Why Motorola?

Motorola has for over 75 years been one of the world's leading providers of computers, components, and communication, and control systems.To ensure reliable system operations, after integrating a new system or upgrading an existing one, Motorola provides field training by our local service teams, or by local system integration firms, who speak your language and understand your operating conditions. Motorola provides you with the best-in-class solution to match your growing needs.

Motorola has been providing reliable wireless SCADA RTUs and systems solutions for over three decades with over 100,000 installations worldwide in a wide range of applications. Motorola is committed to uncompromising quality of products, services and system solutions and delivers Six Sigma quality level. Motorola has received the prestigious Malcolm Baldrige National Quality award.

- **Enhanced performance.** The Motorola ACE3600 and MOSCAD family of RTUs allow you to get the most from your existing installations.

- **Advanced Communications.** ACE3600 and MOSCAD RTUs can work seamlessly with most standard SCADA systems and interface with other devices and protocols to create cost-effective turnkey solutions over multiple communications media.

- **Built-in Protocol Transcoder.** ACE3600 and MOSCAD RTUs support transcoding between several common SCADA industry protocols, such as Motorola Data Link Communications (MDLC), Modbus RTU/Binary, DF/1, DNP3.0 and more.

Reliably Operating and Cost Effective SCADA Solutions are vital to your organization.

Motorola has the solutions for all your needs: ACE3600 and MOSCAD.

MOTOROLA

Motorola Inc.
1301 E. Algonquin Road
Schaumburg, Illinois 60196
Tel: 1-800-367-2346 ext, 4821

Europe
Tel: +972-3-565-8127
Fax: +972-3-562-5774

Latin America
Tel: +591-44-234272
Fax: +591-44-115250

Asia-Pacific
Tel: +65-6486-3433
Fax: +65-6483-1563

For regional technical support contacts and more information refer to our web site: www.motorola.com/moscad

RC-99-2152

Motorola Enhanced SCADA Solutions

ACE3600 – New Generation RTUs Expanding the MOSCAD Family
MOSCAD – Family of Field Proven Versatile Industrial Solutions

MOTOROLA

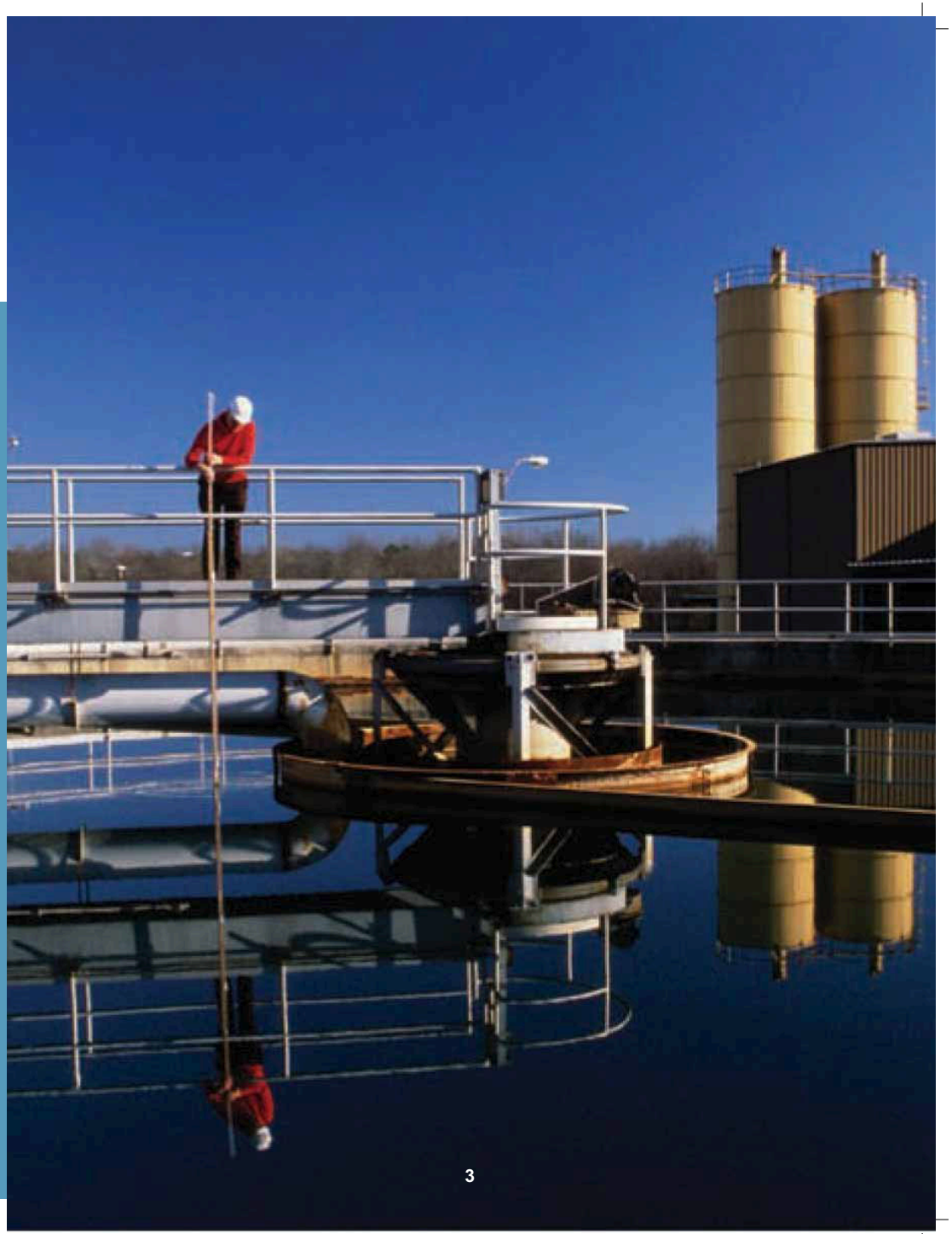
Motorola SCADA Solutions Deliver Unparalleled Performance

- In today's highly competitive world it is the bottom line benefit that counts - and Motorola makes the difference. Over 100,000 Motorola SCADA (Supervisory Control and Data Acquisition) Motorola RTUs installed worldwide and over three decades of accumulated experience are evidence of Motorola's ability to offer you top-class SCADA solutions.

- Both the new generation Motorola ACE3600 and the Motorola MOSCAD, MOSCAD-L, and MOSCAD-M RTUs (Remote Terminal Units) utilize innovative control and data communications. This facilitates integrated SCADA solutions tailored to applications in water and electric utilities, telecommunications, public safety, transportation, and other industries.

- Motorola RTUs' unique performance and uncompromising commitment translate into increased operating and cost benefits for our clients. Motorola SCADA solutions combined with reliable wired or wireless communications provide exceptional system architecture flexibility, reliable control, enhanced system performance, and data communications security.

- Motorola RTUs allow you to integrate new systems or expand existing ones, using a wide selection of Master Control Center (MCC) software, data communication links and networks over wires, fiber optics as well as a variety of other advanced wireless media. Thus, as your system needs grow, upgrades and expansions can be easily added.



Motorola SCADA Applications

Customers throughout the world have experience with SCADA solutions that boost operating reliability, help reduce operating costs, simplify maintenance procedures and help make maintenance crews more efficient.

Motorola designed the new generation ACE3600 and the MOSCAD family as upgradeable and expandable systems to enhance the performance, data security and operating reliability of remote sites.

Thousands of Motorola SCADA systems with over 100,000 RTUs are operating around the world, serving the oil and gas industry, electric and water utilities and public safety agencies.

Electricity Distribution

Distribution Automation (DA) and computerized remote control of Medium Voltage (MV) substations and power grids help electric utilities achieve higher reliability of supply and reduce operating and maintenance costs.

In the past, Sectionalizer Switchgears, Ring Main Units, Reclosers and Capacitor Banks connected to the MV power grid were designed for local operation without remote control. Today, Motorola RTUs provide easily integrated solutions when upgrading remotely installed electric equipment. Motorola's upgrade solutions include integration of Capacitor Bank controllers, transducer-less AC Measurement units and Fault Passage Detection (FPD) units from 3rd party vendors. These operate as Intelligent Electronic Devices (IEDs) and can be connected to the RTU via Ethernet, RS-232 or RS-485 ports.

In a Distribution Management System (DMS), Motorola RTUs seamlessly interface with a wide range of high performance control centers supplied by leading vendors worldwide. Connection to these EMS, and DA/DMS control centers is typically established via the high performance MOSCAD IP Gateway, MODBUS or OPC-type Interface units.

Oil and Gas Industry

Oil and gas operations require remote control for production wellheads, along long pipelines and at valves located at difficult-to-access sites. This industry must maintain the strictest safety measures to prevent and detect leakages or fire at remote installations. Thus each site must be supervised via RTUs with communications to one or more control centers.

RTUs in gas installations calculate gas flow according to AGA-3 (American Gas Association), AGA-7, AGA-8 and other standard formulas, while RTUs along oil pipelines perform analog pressure control using PID (Proportional-Integral-Derivative) lops, Monitor Cathodic Protection rectifiers, flow meters and more.

Intrinsically safe connection to RTUs from field sensors installed in restricted zones can be provided by adding barrier devices to the discrete Input/Output and RS-232 serial cables.

Fresh Water and Wastewater

Among the goals commonly cited by municipalities and water utilities worldwide are cost savings due to reduction of unaccounted-for water, maintenance cost reduction, lift station early failure detection, electric energy cost reduction, deferment of expansions, etc.

Motorola's wireless and wired data communication based RTUs provide solutions to these types of applications. They can be configured to monitor the water flow along the pipe lines helping improve regulation of water pressure using Pressure Regulated Valves, cut down on unnecessary consumption and reduce water losses. RTUs collect real time information on the water level in reservoirs and pump operation and communicate report-by-event based data that helps maintain a reliable supply and stable pressure. Without a SCADA solution in place, this would require additional pumps, storage tanks and pressure regulating equipment.

Siren Warning Systems

Electronic sirens warn the general public in cases of severe weather conditions, civil defense air raid alerts, pollution and radiation alerts around nuclear power plants. Toxic gas clouds might emanate from chemical plants or hazardous waste dumps. In order to minimize those risks, operators require a reliable method for immediately alerting the public – wireless triggering of multiple sirens is the preferred method. Such solutions often require redundant data communications. Both ACE3600 and MOSCAD family RTUs have this capability.

RTUs installed at remote siren sites can provide the communication between the sirens and the control center and expand the usage options of the system. They are capable of selecting combinations of tones and even pre-recorded voice messages. The use of multiple control centers, which communicate with all sirens offer advanced and flexible functions such as activation of sirens in selected groups, backup control, silent test, download of pre-recorded public warning messages as well as redundancy.

Public Safety and Fire Station Alerting

Accurate dispatch capability of fire trucks and ambulances in a city is an important requirement of Emergency Services departments. This action must be done quickly and effectively to maximize the responsiveness to the community. A wrongly communicated address due to incorrect voice comprehension can lead to loss of life. RTUs can be programmed in such a way that upon receipt of an alert at the fire station, they turn on lights, connect the voice dispatch message to the building public address system, open the fire station doors or the vehicles assigned to the task, and send a message to dispatcher when all vehicles have left the station.

These solutions also support a Computer Aided Dispatch (CAD) interface at the Dispatch Control Center, which permits easy and optimal selection of the regional fire station(s) and activation of vehicles in each station. The Dispatch Control Center can also provide voice dispatch capability and redundant two-way communications.

Natural Disaster Warning Systems

Governments today are acutely aware of the risk to the general public resulting from pollution, floods, storms, mud slides, earthquakes, Tsunami events and other environmental dangers. This creates a need for innovative solutions, which help report the status of electronic sensors located across a wide area.

Applicable SCADA software is used to collect and communicate critical information from RTUs to the control center. This data is processed and made available to the public via radio, TV, the Internet, etc.

Thanks to its low power consumption, solar panel operation and versatile communications, the MOSCAD-M mini-RTU, is particularly suitable for this application.

Each such RTU can report directly to the control center or can communicate in a hierarchical fashion via ACE3600 or MOSCAD based data concentrators located at selected sites. Having such solutions in place increase public awareness and upon a disaster event help by alerting the public at an early stage.

ACE3600 RTUs for Advanced SCADA Solutions

With the wide range of SCADA RTUs and communication solutions offered by Motorola, including the recently introduced ACE3600, Motorola or its partners can integrate turnkey solutions with versatile control centers, interface to 3rd party sensors, IEDs and PLC units. The ACE3600 and the family of MOSCAD RTUs are designed to allow horizontal as well as vertical system expansion, which enhances the performance and operating reliability of remote installations.

At the heart of the Motorola ACE3600 technology is its powerful processing and communications capability that allow polling communications combined with peer-to-peer and RTU-to-host event based reporting.

On-site control conducted by an RTU can be based on local conditions, downloaded parameters as well as system-wide conditions using data imported via RTUs from other sites. The protocol conversion capability of the RTUs allows integration of intelligent sensors through Ethernet, RS-232 or RS-485 ports.

The ACE3600 RTU may simultaneously communicate with other RTUs, SCADA control center and IEDs via up to five communication ports.

The processing power of the ACE3600 provides powerful calculations and data analysis for the most critical, real-time monitoring and control applications. The ACE3600 may emulate a range of communication protocols. This facilitates gathering and analyzing data from multiple sensors and IEDs at remote sites.

The RTU provides on time data transmission to numerous locations that have access to the SCADA system via a wireless network or an Internet/Intranet connection.

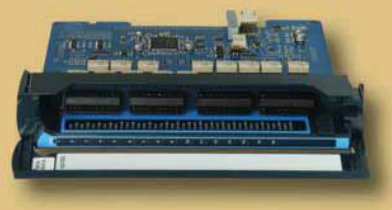
Each RTU in the network can also act as a communication node or Store & Forward (S&F) data repeater to cover a wider geographical area. This function also supports redundant data transfer links to achieve an even higher level of data reliability and dead spot elimination.

ACE3600 RTU

ACE3600 CPU Module

- Secure RTU Operation can be achieved by utilizing encrypted data communication.
- The Power Supply operation can be monitored and controlled via the application and RTU firmware.
- The Digital Output relays are supplied with manually switched control lines, which permit disabling relay operation. This disabling can be activated during field maintenance.
- The RTU can be used with the Motorola-supplied high quality rechargeable back-up battery pack or with a range of 3rd party rechargeable batteries.
- Reduced power consumption can be invoked to extend the RTU backup operating time. A battery diagnostics feature is available to monitor the battery health and remaining operating time.
- All RTU modules are designed for "Hot Swap". If permitted by the application, I/O modules can be replaced without stopping RTU operation.
- The RTU architecture is" dual-radio ready", which makes it suitable for operating as a wireless-to-wireless or wireless-to-other data communication media node.
- The RTU utilizes VX-Works™ based multitasking operating system firmware that maximizes operating performance.
- The RTU has up to 20 fast counters on the 32 DI module and 16 bit Analog resolution on the AI module. The AI refresh rate is 10 ms, which allows multiple calculations to be performed quickly.
- The RTU extended operating temperature range is - 40 to +70°C, which ensures reliable operation even under the most-harsh environment (refer separately to radio and battery temperature restrictions).
- Cost effective RTU configuration is achieved by utilizing configurable mix of DI and DO connections on a single I/O Mixed I/O module.

To withstand harsh outdoor environments, the ACE3600 RTU can be integrated into a variety of standard and customized enclosures made from high quality materials, such as painted metal, and stainless steel supplied by Motorola and more types such as plastic, fiberglass, etc. supplied by 3rd party vendors.



ACE3600 Module

Note: Motorola continuously adds enhanced features to the ACE3600.

The System Tool Suite - A Modern Tool for Programming

The System Tool Suite (STS) is a framework for designing, configuring, programming and maintaining ACE3600 based SCADA systems. The STS provides the system engineer with a centralized project oriented intuitive tool that enables quick implementation of advanced SCADA projects.
The combination of ACE3600's unprecedented flexibility and straightforward operation makes it a perfect tool for implementing and upgrading new and existing SCADA systems at minimum cost and with minimum effort.

The following are the main benefits of the STS:

- Project oriented tool - handles multiple sites from a system design approach.
- Integrates all SCADA related functions in a single tool – Configuration, Setup, Programming, Debugging and Maintenance.
- Provides a graphical view of system sites and the entire network.
- Automatically manages all project related files.
- Inventory library of RTUs, ports and I/O modules enables creating new sites simply by drag & drop operations
- Setup of RTUs, ports, I/O modules can be saved in user library for later reuse in other projects
- RTU Network files are created automatically per project
- Provides batch download of files to all sites in a single command (broadcast)
- Implements Graphical User Interface (GUI) based on .NET technology

Setup: System building and setup is performed easily by dragging RTUs, ports and I/O modules from the Inventory library to the system view.

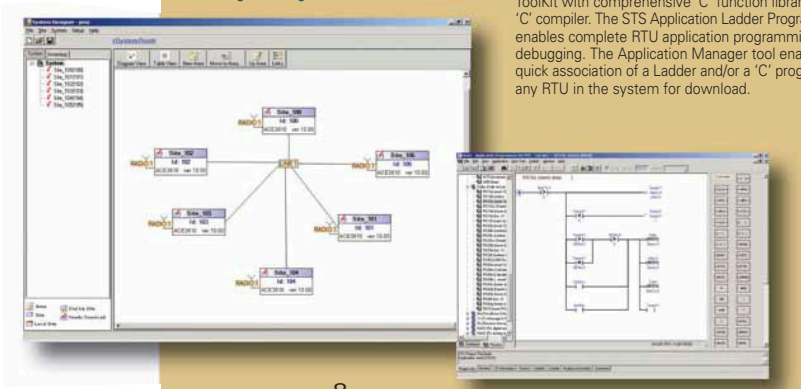
The system can also be presented in table format. Clicking on a site icon enables the following main operations:

- Edit site ID, site name, and site description.
- Configure Ports, I/Os and other advanced parameters.
- Associate files to a specific site.
- Save configured items (ports, I/Os or the entire RTU configuration) to User library.
- Download or Upload firmware, configuration, Date & Time, network and other associated files.
- Upload RTU configuration, Data Loggers, application program source files, etc.
- Perform complete hardware test.
- Edit Ladder programs associated with this site.

Several RTUs can be gathered under one geographical /logical area in the system view. This allows dividing the system view into several areas. The STS also enables batch file downloading to any group of RTUs in the system. The user may choose which files will be downloaded to the RTUs in the batch download. This feature saves considerable time and effort during new system setup or when numerous changes are made.

Programming: The ACE3600 application programs may be written in "Ladder Diagram or in "C" programming language. Motorola provides a 'C' ToolKit with comprehensive 'C' function library and 'C' compiler. The STS Application Ladder Programmer enables complete RTU application programming and debugging. The Application Manager tool enables quick association of a Ladder and/or a 'C' program to any RTU in the system for download.

STS Programming Screen



Motorola SCADA Communication Solutions

The ACE3600 and the family of MOSCAD RTUs are designed for reliable, secure, versatile and easy to implement connectivity to a wide range of SCADA control centers offered by leading vendors worldwide.

Motorola offers multiple interface options to these control centers using a range of industry standard interfaces.

LAN Interface Processor (IP Gateway)

The IP Gateway plugs into the standard LAN (Local Area Network) of your Ethernet-based SCADA system and allows wide area connectivity. Via the IP Gateway, the control center has instant access to a large number of RTUs in the network and collects up-to-date field information. A Client/ Server architecture allows the IP Gateway to distribute data to multiple clients – both to one or more SCADA control centers and to all RTUs in the field.

The Motorola IP Gateway's API (Application Programming Interface) provides easy implementation of a driver for the SCADA application software. Via the API, the IP Gateway may seamlessly integrate with virtually any Master Control Center (MCC) utilizing industry standard operating systems such as, UNIX, Windows 2000 and Windows XP. Several major SCADA software vendors have already developed drivers for MOSCAD IP Gateway connectivity.

The IP Gateway provides interface for communications with the field installed ACE3600 and MOSCAD RTUs.

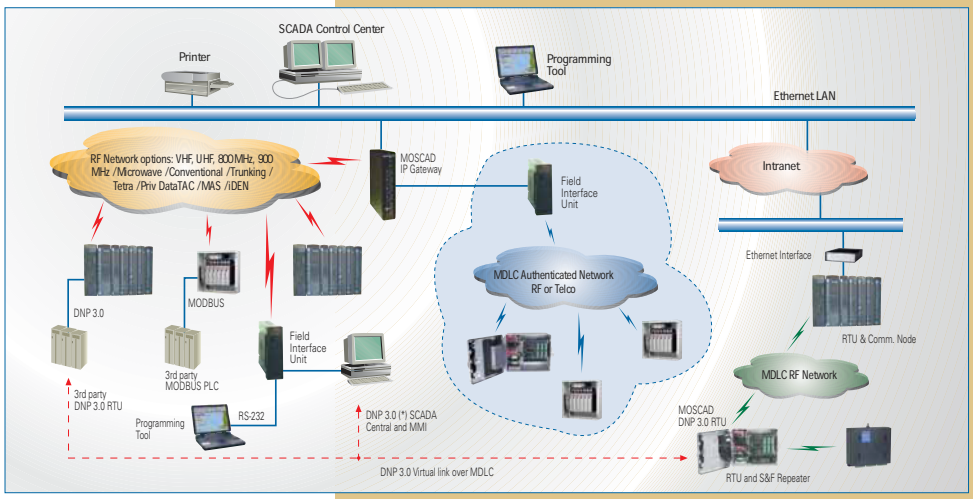
OPC Interface Server (M-OPC)

The M-OPC uses the OPC (OLE for Process Control) and is based on standard MS Windows connectivity to a wide range of modern control centers. The M-OPC runs on an Windows XP or Windows 2000 standard PC OS and makes the field data instantly accessible to the SCADA computer. M-OPC manages the communications with the field installed ACE3600 and MOSCAD RTUs and provides a great opportunity for SCADA system owners to migrate to OPC.

Interface Using CPU as FIU

The ACE3600 and the MOSCAD Family of RTUs may interface to a wide range of MCC utilizing the MODBUS, DNP 3.0 or the IEC-60870-5-101 protocols. Such MCC connectivity can be established via a MOSCAD or MOSCAD-L CPU, which act as a Field Interface Unit (FIU).

Integrated Motorola SCADA Architecture



(*) Similar solutions apply for IEC 60870-5-101 protocol based systems