# Webinar: HIL Testing a Fault Interrupter with a Distribution Feeder Model

## Wednesday, March 24, 2021

## Questions and Answers

*If you have any further questions, please contact [marketing@rtds.com](mailto:marketing@rtds.com).*

**Q1: Will the slides/recording be made available?**

Yes. The presentation and webinar recording are available to all registrants. A link has been included with this document in the post-webinar email.

**Q2: Will the RSCAD case be made available?**

The RSCAD case used in today's demo is already available for RSCAD users. It is located in the Samples directory of RSCAD, and is fully documented.

**Q3: I have RSCAD installed on my computer, however all tabs related to distribution in the master library are inactive. Why?**

When you create a new Draft case in the RSCAD software, you can choose between 'New Circuit and 'New Distribution Case'. Selecting a Distribution Case activates the Distribution Mode-specific tabs in the master library (Distribution, Distribution Controls, Distribution Protection & Automation, and Distribution Stretchable Components).

**Q4: Would it be possible to interface a "Distribution" model with a regular one?**

In order to decouple a circuit into subsystems, a travelling wave transmission line model is used. The travel time of the transmission line (signal propagation time) must be equal to or greater than the simulation timestep, which means the minimum line length for subsystem splitting is 7.5 km for a 25 µs timestep – or 30 km for the 100 µs minimum timestep of Distribution Mode. Typically, lines of this length are not present in distribution feeders.

The Distribution Mode environment is designed for closely-coupled systems and they must be run on a single chassis/rack. The Distribution Mode library does not include travelling wave transmission lines, so Distribution Mode cases cannot be interfaced to other

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subsystems. To accommodate this, the Distribution model would need to be transferred into normal simulation mode (and reductions would potentially need to be done).

## Q5: How many cores are needed in Novacor to perform Fault interupter testing in IEEE 123 bus?

The IEEE 123 bus case, with no modifications, runs on 1 core. In the demo we are using a modified version of the case which requires 2 cores.

## Q6: Can the solution be scaled to test a full distribution automation system (ie. source restoration scheme)?

Yes. One of the benefits of hardware-in-the-loop testing is that many devices can be tested together. There is no practical limit to the quantity of devices that can be tested at one time – it is a matter of ensuring that the processing hardware and I/O are scaled as necessary. The processing hardware is scaled via core licensing – adding core licenses to a NovaCor chassis increases the size and complexity of the circuit that the hardware can simulate. The I/O is provided via modular cards, so it is also very straightforward to scale. Each analogue output card, for example, has 16 channels, and many of these cards can easily be added to a single NovaCor unit. Digital and communication protocol-based I/O is also modular.

Many users of the RTDS Simulator have dozens or hundreds of I/O channels involved in their test interface, and test many devices at one time.

## Q7: Is it possible to test FLISR schemes which involve several IntelliRupter reclosers with this RTDS test setup?

Yes. FLISR scheme testing in general is possible with the RTDS Simulator. Currently, we have a utility customer who is testing a FLISR scheme that involves 20 distributed controllers in the loop simultaneously. Soon there will be an RTDS Simulator case study document that describes this project in more detail.

If multiple IntelliRupter reclosers were to be tested at once, any necessary communication between IntelliRupters (likely via the communication module) would need to be established.

**Q8: In this HIL test was it necessary to use analog passive filters for the analog signals? i.e. were analog signals filtered?**

The analog signals were not filtered. The washout filter shown in the demonstration is used to model the derivative term of the Rogowski coil.

**Q9: Are you able to test the control module while operating the overhead switch?**

If you recall during the presentation, we showed how the IntelliRupter equipment is mounted in the field. Connected into the base of the actual switchgear is the IntelliRupter's control module, which we remove from the assembly and connect to the RTDS Simulator in the HIL interface. So, the full switchgear is not in the lab – just the control module, which is connected to the IntelliRupter test interface unit. The actual switches are not operating while we are testing – we are testing the control signals that would then operate the switches in the field.

**Q10: How were you able to measure the pulses from the recloser controller? Any GTAI in the loop?**

The analogue signals (Rogowski coil output voltages to represent breaker current, voltages on either side of the breaker) are sent to the IntelliRupter from the simulation via the GTAO (analogue output) card of the RTDS Simulator, which is connected to the IntelliRupter test interface unit from Omicron or Doble. The IntelliRupter's command signals to perform pulse closing are binary signals, which are brought into the simulation via the GTFPI card for low-level digital input and output. So no, there is no GTAI (analogue input) card in the interface.

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