AN-282

Programming Door Mechanisms in Protege GX

Application Note

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Contents

Introduction

Along with standard locking devices, Protege GX provides the ability to control a wide range of mechanisms which are installed on doors. These devices are commonly used to improve security, provide accessibility and achieve regulatory compliance.

This application note provides programming examples for the following mechanisms:

- Night locks / safety locks
- Door pumps / automatic door openers
- Shunt relays

The examples given in this application note are designed to cover common requirements for the operation of these mechanisms. You can adapt the programming to meet the requirements of your own site.

Several mechanisms covered in this document use the function outputs feature. For more information on function outputs, see Application Note 336: Programming Function Outputs in Protege GX.

Prerequisites

The following versions are required to use the function outputs feature. Other features used in this app note do not require any particular Protege GX software or firmware versions.

Component	Version
Protege GX software	4.3.317.10 or higher
PRT-CTRL-DIN	2.08.1238 or higher
PRT-CTRL-DIN-1D	

Programming Night Locks

A night lock is a secondary safety lock on a door. When the area is armed, both locks are engaged and both disengage when the door is unlocked. When the area is disarmed, the regular lock remains engaged but the night lock is disengaged. These are typically used for exterior doors which require higher security.

Programming Scenario

We will use a programmable function to control a night lock based on the status of an area and the main door lock. Before you begin, program the following records:

- **Door**: Exterior Door
- **Area**: Reception
- **Outputs**:
  - Exterior Door Lock (set as the **Lock output** for the door)
  - Exterior Door Night Lock (physically controls the night lock)
- **User**: One user with access to the door and area.

Programming the Virtual Output

For this programming we need one virtual output, which will be activated when the area is disarmed.

1. If you do not already have virtual outputs available, navigate to **Expanders | Output expanders** and create a virtual output expander:
   - From the toolbar, select the **Controller** that will control these outputs, then click **Add**.
   - Ensure that the **Virtual module** option is enabled.
   - Set the **Physical address** to a value above existing physical expanders (e.g. 32). Click **Save**.
   - Disable **Add trouble inputs** and click **Add now**.
   - It is recommended that you navigate to **Programming | Outputs** and rename the resulting outputs so that they include the term Virtual or VO in their names.
2. Select one of the virtual outputs and give it the name Reception Area Disarmed VO.
3. Click **Save**.
4. Navigate to **Programming | Areas | Outputs**.
5. Select the Reception area and set the **Disarmed output** to Reception Area Disarmed VO.
6. Click **Save**.

Creating the Programmable Function

The programmable function will be used to activate the night lock output when the area is armed and the door is locked. It will be deactivated if the area is disarmed or the door is unlocked.

1. Navigate to **Automation | Programmable functions**.
2. Select a **Controller** from the toolbar and click **Add**.
3. Name the new function Activate Night Lock.
4. Set the **Type** to Logic control.
5. In the **Logic control** tab, configure the following settings:
   - **Logic function mode**: 8 - Follow logic NOR
   - **First output to check**: Reception Area Disarmed VO

- **Second output to check**: Exterior Door Lock
- **Output to control**: Exterior Door Night Lock

When both the 'checked' outputs are deactivated, the night lock will be activated. When one output is deactivated, the night lock will also be deactivated. The logic is outlined in the table below:

Reception Area Disarmed VO	Exterior Door Lock	Exterior Door Night Lock
✓	✓	✗
✓	✗	✗
✗	✓	✗
✗	✗	✓

6. Click **Save**.
7. Wait for the changes to be downloaded to the controller. Right click on the programmable function and click **Start**.

Testing the Night Lock Operation

Now we can test the functionality of the night lock to ensure that it is working correctly.

1. Arm the Reception area. The night lock output should turn on with the following event:

   ```
   Output Exterior Door Night Lock (174) On By Programmable Function Activate
   Night Lock (6)
   ```

   When the building is armed and no one is present, the night lock engages for additional security.
2. Use a card or the software to unlock the Exterior Door. While the door is unlocked, the night lock should also turn off:

   ```
   Output Exterior Door Lock (165) On By Exterior Door (19) Function Lock
   Output Exterior Night Lock (174) Off By Programmable Function Activate
   Night Lock (6)
   ```

   This allows users to enter the building after hours.
3. After 5 seconds the door relocks and the night lock turns on:

   ```
   Output Exterior Door Lock (165) Off By Exterior Door (19) Function Lock
   Output Exterior Night Lock (174) On By Programmable Function Activate
   Night Lock (6)
   ```
4. Disarm the Reception area. The night lock output should turn off:

   ```
   Output Exterior Door Night Lock (174) Off By Programmable Function
   Activate Night Lock (6)
   ```

Note that the night lock operates in a 'fail safe' manner: i.e. when the output is de-energized the night lock is disengaged.

Programming Door Pumps

Door pumps, or automatic door openers, automatically open a door when it is unlocked. This improves the accessibility of the doors for people with mobility impairments.

The following are common requirements for door pumps:

- The door pump should be activated when a user badges a card to unlock the door. In some cases the door should be opened only for people with disabilities instead of all users.
- The door pump may also be activated by buttons on the entry/exit sides of the door.
- To prevent mechanical strain, the door pump should only be activated when the door is unlocked.
- If a user badges their card or presses the button while the door is already open, the door pump should retrigger or stay open for longer.
- The door pump should not be activated when the door is unlocked by schedule or area control. However, if a user badges or presses a button the door pump will be activated.

Programming Scenario

We will use function outputs to fulfill the door pump requirements outlined above. Add a door called Lecture Theater 10B Door and a user with access to the door. We will use the following physical outputs and inputs:

- **Outputs**:
  - 10B Lock
  - 10B Door Pump Mode Auto/Off
  - 10B Door Pump Control

  The two door pump outputs are wired so that the door pump will open the door only if both of these outputs are activated at the same time. When the mode output is on (i.e. the door pump is in auto mode), pulsing the control output will cause the door pump to open and close the door.
- **Inputs**:
  - 10B Door Contact
  - 10B REX
  - 10B Entry Button

    The entry button does not unlock the door, but is physically wired to the door pump and will cause it to activate when pressed. If physical wiring is not available, an input type could be used to activate the door pump when this input is triggered.

Programming the Door

To program the door pump for the lecture theater door:

1. Navigate to **Programming | Doors** and select the Lecture Theater 10B Door.
2. In the **General** tab, expand the **Commands** section and add the following command:

   `RecycleDoorTimeOnAccess = true`

   This is required for the **Recycle time on access** function below.
3. In the **Outputs** tab, program the following lock output settings:
   - **Lock output**: 10B Lock
   - **Lock activation time**: 15 seconds
   - **Enable additional lock outputs**: Enabled
   - **Lock 2 output**: 10B Door Pump Mode Auto/Off

- **Lock 2 activation time**: 15 seconds
- **Lock 2 delay before activation**: 0

When the door is unlocked by any method the lock will be unlocked and the door pump will be switched to auto mode for the same length of time.

4. In the **Function outputs** tab, program the following function output settings:
   - **Function 1 output**: 10B Door Pump Control
   - **Function 1 activation time**: 5 seconds
   - **Activate on access**: Enabled
   - **Activate on REX/REN**: Enabled
   - **Deactivate on door open**: Enabled
   - **Recycle time on access**: Enabled
   - **Recycle time on REX/REN**: Enabled

   With these settings the door pump control output will be activated when the door is unlocked by access or REX, but not by schedule, operator control or other remote methods.

   Alternatively, you may want the door pump to only be activated when a disabled person accesses the door. To achieve this, disable **Activate on access** and **Recycle time on access**, and instead enter the commands `ActivateOnADAF1 = true` and `RecycleOnADAF1 = true` in the **General** tab.

5. In the **Inputs** tab, configure the following REX settings:
   - **REX input**: 10B REX
   - **Always allow REX**: Enabled
   - **Recycle REX time**: Enabled
6. Click **Save**.

Testing the Door Pump

Now we can test the functionality of the door pump.

1. Badge the user's card at the Lecture Theater 10B Door. Three outputs should be activated:

   ```
   Output 10B Lock (138) On By Lecture Theater 10B Door (13) Function Lock
   Output 10B Door Pump Mode Auto/Off (175) On By Lecture Theater 10B Door
   (13) Function Lock
   Output 10B Door Pump Control (130) On By Lecture Theater 10B Door (13)
   Function Lock
   ```

   Because both 10B Door Pump Mode Auto/Off and 10B Door Pump Control are on, the door pump mechanism should be activated.

2. Open the door using the 10B Door Contact input. 10B Door Pump Control should turn off:

   ```
   Door Lecture Theater 10B Door (DR13) Opened
   Output Door Pump Control (130) Off By Lecture Theater 10B Door (13)
   Function Lock
   ```

3. While the door is still open and unlocked, badge your card again. The 10B Door Pump Control output should turn on again for 5 seconds. This would reactivate the door pump mechanism.
4. Repeat the above testing with the REX button.
5. Latch unlock the door using a manual command or by setting an **Unlock schedule**. The 10B Door Pump Control output should not turn on, so the door pump mechanism will not be activated when the door is unlocked unattended.
6. While the door is unlocked, badge a card or press the REX button. The 10B Door Pump Control should be activated to open the door.

Programming Shunt Relays

Some doors are monitored by third-party intruder detection systems which will go into alarm when the door is opened. These doors require a shunt relay to bypass the alarm system when the door is opened legitimately. When the door is unlocked by Protege GX the shunt relay output should turn on until the door is locked, or for a set duration.

We can use function outputs to program shunt relay outputs. This section contains two examples of programming for common shunt relay requirements:

- Shunt relay for a fire door (see below)
- Shunt relay for a truck gate (see page 11)

Scenario 1: Fire Door

In this scenario we have a fire door which is required to be latch unlocked during the day and locked at night. The shunt relay for this door has the following requirements:

- While the schedule is invalid (i.e. at night) the shunt relay should turn on for the activation time whenever a user unlocks the door by access or REX. When the door is closed, the output should turn off.
- The shunt relay should be on continuously while the door is unlocked by schedule. When the schedule ends the output should remain on until the door is closed or the activation time expires.

Before you begin, add the following records:

- **Door**: Break Room Door
- **Output**: Break Room Door Shunt
- **Schedule**: Break Room Door Schedule (9am-5pm)
- **User**: One user with access to the door

Programming the Door

To program the shunt relay for the fire door:

1. Navigate to **Programming | Doors** and select the Break Room Door.
2. Set the **Unlock schedule** to Break Room Door Schedule (9am-5pm).
3. In the **Function outputs** tab, program the following:
   - **Function 1 output**: Break Room Door Shunt
   - **Function 1 activation time**: 30 seconds
   - **Deactivate on door closed**: Enabled

   With these settings the function output will be activated whenever the door is unlocked by any method.
4. In the **Options** tab, enable the **Relock on door open** option. This ensures that the lock will be secured again as soon as the door is opened.
5. Click **Save**.

Testing the Shunt Relay

We can now test the shunt relay operation for the fire door.

1. Navigate to **Sites | Controllers**. Right click on the controller, set the time to 07:59:50 AM and click **Set controller date time**.
2. Wait until the schedule becomes valid and the door unlocks. The shunt relay output should turn on.

```
Output Break Room Door Shunt (131) On By Break Room Door (14) Function
Lock
```

3. Open and close the Break Room Door. The shunt relay output should remain on.
4. Change the controller time to 04:59:50 PM.
5. Wait until the schedule becomes invalid and the door locks. The shunt relay output should remain on for 30 seconds, then turn off.

   ```
   Output Break Room Door Shunt (131) On By Break Room Door (14) Function
   Lock
   ```

6. Right click on the door and latch unlock it. The shunt relay output should turn on.
7. Open the door, then use the software to lock it. If you close the door before the shunt relay output's 30 second activation time ends it should turn off early.
8. Badge a card or press the REX button. The shunt relay output should turn on for 30 seconds.
9. Badge a card or press the REX button, then open and close the door. The door should relock when the door is opened, and the shunt relay should turn off when the door is closed.

Scenario 2: Truck Gate

Another common scenario is a truck gate which must remain open while a truck is loading or unloading cargo. The time the truck needs access to the loading zone can vary significantly, so it makes sense to activate the shunt relay until the truck has left rather than on a specific timer. The requirements for this scenario are:

- When the gate is unlocked temporarily the shunt relay will be activated and stay on indefinitely until the gate is closed.
- When the gate is latch unlocked the shunt relay will be activated and stay on until it is relocked.
- If the gate is forced open the shunt relay will be deactivated immediately.

Before you begin, add the following records:

- **Door**: Delivery Gate
- **Output**: Delivery Gate Shunt
- **User**: One user with access to the door

Programming the Door

To program the shunt relay for the truck gate:

1. Navigate to **Programming | Doors** and select the Delivery Gate.
2. In the **Function outputs** tab, set the following:
   - **Function 1 output**: Delivery Gate Shunt
   - **Function 1 activation time**: 0
   - **Deactivate on door close**: Enabled
3. Click **Save**.

Optional: Deactivating the Shunt Relay on Door Forced

With the programming above, when the gate is unlocked temporarily by access the shunt function will turn on until the gate is closed. If the gate is not opened and closed the shunt relay will remain on indefinitely. This means that if the gate is forced open the third-party alarm system will not detect the intrusion because it is still being bypassed.

This can be prevented by using a programmable function to deactivate the shunt relay when the gate is forced open.

Alternatively, you could install a second output that will physically break the bypass when a door forced alarm occurs.

1. In **Programming | Doors**, navigate to the **Outputs** tab.
2. Set the **Forced open output** to the reader beeper for this door (or any other relevant output).
3. Click **Save**.
4. Navigate to **Automation | Programmable functions**.
5. Select the **Controller** in the toolbar and add a new programmable function with the name Deactivate Delivery Gate Shunt on Door Forced.
6. Set the **Type** to Logic control.
7. In the **Logic control** tab, set the following:
   - **Logic function mode**: 3 - Inverted follow pulse on first output
   - **First output to check**: Door forced output selected above
   - **Output to control**: Delivery Gate Shunt

8. Click **Save**.
9. Wait for the changes to be downloaded to the controller, then right click on the record and click **Start**.

Testing the Shunt Relay

To test the operation of the truck gate shunt relay:

1. Badge a card at the Delivery Gate or press the REX button. The door should unlock and the Delivery Gate Shunt should turn on.

   ```
   Output Delivery Gate Shunt (176) On By Delivery Gate (20) Function Lock
   ```

   The shunt relay output will remain on indefinitely instead of turning off on a timer.
2. While the door is still unlocked, open and close the door contact. The shunt relay output will turn off.

   ```
   Output Delivery Gate Shunt (176) Off By Delivery Gate (20) Function Lock
   ```
3. In the software, latch unlock the Delivery Gate. The Delivery Gate Shunt should turn on.
4. Open and close the door contact. The shunt relay output should not be deactivated while the door is latch unlocked.
5. In the software, lock the door. The shunt relay output should turn off immediately.
6. Badge your card again. This time wait until the door relocks, without opening the door. The Delivery Gate Shunt will not turn off.
7. Open the door contact to cause a door forced alarm. When the door is forced the reader beeper or other alarm output should turn on, causing the Delivery Gate Shunt to be deactivated.

   ```
   Output RD 2 Beeper R2 (172) On By Delivery Gate (20) Function Forced
   Output Delivery Gate Shunt (176) Off By Programmable Function Deactivate
   Delivery Gate Shunt on Door Forced (7)
   ```

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