



Installation Instructions

ControlLogix High Speed Counter Module (Cat. No. 1756-HSC)

Use this document to install the ControlLogix™ High Speed Counter module.

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This module mounts in a ControlLogix™ chassis and uses a Removable Terminal Block (RTB) or a Bulletin 1492 Interface Module (IFM) to connect all field-side wiring. When using an IFM to wire your module, consult the installation instructions that came with it to connect all wiring.

Before you install your module you should have already:

- installed and grounded a 1756 chassis and power supply.
- ordered and received an RTB or IFM and its components for your application.

Note the Power Requirements

The backplane provides module power with 2 sources of power: 300mA at 5.1V and 3mA at 24V. Add this current to the requirements of all other modules in the chassis to prevent overloading the backplane power supply.

Prevent Electrostatic Discharge



ATTENTION: Electrostatic discharge can damage integrated circuits or semiconductors if you touch backplane connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
 - Wear an approved wrist-strap grounding device.
 - Do not touch the backplane connector or connector pins.
 - Do not touch circuit components inside the module.
 - If available, use a static-safe work station.
 - When not in use, keep the module in its static-shield box.
-

Removal and Insertion Under Power (RIUP)



ATTENTION: This module is designed so you can remove and insert it under backplane power and field-side power. When you remove or insert a module while field-side power is applied, you may cause an electrical arc. An electrical arc can cause personal injury or property damage because it may:

- send an erroneous signal to your system's field devices, causing unintended machine motion or loss of process control.
- cause 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.

Understand Compliance to European Union Directive

If this product bears the CE marking, 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
- SGI-1.1 Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control

This equipment is classified as open equipment and must be installed (mounted) in an enclosure during operation as a means of providing safety protection.

Identify the Module Components

You received two components with your order.

- 1756-HSC module
- RTB door label

If you did not receive either of these components, contact your local Allen-Bradley representative.

Removable Terminal Block and Housing

A separately-ordered RTB connects field-side wiring to the module. You cannot use your module without an RTB and its components.

Use one of the following RTBs with your module:

- 1756-TBCH 36 position Cage clamp RTB
- 1756-TBS6H 36 position Spring clamp RTB

You received the following components with your RTB:

- standard-depth RTB housing
- wedge-shaped keying tabs and U-shaped keying bands
- a generic RTB door label

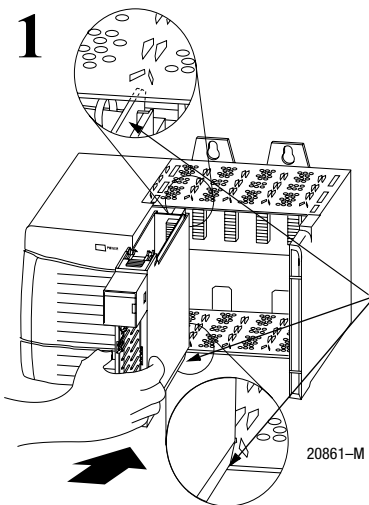
Use these components in all module applications. Use an optional extended-depth cover (1756-TBE) for applications requiring additional routing space.

Install the Module

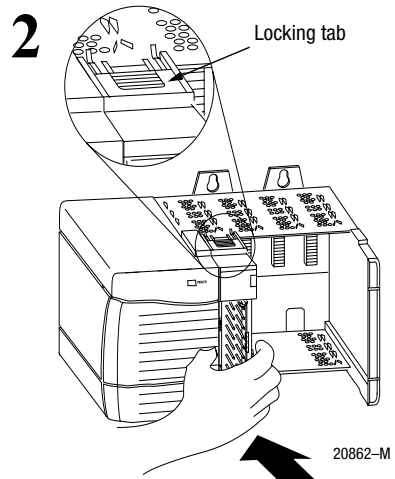
You can install or remove the module while chassis power is applied.



ATTENTION: The module is designed to support Removal and Insertion Under Power (RIUP). However, when you remove or insert an RTB with field-side power applied, **unintended machine motion or loss of process control can occur**. Exercise extreme caution when using this feature.



Align circuit board with top and bottom chassis guides.

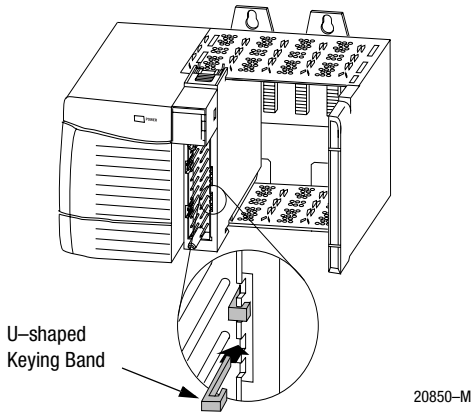


Slide module into chassis until module tabs 'click'.

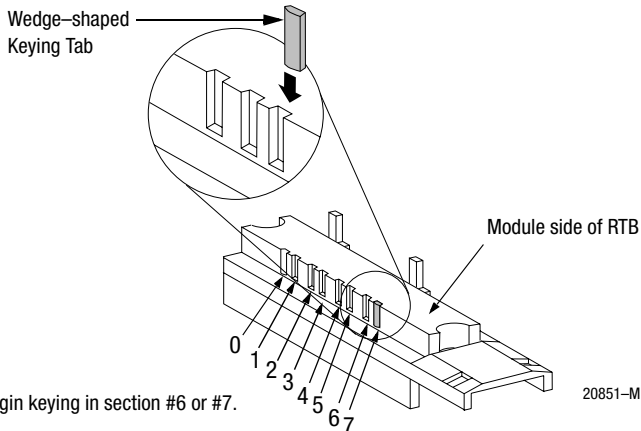
Key the Removable Terminal Block/Interface Module

Key the RTB or IFM to prevent inadvertently making the wrong wire connections to your module. Use a unique keying pattern for each module. You can use a minimum of one key.

1. Key the module. Insert the U-shaped band with the longer side near the terminals. Push the band onto the module until it snaps into place.



2. Key the RTB in positions that correspond to unkeyed module positions. Insert the wedge-shaped tab on the RTB with the rounded edge first. Push the tab onto the RTB until it stops.



NOTE: Begin keying in section #6 or #7.

Reposition the tabs to rekey future module applications.

Wire the Removable Terminal Block

Wire the RTB before installing it onto the module. Use a 1/8 inch (3.2mm) maximum flat-bladed screwdriver.

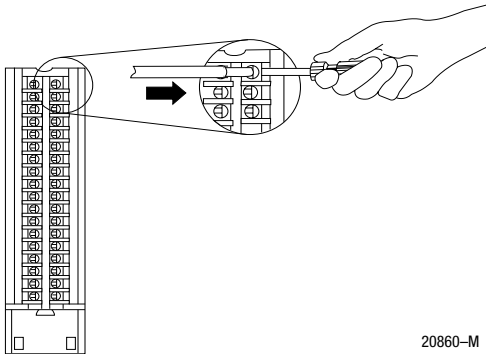
Important: Pull the housing off of the RTB before wiring.

Shielded cable is required when using this module. We recommend using Belden 8761 cable to wire the RTB for most applications. The RTB terminations can accommodate 14-22 gauge shielded wire.

For the Spring Clamp RTB

Strip 7/16 inch (11mm) maximum length to wire your RTB.

1. Insert the screwdriver into the inner hole of the RTB.
2. Insert the wire into the open terminal and remove the screwdriver.

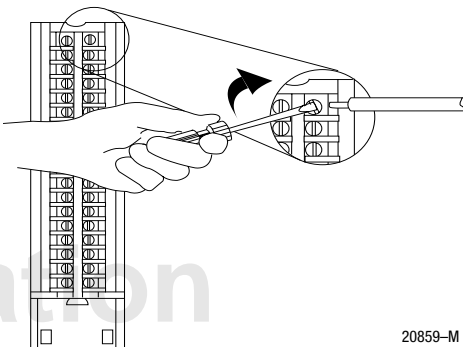


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For the Cage Clamp RTB

Strip 5/16-3/8 inch (8-9.5mm) length to wire your RTB.

1. Insert the wire into the open terminal.
2. Turn the screw clockwise to close the terminal on the wire.



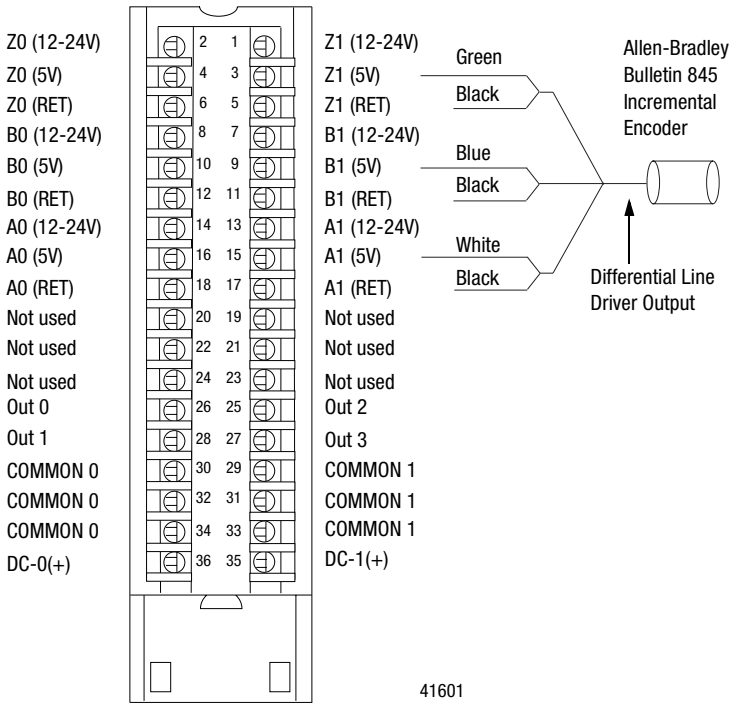
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Wiring Terminations

Wiring an Allen-Bradley 845 Incremental Encoder

Use the following tables to connect the High Speed Counter module to an Allen-Bradley 845 incremental encoder:

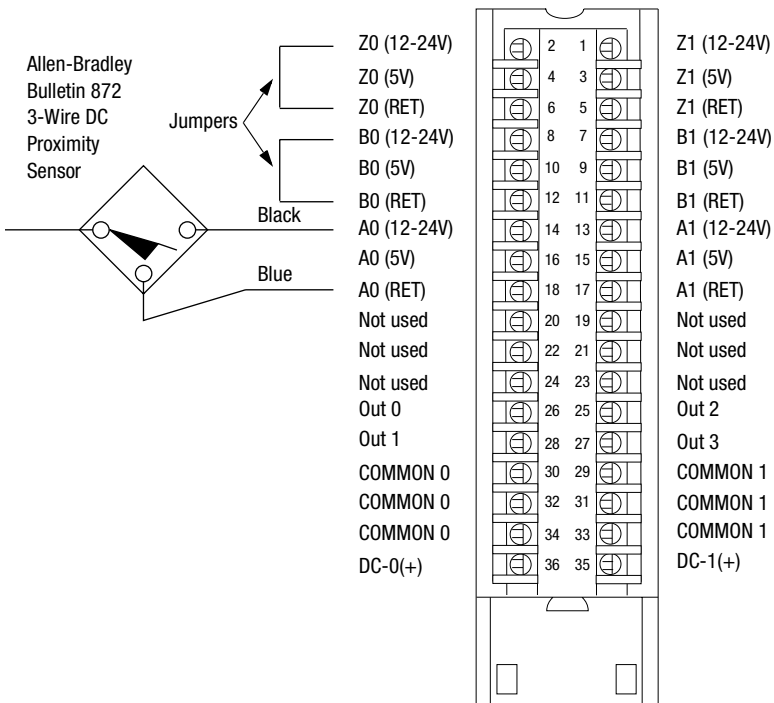
Application:	A1 Connections:	B1 Connections:	Z1 Connections:
Differential Line Driver Output (40mA)	White - A1 (5V) Black of white - A1 (RET)	Blue - B1 (RET) Black of blue - B1 (5V)	Green - Z1 (5V) Black of green - Z1 (RET)



Wiring an Allen-Bradley Bulletin 872 3-Wire DC Proximity Sensor

Use the following table and diagram to connect the High Speed Counter module to an Allen-Bradley 872 3-wire DC proximity sensor:

Application:	A0 Connections:	B0 Connections:	Z0 Connections:
PNP (Sourcing) N.O.	Black - A0 (12-24V) Blue, PS(-)- A0 (RET)	Jumper B0 (12-24V) to B0 (RET)	Jumper Z0 (12-24V) to Z0 (RET)

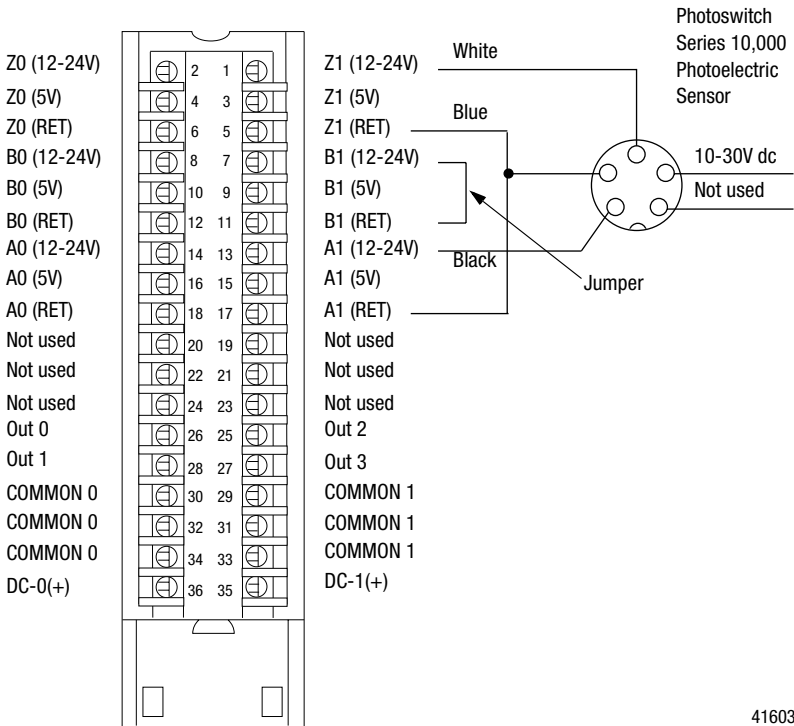


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Wiring a Photoswitch Series 10,000 Photoelectric Sensor

Use the following table and diagram to connect wiring to a series 10,000 photoelectric sensor:

Application:	A1 Connections:	B1 Connections:	Z1 Connections:
Any	Black - A1 (12-24V) Blue - A1 (RET)	Jumper B1 (12-24V) to B1 (RET)	White - Z1 (12-24V) Blue - Z1 (RET)



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Ground the Module

Connect grounded end of the cable

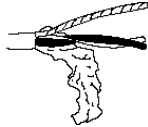
1. Ground the drain wire.

Important: We recommend grounding the drain wire at the field-side. If you cannot ground at the field-side, ground at an earth ground on the chassis as shown below.

- a. Remove a length of cable jacket from the Belden 8761 cable.



- b. Pull the foil shield and bare drain wire from the insulated wire.



- c. Twist the foil shield and drain wire together to form a single strand.



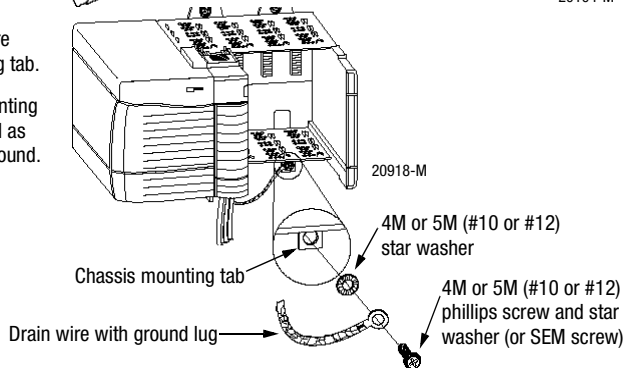
- d. Attach a ground lug and apply heat shrink tubing to the exit area.



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- e. Connect the drain wire to a chassis mounting tab.

Use any chassis mounting tab that is designated as a functional signal ground.



2. Connect the insulated wires to the field-side.

Connect ungrounded end of the cable

1. Cut the foil shield and drain wire back to the cable casing and apply shrink wrap.
2. Connect the insulated wires to the RTB (see page 8).

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Cable Considerations

We recommend using Belden 8761 for your High Speed Counter module, for most applications. For demanding applications (e.g. applications with frequencies of +100KHz and cable length of +100 ft), we recommend using Belden 9182 cable. Consider the following when wiring your application:

- cable length
- cable impedance
- cable capacitance
- cable frequency
- totem-pole devices

Cable Length

Long cables can result in changes in duty cycle, rise and fall times, and phase relationships. For applications using a differential line driver, we recommend 250ft or less of cable.

For applications using an open collector, or other single-ended driver, we recommend 250 ft or less of any of the following 5V line drivers:

- DM8830
- DM88C30
- 75ALS192

Cable Impedance

We recommend 150Ω Belden 9182 cable for use with encoder and module input circuits.

Important: Termination of one, or both ends, of the cable with a fixed resistor whose value is equal to the cable impedance will not necessarily improve 'reception' at the end of the cable. It will increase the dc load seen by the cable driver, though.

Cable Capacitance

High capacitance cable rounds off incoming square wave edges and uses driver current to charge and discharge. Also, remember that increasing cable length causes a linear increase in capacitance.

Cable Frequency

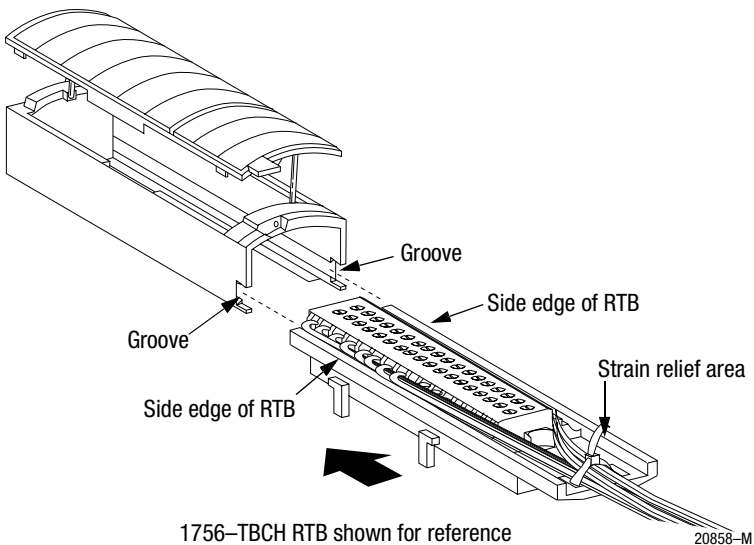
The maximum encoder input of 250KHz is designed to work with Allen-Bradley Bulletin 845H or similar incremental encoders with a quadrature specification of $90^\circ (\pm 22^\circ)$ and a duty cycle specification of 50% ($\pm 10\%$). Additional phase or duty cycle changes caused by the cable will reduce the specified 250KHz specification.

Totem-pole Output Devices

Standard TTL totem-pole output devices, usually rated to source $400\mu\text{A}$ at 2.4V in the high logic state, will not turn on the High Speed Counter module. We recommend using a high current 5V differential line driver when choosing an encoder.

Assemble the Removable Terminal Block and the Housing

1. Align the grooves at the bottom of each side of the housing with the side edges of the RTB.
2. Slide the RTB into the housing until it snaps into place.



Install the Removable Terminal Block onto the Module

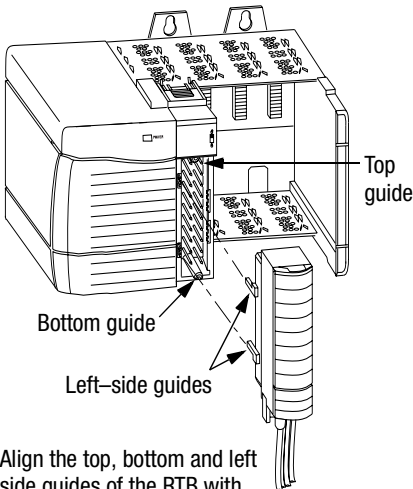


ATTENTION: Shock hazard exists. If the RTB is installed onto the module while the field-side power is applied, the RTB will be electrically live. Do not touch the RTB's terminals. Failure to observe this caution may cause personal injury.

The RTB is designed to support Removal and Insertion Under Power (RIUP). However, when you remove or insert an RTB with field-side power applied, **unintended machine motion or loss of process control can occur.** Exercise extreme caution when using this feature. It is recommended that field-side power be removed before installing the RTB onto the module.

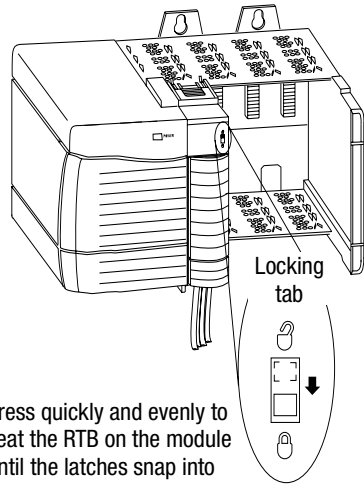
Before installing the RTB, make certain:

- field-side wiring of the RTB has been completed.
- the RTB housing is snapped into place on the RTB.
- the RTB housing door is closed.
- the locking tab at the top of the module is unlocked.



Align the top, bottom and left side guides of the RTB with the guides on the module.

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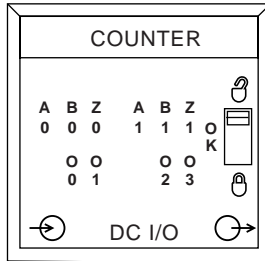


Press quickly and evenly to seat the RTB on the module until the latches snap into place. Slide the locking tab down to lock the RTB onto the module.

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Check the Indicators

The 1756-HSC module uses the following status indicators.



LED indicator	This display:	Means:	Take this action:
Input (A, B, Z)	Off	Input turned off Input not currently used Wire disconnected	If you need to use the input, check wiring connections
	On/Yellow	Input turned on	None
Output (0, 1, 2, 3)	Off	Output turned off Output not currently used	If you need to use the output, check input wiring connections and your ladder application.
	On/Yellow	Output turned on	None

Remove the Removable Terminal Block from the Module

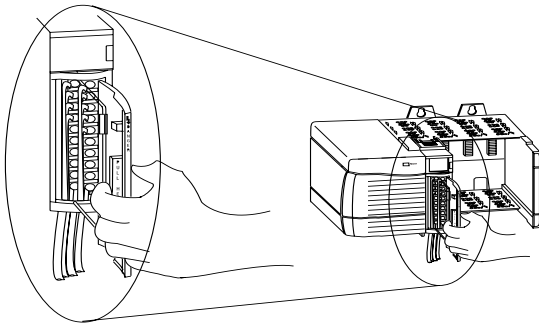


ATTENTION: Shock hazard exists. If the RTB is removed from the module while the field-side power is applied, the module will be electrically live. Do not touch the RTB's terminals. Failure to observe this caution may cause personal injury.

The RTB is designed to support Removal and Insertion Under Power (RIUP). However, when you remove or insert an RTB with field-side power applied, **unintended machine motion or loss of process control can occur.** Exercise extreme caution when using this feature. It is recommended that field-side power be removed before removing the module.

Before removing the module, you must remove the RTB.

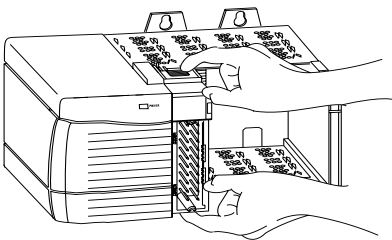
1. Unlock the locking tab at the top of the module.
2. Open the RTB door and pull the RTB off the module as shown below.



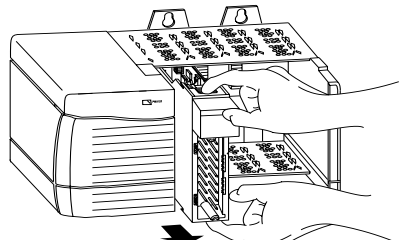
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Remove the Module

1. Push in top and bottom locking tabs.
2. Pull module out of the chassis.







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1756-HSC Specifications

Module Location	1756 ControlLogix Chassis
Backplane Current	300mA @ 5.1V dc , 3mA @ 24V dc (1.6 W)
Maximum Power Dissipation	5.6 W @ 60°C
Thermal Dissipation	19.1 BTU/hr
Number of Counters	2
Inputs per Counter	3 (A, B, Z for Gate/Reset)
Maximum Input Frequency	1 MHz in counter modes (A input) 500 KHz in rate measurement mode (A input) 250 KHz in encoder mode (A/B inputs, X1 or X4) 50Hz with debounce filter enabled
Count Range	0 - 16,777, 214
Input Voltage Range 5V Inputs 12-24V Inputs	4.5-5.5V dc 10-26.4V dc
Input Current Typical Minimum	15mA 4mA
Number of Outputs	4 (2 outputs/common)
Output Voltage Range	4.5-5.5V dc 10-31.2V dc
Output Current Rating (per point)	20mA @ 4.5-5.5V dc 1.0A @ 10-31.2V dc
Output Control	Any number of outputs is assignable to each counter channel. Each output can have 2 "turn-on" and "turn-off" preset values.
Surge Current/Point	2A for 10 ms every 1s @ 60°C
Minimum Load Current	3mA/point (5V operation) 40mA/point (12-24V operation)
Maximum On-state Voltage Drop/Output	0.55V
Maximum Off-State Leakage Current/ Output	300 μ A/point
Output Delay Time Off to On On to Off	20 μ s typical 50 μ s maximum 60 μ s typical 300 μ s maximum
Current Limit	<4A
Output Short Circuit Protection	Electronic Remove load and toggle output On-Off to restore

Reverse Polarity Protection	Yes (If wired incorrectly, module outputs may be permanently disabled)
Isolation Group to Group User to System	100% tested at 1700V dc for 1s (250 Vac max continuous between groups) 100% tested at 1700V dc for 1s
Module Keying (Backplane)	Software configurable
RTB Screw Torque (Cage clamp)	4.4 inch-pounds (0.4Nm)
RTB Keying	User defined mechanical keying
RTB and Housing	36 Position RTB (1756-TBCH or TBS6H) ²
Environmental Conditions Operating Temperature Storage Temperature Relative Humidity	0 to 60°C (32 to 140°F) -40 to 85°C (-40 to 185°F) 5 to 95% non-condensing
Conductors Wire Size Category	22-14 gauge (2mm 2) stranded ¹ 3/64 inch (1.2 mm) insulation maximum ₁ ^{2,3}
Screwdriver Width for RTB	1/8 inch (3.2mm) maximum
User Manual	Publication 1756-6.5.18
Agency Certification (when product or packaging is marked)	  Class I Div 2 Hazardous ⁴  marked for all applicable directives  marked for all applicable directives

¹ Maximum wire size will require extended housing - 1756-TBE.
² Use this conductor category information for planning conductor routing as described in the system level installation manual.
³ Refer to publication 1770-4.1, "Programmable Controller Wiring and Grounding Guidelines"
⁴ CSA certification—Class I, Division 2, Group A, B, C, D or nonhazardous locations.

Understand CSA Hazardous Location Approval

CSA certifies products for general use as well as for use in hazardous locations. Actual CSA certification is indicated by the product label as shown below, and not by statements in any user documentation.

Example of the CSA certification product label:



To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for this CSA-certified industrial control product.

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only.
- The products having the appropriate CSA markings (that is, Class I, Division 2, Groups A, B, C, D) are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction.

Important: Due to the modular nature of a programmable control system, the product with the highest temperature rating determines the overall temperature code rating of a programmable control system in a Class I, Division 2, location. The temperature code rating is marked on the product label as shown.

Temperature code rating:



CL I, DIV 2
GP A,B,C,D
TEMP



Look for temperature code rating here.

The following warnings apply to products having CSA certification for use in hazardous locations.

WARNING: Explosion hazard--



- Substitution of components may impair suitability for Class I, Division 2.
- Do not replace components unless power has been switched off or the area is known to be non-hazardous.
- Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on this equipment by using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lb.) separating force applied for a minimum of one minute.
- Batteries must only be changed in an area known to be non-hazardous.

CSA logo is a registered trademark of the Canadian Standards Association.

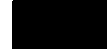
Approbation d'utilisation dans des environnements dangereux par la CSA

La CSA certifie des produits pour une utilisation générale aussi bien que pour une utilisation en environnements dangereux. La certification CSA en vigueur est indiquée par l'étiquette produit et non par des indications dans la documentation utilisateur.

Exemple d'étiquette de certification d'un produit par la CSA :



CL I, DIV 2
GP A,B,C,D
TEMP



Pour satisfaire à la certification CSA en environnements dangereux, les informations suivantes font partie intégrante de la documentation des produits de commande industrielle certifiés.

- Cet équipement ne convient qu'à une utilisation dans des environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux.
- Les produits portant le marquage CSA approprié (c'est-à-dire Classe 1, Division 2, Groupes A, B, C, D) sont certifiés pour une utilisation avec d'autres équipements, les combinaisons d'applications et d'utilisation étant déterminées par la CSA ou le bureau local d'inspection.

Important: De par la nature modulaire des systèmes de commande programmables, le produit ayant le code de température le plus élevé détermine le code de température global du système dans un environnement de Classe I, Division 2. Le code de température est indiqué sur l'étiquette produit.

Code de température :



CL 1, DIV 2
GP A,B,C,D
TEMP



Le code de température est indiqué ici.

Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour une utilisation dans des environnements dangereux.

AVERTISSEMENT : Risque d'explosion --



- La substitution de composants peut rendre ce matériel inadapté à une utilisation en environnement de Classe 1, Division 2.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de remplacer des composants.
- 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 fournis par l'utilisateur pour se brancher aux circuits externes de cet appareil à l'aide de vis, loquets coulissants, connecteurs filetés ou autres, de sorte que les connexions résistent à une force de séparation de 15 Newtons (1,5 kg - 3,4 lb.) appliquée pendant au moins une minute.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

Le sigle CSA est une marque déposée de la Canadian Standards Association.

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