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Application Note

BE1-11*d* - DC Power Protection System

Basler Electric has provided the Electricity market with solutions for more than 75 years. Our history has included a wide variety of products for both ac and dc applications. In 1959, Basler Electric introduced its first solid-state voltage regulator. In the 1960's, we introduced our first solid-state protective relays. In addition, in the 1970's, we developed our first static dc excitation systems for controlling large-scale electric power generators. All of these developments, and developments since, have been designed and supported out of Highland, IL and manufactured in the USA.

The BE1-11*d* DC Power Protection System is a consolidation of our expertise in dc excitation systems and ac utility grade protective relays. It utilizes the signal monitoring and algorithms of our dc experience with the core manufacturing and capabilities of high performance protective relaying. The result is a solution applicable for almost any dc power application up to 1,500 Vdc nominal.

The BE1-11*d* System

The BE1-11*d* DC Power Protection System consists of two main components: the base BE1-11*d* protective relay and the IT-D isolation transducer.

The IT-D is responsible for measuring and isolating the high voltage dc signals from the main interface of the BE1-11*d*. Intelligent design allows us to maintain high accuracy over any voltage range of 0 to 2,000 Vdc or 25 to 100 mVdc with the same hardware. Current measurements are monitored from a 25 to 100 mV shunt output. Voltages are monitored directly. Each IT-D module is capable of monitoring two sources. Any of the IT-D input channels can monitor voltage or current. The BE1-11*d* can accept signals from up to two IT-D modules for a total of three voltage channels and one current channel. Finally, the IT-D provides isolation by means of fiber optic communications between the IT-D and BE1-11*d* main unit.

Figure 1 - BE1-11*d* and IT-D

Figure 2 shows a typical system one line for traction applications. As shown, the IT-D directly measures the voltage bus and measures current from the shunt. The protective and metering measurements are measured from these inputs. User supplied resistors are wired into the measurement circuit and coordinated internally with the Line Test algorithm of the BE1-11*d*.

The BE1-11*d* is the brains of the system. First released in 2008, the BE1-11 has received enhancements regularly to operate in new applications and as existing application requirements change. The BE1-11 relay is designed to be the relay system for any application from a single firmware file. This facilitates a minimal learning curve and optimum reliability for any BE1-11 user. This heavily proven platform is utilized across all groups of protective relay systems including; Transit, Distribution, Transmission, Power Generation, Heavy Industrial, Commercial, and Military.

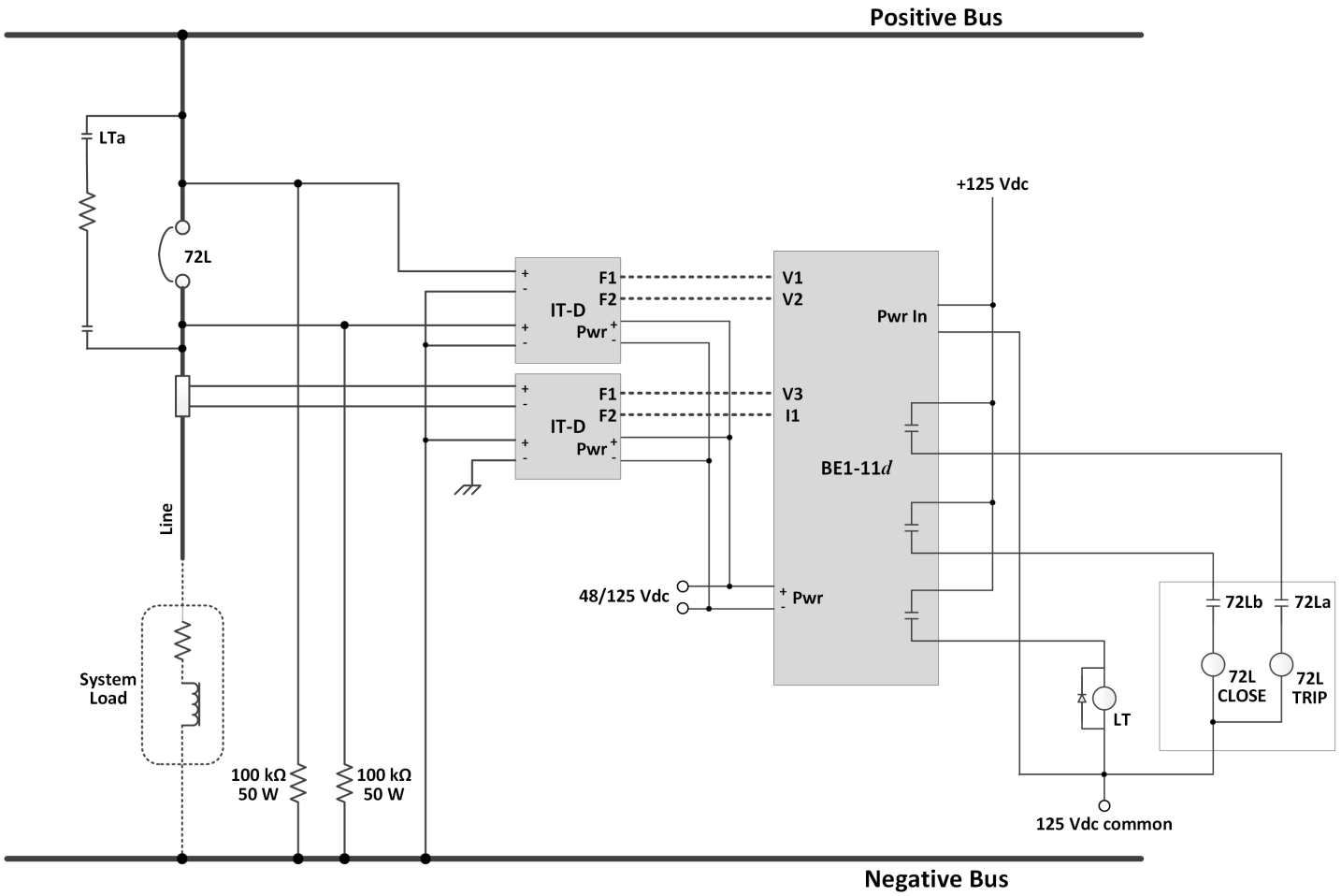

Figure 2. Typical One-Line Drawing for Traction Application

Protection Flexibility

The BE1-11*d* system continues the BE1-11 approach of flexibility. Every BE1-11*d* includes 13 Overcurrent, 2 Undervoltage, 2 Overvoltage, 2 Power, Recloser, Thermal Overcurrent, and 2 Rate of Rise elements. The DC Overcurrent Protection settings screen is shown in Figure 3. Extra and mode variable elements allows the BE1-11*d* to be utilized as needed.

BE1-11 systems utilize full drag-and-drop visual logic with an extensive library of operators and functions. Timers, counters, latches, edge triggers, comment blocks, virtual nodes, customizable alarms, customizable targets, front display LED's, IEC61850 Goose bits, and more are all included to allow a wide variety of desired performance. Utilize our pre-canned Logic Templates and Offline Logic Simulator (Figure 4) at no cost to ensure the system is going to perform as expected.

Extra Credit

Today's protective relays are capable of so much more than simply protection. In addition to providing the protection required, the BE1-11 has you covered for:

- High-Speed Fault Capture in native Comtrade format and Sequence of Events Recording.
- Advanced communications with Advanced Security.
  - Communications is only useful if it does not become manipulated and cause false operation.
  - Complex passwords, user account expiration, 6 levels of access, selectable by port and protocol.
- Any Overcurrent curve via standard IEEE, IEC, Curve Coefficient, and Table Curves.
  - Any curve shape imagined can be implemented. Some dc applications require abnormal coordination that IEEE and IEC curves do not match.
- Intuitive real-time metering with export capabilities.

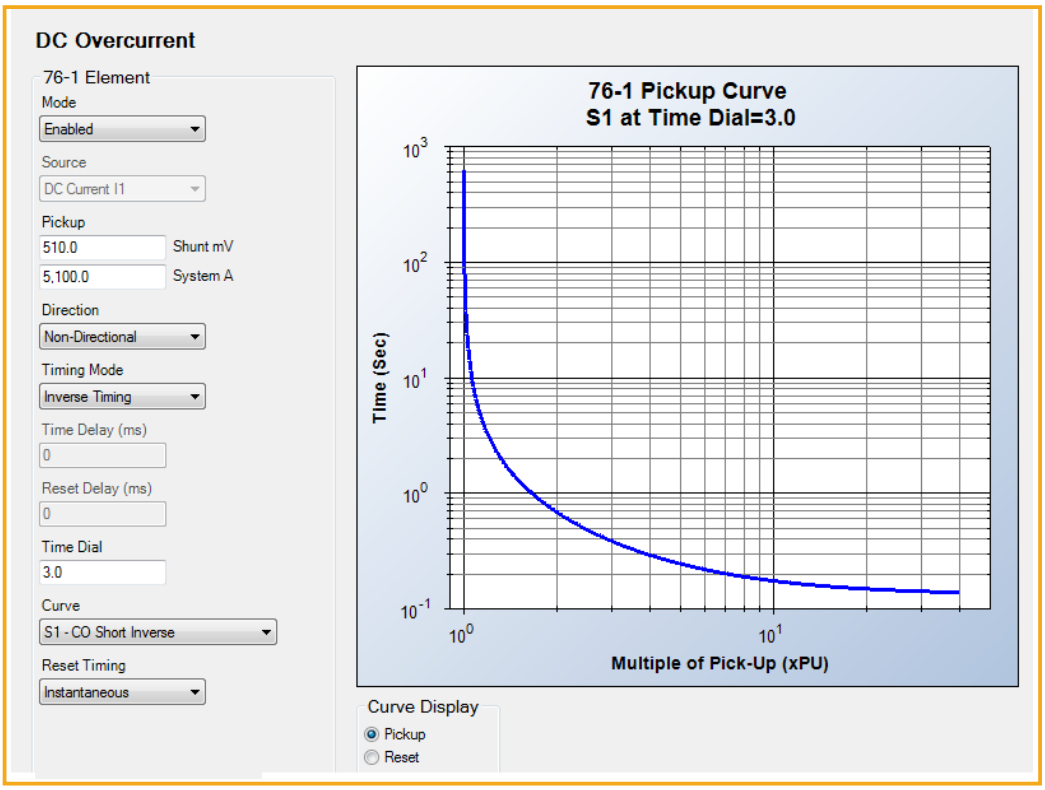

Figure 3. DC Overcurrent Protection Settings

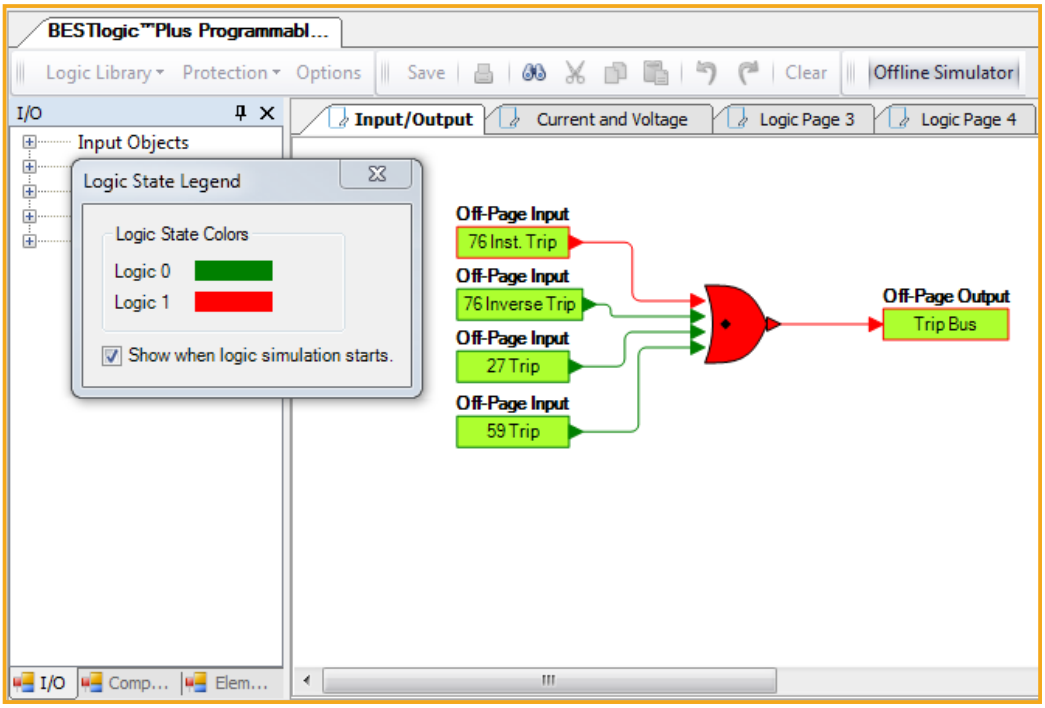

Figure 4. Offline Logic Simulator

For more information

For further assistance with product orders or questions, contact Basler Electric Technical Support at 618-654-2341.

For additional information on BESTCOMSPlus software, including more application notes, product bulletins and instruction manuals, visit www.basler.com, contact your Application Engineer, or contact Technical Support at 618-654-2341.

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