

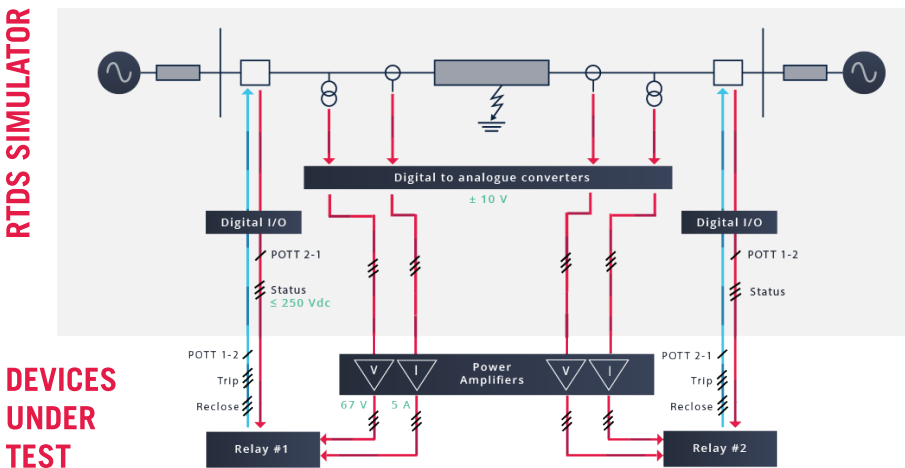
PROTECTION AND AUTOMATION

The RTDS Simulator® offers the most advanced and effective means available for testing protection systems. Since the simulation runs in real time, the physical protection equipment can be connected in closed-loop with the power system model.

The controlled and flexible environment of the digital simulation allows protection equipment to be subjected to virtually all possible faults and operating conditions. The closed-loop interaction of the protection system with the network model provides insight on both the performance of the relay scheme as well as its effect on the power system.

TESTING VIA ELECTRICAL INTERFACE

A model of the power system is implemented on the RTDS Simulator that includes the high voltage components (e.g. lines, breakers, instrument transformers, power transformers, generators, etc.), plus the required protection and control functions not included in the equipment under test.



Typically, detailed models of the instrument transformers (CT, PT and CVTs) are used to provide signals to digital to analogue (D/A) converters.

These signals are proportional to the secondary voltage and current signals the protection equipment would see in service.

Including the instrument transformers in the model makes it possible to evaluate their effect on the performance of the protection system. Alternatively the primary voltage and current signals can be sent directly

to the protection equipment using the appropriate scaling factor.

The analogue output of the RTDS Simulator is provided by the GTAO card, which uses 16-bit D/A converters and allows high accuracy gain and offset calibration. The GTAO operates over a maximum range of +/- 10 Vpeak. To provide secondary voltage and current to the protection equipment, the GTAO output is connected to power amplifiers. In some cases, however, the GTAO output is connected directly to the protection equipment for “low level” testing, which bypasses the auxiliary current and voltage transformers inside the protection equipment.

The protection should respond to faults by providing trip and possibly subsequent reclose signals. Since the network model is simulated in real time, the signals from the protection will be used to operate breakers modeled in the simulation. The breaker models can include the mechanical operating time (either fixed or statistically varied) and provide breaker status via dry contacts.

There are several ways for the breaker commands to be imported into the real time simulation from the protection equipment. If the protection provides signals via conventional dry contacts they can be input either via a Low Voltage Digital Input/Output Interface Panel, which is included with the RTDS cubicle, or a GTDI card.



