

GuardPLC 1800 Controllers

Catalog Numbers 1753-L32BBBM-8A, 1753-L32BBBP-8A

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Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature/>) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

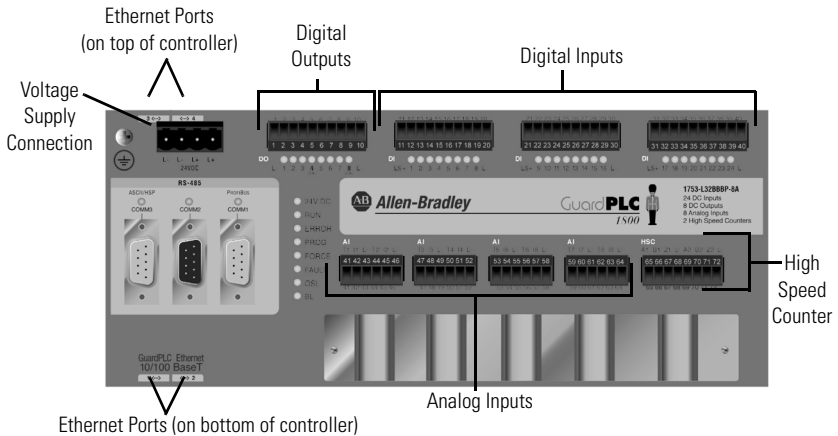
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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	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. Attentions help you identify a hazard, avoid a hazard and recognize the consequences.
	SHOCK HAZARD: Labels may be on or inside the equipment, for example, drive or motor, to alert people that dangerous voltage may be present.
	BURN HAZARD: Labels may be on or inside the equipment, for example, drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

About the Controller

The GuardPLC 1800 controller is a programmable electronic system featuring 24 digital inputs, 8 digital outputs, 2 counters, 8 analog inputs, and 4 connections for GuardPLC Ethernet communication.



General Safety



ATTENTION: Personnel responsible for the application of safety-related programmable electronic systems (PES) shall be aware of the safety requirements in the application of the system and shall be trained in using the system.

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 static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use.

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 m (6562 ft) without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR 11. Without appropriate precautions, there may be difficulties with electromagnetic compatibility in residential and other environments due to conducted as well as radiated disturbances.

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 enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5VA, V2, V1, V0 (or equivalent) if non-metallic. 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.

In addition to this publication, see:

- Industrial Automation Wiring and Grounding Guidelines, Rockwell Automation publication [1770-4.1](#), for additional installation requirements.
 - NEMA 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.
-

Install the Controller

Follow these steps to install the GuardPLC 1600 controller.

1. Mount the controller to a DIN rail.
2. Ground the controller.
3. Wire the controller.
4. Make communication connections.

This publication describes these steps in detail.

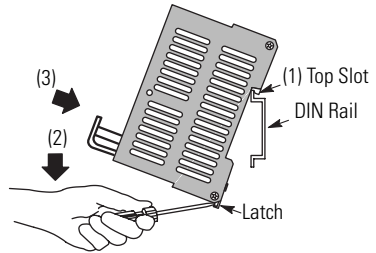
Mount the Controller

IMPORTANT For effective cooling, mount the controller following these guidelines

- Mount the controller horizontally.
- Provide a gap of at least 100 mm (3.94 in.) above and below the controller.
- Select a location where air flows freely or use an additional fan.
- Do not mount the controller over a heating device.

The controller cannot be panel-mounted. Mount the controller to a DIN rail by following these steps.

1. Hook the top slot over the DIN rail.
2. Insert a flathead screwdriver into the gap between the housing and the latch and pull the latch downward.
3. Hold the latch down as you push the housing back onto the DIN rail.
4. Release the latch to lock the device onto the rail.



TIP

To remove the controller from the DIN rail, insert a flathead screwdriver into the gap between the housing and the latch and pull the latch downward as you lift the controller off of the rail.

Ground the Controller

The controller is functionally grounded through its DIN rail connection. A protective earth ground connection is required and is provided through a separate grounding screw on the upper left of the housing and marked with the grounding symbol Ⓧ.

You must also provide an acceptable grounding path for each device in your application. For more information on proper grounding guidelines, refer to the Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).



ATTENTION: This product is grounded through the DIN rail to chassis ground. Use zinc-plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN rail materials (for example, aluminum or plastic) that can corrode, oxidize, or are poor conductors, can result in improper or intermittent grounding. Secure DIN rail to mounting surface approximately every 200 mm (7.8 in.) and use end-anchors appropriately.

Wire the Controller

The following section describe how to connect the voltage supply and wire the controller's digital inputs and outputs.

Connect the Voltage Supply

The 24V DC voltage supply must feature galvanic isolation (in accordance with EN 60950 or UL 1950) since inputs and outputs are not electrically isolated from the processor. To comply with CE Low Voltage Directives (LVD) and UL restrictions, you must use either a Safety Extra Low Voltage (SELV), or a Protected Extra Low Voltage (PELV) power supply to power this controller. A SELV supply cannot exceed 30V rms, 42.4V peak, or 60V DC under normal conditions and under single-fault conditions. A PELV supply has the same rating and is connected to protected earth.

IMPORTANT Protect the controller with a slow-blowing fuse.

IMPORTANT The GuardPLC 1800 controller can draw up to 9 A. The controller needs 1 A to operate. Up to 8 A can be used to source voltage power for inputs and outputs connected to the controller.

The supply voltage is connected via a 4-pin connector that accommodates wire sizes up to 2.5 mm² (14 AWG). You need to connect only one wire to L+ and one wire to L-. Both L+ and L- terminals are internally connected, so you can daisy-chain 24V DC power from the GuardPLC controller to other devices in the panel by using the remaining terminal.

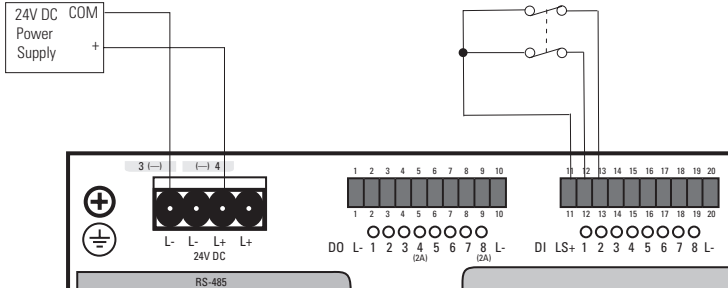


ATTENTION: Do not reverse the L+ and L- terminals or damage to the controller will result. There is no reverse polarity protection.

Safety-Related Digital Inputs

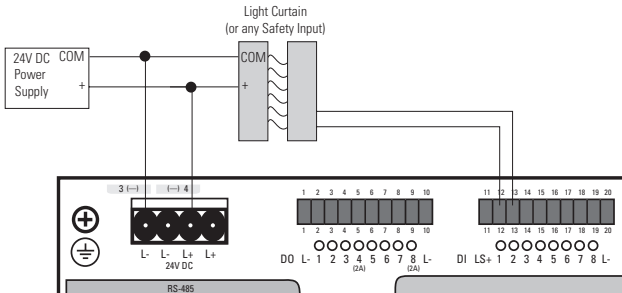
The controller has 24 digital inputs whose status is indicated via status indicators when the controller is in RUN mode.

LS+ is a voltage source that provides 24V DC for a group of eight dry contact inputs. There are three groups on the GuardPLC 1800 controller.



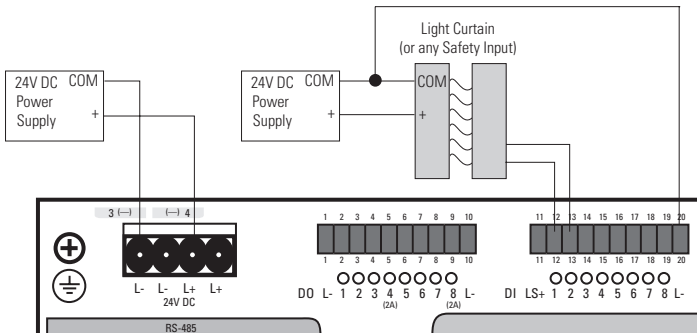
Connection of Voltage Supply to Input Device

If devices require 24V DC to operate and use the same power source as the controller, then wire the outputs of the device directly to inputs on the controller.



Connection of Voltage Supply to Input Device

Devices with their own dedicated power supply can also be connected. Connect the reference pole of the external power supply to the L- reference pole of the input.

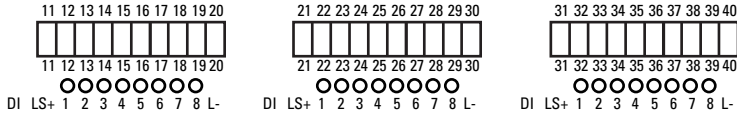


Connection of Devices with Dedicated Power Supplies

The safe state of an input is indicated by a 0 signal being passed to the user program logic. If the test routines detect a fault in the digital inputs, a 0 signal is processed in the user program for the defective channel. When a fault occurs, the inputs are switched off (0).

Follow the closed-circuit principle for external wiring when connecting sensors. To create a safe state in the event of a fault, the input signals revert to the de-energized state (0). The FAULT status indicator activates.

Digital Input Terminals



Terminals accommodate wires up to 1.5 mm² (16 AWG). See the terminal torque specifications on page 21. Digital inputs are connected to these terminals.

Terminal Number	Designation	Function
11	LS+	Sensor supply for inputs 1...8
12	1	Digital input 1
13	2	Digital input 2
14	3	Digital input 3
15	4	Digital input 4
16	5	Digital input 5
17	6	Digital input 6
18	7	Digital input 7
19	8	Digital input 8
20	L-	Reference pole
21	LS+	Sensor supply for inputs 9...16
22	9	Digital input 9
23	10	Digital input 10
24	11	Digital input 11
25	12	Digital input 12
26	13	Digital input 13
27	14	Digital input 14
28	15	Digital input 15
29	16	Digital input 16
30	L-	Reference pole

Terminal Number	Designation	Function
31	LS+	Sensor supply for inputs 17...24
32	17	Digital input 17
33	18	Digital input 18
34	19	Digital input 19
35	20	Digital input 20
36	21	Digital input 21
37	22	Digital input 22
38	23	Digital input 23
39	24	Digital input 24
40	L-	Reference pole

LS+, not L+, should be used for short-circuit protection. Each LS+ features individual short-circuit and EMC protection that make it important to use LS+ for only its eight related inputs.

Line Control

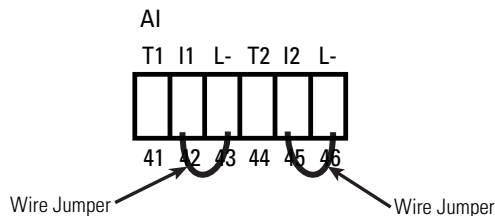
The short-circuit and line break monitoring system, such as E-stop inputs, cannot be configured for the GuardPLC 1800 controller. This is due to the fact that the 24 discrete inputs are actually analog inputs with a resolution of one bit.

Safety-Related Analog Inputs

The controller has 8 analog inputs with transmitter supplies for the unipolar measurement of voltages from 0...10V, referenced to L-. A 10 K Ω shunt is used for single-ended voltage signals. With a 500 Ω shunt resistor, currents from 0...20 mA can also be measured.

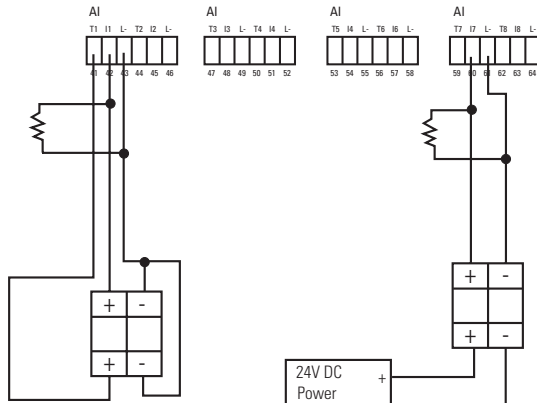
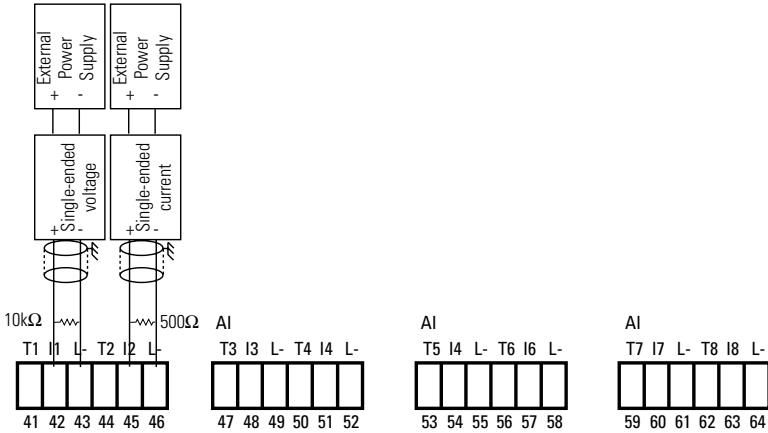
The feeder lines should be no more than 300 m (984 ft) in length. Use shielded, twisted-pair cables, with the shields connected at both ends, for each measurement input.

Unused analog inputs must be short-circuited. Place wire jumpers into any inputs that are not used.



Analog Input Terminals

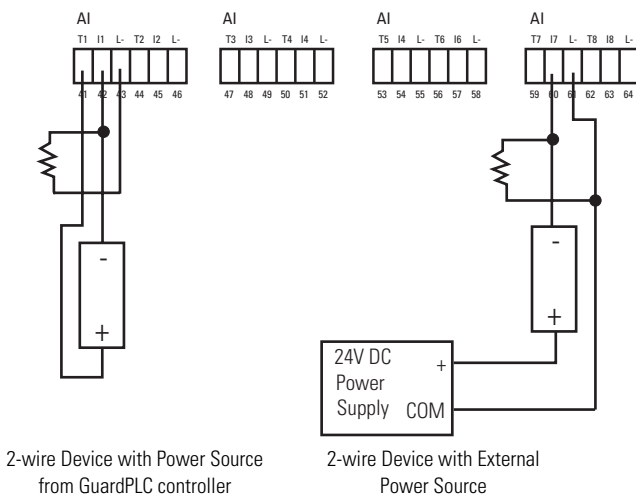
GuardPLC 1800 controller with a 4-wire device



4-wire Device with Power Source from GuardPLC controller

4-wire Device with External Power Source

GuardPLC 1800 with a 2-wire Device



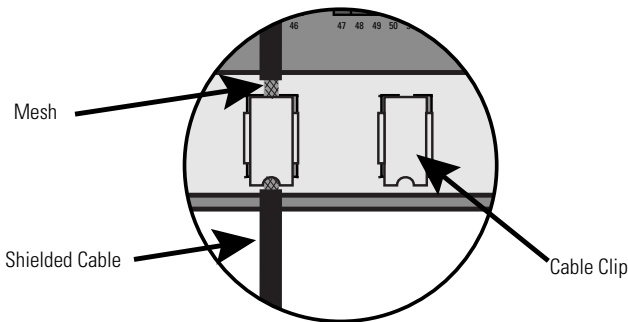
Terminals accommodate wires up to 1.5 mm² (16 AWG). The analog inputs are connected to these terminals.

Terminal Number	Designation	Function
41	T1	Transmitter supply 1
42	I1	Analog input 1
43	L-	Reference pole
44	T2	Transmitter supply 2
45	I2	Analog input 2
46	L-	Reference pole
47	T3	Transmitter supply 3
48	I3	Analog input 3
49	L-	Reference pole
50	T4	Transmitter supply 4
51	I4	Analog input 4
52	L-	Reference pole
53	T5	Transmitter supply 5
54	I5	Analog input 5
55	L-	Reference pole
56	T6	Transmitter supply 6
57	I6	Analog input 6
58	L-	Reference pole

Terminal Number	Designation	Function
59	T7	Transmitter supply 7
60	I7	Analog input 7
61	L-	Reference pole
62	T8	Transmitter supply 8
63	I8	Analog input 8
64	L-	Reference pole

Connecting the I/O Circuits

The I/O circuits are connected to the front plate of the controller using pluggable terminals. For controls with analog inputs, shielded cabling is fed in from below so that the shielding can be connected to the shield contact plate using a clip. Remove about 2 cm (0.78 in.) of the outer cable insulation so that the mesh is exposed at the point where the cable is clipped to the plate. Position the clip over the uninsulated cable shielding and push it into the slots of the shield contact plate until it fits firmly in place, as shown below.



IMPORTANT Make sure that the mesh comes in direct contact with the shield contact plate. If the mesh does not touch the plate, the cable is not grounded.

Safety-related Digital Outputs

The controller has eight digital outputs (DO1...DO8) whose status is indicated via status indicators.

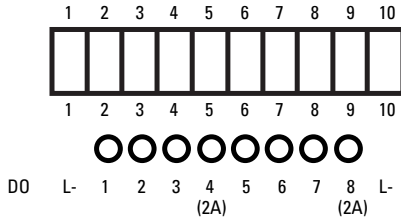
An output is in a safe state when it is de-energized. When a fault occurs, all outputs are switched off.

Outputs 1...3 and 5...7 can have a load of 0.5 A at an ambient temperature of 60 °C (140 °F). Outputs 4 and 8 can each have a load of 1 A at an ambient temperature of 60 °C (140 °F), or up to 2 A at an ambient temperature of 50 °C (122 °F).

With an overload, one or all of the outputs are turned off. When the overload is eliminated, the outputs are activated again according to the specified value.

Although the external line of an output is not monitored, a short-circuit will be indicated.

Digital Output Terminals

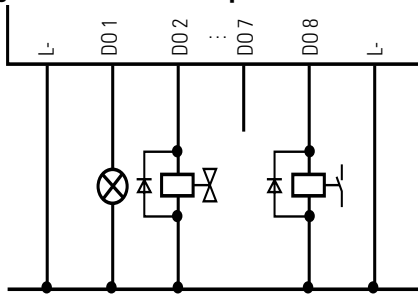


Terminals accommodate wires up to 1.5 mm^2 (16 AWG). See the terminal torque specifications on page 21. Digital outputs are connected to these terminals.

Terminal Number	Designation	Function	Current
1	L-	Reference pole	—
2	1	Digital output 1	0.5 A
3	2	Digital output 2	0.5 A
4	3	Digital output 3	0.5 A
5	4	Digital output 4 (for increased load)	2.0 A
6	5	Digital output 5	0.5 A
7	6	Digital output 6	0.5 A
8	7	Digital output 7	0.5 A
9	8	Digital output 8 (for increased load)	2.0 A
10	L-	Reference pole	—

For connection of a load, the reference pole L- of the concerned channel group must be used (2-pole connection). Although L- at terminals 1 and 6, 7 and 12 is connected internally to L- on the power supply input, it is strictly recommended to use 1 and 6 for outputs 1...4 only and 7 and 12 for outputs 5...8 only. EMC testing was performed in this manner.

Example: Connecting Actuators to the Outputs



TIP Inductive loads can be connected without a protection diode on the load. However, Rockwell Automation strongly recommends that a protection diode be fitted directly to the load to suppress any interference voltage. A 1N4004 diode is recommended.

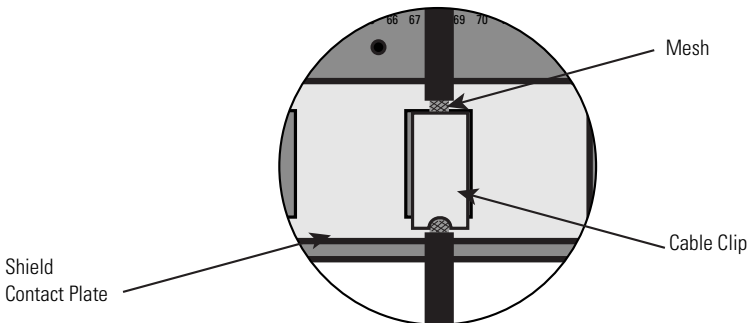
High-speed Counter Connections

The controller features two independent high-speed counters. Both counters are 24-bit, are configured for either 5V or 24V DC, and have a maximum input frequency of 100 KHz.

The counters can be used as a counter or as a decoder for 3-bit Gray Code inputs. As a counter, input A is the counter input, input B is the counter direction input, and input Z is used for a reset.

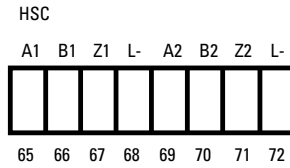
The counter inputs must be connected using shielded, twisted-pair cables for each measurement input. The shields must be connected at both ends. The input lines should be no more than 500 m (1640 ft) in length. All L- connections are internally connected on the controller.

Cables are clipped to the shield contact plate when connecting counter inputs. Remove about 2 cm (0.78 in.) of the outer cable insulation so that the mesh is exposed at the point where the cable is clipped to the plate.



IMPORTANT Make sure that the mesh comes in direct contact with the shield contact plate. If the mesh does not touch the plate, the cable is not grounded.

High-speed Counter Terminals



Terminals accommodate wires up to 1.5 mm² (16 AWG). Counters are connected to these terminals.

Terminal Number	Designation	Counter Function	Gray Code Function
65	A1	Input A1	bit 0 (LSB)
66	B1	Input B1	bit 1
67	Z1	Input Z1	bit 2 (MSB)
68	L-	Common reference pole	
69	A2	Input A2	bit 0 (LSB)
70	B2	Input B2	bit 1
71	Z2	Input Z2	bit 2 (MSB)
72	L-	Common reference pole	

IMPORTANT Do not terminate unused inputs.

TIP

For more information on GuardPLC system wiring and counter configuration, see the GuardPLC Controller Systems User Manual, publication [1753-UM001](#).

Make Communication Connections

The controller supports separate connections for safety and nonsafety-related communication.

Connections for Safety-related Communication

The controller has four 10/100BaseT, RJ45 connectors to provide communication via GuardPLC Ethernet protocol to distributed I/O and other GuardPLC controllers, OLE for Process Control (OPC) servers, and with the programming software. Connectors 1 and 2 are on the bottom side on the left. Connectors 3 and 4 are on the top side on the left. All four connectors and the GuardPLC processor are connected together by an internal Ethernet switch. The switches are auto-detect. Either crossover or straight-through Ethernet cabling can be used.

Star or line configurations are available. Make sure that a network loop is not generated. Data packets must be able to reach a node only via a single path.

OPC Server

The GuardPLC 1800 controller is an OPC client. An OPC server, catalog number 1753-OPC, is available from Rockwell Automation and lets computer applications read and write data to and from the GuardPLC controller.

MAC Address

The media access control (MAC) address of the controller can be found on the label positioned over both lower RJ45 connections.

Connections for Nonsafety-Related Communication

Three 9-pin D-shell connectors on the front of the controller provide the following communication options.

Designation	Function
COMM1 (RS-485)	Modbus Slave (1753-L32BBB-M) Profibus-DP-Slave (1753-L32BBB-P)
COMM2	TBD
COMM3 (RS-485)	GuardPLC ASCII Protocol

The pin assignments of the D-shell connector are listed in this table.

Connection	Signal	Function
1	—	—
2	RP	5V, decoupled with diodes
3	RxD/TxD-A	Receive/transmit data A
4	CNTR-A	Control signal A
5	DGND	Data reference potential
6	VP	5V, positive pole of supply voltage
7	—	—
8	RxD/TxD-B	Receive/transmit data B
9	CNTR-B	Control signal B

IP Address and System ID (SRS)

A transparent label provided with the controller can be used to note the IP Address and system ID (SRS). The default value for the IP Address is 192.168.0.99. The default SRS is 60000.

IMPORTANT If you attach the label to the controller, make sure you do not cover any of the ventilation slots.

Reset Push Button

The controller is equipped with a reset push button. Reset via the push button is necessary under the following conditions.

- You forget the password to go online via the programming software.
- You are unable to determine the IP address and SRS of the controller.

The push button is accessible through a small round hole at the top of the housing, approximately 4...5 cm (1.6...2.0 in.) from the left rim and recessed approximately 9.5 mm (0.375 in.).

IMPORTANT Activate the reset push button using an insulated pin to prevent short-circuits.

To reset, press and hold the push button for 20 seconds while rebooting the device by cycling power. Pressing the Reset push button during operation has no effect.

With activation of the reset button:

- all accounts are deleted except for the default account.
- IP Address and System ID (SRS) are set to their default values.

The next time you cycle power, these settings will be restored to the last values stored into nonvolatile memory. This means that either the settings prior to the reset will be restored, or if any settings were changed after the reset, those new settings will still be in effect.

Controller Tests

In addition to the tests for safety, the controller tests the supply voltage and controller temperature.

Supply Voltage Tests

The supply voltage (24V DC) is monitored and the alarm and system shutdown are controlled according to the voltage levels listed below.

Voltage Level	System Condition
19.3 to 28.8V	Normal
< 19.3V	Alarm state 1 (internal variables are written)
< 15.4V	Alarm state 2 (prepares for shutdown)
< 13.0V	Switched off

Temperature Tests

The temperature of the controller is automatically and continuously monitored. The alarm is triggered by the temperature conditions described in the table below.

Operating Temperature	Alarm
< 60 °C (140 °F)	None (normal)
60...70 °C (140...158 °F)	Warning on
> 70 °C (158 °F)	Main alarm on
return to 64... 54 °C (147.2...129.2 °F)	Main alarm off, warning on
return to < 54 °C (129.2 °F)	None (return to normal)

Status Indicators

Indicator	State	Description
24V DC	On	24V DC operating voltage present.
	Off	No operating voltage.
RUN	On	This is the normal status of the controller. A routine, which has been loaded into the controller, is executed. The controller processes input and output signals, carries out communication, and performs hardware and software tests.
	Flashing	The controller is in STOP mode and is not executing a routine. All system outputs are reset. STOP mode can be triggered by setting the <i>Emergency stop</i> system variable to TRUE in the routine, or by direct command from the programming software.
	Off	The controller is in ERROR_STOP mode (see ERROR).
ERROR	On	<ul style="list-style-type: none"> ● A hardware error has been detected by the controller. The controller goes to ERROR_STOP mode and the execution of the routine is halted. Hardware errors are errors in the controller, errors in one or more of the digital input and output modules, or errors in the counters. ● A software error in the operating system has been detected by the controller. ● The watchdog has reported an error due to exceeded cycle time. All system outputs will be reset and the controller ceases all hardware and software tests. The controller can only be restarted by a command from the programming software.
	Off	No errors are detected.
PROGRESS	On	The upload of a new controller configuration is in progress.
	Flashing	The upload of a new operating system into the nonvolatile ROM is in progress.
	Off	No upload of controller configuration or operating system in progress.
FORCE	On	The controller is executing a routine (RUN) and FORCE mode is activated by the user.
	Flashing	The controller is in STOP mode, but Forcing has been initiated and will be activated when the controller is started.
	Off	Forcing is OFF.
FAULT	On	<ul style="list-style-type: none"> ● The routine (logic) has caused an error. ● The controller configuration is faulty. ● The upload of a new operating system was not successful, and the operating system is corrupted.
	Flashing	An error has occurred during a nonvolatile ROM write cycle. One or more I/O errors have occurred.
	Off	None of the above errors has occurred.
OSL	Flashing	Emergency O perating S ystem L oader is active.
BL	Flashing	B oot L oader unable to load operating system or unable to start COMM operating system loader.

Controller status can be interrogated through the programming software. For more information, see the GuardPLC Controller System User Manual, publication [1753-UM001](#).

Communication via GuardPLC Ethernet is indicated by two small status indicators integrated into all connecting sockets.

Indicator	State	Description
Green	On	Full-duplex operation
	Flashing	Collision
	Off	Half-duplex operation, no collision
Yellow	On	Connection established
	Flashing	Interface activity

Additional nonsafety-related communication occurs on the field buses and is indicated by the status indicators.

Indicator	Connection	Description
Green	COMM 1	RS-485 interface, field bus active
	COMM 2	Unassigned
	COMM 3	Unassigned

Specifications

Technical Specifications – GuardPLC 1800 Controllers

Attribute	1753-L28BBBM-8A, 1753-L28BBBP-8A
User memory	250 KB max user program memory 250 KB max application data memory
Watchdog time, min	10 ms
Safety time, min	20 ms
Current consumption	9 A max (with max load) 0.75 A idle current
Operating voltage	24V DC, -15...20%, $w_{SS} \leq 15\%$ (from a power supply with protective separation conforming to IEC 61131-2 requirements)
Isolation voltage	50V (continuous), Basic Insulation Type, I/O to Ethernet and Ethernet to DC power
Wiring category ⁽¹⁾	Category 2 on communication ports, signal ports, and power ports
Wire size	<ul style="list-style-type: none"> • I/O – 0.13...1.3 mm² (26...16 AWG) solid or stranded copper wire rated at 75 °C (167 °F) or greater with 1.2 mm (3/64 in.) insulation max • Power – 0.33...2.1 mm² (22...14 AWG) solid or stranded copper wire rated at 75 °C (167 °F) or greater with 1.2 mm (3/64 in.) insulation max • 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 • Comm: 9-pin D-sub

Technical Specifications – GuardPLC 1800 Controllers

Wire type	Shielded on Ethernet, analog, and high-speed counter inputs
Terminal block torque	0.51 N•m (4.5 lb•in)
Fuse (external)	24V DC power: 10 A (time-lag)
Enclosure type rating	Meets IP20
Width, approx.	257 mm (10.1 in.) including housing screws
Height, approx.	114 mm (4.49 in.) including latch
Depth, approx.	66 mm (2.60 in.) including grounding bolt
Weight, approx.	1.2 kg (2.64 lb)
Digital Inputs	
Number of inputs	24 (not electrically isolated)
On state	Voltage: 15...30V DC Current consumption: approximately 3.5 mA @ 24V DC Current consumption: approximately 4.5 mA @ 30V DC
Off state	Voltage: 5V DC max Current consumption: 1.5 mA max (1 mA @ 5V DC)
Input resistance	< 7 k Ω
Overvoltage protection	-10V, +35V
Line length, max	300 m (9.8 ft)
Supply	20V / 100 mA, short-circuit proof
Digital Outputs	
Number of outputs	8 (not electrically isolated)
Output voltage range	\geq L+ minus 2V
Output current	Channels 1...3 and 5...7: 0.5 A @ 60 °C (140 °F) Channels 4 and 8: 1 A @ 60 °C (140 °F); 2 A @ 50 °C (122 °C)
Surge current per channel	1 A for 10ms @ 1Hz (channels 1...3 and 5...7) 4 A for 10ms @ 1Hz (channels 4 and 8)
Current load, min	2 mA per channel
Internal voltage drop	2.0V DC max @ 2 A
Off-state leakage current	1 mA max @ 2V
Total output current	7 A max

Technical Specifications – GuardPLC 1800 Controllers

Counters	
Number of counters	2 (not electrically isolated)
Inputs	3 per counter (A, B, Z)
Input voltages	5V and 24V DC High signal (5V DC): 4...6V High signal (24V DC): 13...33V Low signal (5V DC): 0...0.5V Low signal (24V DC): -3...5V
Input currents	1.4 mA @ 5V DC 6.5 mA @ 24V DC
Input impedance	3.7 k Ω
Counter resolution	24-bit
Input frequency, max	100 kHz
Triggered	on negative edge
Edge steepness	1 V/ μ s
Pulse duty factor	1:1
Analog Inputs	
Number of inputs	8 (unipolar, not electrically isolated)
External shunt (for current measurement)	500 Ω for 0...20 mA
Input values related to L-	Nominal Value: 0...10V DC or 0...20 mA with 500 Ω shunt Service Value: -0.1...11.5V DC or -0.4...23 mA with 500 Ω shunt
Input impedance	1 M Ω
Internal resistance of the signal source	\leq 500 Ω
Overvoltage protection	+15V, -4V
Resolution (A/D converter)	12-bit
Accuracy	0.1% @ 25 °C (77 °F) 0.5% @ 60 °C (140 °F)
Transmitter supplies	25.37...28.24V / \leq 46 mA, short-circuit proof
Safety accuracy	\pm 2%

- (1) Use this Conductor Category information for planning conductor routing. Refer to Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

Environmental Specifications – GuardPLC 1800 Controllers

Attribute	1753-L28BBB-M, 1753-L28BBB-P
Temperature, nonoperating <ul style="list-style-type: none"> • 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, operating <ul style="list-style-type: none"> • 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...60 °C (32...140 °F)
Temperature, surrounding air	60 °C (140 °F)
Vibration <ul style="list-style-type: none"> • IEC 60068-2-6 (Test Fc, operating) 	1 g @ 10...150 Hz
Shock, operating <ul style="list-style-type: none"> • IEC 60068-2-27 (Test Ea, unpackaged shock) 	15 g
Relative humidity <ul style="list-style-type: none"> • IEC 60068-2-30 (Test Db, unpackaged damp heat) 	10...95% noncondensing
Emissions	CISPR 11: Group 1, Class A
ESD Immunity <ul style="list-style-type: none"> • IEC 61000-4-2 	<ul style="list-style-type: none"> • 6 kV contact discharges • 8 kV air discharges
Radiated RF Immunity <ul style="list-style-type: none"> • IEC 61000-4-3 	<ul style="list-style-type: none"> • 10V/m with 1kHz sine-wave 80% AM from 80 MHz...2000 MHz • 1 V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B Immunity <ul style="list-style-type: none"> • IEC 61000-4-4 	<ul style="list-style-type: none"> • ±2 kV @ 5 kHz on DC power ports • ±1 kV @ 5 kHz on signal ports • ±1 kV @ 5 kHz on communication ports
Surge Transient Immunity <ul style="list-style-type: none"> • IEC 61000-4-5 	<ul style="list-style-type: none"> • ±500V line-line (DM) and ±500V line-earth (CM) on DC power ports • ±1 kV line-earth (CM) on signal ports • ±1 kV line-earth (CM) on communication ports
Conducted RF Immunity <ul style="list-style-type: none"> • IEC 61000-4-6 	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Damped Oscillatory Wave Immunity <ul style="list-style-type: none"> • IEC 61000-4-12 	<ul style="list-style-type: none"> • ±1 kV line-earth (CM) on signal ports • ±1 kV line-earth (CM) on power ports

Certifications

Certification (when product is marked)⁽¹⁾	1753-L28BBBM-8A, 1753-L28BBBP-8A
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CE	European Union 2004/108/EC EMC Directive, compliant with: <ul style="list-style-type: none"> • EN 61326-1 Meas./Control/Lab., Industrial Requirements • EN 61000-6.2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Functional Safety	Certified by TÜV ⁽²⁾ : up to and including SIL 3 according to IEC 61508 and Ple (Cat. 4) according to ISO 13849-1

(1) See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

(2) When used with specified firmware revisions.

Additional Resources

The table below provides a listing of publications that contain important information about GuardPLC systems.

Resource	Description
GuardPLC Controller Systems Safety Reference Manual, publication 1753-RM002	Detailed information regarding the safety certification of the GuardPLC System
GuardPLC Controller Systems User Manual, publication 1753-UM001	Detailed information on installing, wiring, configuring, operating, maintaining, and troubleshooting GuardPLC systems
Using RSLogix Guard PLUS! Software with GuardPLC Controllers Programming Manual, publication 1753-PM001	Detailed information on programming your GuardPLC system using RSLogix Guard PLUS! software
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	General guidelines for installing a Rockwell Automation industrial system

You can view or download publications at <http://www.rockwellautomation.com/literature>. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

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Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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