



Loss of Excitation Commissioning Test for the 489 Relay

GE Publication No. GET-8405

Copyright © 2002 GE Power Management

TEST PREPARATION

Prior to implementing the loss of excitation commissioning test with the 489 Generator Management Relay, please note the following:

- It is necessary to fully read the instruction manual and understand all relay functions.
- Ensure that the relay output contacts are isolated from the breaker tripping circuits and the current and voltage inputs are isolated from the CT and VT circuits.
- Application of excessive current ($>3 \times I_n$) for extended periods will cause damage to the relay.

TEST PROCEDURE

1. Apply the following settings to the relay.

In the **S6 VOLTAGE ELEMENTS \ LOSS OF EXCITATION** settings menu:

ENABLE VOLTAGE SUPERVISION: No

CIRCLE 1 TRIP: Unlatched

ASSIGN CIRCLE 1 TRIP RELAYS (1-4): 1---

CIRCLE 1 DIAMETER: 25 Ω sec.

CIRCLE 1 OFFSET: 2.5 Ω sec.

CIRCLE 1 DELAY: 0.1 s

CIRCLE 2 TRIP: Unlatched

ASSIGN CIRCLE 2 TRIP RELAYS (1-4): -2--

CIRCLE 2 DIAMETER: 35 Ω sec.

CIRCLE 2 OFFSET: 2.5 Ω sec.

CIRCLE 2 DELAY: 0.1 s

In the **S2 SYSTEM SETUP \ VOLTAGE SENSING** settings menu:

VT CONNECTION TYPE: Delta

2. Connect the relay according to Figure 1.
3. Apply a balanced three phase current equal to $I_{nominal} / 2$.
4. Apply three phase voltage equal to $V_{nominal}$.
5. Set the fault angle to 270°.

6. Confirm the following 489 measurements:
 - Measured vars are negative.
 - Angle of phase A current is 300° lag.
 - Angle of phase B current is 60° lag.
 - Angle of measured impedance, V_{ab}/I_{ab} is 270°.
7. Reduce the phase AB voltage until Circle 2 element operates. Record the measured impedance (calculated as shown below) as the Circle 1 Upper Limit.

$$\frac{V_{ab}}{I_a - I_b} \quad \text{or} \quad \frac{V_{ab}}{\sqrt{3} \times I_a} \quad \text{(EQ 1)}$$

8. Continue to reduce the three phase voltage until the stage 1 element operates. Record this value as Circle 1 Upper Limit.
9. Continue to reduce the three phase voltage until both elements reset.
10. Increase the three phase voltage until the Circle 2 element operates. Record this value as Circle 2 Lower limit.
11. Continue to increase the three phase voltage until the Circle 1 element operates. Record this value as Circle 1 Lower limit.
12. Repeat Steps 5 through 11 for the fault angle values listed in the remainder of the table.
13. Confirm that the accuracy of the measured values are according to specification.
14. Return all settings to pretest values.

TEST RESULTS

Record the test results below and in the following tables:

Order Code: _____

Serial Number: _____

Revision: _____

Tested by: _____

Date: _____

GET-8405: Loss of Excitation Commissioning Test for the 489 Relay

CIRCLE 1: DIAMETER = 25 Ωsec, OFFSET = 2.5 Ωsec						
ANGLE	UPPER LIMIT			LOWER LIMIT		
	CALCULATED	MEASURED	ACCURACY	CALCULATED	MEASURED	ACCURACY
220°	14.563 Ω			4.721 Ω		
230°	19.446 Ω			3.535 Ω		
240°	22.990 Ω			2.990 Ω		
250°	25.494 Ω			2.697 Ω		
260°	26.998 Ω			2.547 Ω		
270°	27.500 Ω			2.500 Ω		
280°	26.998 Ω			2.547 Ω		
290°	25.494 Ω			2.697 Ω		
300°	22.990 Ω			2.990 Ω		
310°	19.446 Ω			3.535 Ω		
320°	14.563 Ω			4.721 Ω		

CIRCLE 2: DIAMETER = 35 Ωsec, OFFSET = 2.5 Ωsec						
ANGLE	UPPER LIMIT			LOWER LIMIT		
	CALCULATED	MEASURED	ACCURACY	CALCULATED	MEASURED	ACCURACY
220°	21.313 Ω			4.399 Ω		
230°	27.194 Ω			3.447 Ω		
240°	31.682 Ω			2.959 Ω		
250°	34.902 Ω			2.686 Ω		
260°	36.848 Ω			2.544 Ω		
270°	37.500 Ω			2.500 Ω		
280°	36.848 Ω			2.544 Ω		
290°	34.902 Ω			2.686 Ω		
300°	31.682 Ω			2.959 Ω		
310°	27.194 Ω			3.447 Ω		
320°	21.313 Ω			4.399 Ω		

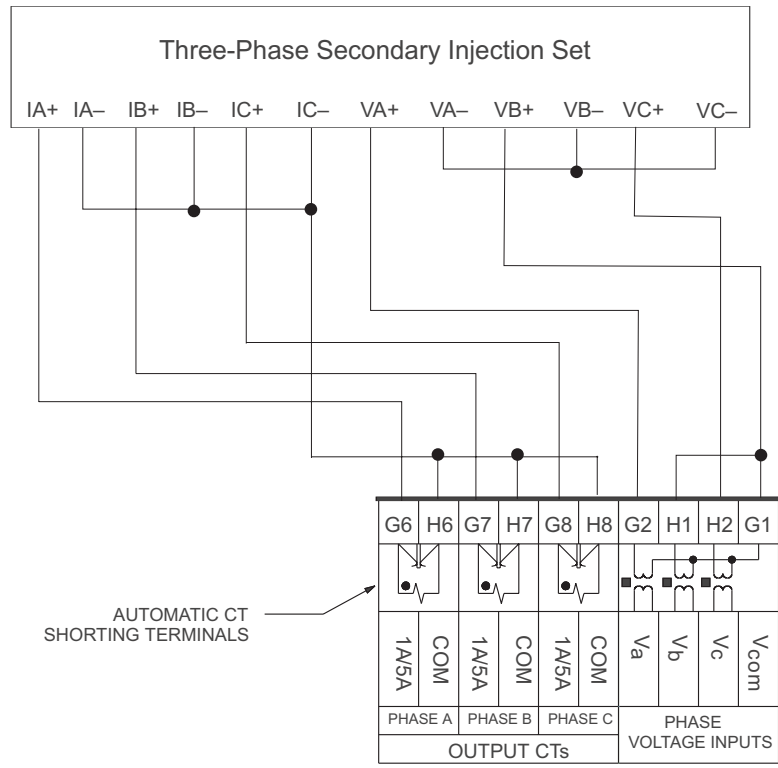


FIGURE 1. Loss of Excitation Commissioning Test Wiring