FMS
Using Simple Digital Inputs

Technical Note TCC-200
Rev A

Introduction

FMS Software has interfaces with several devices that offer digital inputs. This document will focus on the Phoenix Contact Bus Controller, but the concepts and uses would be transferrable to any of the digital input modules currently supported by FMS Software. For FMS supported products, reference TSI Technical Note TCC-168: Authorized Components for FMS 5.1 and Newer Software.

The digital input is a simple ON/OFF indicator that sends the controller a "1" or "0" as the input. It is the simplest form of input for a system as there are only two possibilities, ON or OFF. Even though it is a simple interface, there are several uses and scenarios that are perfect for digital inputs.

Mechanics of Digital Inputs

The mechanics behind a digital input is simple electrical continuity, or it can be thought of as a switch. If the switch makes contact, there is electrical continuity. This action lends itself to monitoring door switches to determine if a door is open or closed, and allows FMS to alarm based on the door position. This is useful for alarming doors that need to stay closed in order to maintain either positive or negative pressures in a cleanroom.

Many building management systems will recognize the degrading pressure difference and ramp up the fans to maintain the pressure differential, resulting in higher energy use. Using FMS and digital inputs, personnel can be alerted to an impending situation that allows mitigation of the situation BEFORE fans ramp up.

For example, imagine a scenario where positive pressure to a cleanroom must be maintained. There is a door connecting the Class A area to the Class B area. Employees will often stand in the doorway, with the door open, for various reasons. A door switch can be used to signal FMS that the door is open. If it stays open too long, the room risks losing its positive pressure compared to the Class B area.

FMS and a digital input to alarm employees that the door has been open for an extended period can be used. However, it's unproductive for the system to alarm every time a door is opened, but critical if it is left open for a lengthy duration. FMS alarm threshold functionality has the capability to limit nuisance alarms caused by simply opening a door.

Understanding Digital Inputs—An Example

Provided here is an example of a digital input set up to monitor a door switch. The sample point chosen is DI1 and is indicated with a red circle drawn around it. The sample point is set up to indicate a normal operation with the door closed. If the door is open for more than about 15 seconds, the sample point color will change to yellow. If left open for more than 30 seconds, the color would turn red. These changes could also be reflected on a light stack with audible alarms locally.

Setting Up Digital Outputs

FMS uses a Digital Output to trigger the Email Unit. The setup of the Email Digital Output is identical to setting up any other type of digital output. Care must be taken to select the correct Unit that corresponds with the email alert desired. For this reason, logical naming conventions for units and digital outputs should be employed. The names should provide insight as to the function (i.e., DO_Email Counts and U_Email_Counts). As highlighted, the digital output could be further acted upon by using a recipe. This will complicate the configuration, however there could be circumstances where this would be necessary.

Select the correct Alarm Group and enable the digital output. Select the desired Alarm State. Normally, this is set to "=Alarm", although the email could be set to be sent based on any of the conditions, including None, OK, Warning, Alarm, Failure, or Needs Acknowledgement. With thought, using the different Alarm States allows for FMS to become quite powerful in its email capabilities.
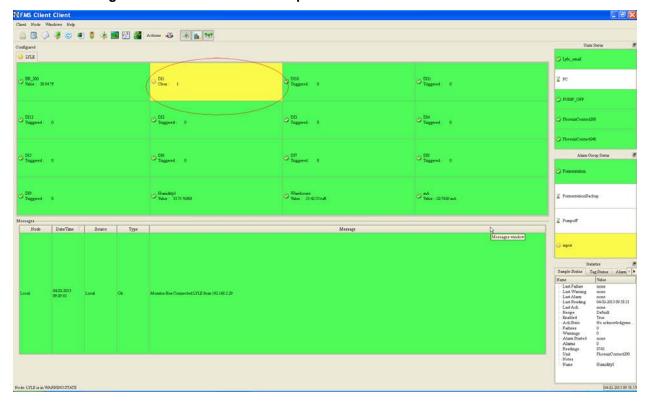
It is possible to Allow Control and Scheduling as well as function to be used for manually triggering email output. It is recommended to disable Control and Scheduling once testing is complete. Automated settings, based on alarm conditions, will prevail over manual control.

The email alert will only be sent once. However, this can be changed by selecting "Retrigger" to initiate sending multiple emails until the condition is corrected.
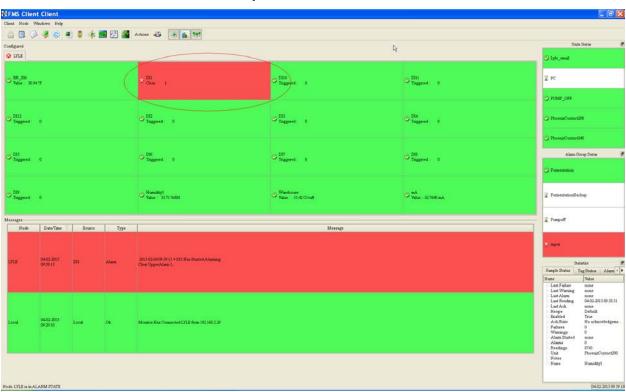
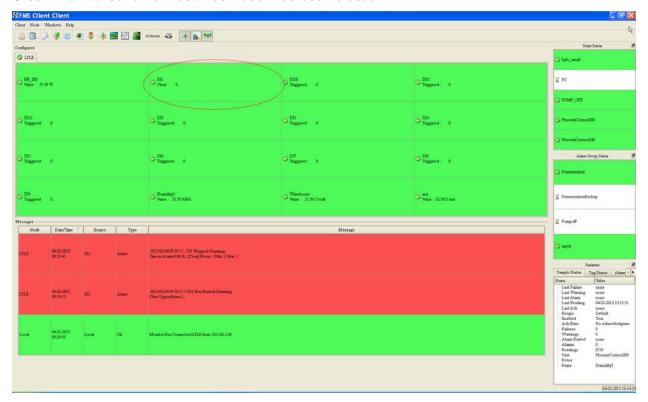**Green: Normal condition— door is closed.**

Yellow: Warning condition—door has been open for at least 15 seconds.

Red: Alarm condition—door has been open for more than 30 seconds.
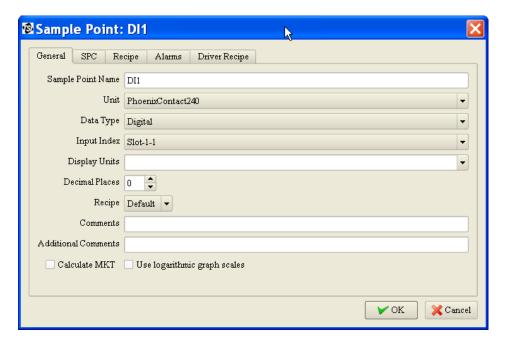
Green: Normal condition resumes—door has been closed.
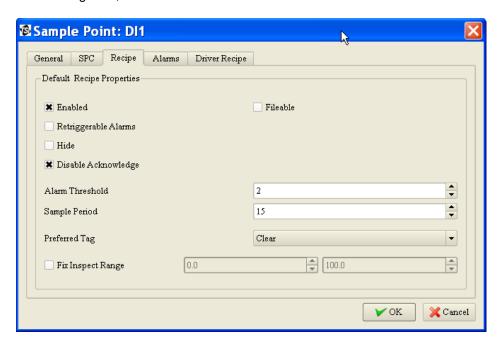

Setting Up Digital Inputs

The configuration for the example herein is simple. It is based on a Phoenix Contact bus controller using the first input available on the controller. It is assumed the Phoenix Contact bus controller unit has been set up in FMS Software and the user understands the basic configuration of the controller and the software. Set up is easy.

Open the configuration tab and navigate to sample points. Right click to add a new point. Click on the General tab and name the point. Click OK to save the point. Right double-click on the sample point name to open up the properties page with all tabs available.

For this example, the sample point name is DI1. It is assigned to the PhoenixContact240 unit and configuring a digital data type with an input index selection of Slot 1-1. There is no need to indicate display units or decimal points (digital inputs are either 0 or 1).
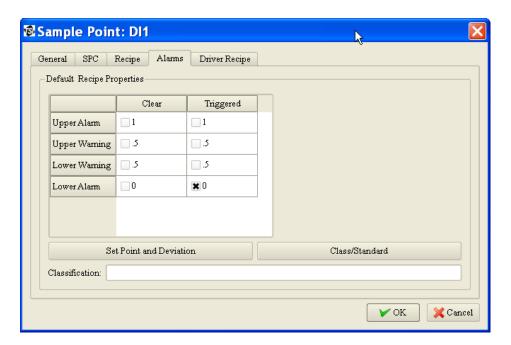
Click on the Recipe tab to set up timing and other needed parameters—such as alarm thresholds, alarm acknowledgment, and others.

Make sure the sample point is enabled. Please note—It is not recommended to make a digital input "fileable" because of its shorter sample times. At 15 second sample times, a tremendous amount of data will be generated and filed over a 24 hour period. Door switch data is probably not necessary to archive but is up to the end user's discretion. The alarms produced by an open door would still be logged, even if the data is not filed.

For this sample, the alarm is set up to not require alarm acknowledgement—otherwise the user would need to acknowledge alarms every time the door is opened. The alarm threshold is set for 2, which means that with a 15 second sample time, if the door is left open for more than 30 seconds, the sample point will red alarm. If the door is open for 15 seconds, the sample point will go to a yellow warning state. If the door is closed before 30 seconds, the sample point will return to green normal state.

An important point to understand in setting up a digital input is whether to select "Clear" or "Triggered" as the preferred tag. In this example, choosing "Triggered" and setting a lower alarm at 0 under the Triggered column, the sample point maintains green normal state with the door closed and the switch is closed. On a door switch with both normal open and normal closed positions, it is necessary to wire to the normal closed wire for a closed door. When the door is opened, the switch is also opened, initiating the a red alarm condition.

Many combinations of Clear or Triggered alarms on the Alarms tab, or Clear or Triggered Preferred Tags on the Recipe tab, can be used to set up the exact conditions desired for alarming.

Summary

A digital input should be considered as a monitor of any type of switch or continuity position. It can also be used as a monitor for hard switches, like door switches, including freezers or entry doors and key switches, as well as proximity switches. It can also supply feedback on whether a circuit is energized or possibly whether a valve is activated. These are simple "ON/OFF" functions of a digital input.

The simple "ON/OFF" functions of a digital input can also be used to trigger more advanced functionality, like turning on or off a recipe within FMS Software. Advanced uses might include using the alarm settings of a digital input to energize a relay or relay output to start or stop processes or machinery.