



## THE POWER OF ASSET MANAGEMENT: FOUR CAPACITOR BANK PROTECTION RELAYS NOW AVAILABLE TO MAXIMIZE BANK AVAILABILITY

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As one of the world's largest and leading high-voltage capacitor suppliers, Cooper Power Systems has provided the protection for thousands of capacitor banks and filters all over the world. A new line of Edison Idea capacitor bank protection relays (iCP) are the distillation of this experience. The iCP relays provide protection for numerous capacitor bank configurations ranging from double-wye, ungrounded wye, and multi-string fuseless banks. The basic protection philosophy is to maximize bank availability, ensuring the var supply required for efficient system operation.

All four protection relays have a common look and feel and provide advanced power quality, metering,

communication, and PLC functions. Cooper's ProView interface software package for PCs running the Microsoft® Windows® operating system enhances the relays with exclusive features and functions including the Idea Workbench, Virtual Test Set, and Relay Replay software functionality. These features provide the unprecedented ability to observe the relay's protection and control functions in operation while simultaneously offering unexcelled flexibility for custom applications.

### Four Relays

The iCP-191 relay is designed for the protection of multi-string, fuseless, grounded shunt capacitor or filter banks. The relay calculates

the apparent impedance of each string and determines capacitor unit failure when the impedance changes beyond a threshold. Protection on a per-string basis permits enhanced sensitivity and rapid identification of capacitor problems to the affected string. Per-string-based protection permits greater bank availability as the protective levels are set relative to actual string capacitor overvoltages. This compares to traditional methods based on the cumulative effects measured at the capacitor bank neutral or a derived internal tap point. These traditional methods look at the cumulative affect of shorted capacitor sections distributed throughout the bank. Employing the iCP-191 relay results in the bank remaining in service with multiple shorted series sections in various strings until the individual capacitor unit overvoltage is exceeded. This greater Mvar availability can be especially critical during a system-wide disturbance.

The iCP-440 relay is a full-featured relay suitable for shunt capacitor or filter bank protection and automatic voltage control applications. The relay is ideally suited for new or retrofit applications of fuseless or internally/externally fused banks requiring neutral unbalance protection. Able to accommodate voltage- or current-based neutral unbalance, the relay provides flexible protection for both grounded and ungrounded banks, in either single- or double-wye bank configurations. The relay easily permits nulling of inherent bank unbalance and compensates in real time for varying system unbalances (single wye). This provides maximum sensitivity for detection of internal bank problems. The iCP-440 detects capacitor unit failure when the compensated neutral quantity increases beyond a threshold. On double-wye banks, the relay's Self-Canceling Failure Detection maximizes bank availability by avoiding compromised protection settings. The neutral unbalance



Cooper Power Systems now offers four Edison Idea capacitor bank protection relays for numerous capacitor bank configurations ranging from double-wye, ungrounded wye, and multi-string fuseless banks.

algorithms permit secure and economical protection on banks of various var ratings.

The iCP-630 relay uses a unique Negative Sequence Current Detection technique that takes the negative sequence capacitor current and voltage measurements taken at the bus and applies them against an admittance model of capacitor bank. The result is a highly accurate and stable algorithm that allows identification of failed capacitor units without the need for any neutral transducer. Single- or double-wye bank configurations are accommodated. The relay easily permits nulling of inherent bank unbalance and compensates for system unbalance thus permitting maximum sensitivity to detection of internal problems. The result is reduced bank procurement, installation, and maintenance costs by eliminating the need for the voltage transformer connected from the neutral to ground. The

unbalance algorithm permits secure and economical protection of ungrounded shunt capacitor or filter bank, using externally fused or fuseless capacitor units. The relay also provides automatic voltage control functions.

The iCP-640 voltage differential / impedance relay is designed for fuseless or externally fused shunt capacitor or filter bank protection and provides automatic voltage control capabilities. The relay is ideally suited for new or retrofit applications where highly sensitive capacitor unbalance detection based on voltage differential or impedance is required. The impedance element allows detection of self-canceling failures that are not detectable by traditional voltage differential relays. The relay easily permits nulling of inherent bank unbalance, providing maximum sensitivity to detection of internal problems. The relay detects capacitor unit failure when the compensated

voltage differential or impedance change quantity increases beyond a threshold. The unbalance algorithms provide secure and economical protection on banks with a wide range of var ratings.

### Efficient System Operation

Cooper offers protective relays utilizing a wide range of capacitor bank protection methods including voltage differential, neutral unbalance, impedance, and negative sequence algorithms. Complementing their unbalance functionality, the relays also provide backup overcurrent for reactor and resistor protection and under- and overvoltage protection, voltage control, and comprehensive metering including trending up to the 15th harmonic.

Refer to Comparison Table below to select your Idea Capacitor Bank Relay. Contact your Cooper Power Systems representative to find out how to use these four new relays to maximize your capacitor bank availability today. ■

### Comparison Table of Edison Idea Capacitor Bank Protection Relays

Relay	Grounded	Ungrounded	Double Wye	Neutral Current Based	Neutral Voltage Based	Voltage Differential Based	Impedance Based	System $I_2$ Based	Per Phase Protection	Per String Protection	Fuseless	Ext. Fused	Int. Fused
iCP-191	X						X		X	X	X		
iCP-440	X	X		X	X						X	X	X
iCP-630		X	X					X			X	X	
iCP-640	X	*				X	X		X		X	X	

\* Impedance function only.