Eaton Automatic Transfer Switches

Jody Grabowski – Eaton ATS Product Line Sales Engineer
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Overview

- Understanding Transfer Switch Withstand Ratings
- Switching the Neutral
- New Bypass Isolation Contactor Technology
- Questions
Transfer Switch Withstand Ratings
UL 1008 Withstand Ratings

• **Any Breaker**
  • Any circuit breaker can be used upstream.
  • Test Procedure
    • Withstand - Current is applied for 3 cycles and the contacts must remain closed. The contactor must remain functional.
    • Close-on – Contacts must close on the selected fault current level and remain closed for 3 cycles. ATS must remain functional.

• **Specific Breaker**
  • Only circuit breakers listed as specific breakers on the ATS UL label may be applied upstream.
  • Test Procedure
    • Manufacturer provides UL Rep with the list of desired specific breakers. The ATS is tested with the slowest acting breaker upstream for withstand and close on.

• **Short Time**
  • An ATS must have a short time rating to be applied downstream from a breaker with a short time rating.
    • Withstand - Current is applied for > 3 cycles (manufacturer determined) and the contacts must remain closed. The contactor must remain functional.
    • Close-on – Contacts must close on the selected fault current level and remain closed for same number of cycles. The contactor must remain functional.
    • Temperature Rise Test
Transfer Switch Equipment and UL1008

In 1997:
UL added 41.20, effective September 18, 1997

41.20 A transfer switch tested for three cycles shall be marked, When protected by a circuit breaker without an adjustable short-time response only or by fuses……
Transfer Switch Equipment and UL1008

WHY?

• Unfortunately the UL1008 3-cycle test does NOT require verification of contact viability. The fact that the upstream breaker probably trips, and causes an power failure to the ATS logic, hopefully causes a subsequent transfer to the backup source.

• If you do NOT verify contact viability in a true short-time situation you might get caught with an ATS that acts like a fuse, an upstream breaker that doesn’t trip, and no power failure to the ATS. Hence a loss of power to the load!
Withstand / Close-on Ratings

Critical Power Switches Have 3 Cycle “Any Breaker” Ratings

UL Listing Valid Only if Used with the Circuit Breakers Indicated on Manufacturers Label. Listing must Include Numerous Breakers for Application Flexibility.
Specific Breaker Lists

- Each manufacturer has a unique Specific Breaker List
- Includes Eaton’s and Competitors Breakers
- Includes current and vintage breakers
3 Cycle vs. 30 Cycle

- ATS protected by an PCB with an adjustable trip unit (i.e. LS, LSG)
- ATS has a Short Time Rating
- Downstream PCB selectively coordinated with upstream PCB
- Downstream Breaker clears fault (short time setting up to 0.5s)
- ATS stays on Utility source (no loss of power)
- ATS must maintain integrity as the ATS does not transfer from Utility source, reason for temp test after 30 cycle short time test in UL1008
Short Time Definition in UL1008

Short-time current rating is the maximum amount of fault current a switch can withstand at a specified voltage for a given amount of time and remain **functional**.
In 2002 UL added Paragraph 36A Short-Time Current Rating Test (Optional), and marking 41.20.1.

What is different?

- Paragraph 36A.1 g) requires that a Temperature Rise test be performed AFTER the withstand test.
- Paragraph 36A.1 h) requires that the dielectric withstand test be rerun.
Transfer Switch Equipment and UL1008

If you will be using a breaker with a Short Time Trip element upstream from the ATS, then UL indicates you MUST use a transfer Switch with a UL1008 Short Time Rating.
## Selective Coordination & NFPA 70
### The National Electrical Code (NEC)

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**Legend:**
- Star indicates a new or revised section.

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Conclusion on Short Time Ratings

• Although the Short time test is optional, it is required for certain applications.
• If your ATS is not labeled with a short time rating as shown, it is a misapplication of the ATS if selectively coordinated between breakers set higher than 3 cycles.
• A 3 cycle ATS rating can only be protected by a breaker with an instantaneous trip.
Switching the Neutral
When to Switch the Neutral

- It is recommended to switch the neutral when working with a separately derived system. This is generally accomplished with a fully rated four pole switch or by utilizing a three pole switch with an overlapping neutral.

  - **Non-Separately Derived System** - Those systems where only one bonding jumper between the neutral and ground exists.

  - **Separately Derived System** – Each power source has its own reference to ground.
## Methods to Address Separately Derived Systems

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<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td><strong>Option 1</strong> 3-Pole Switching</td>
<td>• Lowest Cost</td>
<td>• Nuisance tripping of GF relay on de-energized source</td>
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<td>• De-sensitizing the energized source GF relay.</td>
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<td>• Added complexity for GF relay switching as shown in Figure 5 to prevent nuisance tripping of de-energized source.</td>
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<td><strong>Option 2</strong> 4-Pole Switching</td>
<td>• No circulating current, so no possibility of desensitizing energized source GF relay and no possibility of nuisance tripping a GF relay protecting a de-energized source</td>
<td>• Higher cost</td>
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<td>• Larger footprint (size)</td>
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<td>• Reported neutral transients*</td>
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<td><strong>Option 3</strong> 3-Pole Switching with Overlapping Neutral</td>
<td>• May be less expensive than true 4-pole since overlapping neutral typically is not rated for fault duty switching</td>
<td>• During the time when both neutrals are connected, the same disadvantages as a 3-pole switch (nuisance tripping of GF relay on de-energized source and de-sensitizing energized source GF relay) exists</td>
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<td>• Added complexity and reduced reliability from an external switch controlled by levers and interlocks connecting to main switch</td>
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<td>• Added complexity to add GF relay switching as shown in Figure 5 to prevent nuisance tripping of de-energized source.</td>
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<td><strong>Option 4</strong> 3-Pole Switching with Special GF Sensing Scheme</td>
<td>• Less expensive than 4-pole or 3-pole with overlapping neutral</td>
<td>• More complex wiring as de-energized sources have their trip circuits de-energized and their CT circuits paralleled with the CTs of active sources [11]</td>
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Reference White Paper – 3 pole vs. 4 pole switching

New Bypass Isolation Transfer Switch Technology
Eaton Contactor-Based Bypass Isolation Transfer Switch

- 100A – 1200A 100% rated
- ATC-300, ATC-800
- Delayed and Closed Transition
- Front Accessible
- No Load Break Transfer to Bypass
- Dual ATS
- Available Dual Draw-out or Fixed Bypass
- Nema 1, 3R (12 and 4X 2011)
Dual ATS

- Dual ATS functionality – Both the ATS and the Bypass are controlled by the ATC controller
Bypass Isolation ATS Construction

- Top Interconnect Compartment
- Bypass Contactor Compartment
- ATS Contactor Compartment
- Bottom Interconnect Compartment
- Standard Front Access
- Field Reconfigurable
- Separate Compartment Doors
- 1200 Amp 3 Pole Open Transition
## Eaton Bypass Contactor Withstand Ratings

<table>
<thead>
<tr>
<th>Withstand Rating (Any Breaker) KA @ 480v</th>
<th>Withstand Rating (Specific Breaker) KA @ 480v</th>
<th>Withstand Rating (Any Breaker) KA @ 600v</th>
<th>Withstand Rating (Specific Breaker) KA @ 600v</th>
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<tr>
<td>1200</td>
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Draw-Out ATS with Fixed Bypass

78”H X 30”W X 29”D Nema 1

90”H X 40”W X 29”D Nema 1
Terminal Connections – Fixed Bypass

- Factory configured terminal location
- Top, Bottom, or combination of both.
- Must select at time of order.

Top Connect

Bottom Connect
Dual Draw-out (Optional)

- ATS and Bypass contactors are identical, thus interchangeable
- Both the ATS and Bypass are draw-out contactors
- Connection to Contactor
  - Locked In Position – Connected
  - Isolated Position – Connected
  - Racked Out – Disconnected

90”H X 40”W X 29”D Nema 1
Connectable Bus Links (W/Dual Draw-out Option)
Safety Interlocks

- Five Sets of Interlocks
  - Trip contactor if contactor is closed when racking out
  - Trip contactor to neutral position upon racking unit in
  - Prevent Opening ATS Compartment Door
  - Prevents Opening Ratchet Slot
  - Prevent ATS contactor testing until isolated
Questions?