Introduction

This safety door guarding example uses a SmartGuard 600 safety controller. The SmartGuard 600 controller is wired to a door interlock switch to guard an area and is configured as a standard slave to a CompactLogix controller on a DeviceNet network to exchange the status information.

Features and Benefits

- Programmable safety logic monitors the state of a safety tongue interlock on a 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 using CIP Safety on DeviceNet networks 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 [http://literature.rockwellautomation.com](http://literature.rockwellautomation.com)) 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.

<table>
<thead>
<tr>
<th>WARNING</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMPORTANT</td>
<td>Identifies information that is critical for successful application and understanding of the product.</td>
</tr>
<tr>
<td>ATTENTION</td>
<td>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.</td>
</tr>
<tr>
<td>SHOCK HAZARD</td>
<td>Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.</td>
</tr>
<tr>
<td>BURN HAZARD</td>
<td>Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.</td>
</tr>
</tbody>
</table>
General Safety Information

**IMPORTANT**
This application example is for advanced users and assumes that you are trained and experienced in safety system requirements.

**ATTENTION**
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.

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

Description

This application example describes how to pass standard, non-safety data such as a circuit reset from a standard CompactLogix 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 CompactLogix controller is programmed using RSLogix 5000 software. You must be familiar with this software to use this document.

Safety Function

A SIL 3 rated Category 4 safety solution should perform the following functions:

- Check the status of the inputs and wiring and shut down the system in case of any fault.
- Monitor the filed output device status before start-up and not allow the system to start in case of any existing fault.
- Be capable of identifying faults and shut down the system immediately or perform the safety function when demanded in case of multiple faults.

The SmartGuard 600 controller has pre-defined function blocks for safety inputs from different safety devices and monitors safety redundant outputs.

This function block has all the required logic built in and is certified by TÜV.
Diagnostics

The SmartGuard 600 controller uses pulse-tested outputs which continuously monitor the status of the inputs and feedback from the output device.

It also provides the diagnostics for each input and output via status indicators.

The SmartGuard 600 controller is configured as a slave to the CompactLogix controller and exchanges status values of the system with the CompactLogix controller.

Example Bill of Material

This application example uses these components.

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1752-L24BBB</td>
<td>SmartGuard 600 safety controller</td>
<td>1</td>
</tr>
<tr>
<td>1769-SDN</td>
<td>DeviceNet scanner</td>
<td>1</td>
</tr>
<tr>
<td>1769-L35E</td>
<td>CompactLogix processor</td>
<td>1</td>
</tr>
<tr>
<td>440K-H11120</td>
<td>Trojan safety interlock switch</td>
<td>1</td>
</tr>
<tr>
<td>100S-C09DJ14C</td>
<td>Safety contactors</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Standard USB cable</td>
<td>1</td>
</tr>
</tbody>
</table>

Software Requirement

- RSNetWorx for DeviceNet software, version 8.00.01
- RSLinx Classic software, version 2.51 or later
- USB drivers for SmartGuard 600 safety controller
- RSLogix 5000 software

System Overview
Setup and Wiring

This setup requires wiring the safety input and output devices to the SmartGuard 600 controller to provide Category 4 safety wiring.

A DeviceNet communication cable is connected between the 1769-SDN scanner and SmartGuard 600 controller.

For detailed information on installing and wiring, refer to the product manuals listed in the Additional Resources on page 28.

Wiring

Configure SmartGuard 600

These steps show how to set up drivers to communicate to the controller. The USB driver required for communicating to the SmartGuard 600 controller must be installed on your computer.

1. Connect the USB cable between the SmartGuard 600 controller and your programming station personal computer.
2. Wait for Windows operating system to recognize the new USB device.
3. Open RSLinx Classic software by clicking on the RSLinx service icon in the Windows system tray (lower right-hand corner of window).
4. If this service is not running, double-click the RSLinx Classic icon on your desktop.

or

Configure USB Driver

These steps show how to set up drivers to communicate to the controller. The USB driver required for communicating to the SmartGuard 600 controller must be installed on your computer.
5. Select Communications > Configure Drivers to set up communication to the controller.

![Configure Drivers](image)

6. From the pull-down menu, select the SmartGuard USB Driver.

7. Click Add New.

![Configure SmartGuard USB Device](image)

8. Press OK to confirm the name of the driver.

9. From the Select Interface pull-down menu, select 1752 SmartGuard USB Port.

10. Click OK.

11. Click Close.

12. Minimize RSLinx Classic software.
Going Online in RSNetWorx for DeviceNet Software

To select the DeviceNet configuration and the SmartGuard USB driver, follow these steps.

1. On your desktop, double-click the RSNetWorx for DeviceNet icon.

2. Select File > New.

3. Select DeviceNet Configuration from the list.

4. Click OK.

5. Click the RSWho button to go online.

6. Select your SmartGuard USB driver from the list.
7. Click OK.

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

The network displays SmartGuard 600 controller at Node 2 and 1769-SDN scanner at Node 3.
9. In the RSNetWorx online graph, double-click 1752-L24BBB SmartGuard controller to open the Properties dialog.
Configure SmartGuard Controller Local Inputs and Outputs

To configure local inputs and outputs, follow these steps.

1. Click the Local Input/Test Output tab.
2. Name your local I/O so it is easy to recognize later in the programming editor.
3. Using the wiring diagram, assign names to your inputs.
4. On the General tab, double-click No. 00.

According to our wiring diagram, this is Input 1 for Door Interlock Switch.

5. Type Ch1 in I/O Comment window.
6. In Channel Mode pull-down menu, select Test Pulse From Test Out.
7. Click OK.
8. Enter other signals as shown.

9. Click the Local Output tab and enter the signals as shown.
Configure Slave I/O Tags in SmartGuard Controller

To create tags and output connections, follow these steps.

1. Click the Slave I/O tab and click New to create tags.
2. Open the Edit Slave I/O dialog and click New to create Output tag connection.
3. Type Reset_ClIx as a tag name.
4. Click OK.
5. Reset_Clxx appears as the tag in the Output tab.

6. Click OK.
7. Select the IN tab.
8. Check Local Input Status, Local Output Status, Input and Output for Bit-Strobe connection as shown.
9. Click OK.

A Poll type output connection is created in the Slave I/O tab.
Configure CompactLogix Controller

To configure the CompactLogix controller for the 1769-SDN DeviceNet scanner and to set the ladder logic, follow these steps.

1. Launch RSLogix 5000 software.
2. Open a new file.
3. Select the controller.
4. In the I/O Configuration, select the 1769-SDN DeviceNet scanner in the first slot.

5. Enter the following ladder rungs and download them to the controller.
Configure SmartGuard 600 Controller as Slave to 1769-SDN Scanner

To configure the SmartGuard 600 controller as a slave to the 1769-SDN scanner, follow these steps.

1. Go to RSNetWorx for DeviceNet software and right-click 1769-SDN scanner.
2. Click Properties.
3. Click the Scanlist tab.
4. Add the 1752-L24BBB controller to the Scanlist.
5. Click Apply.
6. In the Scanner Configuration Applet dialog, click Yes.

Programming

Programming the SmartGuard 600 Controller.

To program the SmartGuard 600 controller, set the parameters and connect the inputs and outputs. Follow these steps.

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

In the editor there are two sections, the Function List section and the Workspace section.
3. From the Safety Device area of the Function Block tab, drag and drop the EDM, Restart, and Safety Gate Monitoring Function blocks onto the empty workspace, as shown. Leave space to the left for your inputs.

4. Double-click the Restart function block. Several functions may be set up within the block.

5. Click Reset Signal in the Parameter tab.

6. For the value, select Rising Edge from the pull-down menu. The Reset Type doesn’t matter because this application uses a momentary switch.
7. In the Function List, choose the Input tab.

8. Expand the SmartGuard inputs and then the Safety Input section to view the Local Inputs configured earlier along with the Local Outputs.

9. Connect the input and output signals as shown.
10. In the upper left corner of the editor, click Apply.

11. Click OK.

12. Select File > Exit.

13. Click Apply in the SmartGuard Properties dialog.

14. Click Yes to confirm any prompts.
Browsing the DeviceNet Network

To select the communication path to the network, follow these steps.

1. Open RSNetWorx for DeviceNet software.
2. Select the browsing path as shown.
4. Click the ScanList tab.
5. Select Upload from the Scanner Configuration Applet.
SmartGuard is listed in the 1769-SDN scan list.

6. Click Apply.

7. Click OK.

Online Monitoring

To change the SmartGuard controller from Idle or Program mode to Execute or Run mode, follow these steps.

1. Click the Mode/Cycle Time tab.

2. Click Change Mode.
3. Click Execute.
4. Click OK to change modes.

![Change Mode dialog box](image)

5. To observe your program online, return to the Logic tab.
6. Click Edit.
7. Click the Monitoring button.

![SmartGuard software interface](image)

The Safety Gate inputs and Contactor Feedback turn green. This indicates they are logically true.
8. Give the Reset Input command from the CompactLogix controller by forcing the Reset bit.

The contactors connected to the safety outputs will turn on and screen appear as shown.

9. To view the status of the standard and safety I/O, open the DNB inputs as shown.
Additional Resources

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

<table>
<thead>
<tr>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SmartGuard 600 Safety Reference Manual, publication 1752-UM001</td>
<td>Provides safety information for using and installing SmartGuard 600 controller.</td>
</tr>
<tr>
<td>SmartGuard 600 Controller Product Profile, publication <a href="http://www.ab.com/programmablecontrol/safety/smartguard.html">http://www.ab.com/programmablecontrol/safety/smartguard.html</a></td>
<td>Provides product profile information on SmartGuard 600 Controller.</td>
</tr>
<tr>
<td>Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1</td>
<td>Provides general guidelines for installing a Rockwell Automation industrial system.</td>
</tr>
</tbody>
</table>

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

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Power, Control and Information Solutions Headquarters
Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0500, Fax: (32) 2 663 0640
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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