Application Note

DECS-2100: The solution for WDR-2000 Obsolescence

In 1993, Westinghouse introduced its first digital voltage regulator, the WDR-2000. In 1994, Eaton/Cutler-Hammer acquired the Westinghouse static excitation and voltage regulator product line, which included the WDR-2000 (Fig. 1). Production of the WDR-2000 continued until 2001, and during this time, more than 150 WDR-2000-based systems were commissioned throughout the world. In the early 2000's, Eaton/Cutler-Hammer released the ECS2100 Excitation Control System and, soon after, the ECS/RW retrofit voltage regulator. The ECS/RW was designed as a retrofit for the WDR-2000 voltage regulator and used the same technology as the ECS2100. In 2006, Basler Electric acquired the Eaton/Cutler-Hammer static excitation and voltage regulator product line. Basler Electric combined the technology of the ECS2100 with the already successful DECS-400 Digital Excitation Control System and released the DECS-2100 Digital Excitation Control System in 2011.

Figure 1: WDR-2000, showing voltage regulator and logic control modules

Solutions for WDR-2000 Obsolescence

As technology continues to move forward, the older components found in WDR-2000 systems are becoming obsolete, making it increasingly difficult to obtain repairs and spare parts. However, Basler Electric offers solutions for this problem.

DECS-2100 Front-End Retrofit

In a DECS-2100 front-end retrofit, all existing control equipment is removed and replaced with updated technology. A DECS-2100 front-end retrofit replaces the WDR-2000 voltage regulator, all logic control modules, and even the current pulse transformers, but retains the PPT, breaker, and rectifier bridges.

The new retrofit system usually contains four pan chassis assemblies that will be installed in the existing WDR cabinet. The first pan chassis may include one or two ECM-2 controllers. Full control redundancy is achieved by using two ECM-2 controllers. Also included on this chassis are interposing relays, an eight channel Ethernet port, USB hub, two PT cards, and one CT card (Fig. 2).

The second panel contains the I/O (input/output) modules. The standard upgrade kit has two digital I/O modules and one analog input/output module. Typically, each ECM-2 controller has its own set of digital and analog I/O boards (Fig. 3). This approach offers the most robust approach to control and I/O redundancy. Alternately, the ECM-2 controllers may share a single set of digital and analog I/O boards if space is an issue or a special I/O configuration is needed.

The third panel consists of the ac and dc transducers, along with associated power supplies and control transformers. This chassis also contains an integrated ground detector relay for rotor field protection (Fig. 4).

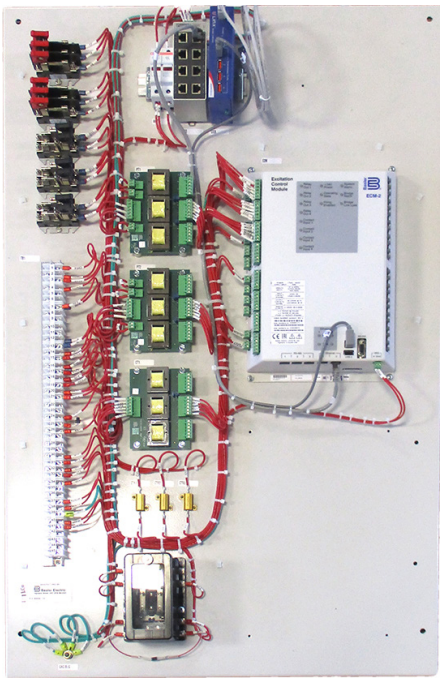

Figure 2: Control panel 1 (Typical Installation)

The fourth panel includes all of the bridge control modules that perform the firing function. The number of bridge control modules depends on how many SCR power drawers are included in the system. Each SCR power drawer requires a bridge control module (Fig. 5).

The DECS-2100 front-end retrofit is also supplied with an IDP Interactive Display Panel (Fig. 6). It has a high-resolution, color touchscreen which provides control, metering, alarm, and graphical screens. The IDP has more flexibility and features than the annunciation panel on WDR-2000 systems.

The existing non-linear resistor field protection circuit is replaced with a new DX/CB-2 module and accompanying field discharge resistor(s).

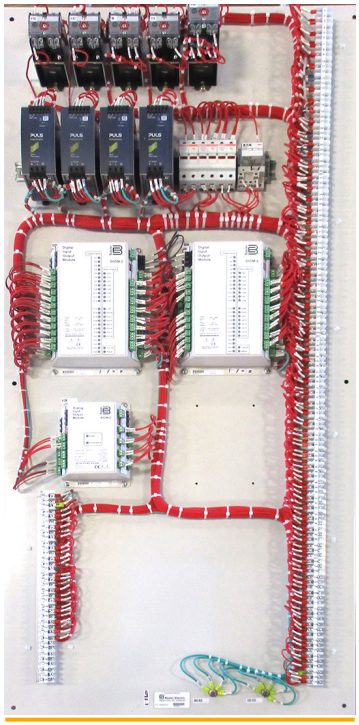

Figure 3: Control panel 2 (Typical Installation)

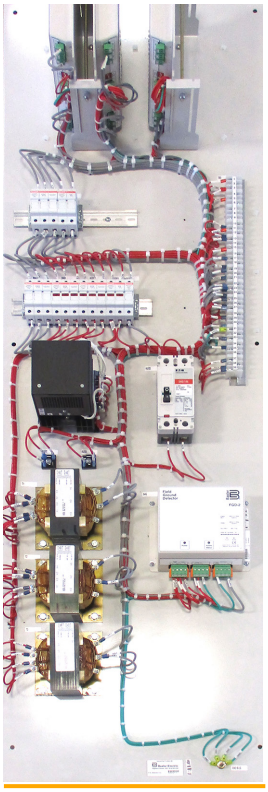

Figure 4: Control panel 3 (Typical Installation)

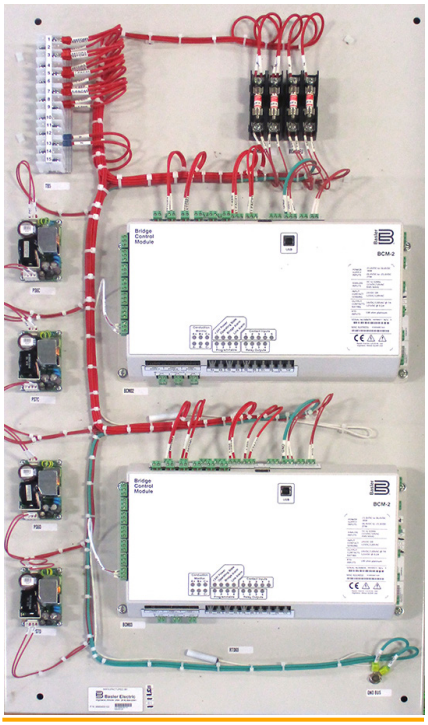

Figure 5: Control panel 4 (Typical Installation)

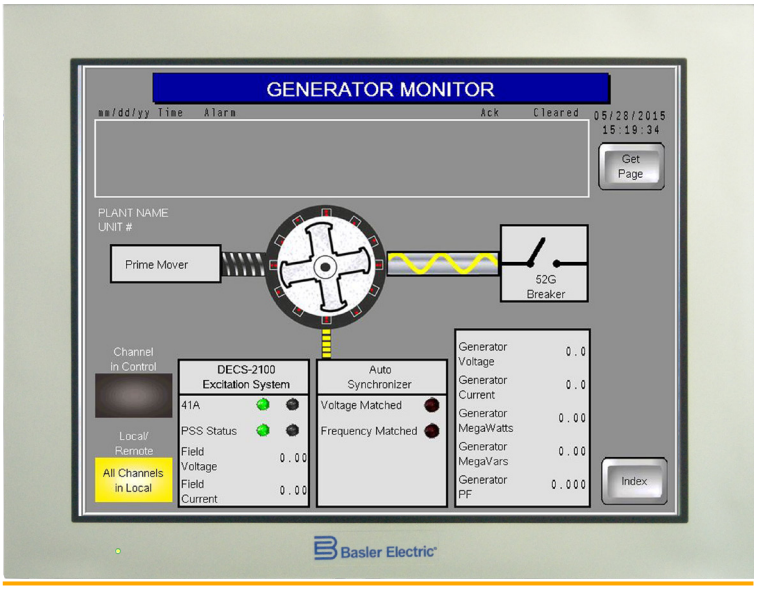

Figure 6: IDP-1201

Features and Functions

A DECS-2100 front-end retrofit will greatly extend the life of a WDR-2000 system. Features and functions provided in a DECS-2100 front-end retrofit include:

- Voltage regulation accuracy of ±0.1%
- Control modes with auto-tracking
  - Automatic Voltage Regulation (AVR)
  - Manual (field current and voltage)
  - Var
  - Power Factor
- Dual channel options
- IDP-1201 Interactive Display Panel for local and/or remote monitoring and control
- Real-time monitoring of up to six parameters
- Sequence of events recording
- Oscillography
- System simulation mode
  - Time responses
  - Frequency responses
- Auto-tuning
- Programmable input/output terminations
- IRIG-B time synchronization
- Communication
  - Multi-port Ethernet
  - USB
  - Fiber optics for bridge firing
  - RS-485
- Protection
  - Field overvoltage
  - Generator overvoltage and undervoltage
  - Bridge overtemperature
  - Field flashing
  - Field overtemperature
  - Loss of excitation
  - Loss of voltage sensing
  - Overcurrent
  - Overexcitation
  - PPT fuse failure
  - Thyristor conduction monitor
  - Volts/hertz
  - Watchdog
  - Exciter/main field ground protection
- Limiters
  - Maximum field current
  - Minimum field current
  - Overexcitation
  - Underexcitation
  - Stator current
  - Temperature compensation
  - Volts/hertz
- Dual PID settings group
- Automatic synchronizing (optional)
- Integrated power system stabilizer (PSS Type 2A/2B/2C) (optional)

As this application note has shown, Basler Electric offers cost-effective upgrade solutions for aging WDR-2000 systems. A DECS-2100 front-end retrofit is a viable solution when:

- Available space won't accommodate the equipment of an entirely new system.
- The WDR-2000 logic modules are obsolete but the power bridges are still intact.
- Funds aren't available for a full system upgrade.

DECS-2100 Digital Excitation Control System

The entire WDR-2000 system can be upgraded to the DECS-2100 Digital Excitation Control System. This solution replaces all control, protection, and power related components, but retains the existing power transformer. See the DECS-2100 Product Bulletin available at www.basler.com.

Turnkey Services Available

Through our wholly owned subsidiary, E^2 Power Systems, LLC, Basler Electric can offer full service turnkey installation and commissioning of a WDR-2000 replacement or Front-End Retrofit. These services ensure the WDR-2000 is upgraded, the exciter cabinet is modified properly, and site drawings are updated accordingly. Exciter tuning, commissioning, and Power System Stabilizer studies are completed by industry leaders in retrofit applications.

Note

Basler Electric attempts to make settings and configuration updates as easy as possible for the user. However, product enhancements, updates, and feature additions may create differences between devices. It is recommended that all settings are reviewed and system performance is verified. It is not the intention of this document to identify all changes or differences between devices. For more information, please refer to the appropriate instruction manual. If there are questions or concerns, contact our Technical Sales Support staff for assistance.

For More Information

For information on Basler's complete range of exciter solutions, visit www.basler.com to access product documentation, Application Notes, and technical papers. To discuss your application, consult Basler at +1 618.654.2341.

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