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National Grid
Technical
Specification

**Ferroresonance
Suppression**

NGTS 3.24.17
Issue 1
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FERRORESONANCE SUPPRESSION

FOREWORD

This specification is a functional specification within the Substation Information, Control and Protection suite of technical specifications. It shall be called up and applied by appropriate bay level specifications.

1 SCOPE

This specification describes the functional and performance requirements for ferroresonance annunciation, DAR Lockout and suppression for National Grid's 400, 275 and 132 kV circuits.

2 REFERENCES

NGTS 3.24.4 Hardware Platform

NGTS 3.24.80 Ferroresonance Detection

3 DEFINITIONS

Ferroresonance In the majority of cases, transformer feeder circuits, or equivalent, will include a section of double circuit overhead line. During operation, it may be necessary to disconnect the transformer feeder from the system while the parallel circuit in the double circuit section remains on load. The condition is characterised by non-sinusoidal voltage waveforms at fundamental or a sub-harmonic frequency (typically one-third fundamental) on all three or more usually two phases. The vector sum of these voltages is always zero. If ferroresonance is sustained, the associated transformer(s) cores are driven into saturation with consequent overheating and eventual damage. For this reason it is necessary to detect and quench the condition.

Transformer Feeder A transformer is considered to be connected into the main HV system via transformer feeder circuit when the distance between the transformer and the associated HV circuit breaker exceeds 1000 m

4 FUNCTIONAL OVERVIEW

Informative: National Grid schemes F1, F2A, F2B, F3 and F4 are defined below for the provision of ferroresonance annunciation, DAR Lock-out and suppression of Ferroresonance conditions. The scheme required for a particular installation will be defined in the Contract. The requirements for Ferroresonance Detection are covered by NGTS 3.24.80.

5 FERRORESONANCE SCHEME F1

Informative: Scheme F1 is designed to initiate an alarm condition, for use by local and remote systems as required, while the ferroresonant condition is present.

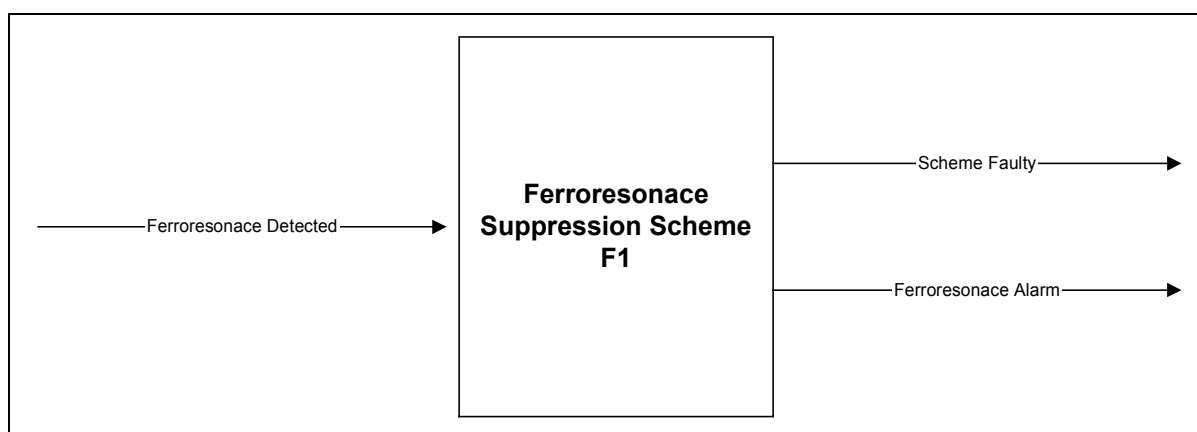


Figure 1: Scheme F1 Interfaces

General Requirements

- 5.1** Scheme F1 shall be provided with the functions and interfaces specified by the F1 Scheme functional and interface requirements.

Scheme F1 Interface Requirements

- 5.2** The F1 scheme shall be provided with the interfaces as defined in Table 1: Scheme F1.

Table 1: Scheme F1		
Interface	Interface Function	Type of Interface
Scheme Faulty	This output shall be set while the F1 scheme is faulty.	Single Point Status output
Ferroresonance Detected	This input shall accept a signal that indicates the presence of ferroresonance.	Single Point Status Input
Ferroresonance Alarm	This output shall be set when the conditions for Ferroresonance Alarm ON have been met.	Single Point Status Output

Scheme F1 Functional Requirements

- 5.3** The F1 scheme shall provide the functionality as defined in Figure 2.

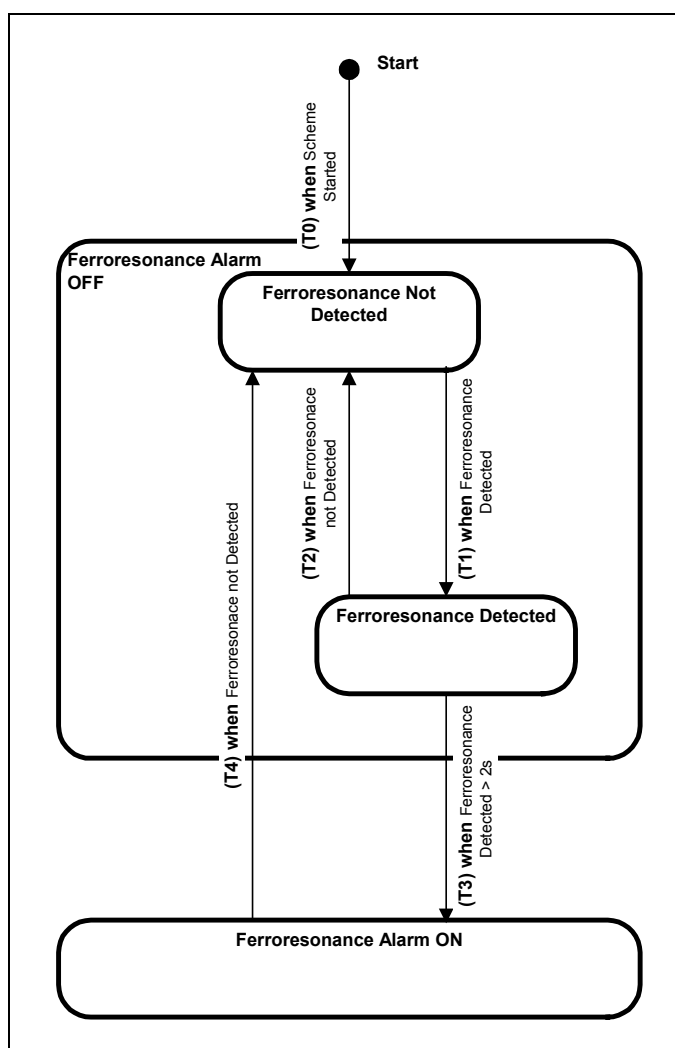


Figure 2: Statechart for Schemes F1, F2A and F2B

Start – F1 Scheme

Informative: Start (F1 Scheme) is the Pseudo State occupied prior to the defined functionality becoming operational and therefore represents the starting point for all subsequent operational transitions. The transitions from this state would typically occur when the equipment platform is powered-up or restarting from a function restart condition.

- 5.4 The start transition (T0) from the Start state to the operational states Ferroresonance Not Detected and Ferroresonance Alarm Not Operated shall take place when the event Scheme Started occurs.

Ferroresonance Alarm OFF

- 5.5 While in the state Ferroresonance Alarm OFF the output Ferroresonance Alarm shall not be set.

Ferroresonance Not Detected

- 5.6 If the input Ferroresonance Detected is set then transition T1 to the state Ferroresonance Detected shall take place.

Ferroresonance Detected

- 5.7 On entering the state Ferroresonance Detected the Ferroresonance Detected Alarm timer shall be started.
- 5.8 If the Ferroresonance Detected Alarm Timer expires then transition T3 to the state Ferroresonance Alarm ON shall take place.
- 5.9 If the input Ferroresonance Detected resets before the timer has expired then transition T2 to the state Ferroresonance not detected shall take place.

Ferroresonance Alarm On

- 5.10 While in the state Ferroresonance Alarm ON the output Ferroresonance Alarm shall be set.
- 5.11 If the input Ferroresonance Detected resets then transition T4 to the states Ferroresonance Not Detected and Ferroresonance Alarm OFF shall take place.

6 FERRORESONANCE SCHEMES F2A AND F2B

Informative: Schemes F2A and F2B are designed to initiate an alarm condition, for use by local and remote systems as required, while the ferroresonant condition is present. Scheme F2A will additionally lockout associated local DAR sequences while the ferroresonant condition is present. Scheme F2B will additionally lockout local DAR sequences and inhibit/lockout remote DAR sequences.

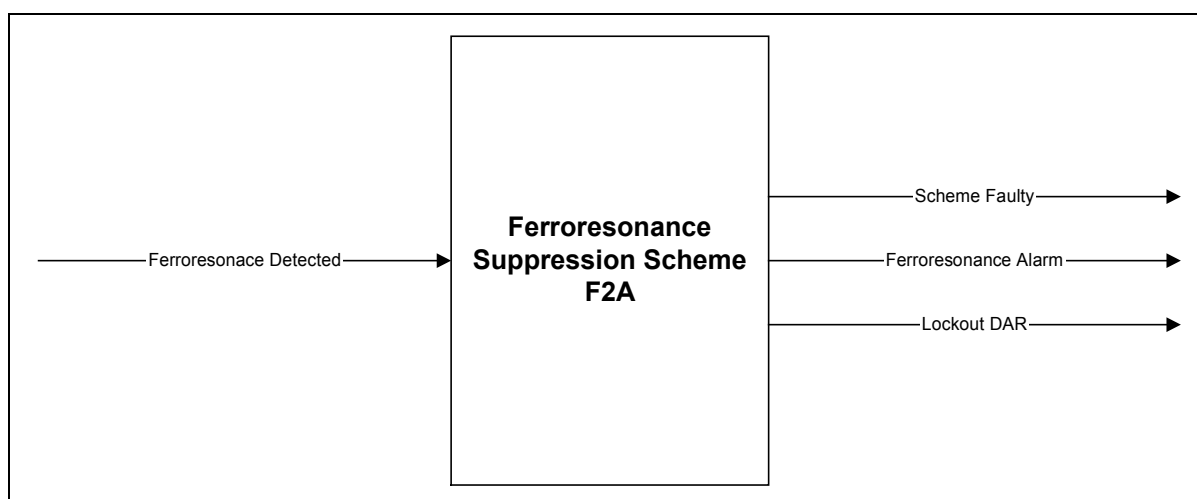


Figure 3: Scheme F2A Interfaces

Scheme F2A General Requirements

- 6.1 Scheme F2A shall be provided with the functions and interfaces specified by the F2A functional and interface requirements.