



PCS-9400

Generator Excitation System

Excitation system is an important part of generator that is used to inject the exciting current into rotor to establish the magnetic field. The excitation system need to maintain the generator voltage level and is required to act on power system static and transient conditions.

NR provides microprocessor-based excitation system to improve generator performance and reduce maintenance costs. It offers the comprehensive control strategies for different applications, such as power system stabilizer, optimum control or adaptive control, etc. It also can be customized to meet the various specifications of specific

project. The current rating is available from 100A up to 7000A and the voltage rating is available from 100V up to 700V.

Functions

- Maintain the terminal voltage at a given value by adjusting the strength of the magnetic field when the generator loads changes.
- Reasonably distributing the reactive power between the generator units in parallel.

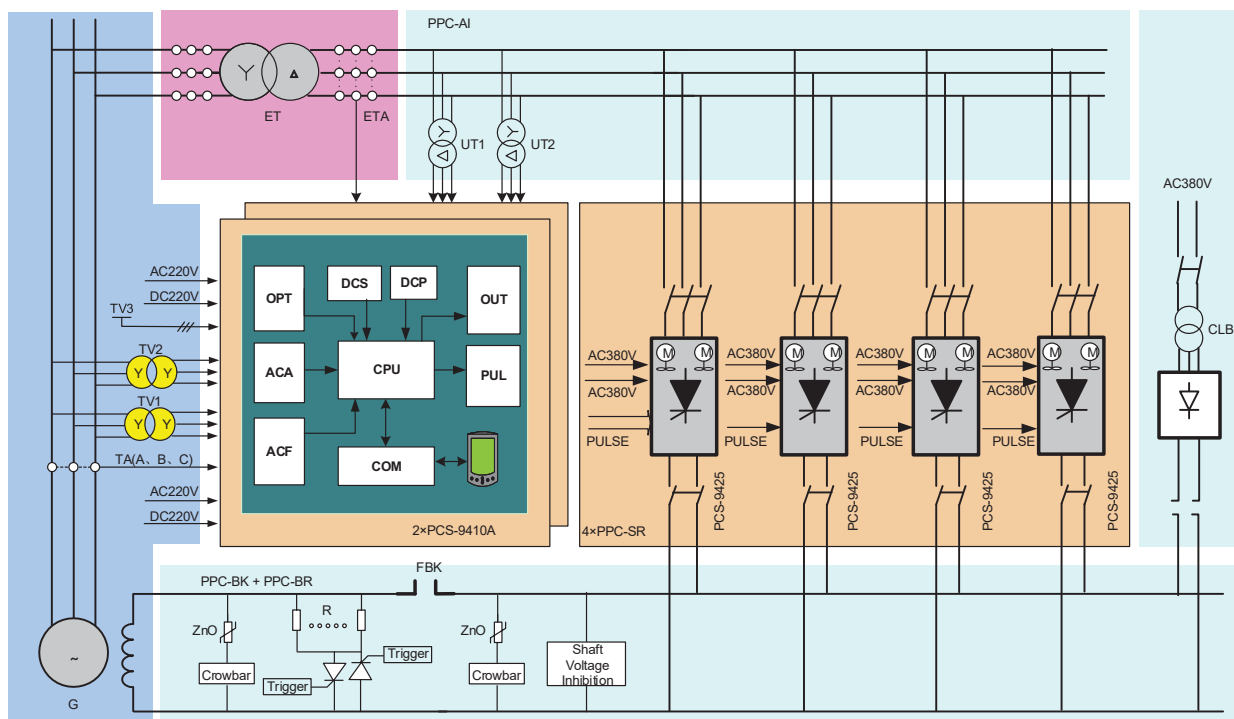


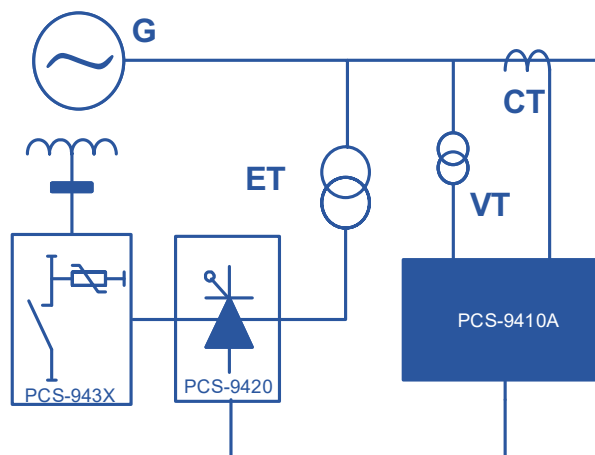
Figure 1 Static Excitation for 600MW Generator

- Improve the stability of power system, including static stability, transient stability and dynamic stability.
- Do de-excitation to reduce the extent of the damage in case of internal fault of generator.
- Perform the maximum excitation limit and the minimum excitation limit for the generator according to operational requirements.

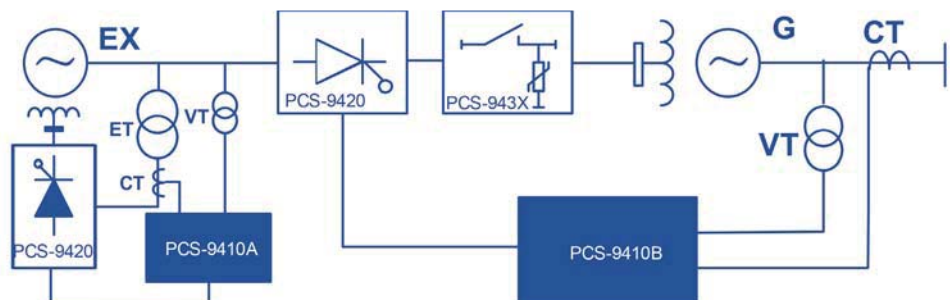
System Configuration

NR's excitation system consists of numerical excitation regulator, thyristor rectifier, diode valve rectifier, de-excitation equipment and auxiliary cabinets. According to the different requirements of each excitation mode, the above equipments can be flexibly tailored to combine the compatible solution.

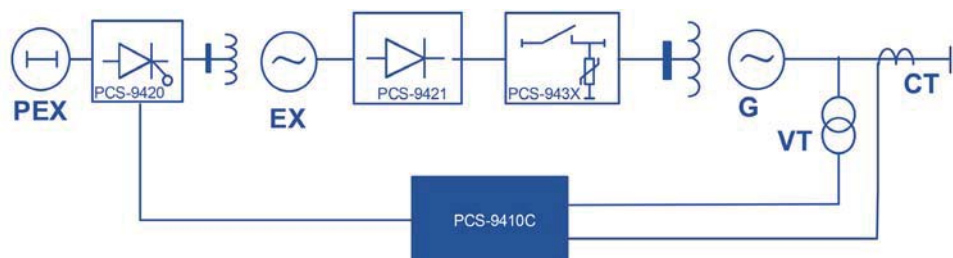
PCS-9400A
Self-excitation
Excitation
System



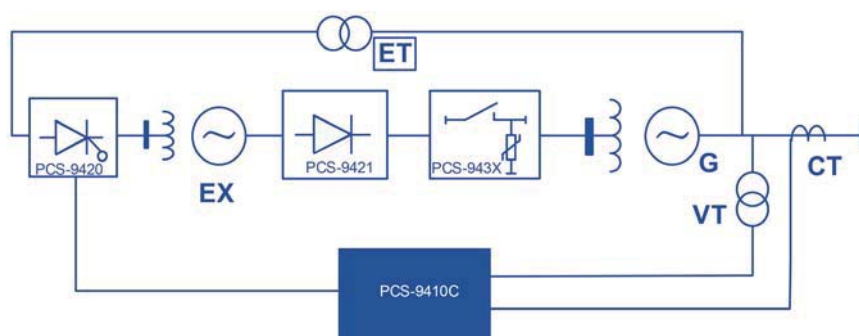
PCS-9400B
Two-machine
Separate Excitation
System



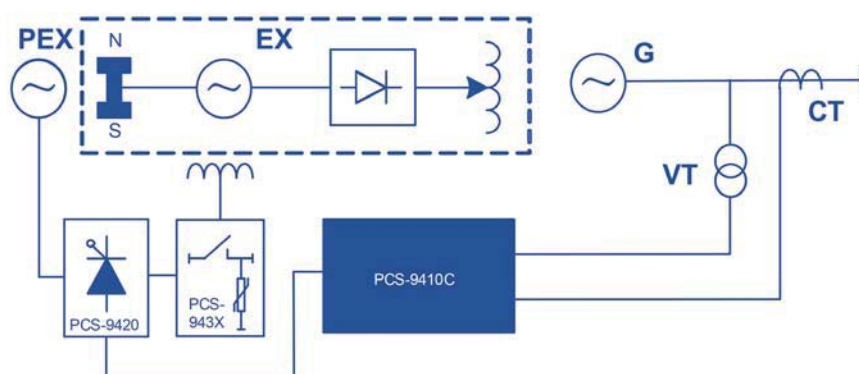
PCS-9400B
Two-machine
Separate Excitation
System



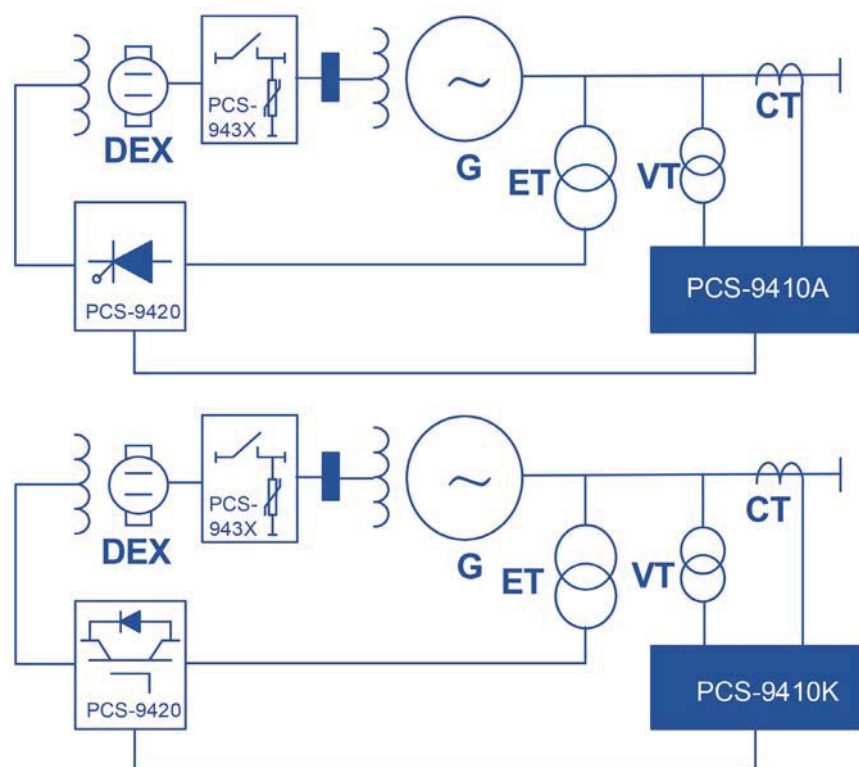
PCS-9400C
Three-machine Plus
Transformer Separate
Excitation System



PCS-9400D
Brushless Excitation
System



PCS-9400E
DC Exciter Excitation
System



Key Components

- PCS-941X Digital Excitation Regulator**
 It consists of dual-channel configuration or three-channel configuration. Each channel is an independent regulation unit based on advanced hardware platform, which is based on multi-processor system including PowerPC, DSP and FPGA. The system provides all essential functions, such as PID regulation+ PSS strategy, many closed-loop and open-loop control laws, difference regulation, many limiters and protections, i.e. under-excitation limiter, over-excitation limiter, false strong excitation limiter, peak current limiter, V/F limiter, overvoltage protection on no-load, TV signal failure protection etc. And self-diagnose function, fault-tolerance control element, oscilloscope and event recording function are all equipped with. The HMI with a LCD and a 9-button keypad is friendly to users. And it is also easy to communicate with PC at higher level. Ethernet interface, optical fiber interface and RS-232/RS-485 serial ports are supplied for communication.
- PCS-9420 Thyristor Rectifier**
 A lot of levels of current output are supplied to match the requirements of users, i.e. 250A, 800A, 1200A, 1800A, 2400A and 3000A. Parallel-connected multi-cabinet operational mode is adopted. The coefficient of equalizing current is larger than 0.9. Aluminum Radiator or Heat Pipe Radiator can be selected alternatively.
- PCS-9421 Diode Rectifier**
 A lot of levels of current output are supplied to match the requirements of users, i.e. 1800A, 2400A and 3000A. Parallel-connected multi-cabinet operational mode is adopted. The coefficient of equalizing current is larger than 0.9. Aluminum

Radiator or Heat Pipe Radiator can be selected alternatively.

- PCS-943X De-excitation Equipment**
 Linear or nonlinear resistor and magnetic blow-out switch are supplied in de-excitation equipment. And overvoltage protection is also equipped with.
- PCS-944X Auxiliary Equipment**
 Special devices for complicated requirements and logic circuits are equipped with the cabinet.

Features

- The Automatic Voltage Regulator (AVR) uses high- performance CPU as the core hardware, and adopts high precise multi-point AC sampling technology, and all the control, regulation, protection function are realized by the module designed software.
- Rectifier cabinet can withstand high capacity, with air wind cooling system.
- A lot of elements and protections are supplied for complete control function of excitation system.
- Parallel-connected dual-cabinet operational mode without switchover process has more reliability.
- Trending and recording data are provided. The user can record the data one second before fault. The system measures AC current and voltage of generator, active power, reactive power and power factor, etc.
- The user can configure and troubleshoot the PCS-9400 via the communication network.

Technical Data

SCR (Silicon Controlled Rectifier) control angular resolution	0.00045°
AD conversion resolution	1pu/2-16, 16-bit
Sampling type	AC sampling directly, 72 points per cycle
Adjustment speed	4000 times/s (Adjustment period 0.25ms)
Voltage regulating range	10% ~ 130% U_{gn} (settable)
Phase shift range	0~180°
Voltage response time	<0.1s (up), <0.1s (down)
Frequency response range	5 ~ 1000Hz