

Auto-Changeover & Feeder Automation

Reclosers & Sectionalizers

WHY AUTOMATE?

COMPETITION

SERVICE

VALUE

QUALITY

RELIABILITY

REGULATION

RATES BASED ON RELIABILITY

&

PERFORMANCE PENALTIES

REGULATION

SAIDI (**S**ystem **A**verage **I**nterruption **D**URATION
Index)

SAIFI (**S**ystem **A**verage **I**nterruption **F**REQUENCY
Index)

CAIDI & CAIFI (Customers)

FEEDER AUTOMATION

There's more than one way to skin a cat'



FEEDER AUTOMATION

- 1) SCADA MASTER CONTROLLED AUTOMATION
- 2) SUBSTATION RTU CONTROLLED AUTOMATION
- 3) DISTRIBUTED INTELLIGENCE (PEER-TO-PEER Comms.)
- 4) DISTRIBUTED INTELLIGENCE (No PEER-TO-PEER Comms.)

DISTRIBUTED INTELLIGENCE

CURRENT AND VOLTAGE
SENSING IS ESSENTIAL

DISTRIBUTED INTELLIGENCE

TWO BASIC TYPES:

1. Auto-Throwover (ATO)
 - Peer-to-Peer comms.
 - Non Peer-to-Peer comms.

2. Loop Automation
 - Peer-to-Peer comms.
 - Non Peer-to-Peer comms.

AUTOMATIC THROWOVER (Peer-to-peer)

ATO automatically switches a critical load from the normal supply to the alternate supply and back again.

Communications between controls can be either radios or fiber optics. Does not impede SCADA comms.

AUTOMATIC THROWOVER (Peer-to-peer)

MASTER: Main supply, normally closed.

SLAVE: Alternate supply, normally open.

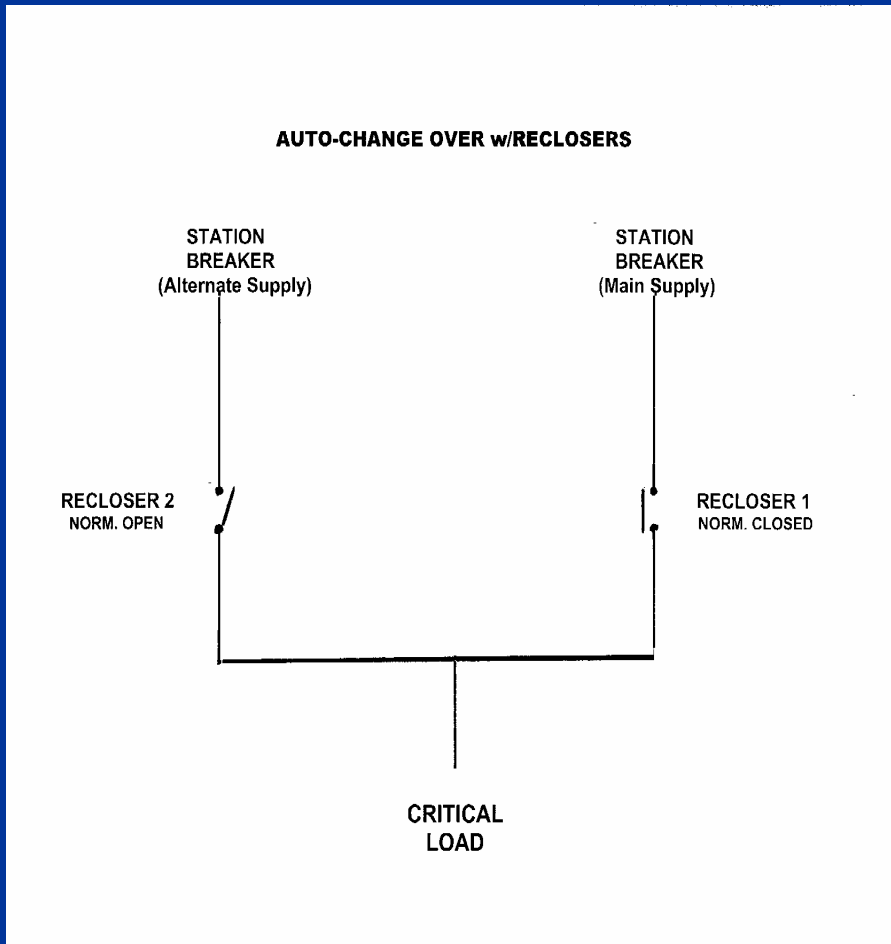
ATO

NORMAL STATE

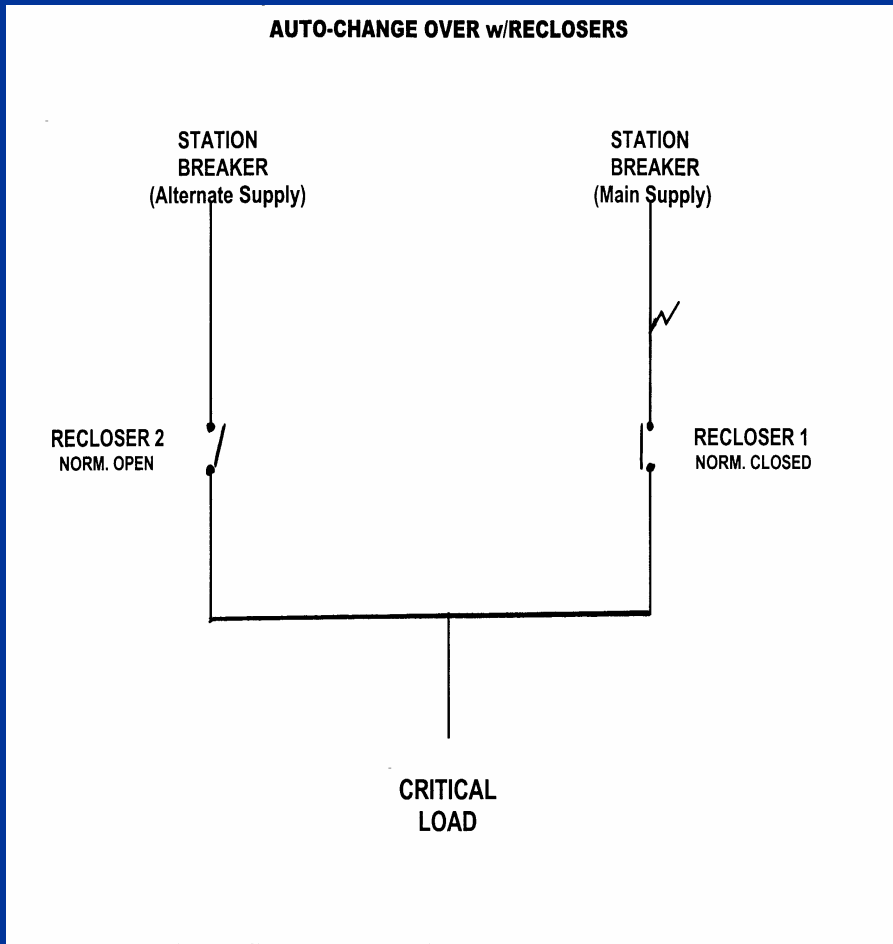
Station Breaker: Closed

Master: Closed

Slave: Open



ATO



UPSTREAM FAULT

Station Breaker: Locks Out

Master: Source Supply Dead

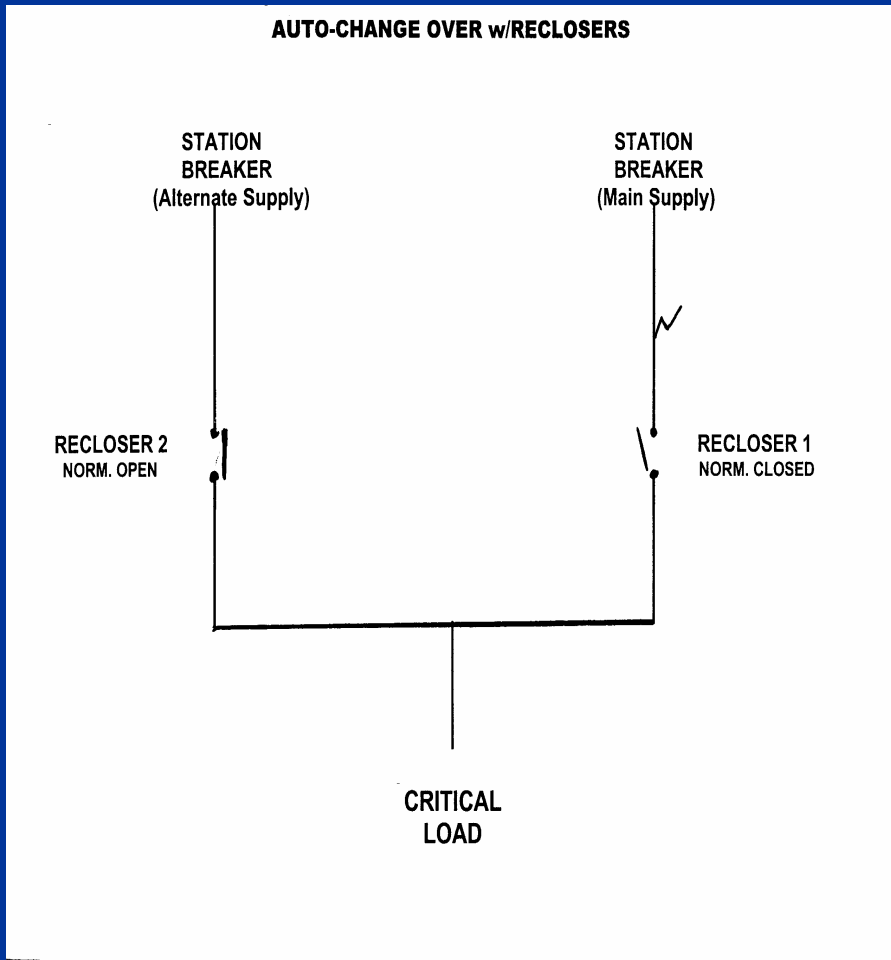
Slave: Load Supply Dead



Loss of Preferred Supply to Master Device

- ACO is on
- Master ACR is closed
- Slave device has supply at the source side and is ready to close
- Master and Slave are in “remote control” mode
- Master ACR load and source are both dead

ATO



Master:

Sees dead source side bushings. After a pre-set time it opens and sends a close command to the Slave.

Slave:

Follows 'Close' command only if source bushings show voltage, otherwise it rejects the command.

**CRITICAL LOAD
RESTORED**



ATO

NORMAL STATE

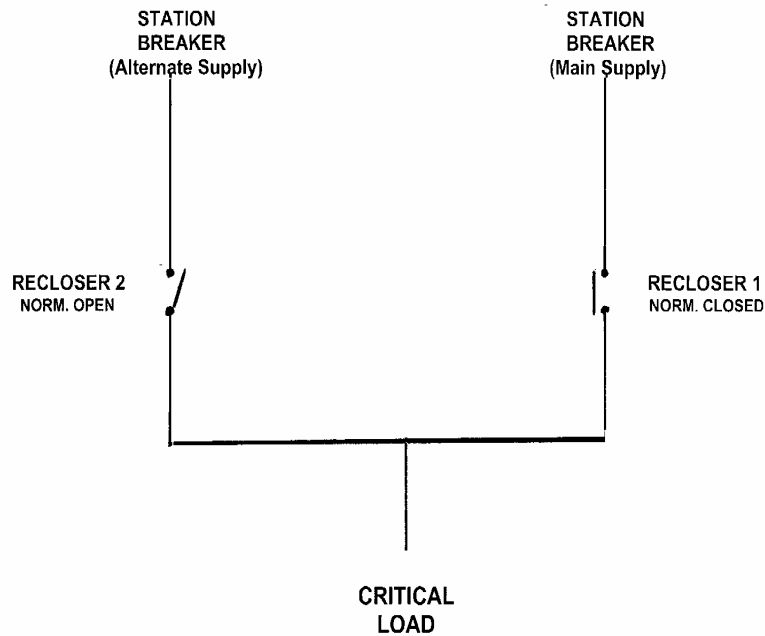
Station Breaker: Closed

Master: Closed

Slave: Open

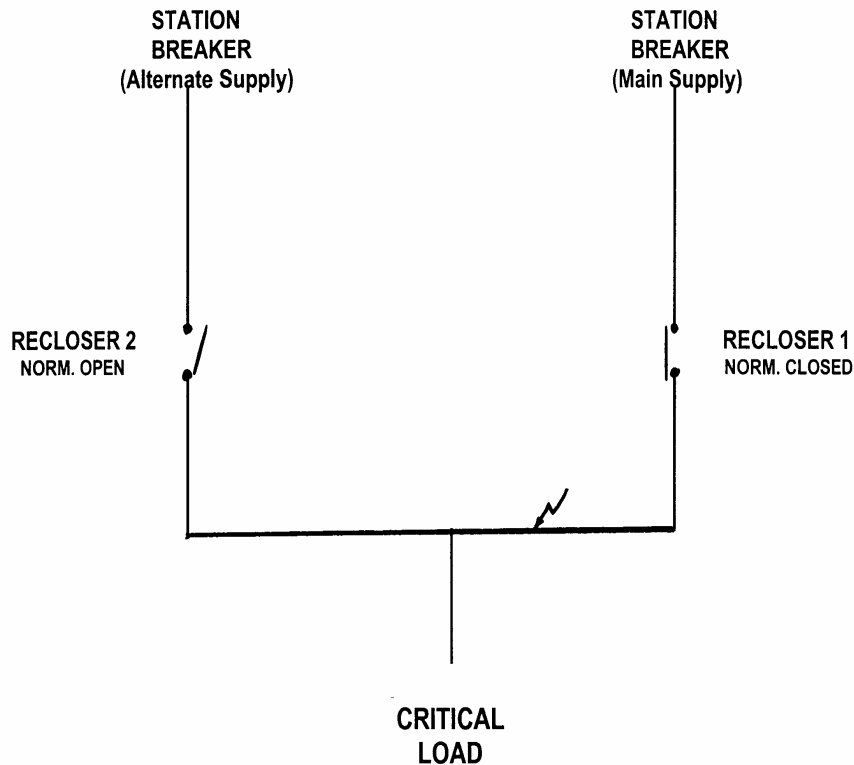


AUTO-CHANGE OVER w/RECLOSERS



ATO

AUTO-CHANGE OVER w/RECLOSERS



DOWN STREAM FAULT

Fault Location:
Downstream of
Master on Normal
Supply Feeder.



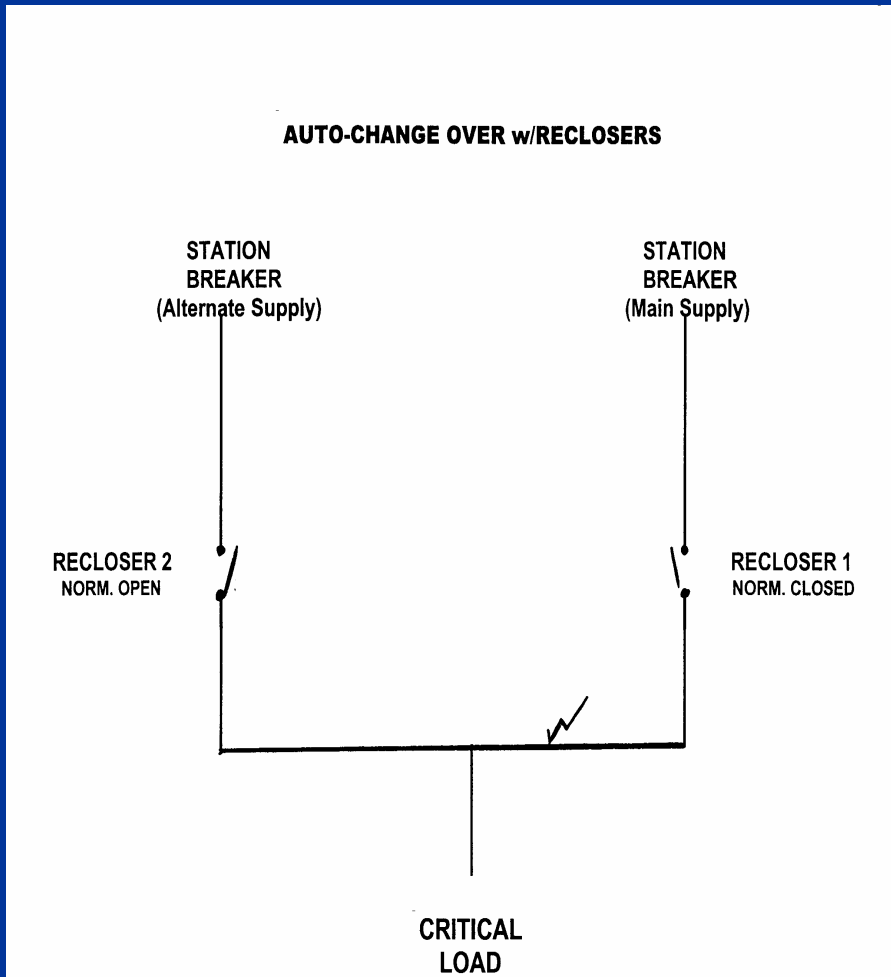
ATO

LINE FAULTED

Master:

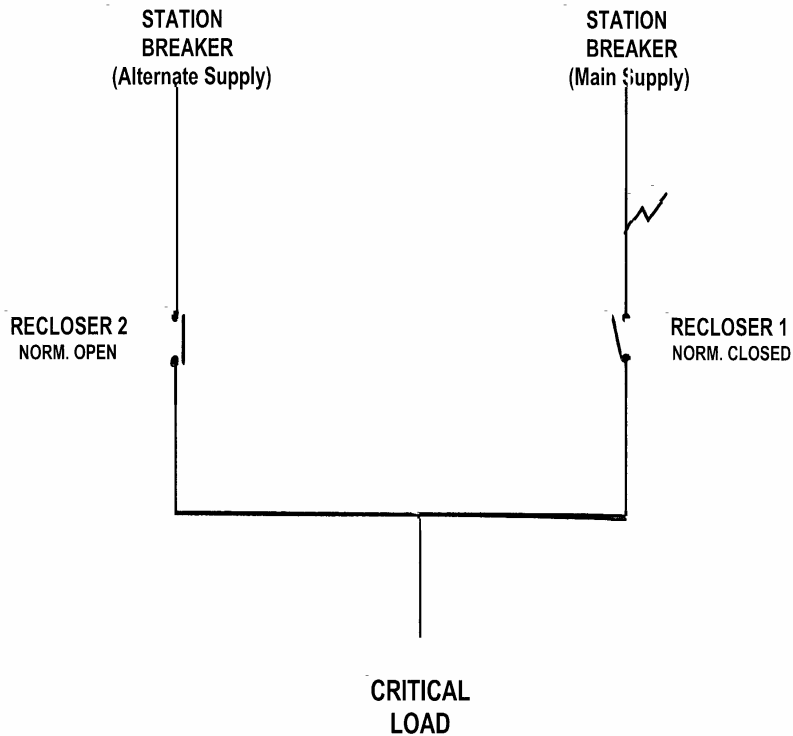
Through normal recloser protection settings 'locks out' and does not send a 'close' command to the Slave.

Critical Load Not Restored



AUTO-RESTORE

AUTO-RESTORE w/RECLOSERS



Station Breaker: Locked Out

Master: Open

Slave: Closed

Critical Load OK



Restoration of Preferred Supply to Master Device

- Auto-restore is ON
- Slave ACR is still closed
- Master ACR is still OPEN
- Master & Slave are both in “remote” mode
- Master ACR load & source side are both Live

AUTO-RESTORE

FAULT CLEARED

'MAKE' BEFORE 'BREAK'

or

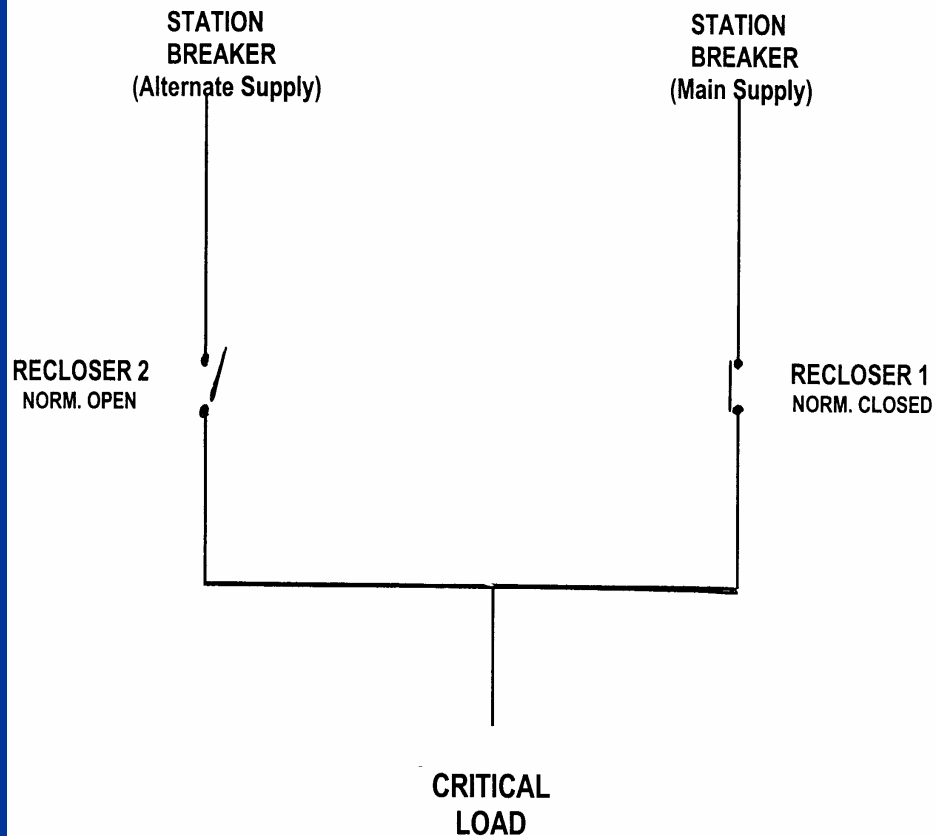
'BREAK' BEFORE 'MAKE'

Station Breaker: Closes

Master:

Sees source voltage return to normal. After a pre-set time the master then either: closes and sends an 'open' command to the Slave or it sends an 'open' command to the Slave then closes depending on set-up. 😊

AUTO-RESTORE w/RECLOSERS



LOOP AUTOMATION

Automatically restores power to the unfaulted sections the feeder normally achieved in less than one minute.

Can be programmed to automatically restore the reclosers to the pre-faulted configuration after the fault has been cleared.

LOOP AUTOMATION

TYPES:

No communications between devices – stand alone. (Can still communicate with SCADA)

With Communications between devices – Peer to Peer and with SCADA.

LOOP AUTOMATION

MAJOR DIFFERENCES

1. With no communications, the cost savings are many thousands of dollars per recloser.
2. With communications, you do not have to close back onto a fault in a limited number of sections of the loop.

Loop Automation Basic Rules

- **Rule A** - A Feeder recloser trips when it loses supply
- **Rule B** - A Mid-point recloser changes to “B” Protection Group and changes to single-shot for a short time when it loses supply
- **Rule C** - A Tie recloser closes when it detects loss of power on one side
- **Rule D** - A Feeder recloser closes when its source supply is restored or when it has supply on both sides
- **Rule E** - A Mid-point recloser closes when it has supply on both sides
- **Rule F** - A Tie recloser trips when it detects 50% reduction or a direction reversal in the power flow

Loop Automation Network

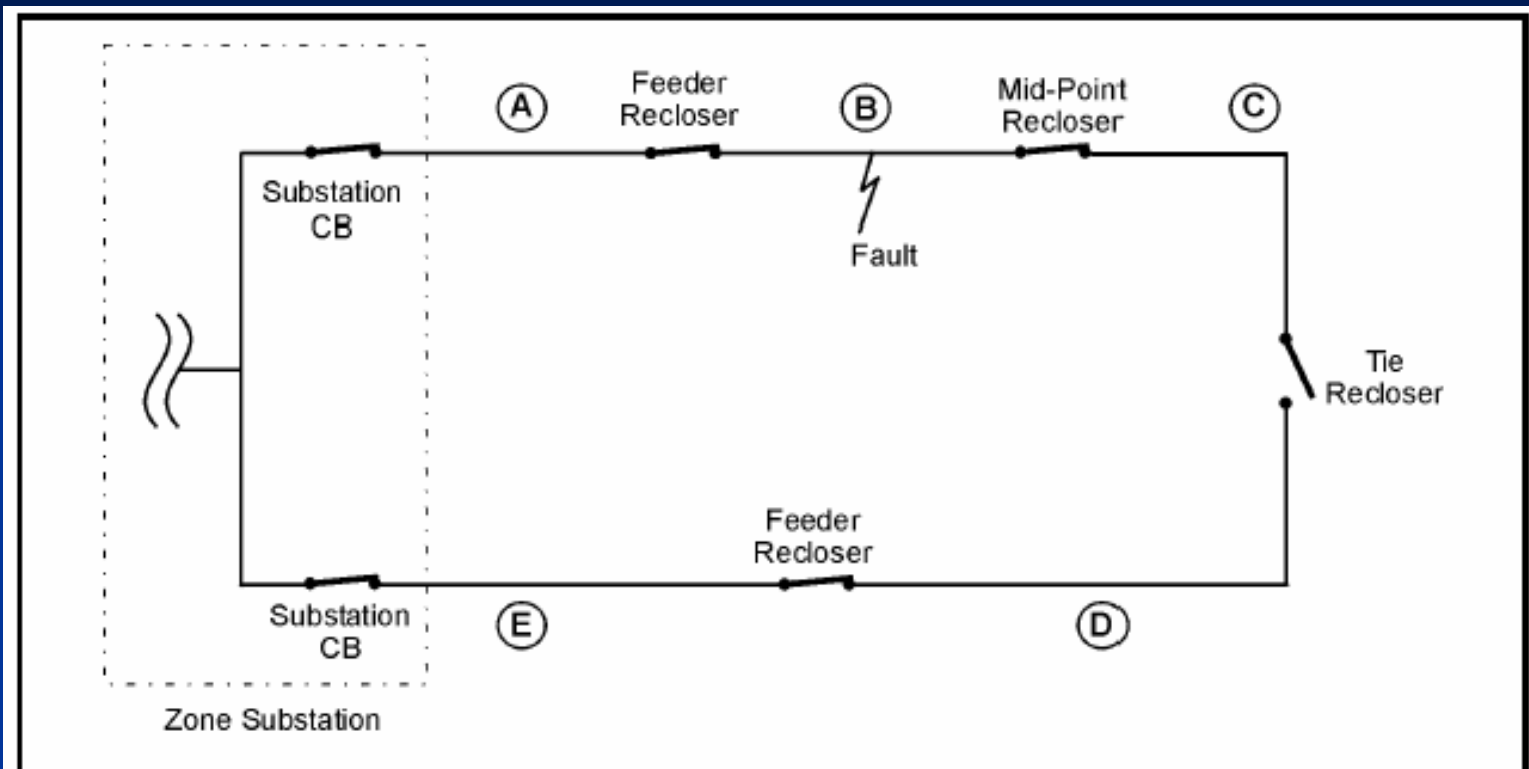


Figure 1: Example of Loop Automation Network

- Feeder trips – OC protection – reclose – Lockout
- Tie closes (rule C)
- Mid-Point trips – lockout (rule B)

Auto-Restoration

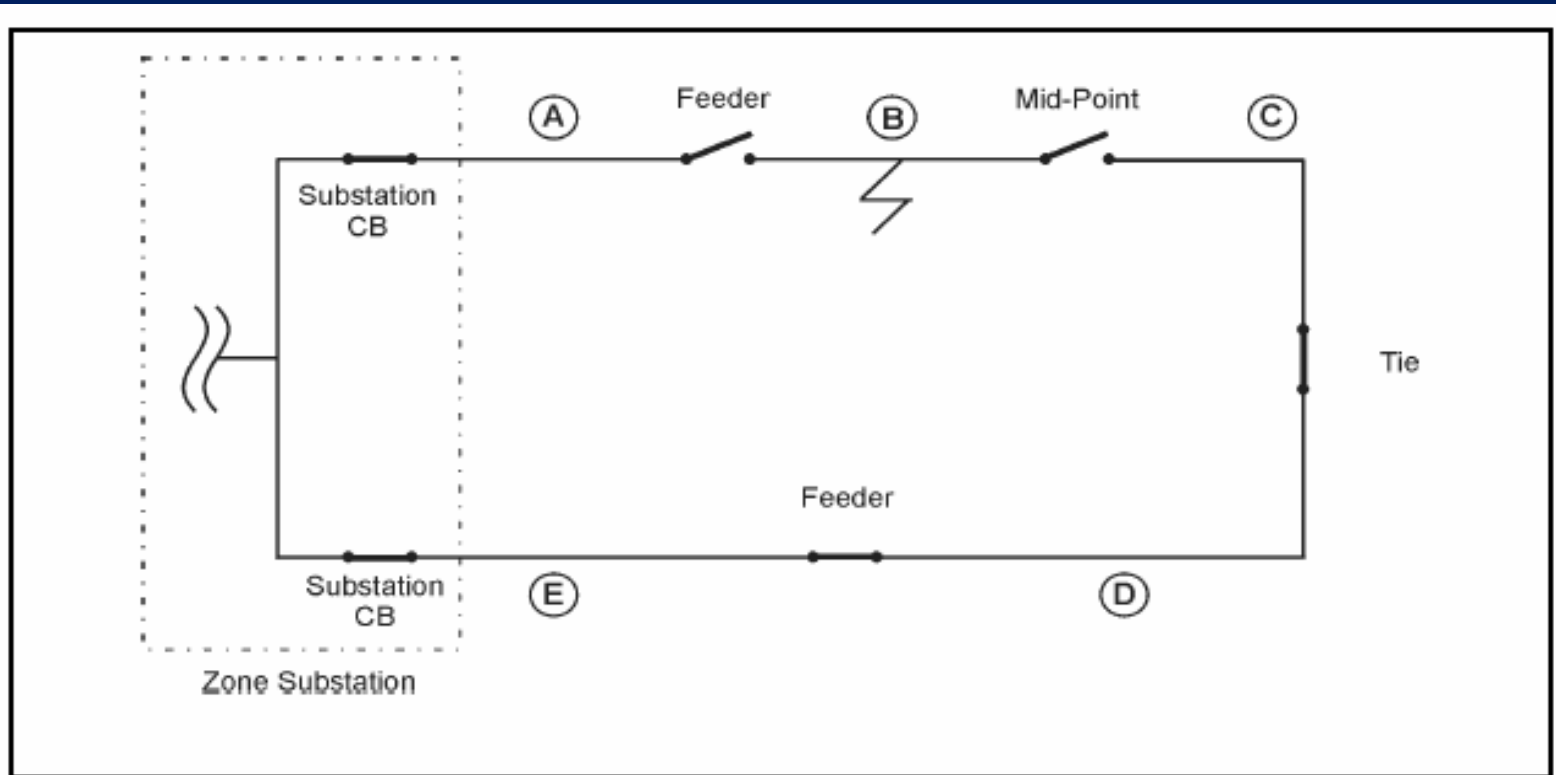


Figure 3: Auto-Restoration - Section B

- Feeder closed by operator , re-arms Loop Auto
- Mid-Point will close (rule E)

Automation

Reclosers & Sectionalizers

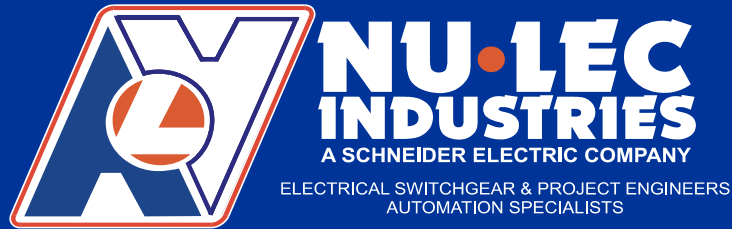
- Simple
- Reliable
- Current & voltage sensing included
- No need for external sensing devices
- Suitable for future planning & automation
- Low Cost

LOOP AUTOMATION

Interactive Loop Automation Demo. is available

at

www.nulec.com



THANK YOU!

