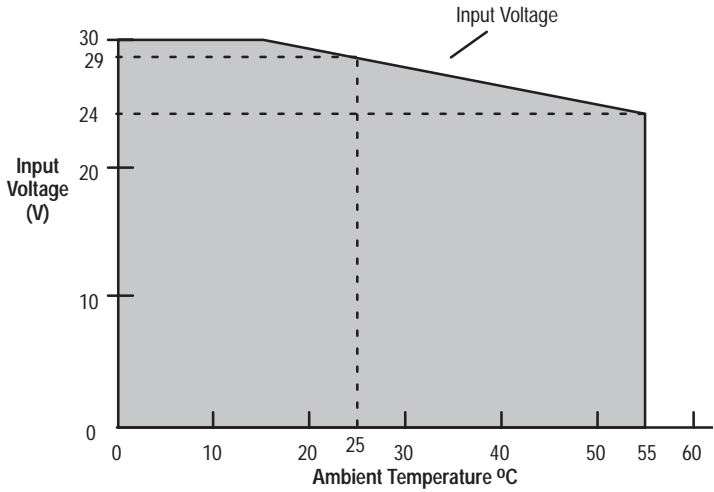
Specifications continued on the next page.

Specifications – 1794-VHSC Very High Speed Counter Module**General Specifications**

Module Location	Cat. No. 1794-TB3G or -TB3GS Terminal Base
Dimensions Inches (Millimeters)	1.8H x 3.7W x 2.1D (45.7 x 94.0 x 53.3)
External dc Power Supply Voltage Voltage Range Supply Current	24V dc nominal 19.2 to 31.2V dc (includes 5% ac ripple) 100mA @ 24V dc
Environmental Conditions Operational Temperature Storage Temperature Relative Humidity Shock Operating Nonoperating Vibration	0 to 55°C (32 to 131°F) -40 to 85°C (-40 to 185°F) 5 to 95% noncondensing (operating) 5 to 80% noncondensing (nonoperating) 30g peak acceleration, 11(±1)ms pulse width 50g peak acceleration, 11(±1)ms pulse width Tested 5g @ 10–500Hz per IEC 68-2-6
Conductors Wire Size Category	12 gauge (4mm ²) stranded maximum 3/64 inch (1.2mm) insulation maximum 2 ¹
Agency Certification (when product is marked)	<ul style="list-style-type: none"> • CSA certified • CSA Class I, Division 2 Groups A, B, C, D certified • UL listed • CE marked for all applicable directives
User Manual	Publication 1794-6.5.10

¹ Use this conductor category information for planning conductor routing . Refer to publication 1770-4.1, "Industrial Automation Wiring and Grounding Guidelines for Noise Immunity."

24V Input Derating Curve



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 temperatures. This includes all possible mounting positions, including inverted horizontal.

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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