



Installation Instructions

ControlLogix™ Hydraulic Servo Module

Catalog Number 1756-HYD02

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Obtain a User Manual

This product also has a user manual (pub. no. 1756-UM525). To view it, visit www.ab.com/manuals or www.theautomationbookstore.com.

To purchase a manual, you can:

- contact your distributor or Rockwell Automation representative
- visit www.theautomationbookstore.com and place an order
- call 800.963.9548 (USA/Canada) or 001.320.725.1574 (outside USA/Canada)

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. In no event will Rockwell Automation be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Rockwell Automation office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Reproduction of the contents of this copyrighted publication, in whole or part, without written permission of Rockwell Automation, is prohibited.

Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

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.
ATTENTION 	Identifies information about practices or circumstances that can 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.

Environment and Enclosure

ATTENTION

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.

Prevent Electrostatic Discharge

ATTENTION

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.

When not in use, store the equipment in appropriate static-safe packaging.

Removal and Insertion Under Power

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.

Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

The Hydraulic Servo Module (1756-HYD02) mounts in a ControlLogix™ chassis and uses a removable terminal block (RTB) to connect all field-side wiring.

Before you install your module you should have:

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

Note the Power Requirements

This module receives power from the 1756 chassis power supply and requires two sources of power from the backplane:

- 700mA at 5.1 V dc
- 2.5 mA at 24V dc

Add this current to the requirements of all other modules in this chassis to prevent overloading the backplane power supply.

Identify Module Components

You received two components with your order:

- 1756-HYD02 module
- RTB door label

If you did not receive these components, contact your Rockwell Automation representative.

This module mounts in a 1756 chassis and uses a separately-ordered RTB or a Bulletin 1492 Interface Module (IFM)⁽¹⁾ to connect all field-side wiring. This module uses one of the following RTBs:

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

Use an extended-depth cover (1756-TBE) for applications with heavy gauge wiring or requiring additional routing space. When using an IFM, consult the documentation that came with it to connect wiring.

IMPORTANT

Before you install your module, you should:

- install and ground a 1756 chassis and power supply.
 - order and receive an RTB or IFM, and its components, for your application.
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⁽¹⁾ The Bulletin 1492 IFM may not be used in any application that requires agency certification of the ControlLogix system. Use of the IFM violates the UL, CSA and FM certifications of this product.

Install the Module

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

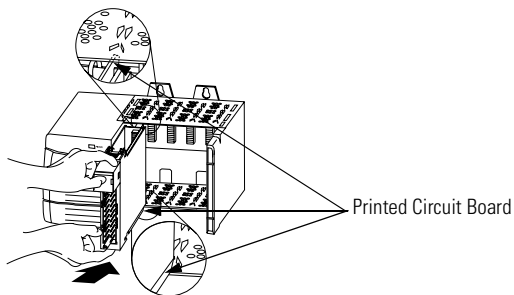
WARNING



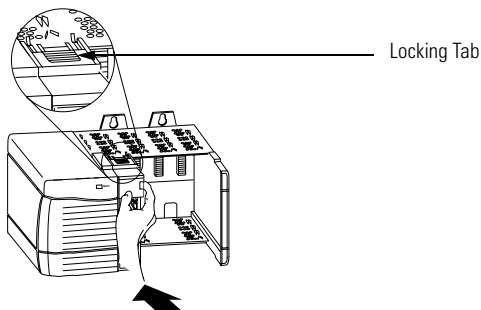
When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

1. Align the circuit board with the top and bottom chassis guides.



2. Slide the module into the chassis until module tabs 'click'.

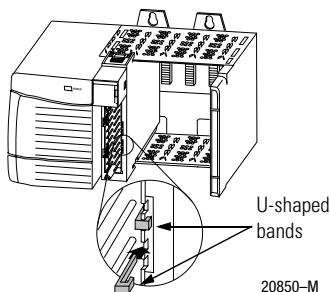


Key the Module and Removable Terminal Block/Interface Module

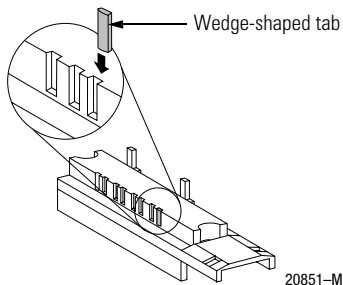
Use the wedge-shaped keying tabs and U-shaped keying bands to prevent connecting the wrong wires to your module.

Key positions on the module that correspond to unkeyed positions on the RTB. For example, if you key the first position on the module, leave the first position on the RTB unkeyed.

1. To key the module, insert the U-shaped band, as shown.



2. Push the band until it snaps in place.
3. To key the RTB or IFM, insert the wedge-shaped tab with rounded edge first, as shown.



4. Push the tab until it stops.

Reposition the tabs to rekey future module applications.

Wire a Removable Terminal Block (RTB)

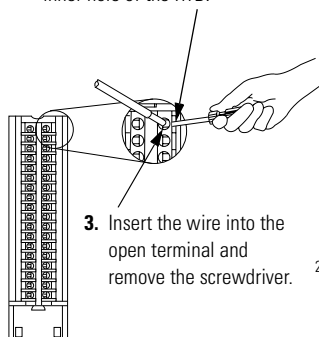
Your 1756-HYD02 module uses two types of RTBs (each RTB comes with housing) to connect wiring.

- Cage clamp - Catalog number 1756-TBCH
- Spring clamp - Catalog number 1756-TBS6H

Connect the wires as shown below.

Spring Clamp RTB

1. Strip 7/16 inch (11mm) maximum length of wire.
2. Insert the screwdriver into the inner hole of the RTB.

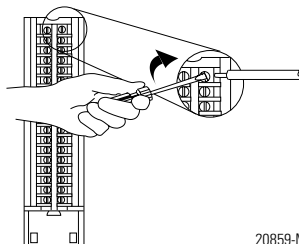


3. Insert the wire into the open terminal and remove the screwdriver.

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Cage Clamp RTB

1. Strip 3/8 inch (9.5mm) maximum length of wire.
2. Insert the wire into the open terminal.
3. Turn the screw clockwise to close the terminal on the wire.

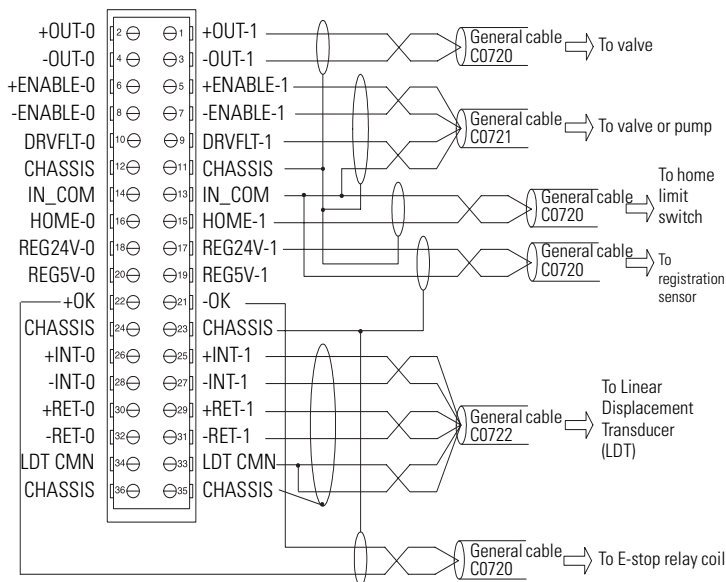


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Wire to a Servo Module

Use the wiring example in Figure 1 to wire to your module.

Figure 1



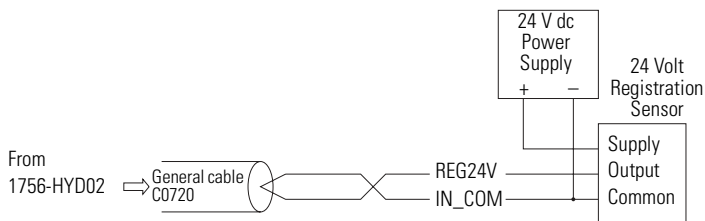
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- NOTES: 1. This is a general wiring example illustrating Axis 1 wiring only. Other configurations are possible with Axis wiring identical to Axis 1.
2. Make sure that any transducer connected to the 1756-HYD02 module uses an external interrogation signal.
3. Do not exceed the specified isolation voltage between power sources.

Wiring Registration Sensors

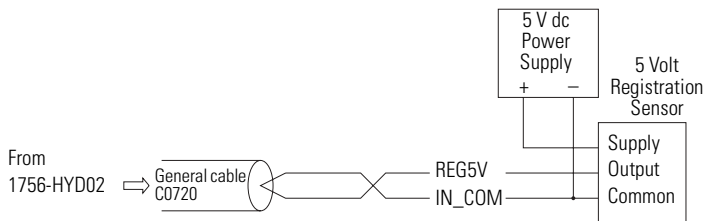
The registration inputs to the servo module can support 24V dc or 5V dc registration sensors. These inputs should be wired to receive source current from the sensor. Current sinking sensor configurations are not allowed because the registration input common (IN_COM) is shared with the other 24V dc servo module inputs.

Figure 2 - 24V Registration Sensor



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Figure 3 - 5V Registration Sensor

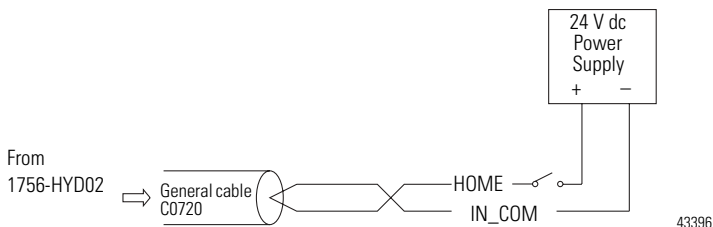


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Wiring the Home Limit Switch Input

The home limit switch inputs to the servo module are designed for 24V dc nominal operation. These inputs should be wired for current sourcing operation.

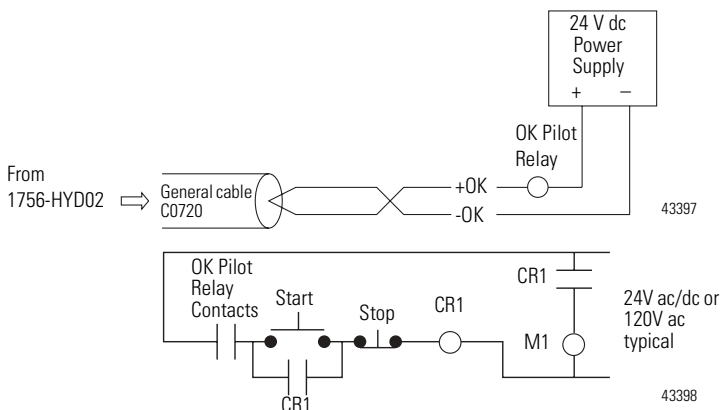
Figure 4



Wiring the OK Contacts

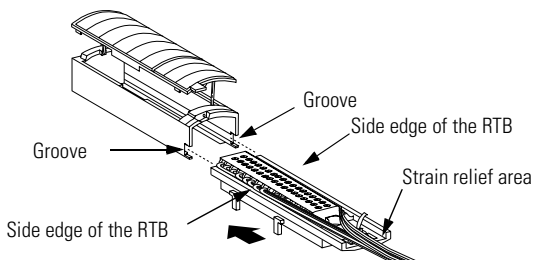
A set of isolated solid- state OK relay contacts is provided for optional interface to an E- stop string, which controls power to the associated pumps. The OK contacts are rated to drive an external 24V dc pilot relay (for example, Allen-Bradley 700- HA32Z24) whose contacts can be incorporated into the E- Stop string as in Figure 5.

Figure 5



Assemble the Removable Terminal Block and the Housing

1. Align the grooves at the bottom of the housing with the side edges of the RTB.



2. Slide the RTB into the housing until it snaps into place. 20858-M

Install the Removable Terminal Block onto the Module

WARNING

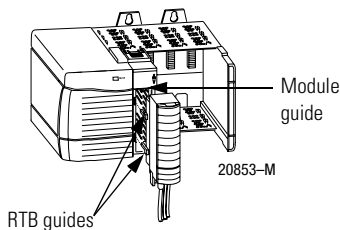


When you connect or disconnect the Removable Terminal Block (RTB) with field side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

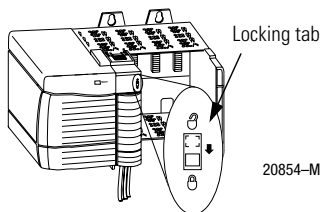
Before installing the RTB, make certain:

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

1. Align the module and RTB guides to make sure the module will seat properly.



2. Press quickly and evenly to seat the RTB until the latches snap into place.



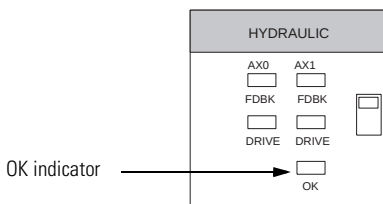
3. To lock the RTB on the module, slide the locking tab down.

Checking the LED Indicators

The module uses a single bi-colored LED to indicate module OK status and bi-colored LED indicators to show individual feedback (FDBK) and drive (DRIVE) status for both axes.

During power up, the module completes an indicator test. The OK indicator turns red for 1 second and then turns to flashing green if the module passes all its self tests.

Understanding Module Status Using the OK Indicator

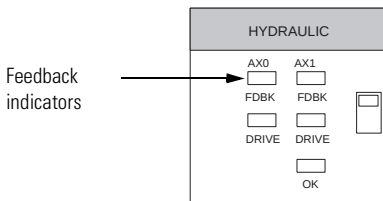


The table below offers an explanation of the OK indicator.

If the OK indicator displays:	The module status is:	Take this action:
Off	The module is not operating.	• Apply chassis power. • Verify the module is completely inserted in chassis and backplane.
Flashing green light	The module has passed internal diagnostics, but it is not communicating axis data over the backplane.	• None, if you have not configured the module. • If you have configured the module, check the slot number in the 1756-HYD02 Properties dialog box.
Steady green light	One of the following: • Module is exchanging axis data. • The module is in the normal operating state.	None

If the OK indicator displays:	The module status is:	Take this action:
Flashing red light	One of the following: • A major recoverable failure has occurred. • A communication fault, timer fault, or non-volatile memory storage (NVS) update is in progress. • The OK contact has opened.	If an NVS update is in progress, complete the NVS update. If an NVS update is not in progress: • Check the Servo Fault word for the source of the error. • Clear the servo fault condition via Motion Axis Fault Reset instruction. • Resume normal operation. • If the flashing persists, reconfigure the module.
Steady red light	One of the following: • A potential non-recoverable fault has occurred. • The OK contact has opened.	• Reboot the module. • If the solid red persists, replace the module.

Understanding Module Status Using the FDBK Indicator



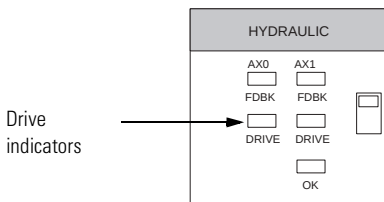
IMPORTANT

Make sure that any transducer used with the 1756-HYD02 module uses an external interrogation signal.

The table below offers an explanation of the FDBK indicator.

If the FDBK indicator displays:	The module status is:	Take this action:
Off	The axis is not used.	- None, if you are not using this axis. - If you are using this axis, make sure the module is configured and an axis tag has been associated with the module.
Flashing green light	The axis is in the normal servo loop inactive state.	None. The servo axis state can be changed by executing motion instructions.
Steady green light	The axis is in the normal servo loop active state.	None. The servo axis state can be changed by executing motion instructions.
Flashing red light	The axis servo loop error tolerance has been exceeded.	- Correct the source of the problem. - Clear the servo fault condition using the Motion Axis Fault Reset instruction. - Resume normal operation.
Steady red light	An axis LDT feedback fault has occurred.	- Correct the source of the problem by checking the LDT and power connections. - Clear the servo fault condition using the Motion Axis Fault Reset instruction. - Resume normal operation.

Understanding Module Status Using the DRIVE Indicator



The table below offers an explanation of the DRIVE indicator.

If the DRIVE indicator displays:	The module status is:	Take this action:
Off	One of the following: - The axis is not used. - The axis is a position-only axis type.	- None, if the axis is not used or is a position-only type. - Otherwise, make sure the module is configured, an axis tag has been associated with the module, and the axis type is servo.
Flashing green light	The axis drive is in the normal disabled state.	None. The servo axis state can be changed by executing motion instructions.
Steady green light	The axis drive is in the normal enabled state.	None. The servo axis state can be changed by executing motion instructions.

If the DRIVE indicator displays:	The module status is:	Take this action:
Flashing red light	The axis drive output is in the shutdown state.	• Check for faults that may have generated this state. • Execute the Shutdown Reset motion instruction. • Resume normal operation.
Steady red light	The axis drive is faulted.	• Check the drive status. • Clear the Drive Fault condition at the drive. • Clear the servo fault condition using the Motion Axis Fault Reset instruction. • Resume normal operation. • Check the configuration for the Drive Fault. • If configured to be normally open and there is no voltage, this is the normal condition. • If configured to be normally closed and 24V dc is applied, this is the normal condition.

Remove the Removable Terminal Block from the Module

If you need to remove the module, you must remove the RTB first.

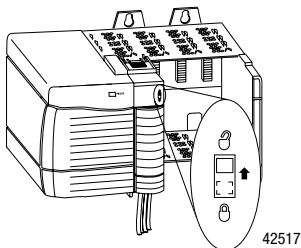
WARNING



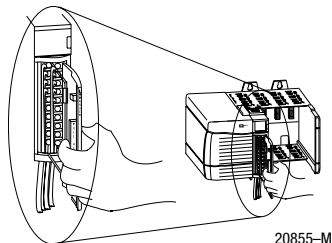
When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Before removing the module, you must remove the RTB.

1. Unlock the locking tab at the top of the module.

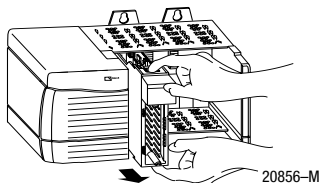


2. Open the RTB door and pull the RTB off the module.

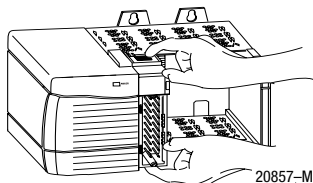


Remove the Module

1. Push in top and bottom locking tabs.



2. Pull module out of the chassis.



1756-HYD02 Specifications

Number of axes	2 axes maximum
Servo loop	
Type	Proportional, integral and differential (PID) with Feed-Forwards and Directional scaling
Gain resolution	32- bit floating point
Absolute position range	230,000 LDT counts
Rate	500Hz to 4kHz (Selectable)
Module location	1756 ControlLogix chassis
Module keying	Electronic
Power dissipation	5.5W maximum
Thermal dissipation	18.77 BTU/hr
Backplane current	5.1V dc @ 700mA and 24V dc @ 2.5mA
LDT input	
Type	PWM, Start/Stop rising or falling edge
Resolution	less than 0.001 inch with single recirculation
Electrical Interface	Isolated 5V differential (RS-422 signal)
Input impedance	215 Ohm differential
Output Load	100 Ohm minimum
Transducer	Must use External Interrogation signal

Registration inputs Type 24V dc input voltage Maximum on Minimum on Maximum off 5V dc input voltage Maximum on Minimum on Maximum off Input impedance 24V dc input 5V dc input Response time (position latched)	Optically isolated, current sinking input +24V dc nominal 26. 4V dc 18. 5V dc 3.5V dc +5V dc nominal 5.5V dc 3.7V dc 1.5V dc 1.2 kΩ 9.5 kΩ 1 servo update period - Servo update period is the period at which the position and/or velocity feedback is sampled and a new servo loop is closed to generate a new servo output. The time of this period is a user-defined setting from 250μs to 2000μs.
All other inputs Type Input voltage Maximum on Minimum on Maximum off Input impedance	Optically isolated, current sinking input +24V dc nominal 26. 4V dc 17. 0V dc 8.5V dc 7.5 kΩ
Servo output Type Voltage range Voltage resolution Load Maximum offset Gain error	Analog voltage $\pm$10V dc 16 bits 5.6 kOhms resistive minimum 25 mV $\pm$4%
All other outputs Type Operating voltage Maximum Operating current	Solid-state isolated relay contacts +24V dc nominal 26. 4V dc 75 mA

Isolation Voltage User to System	30V continuous
RTB keying	User-defined
Field wiring arm	36-position RTB (1756-TBCH or -TBS6H) ⁽¹⁾
RTB screw torque (cage clamp)	4.4 inch-pounds (0.4Nm) maximum
Conductors Wire size	#22 to #14 AWG (0.324 to 2.08 sq. mm) stranded ⁽¹⁾ 3/ 64 inch (1.2 mm) insulation maximum
Category	2 ⁽²⁾ , ⁽³⁾
Screwdriver blade width for RTB	1/8 inch (3.2mm) maximum
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 60°C (32 to 140°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): 2g @ 10-500Hz
Shock	IEC60068-2-27 (Test Ea, Unpackaged shock): Operating 30g Non-operating 50g
Emissions	CISPR 11: Group 1, Class A

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ESD Immunity	IEC 61000-4-2: 6kV contact discharges 8kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10V/m with 1kHz sine-wave 80%AM from 80MHz to 2000MHz 10V/m with 200Hz 50% Pulse 100%AM at 900Mhz
EFT/B Immunity	IEC 61000-4-4: ±2kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±2kV line-earth (CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms with 1kHz sine-wave 80%AM from 150kHz to 80MHz
Enclosure Type Rating	None (open-style)
Certifications (when product is marked)	UL UL Listed Industrial Control Equipment CSA CSA Certified Process Control Equipment CSA CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations CE ⁽⁴⁾ European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions C-Tick ⁽⁴⁾ Australian Radiocommunications Act, compliant with: AS/NZS 2064; Industrial Emissions

(1) Maximum wire size requires the extended-depth RTB housing (1756-TBE).

(2) Use the conductor category information for planning conductor routing as described in the system level installation manual.

(3) Refer to Industrial Automation Wiring and Grounding Guidelines, publication number 1770-4.1.

(4) See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

The following information applies when operating this equipment in hazardous locations:	Informations sur l'utilisation de cet équipement en environnements dangereux :
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.	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.
WARNING EXPLOSION HAZARD • 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 • 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.

Rockwell Automation Support

Rockwell Automation tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility.

If you are experiencing installation or startup problems, please review the troubleshooting information contained in this publication first. If you need technical assistance to get your module up and running, please contact Customer Support (see the table below); our trained technical specialists are available to help.

If the product is not functioning and needs to be returned, contact your distributor. You must provide a Customer Support case number to your distributor in order to complete the return process.

Phone	United States/Canada	1.440.646.5800
	Outside United States/Canada	You can access the phone number for your country via the Internet: 1. Go to http://support.rockwellautomation.com/ 2. Under <i>Contacting Customer Support</i> and Other Countries, click on <i>Click here</i>
Internet	Worldwide	Go to http://support.rockwellautomation.com/

www.rockwellautomation.com

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