

# Relaying Type Current Transformers Field Testing



I.L. 33-256-CT

## CAUTION

IF THE METALLIC SUPPORT PLATE OF A BUSHING TYPE CURRENT TRANSFORMER TOUCHES A CIRCUIT BREAKER BUSHING, THE TRANSFORMER WILL NOT PRODUCE THE CORRECT RATIO. THE OUTPUT OF THE TRANSFORMER SECONDARY WILL BE REDUCED TO SOME VALUE DETERMINED BY THE IMPEDANCE OF THE CIRCUIT.

During any inspection of a circuit breaker the clearance between the transformer mounting plate and the bushing should be checked. A minimum of .062 inch is acceptable.

## RATIO TEST

The voltage method and the current method are two common ways to measure transformer ratio. Since the voltage test requires simple apparatus to conduct, this method is discussed here.

Refer to Fig. 1. The burden or short circuit should be removed from all other transformers on the same pole. Some appropriate voltage below saturation, approximately 25% of the accuracy class, should be applied to the full winding of the secondary and the primary voltage read with a high impedance, 20,000 ohms/volt low range meter. The turns ratio is approximately equal to the voltage ratio. Refer to Table 1 for suggested impressed voltages.

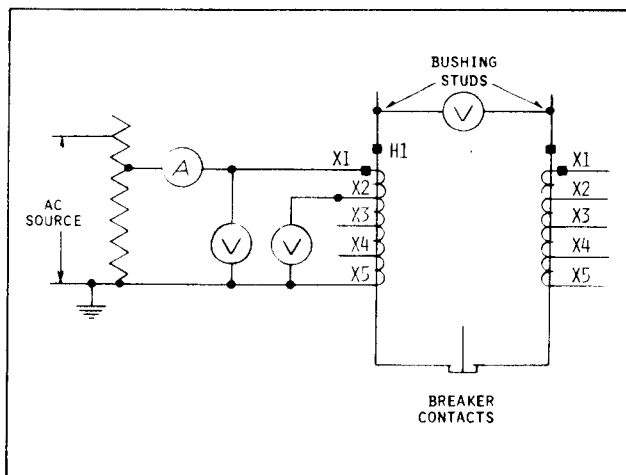


Fig. 1 Ratio Check Connections

After the overall ratio is measured, the tap ratios can be measured by comparing the tap voltage to the full winding voltage. Tap voltage can be determined by the ratio:

$$\frac{\text{Full Winding Volts}}{\text{Full Winding Turns}} = \frac{\text{Tap Voltage}}{\text{Tap Turns}}$$

A vacuum tube voltmeter is a good instrument for reading the primary. The turns ratio and accuracy class may be found on the transformer nameplate located on the mechanism housing door.

With the voltage in Table 1 applied on the respective transformers, the ammeter will read a very low current. If by accident a saturating voltage is applied the current will rise rapidly. When this occurs the voltage should be run slowly and continuously to zero and then the correct voltage applied.

Table 1  
Voltage Applied on Secondary – Full Winding

C.T. Ratio	Accuracy Class			
	C100	C200	C400	C800
600/5	24V (.2V)*	48V (.4V)	96V (.8V)	---
1200/5	---	48V (.2V)	72V (.3V)	120V (.5V)
2000/5	---	---	100V (.25V)	200V (.5V)
3000/5	---	---	60V (.1V)	120V (.2V)
4000/5	---	---	100V (.25V)	200V (.25V)
5000/5	---	---	100V (.1V)	200V (.2V)

\*NOTE: Figures in ( ) = Primary Volts

After the test the voltage should be run slowly and continuously to zero to prevent residual remaining in the core of the transformer.

## CAUTION

IF NO FURTHER TESTS ARE TO BE MADE, SHORT CIRCUIT OR ADD BURDENS TO ALL CURRENT TRANSFORMERS.

## POLARITY TEST WITH OSCILLOSCOPE

A test set-up wired as per Fig. 2 may be used for polarity check. The voltage applied should be lower than the saturation voltage so the values established by Table 1 for the ratio test are safe to use. Again any other transformers on the same pole should be open circuited.

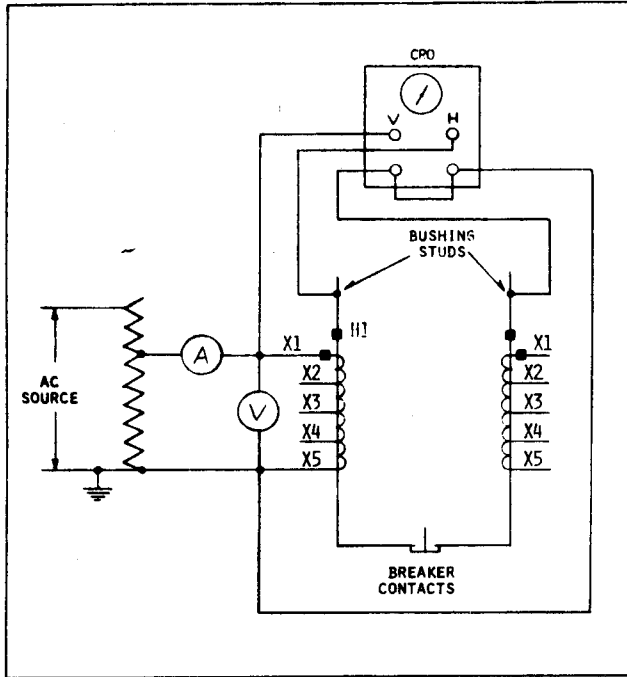


Fig. 2 Polarity Check Connections

Fig. 2 shows a single channel cathode ray oscilloscope with the secondary voltage applied to the vertical input terminals and the primary voltage applied to the horizontal input terminals with the polarity as shown. If the slope of the line on the oscilloscope is positive as shown, then the polarity agrees with the terminal marking.

If the ratios of the transformer taps have been checked, and are correct, then the polarity of the individual taps will be correct. So it is only necessary to check the polarity of the total winding.

If a dual channel oscilloscope is used the primary and secondary voltages should be connected on separate channels. The polarity is correct if the resulting wave forms are in agreement which they should be since the same voltage is applied to both channels.

With the voltages in Table 1 applied on the respective transformers the ammeter will read a very low current. If by accident a saturating voltage is applied the current will rise rapidly. When this occurs the voltage should be run slowly and continuously to zero and then the correct voltage applied.

After the test the voltage should be run slowly and continuously down to zero to prevent residual remaining in the core of the transformer.

If the polarity is proven to be incorrect then the transformer is mounted up-side-down on the bushing.

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#### INSULATION RESISTANCE

Insulation resistance between the current transformer secondary and ground may be measured with a 500 or 1000 volt megger or other conventional insulation test instrument.

The neutral ground must be disconnected from ground. All burdens should be removed. A wire jumper should be connected from X1 to X5 on each transformer. The neutral ground wire can then be used to test all the transformers simultaneously.

One megohm is usually considered the minimum insulation resistance acceptable. Any low reading should be thoroughly investigated and corrective action taken.

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