

ACE3600 RTUs Support Smart Grid Operation with SCADA-Data Communication



In order to achieve high operational reliability, reduce maintenance costs, and improve quality of service in medium voltage (MV) electrical distribution grids, systems must be designed with reliable data communication and built-in intelligence. Supervisory Control and Data Acquisition (SCADA) solutions for Distribution Automation (DA) and Distribution Management Systems (DMS) deliver far-reaching benefits for monitoring and control tasks.

Wireless data communication for DA opens up a range of opportunities for utilities to expand their system, reduce installation and maintenance costs, minimize outages and enhance customer satisfaction. Motorola ACE3600 Remote Terminal Units (RTU)s allow optimal architecture for wireless SCADA-data communications—enabling intelligent and high performance operation.

Proven Performance

For over 35 years, Motorola has delivered SCADA solutions for a range of utility and other applications needing wide geographical control. Today, electric utilities all over the world rely on our wireless voice and data communication to improve their operations and enhance the productivity of their field teams. With over 120,000 Remote Terminal Units installed in SCADA applications worldwide, Motorola solutions help utilities deliver efficient and reliable electric power. Serving small rural and municipal substations and MV distribution grids, utilities worldwide benefit from Motorola's commitment to their success.

Proven Solution for Electric Distribution

Government regulations as well as today's cost-competitive market require electric utilities to meet higher operating standards, improve their power distribution reliability, and reduce operational costs. Distribution Automation solutions employing RTUs for wireless remote control and Intelligent Electronic Devices (IEDs) for local monitoring and control allow utilities to successfully confront these challenges head on.

According to Newton-Evans, nearly 90% of reporting North American electric utility sites have power grid automation and integration strategy in place.¹



The ACE3600/SCADA platform is part of Motorola's Connected Utility portfolio of solutions and provides best in class communications and control for medium voltage power grids.

The Motorola ACE3600 RTU delivers reliable operation over a wide range of communication media and powerful data processing making it an optimal choice for most DA applications. It allows integrators of DA systems to provide utilities with a solid, long lasting system and helps achieve distinct operating and total ownership cost benefits. Motorola supplies standard models of both RTU and radio components integrated into a single, tested off the shelf package.

Fault Detection and Restoration

Continuous grid monitoring and control provide for immediate detection of faults along the feeder and allows quick restoration of service to users. Powerful network communication capability enables the ACE3600 to combine wide area telemetry with local control and integration of IEDs along the power grid.

Upon detection of a fault along the distribution feeder, the RTU reports to the DMS control center and isolates the faulty section. Under direction from the DMS control center, the RTU reconfigures the power grid to restore power to the non-faulty feeder sections. In addition, time-stamped data messages supplied by the RTU to the DMS control center allow for sequence of events (SOE) analysis to determine the location of the fault and expedite service restoration.

Enhance Power Quality Monitoring

Today, more than ever customers demand a stable and uninterrupted supply of electric power. Utilities commonly use the Customer Average Interruption Duration Index (CAIDI) to determine the average outage duration for a given customer. ACE3600 integrated with transducer-less IEDs enables Power Quality Monitoring (PQM) and load level measurements on feeder networks. Depending on the selected IED, PQM measurements of harmonic distortion, power factor ($\cos \phi$), duration and occurrence of voltage spikes and sags combined with ACE3600 communications can significantly improve CAIDI.

Low power factors result in reactive power causing power losses through the distribution network and lead to inefficiency and incorrect billing. Intelligent control of capacitor banks along feeder networks helps reduce reactive power, improve voltage regulation and power factor ($\cos \phi$) correction. Utilities gain a robust, integrated platform that helps improve the efficiency of the power grid and provide more accurate billing.

Load Balancing

Under the guidance of the DMS control center, ACE3600 can perform intelligent load balancing and load sharing. Uniform distribution of the load among substation transformers and feeder networks minimizes power peaks and ensures more stable power. The powerful processor and extensive on-board memory of the ACE3600 gives programmers the capability to implement complex routines that sense load variations via IEDs, perform feeder reconfiguration and optimize load sharing.

Improve Substation Automation

Optimizing MV power grids requires precise load condition monitoring. To perform this function, the ACE3600 communicates with substation IEDs connected directly to current and voltage transformers, substation protection relays (SPR), and circuit breaker reclosers (CBR). With the ability to monitor and control thousands of I/O points, ACE3600 can operate in very large as well as small substations. The ACE3600 allows extensive time-stamped data logging, allowing the DMS computer to perform historical data analyses and give utility managers the information they need for load surveys, energy consumption analysis, and expansion planning.

Supporting Smart Grid Initiatives

Meeting Smart Grid initiatives requires frequent and reliable monitoring of electric parameters and robust communication between the distribution network and the DMS control center. Increased decentralized power generation and time of day pricing, call for an intelligent RTU with reliable data communications deployed along the power grid.



The ACE3600 RTU architecture provides reliable SCADA-data communications, networking capabilities and message security. Capable of redundant wired or wireless communication links through serial and IP ports, ACE3600 delivers a cost-effective, comprehensive, and reliable communication solution. Utilities can use ACE3600 to improve the efficiency of their distribution networks, meet regulatory and reliability guidelines, and confidently accommodate new Smart Grid operating procedures.

An Intelligent, Expandable, Integrated Solution

The Motorola ACE3600 RTU helps utilities boost operating and cost benefits achieved through distribution automation. Built around a modular hardware and software architecture, ACE3600 can implement RTU configurations with CPU, I/O modules and radio/modem options customized to maximize the performance for their application.

Scalable and flexible automation applications enable the ACE3600 RTU to perform most utility applications in municipal substations, pole mounted switchgears and ground based ring main units. The ACE3600 RTU allows seamless communication with a range of human machine interface (HMI) software associated with DMS control centers. Together they create a powerful system that supports most monitoring and management functions.

Unmatched Data Communications for SCADA

- With RS232 and Ethernet connections, the ACE3600 provides seamless integration with multiple wide-area and local area communication media including analog or digital conventional and trunking radios, Multiple Address System (MAS) radios, cellular, spread spectrum, microwave, fiber optic, dedicated or switched wire lines.
- Distribution Automation systems based on ACE3600 RTUs allow intelligent networked communications among all distribution sites. Utilizing report-by-exception configuration reduces communication overhead and allows a large number of remote sites to share the same communication resource. Additionally, to reach distant sites, the ACE3600 RTU incorporates a store-and-forward communication feature, eliminating the need for costly radio repeaters and other equipment.

The ACE3600 combines I/O modularity with reliable, redundant wired and wireless communications, powerful processing, and versatile IED connectivity using industry standard protocols.

- The scalable RTU platform contains extensive support for a range of protocols including DNP3.0, MODBUS, and IEC60870-5-101 and others. Additional protocols for connecting IEDs, PLCs, and third party RTUs can be implemented using protocol emulation and encapsulation methods.
- The ACE3600 allows RTU polling by the DA control center combined with unsolicited calls to the host through event-driven reporting.
- Network wide time synchronization is supported and allows ACE3600 to perform fault occurrence reporting with accurate time stamping at any remote site along the MV power grid.²

Application Programmability

- The ACE3600 RTU offers user-configurable ladder and C language programming for a range of applications involving data acquisition via IEDs, SPRs, and CBRs and FPDs for grid actions such as fault isolation/system restoration, and power quality monitoring.
- User friendly software programming is done with the System Tools Suite (STS) tool on a Windows PC, connected directly to the ACE3600 RTUs via RS-232 or LAN port or remotely via the SCADA network.
- STS allows the operator to remotely and securely upload or download firmware, parameters, application programs and perform application or communication diagnostics.

Enhanced Data Reliability and Operating Security

- MDLC protocol supports full message integrity confirmation over wireless and wired media.
- Time-based authentication restricts non-authorized access to RTUs.
- Network wide data encryption and user-configurable settings improves SCADA security.

Scalable, Future-Proof Investment

- The modular, scalable architecture of the ACE3600 RTU simplifies incremental upgrades and expansions as the utility's design and communication requirements change—reducing capital expense and costly reconfiguration.
- Module hot swapping prevents damage to I/O module during replacement, reducing maintenance costs and downtime.
- Generous memory storage allows new programs and functions to be added as a utility's application needs evolve for the Smart Grid and beyond.



For more information on how you can utilize SCADA within your utility visit Motorola at motorola.com/ace3600

¹ Newton Evans Market Trends Digest, Executive Summary of Findings from EMS, SCADA, DMS Study, July, 2008

² IP-based communications cannot support precise time synchronization of remote sites via the network.



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