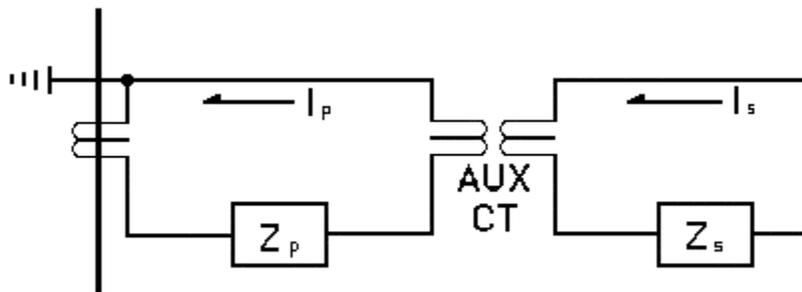


Use of Auxiliary Current Transformers

November 3, 1995

There are several applications for auxiliary current transformers in switchgear, including matching ratios of main CTs, stepping up the secondary current of main CTs for greater sensitivity in metering or relaying, and combining several main CT secondary circuits for totalized metering. Since makers of auxiliary CTs will provide almost any ratio you might need, these devices can be a very useful tool in complex or specialized CT circuits. However, their use may create a burden problem for the main CTs if care is not used in the application of auxiliary CTs.



A typical auxiliary CT circuit is shown in the figure above. The auxiliary CT secondary burden, Z_s , is reflected into the main CT secondary circuit by the square of the current ratios, per the following formula:

$$Z_t = Z_p + \left(\frac{I_s}{I_p} \right)^2 Z_s + Z_a$$

where Z_t is the total burden on the main CT and Z_a is the burden of the auxiliary CT itself.

From this equation you can see that using an auxiliary CT to step the main CT secondary current up increases the burden on the main CT by the square of the step-up ratio, whereas using the auxiliary CT to step the main CT secondary current down decreases the burden by the square of the step-down ratio. From this, it would seem that, if you are matching two main CT ratios by using an auxiliary CT, it would always be preferable to step down the higher main CT secondary current, which is the current from the main CT with the lower ratio.

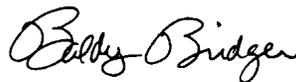
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Unfortunately, it is not always that simple. A couple of other considerations come into play:

- The higher ratio CTs may have a higher burden capability than the lower ratio CTs, and thus be capable of handling a larger burden with the same accuracy.
- The lower current resulting from the step-down transformation may require a lower relay setting to achieve the desired sensitivity, and this lower setting may greatly increase the relay burden.

As always, the best solution is to do a complete burden calculation to see which way, step-up or step-down, gives the best results. "Best results" means that all of the devices, including the main CTs, the auxiliary CTs, and the relays or meters connected in the circuit, are operating within their capabilities, and that the overall circuit will give the performance desired under all operating conditions.



Baldwin Bridger, P.E.
Technical Director