

# Sampled Values Stream handling

Process Bus applications

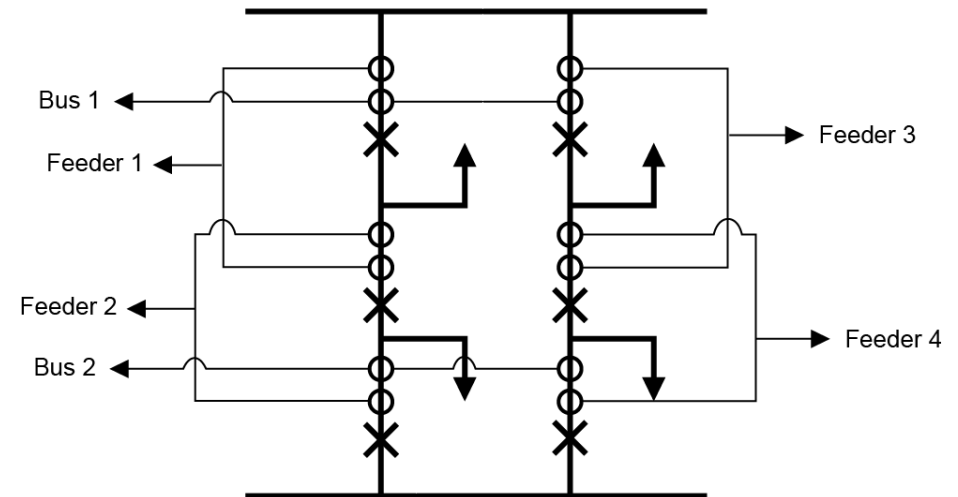
2018

# Breaker and a half substation example

Traditional protection schemes often involve the paralleling of CT wiring.

Breaker and a half examples:

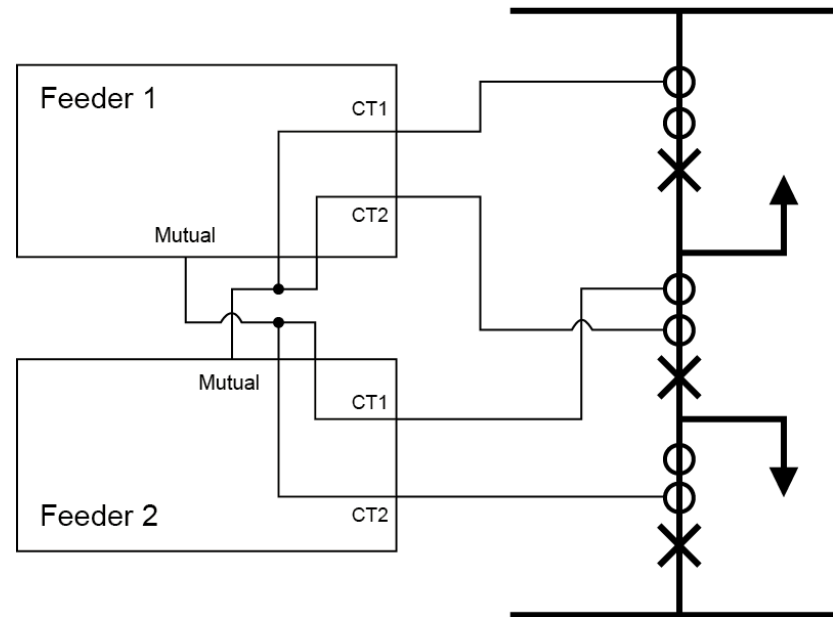
- High Impedance Bus differential (Bus x)
- Feeder protection (Feeder x)



# Breaker and a half substation example

Even dedicated breaker and a half protection devices still often use externally summated currents

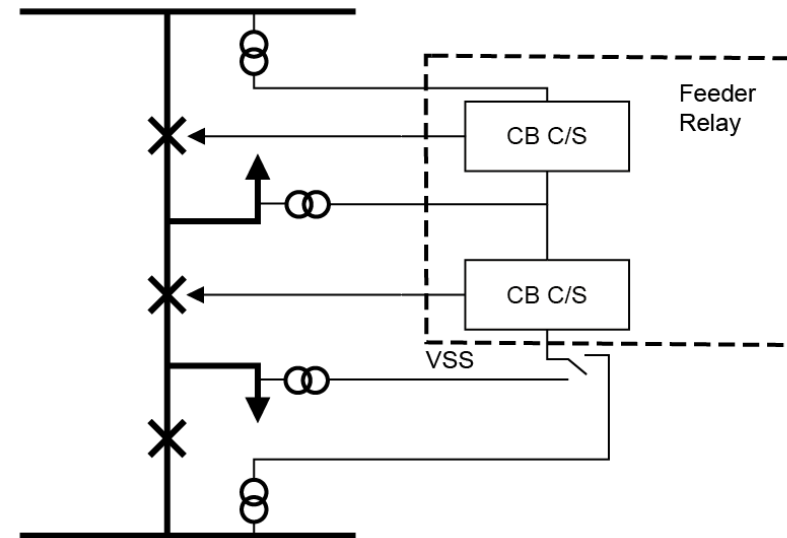
- Mutual current = CT1 + CT2



# Breaker and a half substation example

Voltage Source Selection (VSS) is also performed external to the relay

- Also applies to double bus applications

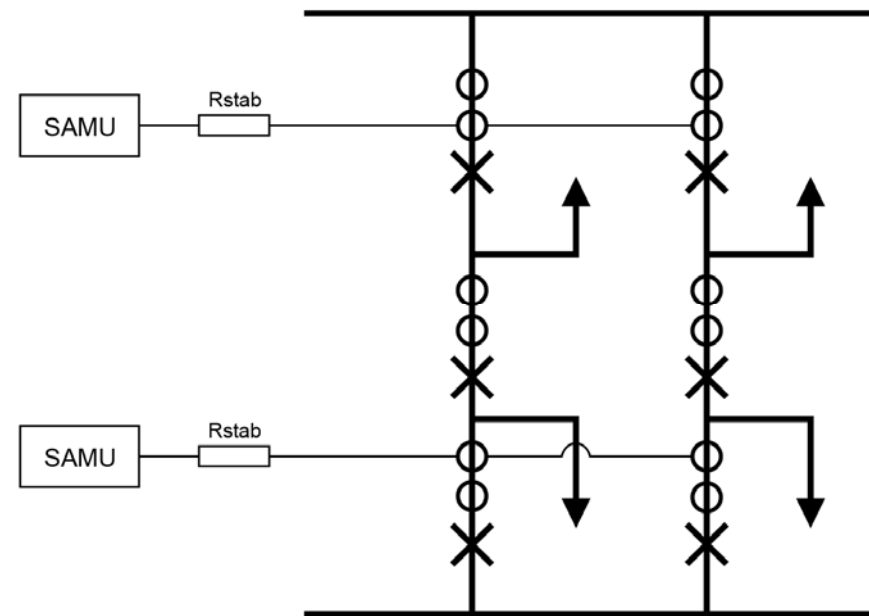


# Replication

Replace existing inputs with Merging Unit (MU)

- CT wiring is paralleled in the field
  - Could be used for high impedance busbar
- Can also be used for VSS
  - Need VSS relay

Not applicable to Low Power Instrument transformers (LPITs)



## SV stream handling relays

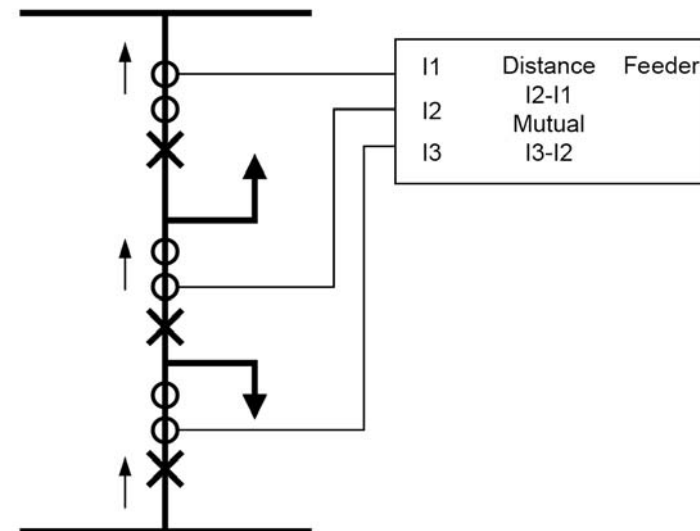
Process Bus relays need to be able to add different SV streams together to replicate external CT summation

- Need to consider polarity when summing

Also need to be able to switch between different SV streams

Ideally the relay should be applicable to process bus and classical (non process bus) applications

- Reduces staff training
- Avoids errors due to non familiarity



# Relay configuration

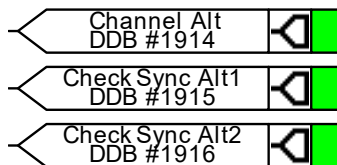
SV stream handling in IED configuration tool

- Allows same setting file to be used for all applications

SV stream handling needs to be simple

- Needs to be understood by all staff involved
  - Testers, Engineers etc

Need to control OR signals in PSL with:



Analog channel parameters

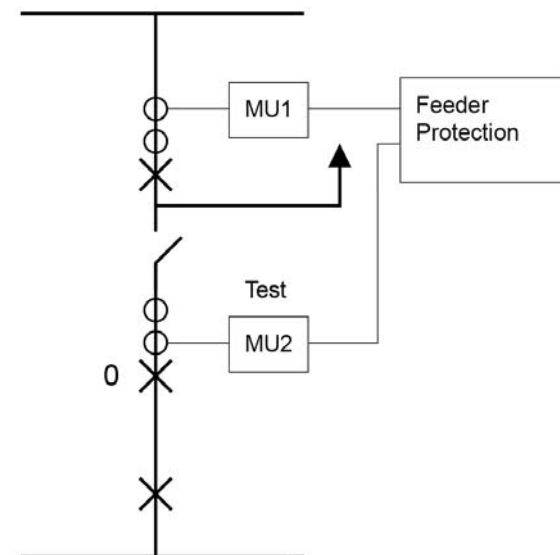
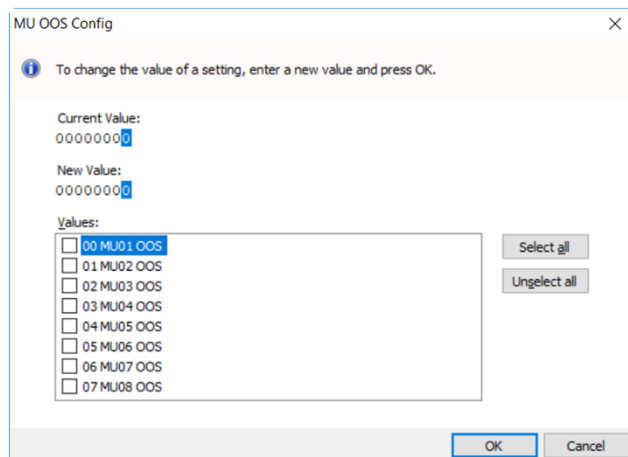
	MU No.	Index	Operation	MU No.	Index
Element Name:Ua	MU1	5	OR	MU3	5
Element Name:Ub	MU1	6	OR	MU3	6
Element Name:Uc	MU1	7	OR	MU3	7
Element Name:Ubus	MU4	0	OR	MU5	0
Element Name:la	MU1	1	-	MU2	1
Element Name:lb	MU1	2	-	MU2	2
Element Name:lc	MU1	3	-	MU2	3
Element Name:lm	MU3	4	+	MU2	4

PSL: Programmable Scheme Logic

# Testing

A benefit of 1.5CB is that each breaker/CT can be tested without disconnecting the line

- During testing the protection needs to be enabled
- Need to mark SV stream Out Of Service

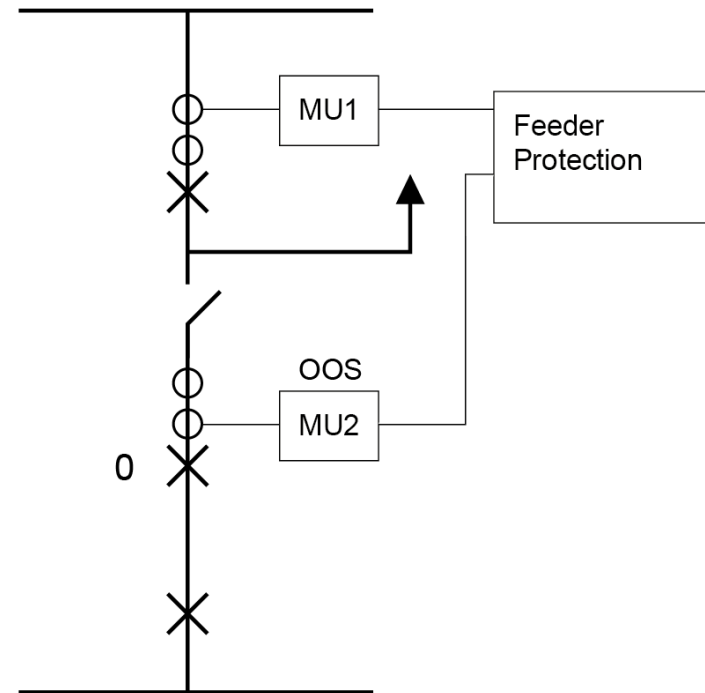
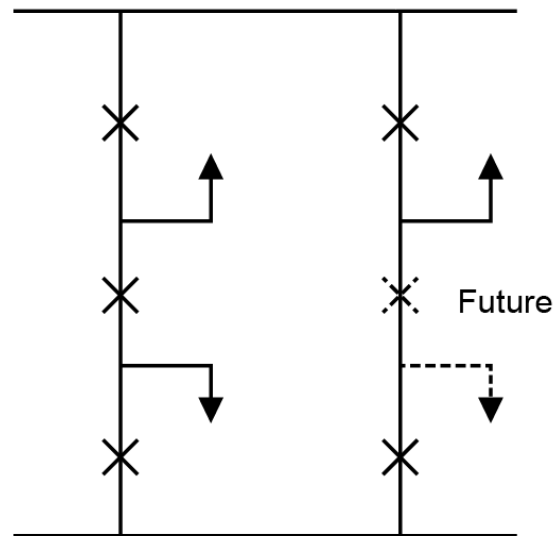




# Substation Evolution

During evolution or following equipment failures, may be out of service for extended periods.

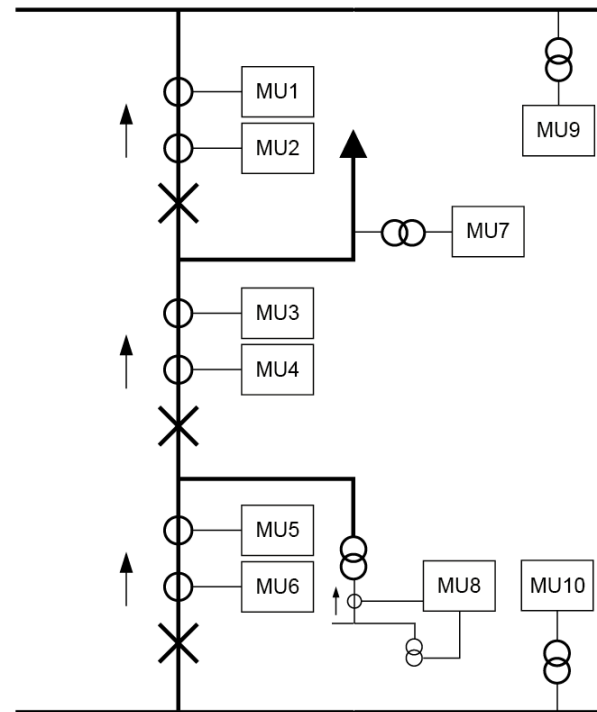
- Out Of Service also applies for these conditions



# Equipment failures

VT failures are today temporarily fixed by “jumpering” the protection to a different VT

- For example, if line VT fails jumper either bus VT secondary to the protection circuits to restore the line
  - Can still be done with SAMU
    - Jumper MU7 to MU9
  - LPITs need to switch SV streams
    - Use OR function or change config
    - Consider in design



# Summary

Most substations will require some form of SV stream handling

- Definitely required for LPITs

Handling needs to be complex enough to handle common situations but simple enough to be understood

- Easergy MiCOM P40 provides simple single operator function within The IED configuration Editor

Operation will require protection to function with missing or test SV streams

- Only block functions affected by missing SV streams
- Manual Out Of Service function

Life Is On

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