

# Application Note

## BESTCOMSPPlus® Series – BE1-11 Step-By-Step Guide to Using BESTCOMSPPlus®, BESTspace™, and Preprogrammed Logic Schemes: *Basic Overcurrent Protection*

**Setting up a numeric relay has never been easier than with the BESTCOMSPPlus BESTspace feature.** A recent national study on electrical reliability has shown that the majority of numeric relay misoperations are caused by incorrect settings/design error. BESTspace combats the issue by clearly identifying relevant settings and adapting to your specific application - minimizing errors and time spent creating settings files. Although BESTspace files can be created and customized, the purpose of this guide is to assist you in using Basler Electric preconfigured BESTspace and preprogrammed logic files.

### Basic Overcurrent Protection

This guide is a walkthrough of the *Basic Overcurrent Protection* BESTspace and logic scheme. The logic scheme provides protection for the system represented by the one line diagram shown in Figure 1. The logic scheme contains three instantaneous and three time overcurrent elements, while unneeded elements can be disabled without changing the logic. Included protective elements are phase, neutral, and negative-sequence overcurrent protection. Functions such as breaker failure, virtual breaker control, automatic reclosing,

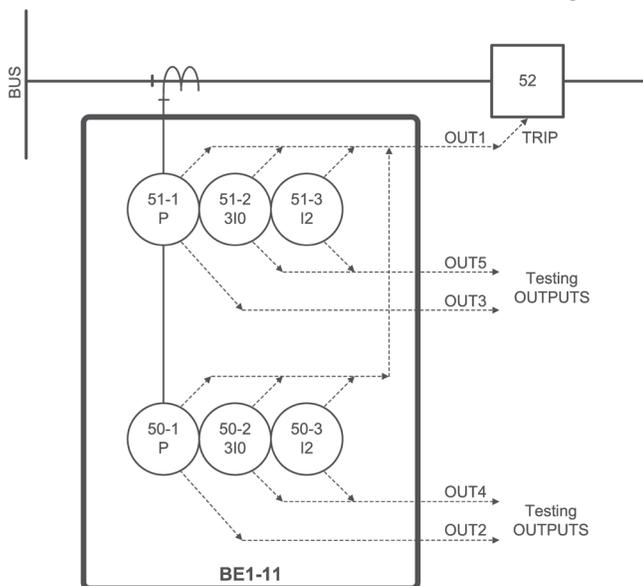


Figure 1 - One-Line Diagram of Basic Overcurrent Protection

and protective voltage features are not enabled in this scheme, however, these features may be added through BESTlogic™Plus.

Recently, the BESTspace feature was added to BESTCOMSPPlus. Opening a BESTspace automatically formats the BESTCOMSPPlus environment to support specific activities. BESTspace files do not add or alter actual settings. The BESTspace discussed in this document is specially designed to work with the *Basic Overcurrent Protection* logic scheme developed by Basler.

### Opening the BESTspace File

BESTCOMSPPlus refers to the software suite used to program BEI-11 relays. The BESTspace feature is only compatible with BESTCOMSPPlus v 2.11.01 or greater.

If not already installed on your computer, it is easy to download the latest version at [www.basler.com](http://www.basler.com). BESTCOMSPPlus requires an activation key for use without an active BEI-11 connection. Please email request for activation to [info@basler.com](mailto:info@basler.com).

The BESTspace file can be downloaded from [www.basler.com/Product/BEI-11-Logic-Schemes](http://www.basler.com/Product/BEI-11-Logic-Schemes).

To begin, launch BESTCOMSPPlus and click on the 'File' dropdown menu at the top left-hand corner of the window. Select to open a new BEI-11 file as shown in Figure 2.

BESTCOMSPPlus will then open a default settings file. To open the BESTspace, click on 'View' directly below 'File' and select to open a new BESTspace as shown in Figure 3.

Based Figure 4, click 'Load' in the Load/Save Window BESTspace File window and browse to BESTspace file 'BasicOvercurrentProtection.bswx'. Click 'Apply' to open the BESTspace.

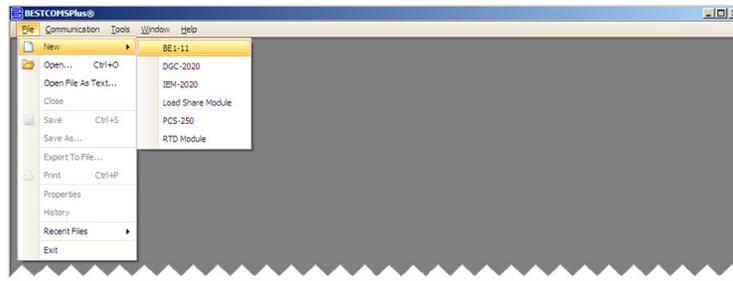


Figure 2 - Opening a File in BESTCOMSPlus

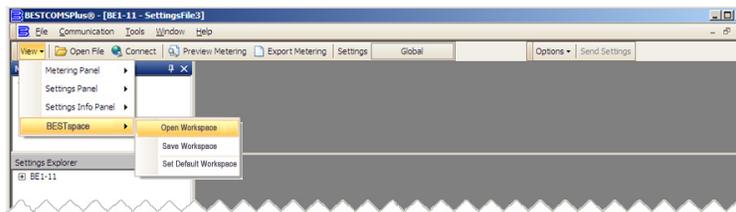


Figure 3 - Opening a New BESTspace File in BESTCOMSPlus

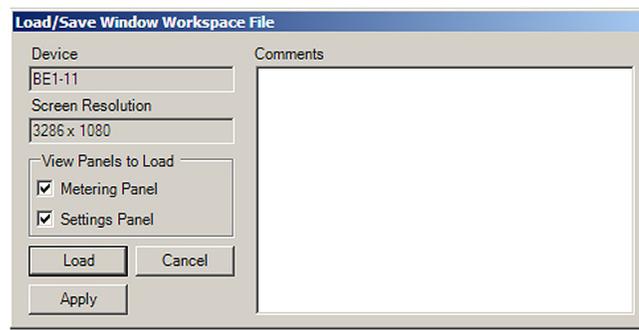


Figure 4 - Loading a BESTspace File

## Establishing the Style Number

Figure 5 demonstrates how the BESTspace formats the working environment with the Style Number screen on top. The environment is tab-based, with tabs aligned across the top of the screen. Check the relay front faceplate for the style number and enter it on the style number screen using the dropdown selection boxes. The right-hand bottom portion of the viewable area contains settings information such as settings ranges and units. It can be closed at any time to increase viewing area. Tabs can be closed by clicking on the 'x' to the right of the right-most tab. Doing this will close the active tab. Close the style number screen when finished. Successive tabs should be closed once you are finished, except where noted.

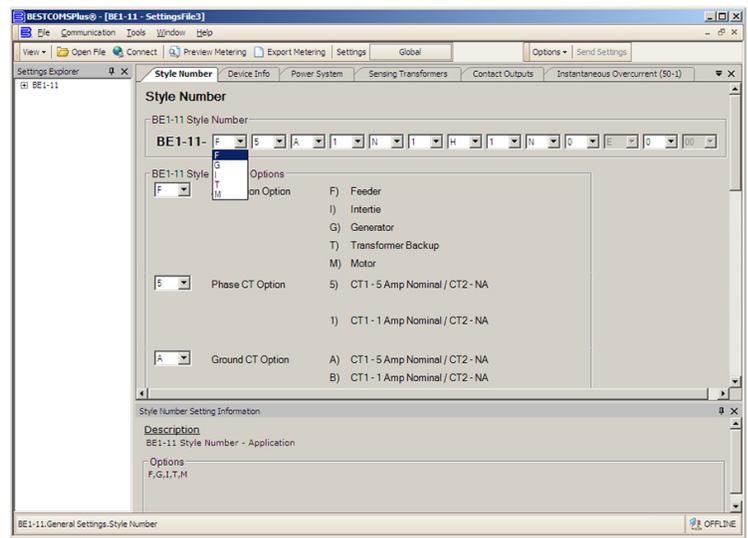


Figure 5 - The Style Number screen is on top when starting a BESTspace file

## Accessing Device Info

Closing the style number screen causes the next tab to the right, "Device Info", to activate. The Device Info screen contains information about the embedded software in the connected BE1-11 relay. 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.

## Power System

The Power System screen contains information about 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). For a basic overcurrent application, the auxiliary voltage input is not typically used, so this setting is left as-is. The phase rotation of the system is crucial. A reverse setting will cause the relay to calculate erroneous negative-sequence current and possibly misoperate.

Although the power line parameters are useful, they are not necessary if the information is not available. MTA is necessary only if you plan to specify a directional overcurrent element. Additional details on the power line parameter and MTA settings can be found in the BE1-11 instruction manual.

## Sensing Transformers

The Sensing Transformers screen contains 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 auxiliary VT ratio and connection type is not necessary for a typical overcurrent application. When using a 4W-Y connection, the relay can operate on PN or PP sensed voltage for the 27 and 59 element. Since no voltage elements are to be used, this setting also can be left unchanged.

## Contact Outputs

Closing the previous screen will pull up the Contact Outputs screen. This screen allows you to customize the physical alarms and contact outputs with a label, energized state labels, and the hold attribute. All customized labels will appear on the BE1-11 LCD screen. The hold attribute serves several purposes. One of the main reasons 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.

## Instantaneous Overcurrent (50-1, 50-2, 50-3)

The next three tabs are Instantaneous Overcurrent (50-1), (50-2), and (50-3). By default, all protection elements are disabled. There are several modes of operation for all overcurrent elements on the BE1-11:

1.  $I_A, I_B, I_C$  operates only on the selected phase of current.
2. 3 Phase will monitor all three phases and operate on any one of them.
3.  $3I_0$  operates on the calculated zero sequence current (calculated 50G).
4.  $I_2$  operates on the calculated negative sequence current (46).
5.  $I_G$  operates on the ground CT input only (50G).
6.  $I_1$  operates on the calculated positive sequence current.
7. Unbalance operates on calculated unbalanced current.

The *Basic Overcurrent Protection* logic scheme is set up for 50 and 51 elements; one each for phase, negative sequence, and ground overcurrent protection. Additional elements can be added as needed. Enter the secondary current pickup and intentional time delay (If no intentional time delay is desired, leave at 0.). Choose the directionality of the element. If three instantaneous overcurrent elements are not needed, they can be left disabled as you continue to the next tabs.

## Inverse Overcurrent (51-1, 51-2, 51-3)

The inverse overcurrent elements have the same mode selections as the instantaneous elements. The element screen contains a setting for pickup, time dial, curve, direction, and reset timing. There are many curves to choose from; however, if these curves do not fit your needs, you can either program your own custom curve using the IEEE C37.112 equation or construct one of up to 40 custom points using a table curve. The table curve feature adds points to the curve and uses a point and click interface to move points around once they are inserted. Configuring a table curve is done on a separate screen under protection > current.

Be sure to set the directionality and reset type. An integrating reset mimics the behavior of an electromechanical reset. Both the inverse timing curve and the reset time can be viewed by changing the selection below the graph.

## Current/Protection Summary

The current protection summary and the more comprehensive protection summary screens are ways of viewing all elements that are enabled and the modes of operation. If elements are disabled when you believe they should be enabled, it will appear on these screens. Each element will have a status color to the right and the mode of operation to the left. Green status indicates that the element is enabled, yellow indicates the setting is disabled by a setting other than the mode (i.e. the element has an invalid setting such as a pickup of 0.000 amps), blue indicates the setting is disabled by only the mode setting, and gray indicates the element has both an invalid setting and disabled mode.

It is a good practice to leave these screens open and double check the protection elements you have set up once you are finished.

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## BESTlogic™Plus

BESTlogicPlus is a powerful tool used to internally route trip signals and other virtual I/O based on system status to physical I/O. Elements can be conditionally enabled or disabled in the logic scheme, such as breaker position. Other important features contained in BESTlogicPlus are

the ability to trigger oscillographic records and configure switchable settings groups.

Preprogrammed logic schemes make it easy to import a file for common applications. To download logic files, visit [www.basler.com/Product/BEI-11-Logic-Schemes](http://www.basler.com/Product/BEI-11-Logic-Schemes) and download the logic scheme 'Basic Overcurrent Logic'.

To import a logic file, click on the 'Logic Library' dropdown menu as shown in Figure 6. Find and open 'BasicOvercurrentProtection.bslx' to import the file.

The BESTlogicPlus working environment is nested within BESTCOMSPPlus 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, physical I/O, logic gates, and elements. Items in the toolbox can be dragged and dropped onto any logic page. Logical I/O are conveyed among pages using custom labeled off-page inputs and outputs.

Preprogrammed logic is complete as downloaded. No changes are necessary to use it. Reviewing it is recommended as it provides useful detail on the operation and purpose of the logic. Below are the tabs that are available:

- *Input/Output* - You will find a brief description of the logic scheme on this page. Additionally you will find each physical output assignment with a description of its intended purpose.
- *Current* - This tab shows the overcurrent elements. Logic elements can be blocked by asserting logic 1 at the 'Block' input. For example, it is useful to toggle the block input to avoid nuisance tripping with an open breaker. Logic elements generate 'Pickup' and 'Trip' signals that are used elsewhere in the logic scheme via off-page outputs to generate physical trips and oscillography.
- *Misc. Logic* - The Misc. tab shows the consolidation of the element off-page outputs using OR gates and two more off-page outputs, 'Trip Bus' and 'Pickup Bus'. It is useful to have a consolidated bit for triggering oscillography and for having a single trip output.

To use the logic scheme, click on the 'Save' button shown in Figure 7 so that it is saved to the settings file. Before saving, a functional 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.

To finish, save the entire settings file by clicking on 'File' at the top left-hand corner of the BESTCOMSPPlus window and select 'Save' or 'Save As...' from the dropdown menu.

## For More Information

To get more information on BESTCOMSP/plus and the BEI-11 product line, including additional application notes, product bulletins, and instruction manuals, go to [www.basler.com](http://www.basler.com) or contact Technical Support at 618-654-2341.

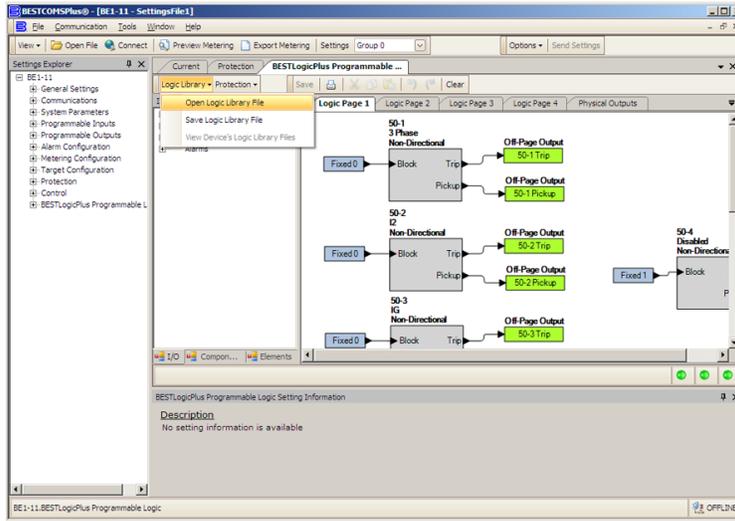


Figure 6 - Working with the Logic Library

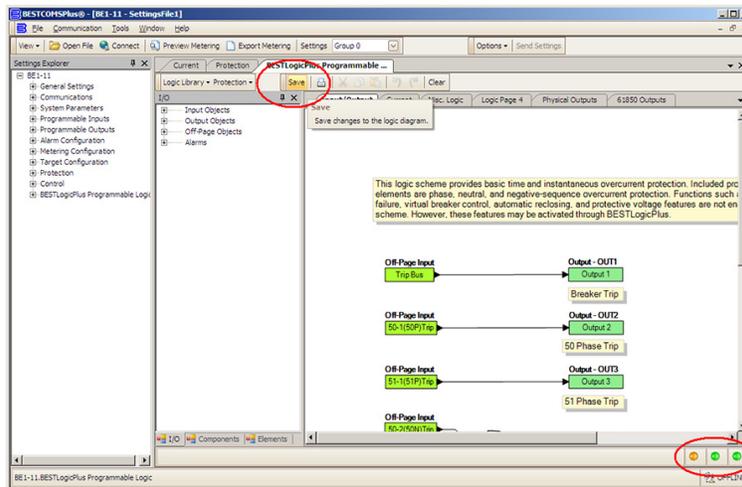


Figure 7 - Saving a Settings File with a Functional Logic Scheme