

Application Note

DECS-2100 Accessory Modules Receive an Upgrade

The ECS2100 excitation control system began production in the year 2000.

At the time, it was designed to be the latest in digital control systems to upgrade the WDR-2000 Westinghouse Digital Regulator and the WTA300B analog system. The ECS2100 consolidated numerous control boards for various functions into just three, the Sensor Input Module (SIM), the Excitation Control Module (ECM), and the Firing Control Interface Module (FCIM). In addition to the three control boards, the ECS2100 is also equipped with various accessory modules. These modules are the Bridge Control Module (BCM), Analog I/O Module (AIOM), Digital I/O Module (DIOM), Isolation Transducer, Field Ground Detector, and De-Excitation/Crowbar (DXCB). The functionality of each module is described below.

In 2012, Basler Electric combined proven technology from the DECS-400 with the ECS2100 to create the DECS-2100 Digital Excitation Control System. The DECS-2100 consolidated the original three control boards into the ECM-2 Excitation Control Module. The ECM-2 is available for retrofit into an ECS2100 and comes standard with the PC operating software BESTCOMS™Pro. For more information on ECM-2 retrofits, refer to Basler Electric’s Application Note entitled “Easy Retrofitting Solution for the ECS2100 Provides Enhanced Capabilities.”

During the transition from the ECS2100 to the DECS-2100, these accessory modules remained unchanged. Since that time, new standards have been put in place that require components inside an excitation control system to be touch safe. Also, because these boards have not been updated since the release of the ECS2100, component availability has become an issue, which makes maintenance and repair more difficult.

In aging printed circuit board designs, component availability always becomes an issue. There are two common solutions. One solution is to find a suitable replacement component that makes the least possible impact to the design. The second solution is to replace the aging circuit board with a new design that has all new components, more efficiency, and will help to extend the life of the ECS2100 or DECS-2100.

Basler chose the second solution and six accessory modules, used in the DECS-2100, have been upgraded. The six accessory modules have also been updated to meet CE and IEC requirements which includes touch safe and RoHS2 compliance.

Product Line Evolution

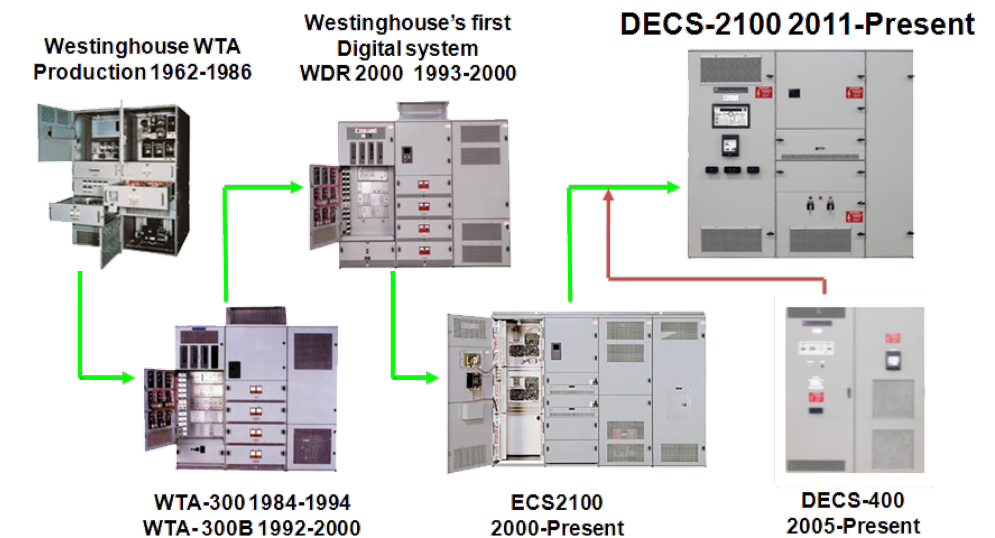


Figure 1. Excitation System Development Timeline

In order to meet the touch safe requirement, each module was placed into its own IP20-rated enclosure. Ingress protection level IP20 is the international enclosure rating that indicates the module is protected from solid objects greater than 50 mm in size. In order to meet the RoHS2 standard, all components and solder are lead free, among other requirements.

All the new modules are backwards compatible with the original accessories. This means they either have the exact same physical footprint or have a smaller package that still uses the original mounting points.

In addition to the changes that were made to all the modules, unique changes were made to each individual module. The operation of each module, its upgraded version, and its unique changes are described below.

Bridge Control Module

The BCM is mounted on the front of each rectifier bridge of the ECS2100 or the DECS-2100 and generates gate pulses for each SCR (silicon controlled rectifier) in the rectifier bridge. It does this by receiving signals from the ECM-2 via fiber optic connections. Fiber optic communication uses light to transmit information back and forth, which provides electrical isolation between the ECM-2 and the BCM. Isolation between the controller and the bridge is necessary to prevent electrical noise from the rectifier bridge from affecting operation of the controller. The BCM has ten fiber optic connections and seven 100-ohm resistance temperature device (RTD) connections for measuring the SCR heat sinks and ambient temperature. Two contact inputs and four contact outputs are also included. The updated BCM is called the BCM-2. See Figure 2. The BCM-2 contains a Type B USB port and an Ethernet port for direct BESTCOMSPRO communication to replace the RS-232 communication port. It also has programmable I/O, including six analog inputs, four output contacts, and five contact inputs for external switches or other system devices.



Figure 2. BCM Card (top), BCM-2 (bottom)

Analog Input/Output Module

The Analog Input/Output Module (AIOM) provides additional analog inputs and outputs to the ECM-2. All the information received by the AIOM is passed onto the ECM-2 over fiber optic communication. In a standard DECS-2100 system, each control channel has its own set of AIOMs. The updated AIOM is called the AIOM-2. The AIOM-2 contains connections for two AIOM boards in one package while

retaining the same physical footprint as one module. See Figure 3. This means one AIOM-2 has two RTD inputs instead of one, four Analog inputs instead of two, and eight analog outputs instead of four. One AIOM-2 may replace either one or two AIOMs. Having one module with the same footprint and double the I/O allows for more available space inside the cabinet or for retrofits into smaller spaces.

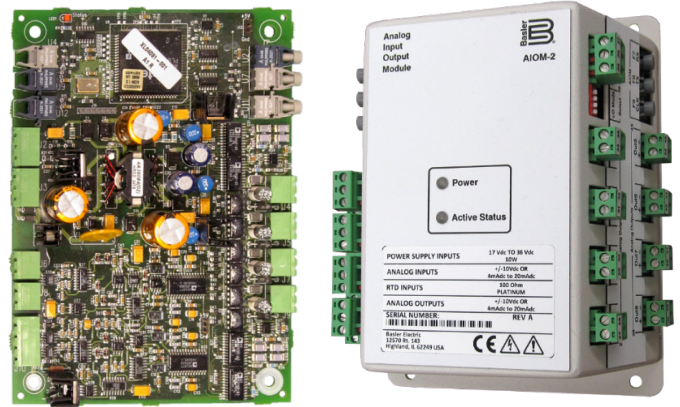


Figure 3. AIOM Card (left), AIOM-2 (right)

Digital Input/Output Module

The Digital Input/Output Module (DIOM) provides additional contact inputs and outputs to the ECM-2. It interfaces with all the external devices such as pushbuttons, switches, and relays that were designed into the DECS-2100. All the digital inputs and outputs are programmable via the logic in the ECM-2 using BESTCOMSPRO software. Every contact input and output has an LED associated with it that illuminates when energized. The updated DIOM is called the DIOM-2. Like the AIOM-2, the DIOM-2 contains connections for two DIOM boards in one package while retaining the same footprint as one module. See Figure 4. This means one DIOM-2 has 24 contact inputs as opposed to 12, and 16 output contacts as opposed to 8. One DIOM-2 may replace either one or two DIOMs.

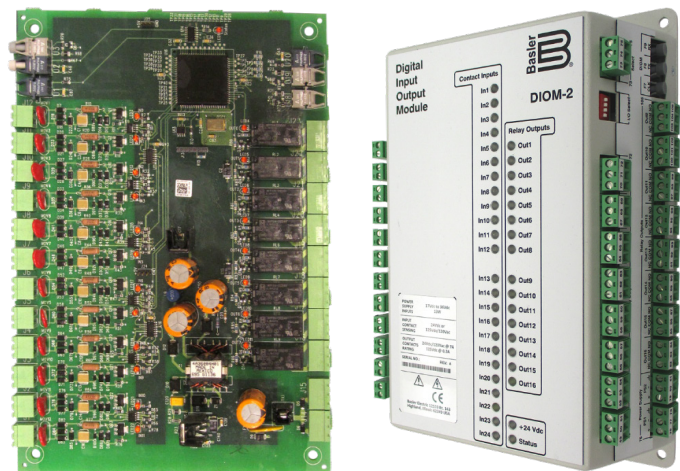


Figure 4. DIOM Card (left), DIOM-2 (right)

Isolation Transducer

The Isolation Transducer, also known as the IT card, electrically isolates the DECS-2100 from the power parameters that are directly monitored by the system. The IT card is designed with two separately isolated voltage inputs. The voltage sensing inputs can range anywhere from 25 mV up to 2,000 Vac/Vdc. Typical parameters monitored by an IT card may include the bridge power input voltage, field voltage, or field current (measured through a metering shunt). Two versions exist: one for the application listed above and one for old power drawers with shunts for current balancing. In the DECS-2100, there is one dedicated IT card per channel with the ability to make adjustments for specific inputs via the ECM-2. The updated IT card is called the IT-2. See Figure 5. Because the IT-2 has an IP20 enclosure, it would be impossible to set the jumper wires for sensing voltage. To resolve this, the IT-2 has been equipped with a 4-pole DIP switch that sets the sensing voltage based on the configuration of the switches. The IT-2 also has multiple LED status indicators. These LEDs indicate the selected input range, invalid range configuration of the DIP switch, overvoltage/undervoltage, and power supply status. A set of LEDs are available for each voltage input.

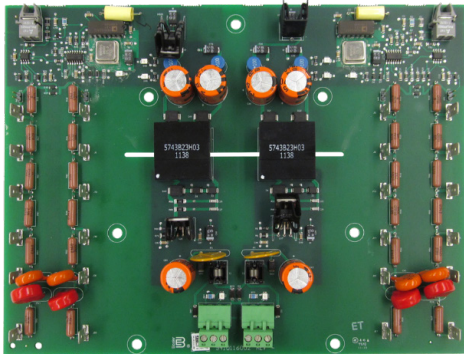


Figure 5. IT Card (top), IT-2 (bottom)

Field Ground Detector

The Field Ground Detector continuously monitors ground faults in the machine field circuit. Ground faults are detected by leakage current traveling to ground. Leakage current to ground is measured and a voltage signal, proportional to the leakage current level, is generated. The signal is then sent from the AIOM or AIOM-2 to the ECM-2 (DECS-2100) or the ECM/SIM/FCIM cards (ECS2100). Two versions of the Field Ground Detector exist: A low voltage version for brush or brushless system applications, and a high voltage version for static excitation systems. In the original version, the Field Ground Detector voltage ranges were 800 Vdc for the low voltage version and 1,250 Vdc for the high voltage version. In the new FGD-2, the low voltage remains the same, but the high voltage is increased to 1,750 Vdc. The FGD-2 is also one third smaller than the original Field Ground Detector but may still be mounted in the same location using only four of the six original mounting holes. See Figure 6.

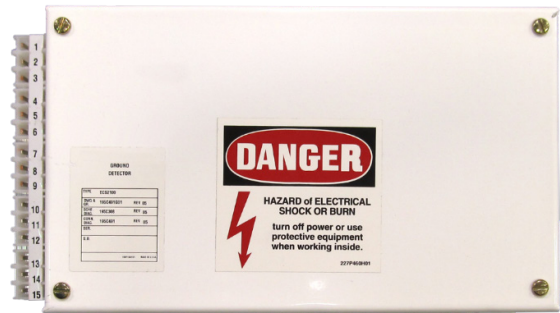


Figure 6. Field Ground Detector (top), FGD-2 (bottom)

De-Excitation/Crowbar

The De-Excitation/Crowbar (DXCB) module protects the generator and exciter field from high transient voltages or damaging arcs that could occur in the system. A DXCB module may be used in either De-Excitation mode or in Crowbar mode. When in De-Excitation mode, it provides a path for generator field current at shutdown. When in Crowbar mode, it provides a path for large positive voltages that appear across the generator field. In addition to the DXCB module, field discharge resistors are placed in series with it to provide the discharge path for the de-excitation and crowbar modes, decreasing the shutdown time of the rotor field. The DXCB can be configured for voltage settings in increments of 800 V. In the new DXCB-2,

the voltage setting increments are reduced to 600 V for more resolution. The overall appearance of the DXCB remained unchanged when moving to the DXCB-2. See Figure 7.

For more information

For further assistance with product orders or questions, contact Basler Electric Technical Support at 618.654.2341.

For additional information on BESTCOMS*Plus* 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.

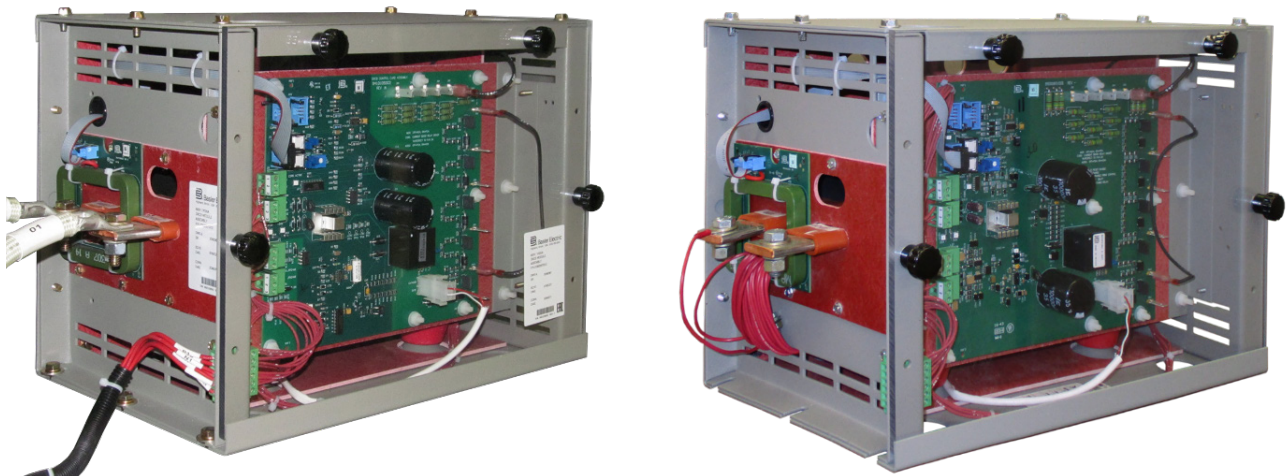


Figure 7. DXCB (left), DXCB-2 (right)