

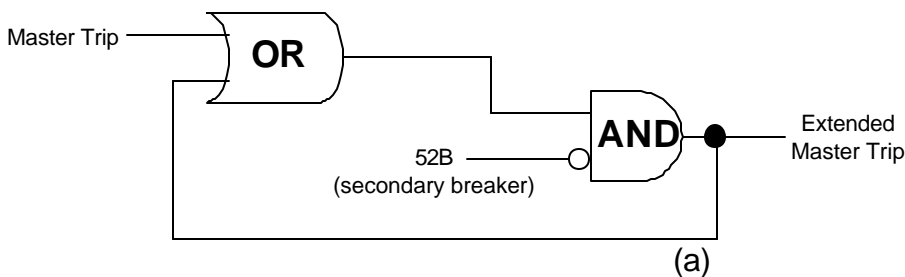
Substation Automation and Protection Division

Tripping Multiple Breakers with a 2000R Relay System

Often there is the application requirement to trip more than one breaker when the seriousness of the fault condition warrants it. With today's protection relay technology, there is most likely only one relay available that must be tasked to trip all essential breakers. However, this lone relay will have only one trip signal that would not only have to be duplicated, but also extended to trip those extraneous breakers. Advanced relay technology allows for programming the master trip signal to multiple programmable output contacts to wire to the multiple trip circuits. However, if the trip signal resets itself or drops out when the primary breaker opens to isolate the fault, it does not last long enough to trip all the breakers – this is the case in 2000R relay systems. This early dismissal of the trip signal will, in the case of slower breakers, result in the contact output interrupting trip circuit current potentially causing permanent damage to that contact output. Where there is no protection against the large amount of energy created during the interruption, there is most assuredly permanent damage to the contact. Even with appropriate internal or external protection, over time that protection will wear, unable to further subdue the energy to the point where the same permanent damage will render the contact useless in a future breaker operation.

Using a timer to extend the duration of the trip signal is a viable way of providing multiple breaker operation, but it requires knowledge of breaker operation times, and because breakers are not consistent over time, may require changing as the breaker operation slows with wear. An alternative to the timer is to extend the trip signal as long as the particular breaker takes to operate. That is, let the eventual operation of the breaker reset the extended trip signal. In this way, no timer or changes to the timer settings are required – its operation dynamically adjusts to the various operating times of the breaker. Obtaining the breaker status of these additional breakers is accomplished by mapping User Logical Inputs, disconnected from their same numbered User Logical Outputs, to physical inputs that are wired to one of its contacts, 52A or 52B – see Application Note AN-84D-01.

Figure 1 shows the logic diagram and associated programmable input and output mapping for extending the master trip of a 2000R relay system for any n^{th} breaker. The programmable mapping utilizes User Logical I/O and feedback I/O. For more information on these logical I/O, see Application Note AN-84D-01 and Section 6 of the DPU2000R or TPU2000R Instruction Booklet. Figure 2 shows the typical external connections made for multiple breaker operation.



Programmable Inputs				
NAME:	52a-PRI	52b-PRI	43a	52b-SEC
LOGIC	I1	I2	I3	I4
52A AND	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52B AND	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43A (AR) AND	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ULI1 AND	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Programmable Inputs - Feedbacks	
LOGIC	FB1
52A AND	<input type="checkbox"/>
52B AND	<input type="checkbox"/>
43A (AR) AND	<input type="checkbox"/>
ULI1 AND	<input checked="" type="checkbox"/>

(b)

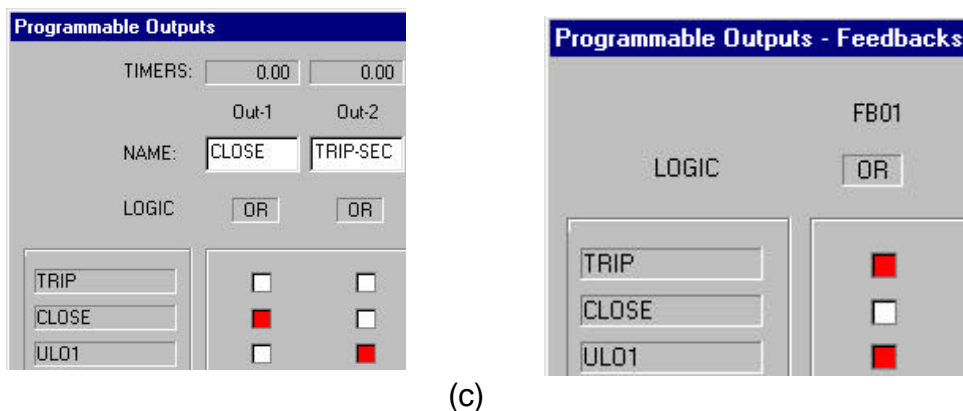


Figure 1 - Extended trip for multiple breaker operation: (a) logic diagram; (b) programmable input mapping; (c) programmable output mapping.

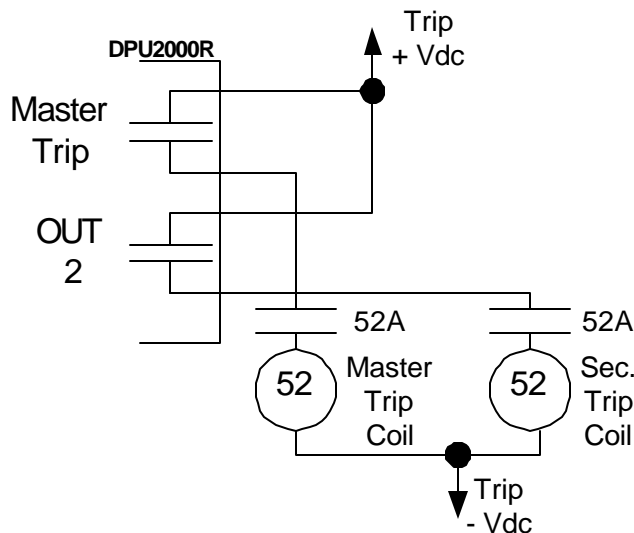


Figure 2 - Typical connections for secondary breaker operation with extended master trip.

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