



Using the SEL-3031 Serial Radio Transceiver in Distributed Generation Schemes

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INTRODUCTION

A distributed generator is defined as an energy source that is connected directly to the distribution network. Distributed energy sources include both distributed generators and energy storage devices. Recently, renewable energy sources have been developed, such as solar, wind, and biofuels. Because of the scale of these sources, there is a tendency towards their integration at the distribution level. Distributed generation (DG) is gaining momentum, with governments all over the world pushing towards clean energy and carbon footprint reduction, causing a paradigm shift in the conventional generation, transmission, and distribution of electrical energy. Distribution systems, which are conventionally radial, may now be equipped with energy sources, making the distribution systems low-voltage transmission networks. Because of the high cost of using optical fiber, wireless technology is becoming a popular economical alternative to provide a low-latency communications link to the DG location. The low installation cost of using SEL-3031 Serial Radio Transceivers allows DG users to comply with regulatory standards and better meet cost targets.

PROBLEM

With the push for using alternative energy resources, many DG sites need to be connected to the distribution network. A high-speed, low-latency communications link from the DG back to the substation is required in order to allow a DG source to feed power. This communications link allows the control center to monitor each DG site, read meter information, and, most importantly, automatically disconnect the DG site if there are any system issues. In many situations, the DG sites are limited by budgets and the cost of adding communications can often prevent the project from occurring. Running optical fiber to the DG location and paying for access to private property add enough cost to render a project not feasible. The low price and installation cost of radios make them a viable alternative to fiber-optic communications links. DG schemes typically require a communications channel to both operate within 100 milliseconds and not drop the communications within 100 milliseconds. If the communications channel drops for longer than 100 milliseconds, the DG scheme will automatically trip the generation.

SEL SOLUTIONS

The SEL-3031 was designed for applications where high-speed, low-latency communication is required. The SEL-3031 used with MIRRORED BITS[®] communications provides a highly reliable, low-cost wireless link. The SEL-3031 ordered with the encryption card provides FIPS 140-2-certified encryption to thwart replay and man-in-the-middle attacks. The SEL-3031 provides the highest level of security and a wireless MIRRORED BITS communications link with less than 6-millisecond latency at up to 20 miles.

SEL relays and automation devices use MIRRORRED BITS communications, enabling relay-to-relay wireless communication. If SEL devices are not available as the endpoints of a system, there are suitable alternatives, such as the SEL-2505 Remote I/O Module, SEL-2506 Rack-Mount Remote I/O Module, and SEL-2440 DPAC Discrete Programmable Automation Controller. These devices convert digital inputs and outputs to MIRRORRED BITS communications. So, whether a communications path is needed between two SEL relays or to other devices with I/O, the SEL-3031 with MIRRORRED BITS communications provides the solution.

SEL-3031 Point-to-Point Links

The SEL-3031 used in point-to-point mode provides three serial ports between two locations at up to a 20-mile distance. Each of the serial ports supports either MIRRORRED BITS communications or any byte-oriented protocol, such as DNP3, Modbus®, or ASCII. The SEL-3031 allows SEL relays or automation devices to efficiently pass MIRRORRED BITS communications data, allowing the DG system to quickly isolate from the grid when the system becomes unstable or to quickly clear a permanent fault on the line. The SEL-3031 provides these low-latency links with less than 6 milliseconds of latency to quickly and reliably operate the circuit breakers.

SEL Hop-Sync™ Technology

Figure 1 shows an example of how a substation can wirelessly communicate to multiple DG sites. Generally, when there are multiple radios at the same site, the transmission from one radio can easily overpower the weaker signals that a nearby radio is trying to receive. By synchronizing collocated radios so they all hop frequencies, transmit, and receive at the same times, none of these collocated radios will transmit while any radios are receiving signals. SEL Hop-Sync technology allows dependable data communication for back-to-back radios with collected antennas. The SEL-3031 allows the placement of all antennas on the same pole and within inches of each other and provides high signal availability for each DG site.

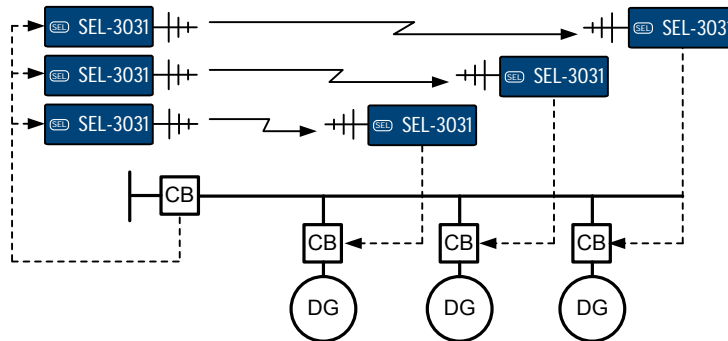


Figure 1 Collocated Radios Used for a DG Scheme