

# Distribution Solutions



Protect your distribution grid—for the people who rely on it—with new solutions that simplify systems and improve reliability

- Deploy more reclosers and keep time-overcurrent protection simple with an SEL High-Density Coordination™ (HDC) scheme.
- Implement fault location, isolation, and service restoration (FLISR) on the Blueframe® Distribution Management System (DMS) without complex modeling.
- Scale up your SEL solutions to meet future needs—without adding complexity to your systems.



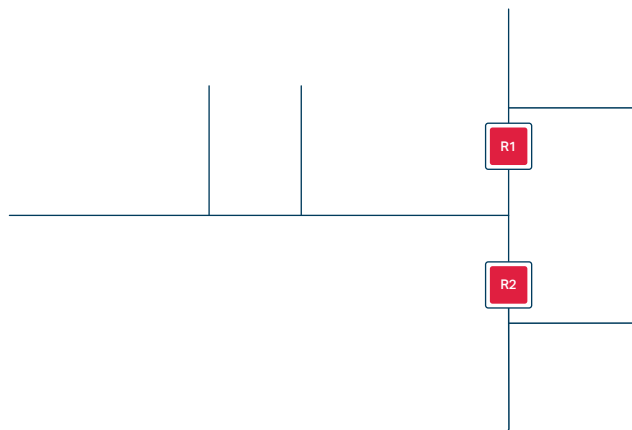
# Simplifying Total System Protection and Control

Because the distribution system is the largest and most varied part of the grid, protection and automation solutions must be scalable and simple to deploy as well as satisfy many different feeder topologies.

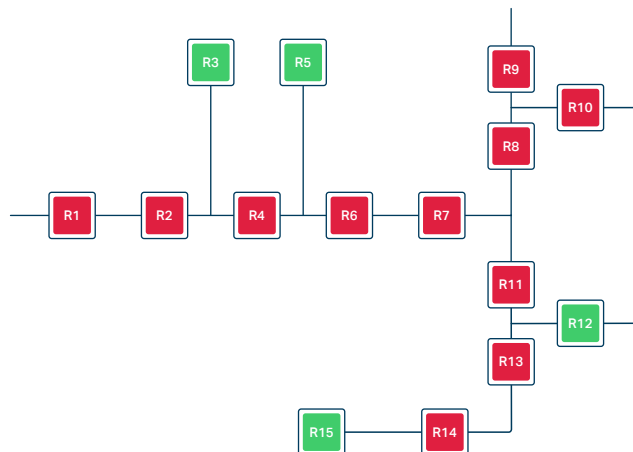
## Innovating Toward Simplicity

Our new distribution offerings—built on the proven capabilities of our intelligent devices—provide a complete distribution solution, from fault inception to system restoration.

- HDC allows you to deploy virtually any number of reclosers and improves time-overcurrent protection.
- Blueframe DMS lets you deploy and scale FLISR schemes with ease.



Feeder networks are evolving. Advanced power grids increase the number of reclosers to reduce the number of customers in each line segment.



SEL HDC simplifies the protection scheme, allowing practically any number of reclosers to operate selectively within coordination margins.

## Seamless Integration—Flexible and Scalable

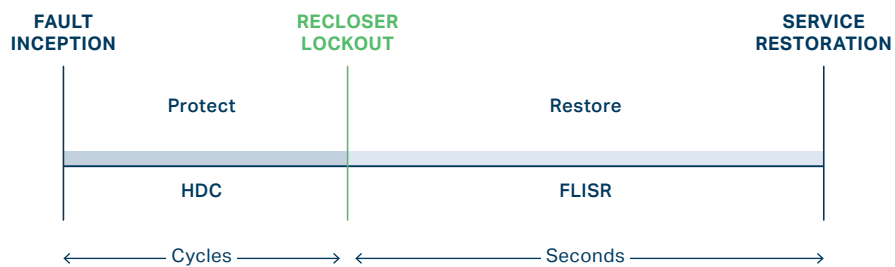
From fault inception to system restoration, our HDC and FLISR solutions deliver a complete distribution feeder protection and restoration solution.

HDC and FLISR are independent systems that work perfectly in tandem. They can be implemented separately or together. And like all SEL solutions, they easily accommodate new capabilities as your distribution system evolves.

### Minimize Outages and Improve Reliability Metrics

When the HDC protection scheme detects a permanent fault, the recloser closest to the fault cycles to lockout.

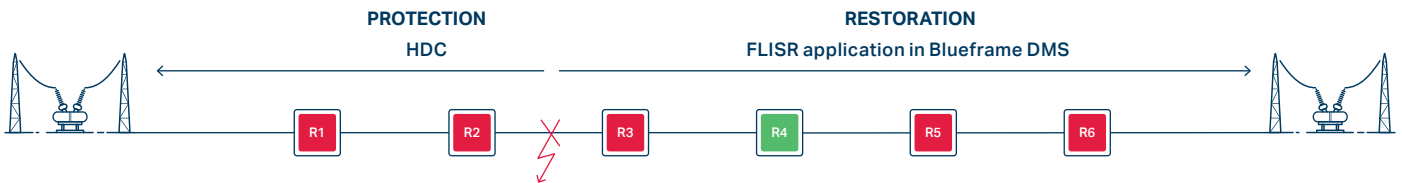
FLISR then recognizes that a recloser has locked out and acts automatically to restore power, reducing outage times on unfaulted sections of the feeder from hours to minutes or seconds.



### Protect Feeders and Restore Service

The HDC scheme protects the feeder upstream of the fault by quickly detecting and extinguishing the fault current.

Downstream of the fault, the FLISR application isolates the faulted line segment and intelligently reroutes power, limiting the outage to the smallest line section possible.



# Improve Reliability With High-Density Protection

Adding recloser controls is one of the best ways to improve distribution system reliability, but in traditional time-overcurrent protection schemes, there is a limit to how many reclosers can be deployed on a feeder before coordination margins become too tight.

SEL HDC solves that problem with a simplified protection scheme that allows the deployment of practically any number of reclosers.

- Improve feeder protection and reduce the number of customers affected by a permanent fault.
- Implement with or without protection-speed communications.
- Deploy at scale or build out over time—simplified device deployment lets you choose your approach.

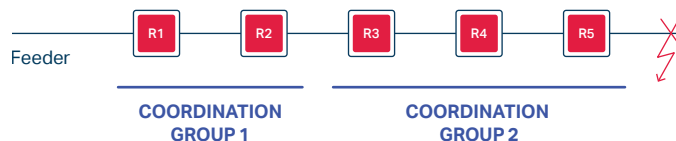
## How HDC Simplifies Protection—Without Protection-Speed Communications

An HDC logic template coordinates the actions of any number of SEL-651R Advanced Recloser Controls. The template restoration logic allows you to achieve many of the benefits of an HDC scheme without an extended protection communications network.

First, coordination groups are established. This allows all SEL-651R controls to remain in recloser mode and operate safely with standard time-overcurrent protection curves on any given feeder.

Then, during fault activity, HDC logic uses group tripping and stepped reclosing to restore the system.

- Recloser controls monitor voltage on both sides of the recloser to accurately identify the faulted line segment.
- The controls use second-harmonic detection to distinguish between inrush and fault current.
- Fast curves and switch-onto-fault logic work together to reduce fault energy and guarantee coordination during the reclosing sequence.



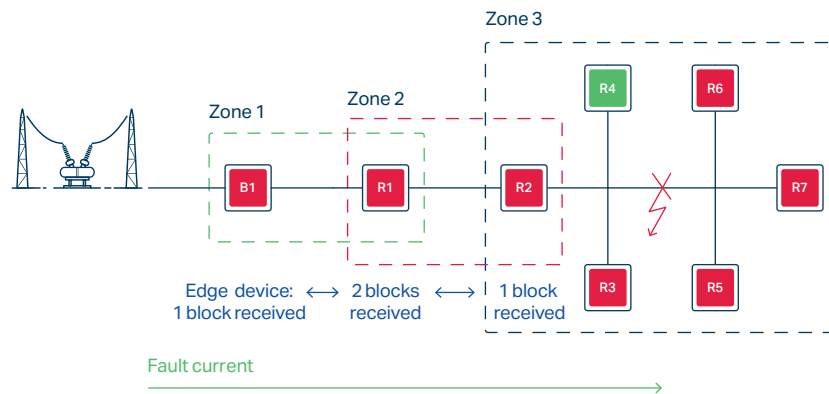
Coordination groups keep time-overcurrent coordination simple and can be applied in any feeder topology.

## Advanced HDC With Protection-Speed Communications— Never Wait to Clear a Fault

Deploy protection-speed communications (IEC 61850 GOOSE protocol over Ethernet fiber) to reduce fault-clearing time, reduce flicker, improve power quality, and extend equipment life.

With high-speed communications, an HDC scheme clears faults in 10 cycles or less, regardless of the fault current magnitude or location.

- Every SEL-651R subscribes to fault activity publications from electrically adjacent devices.
- Recloser controls use fault current detection and zone-interlocking block signals to quickly identify the faulted line segment.
- Coordination groups with group switching and stepped reclosing improve reliability by providing a fallback if communications are lost.



High-speed communications improve fault-clearing times. The HDC scheme remains flexible and can easily accommodate additional reclosers and changes in feeder topology.

# Automate System Restoration With FLISR on Blueframe

Take the next step in improving reliability with a next-generation system restoration solution designed to scale with simplicity.

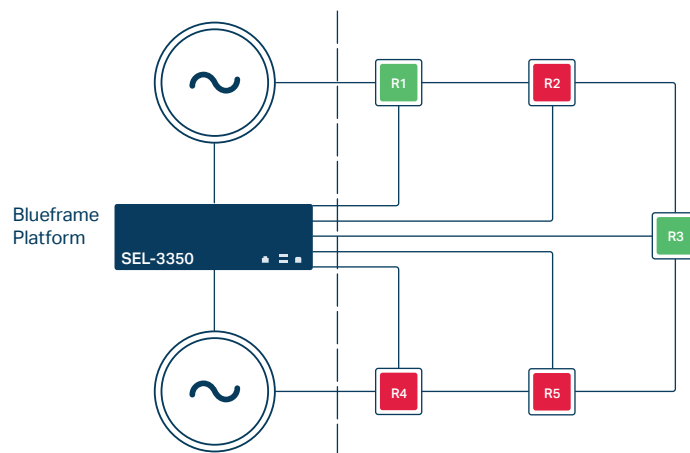
The FLISR application on SEL Blueframe simplifies system restoration and wide-area control by operating independently from the protection scheme and functioning in tandem with it, providing seamless, simplified protection and wide-area control of your entire system.

- Improve SAIDI and SAIFI metrics—reduce outage times downstream of a fault from hours to minutes, seconds, or even milliseconds.
- Deploy in either centralized or distributed architectures.
- Configure and run FLISR without complex modeling—all that's needed is the feeder topology.

## Scale to Fit Any Distribution System

The FLISR application in Blueframe DMS allows you to easily coordinate multiple restoration options for virtually any number of feeders.

- Configure, test, and monitor your FLISR system with software accessed via a web browser.
- Build your system in minutes by drawing each feeder on a graphical interface.
- Add and configure new feeders one at a time while deployed feeders remain operational.
- Test system performance and safety with an integrated simulator.
- Automatically generate detailed event reports.



The Blueframe platform and Blueframe DMS can be embedded in a rugged SEL computing platform or virtualized on any server-grade hardware.

See your system operate at a glance using the built-in graphical feeder topology.

See the current state of FLISR with color-coded status indicators.

Use the integrated simulator to run any feeder in the system through a variety of scenarios.

Issue behavior controls, such as automated Return to Normal.

The screenshot displays the FLISR software interface. At the top, a dark blue header contains the 'SEL' logo, the text 'FLISR', and a notification icon with the number '0' and a blue circle with 'B'. Below the header, the main area is titled 'Feeder 1' and features three status indicators: 'Armed' (green), 'Fault' (blue), and 'Reconfiguration Complete' (green with a checkmark). To the right of the main area are buttons for 'Fullscreen', 'Simulate', and a menu icon. The central part of the interface shows a graphical feeder topology with components labeled B1, R1 (Lockout), R2, R3, and R4. R1 is highlighted with a blue box. R2 and R4 are connected to 'to Feeder 2' and 'to Feeder 3' respectively, both labeled '200'. The diagram includes various symbols for switches (Set 1, Set 2), breakers, and fault indicators (red lightning bolts). At the bottom left, there is a 'Zoom 74%' indicator. On the right side, a panel for device 'R1' is visible, showing 'Device Status' with an 'Open' button, 'In Service' status, and an 'Analog' table.

Phase	Set 1 (V)	Set 2 (V)	I (A)
A	0.71771...	0.71771...	0.7...
B	0.71771...	0.71771...	0.7...
C	0.71771...	0.71771...	0.7...

Draw your system easily on a digital canvas in the included DMS Designer software.

View data received from field devices.

# Build a Complete Distribution Solution

Deploy complete protection and control systems—or start with a device that fills a need and complete the solution over time. Highly reliable, intelligent SEL devices provide solutions for the entire distribution system.

Product Name	Protect	Restore	Optimize
<b>Protective Devices</b>			
<b>Feeder Breaker</b>			
SEL-351S Protection System	•		
SEL-451 Protection, Automation, and Bay Control System	•		
SEL-751 Feeder Protection Relay	•		
SEL-851 Feeder Protection Relay	•		
<b>Pad-Mounted Switchgear</b>			
SEL-451 Protection, Automation, and Bay Control System	•	•	
SEL-487E Transformer Protection Relay	•	•	
SEL-751 Feeder Protection Relay	•	•	
<b>Recloser Controls</b>			
SEL-651R Advanced Recloser Control	•	•	
SEL-651RA Recloser Control	•	•	
SEL-351RS Kestrel® Single-Phase Recloser Control	•		
<b>Wireless Protection System</b>			
SEL-FT50 Fault Transmitter and SEL-FR12 Fault Receiver	•		
SEL-RP50 Fault Repeater	•		
<b>Automation</b>			
SEL Blueframe Platform		•	•
Blueframe DMS			
Blueframe Device Management and Automation (DMA)			
SEL Computing Platforms			
<b>Fault Indicators</b>			
LINAM® FLT and LINAM FLR Fault and Load Transmitter and Receiver System		•	
LINAM AR360 Overhead AutoRANGER® Fault Indicator		•	
SEL Fault Indicators		•	
<b>Capacitor Banks, Voltage Regulators, and More</b>			
SEL-734B Advanced Monitoring and Control System			•
SEL-734W Capacitor Bank Control and LINAM WCS Wireless Current Sensor System			•
SEL-2431 Voltage Regulator Control			•
SEL-2411 Programmable Automation Controller			•
SEL-2414 Transformer Monitor			•



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