



Eaton Automatic Transfer Switches

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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 a 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

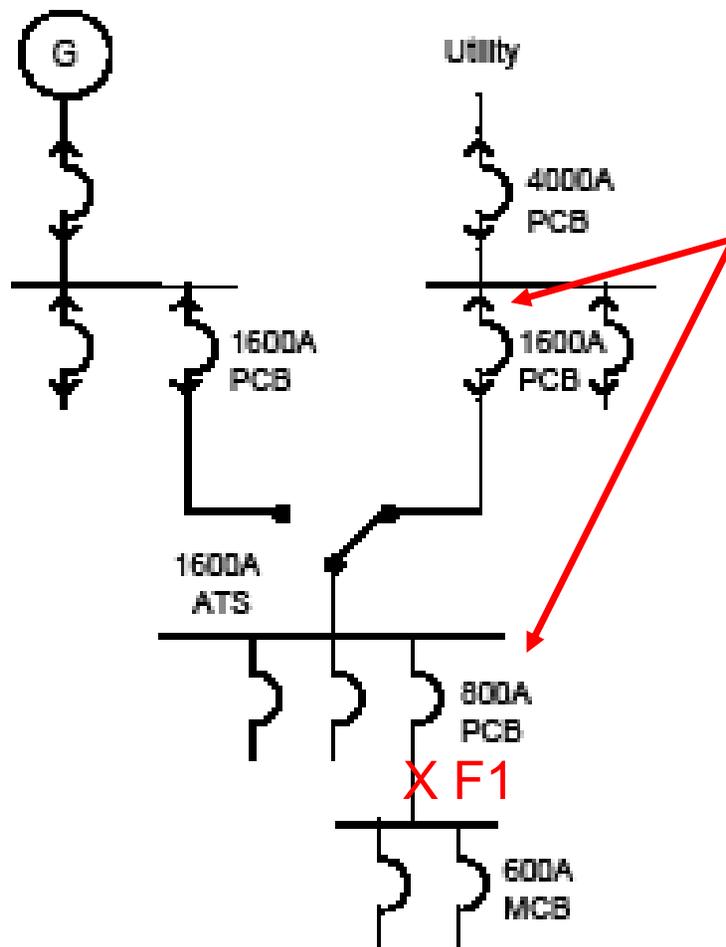
Critical Power Switches Have 3 Cycle "Any Breaker" Ratings

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

PERMANENT LOAD DOES NOT EXCEED SWITCH RATING. 240V MAX. WHEN PROTECTED BY THE SHOWN OVERCURRENT PROTECTIVE DEVICE. THIS SWITCH IS SUITABLE FOR USE ON A CIRCUIT CAPABLE OF DELIVERING NOT MORE THAN THE RMS SYMMETRIC CURRENTS AT THE VOLTAGE SHOWN.

RMS SYMM	AMPS MAX	K1000	VOLTS	BREAKER/MFR/TYP	AMPS MAX
ANY	ANY	ANY	ANY	ANY	PER NE
ANY	ANY	ANY	ANY	ANY	PER NE
50	600				
5	480	GE	TRIP		800
			MICROSENSATRIP TKL		1200
5	480	I-T-E	CLD6, HHL6, HHLXD6, HLD6, SCLD6, SHLD6, CHD6, HMD6, SCMD6, SHMD6, CND6, HND6, SCND6, SHND6, CPD6, SCPD6		800, 600, 800, 1200, 1600
5	480	SQUARE D	MH SERIES 2 SE(LS TRIP), SEH(LS TRIP)		1000, 2500, 2500
5	480	WEST	HLD TRI-PAC NB, TRI-PAC TC		800, 800, 1600
100	480	FUSE	ANY CLASS L		1200

3 Cycle vs. 30 Cycle



- ATS protected by an PCB with an adjustable trip unit (i.e. LS, LSG)
- ATS has as 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**.

Transfer Switch Equipment and UL1008

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)

		NEC VERSIONS					
Article	Title	1993	1996	1999	2002	2005	2008
100	<i>Definitions</i>					★	
517	<i>Healthcare Facilities</i>					517.26	517.26
620	<i>Elevators, Dumbwaiters, Escalators, Moving Walks, Wheel Chair Lifts, and Stairway Chair Lifts</i>	620.51(a)	620.62	620.62	620.62	620.62	620.62
700	<i>Emergency Systems</i>					700.27	700.27 Exception
701	<i>Legally Required Standby Systems</i>					701.18	701.18 Exception
708	<i>Critical Operations Power Systems (COPS)</i>						708.54



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 it's own reference to ground.

Methods to Address Separately Derived Systems

Method	Advantages	Disadvantages
Option 1 3-Pole Switching	<ul style="list-style-type: none"> • Lowest Cost 	<ul style="list-style-type: none"> • Nuisance tripping of GF relay on de-energized source • De-sensitizing the energized source GF relay. • Added complexity for GF relay switching as shown in Figure 5 to prevent nuisance tripping of de-energized source.
Option 2 4-Pole Switching	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Higher cost • Larger footprint (size) • Reported neutral transients*
Option 3 3-Pole Switching with Overlapping Neutral	<ul style="list-style-type: none"> • May be less expensive than true 4-pole since overlapping neutral typically is not rated for fault duty switching 	<ul style="list-style-type: none"> • 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 • Added complexity and reduced reliability from an external switch controlled by levers and interlocks connecting to main switch • Added complexity to add GF relay switching as shown in Figure 5 to prevent nuisance tripping of de-energized source.
Option 4 3-Pole Switching with Special GF Sensing Scheme	<ul style="list-style-type: none"> • Less expensive than 4-pole or 3-pole with overlapping neutral 	<ul style="list-style-type: none"> • 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]

Reference White Paper – 3 pole vs. 4 pole switching

[http://www.eaton.com/ecm/idcplg?IdcService=G
ET_FILE&dID=223905](http://www.eaton.com/ecm/idcplg?IdcService=G
ET_FILE&dID=223905)



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)

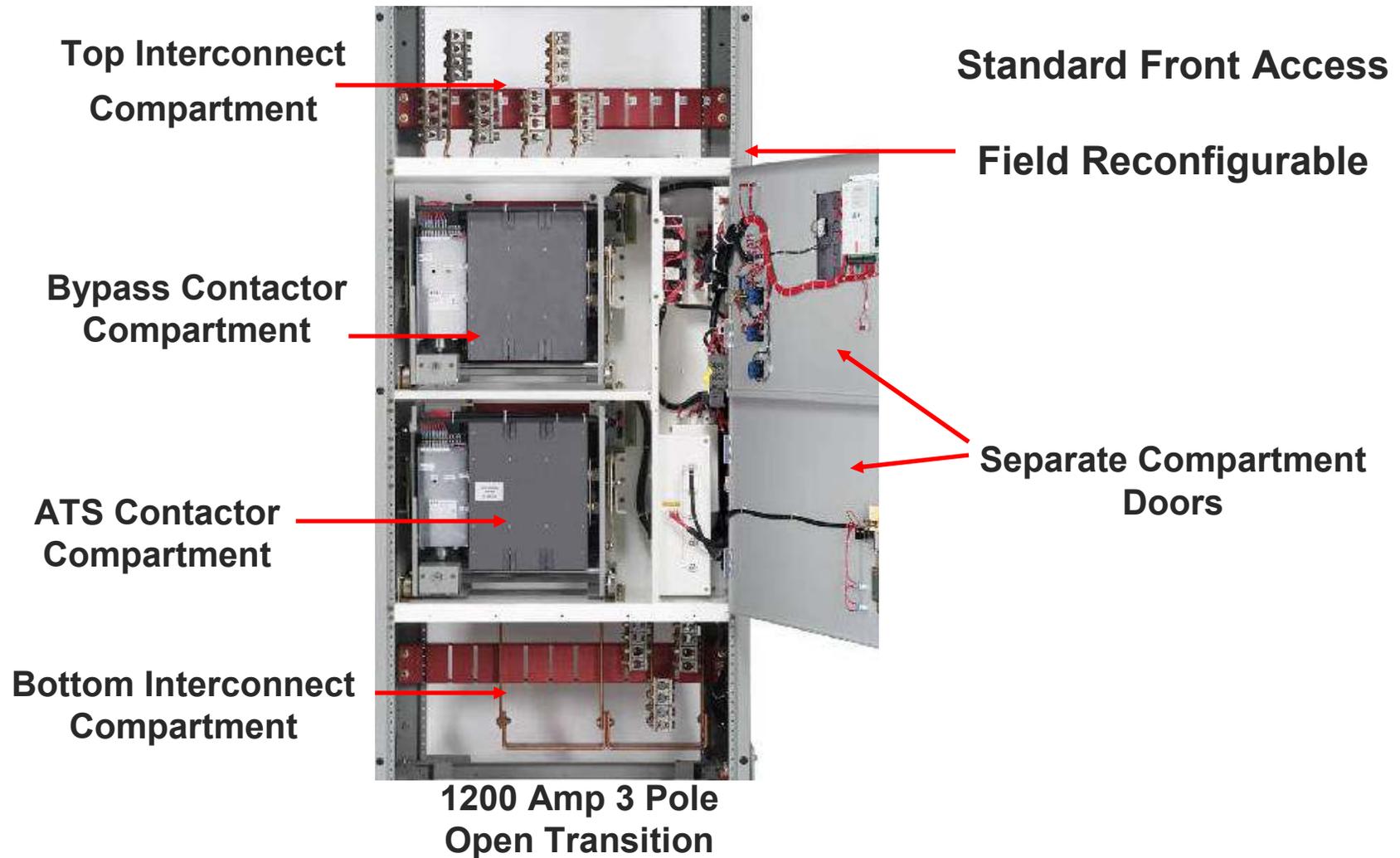


Dual ATS

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



Bypass Isolation ATS Construction



Eaton Bypass Contactor Withstand Ratings

	Withstand Rating (Any Breaker) KA @ 480v	Withstand Rating (Specific Breaker) KA @ 480v	Withstand Rating (Any Breaker) KA @ 600v	Withstand Rating (Specific Breaker) KA @ 600v
100	30	50	30	50
200	30	50	30	50
400	30	50	42	65
600	50	65	42	65
800	50	65	42	65
1000	50	65	42	65
1200	50	65	42	65

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.



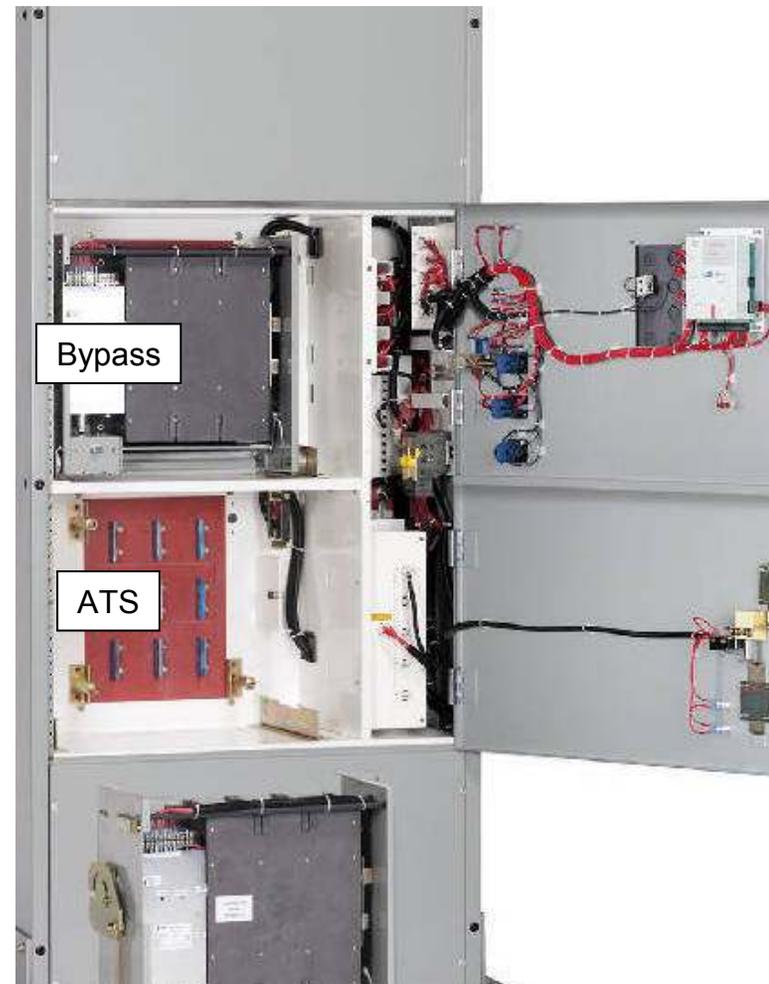
Top Connect



Bottom Connect

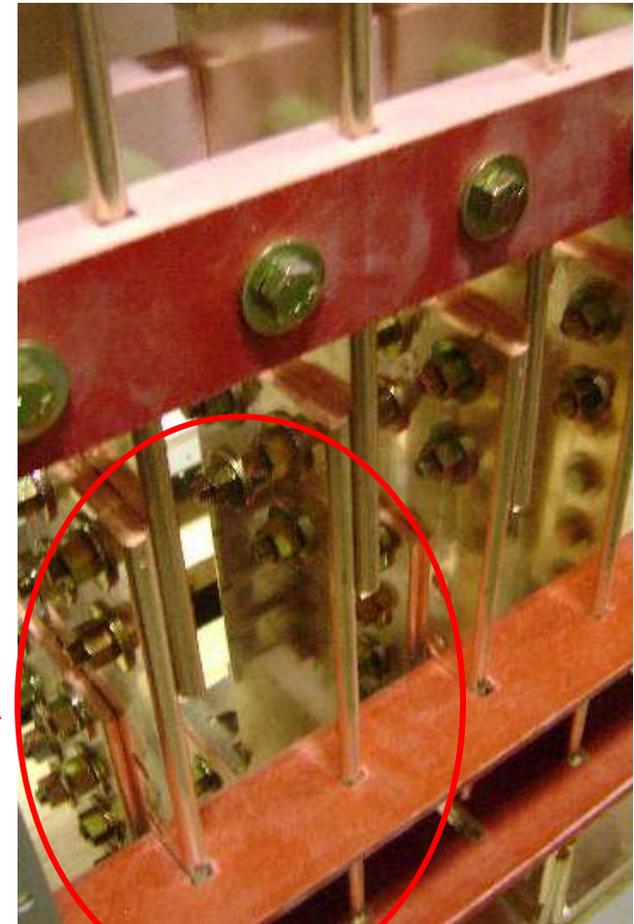
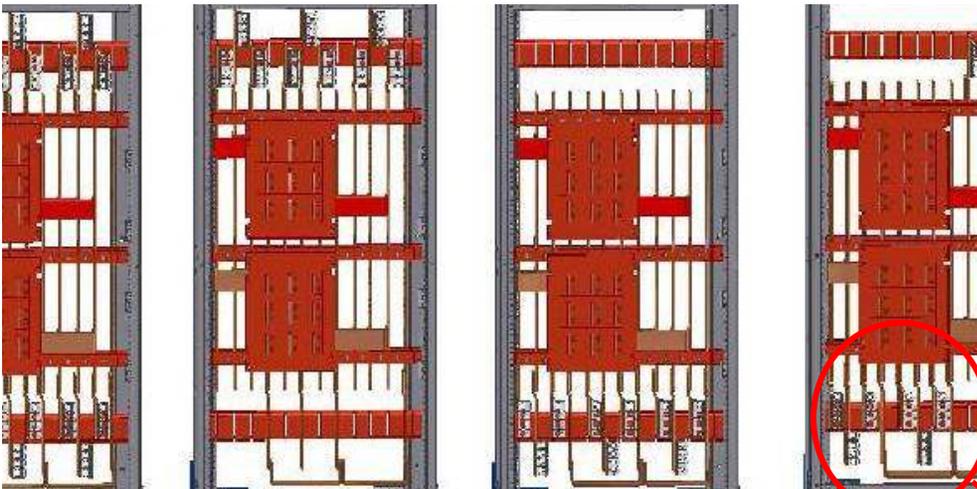
Dual Draw-out (Optional)

- 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

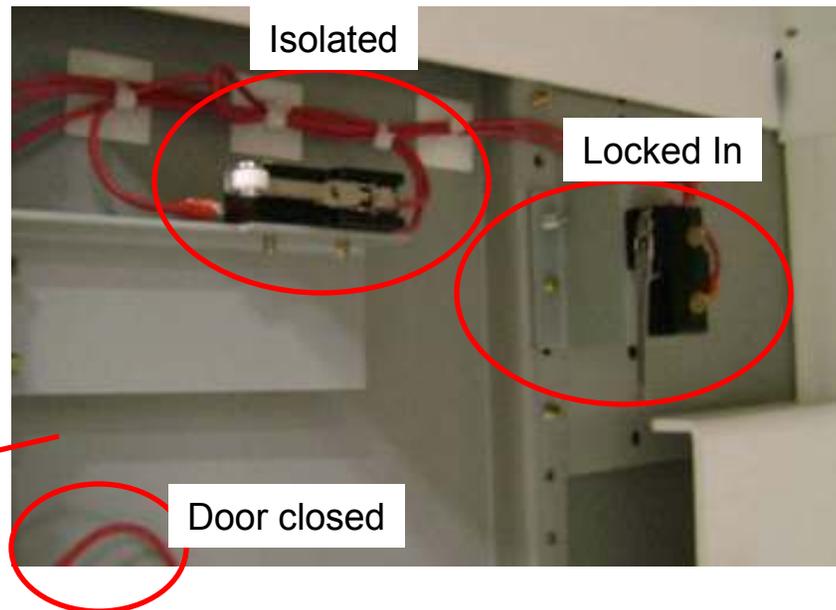
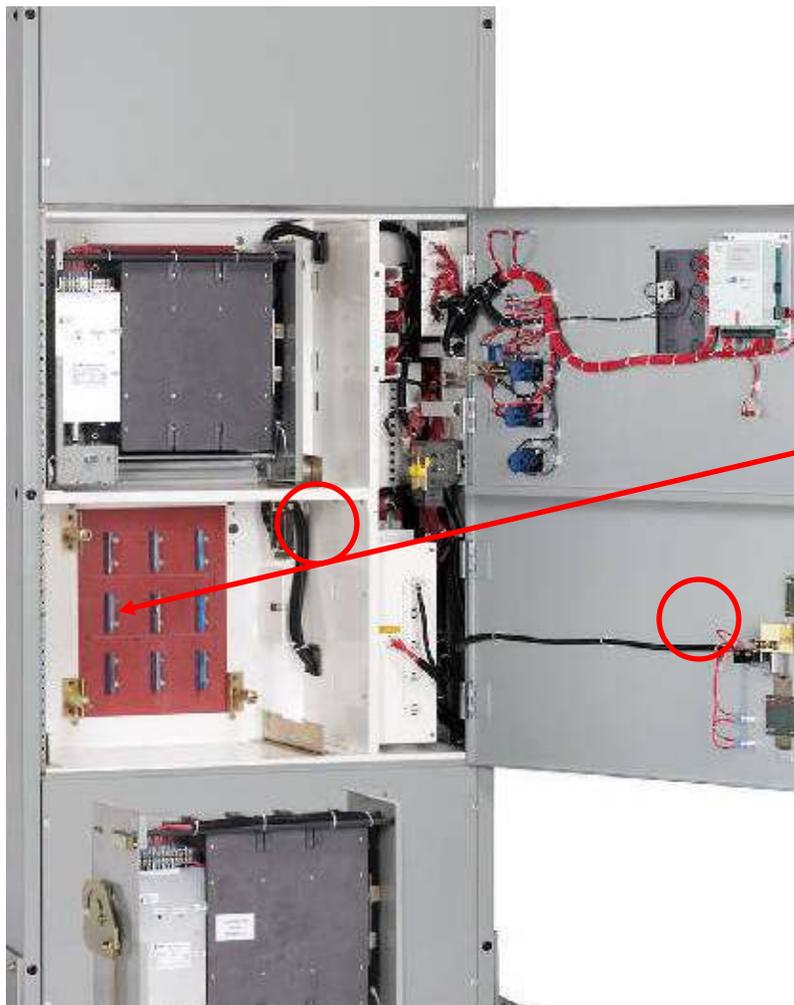


90"H X 40"W X 29"D Nema 1

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?
