

# Application Note

## Application Template and Application Component Instructions

**Setting up a digital relay has never been easier than with BESTCOMSPlus® and the 'add any feature' capabilities of the BEI-FLEX.** A recent national study on electrical reliability has shown that the majority of numeric relay misoperations are caused by incorrect settings and design errors. BESTCOMSPlus combats the issue by filtering based upon required and advanced settings, showing only used functions and providing summary and graphical screens through the configuration – minimizing errors and time spent creating settings files. Although BESTCOMSPlus files can be created and customized, the purpose of this guide is to assist you in using Basler Electric preconfigured application templates.

### Purpose

Application Template and Application Component descriptions are described at the top of the first logic tab for each template. Additional functions are included throughout the logic settings. The logic is available in PDF format from the template download in addition to on the logic settings pages themselves. System one-lines are included with the download for most templates.

Application Templates provide protection settings templates for the full system. At a minimum, pickup values must be set to enable functions. Additional changes can be made to templates as needed and described below.

Application Components are a subset of a full application template and only show a specific purpose or function. Components can be utilized alone, but are commonly utilized as part of a larger multifunction solution. Application Components are only available in PDF format for recreation into larger protection, automation, and control schemes. Functions, inputs, outputs, and other instances will normally need to be edited to match available hardware when part of a larger design.

The Generator – Basic High Impedance Grounded logic scheme is shown in Figure 1 and the one-line is shown in Figure 2 as an example. All templates can be downloaded from [www.basler.com](http://www.basler.com).

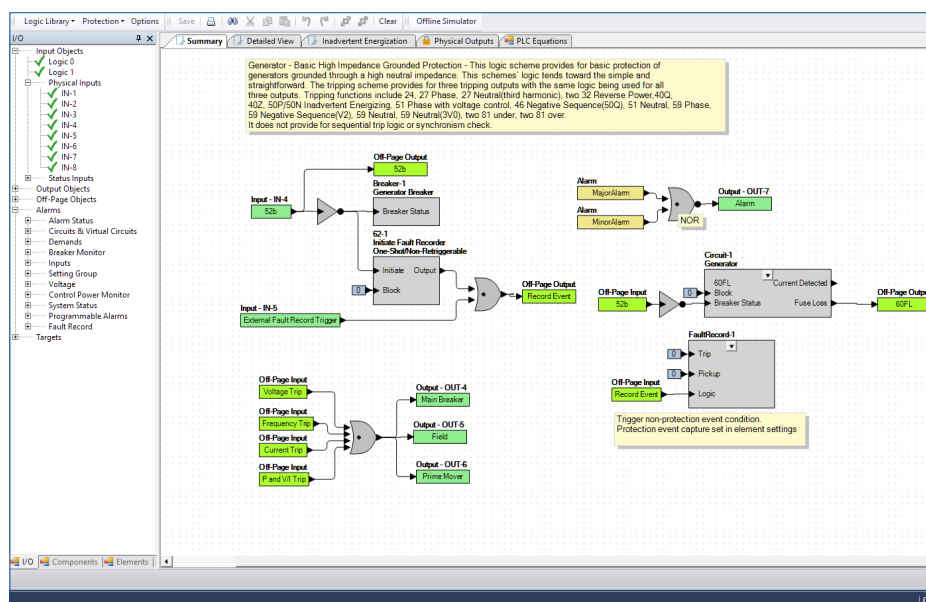


Figure 1 - Generator - Basic High Impedance Grounded Logic



## Utilizing Application Components

Application Components assume a general system settings file has already been created and saved.

**Step 1.** Launch BESTCOMSP<sub>Plus</sub> and click on the File pull-down menu at the top left-hand corner of the window.

**Step 2.** Select Open and select the original settings file as shown in Figure 3.

**Step 3.** Open/view the Application Component Logic document.

Follow the Application Template steps below as a guide and add instances of each item as needed for the application component. For example, Inadvertent Energization will add a Frequency (81), Undervoltage (27), Overvoltage (59), and Logic Timer (62). Add logic as shown and save/upload.

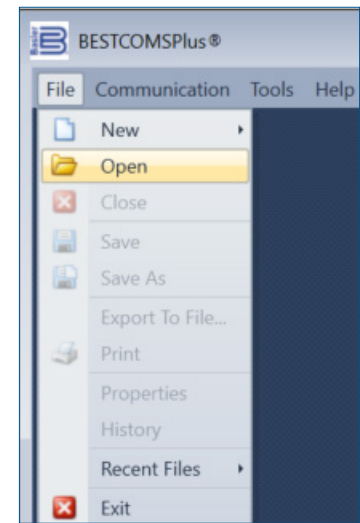
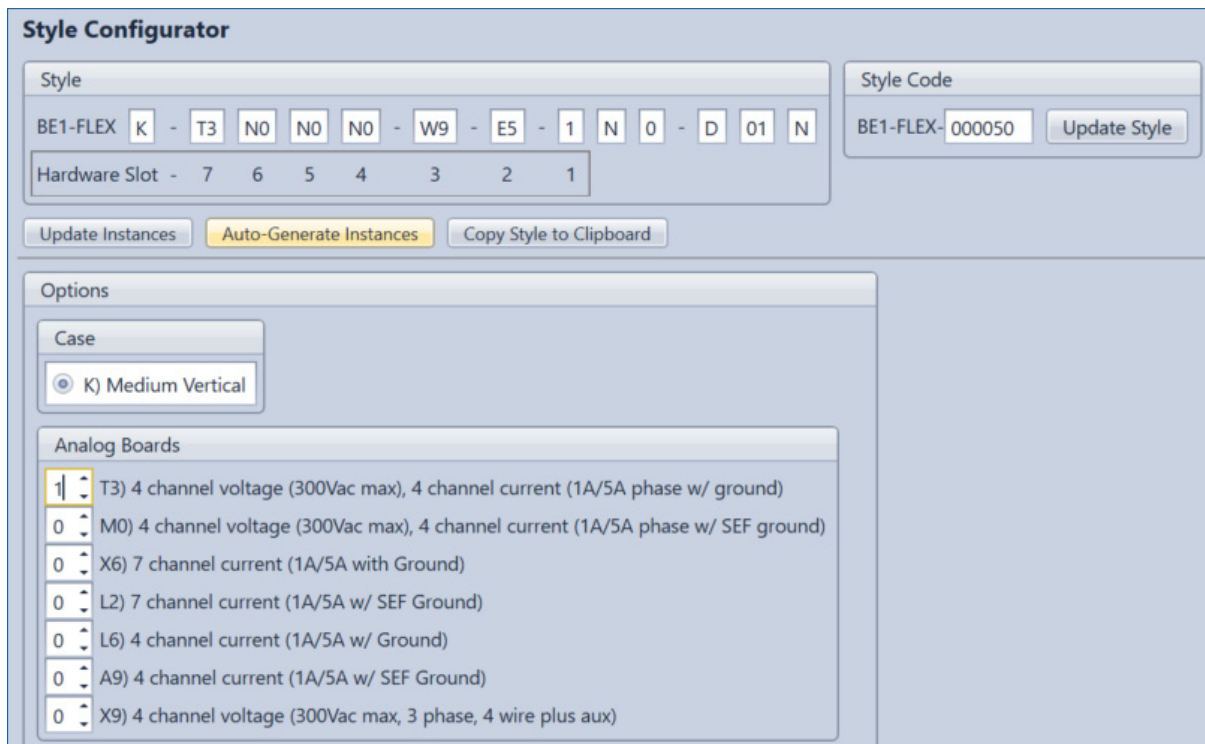


Figure 3 - Opening a File in BESTCOMSP<sub>Plus</sub>

## Style Configurator

View the style configuration applicable for the application template. Changes can be made to match available hardware. If any changes are made, click Update Instances to make the newly created features available. Using the auto-generating instances can cause instance mapping to change and should only be used with templates when acknowledging the changes that are being made. The Style Configurator screen is shown in Figure 4.


 A screenshot of the 'Style Configurator' window. It features a 'Style' section with a sequence of input fields containing 'BE1-FLEX', 'K', '-', 'T3', 'N0', 'N0', 'N0', '-', 'W9', '-', 'E5', '-', '1', 'N', '0', '-', 'D', '01', 'N'. Below this is a 'Hardware Slot' section with a row of seven input fields containing '7', '6', '5', '4', '3', '2', '1'. To the right is a 'Style Code' section with a text field containing 'BE1-FLEX-000050' and an 'Update Style' button. Below these are three buttons: 'Update Instances', 'Auto-Generate Instances', and 'Copy Style to Clipboard'. The 'Options' section is expanded, showing 'Case' with a radio button selected for 'K) Medium Vertical'. Below that is the 'Analog Boards' section, which contains a list of boards with their respective channel counts and specifications. The first board, 'T3', is highlighted with a yellow background.
 

| Board | Description                                                                       |
|-------|-----------------------------------------------------------------------------------|
| 1     | T3) 4 channel voltage (300Vac max), 4 channel current (1A/5A phase w/ ground)     |
| 0     | M0) 4 channel voltage (300Vac max), 4 channel current (1A/5A phase w/ SEF ground) |
| 0     | X6) 7 channel current (1A/5A with Ground)                                         |
| 0     | L2) 7 channel current (1A/5A w/ SEF Ground)                                       |
| 0     | L6) 4 channel current (1A/5A w/ Ground)                                           |
| 0     | A9) 4 channel current (1A/5A w/ SEF Ground)                                       |
| 0     | X9) 4 channel voltage (300Vac max, 3 phase, 4 wire plus aux)                      |

Figure 4 - Style Configurator Screen

## Hardware Configuration

Contact sensing inputs are versatile and accept any wetting voltage based upon Hardware Info settings. The default setting is 120/125 Vac/Vdc. If other wetting voltage is being used, change the Sensing Level setting per board from the Hardware Configuration, Hardware Info (per slot) screens. See Figure 5.

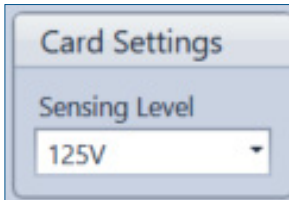


Figure 5 - Input-Sensing Voltage

## Circuit, Breaker, Input and Output Summary

Summary views in the Configuration menu display mapping of hardware to device configuration. Templates have already been automatically configured based upon the configured style of the template. The Circuit Configuration screen is shown in Figure 6.

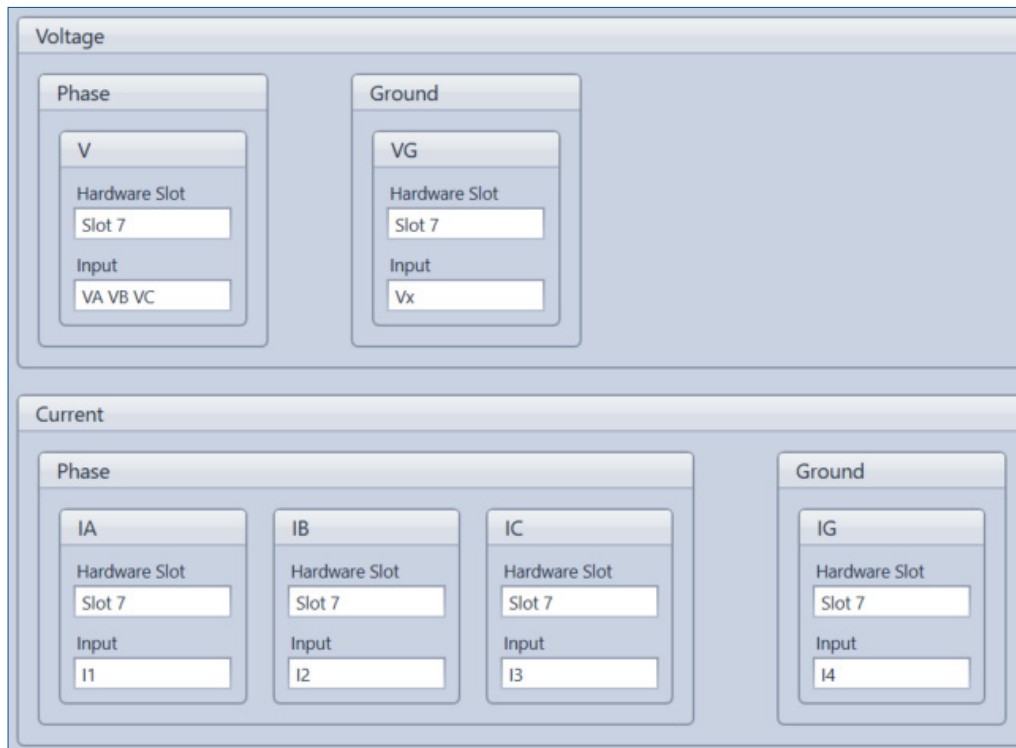


Figure 6 - Circuit Configuration Screen

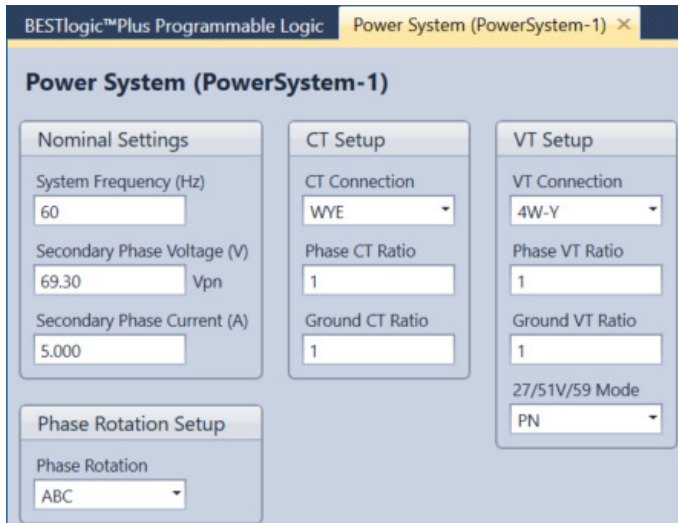
## Power System Configuration

The Configuration, Circuit Summary, Circuit 1, Power System screen (Figure 7) displays information on your system that the relay uses to perform internal calculations. Starting under Nominal Settings, enter the system frequency, nominal secondary voltage in terms of PN quantities, and nominal secondary current (this is the secondary rating of your CT). The ground voltage input should be set up similarly as it is used for detection of zero and negative-sequence overvoltage. The phase rotation of the system is crucial. A reverse setting will

cause the relay to calculate erroneous negative-sequence current and possibly misoperate.

CT and VT Setup Ratios contain settings used to calculate primary voltage and current from the sensed secondary values. These settings are important for accurate primary metering and pickup values set in terms of primary quantities. Enter the turns ratio for the phase and ground CTs. For example, if your CT is 1200:5, the setting would be  $1200/5=240$ . If there is no ground CT in your system, this setting can be left unchanged.

Follow the same process for the phase VT setup making sure to specify the type of transformer connection (4W-Y, 3W, PN, or PP). The Ground VT ratio and connection type settings should be specified similarly. When using a 4W-Y connection, the relay can operate on PN or PP sensed voltage for the 27 and 59 element. Select the units you wish to use under the 27/59 and 27R Mode settings. Repeat for additional circuits as needed.



**Power System (PowerSystem-1)**

| Nominal Settings                              | CT Setup             | VT Setup              |
|-----------------------------------------------|----------------------|-----------------------|
| System Frequency (Hz)<br>60                   | CT Connection<br>WYE | VT Connection<br>4W-Y |
| Secondary Phase Voltage (V)<br>69.30 Vpn      | Phase CT Ratio<br>1  | Phase VT Ratio<br>1   |
| Secondary Phase Current (A)<br>5.000          | Ground CT Ratio<br>1 | Ground VT Ratio<br>1  |
| Phase Rotation Setup<br>Phase Rotation<br>ABC |                      | 27/51V/59 Mode<br>PN  |

Figure 7 - Power System Settings Screen

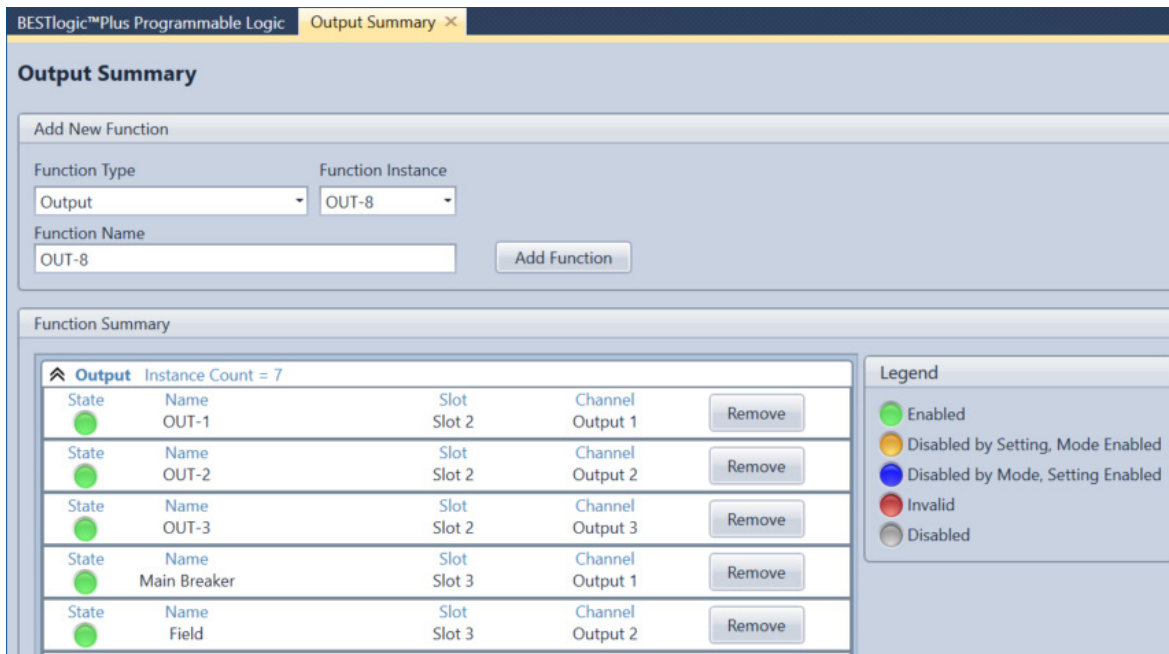
## Contact Input(s) and Output(s)

If desired, edit the Contact Input and Outputs settings from the Input Summary and Output Summary screens. These screens allow you to customize the physical alarms and contact I/O with labels and energized state labels.

Each input has a contact recognition and debounce setting. The default contact recognition and debounce settings enable their use on ac signals as well as dc signals.

The hold attribute serves several purposes for contact outputs. The main use for the BEI-FLEX is to prevent the relay contact from dropping out until the current has been interrupted by the 52a contacts in series with the trip coil. If the tripping contact opens before the dc current is interrupted, the contact might be damaged.

Labeling of the output contacts is not required but it is useful for categorizing outputs as the settings file is created and for later analyzing relay operations. The Output Summary screen is shown in Figure 8.



**Output Summary**

Add New Function

Function Type: Output Function Instance: OUT-8

Function Name: OUT-8 Add Function

Function Summary

| State   | Name         | Slot   | Channel  | Remove |
|---------|--------------|--------|----------|--------|
| Enabled | OUT-1        | Slot 2 | Output 1 | Remove |
| Enabled | OUT-2        | Slot 2 | Output 2 | Remove |
| Enabled | OUT-3        | Slot 2 | Output 3 | Remove |
| Enabled | Main Breaker | Slot 3 | Output 1 | Remove |
| Enabled | Field        | Slot 3 | Output 2 | Remove |

Legend

- Enabled
- Disabled by Setting, Mode Enabled
- Disabled by Mode, Setting Enabled
- Invalid
- Disabled

Figure 8 - Output Summary Screen

## Accessing Device Info

Select the Device Info from the Device Information folder. The Device Info screen contains information about the embedded software in the connected BEI-FLEX relay when communicating. If you are not connected to a relay, this should be mostly blank. It will populate information automatically when settings are downloaded from a relay. Device, station, and user IDs also can be specified here.

## Protection

All enabled protective functions in the template can be viewed by clicking Protection from the settings menu. Clicking the State bubble from the list will jump to each function.

By default, all protection elements are disabled by pickup setting equal to zero. For each function desired, enable it by entering in your pickups, time dial, reset dial, and so on.

Download the BEI-FLEX Instruction manual and the Application Guides from [www.basler.com](http://www.basler.com) for further details on each element's function.

Click on Protection once all functions are set as intended. Verify that each desired is enabled by a green status indicator. The Protection Summary screen is shown in Figure 9.

## Control

Similar to Protection, not all functions in the template are valid by default settings. Click Control from the settings menu to view each control function in the template. Clicking the State bubble from the list will jump to each function.

NOTE: Some control functions will appear green from the Summary screen with default settings, as they are invalid settings. However, they may be invalid for the application.

Download the BEI-FLEX Instruction Manual and the Application Guides from [www.basler.com](http://www.basler.com) for further details on each element's function.

Click on Control once all functions are set as intended. Verify that each desired function is enabled by a green status indicator. The Control Summary screen is shown in Figure 10.

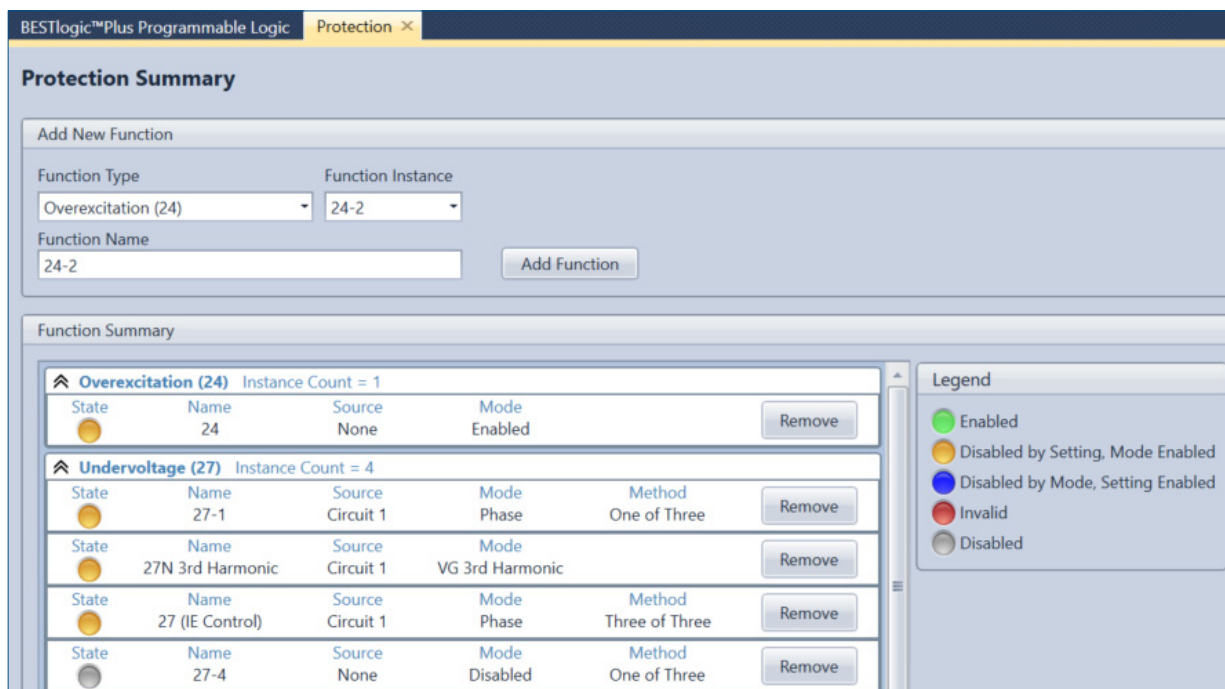


Figure 9 - Protection Summary Screen

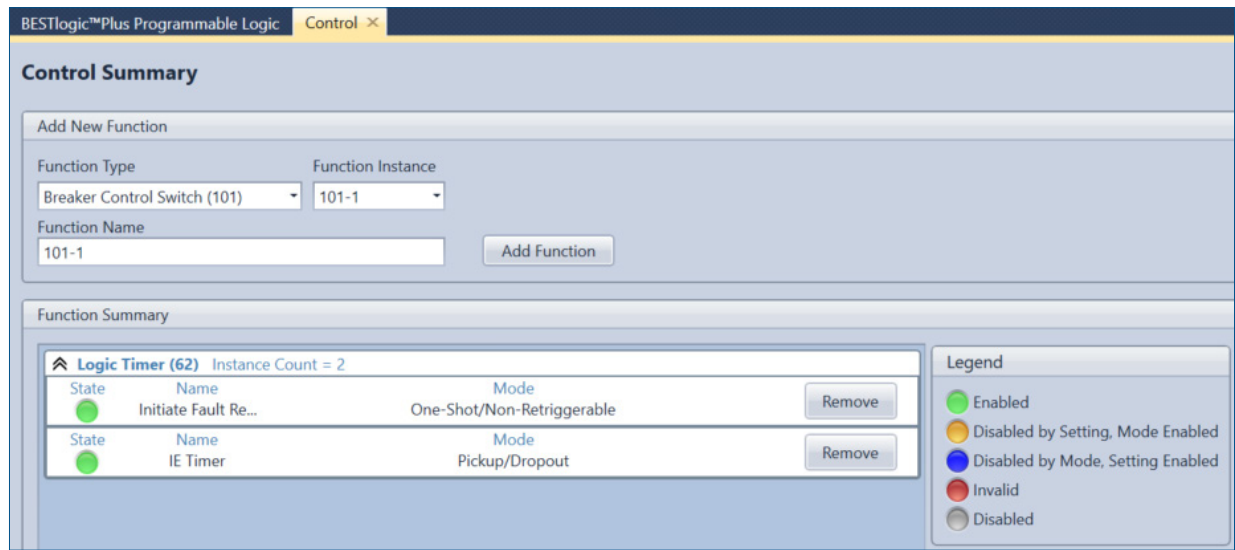


Figure 10 - Control Summary Screen

## BESTlogicPlus™

BESTlogicPlus is a powerful logic editor used to customize relay operation and internally route trip signals and other virtual I/O into physical I/O. Notable features in the logic editor include being able to conditionally enable or disable protective elements and trigger oscillographic records.

The BESTlogicPlus working environment is nested within BESTCOMSPlus and follows the same tabbed interface. Each tab is a new page to organize and build logic. To the left of the logic pages is a toolbox containing all status inputs, physical I/O, logic gates, and elements.

Items in the toolbox can be dragged and dropped onto any logic page. Logical I/O is conveyed between pages using custom-labeled off-page inputs and outputs.

The BESTlogicPlus Programmable Logic screen is shown in Figure 11.

Application Template logic is now complete. No changes are necessary to use it if the device has not been reconfigured. Reviewing it is recommended as it provides useful detail on the operation and purpose of the logic.

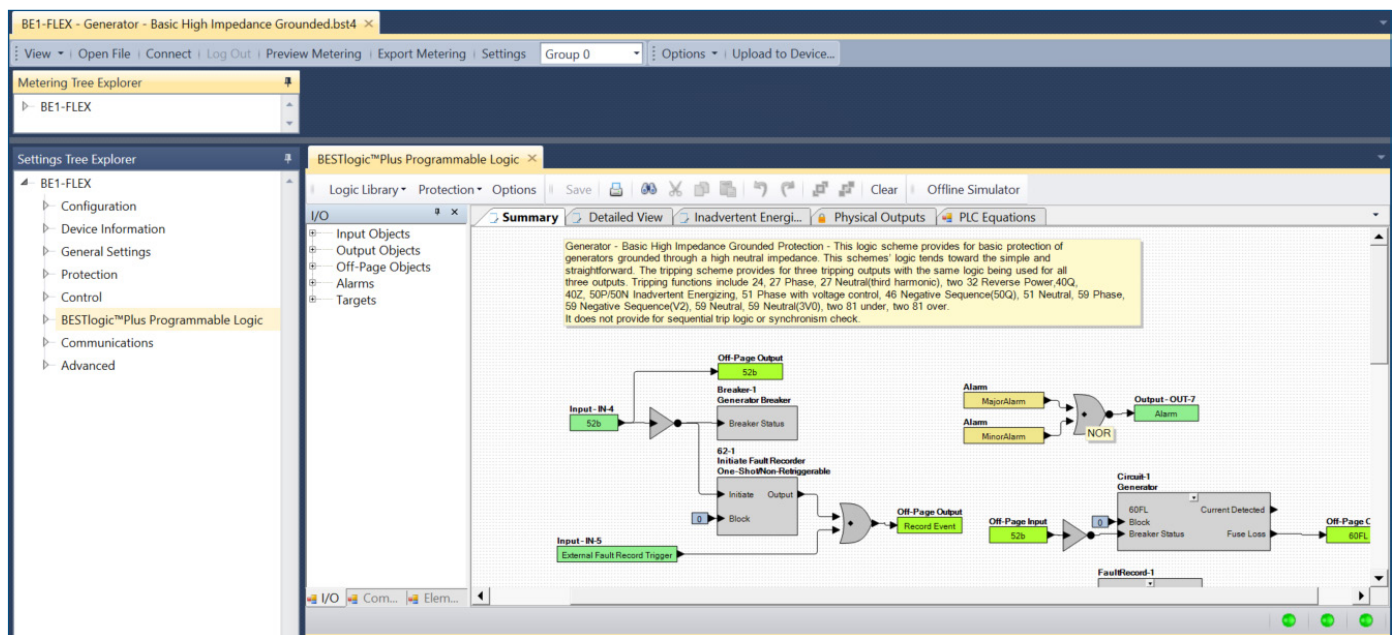


Figure 11 - BESTlogicPlus Programmable Logic

To use the logic scheme, click the Save button shown in Figure 12 so that it is saved to the settings file. Before saving, a healthy logic scheme will have three indicators at the bottom right-hand corner of the window. A yellow and two greens indicate that there are no errors in the scheme and it can be saved. Saving the logic will result in three green indicators.

## Save and Upload

To save the edited template, save the entire settings file by clicking on the File pull-down menu at the top left-hand corner of the BESTCOMSP/plus and select Save or Save As. See Figure 12.

Connect to a device from the Icon bar and Upload settings from the Communication pull-down menu if desired. See Figure 13.

## For More Information

To get more information on BESTCOMSP/plus and the BEI- FLEX product line, including the product bulletin, instruction manual, and additional application notes, visit [www.basler.com](http://www.basler.com) or contact Technical Support at 618-654- 2341.

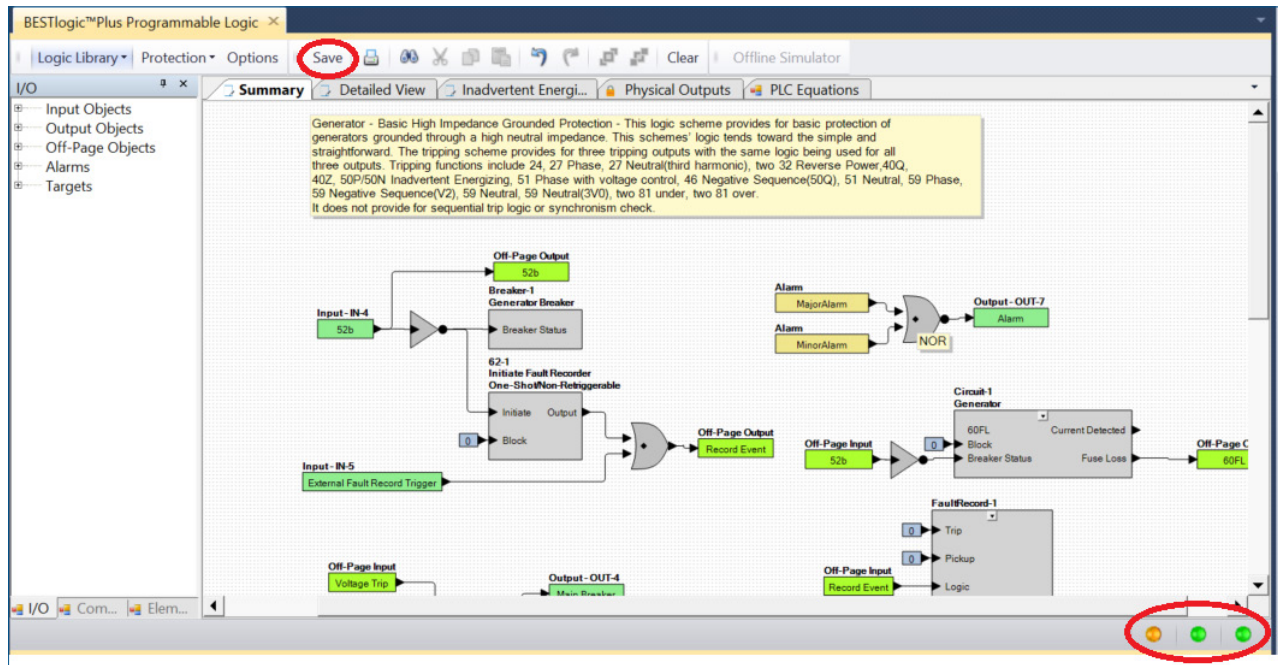


Figure 12 - Saving a Settings File with a Functional Logic Scheme

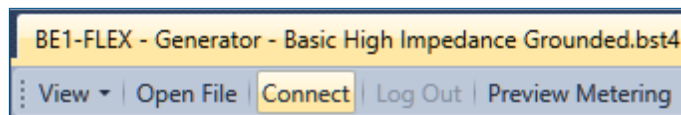


Figure 13 - Connect Button on Icon Bar