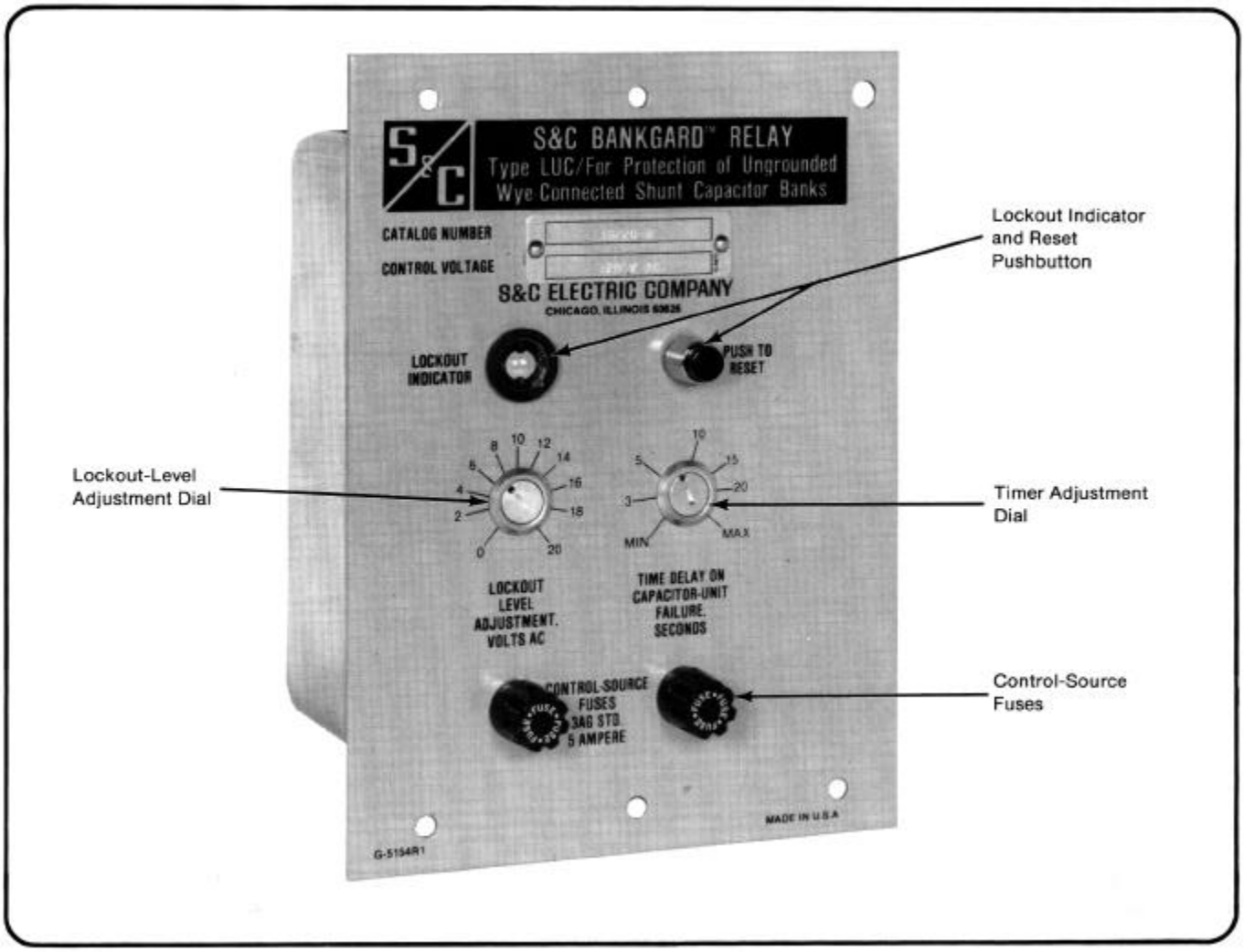
# S&C Bankgard™ Relay - Type LUC

## For Protection of Small- to Medium-Sized Ungrounded, Wye-Connected Shunt Capacitor Banks

The S&C Bankgard Relay-Type LUC provides low-cost protection for small- to medium-sized station-type, *ungrounded,* wye-connected shunt capacitor banks having up to five series groups of capacitor units per phase. It is a solid-state electronic device that detects neutral-to-ground voltage increments caused by isolation of faulted capacitor units from the bank by their respective fuses. When a predetermined neutral-to-ground voltage is exceeded, the Type LUC Bankgard Relay signals a switching device to disconnect the entire bank, thus protecting the surviving capacitor units in the bank against cascading voltage overstress.

The Type LUC Bankgard Relay does not provide system-voltage or capacitor-bank unbalance compensation. It is therefore applicable only to the sizes and configurations of capacitor banks for which the loss of a single capacitor unit results in a neutral-to-ground voltage increment that is at least twice the maximum expected error voltage. (A certain amount of error voltage is always present between the energized capacitor-bank neutral and ground, due to system-voltage unbalance and to inherent capacitor-bank unbalance resulting from manufacturing-tolerance variations among capacitor units in the bank.) S&C Data Bulletin 532-80 tabulates the capacitor-bank sizes and configurations for which the Type LUC Bankgard Relay is suitable, based on the maximum expected total of percent system-voltage unbalance plus percent inherent capacitor-bank unbalance.

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Supersedes Photo Sheet 532-700 dated 4-5-82 



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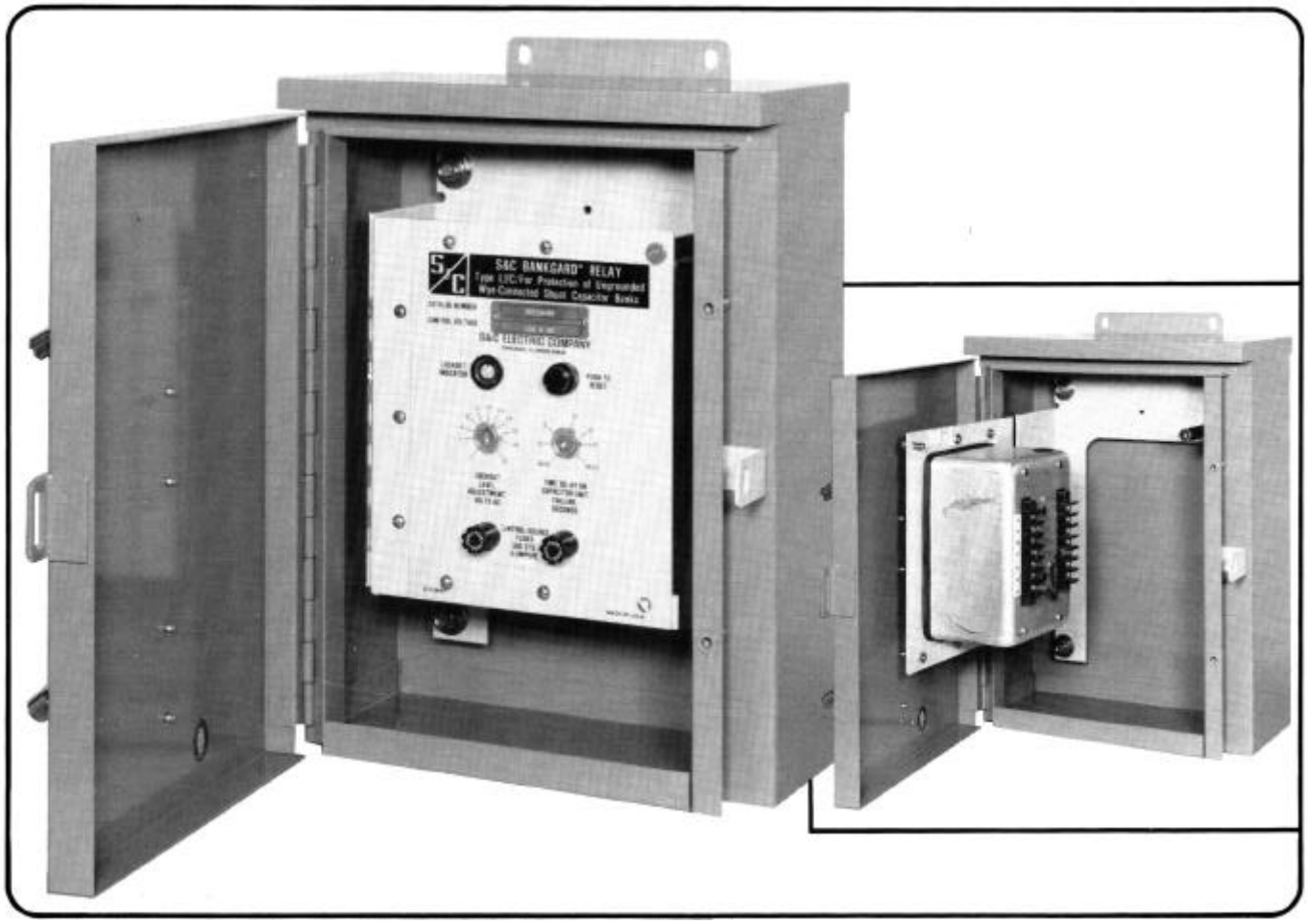
Typically, the capacitor-bank neutral-to-ground voltage is monitored by an S&C Outdoor Voltage Sensor for systems rated through 34.5 kv or by a 15-volt-ampere S&C Potential Device for systems rated through 230 kv-each of which produces an output voltage directly proportional to the voltage applied to its line terminal. Alternately, a fully-system-rated voltage transformer or small distribution transformer may be used for voltage sensing.

The voltage signal, thus derived, is fed into the Type LUC Bankgard Relay, where it passes through an isolation transformer and a bandpass filter to eliminate the effects of harmonic components which may be present at the capacitor-bank neutral. The voltage signal is then compared to a preselected, field-adjustable lockout-level setting. When-as a result of the loss of one or more capacitor units within the bank-the derived voltage signal exceeds the Bankgard relay's lockout-level setting, it activates a built-in electronic timer. The timer (field-adjustable from 2 to 30 seconds) is factory-set for a lo-second delay to allow time for individual capacitor-unit fuses to respond to evolving faults within the units-so as to permit visual identification of the units in need of replacement. When the timer completes its cycle, a latching-type output relay supplies an opening signal to the switching device to effect isolation and lockout of the entire bank. The output relay is provided with an additional isolated contact which can be utilized for remote indication.

The S&C Bankgard Relay-Type LUC is furnished completely assembled and ready for flange mounting in any suitable indoor location (an accessory kit is available for relay-rack mounting). For outdoor use, an accessory weatherproof aluminum enclosure is available. If the latter accessory is included, the Bankgard relay will be hinge-mounted inside the enclosure.

Time-delay and lockout-level adjustment dials, lockout indicator and reset pushbutton, and control-

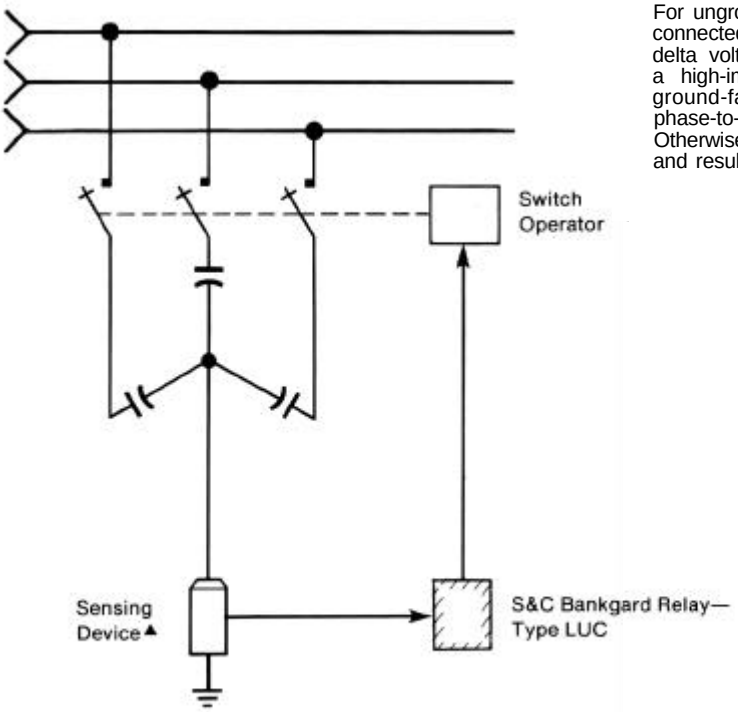



**S&C Type LUC Bankgard Relay mounted in the accessory weatherproof aluminum enclosure. Relay is hinge-mounted to facilitate access to the terminal blocks.**

source fuseholders are located on the front of the device. Readily accessible terminal blocks are at the rear. Control voltage must be provided by an auxiliary power source-typically the source provided for the switching device. The Bankgard relay is available in models for use with control voltages of 48 or 125 volts dc; 120 or 240 volts 60 hertz.

The Bankgard relay, with the precision and compactness of solid-state electronics, offers matchless design features and proven circuits that withstand the rigors of power equipment applications. Superior reliability is assured through use of "enhanced quality" integrated circuits, and single printed-circuit-board construction that minimizes the number of interconnections. The glass-reinforced epoxy circuit board and all attached components receive a resilient, conformal, silicone-dip coating to provide environmental and vibration protection. The output-relay contacts are of gold-flashed silver-cadmium oxide to ensure long service life. Lockout-level and time-delay adjustments are maintained within 3% of settings over an ambient temperature range of –40°F to +160°F.

Metal-oxide surge protectors at critical points in the control circuits provide the optimum in surge protection. S&C's unique surge-control techniques have been field proven through years of successful application in hostile utility-substation environments. The capability of every S&C electronic device to withstand voltage surges is confirmed by two factory quality-check tests: The ANSI Surge Withstand Capability Test (ANSI Standard C37.90a, 1974); plus a much more severe (5-kv, 3.75-joule) capacitive-discharge test specially developed by S&C to duplicate or exceed voltage surges measured in EHV power substations. The specified surges are applied at all terminals of the device. Additional factory tests include a dielectric test, a 168-hour screening test at maximum-design operating temperatures, and functional checks (both before and after the screening test).




**System diagram.**

For ungrounded-source applications, wherein the source is a delta-connected tertiary transformer winding, a grounded-wye broken-delta voltage-transformer "bank" with shunt resistor-referred to as a high-impedance grounding transformer (normally required for ground-fault detection)-is required to maintain the stability of phase-to-ground voltage relationships for all but fault conditions. Otherwise spurious signal voltages could appear at the neutral of, and result in isolation of, the capacitor bank.

▲ A 15-volt-ampere S&C Potential Device or S&C Outdoor Voltage Sensor, and having a system voltage rating as follows:

| Nominal Source Voltage, Kv | S&C Potential Device System Voltage Rating, Kv, Nom. | S&C Outdoor Voltage Sensor System Voltage Rating, Kv, Nom. |
|---|---|---|
| 14.4 (and below) | 23 | 14.4 |
| 25 | 23 | 14.4 |
| 34.5 | 23 | 25 |
| 46 | 23 | — |
| 69 | 34.5 | — |
| 115 | 69 | — |
| 138 | 69 | — |
| 161 | 138 | — |
| 230 | 138 | — |

Alternately, a fully system-rated voltage transformer or small distribution transformer can be used.