



# ACE3600

## Motorola Solutions for Oil & Gas Systems

*Oil & Gas companies worldwide are aiming at achieving more efficient, reliable and safer system control, lowering operating and maintenance costs, improving data security and deferring unnecessary investments. System architects have a challenge in defining an optimal architecture that satisfies the operating requirements, helps prevent fraud and assures secure operation of the network.*

*To achieve these goals the use of Oil & Gas SCADA systems is quite common. Nowadays many installations are already equipped with Remote Terminal Units (RTUs), Intelligent Electronic Devices (IEDs), smart sensors, remotely regulated valves, variable speed pumps, actuators, etc.*

*This application note focuses on describing SCADA solutions implemented with the ACE3600 family of RTUs. MOSCAD and ACE3600 based systems are used worldwide, providing both cost-effective and uncompromising solutions for computerized control of Oil & Gas systems.*



## Oil and Gas Applications Overview

Oil & Gas companies operate a large number of remote and widespread installations such as: drilling and exploration, production, transportation, refining, compression and pressure reduction stations, storage and distribution sites, etc. Each remote site must be continuously monitored and controlled to ensure normal and safe operation as well as to confirm asset security.

SCADA RTUs are required to provide accurate measurement of key parameters, such as: oil

and gas flow rate, accumulated flow, line and wellhead pressure, status of pump operation, monitoring of tank level, etc. Modern systems typically integrate additional functions aimed at achieving enhanced system monitoring and control: oil spill, leakage and fire detection and emergency shut down (ESD).

ACE3600 based SCADA systems can be configured and applied optimally to perform monitoring and control of Oil & Gas pipelines and remote production sites:

- On-shore and Offshore Production fields
- Metering at remote Gathering and Distribution Stations
- Pressure and Flow Monitoring along Pipelines
- Monitoring and Control of Pipeline Cathodic Protection
- Monitoring levels at Tank Farms
- Ship Loading Control
- Support Leak detection systems





Remote Control

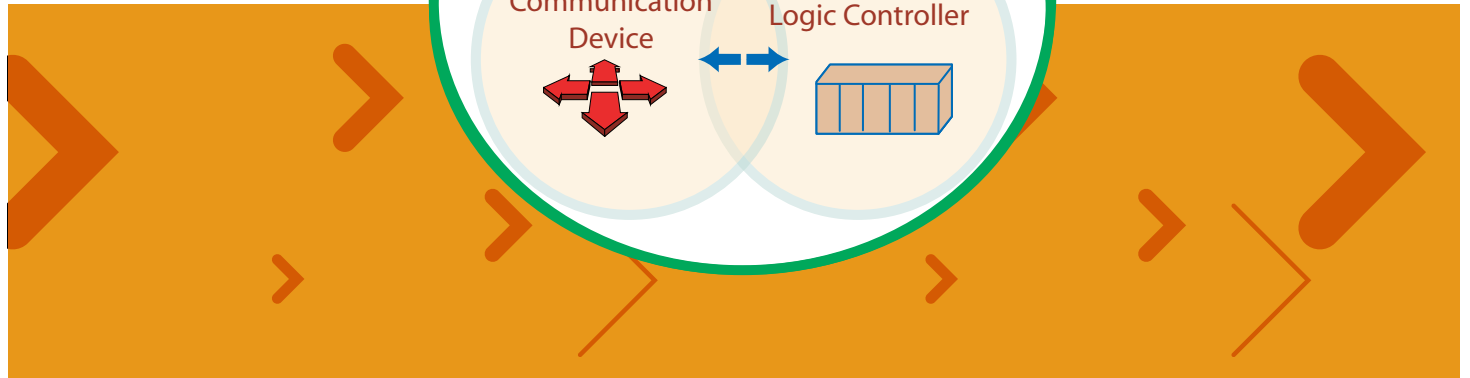
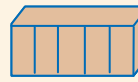
Local Control

**A powerful combination  
of two functions**

Intelligent  
Communication  
Device



Programmable  
Logic Controller



## ACE3600 RTUs – Main Features

### COMMUNICATION FLEXIBILITY

When designing a SCADA communications network between field-installed RTUs and the control center, the system integrator must pay great attention to issues that are unique for the selected media and the data protocol. Among the popular communication media supported by ACE3600 systems are fiber-optic links, telephone and leased lines, VHF/UHF conventional radio including 800 MHz trunked radio, analog and digital wireless networks, UHF Multiple Address Systems (MAS), Broadband data over Internet protocol (IP), Spread Spectrum communication, microwave, satellite, etc. In an actual system, one may have to utilize a combination of several media, carefully selected for each segment of the SCADA network.

### DATA NETWORKING

Taking advantage of the seven-layer OSI/ISO protocol, each ACE3600 RTU connected to the SCADA network may act as a communication node or Store and Forward (S&F) repeater, in addition to its main role. These nodes help resolve coverage issues when a certain RTU cannot communicate with other RTUs or with the control center due to geographical path or propagation problems.

Each ACE3600 RTU can be configured to relay messages between two RTUs or between the RTU and the control center, utilizing the same wireless channel. Alternatively, it can act as a communication

node, linking between two different communication media such as radio, wireline, fiber optics, satellite, microwave etc.

### VERSATILE DATA TRANSACTIONS

ACE3600 RTUs can be polled for new data by the SCADA control center, but they can also initiate unsolicited calls via the wireless network. The typical link establishment process is very fast since radio is inherently a multi-drop medium and the only delay factor is the channel access time; typically 5-200 ms depending on type of radio. The unsolicited call is commonly referred to as "Event Driven Report" and takes place when an unusual condition or alarm is detected by an RTU.

### CALCULATION CAPABILITIES

ACE3600 performs many complex calculation tasks faster, holds larger local databases and controls the site without active intervention from the Control Center.

The ACE3600 has built-in capabilities to perform gas flow calculations at the RTU level according to the AGA Standard. Among the supported calculations are: AGA-3 combined with NX-19, AGA-5, AGA-7 and AGA-8.

### PROGRAM MAINTENANCE and REMOTE DIAGNOSTICS

ACE3600 RTUs provide enhanced tools for convenient and economic hardware and software diagnostics, both locally and remotely, without interrupting the RTU operation system. They eliminate

the need for frequent visits to the remote sites for the purpose of diagnostics, calibration, program and parameter updates, etc.

Upon detection of a problem ACE3600 allows to upload or download data (database, programs and parameters) from any RTU connected to the network, transfer data between RTUs or to/from the control center and perform post-event auditing.

This enables detecting and analyzing even very rare events, such as: temporarily interrupted communication and momentary power failure. It also reduces the response time and the associated costs for repairs to a minimum.

### STS TOOLBOX

Programming and configuration of the ACE3600 RTU is performed with a Windows™ PC based tool called STS. It runs on Windows based Operating Systems.

The STS is the only tool required to perform all programming, configuration, and network definition functions. This PC program can be connected to the ACE3600 network at any site and via that connection it may access all other RTUs. The STS enables creating site and network configurations, update the system database, diagnose and analyze the quality of communication, provide error statistics, and help detecting unusual system problems.

# ACE3600 RTU has the Most Advanced Architecture

## SYSTEM MODULARITY

The Oil & Gas industry has a need for SCADA system solutions, which can be seamlessly adapted for controlling various remote sites with specific sensors and intelligent devices. Occasionally, customers may have a need to modify or upgrade the data communication device and the installed RTU must be ready for easy and economical implementation of such changes.

The ACE3600 RTU is a modular, upgradeable and expandable RTU and can be adapted for a wide variety of digital and analog I/O options and communication interfaces.

## SCADA SECURITY

Implementation of SCADA solutions requires use of secure communications in order to avoid the possibility of fraud related events to take place. Control systems can be vulnerable to a variety of attacks, examples of which have already occurred in many systems worldwide. It is extremely important to have an embedded end-to-end solution that ensures SCADA messaging security. The ACE3600 RTU provides combined prevention means involving data encryption.

## OPERATING REDUNDANCY

ACE3600 RTUs support redundant communication links to the control center. These configuration options are needed in some critical applications to guarantee fail-safe transfer of the control function from the primary device or channel to a preconfigured backup solution.

## POWER SUPPLY SOLUTIONS

A unique feature of ACE3600 RTUs is that they operate as an effective as a UPS. The controlled equipment (compressor, motor

drive, valve, etc.) as well as the RTU and communication modem may operate either from the AC power supply or from the integrated backup battery and may operate even if the battery is faulty or disconnected. This is a highly important feature in SCADA systems.

Since AC power (117V/230V) might not be available at all remote installations, MOSCAD-M RTUs feature low power consumption electronics with built-in power saving mode. A unique power management function, allowing use of small size solar panels (less attractive to theft) and low capacity battery but still providing extended operating time.

## HIGH OPERATING RELIABILITY

Experience has shown that typical life-cycle cost of SCADA hardware (RTUs, radio modems, etc.) is more than double its initial purchase cost. This figure takes into consideration the system purchase cost, programming, commissioning, post-installation modifications, maintenance and occasional repairs.

Use of ACE3600 RTUs and associated communication solutions helps to cope with these challenges aimed at reducing the total cost of ownership.

Efficient, convenient and remotely performed maintenance is highly important in SCADA systems serving the Oil and Gas industry. This function includes remote configuration, upload or download of parameters and application programs. It is possible to execute this program from any RTU connected to the network, even "over-the-air" or from a distant location or via a phone line modem connection to one of the RTUs.





**ACE3600 SYSTEM DIAGRAM**

A typical ACE3600 based SCADA system for Oil or Gas applications performs remote monitoring and control of variety field devices and sensors. The system may use a combination of physical wireline, fiber-optic, microwave, satellite or other wireless communication, creating an integrated SCADA network.

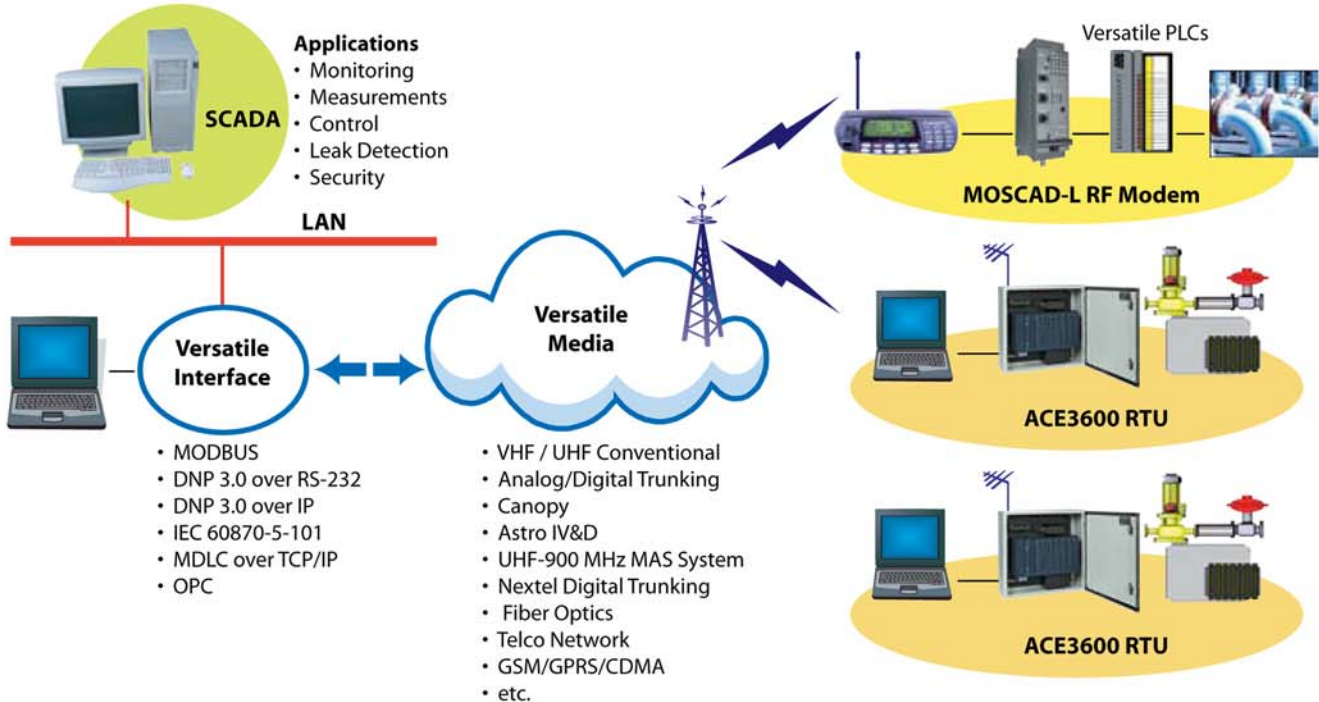
# Summary of Benefits

The unique capabilities of ACE3600 RTUs and SCADA systems allow implementation of advanced system solutions in which each and every RTU can fulfill four important tasks:

1. ACE3600 RTUs perform local monitoring and control functions via their Input/Output ports. These I/Os can be in the form of serial ports, dry or wet contact inputs, FET or relay outputs and analog inputs and outputs.
2. ACE3600 RTUs allow seamless wireless networking between RTUs, either directly or via other RTUs, which act as S&F repeater over a single radio frequency. These capabilities provide sig-

nificant network cost savings eliminating the need for additional channels and reduce the need for costly repeater stations.

3. ACE3600 RTUs provide reliable data networking function, enabling an RTU to communicate with other RTUs over a variety of communications media. In addition to its main role, each RTU may also serve as a communication node linking two or more communication media into the network.
4. ACE3600 RTUs may act as protocol translators for 3rd party vendor devices. This can be achieved using either the protocol encapsulation or protocol emulation method.



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