

UCP-322 Capacitor Bank Protection Scheme

The UCP-322 Relay Scheme is a software file for use with ProView software and the Edison® Pro Protection and Control hardware platform. The UCP-322 is a complete capacitor bank protection and control package for all types of capacitor banks. The UCP-322 offers the following functionality:

- Voltage differential based unbalance protection with separate alarm and trip indications for each phase, providing faulted phase discrimination.
- Separate differential elements for those capacitor units both above and below the voltage tap point.
- For banks where a neutral to ground voltage is available, backup unbalance protection is also provided.
- Phase overvoltage protection
- Capacitor re-energization and discharge logic.
- Breaker failure logic.
- Oscillography and detailed event records.
- Front panel metering .
- Modbus communications (UCA 2.0 optional).

UNBALANCE PROTECTION

The UCP-322 uses a traditional voltage differential based unbalance method. For grounded wye capacitor banks, a VT is placed to monitor an intermediate voltage within each phase of the capacitor bank. This is most commonly performed by monitoring the so-called mid-point voltage, so that roughly an equal number of capacitor units is located above and below the intermediate VT location. The structure of the UCP-322 allows for this intermediate VT to be placed at any location in the bank, including the use of a set of low voltage capacitors and a low voltage VT at the neutral end of each phase of the

capacitor bank. The voltages for each section of the bank, those below and those above the intermediate sensing VTs, is monitored by separate alarm and trip overvoltage elements.

This method allows for faulted phase discrimination as well as identification as to whether the fault occurred above or below the tap VT. The differential nature of the scheme makes it immune to system voltage unbalances.

NEUTRAL UNBALANCE PROTECTION

When a neutral to ground voltage signal is available it is possible to use this voltage signal to perform the unbalance function. The phase voltage inputs are internally summed in an open delta, and this value is subtracted from the neutral voltage. The difference is equal to the overall capacitor bank unbalance.

Three levels of this phase compensated neutral unbalance protection is provided; a first stage alarm level, a second stage alarm with time delayed trip, and a third stage trip.

If phase voltage inputs are not available, two overvoltage elements are provided to monitor the neutral to ground voltage, providing basic unbalance protection, or continued unbalance protection in case of phase fuse operation on any of the bus voltage monitoring VTs. Both of these unbalance methods, along with the voltage differential method may be used together or separately.

OVERVOLTAGE PROTECTION

Both line-to-ground and line-to-neutral overvoltage elements are provided with alarm and tripping stages for overall bank protection.

CAPACITOR RE-ENERGIZATION

Reclose timing logic is included which prevents the capacitor bank from being re-energized before sufficient time has expired to allow

the trapped voltage on the capacitor units to discharge to a safe value.

BREAKER FAIL LOGIC

If the breaker is open (via external contact input) yet any current is flowing into the capacitor bank, a breaker fail condition is indicated. A breaker fail condition is also indicated if a disagreement occurs between the breaker's 52 contact and that expected by the relay.

OSCILLOGRAPHY AND EVENT RECORDS

The UCP-322 scheme shares, along with all schemes for the Edison Pro platform, the unique ability to not only display recorded oscillographic event records, but to replay them back through the scheme on a PC to see exactly how each protective element behaved during a fault event. In addition, setting changes can be made, then the actual fault record replayed, allowing the user to see how the behavior of the relay would have been affected by the revised settings.

APPLICATION DIAGRAM

When a PC running ProView is connected to the relay running the UCP-322 scheme, this view provides the user with live measurements, targets, alarms, and a graphic indication of circuit breaker position. See Figure 1.

HARDWARE REQUIREMENTS

The UCP-322 requires an Edison Pro relay equipped with one SI-2 and one SI-16 boards.

METERING

The UCP-322 provides front panel metering of:

- Capacitor bus phase voltages
- Capacitor bank tie point voltages
- Capacitor bank neutral to ground voltage
- Negative and Zero sequence voltages

UCP-322 CAPACITOR BANK PROTECTION SCHEME

- Remaining time delay before bank re-energization is permitted

Any of the twelve front panel meters may be user modified to display other desired quantities.

ORDERING INFORMATION

The UCP-322 may be supplied already downloaded in to an Edison Pro relay, or separately for downloading into an existing relay.

In either case, specify scheme number UCP-322.

Figure 1 - Application Diagram View in the UCP-322 Scheme

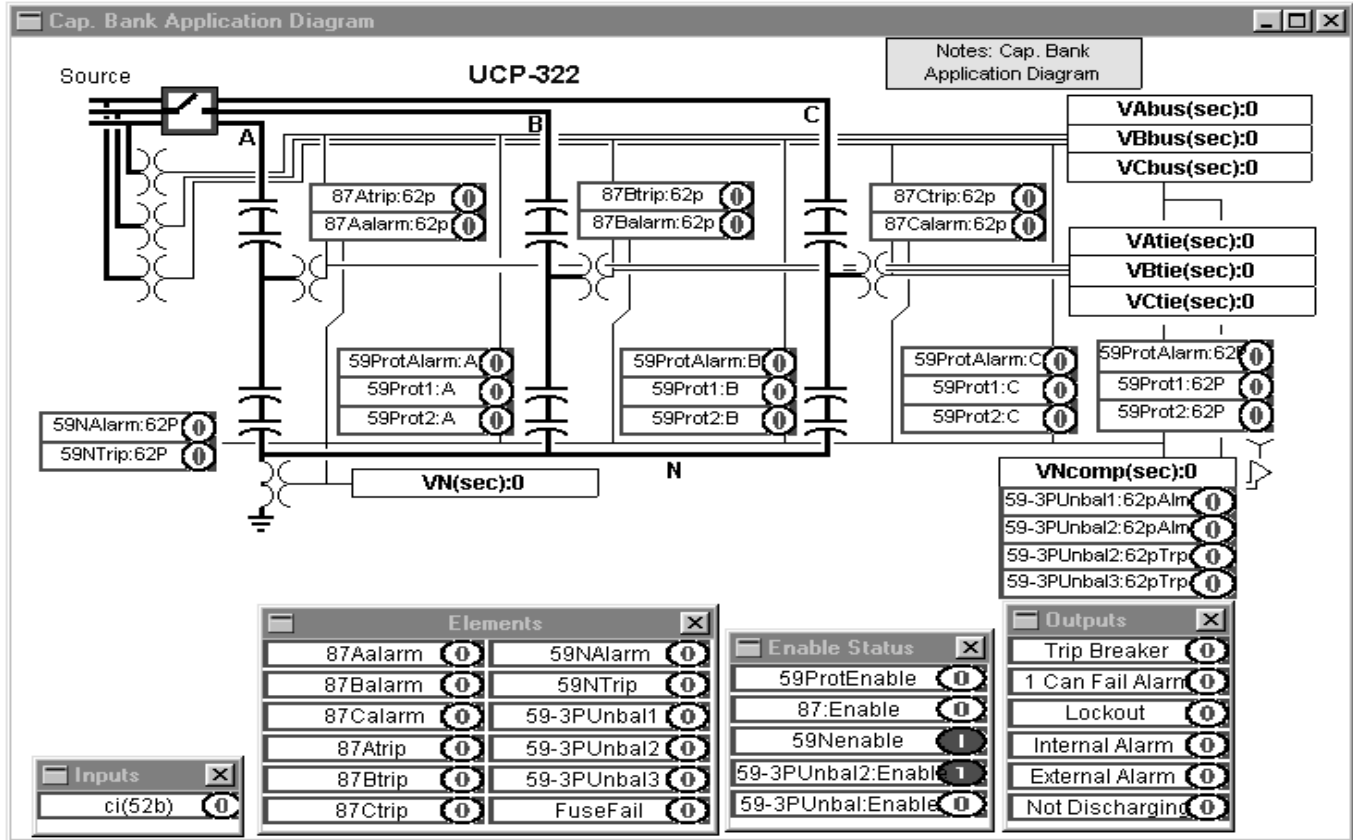


Table of key Protective Functions in UCP-322

Protective Function	Protective Function Description	Protective Function	Protective Function Description
27FF:62P	Fuse failure logic with time delay settings. Fuse failure for Bus VTs and Tie VTs	59N	Neutral voltage alarm and trip with time delays. Note this neutral voltage is not compensated for capacitor tolerances and system unbalance. 4 different levels available.
59-3Punbal:62P	Three Phase Unbalanced settings which include compensation for Inherent manufacturing tolerances of capacitor cans and System Unbalances. Three different levels of unbalance with associated time delays	87	Voltage differential with alarm and trip levels. Faulted phase is identification.