

## Purpose

The purpose of this paper is to provide the reader a brief overview of Touché’s graphical programming software for network configuration. This document is not intended to be a user’s manual or to provide complete instruction on how to effectively use this software. Screen shots of various pages within the software are included for reference purposes.

## Introduction

The lighting control industry has made the commissioning and maintenance of their solutions to be very difficult. This has added a lot of cost and frustration for the end user. One core focus of Touché’s solution is to provide the installer (contractor/commissioner) and end user (facility manager) a solution that is intuitive and simple. The software and how it interacts with the hardware is at the center of this concept. This paper was written to exemplify this position.

Below, we will first define some of the key aspects of the software; second, explain how the interaction of our hardware and software greatly simplifies the commissioning and maintenance processes; and finally, differentiate not just our software but our entire solution from competitors. Prior to development of this solution the Engineers at Touché looked to other industries for concepts and insight of how to “build” the best solution for this industry. The evolvement of the computer industry was a natural comparative industry. As you read through this document keep in mind what Apple® did to the computer industry. First, they developed hardware and software that was designed to work together. Second, they developed interfaces (i.e. programs and an operating system) that were intuitive. Those concepts are the foundation for our solution.

Obviously, these concepts have been around for quite some time, but for various reasons no manufacturer in the lighting control industry has taken this critical step to make lighting control an accepted addition to building automation. It was not until Apple had brought these innovations to the computer world, that the market willingly accepted the desktop computer as a valuable tool. We are bringing lighting control to the same standard so that it too becomes widely accepted (obviously there has been a lot of push back over the years with respect to automated lighting control). By leveraging technology to simplify - Touché has developed a "Simply Brilliant" solution for lighting control.

## Software Overview

Simplification of the programming process was the emphasis for development of the software. Simplifying programming of the system into two basic layers: Virtual devices/system and physical devices. The first screen shot below (Figure 1) shows the layout of the virtual setup page. Virtual devices are devices that the physical devices will later assume the properties of. Later in this paper we will have a discussion of the physical device setup (Figure 7 shows the physical devices page). The physical devices presented on the left side of the page in that figure, represent the real (or actual) devices in the network.

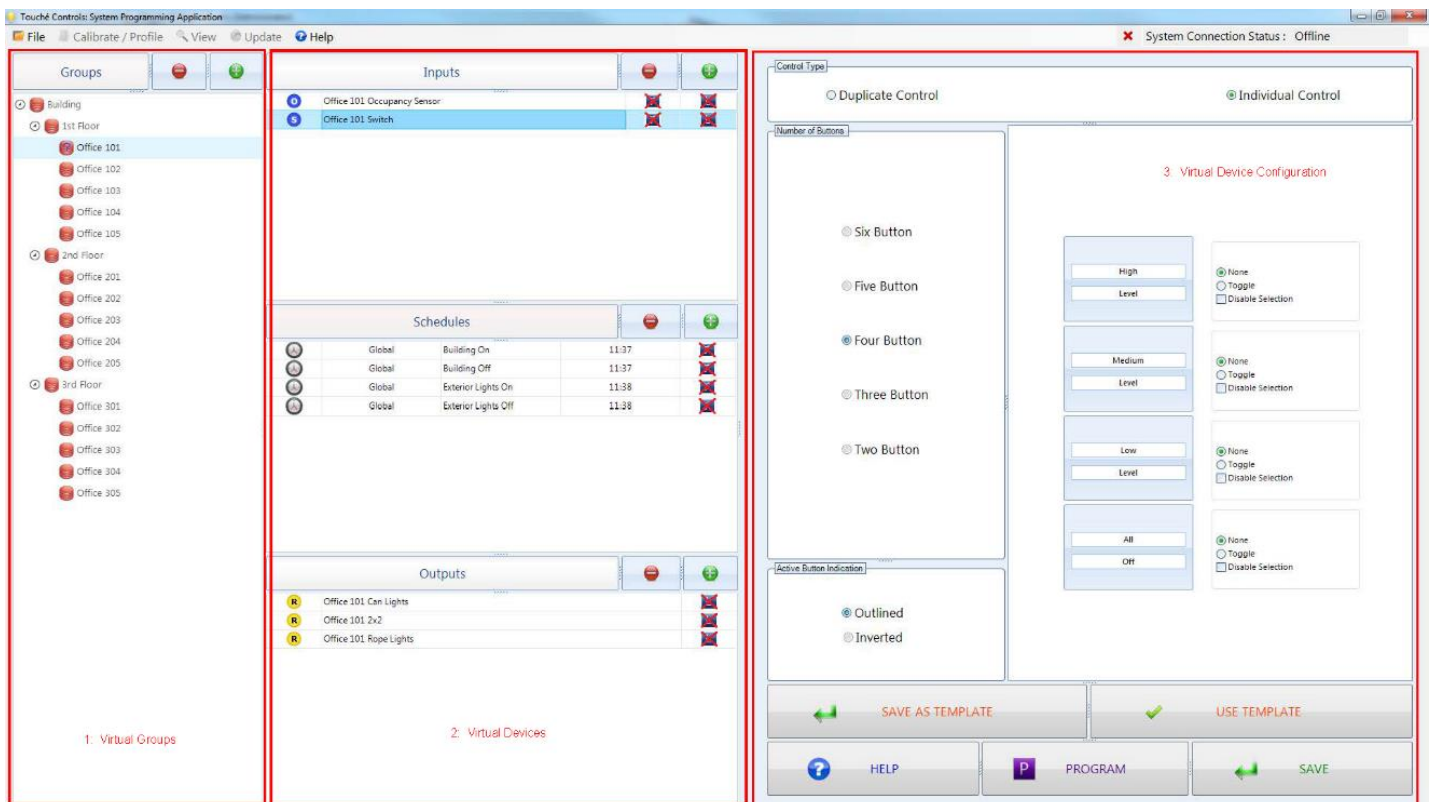


Figure 1: Virtual Device Setup

**The Virtual System:** The virtual system is comprised of virtual “Groups” and virtual “Devices”. Virtual groups (Area #1 of Figure 1 and blown up in Figure 2) typically represent rooms or areas within a building. Although this association is not a requirement it is a recommendation to “build” a virtual building with qualities equal to the real building. This will provide a simple structure for the end user to “find” and associate devices. In other words, virtual groups allow the user to organize the devices of their system into a meaningful structure that is similar to the real building. Groups are organized like file folders on a computer. Virtual groups can reside in other virtual groups.

In this example the hierarchy of the virtual building is “Building” and within the “Building” is the “1<sup>st</sup> Floor” and “2<sup>nd</sup> Floor” and within each of those groups are the different “Rooms” in the facility. The structure of this tree and the naming of each group is entirely up to the individual commissioning or maintaining the system. This provides a great amount of flexibility. There is no wrong or right solution, rather “what makes the most sense to the users.” Items that are grouped together, appear together when programming the different

functions of a building. As an example, if in “Office 101” there was an occupancy sensor, and local over-ride switch, and two relays, then only those items (devices) would appear when determining how they are to interact (i.e. when programming the functions of the system – more on that later).

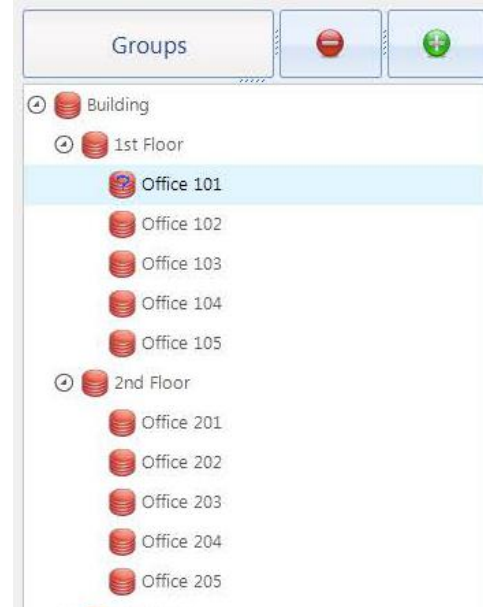


Figure 2: Virtual Groups

### NOTEWORTHY FEATURE

**SINCE TOUCHÉ IS PRIMARILY A TOUCHSCREEN SOLUTION, THE SYSTEM IS ABLE TO PROVIDE INFORMATION IN THE FIELD WHERE IT BELONGS. USER-DEFINED DEVICE DESCRIPTIONS ARE AUTOMATICALLY TRANSFERRED TO THE RESPECTIVE DEVICE OR INTERFACE AS REFERENCE WHEN TROUBLESHOOTING AND MAINTAINING THE SYSTEM.**

The virtual building is next comprised of “Virtual Devices”. Virtual Devices are categorized into three types: Inputs, Outputs, and Schedules. Inputs are devices that create an event that would come “into” the system. Outputs, conversly, would be devices that the system would send “out”. Inputs include: occupancy sensors, switches, digital inputs, ambient sensors, etc. These are all devices that would send a status message into the system (i.e. occupancy sensors would provide the system the current occupancy state of a room). Outputs are devices like relays and dimmers. These are devices that are commanded by the system to do a function (i.e. turn on a relay for the lights).

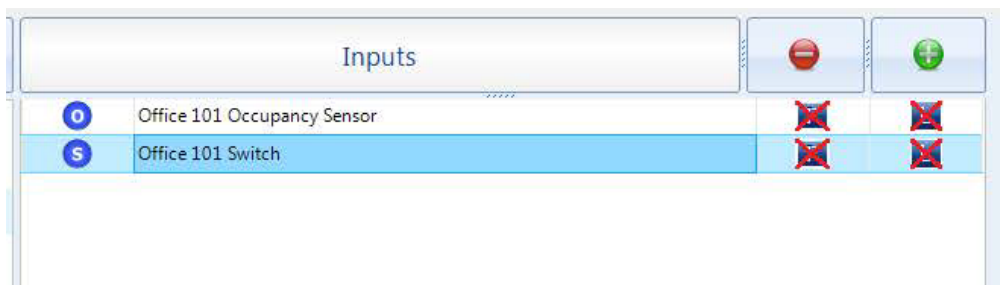


Figure 3: Virtual Inputs

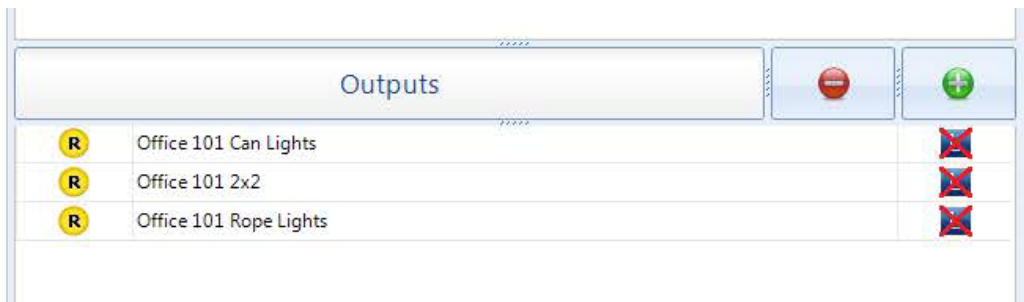


Figure 4: Virtual Outputs

Schedules are time events that are to occur at a specified time of day. Schedules can be dynamic. As an example, a schedule event can include a “dusk” or “dawn” time event. Throughout the year, the dusk and dawn times will vary. By selecting dusk or dawn as the dynamic time event, the schedule will automatically adjust the event time based on the time of the year and the location of the building (i.e. is the building in Arizona or Alaska and is it July or December?). Automation of the dusk and dawn times is automatic after selecting the zipcode of the installation.

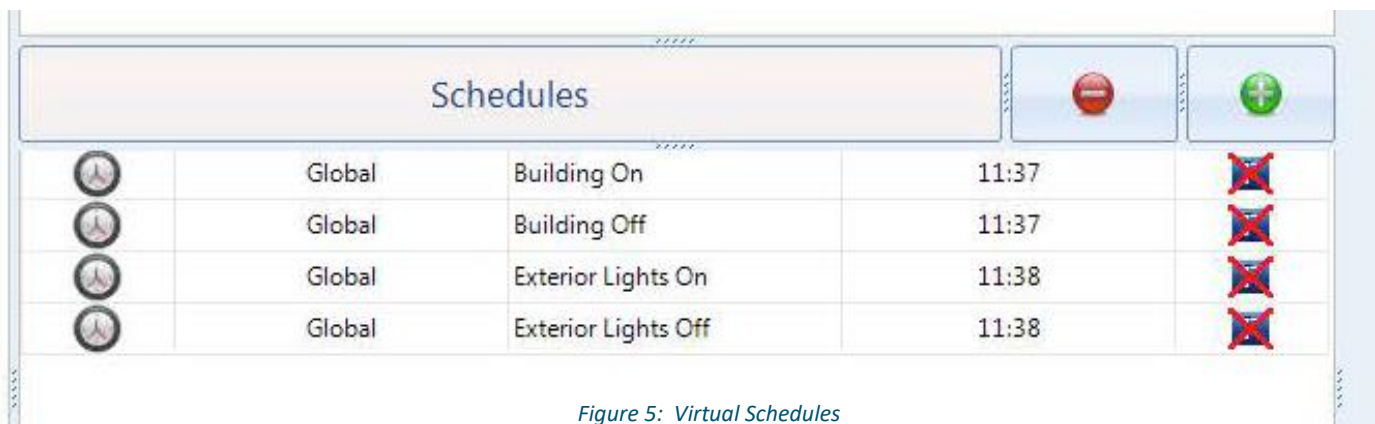


Figure 5: Virtual Schedules

Creating virtual devices allows the system to be completely setup prior to having access to the building. At any time device descriptions and configurations can be changed.

Following the linking of the virtual device to the physical device (described later), the physical device will assume the same properties as the virtual device to which it was linked. In the example below (Figure 6) a new virtual switch has been added to the system. Since Touché’s switches are fully programmable the user has the option to determine how many buttons the switch will have and what text is in each button. As depicted in Figure 6, selecting the button quantity is as simple as selecting a radio button in the software (i.e. Two Button, Three Button, Four Button, and so on). The configuration also allows for different “styles” of selected button (inverted or outlined). Finally, what text is to be displayed in each button is presented in a graphic, similar to the physical device, allowing the user to input the text.

**NOTEWORTHY FEATURE**

**TOUCHÉ HAS ADDED TEMPLATES AND WIZARDS THAT ALLOW FOR SIMPLE AND EFFICIENT ENTRY OF PARAMETERS (I.E. A TEMPLATE CAN BE USED TO AUTOMATICALLY ENTER THE TEXT FOR EACH BUTTON WHEN SELECTED).**

**Control Type**

Duplicate Control  Individual Control

**Number of Buttons**

Six Button

Five Button

Four Button

Three Button

Two Button

High Level	<input checked="" type="radio"/> None <input type="radio"/> Toggle <input type="checkbox"/> Disable Selection
Medium Level	<input checked="" type="radio"/> None <input type="radio"/> Toggle <input type="checkbox"/> Disable Selection
Low Level	<input checked="" type="radio"/> None <input type="radio"/> Toggle <input type="checkbox"/> Disable Selection
All Off	<input checked="" type="radio"/> None <input type="radio"/> Toggle <input type="checkbox"/> Disable Selection

**Active Button Indication**

Outlined

Inverted

**SAVE AS TEMPLATE**

**USE TEMPLATE**

**HELP**

**PROGRAM**

**SAVE**

Figure 6: Device (Switch) Configuration

**Linking Physical Devices to Virtual Devices:** Linking the virtual devices described above is what transfers all of the attributes (i.e. button quantity for a switch or sensor time-delay for an occupancy sensor) from the virtual device to the physical device. After the device is linked it maintains the link so any changes made to the virtual device are automatically synchronized with the physical device. Linking is a simple “drag and drop” process. On the left side of Figure 7 is a listing of all of the physical devices. The right side shows all of the virtual devices. To link the virtual with the physical simply select a virtual device, drag it to the desired physical device and drop it on that device. After a physical device is linked, it automatically shows the virtual device name (i.e. “Occ Sensors in John’s Office”) paired up with the physical device address on the left side of the screen.

The software is smart enough to know when the programming computer is connected to the system. If it is not connected then it will not allow the user to link any devices. Once again, Touché is using technology to help “think” for the user, eliminating costly and time consuming mistakes.

**NOTEWORTHY FEATURE**

**THE PHYSICAL DEVICES ARE AUTOMATICALLY POPLULATED ON THE LEFT SIDE OF THE LINKING SCREEN. THE SYSTEM IS “SMART” ENOUGH TO ORGANIZE EACH DEVICE BY TYPE AND WILL NOT ALLOW A VIRTUAL RELAY, FOR EXAMPLE, TO BE LINKED TO A PHYSICAL SWITCH.**

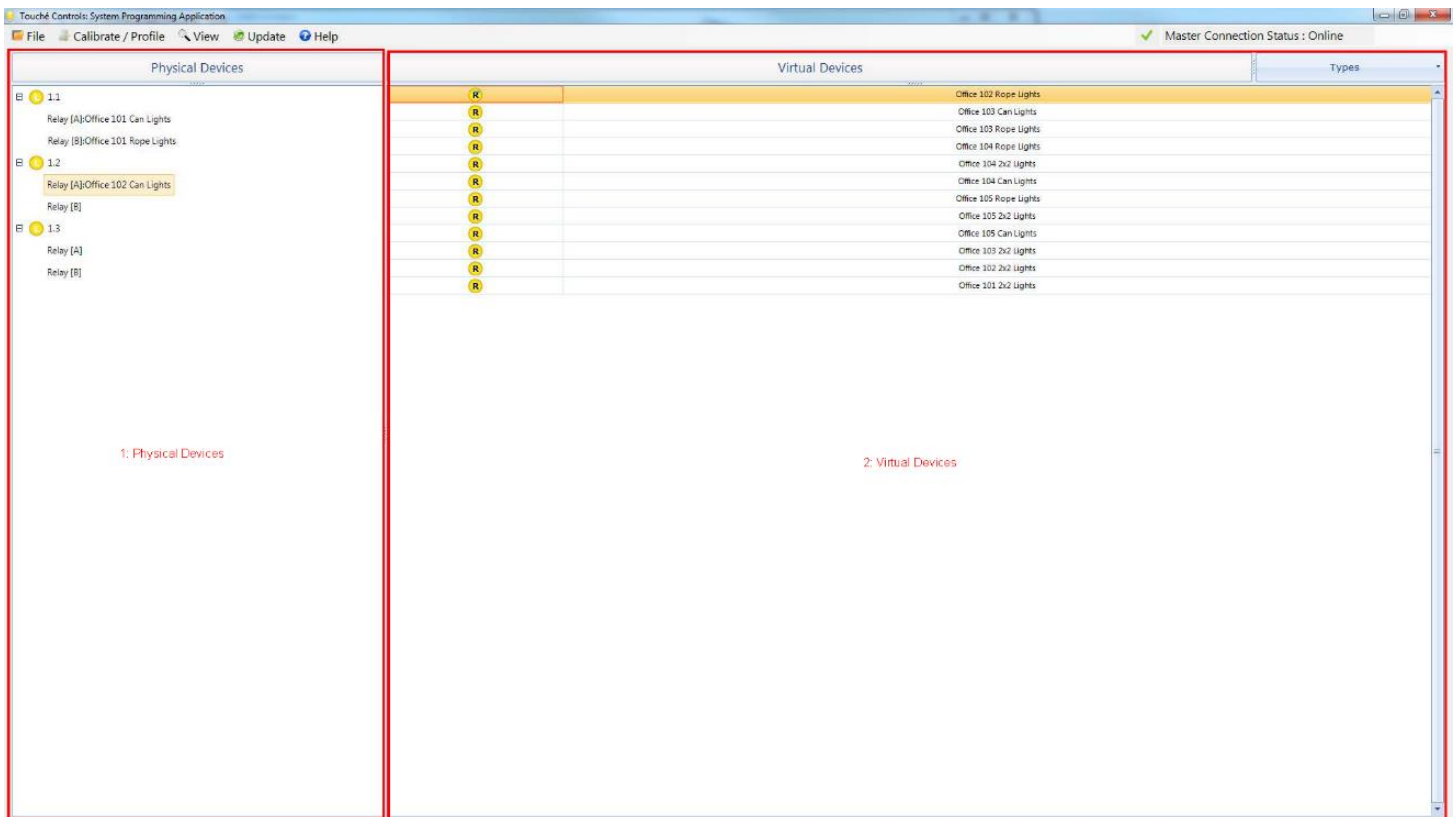


Figure 7: Physical Device Linking (Setup)

**Interaction of Hardware and Software**

What makes Touché’s solution so powerful is the interaction between the software and the hardware. Hardware devices like occupancy sensors “communicate” with the system. They are not passive devices like most solutions (most solutions only provide a status indication of occupied or unoccupied to the system). By distributing the intelligence of the system to the device level Touché has the ability to perform some amazing functions. Auto-calibration is one of those functions. Figure 8 presents the window that allows a user to calibrate sensors within the building. Calibration is a procedure that automatically adjusts the parameters of the sensors (i.e. sensitivity, delay, gain, etc.) for optimum performance. As depicted in the figure below, all of the sensors are automatically listed for the user. It displays a checkbox (to be selected if calibration is desired), the sensor description, when it was last calibrated, and the status of the calibration. To calibrate a sensor or an entire building of sensors, simply select the checkboxes of the sensors to be calibrated, select whether the sensor is to be calibrated now or at a later time, and then press the “Accept” button. It is all automatic from there! No longer is the need to climb up and down ladders to adjust sensors. One interesting note, there are no adjustment dip-switches or dials on any of Touché’s sensors – it is all automatic and adjustable from the software.

**NOTEWORTHY FEATURE**

**IF A ROOM PHYSICALLY CONTAINS MORE THAN ONE SENSOR BUT ALL OF THE SENSORS ARE TO RESPOND AS A SINGLE “SUPER SENSOR”, THEN ONLY ONE VIRTUAL SENSOR IS REQUIRED TO REPRESENT ALL OF THOSE SENSORS. THIS SIMPLIFIES THE PROGRAMMING PROCESS AND ELLIMINATES POTENTIAL CROSS-SENSOR COORDINATION ISSUES.**

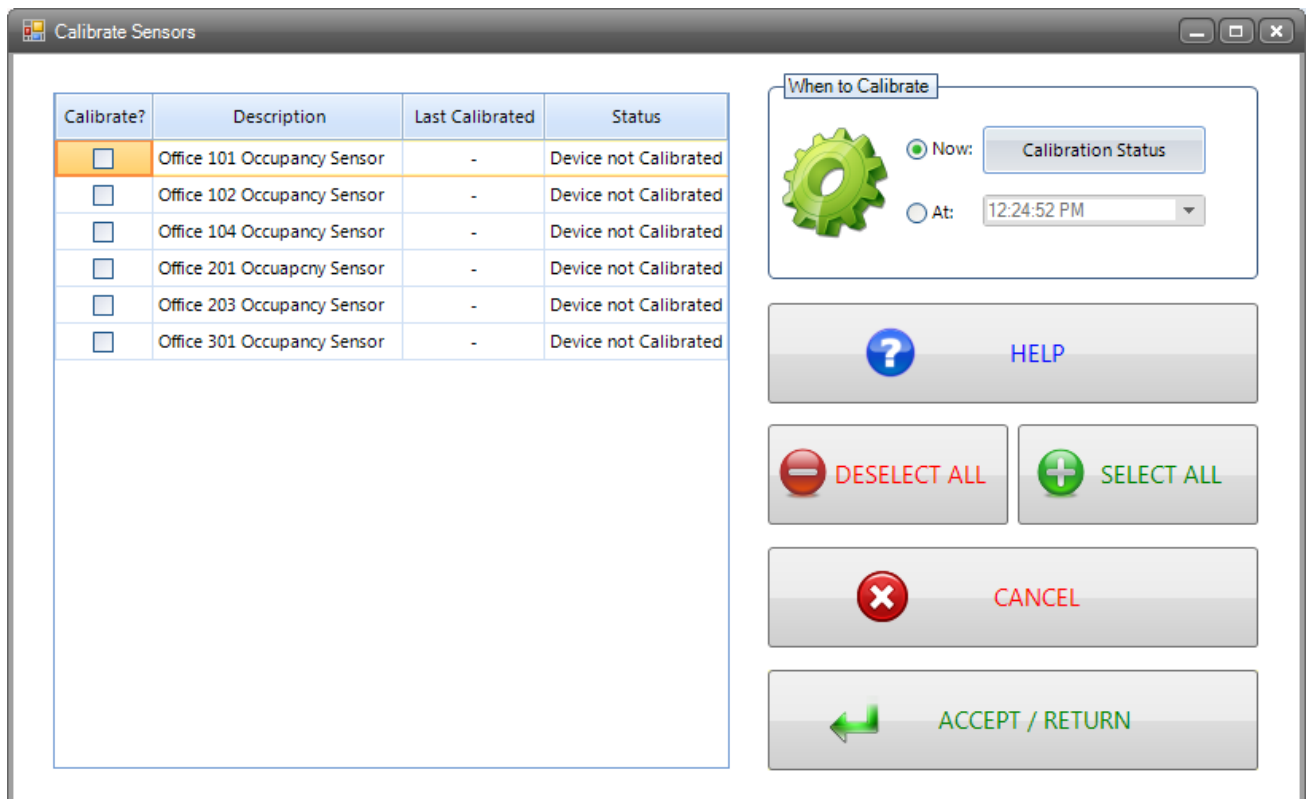


Figure 8: Calibrating Sensors



## Differentiating Aspects of Touché's Solution

The list of differentiating features that separates Touché from other competitors is long, but in an effort to describe a couple of the advantages that Touché offers, and how the interaction between the software and the hardware simplifies the process of setup and commissioning, we will look at two examples.

### Example 1: Programming a Switch

Programming a switch in most systems involves a lot of paperwork. First, most other competitors use button style switches. That typically involves engraved plates or printed stickers. Since Touché uses a touchscreen solution, all of the configuration is programmable (including the descriptions). To take simplicity one step further, Touché has implemented the same “drag and drop” technology used for linking a device to programming the buttons of a switch. Figure 9 presents the programming page for a particular switch. On the left side is a graphical depiction of the switch to be programmed. The right side shows the available relays and dimmers (only the relays and dimmers included in the “group” with the switch are shown). The middle portion of the page shows an “on” box and an “off” box. To program a button, simply select the button on the switch graphic and drag all of the appropriate relays and dimmers from the “available” box to the respective “on” or “off” boxes. If the device is a dimmer then a percent field will automatically appear for each dimmer allowing the user to select the dimmer level. How much simpler can it be?

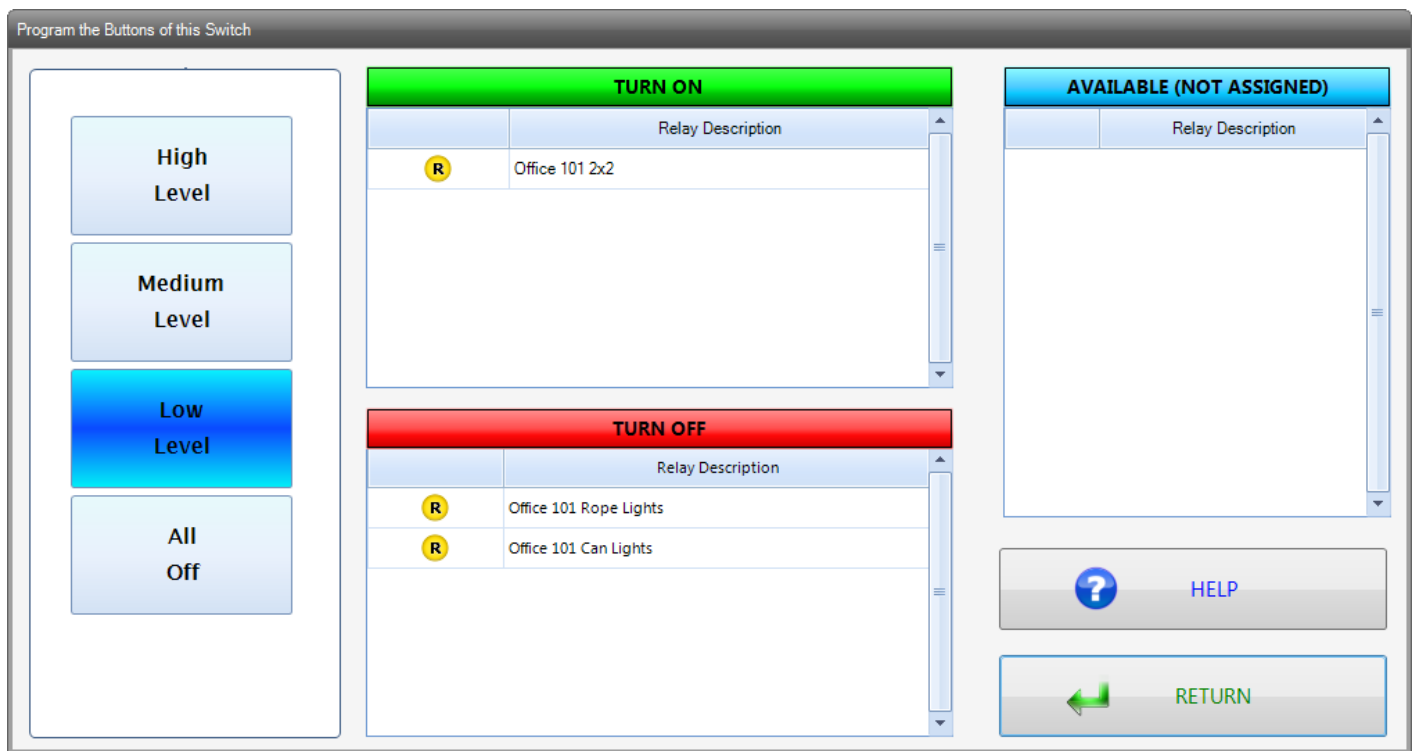


Figure 9: Programming a Touchscreen Switch



**Example 2: Setting up for Daylight Harvesting**

With the advent of LED lighting and the nearly zero-cost adder to implement 0-10V dimming with these light fixtures, daylight harvesting has gained substantial interest. One issue when configuring a system for daylight harvesting has been the complexity of the task. Often the procedures are very laborious and time consuming. Touché has patented a solution that makes the setup for daylight harvesting as simple as pressing a button at the computer. Figure 10 show the software page for configuring a system for daylight harvesting. Similar to the process for calibration of occupancy sensors, Touché allows the user to select the group or groups to be programmed for daylight harvesting. The user then initiates a “profiling” process of the area by selecting the profile button. Like the occupancy sensor calibration procedure, profiling areas for daylight harvesting can be done immediately or at some time specified in the future.

After the area is profiled (a procedure that takes less than five minutes) the system will then automatically control the lights based on the available amount of natural light. Touché’s patented solution automatically determines the range of natural light and the range of artificial light and adjusts the artificial light level with respect to the amount of natural light available. The automatic detection of those ranges is what makes this solution so powerful. Power that only an “intelligent” solution can provide.

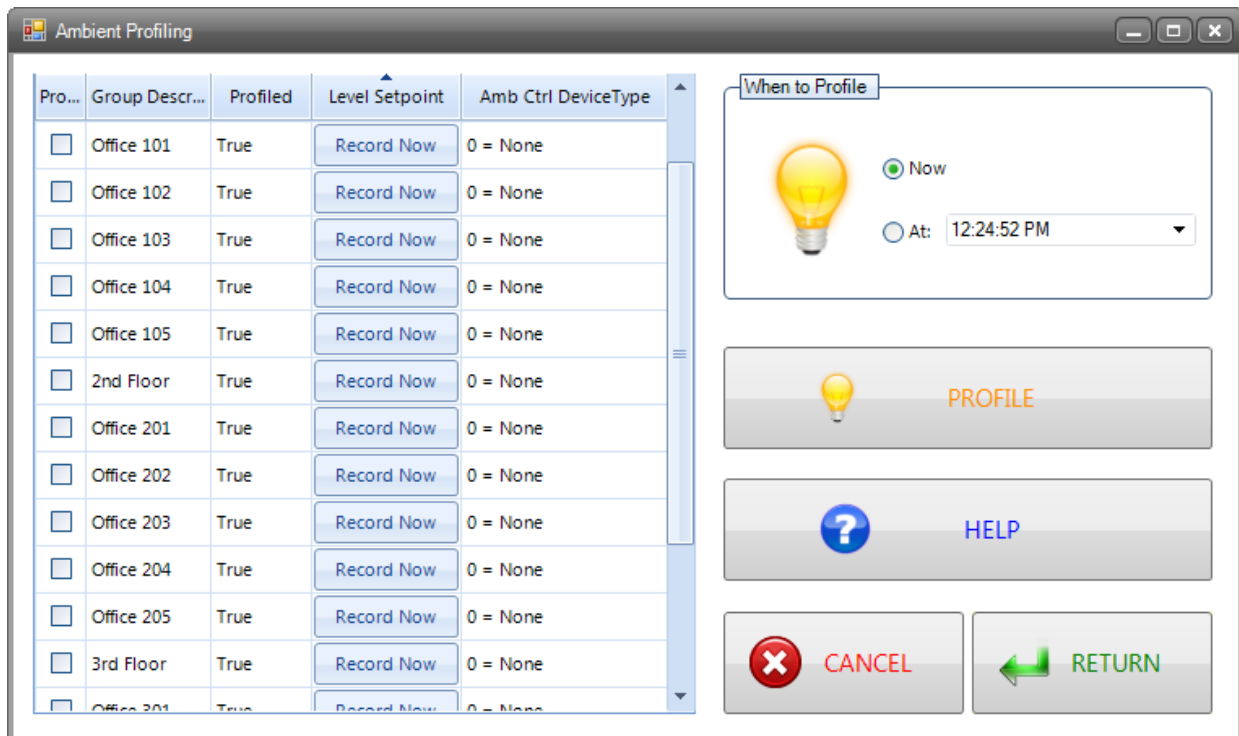


Figure 10: Automating Daylight Harvesting