Spectrum Power™ 3 SCADA

Spectrum Power™ 3 SCADA applications provide all functions required for monitoring, alarming, measuring, calculating, archiving and safe supervisory control based on analog and digital measurements, accumulator values, and momentaries. Supervisory Control in Spectrum Power 3 handles remote control of individual switching devices in correlation with the power network topology, thus improving switching reliability and reducing effort for configuration of interlocking conditions. The operator may define switching procedures and interlocking conditions and test the procedures in a study mode. State-of-the-art database capabilities support online modification and transparent database activation of incremental changes.

Benefits
- Improved switching reliability
- Reduced effort for configuration of interlocking conditions
- Quicker knowledge of and response to issues
- Streamlines processes for network operators
- Open architecture facilitates system growth and communication expansion
- Enables compliance with NERC CIP security standards

Key Features
- Architecture is based on established international IT standards: data links via ICCP (Inter-Control Center Communication protocol). RTU communications with both serial and TCP/IP versions of DNP 3.0, SVG-based one-line diagrams.
- Includes sophisticated topological features, like topological network coloring, interactive topological tracing and integrated topological interlocking checks.
- Features designed for efficient and safe operator interaction, with graphic user interface and operator guidance
- Monitoring of spontaneous status changes
- Online definition/adaptation of switching procedures, e.g. interlocking conditions
- Interactive topological tracing
- Operator definable switching procedures that can be tested in a study mode

User Interfaces
The Spectrum Power 3 SCADA User Interface enables the operator to monitor and control the network. The SCADA displays comprise:
- Message summaries: alarm, operator notes, abnormal status, test status summary
- Graphical network displays with pan/zoom/declutter features
- Curve displays of realtime and historical trends. Curves can be integrated as objects in one-line diagrams
- Tabular displays: displays measurement/process data in a tabular form with multiple columns
- Access rights can be defined at a work station and/or user level

SCADA Processing
SCADA updates the operational database to reflect changing network conditions, tags, and operator notes in the following ways:
- Detection of status changes and value changes, determines whether an incoming event shall be processed as a value change.
- Verify analog data for validity: checks for reasonable values, linear or nonlinear conversion to engineering units, zero threshold correction, estimated value substitution
- Quality code processing: indicates the source of the value, such as an RTU, calculated via data processing or estimated via a Spectrum Power 3 application. Whenever an object value is invalid, the code indicates the reason
- Limit monitoring: multiple limit pairs for each analog point, each limit has a unique alarm deadband, rate of change limit monitoring, summer/winter limit sets.
- Sequence of Events - provides a summary of the events by date and time of occurrence, database point, and current status.

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Manual updating - Operator can update measurements, such as when a telemetered data point shows an invalid quality code or data points are not transmitted. Each manually updated value is clearly indicated by the quality code “manually updated”.

Data calculations - combines incoming real time values (operands) logically or arithmetically and stores the result in the operational database. Calculated results are then processed like any other single value, e.g. for limit checking. Calculations can be defined either generically (applicable to all equipment of a given type) or for specific items.

Tags and notes: Tags are displayed with the related object in network diagrams and substation overviews and the Tag Summary. Pre-defined tags can be applied or removed from network elements ranging from an individual device to an entire substation. Tag notes provide additional information on the conditions surrounding the tag.

Store Data in Database with Time Stamp.

Sends data to historical information system for archiving and after-the-fact analysis for power system disturbances.

Rate-of-change detection of analog measurements with limit violation check and alarming

Data source value selection provides SCADA and other applications the best available data value for every SCADA measurement

Alarm Processing

The alarm summaries display the message text; the network diagrams (overview, one-line) and the station tabular summary show the field device symbol flashing. Direct links between a message entry and the associated field device enable the operator to quickly maneuver between summaries and one-line displays. SCADA alarms also produce an audible alarm, with ability to inhibit or delay. Different tones can be configured to represent different degrees of urgency.

Topology

The topology feature dynamically updates the network equipment colors based on the calculated network statuses. Standard coloring modes include energized, voltage level, and network group. The network group based coloring represents additional states, which include loop, parallel, and overloaded. The topology feature uses tracing in the following modes to do the network group based coloring:

- Upstream
- Downstream
- Trace between selected objects all connected objects
- Common upstream point trace
- Loops
- Parallels

Supervisory Control

The operator can perform supervisory control actions via substation network diagrams, tabular displays, or Switching Procedure Management. Supervisory control will be applied to single switching devices (on/off, open/close), tap changers (one step up/down), continuously regulating devices (raise/lower). A supervisory control action is a three-step procedure performed for security reasons: select, specify action, then execute. There are also check–before-operate features, such as interlocking and operator authority. The list below is checked prior to sending a remote control to a field device:

- Individual rules for comparison of a measurement with a user-defined constant
- Tags
- Invalid switching status quality
- Local/remote e.g. for substation and bay
- One step higher/lower: The field device (e.g. transformer) is already in highest/lowest step position
- Energization of a piece of equipment (isolated, grounded, energized, de-energized)
- A line is affected by a fault (then no energization allowed)
- Network is isolated (grounding allowed only, when isolated)
- Network is grounded (then circuit breakers and load switches may not be closed, unless it is a ground switch)
- Network is under load (then isolators such as disconnectors must not be operated)
- Opening of a switch would cause loss of power

Each successfully executed supervisory control action is logged with the user and console identification. Remote control actions are monitored for timeout during control execution.

Switching Procedures

Switching Procedure Management (SPM) is used to create, edit, check, execute, and reuse switching procedures. Switching steps are pre-checked against all interlocking conditions and user access rights to highly improve the reliability and security of switching actions. Predefined control sequences facilitate complex switching operations, such as feeder switching and busbar changing, in a simple, step-by-step dialog. Simulation Mode enables the operator to test a switching procedure and its effect on the system without impacting the runtime system. Step flow control features are available, such as wait, break, resume, conditional step (if else, end if, while). The switching procedure indicates workflow status, such as new, editing, checked, approved, active, suspended, completed. The switching procedure report logs all executed steps together with their results.