

## Environmental Specifications - 1769 CompactLogix Controllers and Compact GuardLogix 5370 Controllers

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L33ER, 1769-L33ERM, 1769-L36ERM	1769-L30ERMS, 1769-L33ERMS, 1769-L36ERMS	1769-L23-QBFC1B, 1769-L23E-QB1B, 1769-L23E-QBFC1B	1769-L31, 1769-L32C, 1769-L35CR, 1769-L32E, 1769-L35E
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Na, Operating Thermal Shock)	-20...+60 °C (-4...+140 °F)	0...60 °C (32...140 °F)				
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40...+85 °C (-40...+185 °F)					
Temperature, surrounding air, max	60 °C (140 °F)					
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5...95% noncondensing					
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10...500 Hz <sup>(1)</sup>		5 g @ 10...500 Hz		5 g @ 10...500 Hz	
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g <sup>(1)</sup>		20 g - DIN rail 30 g - Panel		20 g - DIN rail 30 g - Panel	
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g <sup>(1), (2)</sup>		30 g - DIN rail 40 g - Panel		30 g - DIN rail 40 g - Panel	
Emissions CISPR 11	IEC 61000-6-4					
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges				4 kV contact discharges 8 kV air discharges	6 kV contact discharges 8 kV air discharges

## Environmental Specifications - 1769 CompactLogix Controllers and Compact GuardLogix 5370 Controllers (continued)

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L33ER, 1769-L33ERM, 1769-L36ERM	1769-L30ERMS, 1769-L33ERMS, 1769-L36ERMS	1769-L23-QBFC1B, 1769-L23E-QB1B, 1769-L23E-QBFC1B	1769-L31, 1769-L32C, 1769-L35CR, 1769-L32E, 1769-L35E
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 10V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz		10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz		10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz	1769-L31, 1769-L32C, 1769-L35CR 10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz  1769-L32E, 1769-L35E 10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±3 kV at 5 kHz on power ports ±3 kV at 5 kHz on signal ports ±3 kV at 5 kHz on communication ports		±3 kV at 5 kHz on communication ports	±3 kV at 5 kHz on communication ports ±4 kV at 5 kHz on Protective Earth (PE)	±2 kV at 5 kHz on power ports ±2 kV at 5 kHz on signal ports ±2 kV at 5 kHz on communication ports	1769-L31, 1769-L32C, 1769-L35CR ±2 kV at 5 kHz on communication ports  1769-L32E, 1769-L35E ±3 kV at 5 kHz on power ports ±3 kV at 5 kHz on communication ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on communication ports	±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on shielded ports ±2 kV line-earth (CM) on communication ports	±2 kV line-earth (CM) on communication ports		±1 kV line-line (DM) and ±2 kV line-earth (CM) on power ports ±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports ±2 kV line-earth (CM) on shielded ports ±2 kV line-earth (CM) on communication ports	1769-L31 Channel 0: ±2 kV line-earth (CM) on shielded ports Channel 1: ±1 kV line-earth (CM) on shielded ports  1769-L32C, 1769-L35CR, 1769-L32E, 1769-L35E ±2 kV line-earth (CM) on communication ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz					

- (1) If you are mounting a CompactLogix™ 5370 L1 controller on an EN 50 022 - 35 x 15 mm (1.38 x 0.59 in.) DIN rail, you must first adhere a bumper on the back of the controller. Failure to install the bumper before mounting the controller causes the system to fail to meet this specification. For more information, see the CompactLogix 5370 Controllers User Manual, publication [1769-UM021](#).
- (2) If you are mounting a CompactLogix 5370 L1 controller on an EN 50 022 - 35 x 15 mm (1.38 x 0.59 in.) DIN rail, the Shock, nonoperating specification = 30 g.

During development, safety and standard have the same rules. The following are allowed:

- Multiple programmers
- Online editing
- Forcing

Once the project is tested and ready for final validation, you apply the safety application signature and safety-lock the application. This process sets the safety task to a SIL 3 integrity level. The Compact GuardLogix enforces the SIL 3 integrity level. When safety memory is locked and protected, the safety logic cannot be modified and all safety functions operate with SIL 3 integrity. On the standard side of the Compact GuardLogix controller, all functions operate like a regular Logix controller. Thus online editing, forcing, and other activities are all allowed.

Standard logic and external devices, like HMIs or other controllers, can read safety memory with this level of integration. This level of integration removes the need to condition safety memory for use elsewhere. The result is easy system-wide integration and the ability to display safety status on displays or marquees. Use Guard I/O™ modules for field device connectivity. For safety interlocking between Compact GuardLogix controllers, use Ethernet or ControlNet™ networks. Multiple Compact GuardLogix controllers can share safety data for zone to zone interlocking, or one Compact GuardLogix controller can use remote distributed safety I/O between different cells/areas.

#### Features - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers

Feature	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L33ER, 1769-L33ERM, 1769-L36ERM	1769-L30ERMS, 1769-L33ERMS, 1769-L36ERMS
Controller tasks:	<ul style="list-style-type: none"> <li>• 32 tasks</li> <li>• 100 programs/task</li> </ul>			
Built-in communication ports	<ul style="list-style-type: none"> <li>• Two EtherNet/IP ports - CompactLogix 5370 controllers have two EtherNet/IP ports to connect to an EtherNet/IP network. The ports carry the same network traffic as part of the embedded switch of the controller. However, the controller uses only one IP address.</li> <li>• One USB port (only for temporary connection)</li> </ul>			
Communication options	EtherNet/IP	<ul style="list-style-type: none"> <li>• EtherNet/IP</li> <li>• DeviceNet via 1769-SDN scanner</li> </ul>		
EtherNet/IP node, max	<ul style="list-style-type: none"> <li>• 1769-L16ER-BB1B: Up to four nodes</li> <li>• 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B: Up to 8 nodes</li> </ul>	<ul style="list-style-type: none"> <li>• 1769-L24ER-QB1B, 1769-L24ER-QBFC1B: Up to 8 nodes</li> <li>• 1769-L27ERM-QBFC1B: Up to 16 nodes</li> </ul>	<ul style="list-style-type: none"> <li>• 1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMS: Up to 16 nodes</li> <li>• 1769-L33ER, 1769-L33ERM, 1769-L33ERMS: Up to 32 nodes</li> <li>• 1769-L36ERM, 1769-L36ERMS: Up to 48 nodes</li> </ul>	
Controller connections	256			
Embedded I/O modules	<ul style="list-style-type: none"> <li>• 16 DC digital inputs</li> <li>• 16 DC digital outputs</li> </ul>	All controllers: <ul style="list-style-type: none"> <li>• 16 DC digital inputs</li> <li>• 16 DC digital outputs</li> </ul> Only 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B: <ul style="list-style-type: none"> <li>• 4 high-speed counters</li> <li>• 4 high-speed counter outputs</li> <li>• 4 universal analog inputs</li> <li>• 2 analog output points</li> </ul>	-	
Sockets, max	32			
Integrated Motion over an EtherNet/IP network	1769-L18ERM-BB1B - 1 or 2 axes	1769-L27ERM-QBFC1B - As many as 4 axes	<ul style="list-style-type: none"> <li>• 1769-L30ERM, 1769-L30ERMS - As many as 4 axes</li> <li>• 1769-L33ERM, 1769-L33ERMS - As many as 8 axes</li> <li>• 1769-L36ERM, 1769-L36ERMS - As many as 16 axes</li> </ul>	
Programming languages	<ul style="list-style-type: none"> <li>• Relay ladder<sup>(1)</sup></li> <li>• Structured Text</li> <li>• Function block</li> <li>• SFC</li> </ul>			
Integrated safety	-			Yes

(1) The Compact GuardLogix 5370 controllers support only the relay ladder programming language in the safety task. The Compact GuardLogix 5370 controllers support all listed programming languages in the standard task.

**Technical Specifications - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers**

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L33ER, 1769-L33ERM, 1769-L36ERM	1769-L30ERMS, 1769-L33ERMS, 1769-L36ERMS
User memory	<ul style="list-style-type: none"> <li>1769-L16ER: 384 KB</li> <li>1769-L18ER, 1769-L18ERM: 512 KB</li> <li>1769-L19ER-BB1B: 1 MB</li> </ul>	<ul style="list-style-type: none"> <li>1769-L24ER-QB1B, 1769-L24ER-QBFC1B: 750 KB</li> <li>1769-L27ERM-QBFC1B: 1 MB</li> </ul>	<ul style="list-style-type: none"> <li>1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM: 1 MB</li> <li>1769-L33ER, 1769-L33ERM: 2 MB</li> <li>1769-L36ERM: 3 MB</li> </ul>	<ul style="list-style-type: none"> <li>1769-L30ERMS: 1 MB standard + 0.5 MB safety</li> <li>1769-L33ERMS: 2 MB standard + 1 MB safety</li> <li>1769-L36ERMS: 3 MB standard + 1.5 MB safety</li> </ul>
Optional nonvolatile memory	1784-SD1 card with 1 Gb of available memory (shipped with controller) 1784-SD2 card with 2 Gb of available memory (available for separate ordering)			
Number of local expansion modules, max <sup>(1)</sup>	<ul style="list-style-type: none"> <li>1769-L16ER-BB1B: Six 1734 POINT I/O™ modules</li> <li>1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B: Eight 1734 POINT I/O modules</li> </ul>	Four 1769 Compact I/O™ modules	<ul style="list-style-type: none"> <li>1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L30ERMS: Eight 1769 Compact I/O modules</li> <li>1769-L33ER, 1769-L33ERM, 1769-L33ERMS: Sixteen 1769 Compact I/O modules</li> <li>1769-L36ERM, 1769-L36ERMS: Thirty 1769 Compact I/O modules</li> </ul>	
Number of I/O module banks, max	–	1	3	
Current draw @ 5V DC, controller power	1 A	<ul style="list-style-type: none"> <li>1769-L24ER-QB1B: 1.54 A Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).</li> <li>1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B: 1 A Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).</li> </ul>	500 mA	850 mA
Current draw @ 24V DC, controller power	–	<ul style="list-style-type: none"> <li>1769-L24ER-QB1B: 0.95A Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).</li> <li>1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B: 0.8 A Value rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).</li> </ul>	225 mA	700 mA
Current draw @ 24V DC, field power, max	3 A - Combined total for all devices that draw current from field power connections Input: 5 mA Output: 500 mA	–		
Power dissipation, max	11.5 W	<ul style="list-style-type: none"> <li>1769-L24ER-QB1B: 12 W</li> <li>1769-L24ER-QBFC1B, L27ERM-QBFC1B: 21 W</li> </ul>	4.5 W	6.5 W
Isolation voltage	50V (continuous), Basic Insulation Type Tested at 500V AC for 60 s, System to Field	30V (continuous), Basic Insulation Type, USB to system, Ethernet to system and Ethernet to Ethernet Type tested at 500V AC for 60 s		50V, Basic Insulation Type Tested at 500V AC for 60 s, System to Communication ports.
Short circuit protection, field power	Internal fuse, Non-replaceable	–		
Recommended external short circuit protection, field power	User-provided 4...5 A @ 3.15...5.5 A <sup>2</sup> t fuse	–		
Weight, approx	0.66 kg (1.5 lb)	<ul style="list-style-type: none"> <li>1769-L24ER-QB1B = 0.63 kg (1.39 lb)</li> <li>1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B = 0.9 kg (1.9 lb)</li> </ul>	0.31 kg (0.68 lb)	0.54 kg (1.18 lb)

**Technical Specifications - CompactLogix 5370 Controllers and Compact GuardLogix 5370 Controllers (continued)**

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B	1769-L24ER-QB1B, 1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B	1769-L30ER, 1769-L30ER-NSE, 1769-L30ERM, 1769-L33ER, 1769-L33ERM, 1769-L36ERM	1769-L30ERMS, 1769-L33ERMS, 1769-L36ERMS
Module width	100.00 mm (3.94 in.)	1769-L24ER-QB1B = 115.00 mm (4.53 in.) 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B = 140 mm (5.51 in.)	55.00 mm (2.17 in.)	89.00 mm (3.50 in.)
Module location	DIN rail mount	DIN rail or panel mount		
Panel-mounting screw torque	N/A	1.1...1.8 N•m (10...16 lb•in) - use M4 or #8 screws		
Embedded power supply	24V DC input, isolated	24V DC Input, isolated	1769-PA2, 1769-PB2, 1769-PA4, 1769-PB4	
Power supply distance rating	–		• Controller and 1769-SDN: 4 • 1769 Compact I/O modules: 4...8, depending on module	4 (3 I/O modules between controller and power supply)
Wire category <sup>(2)</sup>	1 - signal ports 1 - power ports 2 - communication ports		2 - communication ports	
Wire type, Ethernet	RJ45 connector according to IEC 60603-7, 2 or 4 pair Category 5e minimum cable according to TIA 568-B.1 or Category 5 cable according to ISO/IEC 24702			
Wire type, power terminals and embedded I/O connections	Copper		–	
Wire size, power terminals <sup>(3)</sup>	0.051...3.31 mm <sup>2</sup> (30...12 AWG) solid or stranded copper wire rated at 75 °C (167 °F), or greater, 1.2 mm (3/64 in.) insulation, max Each terminal accepts 1 or 2 wires	0.25...2.50 mm <sup>2</sup> (22...14 AWG) solid copper wire rated at 75 °C (167 °F), or greater 1.2 mm (3/64 in.) insulation, max Each terminal accepts only 1 wire	–	
Wire stripping length, power terminals <sup>(3)</sup>	10 mm (0.39 in)	8 mm (0.31 in)	–	
Screw torque, power terminals <sup>(3)</sup>	0.5...0.6 N•m (4.4...5.3 lb•in)	1.0...1.2 N•m (8.9...10.6 lb•in)	–	
Wire size, embedded I/O connections	0.205...1.31 mm <sup>2</sup> (24...16 AWG) solid or stranded copper wire rated at 75 °C (167 °F), or greater 1.2 mm (3/64 in.) insulation, max or 90 °C (194 °F) Each terminal accepts only 1 wire		–	
Wire stripping length, embedded I/O connections	10 mm (0.39 in)		–	
North American temperature code	T4A	T3C	T5	
IEC temperature code	T4		T5	
Enclosure type rating	None (open-style)			

- (1) You can use up to the maximum number of local expansion modules with the CompactLogix 5370 L1 controllers that are listed. This condition applies if only the total current drawn by the embedded I/O and local expansion modules does not exceed both the available POINTBus™ backplane current of 1 A and the field power current of 3 A. For more information on POINTBus backplane current and field-power current considerations when installing local expansion modules, see [page 12](#).
- (2) Use this Conductor Category information for planning conductor routing. See the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#) and the appropriate system-level installation manual.
- (3) In regard to the CompactLogix 5370 L1 controllers, this specification applies to connecting wires to the power connector that is inserted in the controller. In regard to the CompactLogix 5370 L2 controllers, this specification applies to connecting wires to power terminals built into the controller.

**Embedded Power Supply (continued)**

Attribute	1769-L16ER-BB1B, 1769-L18ER-BB1B, 1769-L18ERM-BB1B, 1769-L19ER-BB1B
Available 5V DC POINTBus backplane current	1 A @ 5V DC
Current draw @ 24V DC, field power, max	3 A <sup>(1)</sup>
Inrush, max	10 A
Line loss ride through	10 ms...10 s
Output bus current capacity, max	0.1...3 A @ 5V DC
Load current, min	300 mA
Power dissipation, max	12 W
Short circuit protection	Internal fuse Not replaceable
Overvoltage protection	Yes

(1) Combined total for all devices that draw current from field power connections.

**I/O Module Support - CompactLogix 5370 L2 Controllers**

The CompactLogix 5370 L2 controllers offer embedded I/O modules and the option to use 1769 Compact I/O modules as local expansion modules. This table describes the embedded I/O modules and local expansion modules that the CompactLogix 5370 L2 controllers support.

Cat. No.	Embedded I/O Module Support						Local Expansion Modules Support
	Sinking/Sourcing 24V DC Digital Input Points	Sourcing 24V DC Digital Output Points	High-speed Counters	High-speed Counter Output Points	Universal Analog Input Points	Analog Output Points	1769 Compact I/O Modules
1769-L24ER-QB1B	16	16	—	—	—	—	As many as 4 modules
1769-L24ER-QBFC1B			4	4	4	2	
1769-L27ERM-QBFC1B							

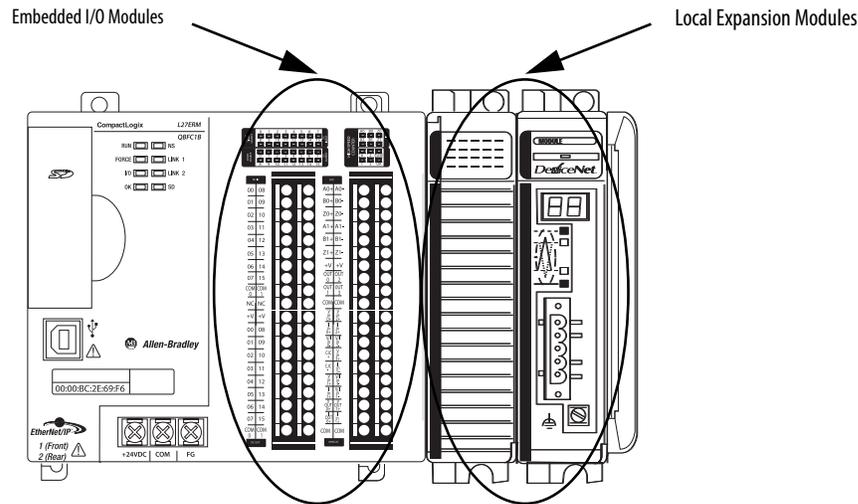
**IMPORTANT** Remember the following when using the embedded I/O modules on CompactLogix 5370 L2 controllers:

- 1769-L24ER-QB1B controller - The digital input points and digital output points are on one embedded I/O module. Therefore, the 1769-L24ER-QB1B controller is considered to have one embedded I/O module.
- 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B controllers - The digital input points and digital output points are on one embedded I/O module. The high-speed counter input/output points, universal analog input points, and analog output points are on another single embedded I/O module. Therefore, the 1769-L24ER-QBFC1B and 1769-L27ERM-QBFC1B controllers are considered to have two embedded I/O modules.

You configure an RPI rate for the embedded I/O modules to establish specific time intervals at which data is transmitted between the controller and the embedded I/O modules. The available RPI range of the embedded I/O modules is 0.5...750.0 ms and can be changed by 0.5 ms increments. The default setting is 20 ms.

To use 1769 Compact I/O modules as local expansion modules, keep in mind the following:

- Local expansion modules must be installed in the same system as the CompactLogix 5370 L2 controller.
- Local expansion modules are installed to the right of the embedded I/O modules.
- You must install a 1769-ECR Compact I/O end cap on the right side of control system. The end cap can be installed on the right side of the embedded I/O module. If local expansion modules are used, the end cap can be installed on the right side of 1769 Compact I/O module.



### *CompactLogix 5370 L2 Controller Local I/O Performance*

The requested packet interval (RPI) defines the frequency at which the controller sends data to and receives data from I/O modules. You set an RPI rate for each I/O module in your system in the programming software. You also set RPI rates through the programming software for embedded I/O modules, local expansion modules, and distributed I/O modules over an EtherNet/IP network.

The CompactLogix 5370 L2 controllers always attempt to scan an I/O module at the configured RPI rate. The controller scans distributed I/O modules at the configured RPI rates.

With embedded I/O modules and local expansion modules, however, some specific system-configuration parameters determine the actual rate at which the controller scans the modules. That is, the controller can be configured to scan an I/O module at one rate, but actually scan the module at another rate.

For individual I/O modules, a Module RPI Overlap minor fault occurs if there is at least one I/O module that cannot be serviced within its RPI time.

The specific configuration parameters for a system determine the impact on actual RPI rates. These configuration factors can impact the effective scan frequency for any individual embedded or local expansion module:

- Rates at which the RPI values of the embedded I/O modules are set
- Number of embedded I/O modules that are used in the system
- Types of embedded I/O modules that are used in the system
- Rates at which RPI values for the 1769 Compact I/O module are set
- Number of 1769 Compact I/O modules in the system
- Types of 1769 Compact I/O modules in the system
- Application user task priorities

The [RPI Rate Guidelines](#) table describes RPI rate guidelines.

### RPI Rate Guidelines

Type of Module	Guidelines
Digital and analog (any mix)	The following guidelines apply: <ul style="list-style-type: none"> <li>1...2 modules can be scanned in 0.5 ms.</li> <li>3...4 modules can be scanned in 1 ms.</li> <li>5...6 modules can be scanned in 2 ms.</li> <li>Some input modules have a fixed 8 ms filter, so selecting a faster RPI has no effect.</li> </ul>
Specialty	The following conditions apply: <ul style="list-style-type: none"> <li>For every full-sized 1769-SDN module in the system, increase the RPI of every other module by 2 ms.</li> <li>For every 1769-HSC module in the system, increase the RPI of every other module by 1 ms.</li> <li>For every full-sized 1769-ASCII module system, increase the RPI of every other module by 1 ms.</li> <li>For every 1769-SM2 module in the system, increase the RPI of every other module by 2 ms.</li> </ul> For example, the system includes four I/O modules that are configured with an RPI = 1 ms and you add a 1769-SDN module to the system. You must increase the RPI value for all four I/O modules by 2 ms. Therefore, when the 1769-SDN module is added to the system, the four I/O modules use an RPI = 3 ms. If, in the same system, you add a second 1769-SDN module, the RPI value of the four I/O modules is increased to 5 ms.

**IMPORTANT** The number of I/O modules can be the embedded I/O modules on the controller or 1769 Compact I/O modules that are used as local expansion modules.

Therefore, the consideration for using modules can be any of the following system configurations:

- Only embedded I/O modules
- Only 1769 Compact I/O modules
- Some combination of embedded I/O modules and 1769 Compact I/O modules

You can set individual RPI rates for 1769 Compact I/O modules higher than those values listed in the [Embedded DC Input Specifications](#) table. The RPI shows how quickly modules can be scanned, not how quickly an application can use the data. The RPI is asynchronous to the program scan. Other factors, such as program execution duration, affect I/O throughput.

### Embedded DC Input Specifications

Attribute	1769-L24ER-QB1B	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Inputs	16	
Voltage category	24V DC sink/source	
Operating voltage range	10...28.8V DC @ 40 °C (104 °F) 10...26.4V DC @ 60 °C (140 °F) 24V DC nom	10...28.8V DC @ 40 °C (104 °F) 10...27.0V DC @ 55 °C (131 °F) 10...26.4V DC @ 60 °C (140 °F) 24V DC nom
Digital filter, off to on	0 s, 100 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms	
Input delay, off to on	100 μs, min 8 ms, max	
Digital filter, on to off	0 s, 100 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms	
Input delay, on to off	100 μs, min 8 ms, max	
Off-state voltage, max	5V DC	
Off-state current, max	1.5 mA	
On-state current, min	2 mA @ 24V DC per channel	
On-state current, max	5 mA @ 24V DC per channel	
Input impedance, max	5.2 kΩ @ 24V DC 6.1 kΩ @ 30V DC	
Cyclic update time	0.5...750 ms	

**Embedded DC Input Specifications (continued)**

Attribute	1769-L24ER-QB1B	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Isolation voltage	75V (continuous), Reinforced Insulation Type Type tested at 1200V AC for 1 s and at 1700V DC for 1 s; group to system, group to group	
IEC input compatibility	Type 3	
Isolated groups	Group 1: inputs 0...7 Group 2: inputs 8...15 Isolated groups operate in either sink or source configurations	

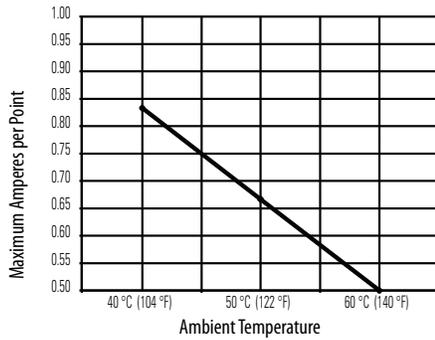
**Embedded DC Output Specifications**

Attribute	1769-L24ER-QB1B	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Outputs	16	
Voltage category	24V DC source	
Operating voltage range	20.4...26.4V DC 24V DC nom	
Output delay, off to on	0.05 ms	
Output delay, on to off	0.5 ms	
Off-state leakage current, max	0.1 mA @ 26.4V DC	
On-state current, max	0.5 mA @ 24V DC per channel	
On-state voltage drop, max	1.0V DC @ 1.0 A	
Current per point, max	0.83 A @ 40 °C (104 °F) 0.5 A @ 60 °C (140 °F)	0.83 A @ 40 °C (104 °F) 0.58 A @ 55 °C (131 °F) 0.5 A @ 60 °C (140 °F)
Current per module, max	6.64 A @ 40 °C (104 °F) 4.0 A @ 60 °C (140 °F)	6.64 A @ 40 °C (104 °F) 4.64 A @ 55 °C (131 °F) 4.0 A @ 60 °C (140 °F)
Surge current per point, max	2.0 A for 10 ms per point, repeatable every 2 s	
Isolation voltage	75V (continuous), Reinforced Insulation Type Type tested at 1200V AC for 1 s and at 1700V DC for 1 s; group to system, group to group	
Isolated groups	Group 1: inputs 0...7 Group 2: inputs 8...15	

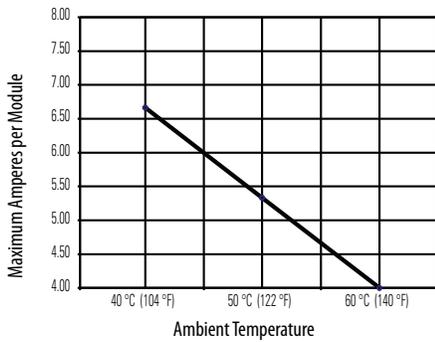
### Embedded DC Output Temperature Derating

The area within the curves represents the safe operating range for the embedded DC outputs under various conditions of user supplied voltages and ambient temperatures.

#### Embedded DC Outputs Maximum Amperes per Point Versus Temperature



#### Embedded DC Outputs Maximum Amperes per Module Versus Temperature



## Embedded Analog Input Specifications

Attribute	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Inputs	4 channels of thermocouple/voltage/current 2 channels of RTD/Resistance inputs
Operating voltage range	2.6...30.0V DC @ 40 °C (104 °F) 2.6...26.4V DC @ 55 °C (131 °F) 2.6...5V DC @ 60 °C (140 °F)
Input types	<ul style="list-style-type: none"> <li>• Thermocouple: J, K, T, E, R, S, B, N, and C</li> <li>• Voltage</li> <li>• Current</li> <li>• RTD: Platinum 385, Platinum 3916, Copper 426, Nickel 672, Nickel 618, Nickel-Iron 518</li> <li>• Resistance</li> </ul>
Input ranges <sup>(1)</sup>	<p>Thermocouple:</p> <ul style="list-style-type: none"> <li>• K at 1370...1372 °C (2498...2501.6 °F)</li> <li>• K at -170...+1370 °C (-274...+2498 °F)</li> <li>• K at -200...+1370 °C (-328...+2498 °F)</li> <li>• S and R at 0...1768 °C (32...3214.4 °F)</li> <li>• S and R at -50...0 °C (-58...+32 °F)</li> <li>• B at 300...1820 °C (572...3308 °F)</li> <li>• B at 250...300 °C (482...572 °F)</li> <li>• J at -210...+1200 °C (-328...+2192 °F)</li> <li>• T at -170...+400 °C (-274...+752 °F)</li> <li>• T at -200...-170 °C (-328...-274 °F)</li> <li>• E at -200...+1000 °C (-328...+1832 °F)</li> <li>• N at -110...+1300 °C (-166...+2372 °F)</li> <li>• N at -200...-110 °C (-328...-166 °F)</li> <li>• C at 0...2315 °C (32...4199 °F)</li> </ul> <p>Voltage:</p> <ul style="list-style-type: none"> <li>• -50...+50 mV</li> <li>• -100...+100 mV</li> <li>• 0...5V</li> <li>• 1...5V</li> <li>• 0...10V</li> <li>• -10V...+10V</li> </ul> <p>Current:</p> <ul style="list-style-type: none"> <li>• 0...20 mA</li> <li>• 4...20 mA</li> </ul> <p>RTD:</p> <ul style="list-style-type: none"> <li>• 0...100 Ω Platinum 385</li> <li>• 0...200 Ω Platinum 385</li> <li>• 0...500 Ω Platinum 385</li> <li>• 0...1000 Ω Platinum 385</li> <li>• 0...100 Ω Platinum 3916</li> <li>• 0...200 Ω Platinum 3916</li> <li>• 0...500 Ω Platinum 3916</li> <li>• 0...1000 Ω Platinum 3916</li> <li>• 0...10 Ω Copper 426</li> <li>• 0...120 Ω Nickel 618</li> <li>• 0...120 Ω Nickel 672</li> <li>• 0...604 Ω Nickel-Iron 518</li> </ul> <p>Resistance:</p> <ul style="list-style-type: none"> <li>• 0...150 Ω</li> <li>• 0...500 Ω</li> <li>• 0...1000 Ω</li> <li>• 0...3000 Ω</li> </ul>
Resolution, max	15 bits plus sign (Bipolar) 16 bits (Unipolar)
Input impedance	Voltage: 10 MΩ Current: 250 Ω
Converter type	Sigma-Delta
Cyclic update time	11...5000 ms dependent on user configuration
Rated working voltage	30V AC/30V DC
Common mode voltage	±10V DC per channel
Common mode rejection ratio, min	115 dB at 50 Hz at 10V 115 dB at 60 Hz at 10V
Normal mode rejection ratio, min	85 dB at 50 Hz at 1.5V 85 dB at 60 Hz at 1.5V

## Embedded Analog Input Specifications (continued)

Attribute	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Accuracy, overall at 25 °C (77 °F) <sup>(2)</sup>	<p>Thermocouple types:</p> <ul style="list-style-type: none"> <li>• J at -210...+1200 °C (-328...+2192 °F): ±0.6 °C (1.1 °F)</li> <li>• N at -110...+1300 °C (-166...+2372 °F): ±1.0 °C (1.8 °F)</li> <li>• N at -200...-110 °C (-328...-166 °F): ±1.0 °C (1.8 °F)</li> <li>• T at -170...+400 °C (-274...+752 °F): ±1.0 °C (1.8 °F)</li> <li>• T at -200...-170 °C (-328...-274 °F): ±1.0 °C (1.8 °F)</li> <li>• K at 1370...1372 °C (2498...2501.6 °F): ±1.2 °C (2.2 °F)</li> <li>• K at -200...+1370 °C (-328...+2498 °F): ±1.0 °C (1.8 °F)</li> <li>• E at -200...+1000 °C (-328...+1832 °F): ±0.5 °C (0.9 °F)</li> <li>• S and R at 0...1768 °C (32...3214.4 °F): ±1.7 °C (3.1 °F)</li> <li>• S and R at -50...0 °C (-58...+32 °F): ±4.0 °C (7.2 °F)</li> <li>• B at 300...1820 °C (572...3308 °F): ±3.0 °C (5.4 °F)</li> <li>• B at 250...300 °C (482...572 °F): ±6.0 °C (10.8 °F)</li> <li>• C at 0...2315 °C (32...4199 °F): ±1.8 °C (3.2 °F)</li> </ul> <p>Voltage inputs:</p> <ul style="list-style-type: none"> <li>• ±50 mV: ±15 µV</li> <li>• ±100 mV: ±20 µV</li> <li>• 0...5V: ±2.5 mV</li> <li>• 1...5V: ±2 mV</li> <li>• 0...10V: ±5 mV</li> <li>• ±10V: ±10 mV</li> </ul> <p>Current inputs:</p> <ul style="list-style-type: none"> <li>• 0...20 mA: ±20 µA</li> <li>• 4...20 mA: ±16 µA</li> </ul> <p>RTD types:</p> <ul style="list-style-type: none"> <li>• Platinum 385: ±0.5 °C (0.9 °F)</li> <li>• Platinum 3916: ±0.4 °C (0.7 °F)</li> <li>• Nickel: ±0.2 °C (0.4 °F)</li> <li>• Nickel-Iron: ±0.3 °C (0.5 °F)</li> <li>• Copper: ±0.6 °C (1.1 °F)</li> </ul> <p>Resistance types:</p> <ul style="list-style-type: none"> <li>• 0...150 Ω: ±0.15 Ω</li> <li>• 0...500 Ω: ±0.5 Ω</li> <li>• 0...1000 Ω: ±1.0 Ω</li> <li>• 0...3000 Ω: ±1.5 Ω</li> </ul>
Accuracy, overall at 0...60 °C (32...140 °F) <sup>(2)</sup>	<p>Thermocouple types:</p> <ul style="list-style-type: none"> <li>• J at -210...+1200 °C (-328...+2192 °F): ±0.9 °C (1.6 °F)</li> <li>• N at -110...+1300 °C (-166...+2372 °F): ±1.5 °C (2.7 °F)</li> <li>• N at -200...-110 °C (-328...-166 °F): ±1.5 °C (2.7 °F)</li> <li>• T at -170...+400 °C (-274...+752 °F): ±1.5 °C (2.7 °F)</li> <li>• T at -200...-170 °C (-328...-274 °F): ±1.5 °C (2.7 °F)</li> <li>• K at 1370...1372 °C (2498...2501.6 °F): ±1.8 °C (3.2 °F)</li> <li>• K at -200...+1370 °C (-328...+2498 °F): ±1.5 °C (2.7 °F)</li> <li>• E at -200...+1000 °C (-328...+1832 °F): ±0.8 °C (1.4 °F)</li> <li>• S and R at 0...1768 °C (32...3214.4 °F): ±3.5 °C (6.3 °F)</li> <li>• S and R at -50...0 °C (-58...+32 °F): ±4.0 °C (7.2 °F)</li> <li>• B at 300...1820 °C (572...3308 °F): ±4.5 °C (8.1 °F)</li> <li>• B at 250...300 °C (482...572 °F): ±9.0 °C (16.2 °F)</li> <li>• C at 0...2315 °C (32...4199 °F): ±3.5 °C (6.3 °F)</li> </ul> <p>Voltage inputs:</p> <ul style="list-style-type: none"> <li>• ±50 mV: ±25 µV</li> <li>• ±100 mV: ±30 µV</li> <li>• 0...5V: ±5 mV</li> <li>• 1...5V: ±4 mV</li> <li>• 0...10V: ±10 mV</li> <li>• ±10V: ±20 mV</li> </ul> <p>Current inputs:</p> <ul style="list-style-type: none"> <li>• 0...20 mA: ±50 µA</li> <li>• 4...20 mA: ±40 µA</li> </ul> <p>RTD types:</p> <ul style="list-style-type: none"> <li>• Platinum 385: ±0.9 °C (1.6 °F)</li> <li>• Platinum 3916: ±0.8 °C (1.4 °F)</li> <li>• Nickel: ±0.4 °C (0.7 °F)</li> <li>• Nickel-Iron: ±0.5 °C (0.9 °F)</li> <li>• Copper: ±1.1 °C (2.0 °F)</li> </ul> <p>Resistance types:<sup>(2)</sup></p> <ul style="list-style-type: none"> <li>• 0...150 Ω: ±0.25 Ω</li> <li>• 0...500 Ω: ±0.8 Ω</li> <li>• 0...1000 Ω: ±1.5 Ω</li> <li>• 0...3000 Ω: ±2.5 Ω</li> </ul>

**Embedded Analog Input Specifications (continued)**

Attribute	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Cold junction compensation accuracy at 0...60 °C (32...140 °F) <sup>(2)</sup>	±1.3 °C (34.34 °F)
Calibration	Cyclic calibration by user configuration
Non-linearity (in percent full scale)	±0.05%
Repeatability at 25 °C (77 °F) with 10 Hz filter	<p>Thermocouple types:</p> <ul style="list-style-type: none"> <li>• J at -210...+1200 °C (-328...+2192 °F): ±0.1 °C (0.2 °F)</li> <li>• N at -110...+1300 °C (-166...+2372 °F): ±0.1 °C (0.2 °F)</li> <li>• N at -200...-110 °C (-328...-166 °F): ±0.25 °C (0.5 °F)</li> <li>• T at -170...+400 °C (-274...+752 °F): ±0.1 °C (0.2 °F)</li> <li>• T at -200...-170 °C (-328...-274 °F): ±1.5 °C (2.7 °F)</li> <li>• K at 1370...1372 °C (2498...2501.6 °F): ±0.15 °C (0.3 °F)</li> <li>• K at -170...+1370 °C (-274...+2498 °F): ±0.1° (0.2 °F)</li> <li>• K at -200...-170 °C (-328...-274 °F): ±2.0 °C (3.6 °F)</li> <li>• E at -200...+1000 °C (-328...+1832 °F): ±0.1° (0.2 °F)</li> <li>• S and R at 0...1768 °C (32...3214.4 °F): ±0.4 °C (0.7 °F)</li> <li>• S and R at -50...0 °C (-58...+32 °F): ±1.0 °C (1.8 °F)</li> <li>• B at 300...1820 °C (572...3308 °F): ±0.7 °C (1.3 °F)</li> <li>• B at 250...300 °C (482...572 °F): ±1.5 °C (2.7 °F)</li> <li>• C at 0...2315 °C (32...4199 °F): ±0.2 °C (0.4 °F)</li> </ul> <p>Voltage inputs:</p> <ul style="list-style-type: none"> <li>• ±50 mV: ±6 µA</li> <li>• ±100 mV: ±6 µV</li> <li>• 0...5V: ±150 mV</li> <li>• 1...5V: ±150 mV</li> <li>• 0...10V: ±150 mV</li> <li>• ±10V: ±150 mV</li> </ul> <p>Current inputs:</p> <ul style="list-style-type: none"> <li>• 0...20 mA: ±0.3 µA</li> <li>• 4...20 mA: ±0.3 µA</li> </ul> <p>RTD types:</p> <ul style="list-style-type: none"> <li>• Platinum 385: ±0.2 °C (0.4 °F)</li> <li>• Platinum 3916: ±0.2 °C (0.4 °F)</li> <li>• Nickel: ±0.01 °C (0.02 °F)</li> <li>• Nickel-Iron: ±0.01 °C (0.02 °F)</li> <li>• Copper: ±0.2 °C (0.4 °F)</li> </ul> <p>Resistance types:</p> <ul style="list-style-type: none"> <li>• 0...150 Ω: ±0.04 Ω</li> <li>• 0...500 Ω: ±0.2 Ω</li> <li>• 0...1000 Ω: ±0.2 Ω</li> <li>• 0...3000 Ω: ±0.2 Ω</li> </ul>
Overload at input terminals, max	Voltage: ±35V DC continuous Current: 32 mA continuous, ±7.6V DC
Channel diagnostics	Invalid configuration, Over- or under-range by bit reporting, open circuit
Isolation voltage	30V AC/30V DC (continuous), reinforced insulation type Type tested at 720V DC for 60 s; inputs to system backplane

(1) Values for these input types rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).

(2) These specification values are based on cyclic calibration and connecting a 4-wire device to the module.

**Embedded Analog Output Specifications**

Attribute	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Outputs	2 single-ended
Output types	<ul style="list-style-type: none"> <li>• Voltage</li> <li>• Current</li> </ul>
Output ranges <sup>(1)</sup>	<p>Voltage:</p> <ul style="list-style-type: none"> <li>• 0...5V</li> <li>• 1...5V</li> <li>• 0...10V</li> <li>• -10V...+10V</li> </ul> <p>Current:</p> <ul style="list-style-type: none"> <li>• 0...20 mA</li> <li>• 4...20 mA</li> </ul>
Converter type	R-2R Ladder Voltage Switching
Resolution, max	15 bits plus sign (Bipolar) 16 bits (Unipolar)

**Embedded Analog Output Specifications (continued)**

Attribute	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Cyclic update time, nom	2.5 ms
Cyclic update time, max	9.5 ms
Current load on voltage output	10 mA max
Resistive load on current output	0...300 $\Omega$
Load range on voltage output	> 1 k $\Omega$ at 10V DC
Inductive load, max (current outputs)	0.1 mH
Capacitive load, max (Voltage Outputs)	1 $\mu$ F
Accuracy, overall at 25 °C (77 °F)	Voltage: $\pm$ 0.5% full scale Current: $\pm$ 0.5% full scale
Accuracy, overall at 0...60 °C (32...140 °F)	Voltage: $\pm$ 0.8% full scale Current: $\pm$ 0.8% full scale
Accuracy drift with temperature	Voltage: $\pm$ 0.0086% full scale per °C Current: $\pm$ 0.0086% full scale per °C
Output ripple range 0...50 kHz (referred to output range)	$\pm$ 0.05%
Non-linearity	$\pm$ 0.05% (in percent full scale)
Repeatability	$\pm$ 0.05%
Output impedance	Voltage: <1 $\Omega$ Current: >1 M $\Omega$
Short-circuit protection	Yes
Short-circuit, nom	Current: 16 mA
Open circuit, max	16V
Output response at system powerup and powerdown	Current: $\pm$ 1.0V spike for < 5 ms Voltage: $\pm$ 1.0V DC spike < 5 ms
Isolation voltage	30V AC/30V DC (continuous), reinforced insulation type Type tested at 500V AC or 710V DC for 60 s; outputs to system backplane

(1) Values for these input types rated at the following ambient temperatures: 40 °C (104 °F), 55 °C (131 °F), 60 °C (140 °F).

**Analog Input Ranges**

Input Type Normal Op. Range	Full Range <sup>(1)</sup>	Raw/Prop. Data Units for Full Range	Eng. Unit Values for Full Range x 1		Eng. Unit Values for Full Range x 10		Scaled-for-PID Values for Normal Operating Range	Scaled-for-PID Values for Full Range	Percent of Normal Op. Range Values	Percent of Full Range Values
			°C	°F	°C	°F				
-10...+10V DC	-10.5V...+10.5V	-32767...+32767	-10500...+10500		-1050...+1050		0...16,383	-410...+16793	-10000...+10000	-10500...+10500
0...5V DC	-0.5V...+5.25V		-500...+5250		-50...+525			-1638...+17202	0...10000	-1000...+10500
0...10V DC	-0.5V...+10.5V		-500...+10500		-50...+1050			-819...+17202		-500...+10500
4...20 mA	3.2...21 mA		3200...21000		320...2100			-819...+17407		-500...+10625

**Analog Input Ranges (continued)**

Input Type Normal Op. Range	Full Range <sup>(1)</sup>	Raw/Prop. Data Units for Full Range	Eng. Unit Values for Full Range x 1		Eng. Unit Values for Full Range x 10		Scaled-for- PID Values for Normal Operating Range	Scaled-for-PID Values for Full Range	Percent of Normal Op. Range Values	Percent of Full Range Values	
			°C	°F	°C	°F					
1...5V DC	0.5V...5.25V	-32767... +32767	500...5250		50...525		0...16,383	-2048... +17407	0...10000	-1250... +10625	
0...20 mA	0...21 mA		0...21000		0...2100			0...17202		0...10500	
J (-210...+1200)			-2100... +12000	-3460... +21920	-210...+1200	-346...+2192		0...16,383			0...10000
K (-200...+1372)			-2000... +13720	-3280... +25020	-200...+1372	-328...+2502					
T (-200...+400)			-2000... +4000	-3280...+7520	-200...+400	-328...+752					
E (-200...+1000)			-2000... +10000	-3280... +18320	-200...+1000	-328...+1832					
R (-50...+1768)			-500... +17680	-580...+32140	-50...+1768	-58...+3214					
S (-50...+1768)			-500... +17680	-580...+32140	-50...+1768	-58...+3214					
B (250...1820)			2500...18200	4820... +32767	250...1820	482...3308					
N (-200...+1300)			-2000... +13000	-3280... +23720	-200...+1300	-328...+2372					
C (0...2315)			0...23150	320...32767	0...2315	32...4199					
-50...+50 mV			-5000...+5000		-500...+500						
-100...+100 mV			-10000...+10000		-1000...+1000						
0...150 Ω			0...15000		0...1500						
0...500 Ω			0...5000		0...500						
0...1000 Ω			0...10000		0...1000						
0...3000 Ω			0...30000		0...3000						
Platinum 385 (-200...+850)			-2000...+8500	-3280... +15620	-200...+850	-328...+1562					
Platinum 3916 (-200...+510)			-2000...+5100	-3280...+9500	-200...+510	-328...+950					
Copper 426 (-70...+150)			-700...+1500	-940...+3020	-70...+1500	-94...+302					
Nickel 618 (-60...+250)		-600...+2500	-760...+4820	-60...+250	-76...+482						
Nickel 672 (-80...+260)		-800...+2600	-1120...+5000	-80...+260	-112...+500						
Nickel-Iron 518 (-100...+200)		-1000...+2000	-1480...+3920	-100...+200	-148...+392						

(1) Includes amount over and under normal operating.

### Embedded Analog Output Module Data<sup>(1)</sup>

Analog Output Module Range	Input Value	Example Data		Output Range State	Raw/Proportional Data		Engineering Unit		Scaled-for-PID		Percent Full Range	
		Controller Ordered	Embedded Analog Module Output		Decimal Range		Decimal Range		Decimal Range		Decimal Range	
					Controller Ordered	Embedded Analog Module Output	Controller Ordered	Embedded Analog Module Output	Controller Ordered	Embedded Analog Module Output	Controller Ordered	Embedded Analog Module Output
±10V	Over 10.5V	+11.0V	+10.5V	Over	–	–	11000	–	17202	–	11000	–
	+10.5V	+10.5V	+10.5V	Over	32767	32767	10500	10500	16793	16793	10500	10500
	±10V	+10.0V	+10.0V	Normal	31207	31207	10000	10000	16383	16383	10000	10000
		0.0V	0.0V	Normal	0	0	0	0	8192	8192	0	0
	-10.0V	-10.0V	Normal	-31207	-31207	-10000	-10000	0	0	-10000	-10000	
	-10.5V	-10.5V	-10.5V	Under	-32767	-32767	-10500	-10500	-410	-410	-10500	-10500
Under 10.5V	-11.0V	-10.5V	Under	–	–	-11000	-10500	-819	-410	-11000	-10500	
0...5V	Over 5.25V	5.5V	+5.25V	Over	–	–	5500	5250	18021	17202	11000	10500
	5.25V	5.25V	+5.25V	Over	32767	32767	5250	5250	17202	17202	10500	10500
	0...5.0V	5.0V	+5.0V	Normal	31207	31207	5000	5000	16383	16383	10000	10000
		0.0V	0.0V	Normal	0	0	0	0	0	0	0	0
	-0.5V	-0.5V	-0.5V	Under	-3121	-3121	-500	-500	-1638	-1638	-1000	-1000
Under -0.5V	-1.0V	-0.5V	Under	-6241	-3121	-500	-500	-3277	-1638	-2000	-1000	
0...10V	Over 10.5V	11.0V	+10.5V	Over	–	–	11000	10500	18021	17202	11000	10500
	+10.5V	+10.5V	+10.5V	Over	32767	32767	10500	10500	17202	17202	10500	10500
	0...10.0V	+10.0V	+10.0V	Normal	31207	31207	10000	10000	16383	16383	10000	10000
		0.0V	0.0V	Normal	0	0	0	0	0	0	0	0
	-0.5V	-0.5V	-0.5V	Under	-1560	-1560	-500	-500	-819	-819	-500	-500
Under -0.5V	-1.0V	-0.5V	Under	-3121	-1560	-1000	-500	-1638	-819	-1000	-500	
4...20 mA	Over 21.0 mA	+22.0 mA	21 mA	Over	–	–	22000	21000	18431	17407	11250	10625
	21.0 mA	+21.0 mA	21 mA	Over	32767	32767	21000	21000	17407	17407	10625	10625
	4...20.0 mA	+20.0 mA	20 mA	Normal	31207	31207	20000	20000	16383	16383	10000	10000
		+4.0 mA	+4.0 mA	Normal	6241	6241	4000	4000	0	0	0	0
	3.2 mA	+3.2 mA	+3.2 mA	Under	4993	4993	3200	3200	-819	-819	-500	-500
Under 3.2	0.0 mA	+3.2 mA	Under	0	4993	0	3200	-4096	-819	-2500	-500	
1...5V	Over 5.25V	+5.5V	+5.25V	Over	–	–	5500	5250	18431	17407	11250	10625
	+5.25V	+5.25V	+5.25V	Over	32767	32767	5250	5250	17407	17407	10625	10625
	1...5.0V	+5.0V	+5.0V	Normal	31207	31207	5000	5000	16383	16383	10000	10000
		+1.0V	+1.0V	Normal	6241	6241	1000	1000	0	0	0	0
	0.5V	+0.5V	+0.5V	Under	3121	3121	500	500	-2048	-2048	-1250	-1250
Under 0.5V	0.0V	0.0V	Under	0	3121	0	500	-4096	-2048	-2500	-1250	
0...20 mA	Over 21.0 mA	+22.0 mA	21 mA	Over	–	–	22000	21000	18201	17202	11000	10500
	21.0 mA	21.0 mA	21 mA	Over	32767	32767	21000	21000	17202	17202	10500	10500
	0...20.0 mA	20.0 mA	20 mA	Normal	31207	31207	20000	20000	16383	16383	10000	10000
		0.0 mA	0.0 mA	Normal	0	0	0	0	0	0	0	0
	Under 0.0 mA	-1.0 mA	0.0 mA	Under	-1560	0	0	-1000	-819	0	-500	0

(1) If Clamping is enabled, the output value is the clamped value that is defined in the configuration.

**Embedded HSC Input Specifications**

Attribute	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Input frequency, max	250 kHz
Input current, max	15 mA per channel
Input current, min	6.8 mA
Input voltage range	2.6...30V DC <sup>(1)</sup>
On-state voltage, max	30V DC
On-state current, min	6.8 mA
Off-state voltage, max	1.0V DC
Off-state current, max	1.5 mA
Off-state leakage current, max	1.5 mA
Input impedance, nom	1950 $\Omega$
Pulse width, min	2.5 $\mu$ s
Phase separation, min	1.3 $\mu$ s
Isolation voltage	75V (continuous), reinforced insulation type Type tested at 1200V AC for 60 s; inputs to system backplane and input to input

(1) See [Maximum Input Voltage - 24V DC Operation](#) temperature derating.

**Embedded HSC Output Specifications**

Attribute	1769-L24ER-QBFC1B, 1769-L27ERM-QBFC1B
Output voltage range	5...30V DC
On-state voltage, max	User power - 0.1V DC
On-state output current, max	0.25 A per channel
On-state output current, min	1 mA
On-state voltage drop, max	0.5V DC
Off-state leakage current, max	5 $\mu$ A
Turn-on time, max	400 $\mu$ s
Turn-off time, max	200 $\mu$ s
Reverse polarity protection	30V DC
Isolation voltage	75V (continuous), reinforced insulation type Type tested at 1200V AC for 60 s; inputs to system backplane and input to input
Current per channel, max	1.0 A @ 40 °C (104 °F) 0.5 A @ 55 °C (131 °F) 0.25 A @ 60 °C (140 °F)
Current per module, max	4.0 A @ 40 °C (104 °F) 2.0 A @ 55 °C (131 °F) 1.0 A @ 60 °C (140 °F)