ASCO Innovation Talk Webinars

Ask The Experts – Power Control Systems

19th January 2021

ASCO Power Technologies™

Life Is On Schneider Electric

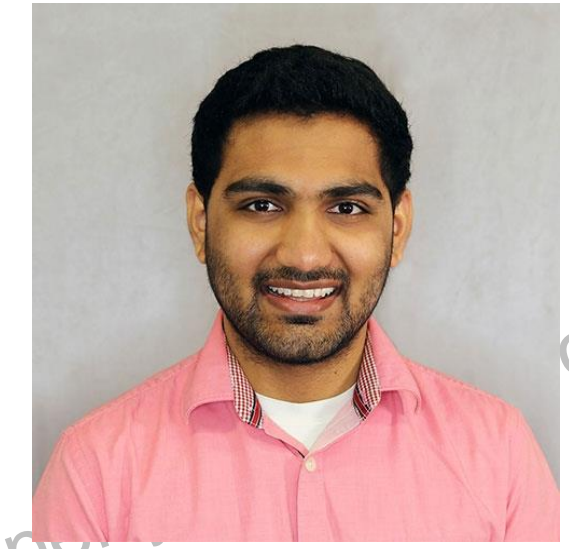
Introduction and Important Notices

- Please put your questions in the webinar tool now and throughout the webinar:
  - Power Control Systems (paralleling switchgear) related questions only please
  - We will get to as many as possible – however we will keep track of all questions and try to answer at a later date if we don't get to them
- We will run through some common questions as well as address live questions
- These slides will be available on the ASCO website in 48 hours

The Expert Panel

Mohamed Mohamed
Senior Project Manager

- Master's degree in Electrical Engineering
- PMP Certified
- With ASCO since 2013
- His experience concentrates around engineering and project management

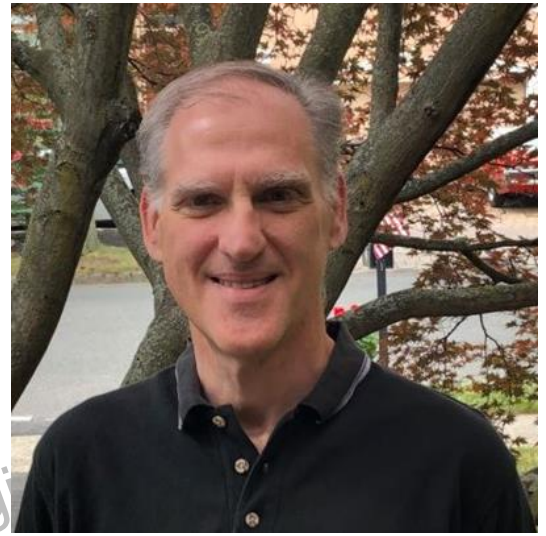


Akshat Patel
Senior Applications Engineer

- With ASCO since 2016
- responsible for creating proposals, drawings, financials and providing technical support to field sales engineers for PCS product line
- Bachelors in Electrical Engineering from New Jersey Institute of Technology
- Co-author of research paper published in Chemical Physics Letters Journal for his previous job in Nanotechnology Research Program

Anthony Landi
Director of Engineering

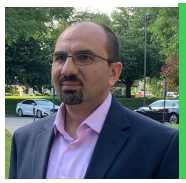
- 28 years with ASCO
- Bachelors degree in Electrical Engineering from Villanova University
- Licensed professional engineer in the state of New Jersey
- 7 years in Switch Power Laboratory
- 7 years as a PCS engineer
- 14 years in Engineering management



Peter Rossomando
Director of Applications Engineering

- 30+ years with ASCO, 36 years industry experience
- 3 years as Applications Engineer
- 15 years as Project Manager in Northeast and Southeast regions
- 12+ years experience in Applications Engineering Management for both ATS & PCS products
- BSEE in Electrical Engineering from New Jersey Institute Technology

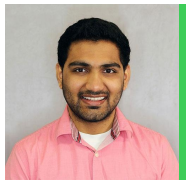
Q: *Do power cables have to be brought directly into the switchgear section in which they are to be terminated, or can they be routed through an adjacent section?*



Mohamed Mohamed
Senior Project Manager

A: Consult the factory. The answer depends on the unique construction and layout of the switchgear.

Q: *What are the Product lines we offer?*



Akshat Patel
Senior Applications Engineer

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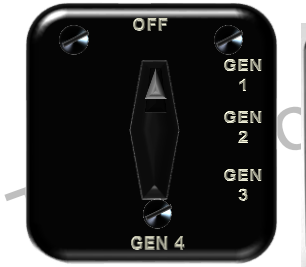
Senior Applications Engineer

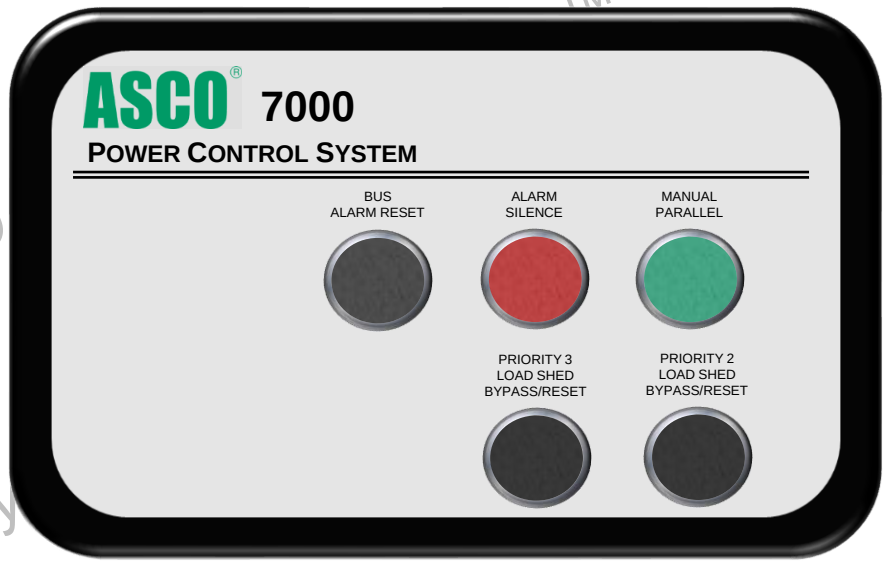
Q: *What are the benefits of a hardwired manual parallel circuit?*

Anthony Landi
Director of Engineering

- **Manual Paralleling**
  - **This provides a means to manually close the generator breakers in-phase if one or more automatic synchronizers are not functioning properly.**
  - **All of the generator breakers can be closed from one location, at the Master, and without having to stand in front of the generator breaker.**
  - **A Synchroscope, Plant Selector Switch and Synch Check Relay aid the operator in the control and prevent out of phase closures.**
  - **A hardwired manual parallel ckt provides an alternate manual close path in case the automatic control relay fails.**
  - **True Manual Paralleling Is Designed To Operate In the Absence Of Automation**



1. **Observe Synchroscope**
2. **Manual Parallel Pushbutton is illuminated**
3. **When Light *goes out* chosen gen is in sync**
4. **Press manual parallel pushbutton initiating breaker close for effected generator.**
5. **Breaker close is wired through a discrete sync check relay insuring breaker is not closed out of sync.**



Q: *What options are available for arc flash protection/reduction for low and medium voltage switchgear?*

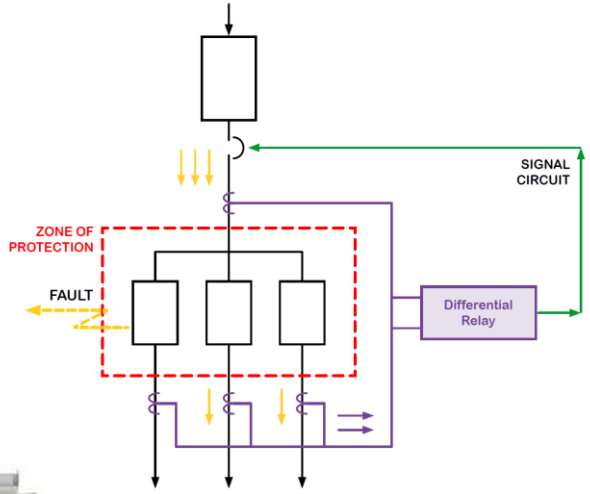
Peter Rossomando
Director of Applications Engineering

NEC Specified Methods – Article 240.87(B)

"One of the following means shall be provided *and shall be set to operate at less than the available arcing current*"

- **Energy-Reducing maintenance switching with local status indication**
- **Energy Reducing active arc flash mitigation**
- **Differential Relaying**
- **Zone Selective Interlocking**
- **An Instantaneous trip that is less than the available arc current**
- **An Instantaneous override that is less than the available arcing current – *Temporary Adjustment of the Instantaneous trip setting to achieve arc energy reduction shall not be permitted***
- **An approved equivalent means**

Circuit Breaker with ERMS switch



Differential Relaying

Protective Relaying with arc protection capability

Arc Resistant Medium Voltage Switchgear – ANSI 37.20.7

2020 NEC added *Article 240.87(C) – Performance testing* requiring:

1. ***Documents that show the implemented arc reduction method operates below the arcing current.***
2. ***Documented field tests that prove the installed method performs as intended.***

Q: *Are full side and rear barriers a requirement of UL1558?*

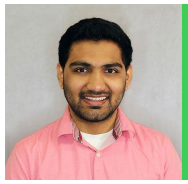
Mohamed Mohamed
Senior Project Manager

A: No, not required. UL1558 requires compartmentalization of the circuit breakers in the sections. Barriers between the sections and barriers in the rear compartments of the sections are optional.

Optional rear barriers

Optional side barriers

Q: *What are the screen sizes we offer?*



Akshat Patel
Senior Applications Engineer

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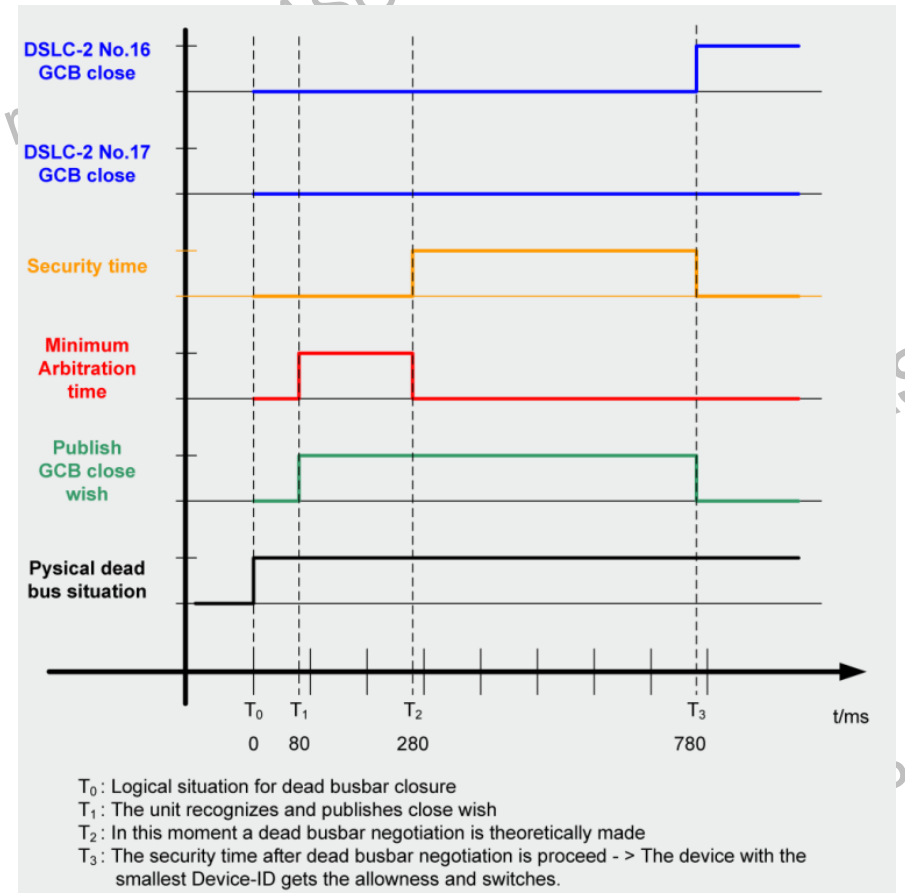
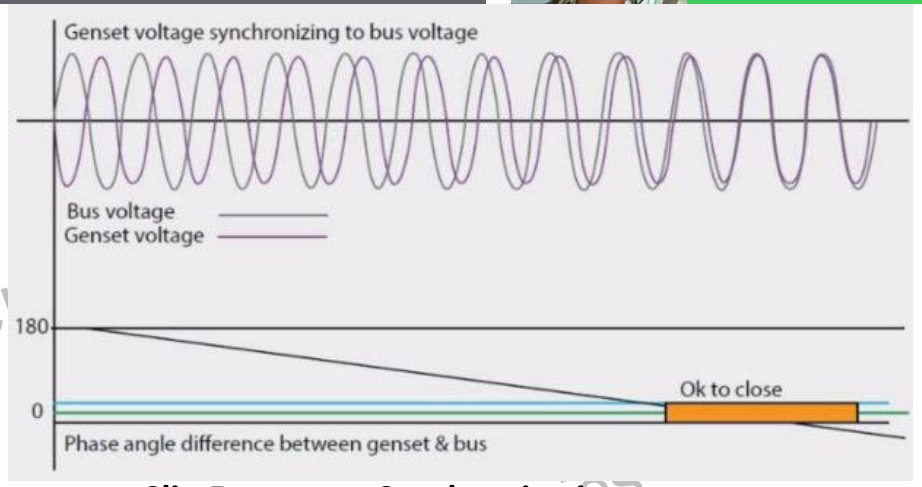
Senior Applications Engineer

Q: *How long should it take for each generator to connect to the bus?*

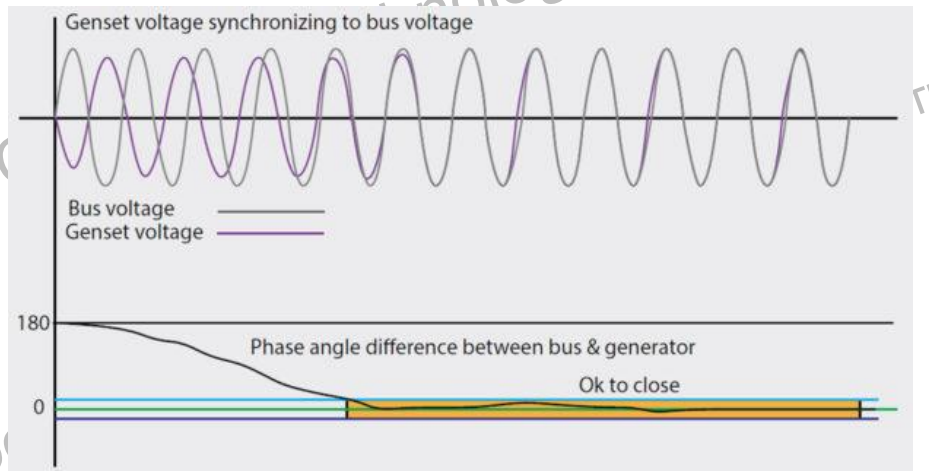
Anthony Landi
Director of Engineering



Dead bus closure arbitration (multiple circuit lockout):



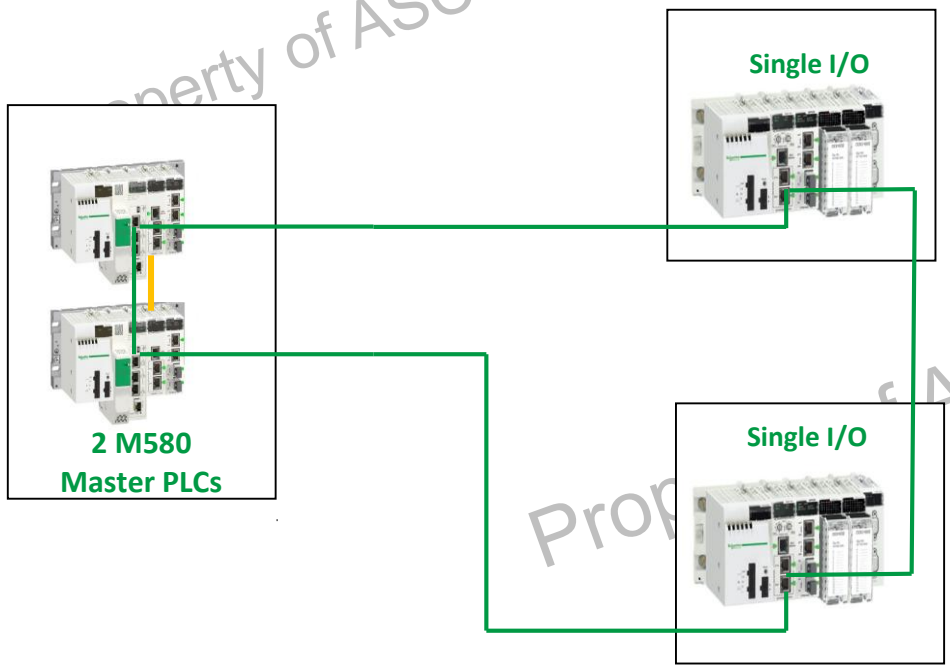
Slip Frequency Synchronization



Phase Match Synchronization

Q: *What is the benefit of Redundant Master PLCs and what options are available if both PLCs are not available?*

Peter Rossomando
Director of Applications Engineering



Redundant Master PLC

- **Increased reliability and uptime for critical applications**
- **Eliminates single point of failure**
- **Synchronized CPUs provide Bumpless transfer if one PLC fails – No interruption to program/process**
- **Additional layer of reliability/protection for relatively low cost**
- **Optional Redundant I/O**
- **Life Safety, Data Center, Financial**

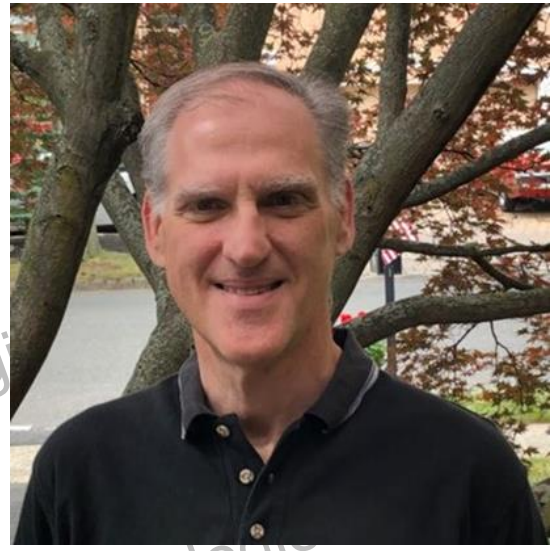
Hard wired manual backup for Load control

Questions from the Audience

Mohamed Mohamed
Senior Project Manager

Akshat Patel
Senior Applications Engineer

Anthony Landi
Director of Engineering



Peter Rossomando
Director of Applications Engineering

Q: *Can 5.0P or 6.0P Trip Units installed on MTZ circuit breakers?*

Mohamed Mohamed
Senior Project Manager

A: No, Trip units 5.0P or 6.0P can be used with NW circuit breakers.
MTZ circuit breakers use 5.0X or 6.0X trip units.

5.0P Trip Unit PN# S163A
6.0P Trip Unit PN# S164A

5.0X Trip Unit PN# LV847602
6.0X Trip Unit PN# LV847603

One of the most advantage of using the 5.0X/6.0X Trip Unit is trip current could be digitally incremented by 1Amp which gives a wide range of trip current selections that are not available when using 5.0P/6.0P Trip Units.

Q: *What are the types of PLCs we offer?*

Akshat Patel
Senior Applications Engineer

Akshat Patel
Senior Applications Engineer

Q: *Does NEC require load shed when a generator is removed from the bus?*

Anthony Landi
Director of Engineering

(B) Selective Load Pickup, Load Shedding, and Peak Load Shaving.

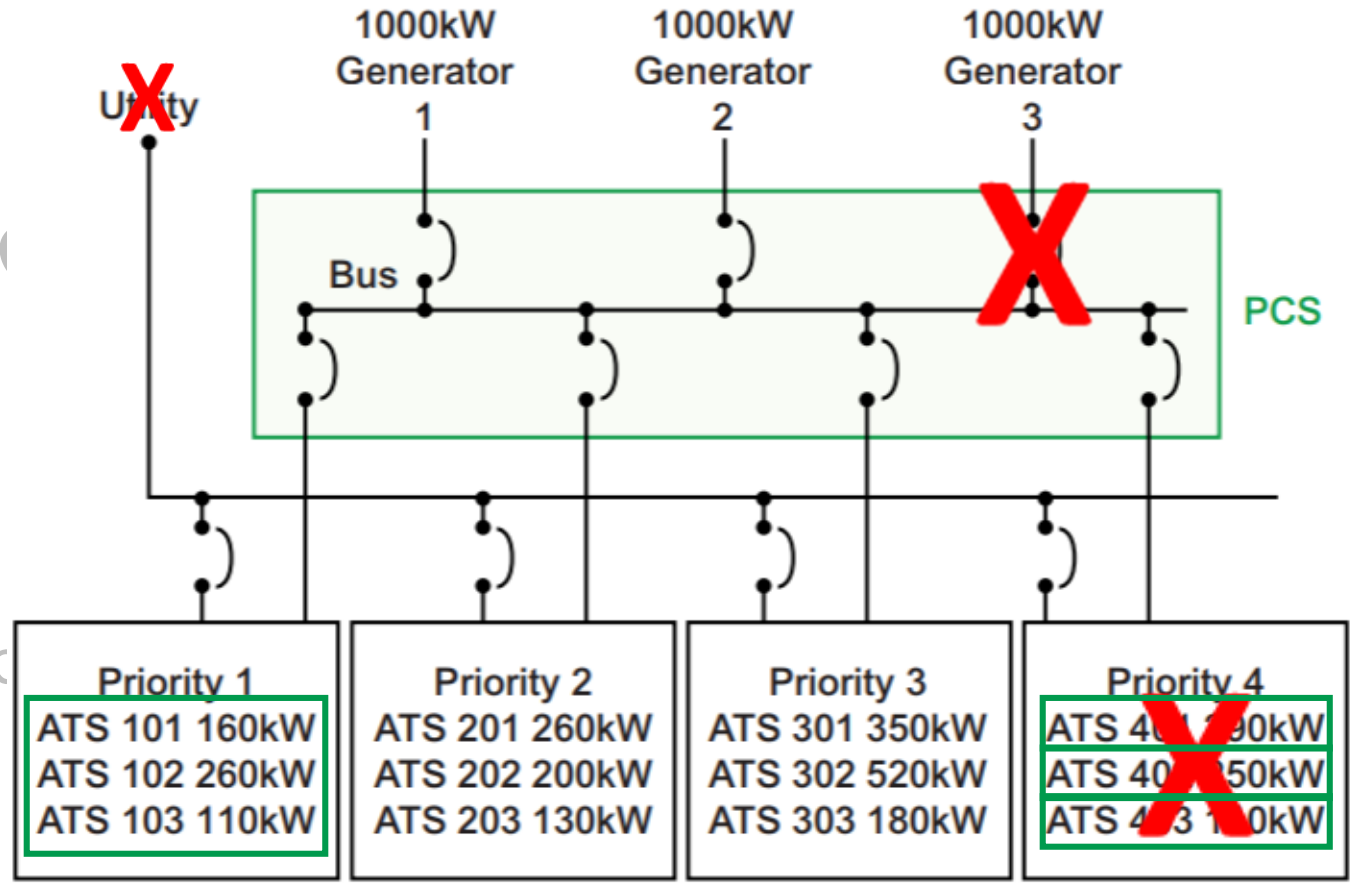
The alternate power source shall be permitted to supply emergency, legally required standby, and optional standby system loads where the source has **adequate capacity** or where **automatic selective load pickup and load shedding is provided as needed to ensure adequate power to (1) the emergency circuits, (2) the legally required standby circuits, and (3) the optional standby circuits, in that order of priority.**

Q: *If an engine fails or fails to start what actions do ASCO controls take?*

Peter Rossomando
Director of Applications Engineering

ASCO Power Control Systems are provided with a standard Bus Optimization Feature

- **Bus Optimization Operates if an engine fails *or* fails to start**
- **Individual Loads within Priority blocks are pre-assigned Subpriorities and kW Values via the Master HMI**
- **The lowest priority load block is shed if the remaining capacity can't support it**
- **After a time delay Loads within a priority block are reconnected to the emergency bus in order up to 90% of capacity**
- ***Dynamic Bus Optimization Measures real time load kW and reconnects loads***
- ***Bus Optimization features are typically under specified***

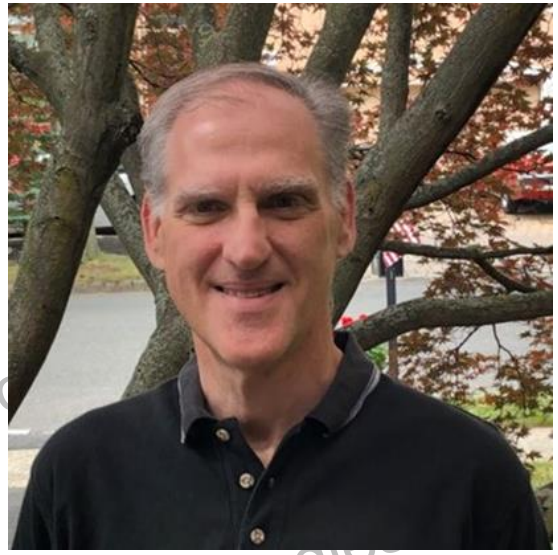


Questions from the Audience

Mohamed Mohamed
Senior Project Manager

Akshat Patel
Senior Applications Engineer

Anthony Landi
Director of Engineering



Peter Rossomando
Director of Applications Engineering

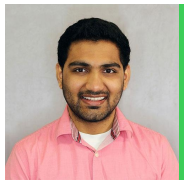
Q: *What is the difference between Seismic Analysis Ip=1.0 and Ip=1.5?*

Mohamed Mohamed
Senior Project Manager

Ip=1.0 Simulation analysis is done for unit under test (no shake testing required). Does not requires functionality validation after an earthquake. Provides Seismic Certificate for the analyzed unit.

Ip=1.50 Physical (shake) test is performed for the unit under test. Provides Seismic Label to the tested unit.

Q: *What are the bus sizes we offer?*



Akshat Patel
Senior Applications Engineer

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Senior Applications Engineer

Q: *What are the benefits of including generator control (synchronizing, load sharing and VAR sharing) within the switchgear vs putting some or all of the control at the generator?*

Anthony Landi
Director of Engineering

Anthony Landi
Director of Engineering

Q: *What are the differences between UL891 and UL1558?*

Peter Rossomando
Director of Applications Engineering

UL 891

- **Developed from NEMA Standards – Dead Front Switchboard Construction in accordance with NEC**
- **Molded Case, Panelboards, Insulated case breakers as defined in UL 489 allowed**
- **Fusible Switches allowed**
- **ANSI Rated Breakers as defined by ANSI 37.16, ANSI 37.13 and UL1066**
- **3 cycle short circuit rating/test**
- **No barriers or compartmentalization required**
- **Defines an interrupting current rating for the breaker**

UL 1558

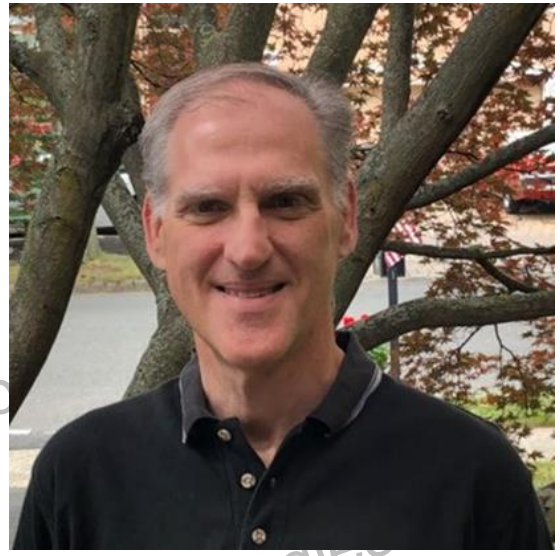
- **Based on ANSI Standard C37.20.1 for Metal Enclosed Low Voltage Circuit Breaker switchgear**
- **Drawout Power circuit breakers as defined in UL 1066 and ANSI are the only type allowed**
- **4 cycle short circuit rating/test**
- **30 or optional 60 cycle short time test**
- **Panelboards, UL489 listed circuit breakers and fusible switches can *NOT* be used in UL 1558 switchgear**
- **Complete breaker compartmentalization required**
- **Defines an interrupting current rating and short time rating (30 cycle rating) for circuit breakers**
- **ASCO UL1558 listing is for up to 200KAIC for 4 cycles and 85KAIC for 60 cycles**

Questions from the Audience

Mohamed Mohamed
Senior Project Manager

Akshat Patel
Senior Applications Engineer

Anthony Landi
Director of Engineering



Peter Rossomando
Director of Applications Engineering

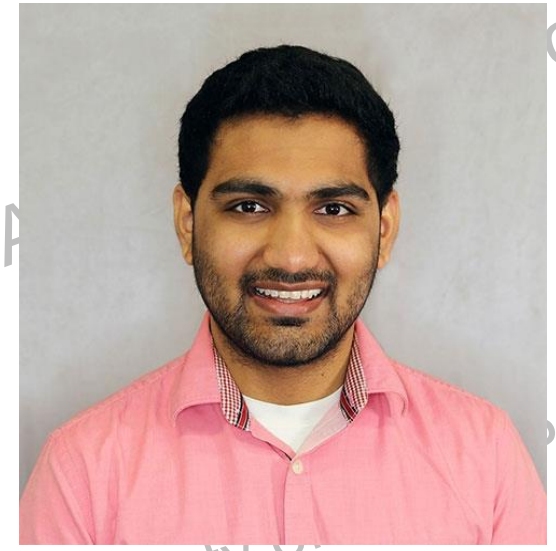
Q: For seismic rated switchgear, how is the gear to be anchored to meet the seismic requirements?

Mohamed Mohamed
Senior Project Manager

A: Refer to the manufacturer supplied installation drawings for anchor requirements and mounting considerations for seismic applications. Required anchor locations, size, style, and load capacities (tension and shear) may be specified on the installation drawings or specified by a 3rd party. Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, wall design, and attachment to non-building structures must be outlined and approved by the Engineer of Record for the project or building. Structural walls, structural floors, and housekeeping pads must also be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads as defined on the installation drawings. The installing contractor is responsible for ensuring the proper installation of all anchors and mounting hardware.

Q: Which synchronizer we utilize in our products?

Akshat Patel
Senior Applications Engineer

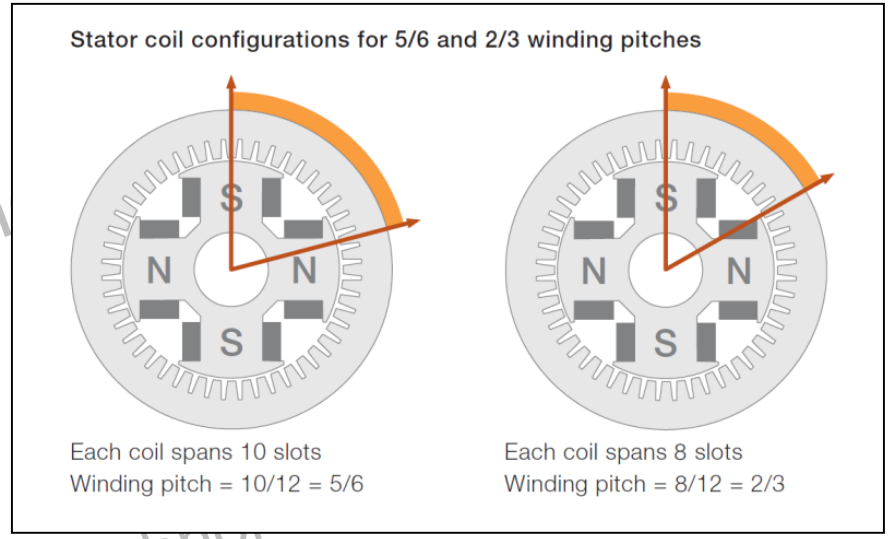


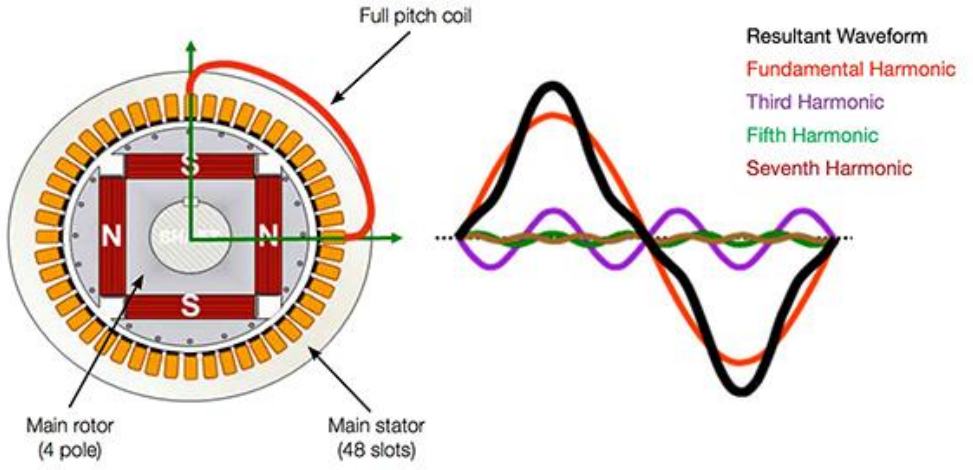
Akshat Patel
Senior Applications Engineer

Q: *What is generator pitch and why is it a problem when it is not matched?*

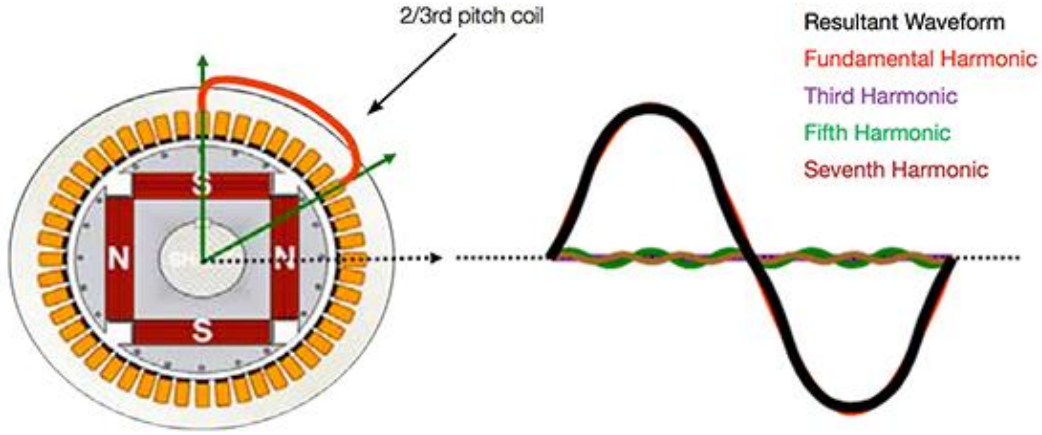
Anthony Landi
Director of Engineering

- **When intending to parallel multiple generators the following considerations always need to be taken into account (Continued):**
- **Paralleling different types of Generators**
  - **All generators are wound to some fractional pitch to provide control over harmonics. The major issue when paralleling different generators is to make sure the pitch is matched.**
  - **While some harmonic control is possible, it is impossible to eliminate all harmonics. The most common is 2/3 pitch. The 2/3 pitch eliminates 3rd level harmonics, but increases 5th level harmonics. Another common pitch is 5/6 which reduces 5th and 7th level harmonics but increases 3rd level harmonics. Therefore, if the pitch is mismatched, instead of reducing harmonics you end up increasing them as the neutral voltage differences at the 3rd and 5th level harmonics will increase waveform distortion. You will likely have to de-rate your system and may experience power quality issues due to waveform distortion.**





Generator full Pitch w/ harmonics



Generator 2/3 Pitch w/ harmonics

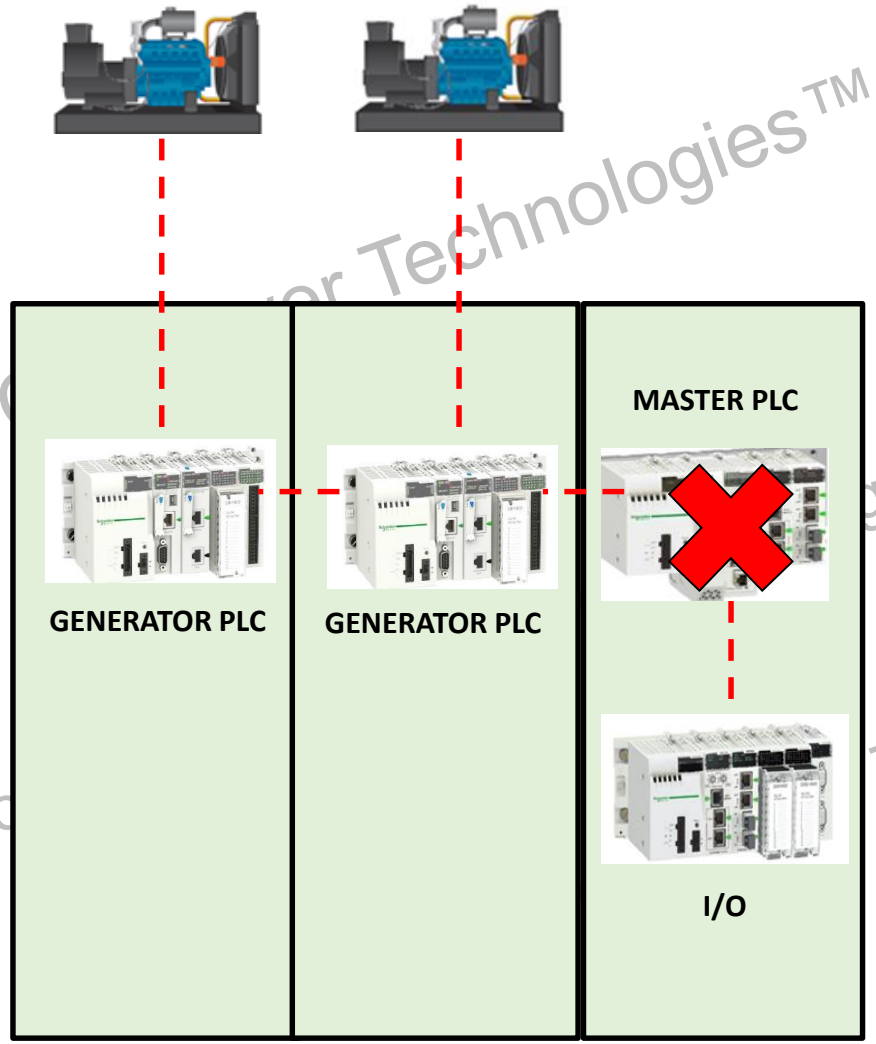
Q: *Why do you need a generator PLC if you have a Master PLC and what happens if a Generator PLC fails?*

Peter Rossomando
Director of Applications Engineering

ASCO provides a dedicated generator PLC for each generator with a CPU so there is no reliance on the Master PLC.

The dedicated generator PLC will send a start signal to the engine and provide engine monitoring of alarms and shutdowns. It also initiates breaker close and open functions when required.

ASCO Power Control Systems provide a hardwired backup for each generator PLC so that if a Generator PLC is unavailable the engine will be started automatically without operator intervention

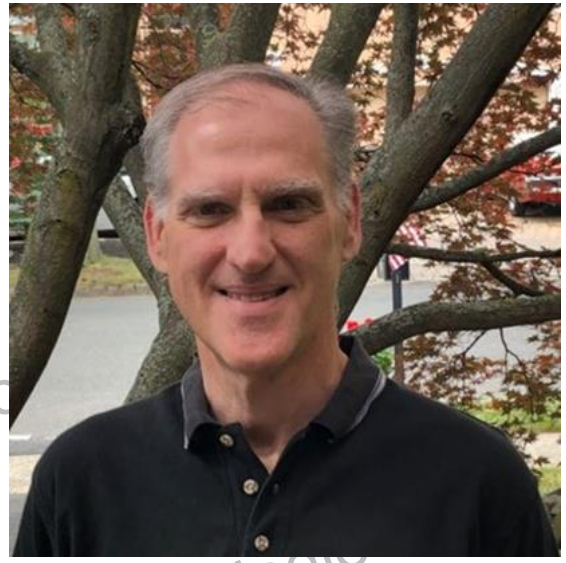


Questions from the Audience

Mohamed Mohamed
Senior Project Manager

Akshat Patel
Senior Applications Engineer

Anthony Landi
Director of Engineering



Peter Rossomando
Director of Applications Engineering

Thank you for your participation on today's Webinar.

There will be further Ask The Experts sessions in future so please keep checking our website for further details. Please complete the follow up survey to provide us with valuable feedback for future sessions.

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