Application Note

Implement Any Logic Scheme Confidently with Basler Electric Offline Logic Simulator

The National Electrical Reliability Council (NERC) study identified incorrect settings and logic among the top causes of misoperation. With that in mind, Basler Electric developed the Offline Logic Simulator. This feature operates within BESTCOMS*Plus*® and visually replicates how complex logic schemes function within any device supported by BESTCOMS*Plus*. (BESTCOMS*Plus* is the PC software application that serves as a graphical user interface with the latest Basler Electric digital devices. It provides metering, oscillography, settings control, and logic scheme creation and editing.) By using the Offline Logic Simulator, you can be confident that your logic operates as intended. The Offline Logic Simulator resides within BESTCOMS*Plus* and is compatible with the following Basler Electric digital devices: BE1-11 Protection Systems, DECS-150, DECS-250, DECS-250N, DECS-250E, or DECS-450 Digital Excitation Control Systems, DGC-2020, DGC-2020ES, or DGC-2020HD Digital Genset Controllers, and IEM-2020 Industrial Engine Modules. Only Basler Electric coordinates expertise in protection, regulation and excitation with a free software package allowing offline logic simulation.

How it works

By simulating logic schemes prior to implementation, commissioning surprises related to logic scheme problems can be avoided. This "in-the-box" technology allows for testing of a logic scheme without the need for a test set or additional expensive simulation equipment. IEC 61850 GOOSE Messages can also be simulated.

The graphical user interface can be customized to suit a variety of user preferences. Forty-eight preloaded color combinations provide a broad array of color schemes that can be applied. The color of text within a logic scheme is adjustable and custom colors for logic states may be assigned. Logic Gate symbol types can be set as either ANSI or IEC. Simulation speeds can be customized for your viewing preferences, including the added flexibility of scalable timers and counters.

Example: Simple Logic Error

The following example illustrates the troubleshooting of a simple latch with the Offline Logic Simulator. In this example, operation of a correct latch and an incorrect latch is shown. Before starting the Offline Logic Simulator, the logic must be saved by clicking on the Save button. To start logic simulation, click on the Offline Simulator button. The default color schemes, which can be modified as desired, are red for low (logic 0) and green for high (logic 1) logic states. Once the Offline Simulator is started, note the state of the correct latch example. We will test what happens when Input 1 goes high. Output 1 is expected to remain high until the target is reset.
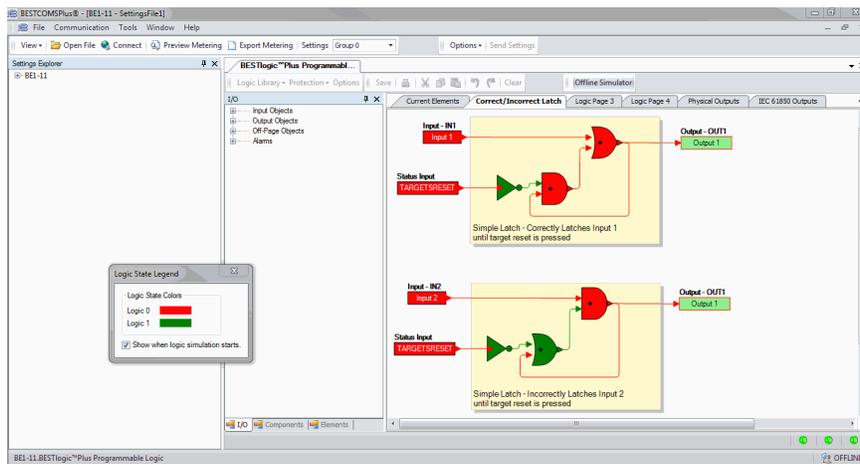
Figure 1 - SImulation Start Screen

We begin the simulation by changing the Input 1 state from low to high. This is accomplished by clicking on the Input 1 logic block, which latches Output 1 high. Everything appears to work as intended.
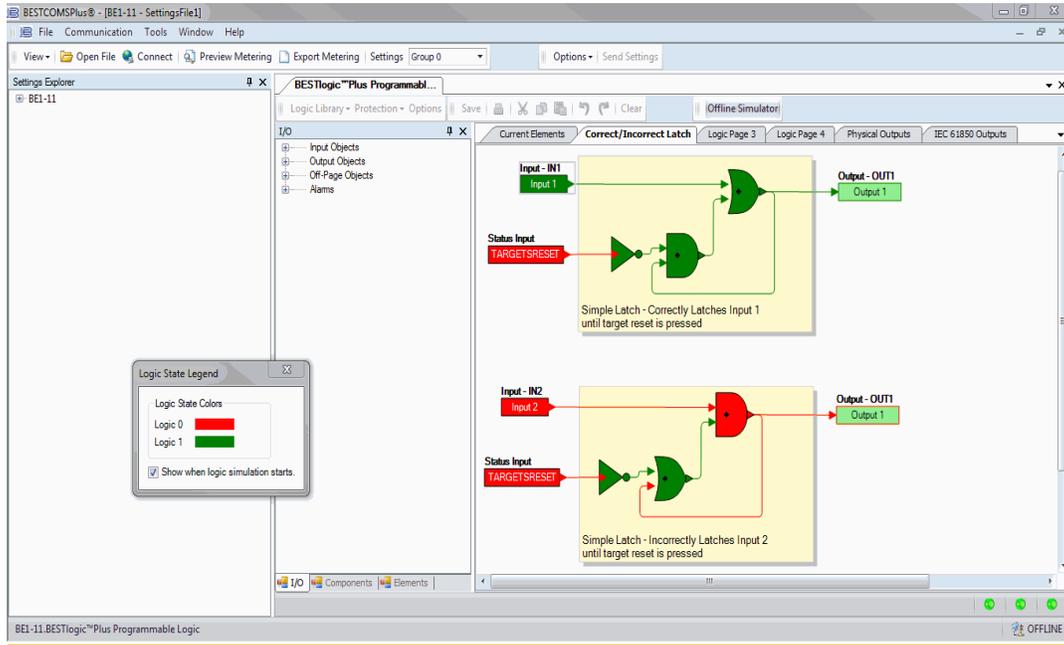
Figure 2 - Change Input 1 from Low to High

We can test the latch by changing the input status from high to low by clicking on the Input 1 logic block. The output is expected to remain in the high, latched position—which it correctly does. This is indicated by the traces and the associated logic gates displayed in green, the color defined for logic 1.
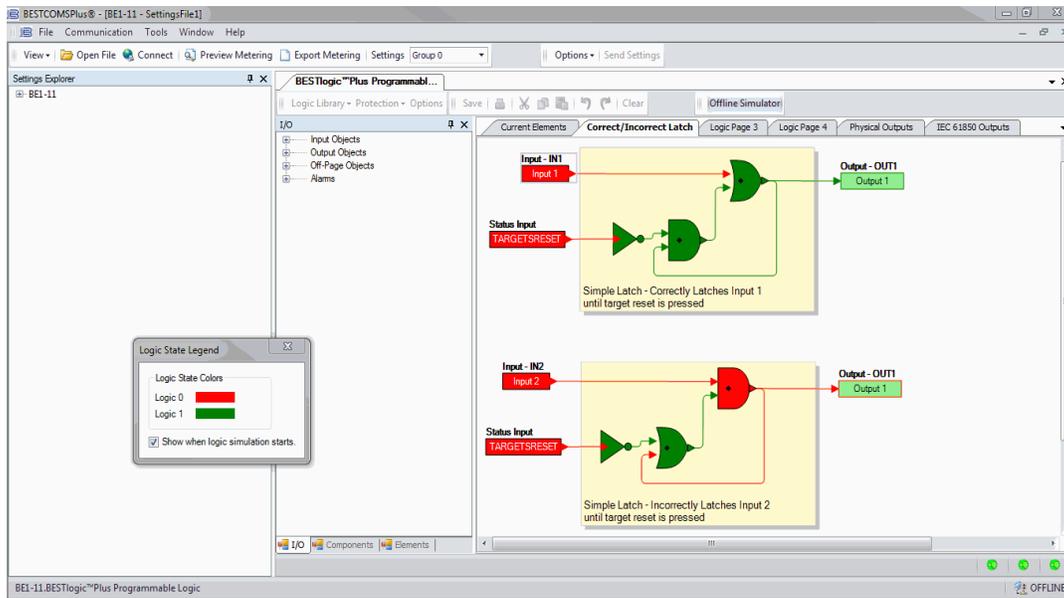
Figure 3 - Change Input 1 from High to Low

BESTlogic™*Plus* has a status input logic block called "Targets Reset" that allows the targets to be cleared. When a target is reset by clicking on the Targets Reset logic block, we can see that the latch is released and the output condition changes from high to low. The latch was correctly released. We know we have a properly functioning latch scheme through the use of the Offline Logic Simulator.
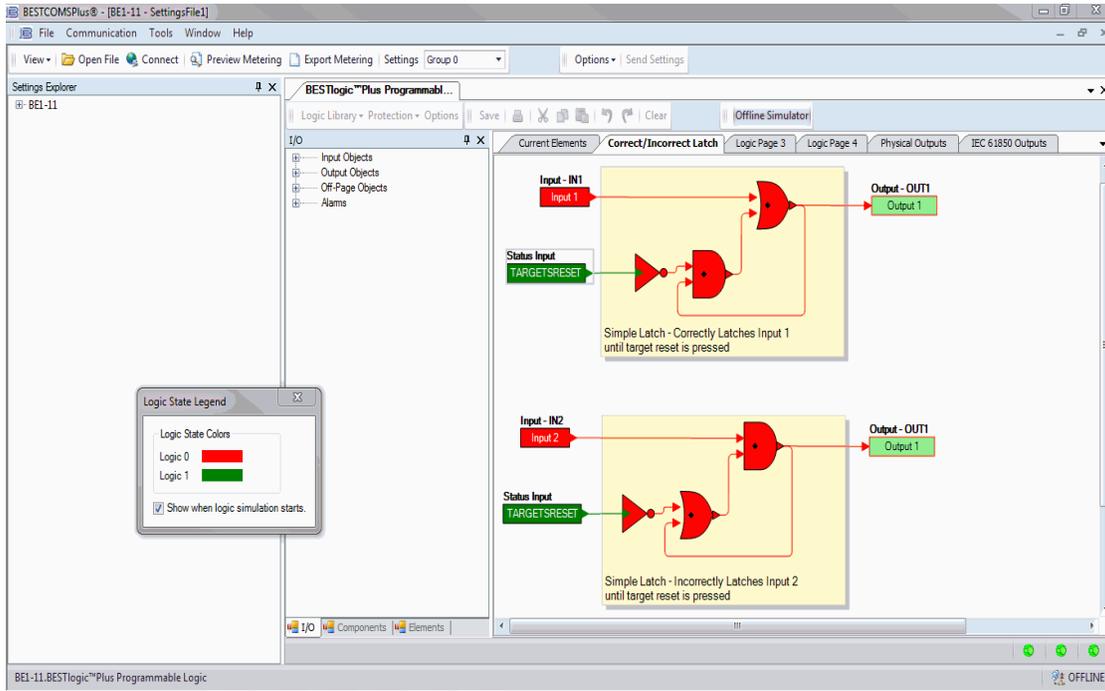
Figure 4 - Confirm Proper Function

Let's look at how incorrect latching logic behaves. In a correct latching scheme, we expect that when Input 2 goes high, Output 1 will stay high until the target is reset. We begin the simulation by changing the Input 2 state from low to high by clicking on the Input 2 logic block, which changes Output 1 to high. Everything appears to be working as intended.
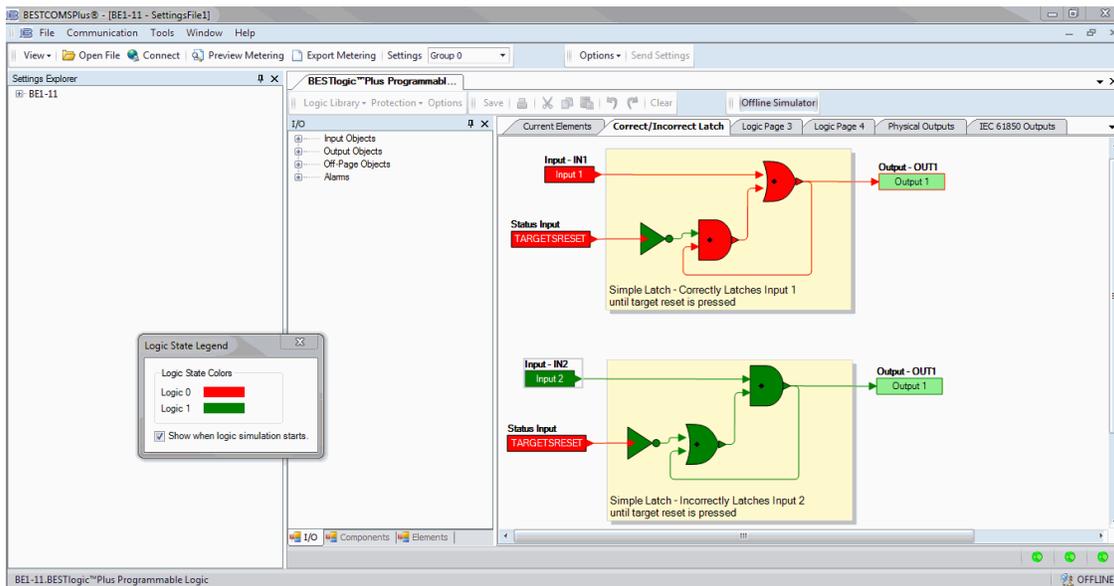
Figure 5 - Incorrect Logic Starting Screen

We can test the latch by changing the input status from high to low by clicking on the Input 2 logic block. We expect the output to remain in the high, latched position. Unexpectedly, the latch does not work. When the input status changed, the output also changed.
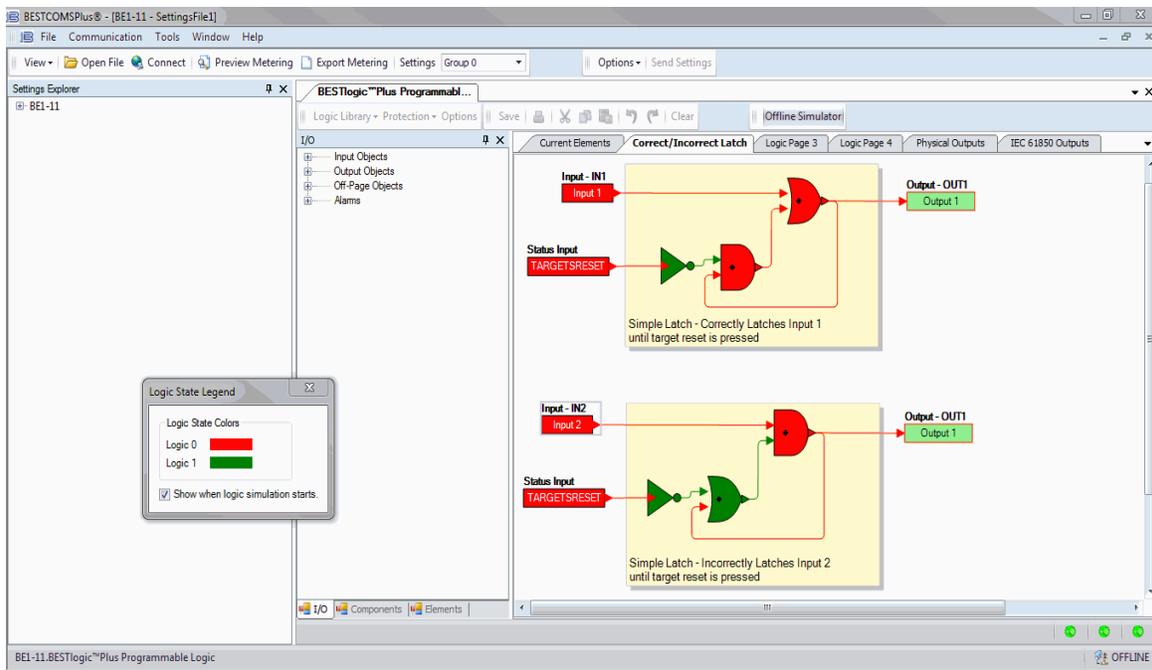
Figure 6 - Confirm Improper Latch Function

Other devices that don't have the ability to troubleshoot logic schemes may miss this flawed logic — with disastrous results. These examples illustrate the benefits of the Offline Logic Simulator by tracing a simple logic error before implementing the logic.

For More Information

For further assistance with product orders or questions about the Offline Logic Simulator, contact Basler Electric Technical Support at +1 618.654.2341.

For additional information on BESTCOMS*Plus* software and all the technologically advanced products, including additional application notes, product bulletins and instruction manuals, go to www.basler.com, contact your Application Engineer, or contact Technical Support at +1 618.654.2341.