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Schedule of Site
Commissioning Tests
SCT 20.12.12
Issue 1
August 1999

ABB REL 531 Distance Protection

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Registered in
England and Wales
No. 2366977

Published by:

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THE NATIONAL GRID COMPANY plc

SCHEDULE OF SITE COMMISSIONING TESTS

SCT 20.12.12 ABB REL 531 DISTANCE PROTECTION

1 GENERAL DATA

Station:

Circuit:

Contractor:

Contractor's Number:

NGC Contract Number:

NOTE: All tests contained within this SCT are to be carried out in accordance the corresponding sections contained within SCT 0.1 - Guidance Notes for Site Commissioning Tests on Protection, Measuring, Control, Alarm and Indication Equipment.



ABB REL 531 DISTANCE PROTECTION

Relay Serial Number:

Terminal Diagram Number:

Configuration Diagram Reference:

Application Scheme Reference:

Software:

Configuration:

Rated Voltage U_r :

Rated Current I_r :

Rated Frequency f_r :

Auxiliary DC Voltage EL:

Binary Input/Output Module DC Voltage:

Tripping Supply:

CT Ratio:

CT Earth: (OUT - Line side / IN - Busbar side)

VT Ratio:

Type of VT

V a.c.
A a.c.
Hz
V d.c.
V d.c.
V d.c.
OUT/IN*
Capacitor/Wound*

*delete as appropriate

1.1 Local Primary System Diagram

1.2 Circuit Parameters

	Feeder
Line Angle	deg.
Length	km
Primary Impedance	
Positive Sequence Z_1	O
Zero Sequence Z_0	O
Phase Fault Loop $Z_p = 2Z_1$	O
Earth Fault Loop	O
$Z_e = \frac{(2Z_1 \% Z_0)}{3}$	

1.3 Mode of Operation

Plain	Accelerated	Blocked

1.4 Required Relay Reach and Zero Sequence Compensation Factor

Primary Impedance	Reactive Reach (ohms per phase)	Resistive Reach (ohms per phase)
Zone 1	$X_1 =$	$R_1 =$
Zone 2	$X_2 =$	$R_2 =$
Zone 3	$X_3 =$	$R_3 =$
Zone 4 (Z3R)	$X_4 =$	$R_4 =$
Zone 1HS	$X_{1HS} =$	$R_{1HS} =$

Required Secondary Impedance = Primary ohms x $\frac{CT \text{ Ratio}}{VT \text{ Ratio}}$

Secondary Impedance	Reactive Reach (ohms per phase)	Resistive Reach (ohms per phase)
Zone 1	$X_1 =$	$R_1 =$
Zone 2	$X_2 =$	$R_2 =$
Zone 3	$X_3 =$	$R_3 =$
Zone 4 (Z3R)	$X_4 =$	$R_4 =$
Zone 1HS	$X_{1HS} =$	$R_{1HS} =$

Zero Sequence Compensation Factor $K_N = \frac{(Z_0 - Z_1)}{3Z_1}$

--

OFF-LOAD TESTS

2 MECHANICAL INSPECTION

CAUTION: Use electrostatic precautions. The equipment contains components sensitive to electrostatic voltage discharge. To avoid damage, handle modules by the front plate and avoid contact with electrical components and connections.

- 2.1 Ensure that all transit packaging etc is removed.
- 2.2 Check proper mounting and access in addition to the requirements contained in Document 099/500, Guidance Notes for Site Commissioning Tests on Protection, Measuring, Control, Alarm and Indication Equipment.
- 2.3 Check fuses, or MCBs, and links for compliance to standard and rating.
- 2.4 Inspect each module for signs of damage and ensure that all units and auxiliary relays are present, fully inserted and correctly located, in accordance with the apparatus list and product specification.

3 CALIBRATED TEST EQUIPMENT

- (a) Record of Calibrated Test Equipment used during Commissioning

	Manufacturer and Type	Serial No.	Date last calibrated	Date next calibration due
Insulation Resistance Tester				
Ammeter or Multimeter				
Voltmeter or Multimeter				
Timer				
Others (state function)				

4 WIRING

Where REL 531 is part of a modular, factory wired system (such as a TPS 5/33 system), it is not necessary to perform insulation tests or to check the cubicle wiring. The tests below should be performed on all wiring where the cubicle has been wired on site and on any connections made at the site.

4.1 Insulation Tests

Note: Use an electronic or brushless 500 V d.c. tester.

- | | | |
|-------|---|----|
| 4.1.1 | Measure insulation resistance of CT circuits to earth | MO |
| 4.1.2 | Measure insulation resistance of VT circuits to earth | MO |
| 4.1.3 | Measure insulation resistance between external d.c. terminals and between each of these terminals and earth | MO |

4.2 Insulation Tests on General and Cubicle Wiring

(See SCT 20.4.1)

4.3 Inter Relay and Cubicle Wiring Checked To:

Circuit Diagram No

Wiring Diagram No

5 INITIAL CHECKS

- | | | |
|-----|--|--|
| 5.1 | Check that the A.C. current and voltage ratings and the rated frequency are correct. | |
| 5.2 | Before energisation, check the auxiliary supply voltage is as stated on the rating plate and is connected with the correct polarity. | |
| 5.3 | When the relay is energised, ensure that the left hand LED gives a steady green light. | |
| 5.4 | Check for correct operation of the test plug handle RTXH 24 in the test plug module RTXP 24. | |

6 REQUIRED RELAY SETTINGS

All configuration and settings may be made in three ways:

- (a) Via the Man Machine Interface (MMI) unit.
- (b) Via a PC connected to the optical front connector.
- (c) Via a PC connected to the optical front connector, using a disc which has been pre-loaded with the required configuration and settings.

When a PC is used for connection to the relay, the software programs needed are SMS-BASE and SM/REL 531. When using a PC, the setting of the slave number and baud rate must be the same in the program and in the relay. The relay slave number and baud rate can be set using the MMI at:

Configuration
SPA Comm
Front

The relay should be delivered pre-loaded with The National Grid Company plc (NGC) Basic Configuration - refer to TGN(E)62, Volume 2, Appendix G for the current reference.

The relay has four setting groups which enable four independent sets of settings to be programmed and selected according to primary system conditions. Where only one set of settings is required, all four groups should be set the same.

6.1 Distance Protection

(All X and R settings to be in secondary ohms)

Group 1	Group 2	Group 3	Group 4
---------	---------	---------	---------

Operation of Zone 1				
X1Z1	O	O	O	O
R1Z1	O	O	O	O
X0Z1	O	O	O	O
R0Z1	O	O	O	O
RFZ1	O	O	O	O
RFNZ1	O	O	O	O
Timer t_1				
t_1	S	S	S	S
DirZ1				

Group 1	Group 2	Group 3	Group 4
---------	---------	---------	---------

Operation of Zone 2

X1Z2	O	O	O	O
R1Z2	O	O	O	O
X0Z2	O	O	O	O
R0Z2	O	O	O	O
RFZ2	O	O	O	O
RFNZ2	O	O	O	O
Timer t_2				
t_2	S	S	S	S
DirZ2				

Operation of Zone 3

X1Z3	O	O	O	O
R1Z3	O	O	O	O
X0Z3	O	O	O	O
R0Z3	O	O	O	O
RFZ3	O	O	O	O
RFNZ3	O	O	O	O
Timer t_3				
t_3	S	S	S	S
DirZ3				