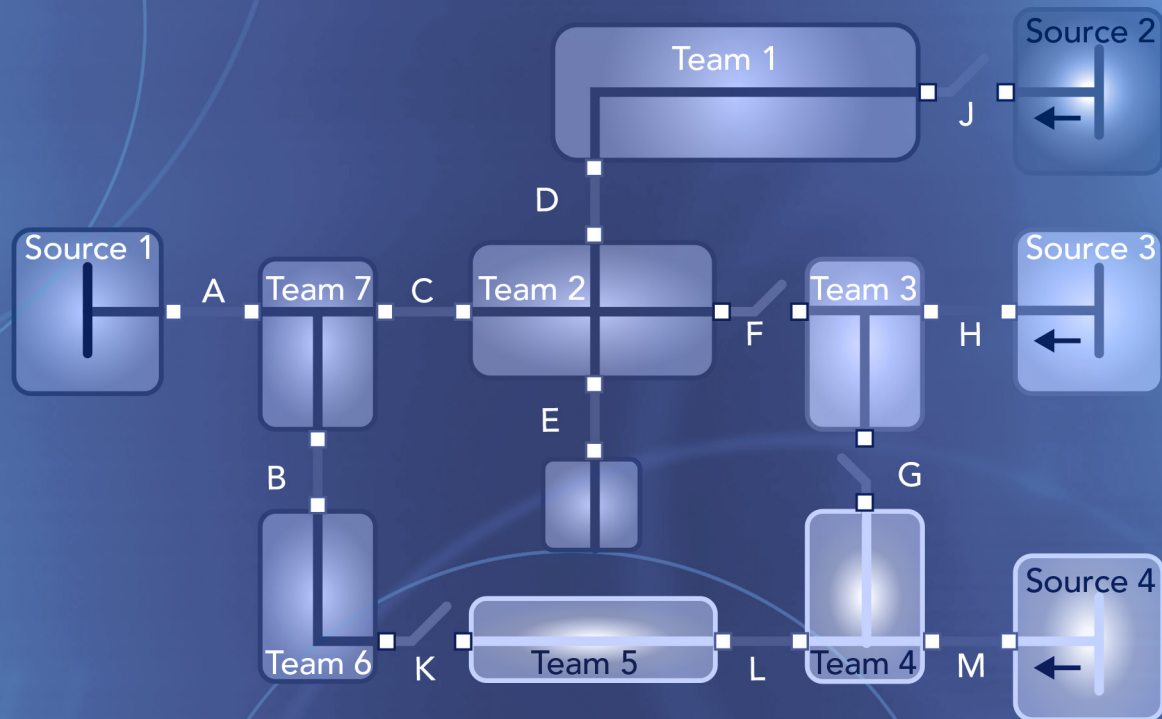


No system is too complex to automate with...



IntelliTeam® II Automatic Restoration System

Introduced in 1997, the IntelliTeam® Automatic Restoration System was the first product of its kind. Using peer-to-peer communication with distributed intelligence, IntelliTeam software tracked system conditions to quickly initiate service restoration. IntelliTeam software was way ahead of its time. S&C's IntelliTeam II software takes automatic restoration to the next level by providing a highly scalable system that is fast and reliable.

IntelliTeam II software works with S&C IntelliRupter® PulseCloser® Fault Interrupters, 6800 Series Automatic Switch Controls, and 6801M Automatic Switch Operators to provide solutions for both overhead and underground distribution circuits for improved service reliability for critical areas of your distribution system. IntelliTeam II software can be expanded to serve entire regions of your system. It requires no central monitoring or SCADA control, though SCADA is fully supported.

With IntelliTeam II software, restoration proceeds without the delays inherent in a dispatcher-operated or centrally controlled system. IntelliTeam II monitors real-time current and voltage throughout the system and uses this information to make smart switching decisions. It acts locally before breakers or reclosers lock out.

Unlike time-coordinated restoration systems that must be carefully pre-programmed, IntelliTeam II software's sophisticated operating logic can automatically restore service under multiple event contingencies. During storms or major outages, it quickly returns service to as many customers as possible, freeing utility personnel to deal with system repairs. IntelliTeam II software minimizes "Customer Minutes of Interruption," improving your reliability ratings.

Easily implemented

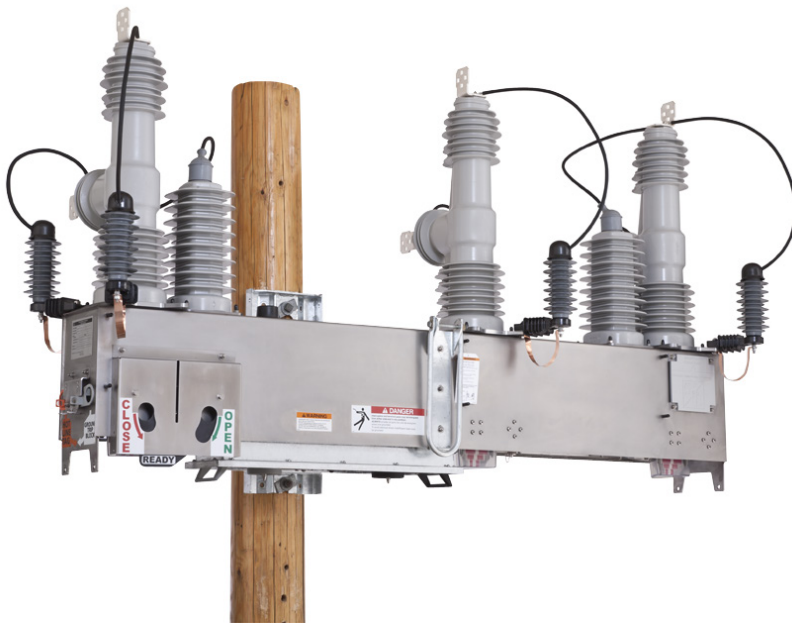
IntelliTeam II software provides out-of-the-box automatic restoration functions. No custom programming or scripting is required. IntelliTeam II software is the easiest, most cost-effective way to improve service reliability. Existing S&C Automation Products can be upgraded to the IntelliTeam II system with a simple software upgrade.

Fully scalable

The original IntelliTeam software was limited to a single team of seven controls, with each control operating one or two switches. The switches needed to be arranged in a loop, with a source at either end and a normally open point.

IntelliTeam II software, on the other hand, supports complex systems of virtually any size and accommodates tie points from multiple sources. It can handle as many teams of switches as line loading will allow. S&C's Power Systems Solutions can readily prepare a load-flow analysis of your system to determine these loading limits.

And with IntelliTeam II software, each team can have up to eight controls. The switches can be arranged in radial circuits, looped circuits, or a combination of both.



38-kV IntelliRupter PulseCloser Fault Interrupter featuring IntelliTeam II software.



6801 Automatic Switch Control featuring IntelliTeam II software.

Maximize the efficiency of your system

Restoration capacity is based on real-time loading and actual feeder capacity, not often-outdated historical loading data. The excess capacity of adjacent sources is used to restore service to unfaulted segments, helping defer the need for system upgrades and allowing you to tie circuits that traditional planning criteria wouldn't permit.

Any remote terminal unit (RTU) or SCADA device using DNP 3.0 can be used to monitor feeder loading at the breaker and continuously transmit this value to the first IntelliTeam II-equipped switch outside the substation. This real-time feeder loading value is subtracted from the total feeder capacity to determine the reserve capacity. Or, S&C's IntelliNode™ Interface Module can be used in conjunction with your substation breaker's control to bring the breaker into the system providing protection to the first segment outside the substation.

You're in control, IntelliTeam II software gives you the flexibility to select restoration strategies. You're assured that system-planning criteria are observed and that critical users get the highest priority.

Compatible with existing systems

IntelliTeam II-equipped controls use DNP 3.0 protocol and peer-to-peer communication via radio or fiber-optic transceivers. No substation automation, or SCADA, is required but is easily integrated with IntelliTeam II software.

When the dead-banding feature of IntelliTeam II software is used, communication traffic on your SCADA system will be significantly reduced. Analog parameters such as voltage, current, and kvars are reported only when measurements exceed user-defined values. You can select either a percentage-based or a fixed dead-band value for each analog parameter.

Designed with your line technicians in mind, IntelliTeam II software uses multiple blocking points to prevent automatic operation when your crews are working on the line. S&C will fully train your line technicians on this and all other features of the IntelliTeam II system with simple demonstrations utilizing actual controls.

How IntelliTeam II Software Works

"Team" and "coach" metaphors describe IntelliTeam II software operation. Each team is a line segment bounded by up to eight switches, each of which can represent a different power source. The software coach continually monitors the real-time voltage and current at each team member and shares this information with coaches of adjacent teams.

When an outage or line fault occurs, the coach of each affected team uses the real-time data, plus voltage and current before to the system event, to develop a restoration strategy. The coaches work together to implement plays that will maximize restoration always within the prioritization rules you've defined.

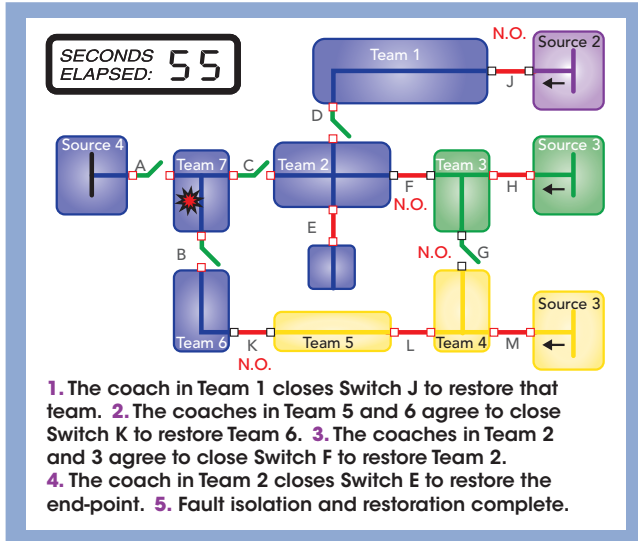
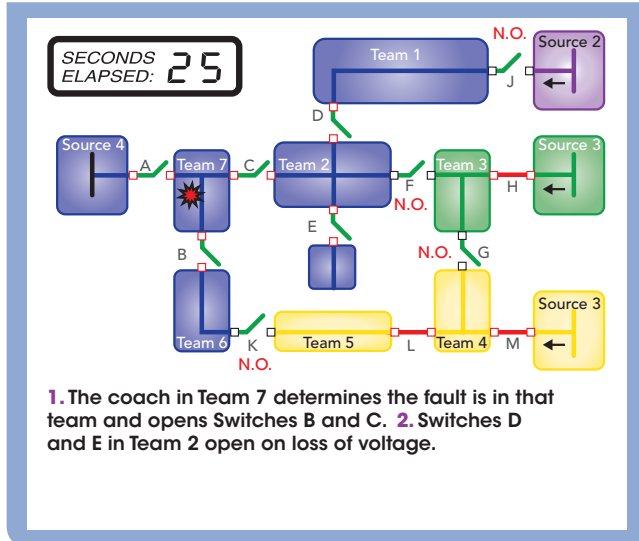
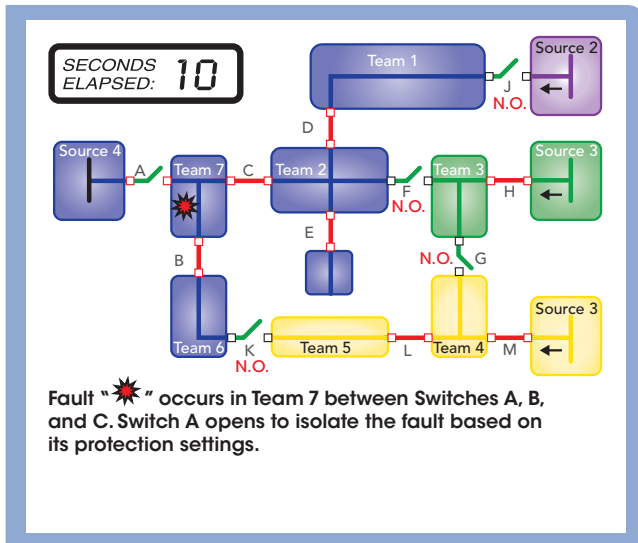
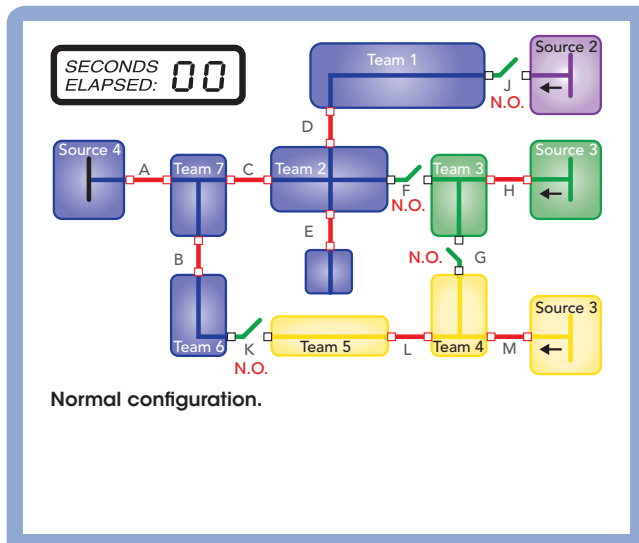
IntelliTeam II operating principles are simple:

- ▶ Each team's mission is to maintain power on its line segment using the normal power source whenever possible.
- ▶ Each team communicates with neighboring teams through switch controls they share in common. The excess capacity of a neighboring team is a possible restoration source that's available at the shared switch.
- ▶ Each switch control monitors the current and voltage at its switch(es). If a fault occurs, the coach of the *faulted team* recognizes that the fault is located in its team because fault current was sensed at only one team switch. (Unfaulted teams upstream of the faulted team will have sensed fault current at multiple switches, indicating that the fault current traveled through the team.) The coach of the faulted team opens all team switches and prevents them from closing, isolating the fault.
- ▶ If an *unfaulted* team experiences extended loss of voltage, its coach evaluates the excess capacity of neighboring teams and transfers load to the first team that has sufficient capacity. The alternate source can be more than one team away; inter-team data exchange ensures the sharing of excess capacity and coordination of restoration decisions. If desired, you can prioritize the order in which alternate sources are specified.
- ▶ When normal power has been restored or the fault has been corrected, the system returns to its normal configuration, either manually, automatically, or via SCADA control.



If another event takes place after the team has transferred to an alternate source, the team will seek another alternate source to keep its line segment energized. The ability to respond to multiple contingencies makes IntelliTeam II software a much more effective tool than other systems. Each coach maintains excess-capacity statistics on adjacent teams that it can use to dynamically prioritize the restoration strategy.

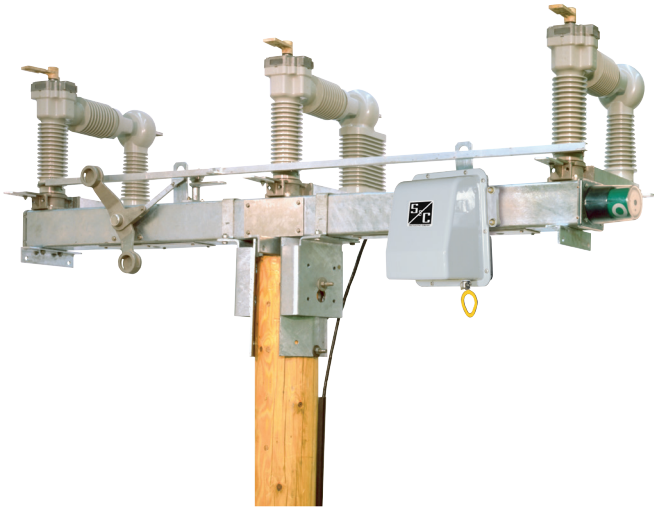
IntelliTeam II software can accommodate virtually any breaker reclosing sequence, provided—there is at least one time-delayed reclose before lockout. Each switch closure is qualified based on pre-fault loading, and each team's capacity for transfer is correspondingly reduced as load is restored.



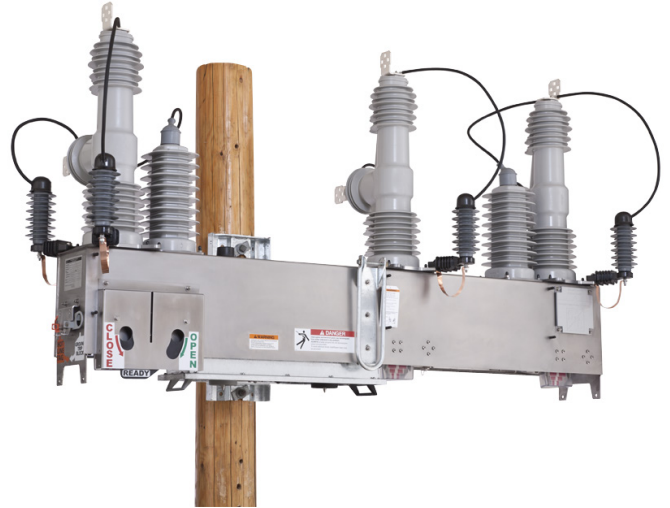
This example shows how IntelliTeam II software responds to a faulted segment. All switches in the affected team experience an overcurrent followed by a loss of voltage. All switches in the team open to isolate the fault. Then service is restored to all the unfaulted segments ... *in less than one minute!*

IntelliTeam II Software Works with Your Equipment

IntelliTeam II software works with overhead and under-ground switching equipment, including S&C's IntelliRupter PulseCloser Fault Interrupter, Scada-Mate® Switching Systems, Remote Supervisory Vista® Underground Distribution Switchgear, and Remote Supervisory Pad-Mounted Gear.



S&C Scada-Mate Switching System.



S&C IntelliRupter PulseCloser Fault Interrupter.



S&C Remote Supervisory Vista Underground Distribution Switchgear.



S&C Remote Supervisory Pad-Mounted Gear.

Descriptive Bulletin 1042-32

June 6, 2016

© S&C Electric Company 2003-2016, all rights reserved

Offices Worldwide ■ sandc.com



S&C ELECTRIC COMPANY

Excellence Through Innovation