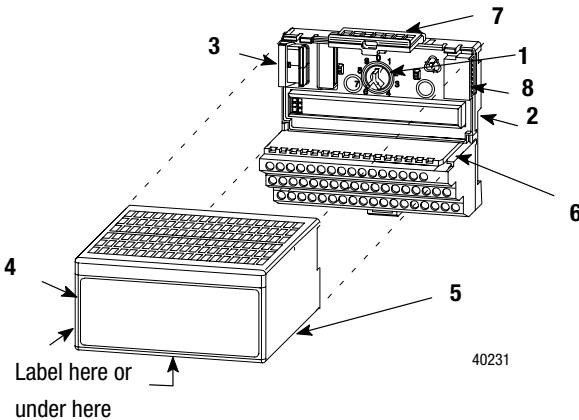




FLEX Ex Thermocouple/RTD Input Module

(Cat. No. 1797-IRT8)

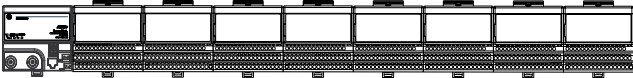


Module Installation

This module must be used with a 1797-TB3 or -TB3S intrinsically safe terminal base unit.

1. Rotate keyswitch (1) on terminal base unit (2) clockwise to position 2 as required for this type of module. **Do not change the position of the keyswitch after wiring the terminal base unit.**
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 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.

6. Make certain that you only connect terminal base units to other intrinsically safe system modules or adapters to maintain the integrity of the intrinsically-safe backplane.



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7. Remove cap plug (8) and attach another intrinsically safe terminal base unit to the right of this terminal base unit if required.

Installation in Zone 1

This module must not be exposed to the environment. Provide a suitable metal enclosure. This module has a protection factor of IP20.



ATTENTION: This module cannot be used in an intrinsically safe environment after it has been exposed to non-intrinsically safe signals.

Electrostatic Charge

Protect the system against electrostatic charge. Post a sign near this module: **Attention! Avoid electrostatic charge.** For your convenience, a sign which can be cut out and posted is included in this installation instruction.

Removal and Insertion Under Power



ATTENTION: This module is designed so you can **remove and insert it under power.** However, take special care when removing or inserting this module in an active process. I/O attached to any module being removed or inserted can change states due to its input/output signal changing conditions.

European Community 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 the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying 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.

Ex Directive

This product is tested to meet the Council Directive 94/9/EC (ATEX 100a) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres by applying the following standards:

- EN50014:1992, Electrical Apparatus for Potentially Explosive Atmospheres
- EN50020:1994, Electrical Apparatus for Potentially Explosive Atmospheres - Intrinsic Safety "i"
- prEN50284:1997, Special requirements for construction, test and marking of electrical apparatus of equipment group II, category 1G

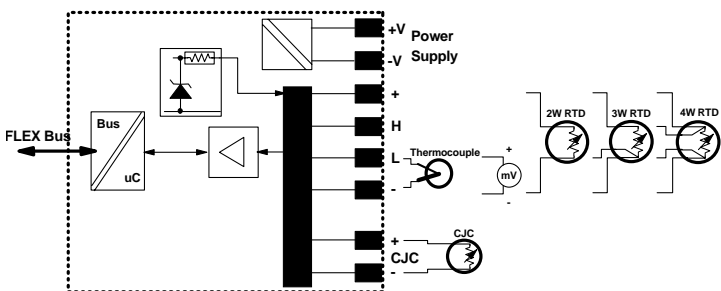
Inputs

Each input can be operated from a thermocouple (TC) or resistance temperature detector (RTD). **Do not apply any non-intrinsically safe signals to this module.**

When using an intrinsically safe electrical apparatus according to EN50020, the European directives and regulations must be followed.

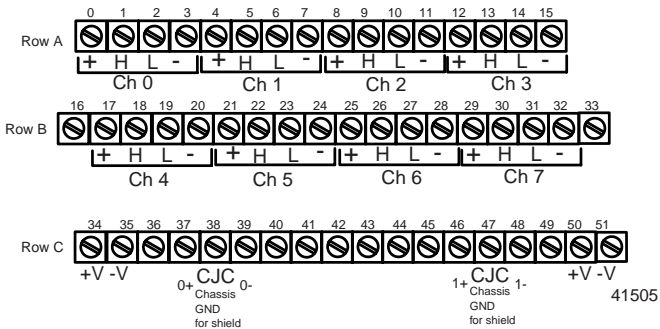
The channels in this module are electrically connected to each other and have a common plus-line.

Important: When interconnecting several lines, you must consider the total accumulated power and check for intrinsic safety.



Wiring to a 1797-TB3 or -TB3S Terminal Base Unit

Connect wiring to the terminal base as shown below.



No connection allowed to terminals 36 and 49

Wiring

1. For RTD inputs:

- connect the individual source current input wiring to (+) terminals for each individual channel (0, 4, 8 and 12) on the 0-15 row (A) and terminals 17, 21, 25, and 29 on the 16-33 row (B) as indicated in the table below.
- connect the associated signal return (-) to the corresponding (-) terminals (3, 7, 11, and 15) on the 0-15 row (A), and terminals 20, 24, 28 and 32 on the 16-33 row (B).

2. For thermocouple inputs:

- connect the individual high signal input wiring to (L) terminals for each individual channel (2, 6, 10, and 14) on the 0-15 row (A) and terminals 19, 23, 27 and 31 on the 16-33 row (B) as indicated in the table below.
- connect the associated low signal (-) to the corresponding (-) terminals (3, 7, 11 and 15) on the 0-15 row (A), and terminals 20, 24, 28, and 32 on the 16-33 row (B).
- connect cold junction compensation wiring to terminals 37, 38 and 39, and terminals 46, 47 and 48.

d. Connect the tail of the CJC as follows:

- when using inputs 0-3 (row A) only for thermocouple inputs: connect the tail of CJC1 to terminal 5 and CJC2 to terminal 12 on row A.
- when using inputs 4-7 (row B) only for thermocouple inputs: connect the tail of CJC1 to terminal 22 and CJC2 to terminal 29 on row B.
- when using thermocouple inputs 0-7: connect the tail of CJC1 to terminal 5 on row A, and CJC2 to terminal 29 on row B.

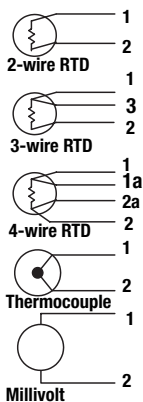
Important: Whenever you use thermocouple inputs, you must use both cold junction compensators.

3. Connect +V to terminal 34 on the 34-51 row (C).
4. Connect -V to terminal 35 on the 34-51 row (C).



ATTENTION: Make certain that you power this module with an intrinsically safe power supply. Do not exceed the values listed in the specifications for this module.

5. If continuing power to the next terminal base unit, connect a jumper from terminal 50 (+V) on this base unit to terminal 34 on the next base unit.
6. If continuing common to the next terminal base unit, connect a jumper from terminal 51 (-V) on this base unit to terminal 35 on the next base unit.



Type of Input	Connect the following:				
	+	H	L	-	Shield ¹
RTD - 2-wire	1			2	
RTD - 3-wire	1		3	2	
RTD - 4-wire	1	1a	2a	2	
Thermocouple			1	2	
Millivolt			1	2	

¹Terminals 16, 33, 40 thru 45 are chassis ground.

RTD or Thermocouple Channel	RTD Source Current (+)	High Signal Terminal (H)	Low Signal Terminal (L)	Signal Return (-)
0	0	1	2	3
1	4	5	6	7
2	8	9	10	11
3	12	13	14	15
4	17	18	19	20
5	21	22	23	24
6	25	26	27	28
7	29	30	31	32
+V		Terminals 34 and 50		
-V		Terminals 35 and 51		

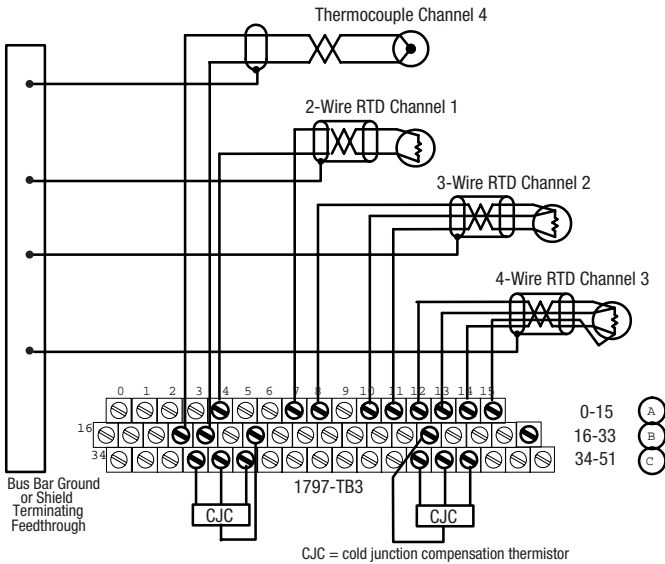
1 Terminals 37, 38 and 39 and 46, 47 and 48 are for cold junction compensation (with 38 and 47 chassis ground). Connect CJC1 to terminal 5 or 22, CJC2 to terminal 12 or 29

2 Terminals 16, 33, and 40 thru 45 are chassis ground.



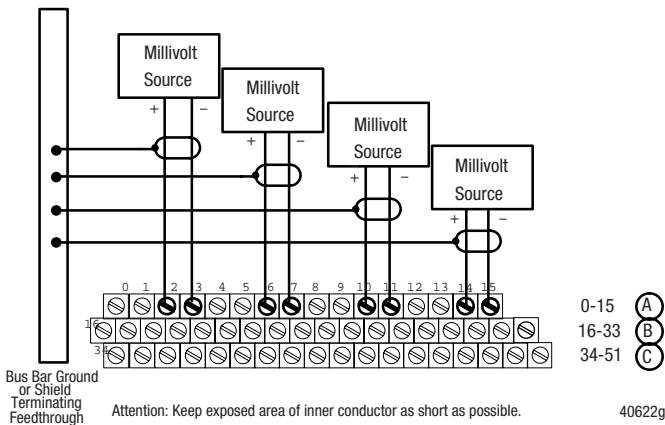
ATTENTION: Do not use the unused terminals on this terminal base unit. Using these terminals as supporting terminals can result in damage to the module and/or unintended operation of your system.

Example of 2-, 3-, and 4-wire RTD and Thermocouple Wiring to a 1797-TB3 Terminal Base Unit



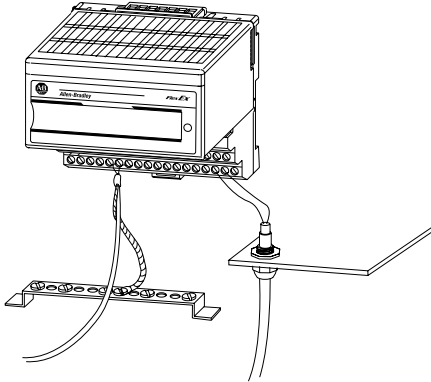
Attention: Keep exposed area of inner conductor as short as possible. 40621gm

Example of Millivolt Wiring to a 1797-TB3 Terminal Base Unit



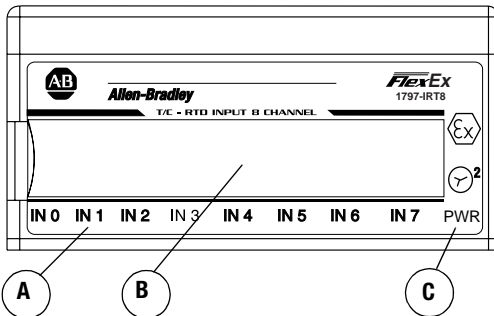
Grounding

All I/O wiring must use shielded wire. Shields must be terminated external to the module, such as bus bars and shield-terminating feed throughs.



30820-M

Indicators



A = Status Indicators - flashing red - channel fault - Channel 0 indicator will turn red

while power-up check is running. (Channel 0 solid red - module did not pass

power-up test.)

B = Insertable labels for writing individual I/O designations

C = Power Indicator - green - indicates power applied to module

Input Map

Bit⇒	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Word⇩	Read															
0	Channel 0 Input Data															
1	Channel 1 Input Data															
2	Channel 2 Input Data															
3	Channel 3 Input Data															
4	Channel 4 Input Data															
5	Channel 5 Input Data															
6	Channel 6 Input Data															
7	Channel 7 Input Data															
8	Overrange Alarm Bits (channel 0 = bit 08, etc.)								Underrange Alarm Bits (channel 0 = bit 00, etc.)							
9	Fit Alm ch 7	Fit Alm ch 6	Fit Alm ch 5	Fit Alm ch 4	Fit Alm ch 3	Fit Alm ch 2	Fit Alm ch 1	Fit Alm ch 0		CJC 2 Alm	CJC 1 Alm		Diagnostic Status			
10	Module command response								Module response data							

Output Map

Bit⇒	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Word⇩	Write															
0					Data Format				Fit Mode ch 4-7	Fit Mode ch 0-3	Reference Junction			Filter Cutoff		
1	TC/RTD Ch 4-7		Sensor Mode ch 4-7		Sensor Type Ch 4-7				TC/RTD Ch 0-3		Sensor Mode Ch 0-3		Sensor Type Ch 0-3			
2	RTD Offset ch 7		RTD Offset ch 6		RTD Offset ch 5		RTD Offset ch 4		RTD Offset ch 3		RTD Offset ch 2		RTD Offset ch 1		RTD Offset ch 0	
3	Module command								Module command data							



Data Format for All Channels - Write Word 0

Bit	11	10	09	08	Data type for channels 0 thru 7
	0	0	0	0	°C (see note)
	0	0	0	1	°F (see note)
	0	0	1	0	°K (see note)
	0	0	1	1	-32767 to +32767
	0	1	0	0	0 to 65535
	0101 thru 1111 not used				

Note: Module defaults to -4000 to 10,000 in millivolt mode, and 0 to 5000 in ohms mode

Fault Mode - Write Word 0

Bit	06	Fault enable for channels 0-3
	07	Fault enable for channels 4-7
		0 = disabled
		1 = enable wire-off detection

“Add-on” Filter Selections - Write Word 0

Bit	02	01	00	Definition
	0	0	0	Hardware filtering only (default filtering)
	0	0	1	40Hz (25ms)
	0	1	0	10Hz (100ms)
	0	1	1	4Hz (250ms)
	1	0	0	2Hz (500ms)
	1	0	1	1Hz (1s)
	1	1	0	0.5Hz (2s)
	1	1	1	0.2Hz (5s)

Reference Junction Selection - Write Word 0

Bits 03-05	Reference Junction - used when sensor is set to thermocouple and sensor mode is set to internal compensation. Sets a fixed reference junction to compensate all thermocouple channels.				
	Bit	05	04	03	Reference Junction
		0	0	0	0°C
		0	0	1	20°C
		0	1	0	25°C
		0	1	1	30°C
		1	0	0	40°C
		1	0	1	50°C
		1	1	0	60°C
		1	1	1	70°C

Sensor Mode Select - Write Word 1

Bit	05	04	Sensor mode for channels 0 thru 3
	13	12	Sensor mode for channels 4 thru 7
			Thermocouple Mode
	0	0	External compensation - uses cold junction sensor
	0	1	Internal compensation - Uses the value selected for reference junction
	1	0	No compensation (Data is referenced to 0°C)
	1	1	Differential measurement between 2 channels
			RTD Mode
	0	0	2-wire RTD - no compensation
	0	1	2-wire RTD with user compensation
	1	0	3-wire RTD
	1	1	4-wire RTD

RTD Offset Select - Write Word 2

Bit	01	00	RTD Offset Select Bits - Channel 0
	03	02	RTD Offset Select Bits - Channel 1
	05	04	RTD Offset Select Bits - Channel 2
	07	06	RTD Offset Select Bits - Channel 3
	09	08	RTD Offset Select Bits - Channel 4
	11	10	RTD Offset Select Bits - Channel 5
	13	12	RTD Offset Select Bits - Channel 6
	15	14	RTD Offset Select Bits - Channel 7
	0	0	Use channel loop compensation value stored during calibration procedure for 2-wire RTD (default = 0 Ω)
	0	1	5 ohm
	1	0	10 ohm
	1	1	15 ohm

Note: This parameter not applicable for Cu 10 ohm, which defaults to 0 ohm.

Sensor Type Select - Write Word 1

RTD Type					
Bit	03	02	01	00	Sensor type for channels 0 thru 3
Bit	11	10	09	08	Sensor type for channels 4 thru 7
	0	0	0	0	Resistance (default)
	0	0	0	1	100 ohm Pt $\alpha = 0.00385$ Euro (-200 to +870 $^{\circ}$ C)
	0	0	1	0	200 ohm Pt $\alpha = 0.00385$ Euro (-200 to +400 $^{\circ}$ C)
	0	0	1	1	100 ohm Pt $\alpha = 0.003916$ U.S. (-200 to +630 $^{\circ}$ C)
	0	1	0	0	200 ohm Pt $\alpha = 0.003916$ U.S. (-200 to +400 $^{\circ}$ C)
	0	1	0	1	100 ohm Nickel $\alpha = 0.00618$ U.S. (-60 to +250 $^{\circ}$ C)
	0	1	1	0	200 ohm Nickel $\alpha = 0.00618$ U.S. (-60 to +200 $^{\circ}$ C)
	0	1	1	1	120 ohm Nickel $\alpha = 0.00672$ U.S. (-80 to +320 $^{\circ}$ C)
	1	0	0	0	10 ohm Copper $\alpha = 0.00427$ U.S. (-200 to +260 $^{\circ}$ C)
	1001 thru 1111 not used				

Table continued on next page.

Thermocouple Type					
Bit	03	02	01	00	Sensor type for channels 0 thru 3
Bit	11	10	09	08	Sensor type for channels 4 thru 7
	0	0	0	0	mV (default)
	0	0	0	1	B 300 to 1800°C (572 to 3272°F)
	0	0	1	0	E -270 to 1000°C (-454 to 1832°F)
	0	0	1	1	J -210 to 1200°C (-346 to 2192°F)
	0	1	0	0	K -270 to 1372°C (-454 to 2502°F)
	0	1	0	1	TXK/XK(L) -200 to 800°C (-328 to 1472°F)
	0	1	1	0	N -270 to 1300°C (-454 to 2372°F)
	0	1	1	1	R -50 to 1768°C (-58 to 3214°F)
	1	0	0	0	S -50 to 1768°C (-58 to 3214°F)
	1	0	0	1	T -270 to 400°C (-454 to 752°F)
	1010 thru 1111 not used				

Repair

This module is not field-repairable. Any attempt to open this module will void the warranty and IS certification. If repair is necessary, return this module to the factory.

Specifications - 1797-IRT8 Thermocouple/RTD Module

Number of Inputs	8 channels
IS Input Type	EEx ia IIB/IIC T4, AEx ia IIC T4, Class I, II, III Division 1 Group A-G T4
IS Module Type	EEx ib IIB/IIC T4, AEx ib IIC T4, Class I, Division 1 & 2 Group A-D T4
Input Type	Suitable for Pt 100, Pt200, Ni 100, Ni120, Ni200, 10Cu RTD, thermocouple Type B, E, J, K, N, R, S, T, TXK/XK (L) Configuration via internal bus
Signal Input Range	0 to 500 ohms; -40 to 100mV
Settling Time to 99% of Final Value	8ms (mV mode, °F thermocouple)
Open RTD Detection	Out of range upscale reading
Lead Resistance Compensation	< 15 ohm total

Specifications continued on next page

Transfer Characteristics	
Accuracy	RTDs: 0.1% of span @ 20°C, filter cutoff < 1Hz Thermocouples: 0.1% of span @ 20°C, filter cutoff < 1Hz
Temperature Effect	Cold junction compensation = $\pm 1^\circ\text{C}$ 150ppm/°C (primary range)
Indicators	8 red fault indicators 1 green module power indicator
Data Organization	
Overrange Alarm	Individually for each channel
Lead Breakage Alarm	Individually for each channel
Fault State	Individually for each channel (includes overrange, lead breakage and short circuit)
Sensor Mode RTD 2, 3, or 4-wire,	Common to groups of 4 channels (ch 0-3, ch 4-7)
TC Sensor Type (e.g. TC, Type B, E, J..., RTD or mV	Common to groups of 4 channels (ch 0-3, ch 4-7)
Internal Reference Junction (TC mode)	Common to all channels (0°C, 20°C, 25°C, 30°C, 40°C, 50°C, 60°C, 70°C selectable)
Output (intrinsically safe) (16 position male/female flexbus connector)	$U_i \leq 5.8\text{V}$ $I_i \leq 400\text{mA}$ $L_i = \text{Negligible}$ $C_i \leq 1.35\mu\text{F}$
Isolation Path	Isolation Type
Input to power supply	Galvanic to DIN EN50020
Input to flexbus	Galvanic to DIN EN50020
Input to input	None
Power supply to flexbus	Galvanic to DIN EN50020
Power Supply (+V, -V intrinsically safe)	$U_i \leq 9.5\text{V dc}$ $I_i \leq 1\text{A}$ $L_i = \text{Negligible}$ $C_i = \text{Negligible}$
Module Field-Side Power Consumption	1.6W
Power Dissipation	1.6W
Thermal Dissipation	Maximum 5.46BTU/hr
Module Location	Cat. No. 1797-TB3 or -TB3S Terminal Base Unit
Conductor Wire Size	12 gauge (4mm ²) stranded maximum 3/64in (1.2mm) insulation maximum
Dimensions	46mm x 94mm x 75mm (1.8in x 3.7in x 2.95in)
Weight	200g (approximate)
Keyswitch Position	2

Environmental Conditions	
Operational Temperature	-20 to +70°C (-4 to +158°F)
Storage Temperature	-40 to +85°C (-40 to +185°F)
Relative Humidity	5 to 95% noncondensing
Shock	Tested to 15g peak acceleration, 11(+1)ms pulse width
Operating	
Nonoperating	Tested to 15g peak acceleration, 11(+1)ms pulse width
Vibration	Tested 2g @ 10-500Hz per IEC68-2-6
Agency Certification	II (1) 2G EEx ia/ib IIB/IIC T4 Class I Division 1 and 2 Groups A-D T4 Class I Zone 1 and 2 AEx ib/[ia] IIC T4
Certificate of Conformity	DMT 98 ATEX E 023 X

CE/CENELEC I/O Entity Parameters

Input circuits (+ to -) for ch0 to ch7 (terminals: 0-3; 4-7; 8-11; 12-15; 17-20; 21-24; 25-28; 29-32)

	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0/R_0 Ratio
$U_0 = 9V$ $I_0 = 37mA$ $P_0 = 83mW$	EEx ia	IIB	40 μ F	80mH	1.7mH/ Ω
	EEx ia	IIC	4.9 μ F	20mH	0.4mH/ Ω

CJC circuits (+ to -) for CJC0 and CJC1 (terminals: 37, 39; 46, 48)

	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0/R_0 Ratio
$U_0 = 9V$ $I_0 = 1mA$ $P_0 = 3mW$	EEx ia	IIB	40 μ F	1H	63mH/ Ω
	EEx ia	IIC	4.9 μ F	1H	15mH/ Ω

Input circuits (+ to -) for ch0 to ch7 and CJC circuits (+ to -) for CJC0 and CJC1 (terminals 0-3, 37, 39; 4-7, 37, 39; 8-11, 37, 39; 12-15, 37, 39; 17-20, 37, 39; 21-24, 37, 39; 25-28, 37, 39; 29-32, 37, 39; 0-3, 46, 48; 4-7, 46, 48; 8-11, 46, 48; 12-15, 46, 48; 17-20, 46, 48; 21-14, 46, 48; 25-28, 46, 48; 29-32, 46, 48)

	Protection	Group	Allowed Capacitance	Allowed Inductance	L_0/R_0 Ratio
$U_0 = 9V$ $I_0 = 38mA$ $P_0 = 86mW$	EEx ia	IIB	40 μ F	80mH	1.7mH/ Ω
	EEx ia	IIC	4.9 μ F	20mH	0.4mH/ Ω

UL, CUL I/O Entity Parameters

Table 1

Wiring Method	Channel	Terminals	V_{oc} (V)	I_{sc} (mA)	V_t (V)	I_t (mA)	Groups	C_a (μ F)	L_a (mH)
1 and 2	Any one channel e.g. ch0	0(+), 1(H), 2(L), 3(-)	9.0	37.0	-	-	A, B	4.9	20.0
							C, E	14.7	80.0
							D, F, G	39.2	160.0
		37, 38, 39 (CJC0) or 46, 47, 48 (CJC1)	9.0	1.0	-	-	A, B	4.9	1000.0
							C, E	14.7	1000.0
							D, F, G	39.2	1000.0
		0(+), 1(H), 2(L), 3(-) 37, 38, 39 (CJC0) or 46, 47, 48 (CJC1)	-	-	9.0	38.0	A, B	4.9	20.0
							C, E	14.7	80.0
							D, F, G	39.2	160.0

Wiring Methods

- Wiring method 1 - Each channel is wired separately.
- Wiring method 2 - Multiple channels in one cable, providing each channel is separated in accordance with the National Electric Code (NEC) or Canadian Electric Code (CEC).

Table 2

Terminals	V_t (V)	I_t (mA)	Groups	C_a (μ F)	L_a (μ H)
Male Bus Connector	5.8	400	A-G	3.0	3.0

① The entity concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of V_t and I_t of the associated apparatus are less than or equal to V_{oc} and I_{sc} or V_{max} and I_{max} of the intrinsically safe apparatus and the approved values of C_a and L_a of the associated apparatus are greater than $C_i + C_{cable}$ and $L_i + L_{cable}$ respectively for the intrinsically safe apparatus.

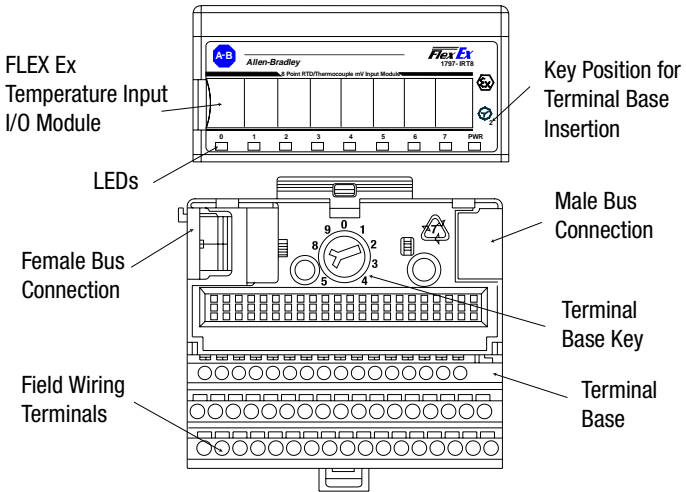
② Simple apparatus is defined as a device which neither generates nor stores more than 1.2V, 0.1A, 20 μ J, or 25mW.

③ Wiring methods must be in accordance with the National Electric Code, ANSI/NFPA 70, Article 504 and 505 or the Canadian Electric Code CSA C22.1, Part 1, Appendix F. For additional information refer to ANSI/ISA RP12.6.

④ This module, 1797-IRT8, must be used with terminal base 1797-TB3 or 1797-TB3S.

⑤ Terminals 36 and 49 shall not be connected.

⑥ **WARNING:** Substitution of components may impair intrinsic safety. **AVERTISSEMENT:** La substitution de composant peut compromettre la sécurité intrinsèque.

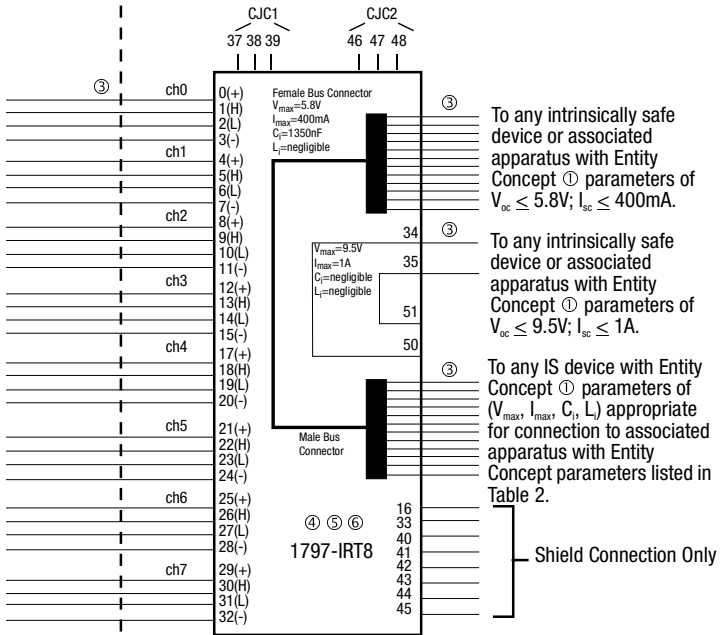


Note: A terminal base may not have an I/O module installed.

Hazardous (Classified) Location
 Class I, Zones 0, 1, & 2 Groups IIC, IIB, IIA
 Class I, Div. 1 & 2 Groups A, B, C, D
 Class II, Div. 1 & 2 Groups E, F, G
 Class III, Div. 1 & 2

Hazardous (Classified) Location
 Class I, Zones 1 & 2 Groups IIC, IIB, IIA
 Class I, Div. 1 & 2 Groups A, B, C, D

Any Simple Apparatus ② or I.S. device with Entity Concept parameters ① (V_{max} , I_{max} , C_i , L_i) appropriate for connection to associated apparatus with Entity Concept parameters listed in Table 1.



Important: or detailed certification information, refer to the FLEX Ex System Certification Reference Manual, publication 1797-6.5.6.

Attention: Avoid electrostatic charge.

Attention: Avoid electrostatic charge.

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European Headquarters SA/NV, avenue Herrmann Debroux, 46, 1160 Brussels, Belgium, Tel: (32) 2 663 06 00, Fax: (32) 2 663 06 40
Asia Pacific Headquarters, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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