Elliott Bay Engineering, Inc.

Professional Electrical Engineering & Power Conversion Services

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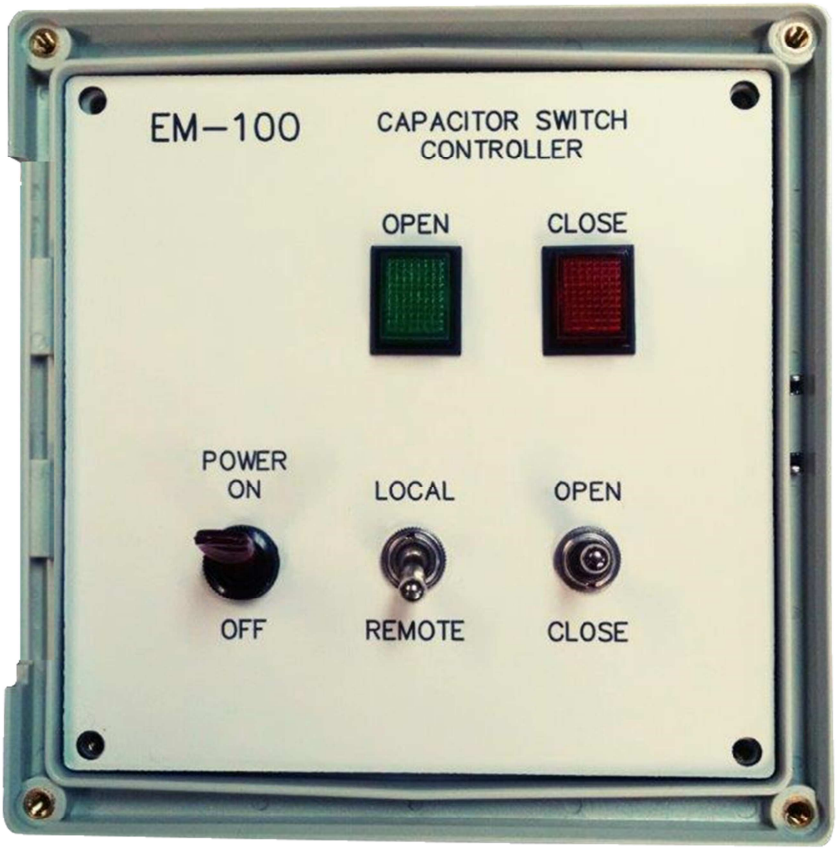
EM-100 Capacitor Switch Controller



THE EM-100 CAPACITOR SWITCH CONTROLLER provides a flexible and economical control interface for utilities to manage switched capacitor banks.

The controller can be operated via OPEN - CLOSE commands from the utility's AMI or SCADA system or via a dedicated wireless monitor and control interface i.e. cellular, WiFi, 900mhz etc…

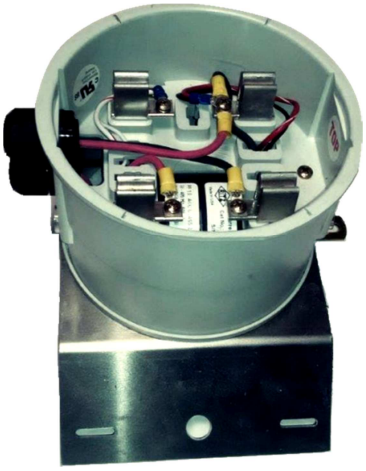
The timing for the OPEN - CLOSE commands can be programmed to suit the utility's capacitor switch control standards.

The EM-100 is fitted with a wireless communications and control module that can interface with some utilities existing AMI networks. The module can be configured to enable local/standalone control of the capacitor bank switches.

This feature utilizes neutral current and line voltage measurements that are received from an adjacent network meter or from other current and voltage measurement equipment.

This feature enables the capacitor banks to be switched ON or OFF depending on local voltage levels to compensate for local voltage fluctuations.

The devices can also be controlled remotely via network communications to enable individual system-wide override control of capacitor bank switches.



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Local/Manual Control

The EM-100 is equipped with manually-operated toggle switches that can be used by maintenance personnel to open and close the capacitor bank switches locally. Switch timing functions are programmable to suit individual utility capacitor control standards.

GRIDSTREAM SBR

The EM-100 can be fitted with a Gridstream-ready Single Board Radio module. The SBR 900 MHZ Utilinet programmable interface module enables utilities with L+G Gridstream networks to monitor and control switched capacitor banks by configuring the SBR as a Gridstream end point.

The Gridstream enabled SBR endpoint can wirelessly interface with an adjacent Gridstream ready, capacitor network meter. The wireless interface can either be as an adjacent mesh endpoint or via the network head-end.

The SBR can be configured with local analytics capability to enable local/automatic control of the capacitor bank switch. The SBR can also be configured to pair with compatible, adjacent, network meters to form a distributed monitor/control system. This configuration allows the installation to be configured without a wired connection between the adjacent meter and the EM-100.

The SBR can be connected via one of two serial ports to additional interface devices e.g. operator/human interface devices, computer and wireless network equipment.

AMI Capacitor Bank Monitor/Controller Development History

AMI Capacitor Bank Monitor/Controller Development History

Elliott Bay Engineering, Inc., in cooperation with Georgia Power Company and Marwell Corporation, has developed a control interface to enable utilities to control distribution power factor correction capacitors by utilizing the communications and control capabilities provided by their AMI network.

Initially, Georgia Power Company and Marwell developed and deployed AMI meters to actively monitor neutral current in wye connected 3 phase capacitor banks. Current flowing in the neutral leg is a likely indication of problems with the capacitor bank, i.e. an open or blown fuse could result in abnormally high neutral current levels being detected by the system.

After successfully deployment of AMI network meters to monitor capacitor bank neutral currents, Georgia Power Company was able to use their existing AMI network to help them detect exceptions within their power factor correction system enabling them to respond to capacitor bank problems as they arise rather than to rely on yearly system inspections to reveal problems with the capacitor bank system. Because the existing AMI system was supported 2 way communication, the next logical step was to selectively control capacitor switches via the AMI system.

The existing AMI system included residential meters with remotely controllable connect/disconnect relay switches which utilized 1 double pole relay per meter. However, typical 3 phase capacitor banks switches utilize separate, independent, OPEN and CLOSE switches for capacitor bank switching. Georgia Power Company and Marwell approached Elliott Bay Engineering, Inc. to develop a switch interface that would receive OPEN/CLOSE signals based upon the status of the integral meter disconnect switch and subsequently coordinate the control of the appropriate OPEN or CLOSE capacitor bank switch.

The AMI system issues a momentary OPEN or CLOSE command to the meter integral disconnect/reconnect switch. The disconnect/reconnect switches are designed to maintain their last commanded position indefinitely regardless of power outages etc. The capacitor bank switches require a fixed duration, momentary, pulse to the desired OPEN or CLOSE operator.

To avoid undesired unnecessary operation of the capacitor switches, the controller delays for 60 sec on power up and a 30 second “debounce” delay precedes each switch operation.

Because power factor correction capacitors are energy storage devices, it is important to avoid switching fully charged capacitors into the system. Once a capacitor bank has been connected to the system then removed, it is necessary to allow the capacitors to partially discharge before reconnecting the capacitors to the grid.

WE ENERGIES
AMI CAPACITOR MONITOR/CONTROL DIAGRAM