Using SmartGuard 600 Packaged Safety Controller as Standard Slave to MicroLogix 1500 Controller

Safety Network-enabled Example Safety Rating: Category 4, according to EN954-1



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Introduction

This example shows how to wire, configure and program a SmartGuard 600 packaged safety controller as a DeviceNet standard slave to a Micrologix 1500 controller.

Features and Benefits

- Programmable safety logic is used to monitor state of a safety tongue interlock on safety door guarding hazardous machinery.
- Expandable as needed by adding additional safety inputs or outputs.
- Easier integration into Logix controllers and HMIs through standard DeviceNet communication.
- Provides safety interlocking with GuardLogix, GuardPLC, and other SmartGuard safety controllers.

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 <u>http://literature.rockwellautomation.com</u>) 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.

	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.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
	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 consequence.
SHOCK HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

IMPORTANT	This application example is for advanced users and assumes that you are trained and experienced in safety system requirements.
	A risk assessment should be performed to make sure all task and hazard combinations have been identified and addressed. The risk assessment may require additional circuitry to reduce the risk to a tolerable level. Safety circuits must take into consideration safety distance calculations which are not part of the scope of this document.

General Safety Information

Contact Rockwell Automation to find out more about our safety risk assessment services.

This application example describes how to pass standard, non-safety data such as Circuit Reset from a standard controller (running discrete control) to a SmartGuard 600 controller running safety logic. In the safety system, the SmartGuard 600 controller is monitoring a safety tongue interlock mounted on a safety gate guarding hazardous machinery.

The SmartGuard 600 safety controller is programmed using RSNetWorx for DeviceNet software. You must be familiar with this software to use this document.

The MicroLogix 1500 controller is programmed using RSLogix 500 software. You must be familiar with this software to use this document.

Safety Function

The safety components used in this example have dual dry contacts.

The SmartGuard 600 controller uses its Test Pulse Outputs (for example T0, T1) to send test pulses to the safety tongue interlock. This ensures that any faults in the safety circuit are caught, including shorts to 24V dc, shorts to ground, and shorts between channels.

This application example uses these components.

Catalog Number	Description	Quantity
1752-L24BBB	SmartGuard 600 controller	1
1764-LRP	MicroLogix 1500 controller	1
1769-SDN	DeviceNet scanner	1
440K-C21058	Cadet 3 tongue interlock switch	1
100S-C	Safety contactors	2
800F	Standard push button	1
N/A (commercially	Standard USB cable (USB-A to USB-B	1
available)	male/male)	
1764-L28BXB	MicroLogix 1500 base unit	1

Setup and Wiring

Example Bill of Material

For detailed information on installing and wiring, refer to the product manuals listed in the Additional Resources on page 18.

Description



Wiring



Configure

Configuring the SmartGuard 600 controller requires you to connect the USB cable, configure the drivers, name the local inputs and outputs, and configure the MicroLogix 1500 software.

Configuring the USB Driver

The USB drivers must be installed and recognized.

- 1. The USB driver needed for communicating to SmartGuard controller must be installed on the computer that will be used to program the SmartGuard controller.
- 2. Connect the USB cable between the SmartGuard controller and the programming station personal computer.
- 3. Wait for the Windows operating system to recognize the USB device.

- 4. Open RSLinx Classic software by clicking on the RSLinx service icon in the Windows System Tray (lower right corner of your window).
- 5. If this service is not running, double-click the RSLinx Classic icon on your desktop.





6. Select Communications > Configure Drivers to set up communication to the controller.

or



7. Use the pull-down menu to select the SmartGuard USB Driver from the list and click Add New.

Co	m	figure Drivers		
Γ	A	vailable Driver Types:		
			Ŧ	Add New
		RS-232 DF1 devices	~	
		Ethernet devices		
Г	٠q	Ethernet/IP Driver		
		1784-KT/KTX[U]/PKTX[U]/PLMK for UH+/UH-485 devices		Chabus
		DE1 Polling Master Driver		
		1784-PCC for ControlNet devices		Running
		1784-PCIC(S) for ControlNet devices		
		1747-PIC / AIC+ Driver		
		DF1 Slave Driver		
		S-S SD/SD2 for DH+ devices		
		DH485 UIC devices		
		Virtual Backplane (SoftLogix58xx, USB)		
		DeviceNet Drivers (1784-PCD/PCIDS,1770-KFD,SDNPT drivers)		
		PLC-5 (DH+) Emulator driver		
		SEC 500 (DH485) Emulator driver	_	
		Smartisuard USB Driver	~	
	4	Solitodixs aliver V	<u> </u>	

- 8. Click OK to confirm the name of the driver.
- 9. Use the pull-down menu to select the 1752 SmartGuard USB Port from the list and click OK.

c	onfigure SmartGuard	USB Device	×
	Select Interface	▼ 1752 SmartGuard USB Port	
	MAC Address	(0~63)	1
	Baud Rate		
	Response Wait Time	15000 (ms)	
	ок.	Cancel Help	

Going Online in RSNetWorx for DeviceNet Software

This series of steps explains how to start a new project to confirm that the driver has been uploaded from the network.

1. Open RSNetWorx for DeviceNet software by double-clicking the icon on the desktop.



2. Choose File > New to create a new project.

📲 De	vice	Net -	RSNetW	orx for	Dev	iceNe	et
<u> </u>	<u>E</u> dit	⊻iew	<u>N</u> etwork	<u>D</u> evice	Dįag	nostic	:s <u>T</u> oo
1	<u>V</u> ew	D	2	Ctrl+I	V.	?	
] 🖻 🦉	Open.	h	2	Ctrl+0	>	柴	?≠
	_				_		

3. Choose DeviceNet Configuration from the list and click OK.

New File	×
Configuration Types	Description
📲 ControlNet Configuration	ControlNet Files (*.xc)
DeviceNet Configuration	DeviceNet Files (*.dnt)
S	7
OK	Cancel

4. Go online by clicking the RSWho button.



5. Choose the SmartGuard USB driver from the list and click OK.

Br	rowse for network	×
s	Select a communications path to the desired network.	
	Autobrowse Refresh	
	🖃 🗐 Workstation, USMAYMWMILLER1	_
	由 品 Linx Gateways, Ethernet	
	由 品 AB_ETH-1, Ethernet	
	🞰 🚠 AB_SmartGuard-1, DeviceNet	

6. Click OK again to confirm the initial upload from the network.

The network displays SmartGuard 600 controller at node 2 and the 1769-SDN module at node 3 as shown.



7. In the RSNetWorx online graph, double-click 1752-L24BBB SmartGuard controller to open the properties dialog.

The screen should look like this.

💐 1752-L24BB	в ? 🛛
Slave I/O Mode/Cucle T	Local Output Local Input/Test Output
General	Safety Safety Connection Safety Slave I/O
175	2-L24BBB
Name:	1752-L24BBB
Description:	
Address:	2
Device Identil	y [Primary]
Vendor:	Rockwell Automation - Allen-Bradley [1]
Type:	Safety Controllers [138]
Device:	1752-L24BBB [1]
Catalog:	1752-L24BBB
Revision:	
	OK Cancel Apply Help

Configuring SmartGuard Local Inputs and Outputs

In these steps you will name the inputs and outputs.

- 1. Click the Local Input/Test Output tab.
- 2. Give the local I/O meaningful names so that they are easy to recognize later in the programming editor.
- 3. Using the wiring diagram, assign names to the inputs as shown below.
- 4. On the General tab, double-click the first entry in the list labeled No. 00.

Mode/Cy General Slave I	vcle Time │ Main │ Safety │ /0 │ Local 〔	itenance L Safety Connection Jutout L	ogic Error Histor 1 Safety Slave I/0 2 ocal Input/Test Output
Error Lato	h Time 1000 + ms ((0 - 65530 ms defa	ault : 1000 ms)
General	OnOff Delay/Discrep	oancy Time Test	Output
No.	Name	Mode	Test Source
00		Not Used	Not Used
🥥 01		Not Used	Not Used
🧿 02		Not Used	Not Used
🥥 03		Not Used	Not Used
🥥 04		Not Used	Not Used
🥥 05		Not Used	Not Used
🥥 06		Not Used	Not Used
🥥 07		Not Used	Not Used
🥝 08		Not Used	Not Used
🥥 09		Not Used	Not Used
(2) 10		Not Used	Not Used 🔍
- 10	-		with cucle time value

- 5. Fill in the Local Input Terminal fields.
 - a. In the I/O Comment field, type ch1.
 - b. From the Channel Mode pull-down menu, select Test pulse from test out.
 - c. From the Test Source pull-down menu, select Test Output0.

Edit Local Input Terminal 🛛 🔹 🔀
I/O Comment ch1
Channel Mode Test pulse from test out
Test Source Test Output0
Off On Delay : 0 ms Cycle Time
On Off Delay: 0 ms
Dual Channel
Channel Mode : Single Channel
Discrepancy Time 🛛 💼 ms
OK Cancel

6. Enter the other Signals as displayed below.

1752-L24BBB ? 🔀					
Mode/Cycle Time Maintenance Logic Error History General Safety Safety Connection Safety Slave I/O Slave I/O Local Output Local Input/Test Output					
Error Latch Time					
No.	UnUff Delay/Discrepan	Mode	utput Test Source		
00	ch1	Test pulse fr	Test Output0		
O1	ch2	Test pulse fr	Test Output1		
02	feedback	Used as safe	Not Used		
O3		Not Used	Not Used		
Ø 04		Not Used	Not Used		
🥥 05		Not Used	Not Used		
Ø 06		Not Used	Not Used		
07		Not Used	Not Used		
08 📀	O8 Not Used		Not Used		
🥝 09		Not Used	Not Used		
🥥 10	10 Not Used		Not Used	v	
1				21	
E dit	Adjust the valid	ON/OFF delays w	vith cycle time value.		
OK Cancel Apply Help					

7. Under the Local Output tab, enter the signals as displayed below.

1752-L2	4BBB ?	C
Mode/Cy General Slave I/	cle Time Maintenance Logic Error History Safety <u>Safety Connection</u> Safety Slave I/O /O Local Output Local Input/Test Output	
Error Latc	h Time ms (0 - 65530 ms default : 1000 ms)	
General No.	Name Mode	1
🥥 00	coil1 Safety	
O1	coil2 Safety	
02	Not Used	
2 03	Not Used	
04	Not Used	
O5	Not Used	
06	Not Used	
07 🖸	Not Used	
<u>E</u> dit		
	OK Cancel Apply Help	

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Configuring the MicroLogix 1500 Controller

To configure the MicroLogix 1500 controller, you must select the processor and download the controller.

- 1. Launch RSLogix 500 software.
- 2. Open a new file.
- 3. Select the controller.

RSLogix 500 Pro	
ile View Comms Tools Window Help	
D 😂 🖬 🚳 👗 🖻 🖻 🗠 🗠 🛛 🔽 🗾 💽 🖌 🖓 🔛 😰	🔍 🔍 🗖 🔂
OFFLINE ● No Forces ● Image: State of the s	.tput _{ Compare
Select Processor Type	
Processor Name: UNTITLED	ОК
1747-L524 5∕02 CPU 4K Mem. 1747-L514 5∕01 CPU 4K Mem. 1747-L511 5∕01 CPU 1K Mem.	Cancel Help
Bul.1764 Micrologix 1500 LRP Series C Bul.1764 Micrologix 1500 LSP Series B Bul.1764 Micrologix 1500 LSP Series C Bul.1764 Micrologix 1500 LSP Series B Bul.1764 Micrologix 1500 LSP Series A Bul.1764 Micrologix 1200 Series C (1 or 2 Comm Forts) Bul.1762 Micrologix 1200 Series B Bul.1762 Micrologix 1200 Series A Bul.1761 Micrologix 1000 Analog Bul.1761 Micrologix 1000 DH-485/HDSlave Bul.1761 Micrologix 1000	
Communication settings Driver Processor Node: Reply Timeout: AB_DF1-1 I Decimal (=1 Who Active 10 (Sec.) Octal)	

4. In the I/O Configuration dialog, place the 1769-SDN DeviceNet Scanner module in the first slot.

RSLogix 500 Pro - UNTITLED	
Hile Edit View Search Comms Tools Window Help	
D 📽 🖬 🚑 🐰 🖻 🖻 🗠 🖂 N7:7	- 3 8 % 2 9 2 2 - 4
OFFLINE Image: No Forces No Edits Image: Forces Driver: AB_DF1-1 Node : 1d	E 3/E <> 42> 40> ABL ABS
🕅 UNT 🎹 I/O Configuration	
PowerSupply Power	Current Cards Available Filter All ID Part # Description 1769-0A8 8-Output 120/240 VAC 1769-0A8 8-Output 120/240 VAC 1769-0A8 8-Output 120/240 VAC 1769-0B8 8-Output High Current 24 VDC 1769-0B16 16-Output 14// CVDC: Source w/ Protectio 1769-0B23 32-Output High Density 24 VDC 1769-0F2 Analog 2 Channel Output 1769-0F8C Analog 3 Chan Variage Output 1769-0F9K Analog 3 Chan Variage Output 1769-0F9K Analog 3 Chan Variage Output 1769-0F9K Analog 4 Chan Variage Output 1769-0F9K Analog 8 Chan Variage Output 1769-0F9K Analog 8 Chan Variage Output 1769-0F9K 8-Output 14// DC Sink 1769-0F9K 8-Output 150lated Belay 1769-0F9K 8-Output Isolated Belay 1769-0F9K 8-Output Isolated Belay 1769-0F9K 8-Output Isolated Belay 1769-0F9K Compact I/O to DFI/SCANport Module 1769-0F9K Compact I/O to DFI Module 1769-0F9K C
12 Adv Config Help Hide All Cards	1769-P84 Power Supply 1769-P84 Power Supply Any 1769 PowerSupply

- 5. Enter the following rungs of ladder logic.
- 6. Download to the controller.
- 7. Switch the controller to Run mode.



Programming

Programming this setup includes setting the parameters, uploading the 1769-SDN Scanner module, and monitoring the code.

Programming the SmartGuard 600 Controller

To program the SmartGuard 600 controller, the editor is opened, functions are set up in the workspace, and the parameters are set.

- 1. Click the Logic tab to access the programming editor.
- 2. Click the Edit button to open the editor.

SmartGuard			? 🛛
General Safe	ty Safety Conr	nection	Safety Slave I/O
Slave I/O	Local Output	Local In	put/Test Output
Mode/Cycle Time	Maintenance	Logic	Error History
Edit			

When the editor opens, there are two sections. They include the Function List and the Workspace section.



- 3. In the Safety Device area of the Function Block tab, locate the EDM, Restart, and Safety Gate Monitoring Function blocks.
- 4. Drag and drop the blocks onto the empty Workspace, as shown below.

Leave space to the left for the inputs.



5. Double-click the Restart function block and notice that several functions may be set up within the block.

):[#02] Reset		X
Parameter In/Out Setting	Out point Comment	
Parameter Name	Value	
Restart/Reset	Reset	
Beset Signal	Low-High-Low	
the second second second	Low rightow	

6. Click Reset Signal in the Parameter tab.

Parameter Name	Value
Restart/Reset	Reset
Reset Signal	Rising Edge
	Low-High-Low
	Rising Edge

7. For the value, select Rising Edge from the pull-down menu.

For this application example it does not matter what the Reset type is because a momentary switch is used.

- 8. Connect the block to the inputs and outputs that were configured previously.
- 9. Click the Input tab in the Function List.



10. Expand the SmartGuard inputs and then the Safety Input section and observe the local inputs that were configured earlier. Similarly, observe the local outputs.



11. Connect function blocks to the input and output signals as shown below.



- 12. Click Apply in the upper left corner of the editor.
- 13. Confirm by clicking OK to the prompt.



14. Choose File > Exit.



- 15. To download the program to the computer, click Apply on the SmartGuard Properties dialog.
- 16. Confirm by clicking Yes to any prompts.



Browsing DeviceNet

In these steps you will upload the SmartGuard 600 controller.

- 1. Open RSNetworx for DeviceNet network.
- 2. Select the Browsing path as shown below.

ProviceNet - RSNetWorx for DeviceNet
Eile Edit View Network Device Diagnostics Iools Help ¹ ¹ ¹ ² ¹
Hardware zi
Browse for network
Select a communications path to the desired network.
Image: Second state sta

- 3. Double-click 1769-SDN Scanner Module.
- 4. Go to scan list and select Upload.

17 M		Net - RSNetWorx	for DeviceNet			
Ele	Edit	View Network Devic	e Djagnostics Iools Help			
1	🔊 -	· 🖬 🍜 🐰 🖻	1 IB N2			
Ð2	Q	E 18 😻 - 💑	🛧 🖾 👪			
Han	dware	37 1769-SDN Sca	nner Module	? ×	1752-L24BBB 1769-SDN	
	•	General Module	Scanlist Input Output Summary		Scanner	
		1769	SDN Scanner Module			
		Name:	1769-SDN Scanner Module		02 15	
		Description:				•
					Scanner Configuration Applet	4
		Address:	3		Do you want to upload the configuration from the device, updating the software's configuration; or download the software's configuration to the device, undering the device.	
		Device Identity	[Primary]			
	÷ 🌔	Vendor: F	Rockwell Automation - Allen-Bradley [1]		For more information, press F1	
		Type: 0	Communication Adapter [12]			
	÷-	Device: 1	1769-SDN Scanner Module [105]		Upload Download Cancel	
		Catalog: 1	1769-SDN			
		Revision:	1.001			
	۲		DK Cancel Apply He	qle		
	_					

The SmartGuard is listed in the scan list of the 1769-SDN scanner.

- 5. Click Apply.
- 6. Click OK.

DeviceNel	t - RSNetWorx for DeviceNet				
Eile Edit Viev	v Network Device Diagnostics	Tools Helb			
🗎 🗃 - 🖥	a 🕾 🔉 🖻 🖻 <table-cell></table-cell>				
@ Q E	"는 🐺 - 몲 🛧 🗷 🟅	1			
Hardware ==		<u>×</u>		1752-L24000	1769-SDN
- • ¢	1769-SDN Scanner Modu	ile	2 🗙		Scanner
					Mindule
ěď	General Module Scarilist Inp	out Output Summary			
• \$	Available Devices:	Scanlist:		3	-0
		02, 1752-L24BBB		02	00
т		>			
6		<		· · · · · ·	· · · ·
E 🖗					
		>>			
₽Ŷ		<<			
🖻 🜔 Ver					
	Automap on Add	Vode Active			
i i i i i i i i i i i i i i i i i i i	Upload from Scanner	Electronic Key:			
	opida non scanner	Version			
i č	Download to Scanner	Product Code			
• °	Edit I/O Parameters	Major Revision	Materia de la competition de la compet		
1 18		I Minor I or	nigher		
<	ОК	Cancel Apply	Help	Coundeback) Marta 10	laur Carlingation) Diama
				spreadsheet & Master/S	have configuration & Diagno

Online Monitoring

These steps show you how to observe the code online.

1. Click the Mode/Cycle Time tab.

🍱 1752-L24BBB			? 🛛	
Slave I/O General S. Mode/Cycle Time	Local Output Safety Con Maintenance	Loca nection Logic	I Input/Test Output Safety Slave I/O Error History	
Automatic Execution Mode				

The SmartGuard controller may be changed from Idle mode or Program mode to Execute or Run mode.

2. Click Change Mode.

Cycle Time	1/0 Refresh Cycle Time	
5.0 ms	5.0 ms	ige Mode
ОК	Cancel <u>A</u> pply	Help

- 3. Click Execute.
- 4. Click OK to change modes.



- 5. To observe the program online, return to the Logic tab.
- 6. Click Edit.
- 7. Click the Monitoring button to begin observing the code online.

- [[#13] SmartGuard - Page 1 (297mm x 211mm)]											
File	Edit	View	Function	Page	Function	nBlock	Help				
] 🛛	8	Þ	B X	$\times <$	$\circ \circ $	<u>م</u> ا[100%		E		t)
		Input	1	💑 Ou	tput	× Pa	ige 1			Monitorii	ng



The Safety Gate inputs and Contactor Feedback turn green. This indicates that they are logically true.

8. Give the Reset input command from the MicroLogix 1500 controller by forcing the Reset Bit.



The contactors connected to the Safety outputs turns on and the screen appears as shown.



Additional Resources

For more information about the products used in this example, refer to these resources.

Resource	Description			
MicroLogix 1500 Programmable Controller User Manual, publication <u>1764-UM001</u>	Provides information for using the MicroLogix 1500 Programmable Controller.			
SmartGuard 600 Controllers, publication <u>1752-UM001</u>	Provides information for configuring, operating and troubleshooting the SmartGuard 600 controller.			
DeviceNet Scanner User Manual, publication <u>1769-UM009</u>	Provides information for designing, installing, programming and troubleshooting the Compact I/O DeviceNet Scanner Module.			
Product Certifications website, <u>http://ab.com</u>	Provides declarations of conformity, certificates and other certification details.			
Industrial Automation Wiring and Grounding Guidelines, publication <u>1770-4.1</u>	Provides general guidelines for installing a Rockwell Automation industrial system.			
S115 - Interlock Tongue Switches Safety Catalog, publication <u>440K-CA502-EN-P</u>	Provides description and specifications on the S115 - Interlock Tongue Switches.			
Cadet 3 Compact Tongue-Operated Interlock Safety Switch Installation Instructions, publication <u>44545/1</u>	Provides information for installing Cadet 3 Compact Tongue- Operated Interlock Safety Switches.			

You can view or download publications at

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