Application Note

Automatic Load Transfer Scheme Between Two Substations Without Using Direct Communication Between Switching Points

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Introduction

Reliability can be enhanced significantly by using VR-3S reclosers with PCD controls. These products enable the transfer of load(s) between two substations by using voltage detection on the line and employing functions 27 and 59 (undervoltage and overvoltage). Figure 1 shows the set up.

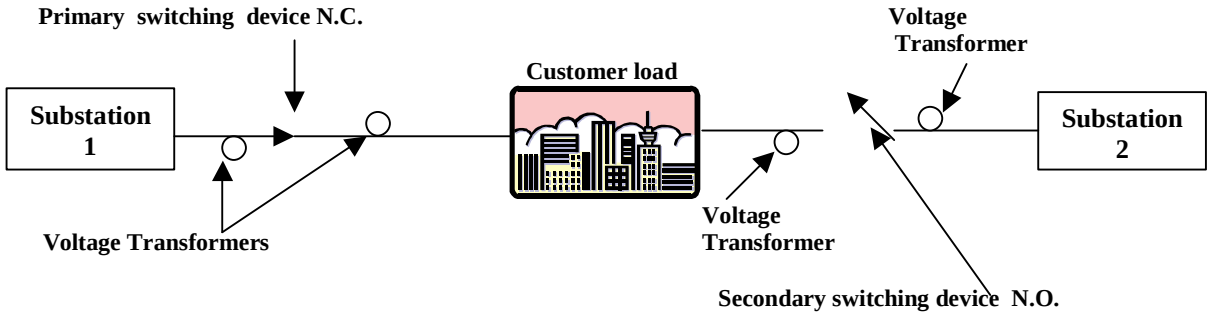

Figure 1

Devices

- Two VR-3S reclosers for primary and secondary switching points.
- Four voltage transformers (VTs) for voltage sensing on source and load side of the switching points. They must be placed on different phases, i.e. on A for the source side and on B for the load side. VTs are also an auxiliary AC source for the reclosers. Back up batteries, good for up to 48 hours, come with the reclosers.
- Substation breakers will have distribution relays to protect the feeder.

System Characteristics

Loads along the feeders are similar. Substation two is able to pick up the burden if switching point one opens and transfer the load.

Available faults levels are below 10,000 amperes. All switching will be in three-phase mode.

Transfer Logic

a. A fault occurs between substation one and the primary switching point (see Figure 2). After the circuit breaker in substation one goes to its reclose sequence and lockout, the PCD control in the recloser at the primary switching point will detect loss of voltage (27-3P) and open the recloser after a predetermined set time. At this point, the PCD control in this recloser will switch from the Primary settings program to Alternate 1 settings program. The recloser at the secondary switching point will sense loss of voltage (27-3P) from the load side and if voltage is still present (59-3P) at the source side (from substation two), it will close after a predetermined set time. The PCD control in this recloser will switch from the Primary settings program to Alternate 1 settings program. Restoration to the original state will be made manually.

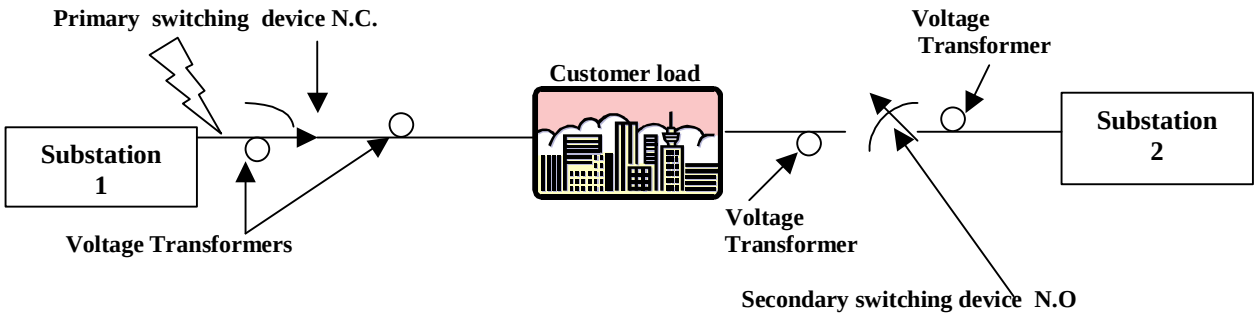

Figure 2

b. A fault occurs between the primary switching point (see Figure 3) and the customer load. The recloser and breaker in substation one use zone sequence coordination to avoid unnecessary trips at the substation. After the recloser goes to lockout, the PCD control in this device will switch from the Primary settings program to Alternate 1 settings program. The PCD control in the recloser at the secondary switching point will detect loss of voltage (27-3P) at the load side, and if voltage is still present (59-3P) at the source side (from substation two), it will close after a predetermined set time. At this point, the PCD control in this device will switch from the Primary settings program to Alternate 1 settings program. Restoration to the original state will be made manually.

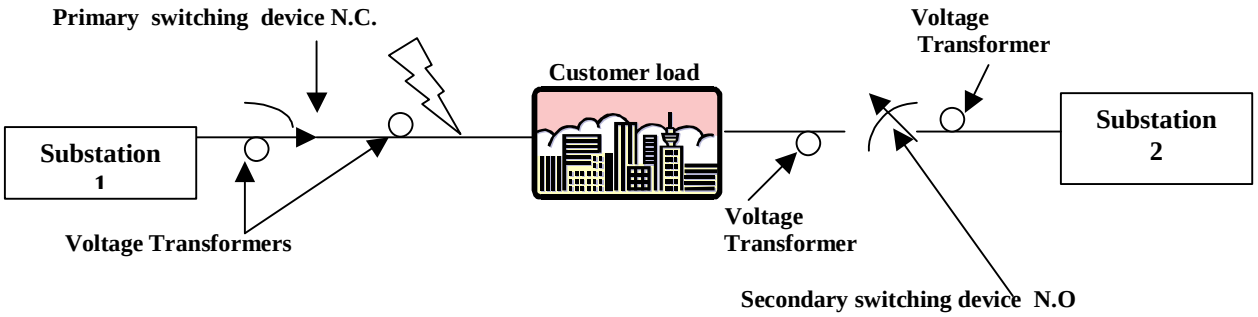

Figure 3

Options

The VR-3S recloser, along with the PCD control, offers a single phase tripping option for extra flexibility and to further enhance reliability in the system. It works similar to the three-phase mode, but it can be configured to isolate faulted phases only, leaving the others operating, minimizing customer outages. This option will require two extra VTs on the load side of each recloser and the addition of a LCM (Loop Control Module) to the PCD. This option is discussed in more detail in a separate paper.

Conclusion

This paper describes how the transfer scheme discussed works without communications between the IED controls in the reclosers, emphasizing the use of voltage sensing. However, SCADA or remote access communication using Modbus or DNP protocol can be utilized for restoration and to retrieve information from the PCD. To fully understand the operation of the recloser, information of the VR-3S and the PCD control must be read in order to apply the above scheme as described.

The latest information on the PCD control can be found at our website at www.abb.com/mediumvoltage. (Select PCD from the dropdown Shortcuts menu.)

For additional support or information please call ABB Inc. at 1-800-929-7947 Ext. 5 then 1 or +1-407-732-2000 Ext. 2510.