

# PME-500-TR: TIME ANALYSIS ON AN S&C™ 2020 INTERRUPTER

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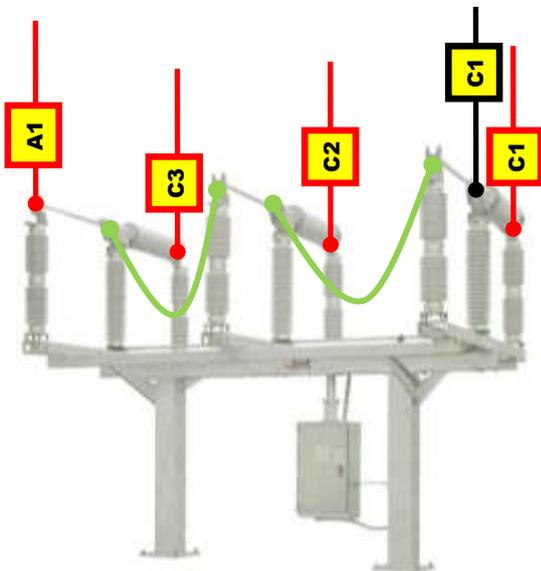
## INTRODUCTION

The term *Interrupter* is used here to refer to switchgear that combines the functionality of a circuit breaker and a disconnecter or isolating switch in a single device. This document illustrates the use of the PME-500-TR's auxiliary inputs as an additional data acquisition channels, as well as a powerful resource for remote test control. The described practice will produce a chronogram with opening and closing times of the combined operation of the circuit breaker and the disconnecter featured by an S & C's 2020 Interrupter.

### NOTICE

A basic knowledge of the operation of the PME-500-TR's circuit breaker analyzer is assumed throughout this document, so only procedures that are specific to this practice will be described in detail.

## MEASUREMENT METHOD



While separate open/close operation times will be recorded for each phase in the circuit breaker, the associated disconnecter will be considered as a single contact, the closing time of which will be determined by the slowest phase and, conversely, the opening time will correspond to the phase that opens first.

In a close operation, the PME-500-TR will start recording data immediately after the interrupter completes the close maneuver, i.e. the slowest of the three rods comes into closed position. It is assumed that no intentional delay is imposed between this event and the initiation of the close operation by the circuit breaker.

In an open operation, the PME-500-TR will start the data recordings when the operator starts the test from within the instrument's TEST menu. When this occurs, the PME-500-TR will issue a trip command to the circuit breaker, which will execute the operation immediately. Upon completion of the trip command, the associated disconnecter is meant to immediately initiate the opening process, which will also be recorded by the PME-500-TR corresponding to the instant when the fastest of the three rods departs from the closed position.

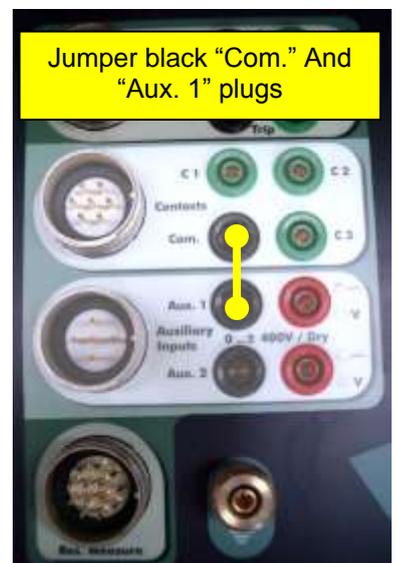
## REQUIRED CONNECTIONS

### WARNING

The procedure described here is not intended for field testing. The interrupter as a whole must be completely isolated from the HV system, which is a condition normally not found in live substations.

The diagram above these lines shows the test leads used and their connections to the S & C 2020 Interrupter. As it can be seen, the three break contacts in the disconnecter section are serialized into a single break section between terminals A1(red) and C1(black) for the sake of the testing, by means of two jumpers represented in green. The black C1 and black A1 terminals are interconnected at the PME-500-TR's connections panel as shown in the image on the left, so the disconnecter section will be "seen" by the test instrument as a single "Aux.1" contact that will appear as 'closed' when its three phases are closed, and will appear as 'open' when one or more of its three phases are open.

The outer side of each pole in the circuit breaker section is connected to one time measurement input channel of the PME-500-TR (red C1, C2, and C3 terminals). As the associated disconnecter is always in closed state

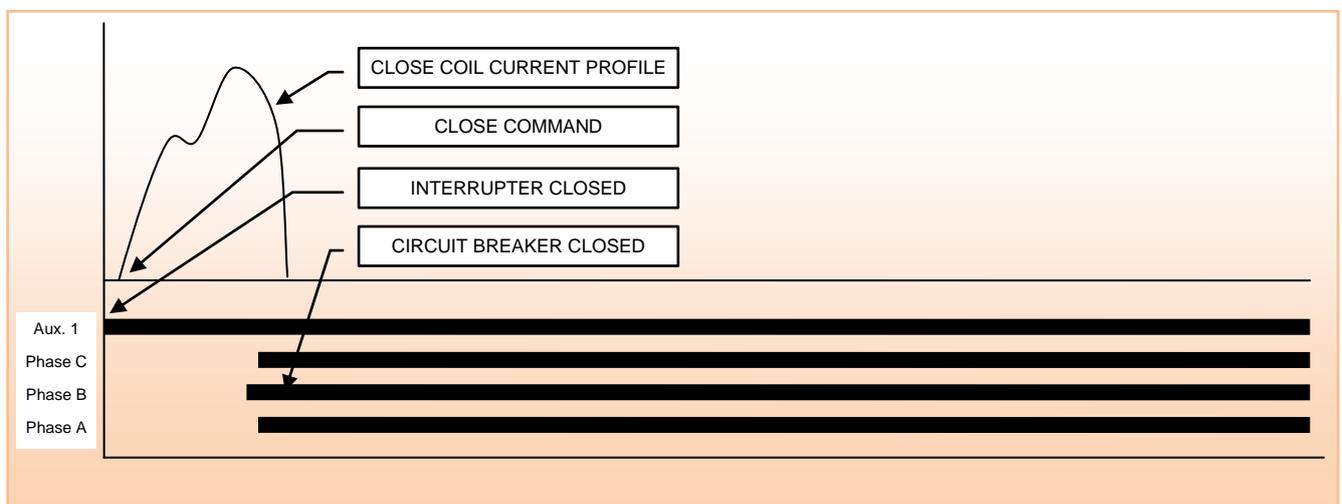


when the circuit breaker operates, the inner side of those poles share a connection to the common side of the input channels (black C1 terminal), thus completing the three time measurement circuits.

To complete the setup, the PME-500-TR must also be connected to the circuit breaker's trip and close coils in order to provide adequate coordination during the test process.

### **CLOSE OPERATION TIME ANALYSIS**

- 1) In the SET menu, choose "C" for "Operation" and select "Aux1 (ON)" for "Trigger".
- 2) In the TEST menu, press "MOD AUX1" repeatedly until you set it to dry contact detection mode (green LED)
- 3) Also in the TEST menu, press the START/STOP button once. The message "Waiting for trigger" should be displayed in the status line at the bottom.
- 4) Start the reconnection maneuver in the S & C 2020. When the three rods come to a steady closed position, AUX1 will be activated, the PME-500-TR's chronometer will start, and the programmed CLOSE command will be issued to the circuit breaker. All state changes in the disconnecter (as a single AUX1 contact) and in the three poles of the circuit breaker will be recorded by the PME-500-TR for the following two seconds.



As you can see, the test process has been initiated by the operator but the actual recording has been remotely triggered by the disconnecter upon closing on the AUX1 input.

### **TRIP OPERATION TIME ANALYSIS**

In this case, the data recording will start when the trip command is issued to the circuit breaker. This can be accomplished in either of two ways: a) programming the PME-500-TR for a trip command and starting the test right away, or b) setting up the PME-500-TR to stand by and detect voltage across the circuit breaker's trip coil, and then launching the trip operation at the circuit breaker itself or from an external control device.

For option a) proceed as follows:

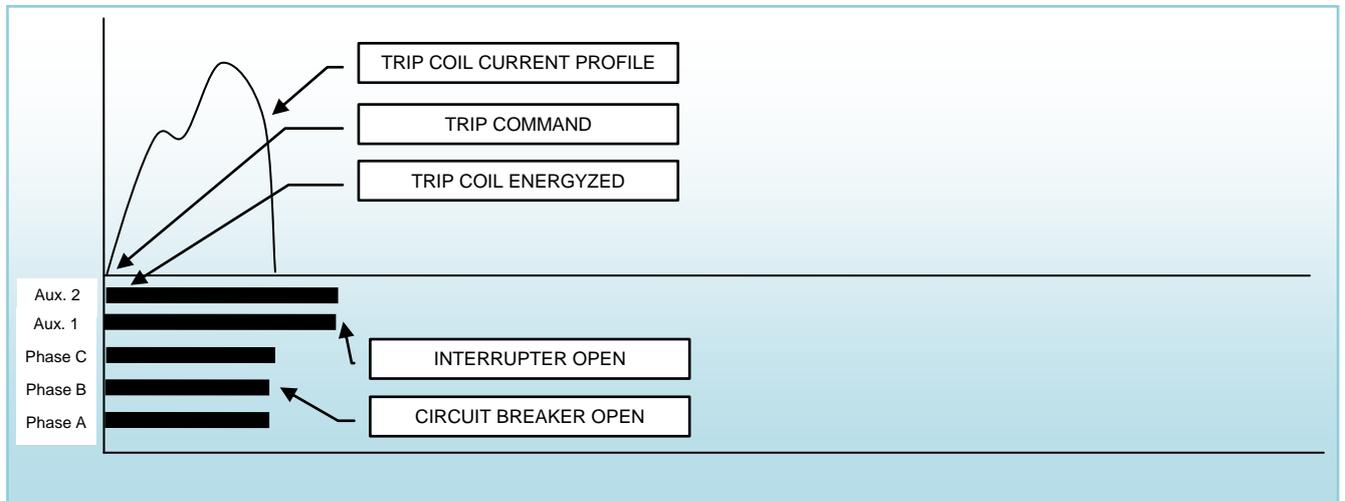
- 1) In the SET menu, choose "Operation" for Trigger and "O" for "Operation".
- 2) In the TEST menu, press "MOD AUX1" repeatedly until you set it to dry contact detection mode (green LED) and then press START / STOP once. The circuit breaker should execute a trip command immediately, followed by the disconnecter's opening.

The PME-500-TR will record the state changes in each of the three circuit breaker's phases individually, and in the disconnecter's phases viewed as a whole.

For option b), proceed as follows:

- 1) Connect the PME-500-TR's Aux. 2 input across (i.e. in parallel to) the circuit breaker's trip coil.
- 2) In the SET menu, choose "O" for "Operation" and "AUX2 (ON)" for "Trigger"
- 3) In the TEST menu, press "MOD AUX2" repeatedly until you set it to Voltage High detection mode (yellow LED), and then press the STERT / STOP button once. The PME-500-TR will be set to stand by and "Waiting for trigger" will be displayed in the status line at the bottom.

- 4) Initiate the trip maneuver at the circuit breaker or from a remote control device. When the trip coil actuation voltage is detected by the PME-500-TR on the AUX. 2 channel, the recording process will start automatically.



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