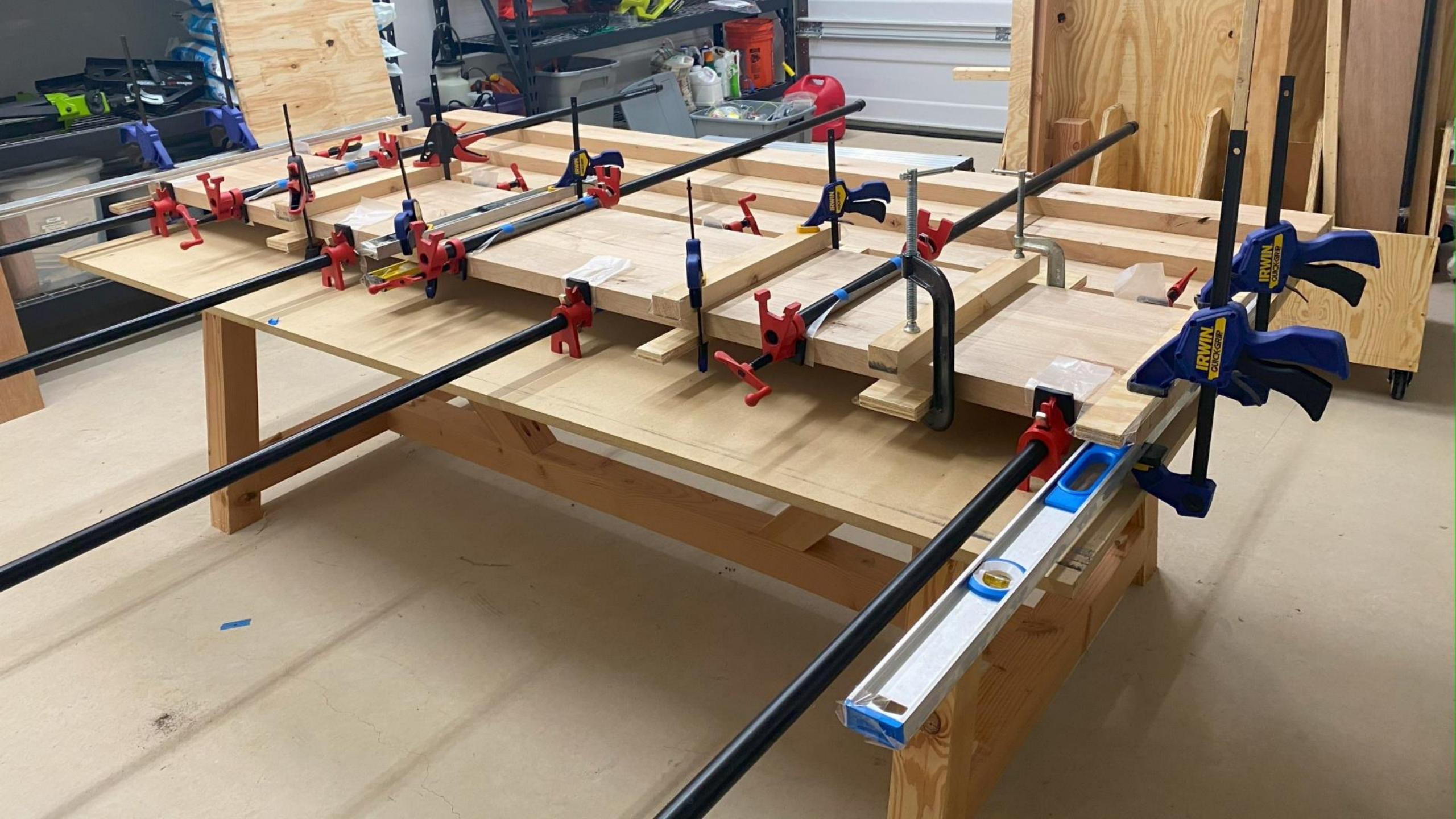


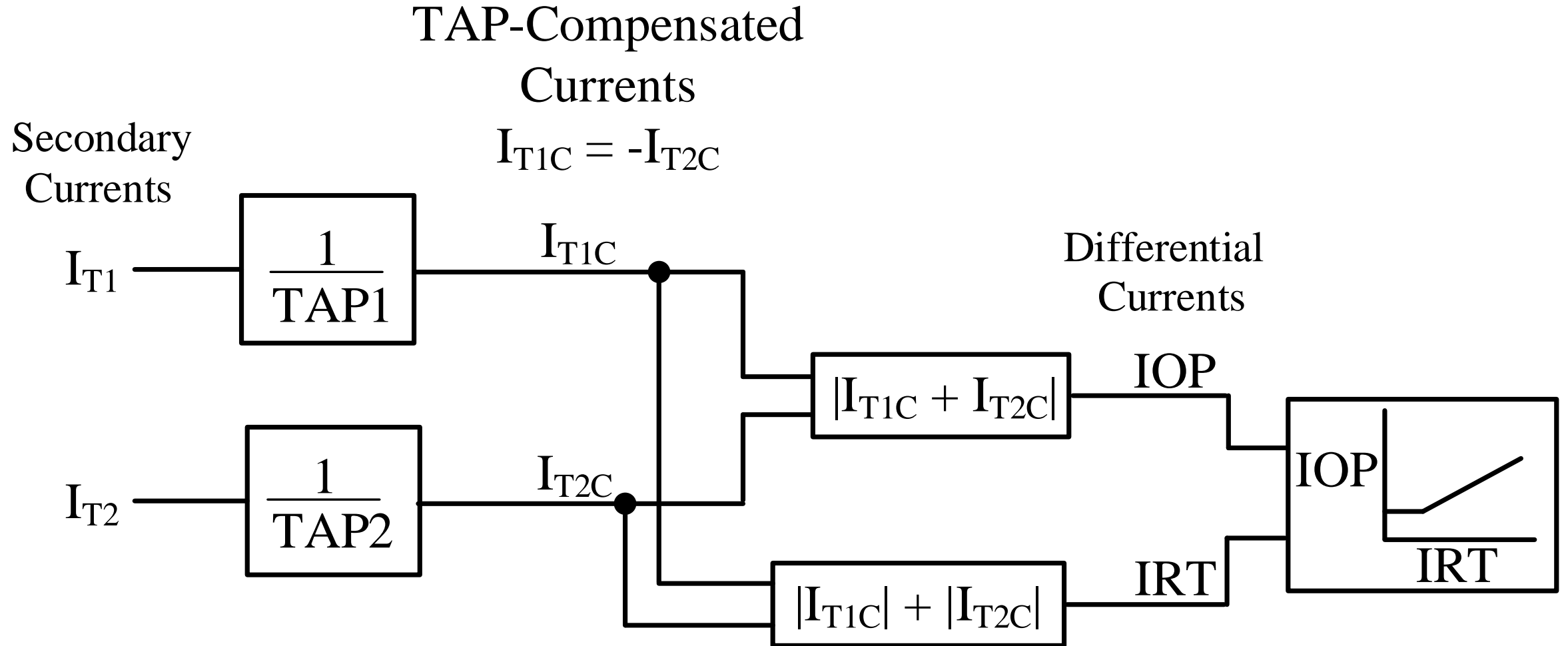


Useful Applications for Differential Relays With Both KCL and ATB 87 Elements

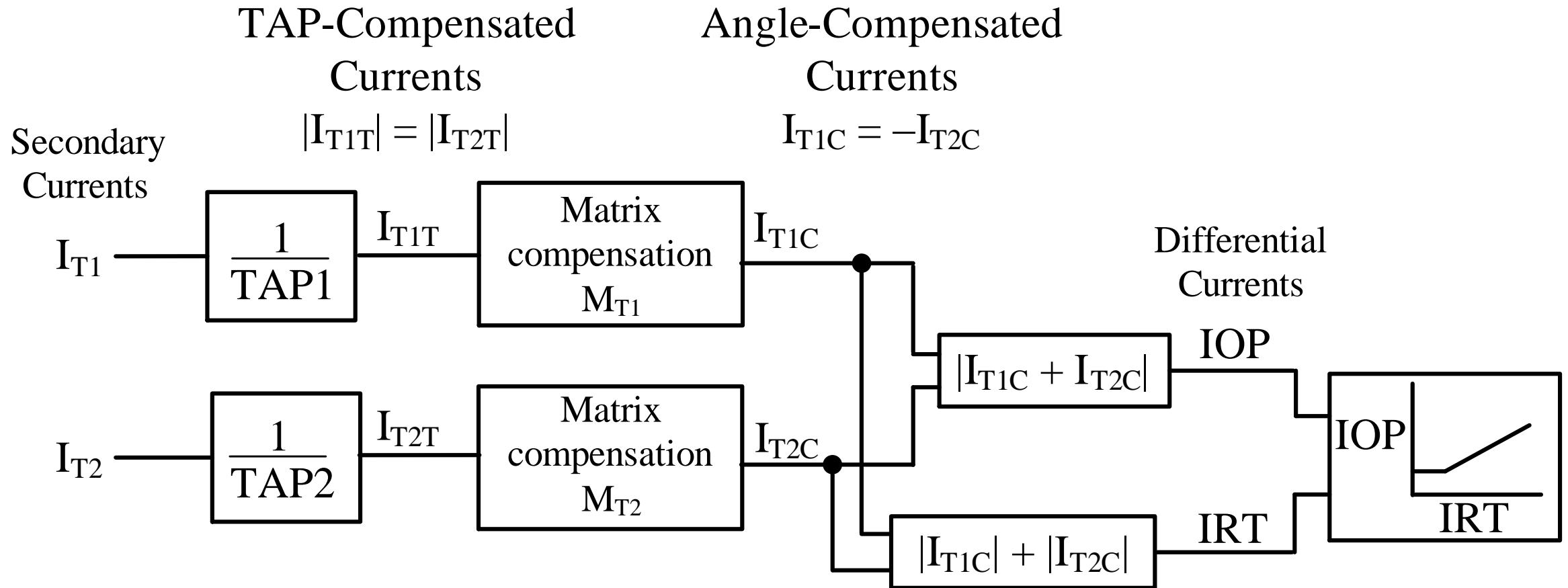
John Hostetler, Michael Thompson, and Ariana Hargrave
Schweitzer Engineering Laboratories, Inc.



KCL-based current differential element



ATB-based current differential element



ATB element requirements

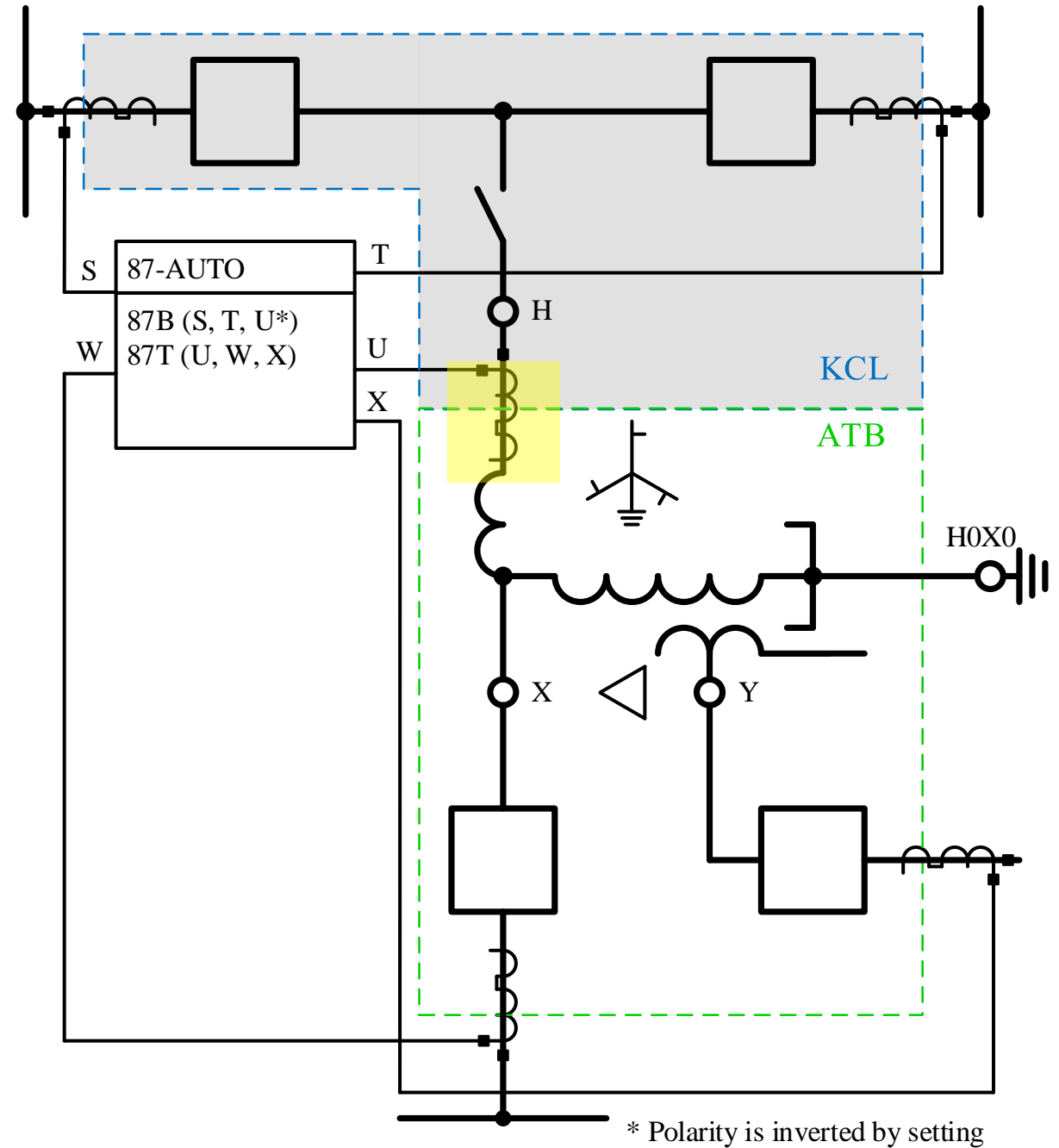
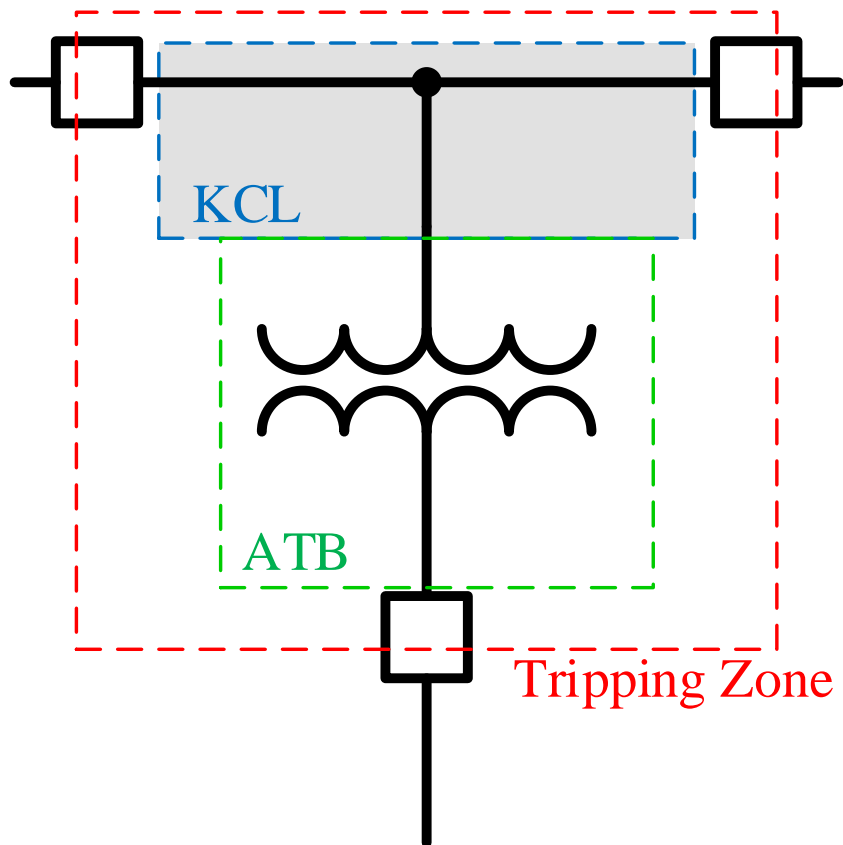


Protection against inrush
(harmonic restraint/blocking)

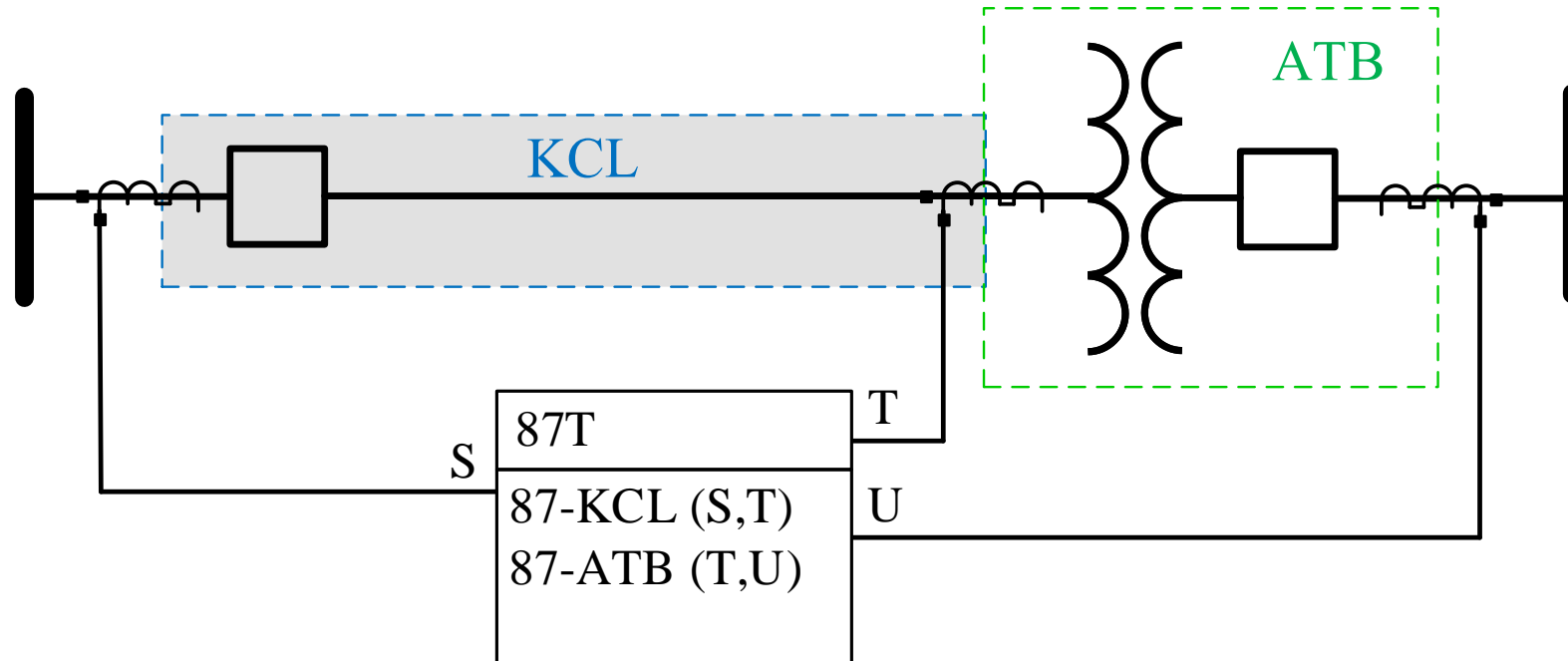


Fast tripping for severe
internal faults (87U)

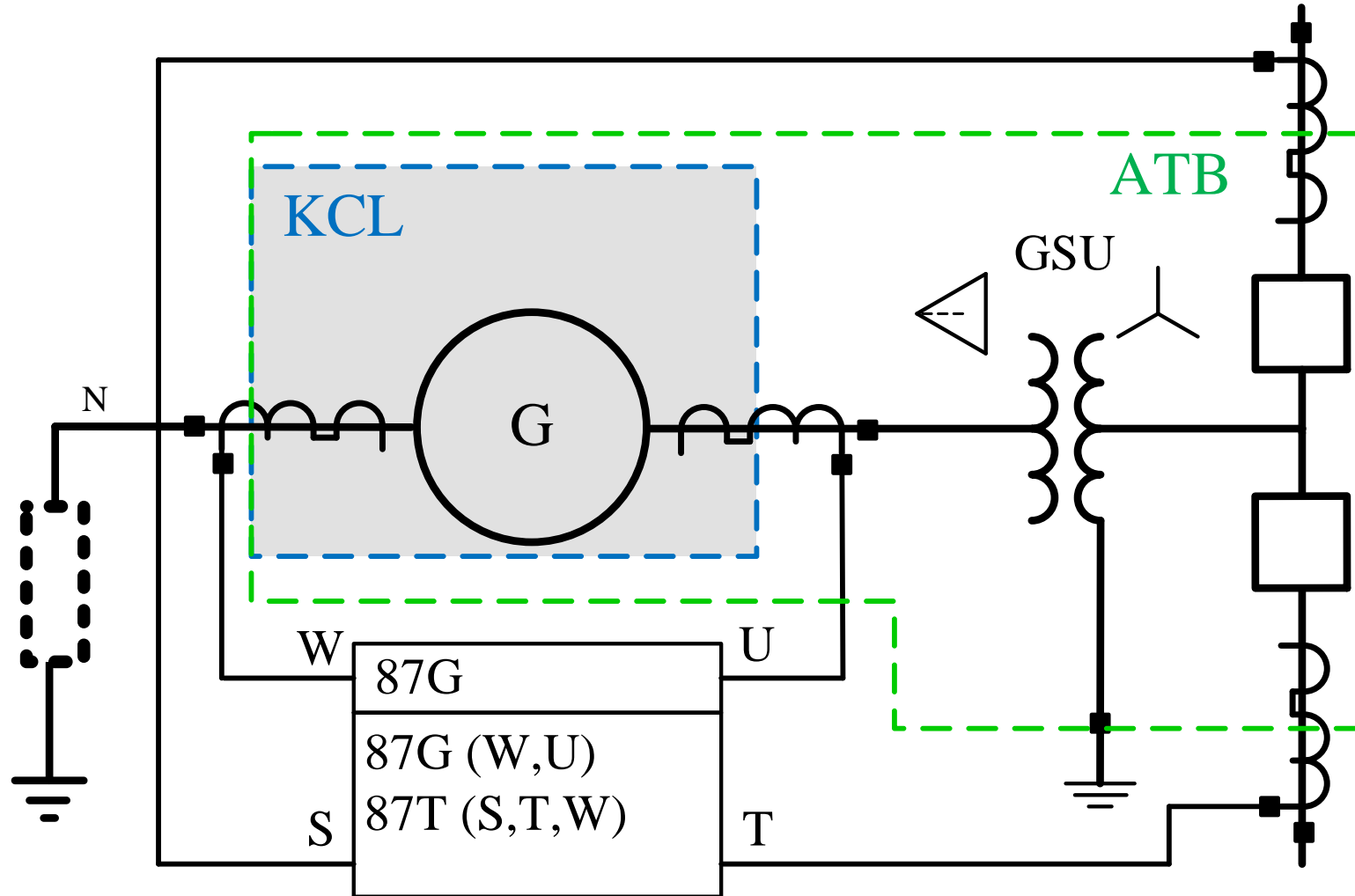
Transformer with dual-breaker terminals



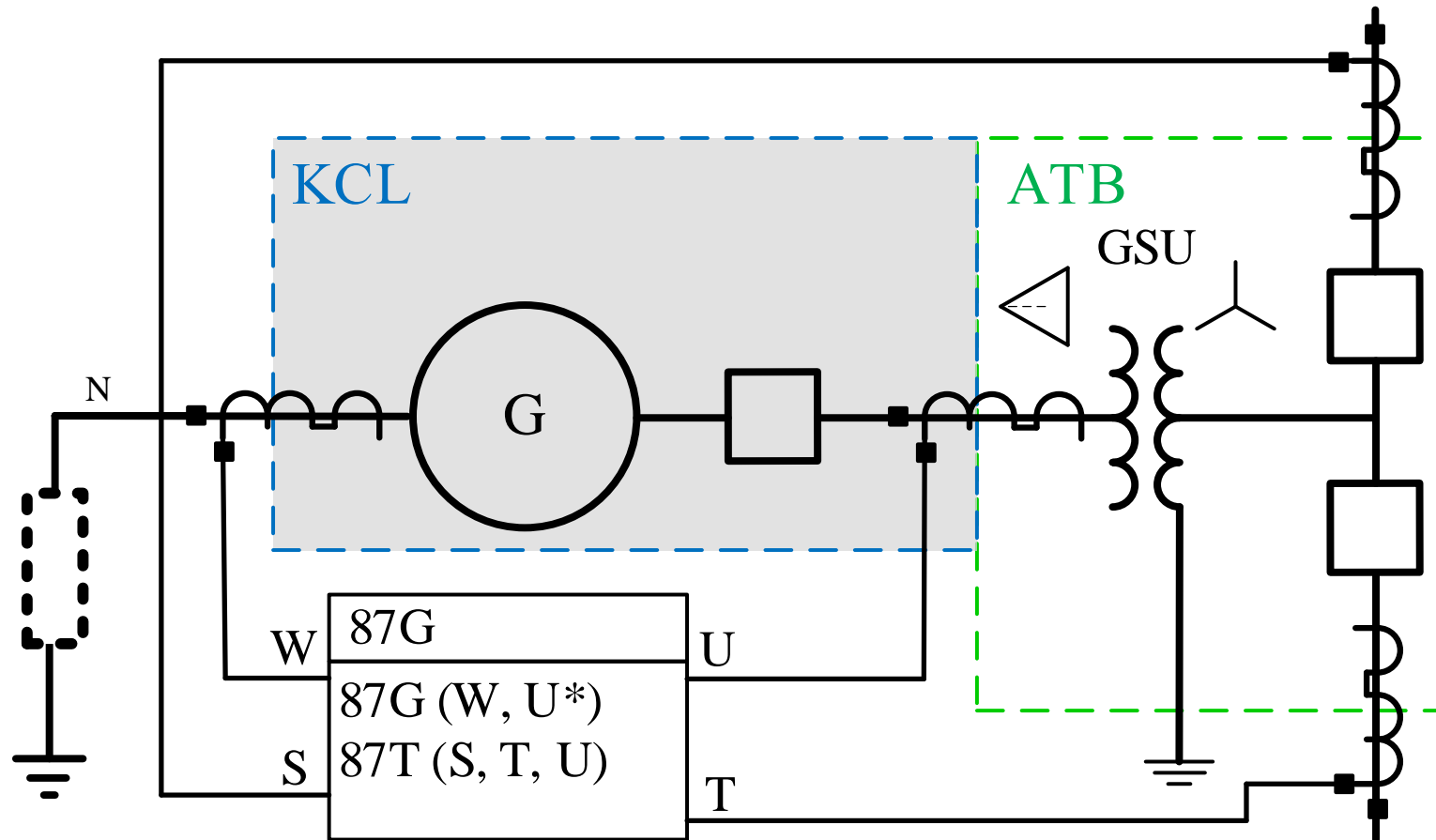
Transformer with long lead bus



Generator and GSU

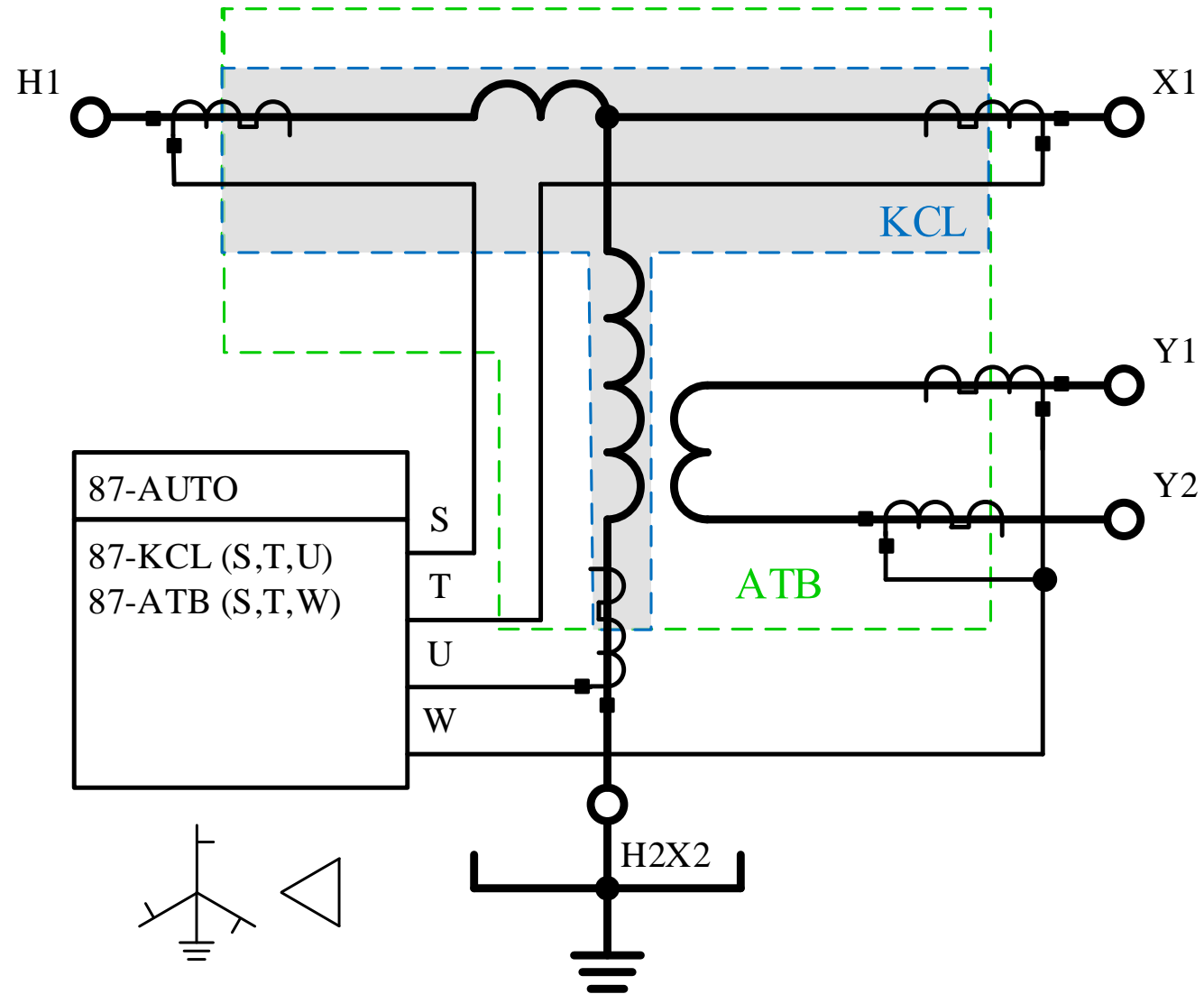


Generator and GSU



* Polarity inverted by setting

Banks of three single-phase transformers



Organizational benefits

- Improved availability
- Reduced maintenance cost
- Simplified stock
- Simplified training
- Reduced panel sizes



Conclusion

- It is important to choose “the proper tool for the proper job”
- Using ATB for everything may lead to compromises in performance
- Adding a KCL element provides extra sensitivity and speed
- Using a relay with both ATB and KCL elements provides organizational benefits
- Paper includes more applications



Questions?