



Board of Building Standards

SPECIAL CODE COMMITTEE MEETING AGENDA

DATE: APRIL 01, 2021
TIME: 1:00 PM
LOCATION: VIDEOCONFERENCE
DIAL-IN # 1 614-721-2972
CONFERENCE ID: 704 459 686#
[Videoconference Link](#)

Guest & Staff “Sign-In”

Call to Order

Old Business

[OB-1](#) Petition 20-01 (2020 NEC)

New Business

NB-1 2021 IBC Review (Chapts 15, 16 & 17)

Adjourn

File Attachments for Item:

OB-1 Petition 20-01 (2020 NEC)

January 30, 2020

Ms. Regina Hanshaw
Executive Secretary
Ohio Board of Building Standards
6606 Tussing Road
Reynoldsburg, OH 43068
Subject: Petition to Update NFPA 70

Dear Ms. Hanshaw:

Pursuant to Ohio Revised Code Section 3781.12, please find attached a petition from the Ohio Electrical Coalition requesting the Ohio Board of Building Standards update the 2017 edition of NFPA 70 to the 2020 edition of NFPA 70.

Thank you for your time and consideration regarding this matter.

Sincerely,

Tom Moore

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APPLICATION

FOR
RULE CHANGE

BOARD OF BUILDING STANDARDS

6606 Tussing Road, P.O. Box 4009

Reynoldsburg, Ohio 43068-9009

(614) 644-2613

bbs@ohio.gov

www.com.state.oh.us/dico/bbs/default.aspx



Pursuant to section 3781.12 of the Revised Code and rules adopted by the Board of Building Standards, application is herewith submitted to adopt, amend, or annul a rule adopted by the Board pursuant to section 3718.10 of the Revised Code.

For BBS use:	
Petition #:	_____
Date Recv'd:	_____

Submitter: Thomas E. Moore Ohio Electrical Coalition
(Contact Name) (Organization/Company)

Address: 3462 Brunk Road
(Include Room Number, Suite, etc.)
Akron Ohio 44312
(City) (State) (Zip)

Telephone Number: 330-289-7932 **Fax Number:** _____

Date: January 17, 2020 **E-mail Address:** tmoore1767@aol.com

Code Section: Referenced Standard NFPA 70 4101:1-35-01, 4101:2-15-01 & 4101:3-15-01

General Explanation of Proposed Change (attach additional sheets if necessary):

Please see attachment.

Explanation of Cost Impact of Proposed Code Change*: Please see attachment.

*Attach additional cost information as necessary to justify any statement of cost increase or cost decrease.

Information on Submittal (attach additional sheets if necessary):	
1. Sponsor:	<p style="text-align: center;">Ohio Electrical Coalition</p> <p style="text-align: center;">Organization sponsoring or requesting the rule change (if any)</p>
2. Rule Title:	<p style="text-align: center;">Referenced Standard NFPA 70 4101:1-35-01, 4101:2-15-01 & Title of rule change 4101:3-15-01</p>
3. Purpose/ Objective:	<p>Please see attachment.</p> <p style="text-align: center;">Technical justification for the proposed rule change</p>
4. Formatted Rule Language (Using Strike-out for Deleted Text and Underline for Added Text)	<p>Please see attachment.</p> <p style="text-align: center;">Use strike-out for deleted text and underline for added text</p>
5. Notes:	<ol style="list-style-type: none"> 1. To encourage uniformity among states using model codes, it is recommended that the submitter first submit any code change directly to ICC and participate in the national model code development process. 2. Please provide a copy of application and documentation. 3. Use a separate form for each code change proposal.

January 13, 2020

Ohio Board of Building Standards
Regina Hanshaw, Executive Secretary
6606 Tussing Road
Reynoldsburg, Ohio 43068

Re: Petition to update referenced standard NFPA 70 National Electrical Code 2017 edition to the 2020 edition

Rule Titles:

4101:1-35-01 Referenced standards: ~~70-17 National Electrical Code~~ 70-20 National Electrical Code

4101:2-15-01 Referenced standards: ~~70-17 National Electrical Code~~ 70-20 National Electrical Code

4101:3-15-01 Referenced standards: ~~70-17 National Electrical Code~~ 70-20 National Electrical Code

Submitter:

Sponsor: Ohio Electrical Coalition

Reason and Technical Justification for Rule Change:

Pursuant to O.R.C. 3781.12, the Ohio Electrical Coalition respectfully requests the Ohio Board of Building Standards update the 2017 edition of NFPA 70 with the 2020 edition of NFPA 70.

NFPA 70 has been with us since shortly after the dawn of electrical distribution. It's mission of practical safeguarding has been built on the collective knowledge of industry experts such as electricians, electrical inspectors, manufacturers, testing lab personnel, and other professionals. The 2020 edition of NFPA 70 was issued by the NFPA Standards Council on August 5, 2019 and was approved as an American National Standard on August 25, 2019.

With the everchanging electrical industry landscape, the 2020 edition of NFPA 70 introduces important changes that not only advance new methods, materials and installation practices for safely distributing electrical power and safe interaction with electrical systems, but also changes to rules used for calculations to modernize and reflect improvements in energy efficiency which may provide relief on the overall cost of the electrical system.

Advancement of technology requires up-to-date standards for safe implementation to

ensure that the end-user can take advantage of this innovation without endangering themselves or their property. New 2020 NFPA 70 requirements that were added relating to alternative energy continue to stay relevant and not serve as a roadblock to the implementation of those technologies.

Advancements in electrical equipment have made systems that power our homes and workplaces even safer. The electrical industry is known for constantly moving forward in promoting safer and more efficient equipment through technology. Updating to the 2020 NFPA 70 is a vitally important and proactive step for consumer protection and for the safe advancement of new electrical system technology.

Following are some of the key changes that impact electrical safety:

Keeping the regulatory document current with industry trends in new technology and delivery and generation of electric power.

- 230.67. New requirement covering surge protection for dwelling units aligns with the everchanging electrical industry landscape to protect against surges that can damage sensitive electronics and systems found in most modern appliances, safety devices and equipment used in dwellings. With the expanded use of distributed energy resources, these can also contribute introduction of surges into the system.
- A new definition for reconditioned equipment and several new sections throughout the *Code* to address whether equipment is permitted to be reconditioned.
- Article 242 Overvoltage Protection – new article addresses installation requirements for Surge-Protective Devices (SPD) and Surge Arrestors used to achieve this protection.
- Article 625 Electric Vehicle Power Transfer System – requirements for electric vehicles and supply equipment to encompass bidirectional current exchange.
- Updates to Articles 690 Solar Photovoltaic (PV) Systems, 691 Large-Scale Photovoltaic (PV) Electric Supply Stations, 706 Energy Storage Systems, Article 710 Standalone Systems and Article 712 Direct-Current Micro-grids continue to support new and expanding technologies, which has immeasurable societal benefits at both a micro- and macro-economic perspective.
- Requirements to address the advancement of Power over Ethernet (PoE) in cables that previously only transmitted data and not power.

Examples of new and revised requirements that may provide relief on the overall cost of the electrical system.

- 210.11(C)(3) & (4). Revision specifies which receptacle outlets are required to be on the required 20 ampere circuit for bathrooms and garages which provides more flexibility with circuiting in those areas.
- Article 220 Branch-Circuit, Feeder, and Service Load Calculations – Several revisions to this article, including the modernization of the tables currently in use for calculations, which has been extensively revised to reflect improvements in energy efficiency and may grant substantial relief for sizing of service and feeder

distribution systems.

- 225.30(B). Revised to permit multiple smaller feeders, with smaller conductors and lower rated OCPD's to allow more flexibility with the design.
- 250.104(A)(1). Revision provides relief with the maximum sized bonding jumper for bonding metal water piping systems.

Protecting electrical workers while maintaining or servicing electrical or electrically-powered equipment.

- 110.26(C)(3). Enhancing electrical worker safety by revising the working space requirements for non-dwelling unit large electrical equipment installations.
- 230.62(C). New requirement that provides additional shock protection with barriers to be placed in service equipment to prevent inadvertent contact.
- 230.71(B). Requirements for service disconnecting means is revised by eliminating the risk of the inability to establish an electrically safe work condition for justified energized work that must be performed within service equipment enclosures with more than one service disconnect.
- 240.67 & 240.87. Revised requirements for arc energy reduction to ensure it is set to operate at less than the available arcing current and prohibits temporary adjustment of the instantaneous trip setting as the method for meeting the requirement for circuit breakers.
- 408.18(C). New requirement that specifies the manufacturer to provide a label on the front of the equipment when working space is required for rear or side access to the equipment.

Protecting patient sleeping rooms in nursing homes and limited-care facilities from fires of electrical origin

- Arc-fault circuit interrupters are the most advanced technology currently recognized by the NEC for protecting premises against fires resulting from damaged wiring. Revisions to these requirements expand this protection to these occupancies.

Protecting people from electric shock in homes, workplaces and places of recreation.

- New requirements for ground-fault circuit interrupter protection (GFCI) expand the protection across a range of uses and occupancies. First introduced in the early 1970s, their continued expansion to cover areas in homes and workplaces where occupants are particularly susceptible to electric shock accidents can be directly attributed to reductions in electrocutions and electric shock accidents.
- Revision to add floating buildings to the scope of Article 555 and revised to provide greater flexibility with the application of ground-fault protection requirements.

Updating the NEC makes sure communities continue to provide an acceptable level of

public safety while supporting the latest technological advances. This will ensure that there are safe installation requirements in place to allow uniform implementation of the latest developments in electrical systems, equipment, and technology to meet consumer demand.

Sincerely,

Ohio Electrical Coalition



"Let the Code Decide"
OHIO CHAPTER
International Association of
Electrical Inspectors

President

Karl Frederick
Central Division

January 17, 2020

First Vice-President

Zach Jenkins
Northwest Division

Ohio Board of Building Standards
6606 Tussing Rd
Reynoldsburg, OH 43068

Second Vice-President

William Beutler
Western Reserve

Subject: 2020 NFPA 70, National Electrical Code (NEC) Update

Immediate Past-President

Michael Koken
Eastern Division

The Ohio Chapter IAEI strongly encourages the Ohio Board of Building Standards to update its current NFPA 70, from the 2017 edition to the 2020 edition for Ohio Building Code regulated occupancies and supports the petition submitted on behalf of the Ohio Code Coalition. The OBBS has proven time and time again that they are at the forefront of public safety by adopting codes that ensure the health, safety and security of the occupants or users of buildings.

Secretary/Treasurer

Lorenzo Adam
Southwest Division

The NEC provides for the practical safeguarding of persons and property from the hazards arising from the use of electricity.

Inspector Member

Pete Baldauf
Southwest Division

In addition to new requirements to address advancing alternative technologies and improved safety for the electrical worker, the 2020 NEC also expands important safety requirements for dwelling unit occupancies. While expansion of important safety requirements may add cost, the 2020 NEC also includes requirements that provide economic relief.

Inspector Member

Jeff Affolter
Akron Division

The Ohio Chapter IAEI Board of Directors respectfully requests the OBBS move forward with updating the NFPA 70, NEC, to the 2020 edition. Embracing these requirements by updating to the 2020 NEC is an important step forward with public safety.

Western Section

Chapter Representative

Jeff Grassi
Western Reserve Division

Education Chairman

Gaylord Poe
Southwest Division

Respectfully,

Historian

Armand Lenarz
Akron Division

Karl J. Frederick

Karl Frederick, President

On behalf of the Board Members of the Ohio Chapter IAEI



Southwest Division

Ohio Chapter, Western Section, I.A.E.I.

International Association of Electrical Inspectors

<http://www.swohiaiei.org>

2020 Board of Directors

January 28, 2020

Dewayne Jenkins,
President

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Gaylord Poe,
Past President

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Secretary & Treasurer

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Dan Larkin

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408 Lexow Ave.
Dayton, Ohio 45419
Phone: (937) 294-4115
dan@Larkinelectric.com

Associate Member

Ken Carr

Carr Electric Co.
Phone 513-574-3753

The Southwest Division, Ohio Chapter of the IAEI fully supports the petition submitted by the Ohio Chapter Board of Directors for adoption of the 2020 edition of NFPA 70 for buildings and structures 4 family and above.

The changes made in the 2020 NEC will further enhance safety and embrace new technologies. Ohio has historically adopted the latest edition of the NEC because it is a recognized standard that promotes electrical safety.

Sincerely,

Pete Baldauf
Vice President
SW Division IAEI



National Fire Protection Association

January 17, 2020

Ms. Regina Hanshaw
Executive Secretary
Ohio Board of Building Standards
6606 Tussing Rd
Reynoldsburg, OH 43068

Re: Support for the Ohio Electrical Coalition's Petition to Update Referenced Standard NFPA 70

Dear Ms. Hanshaw:

NFPA 70 focuses on the proper installation of electrical systems and equipment to protect people and property from hazards arising from the use of electricity. As electrical equipment has become more complex and widespread, the NFPA 70 has adapted to meet new challenges. Revised every three years to allow for new technologies and improved installation safety practices, NFPA 70 is a ready-to-use, comprehensive standard suitable for adoption.

NFPA 70 is developed and produced by the National Fire Protection Association (NFPA), an independent, not-for-profit standards developing organization and advocate of fire, building, and electrical safety. Since 1911, NFPA has been the sponsor of NFPA 70 and the requirements of this standard have continued to evolve with America's heavy reliance on reliable and safe electrical energy. NFPA 70 is developed through an open, transparent, and balanced process accredited by the American National Standards Institute.

The NFPA 70 community has worked diligently to make sure safe installation rules are in place for the continuously changing electrical industry landscape. The 2020 edition of NFPA 70 has been issued by the NFPA Standards Council.

NFPA supports the petition filed on behalf of the Ohio Electrical Coalition, to update the 2017 edition of NFPA 70 to the 2020 edition. We encourage the Ohio Board of Building Standards to move forward by providing its citizens with the appropriate level of safety outlined in the 2010 edition of NFPA.

Sincerely,

Gregory B. Cade
Regional Director
2121 Allen Gimbert Way
Virginia Beach, VA 23453-6672
202-309-8537
gcade@nfpa.org



January 27, 2020

Ohio Board of Building Standards
Regina Hanshaw, Executive Secretary
6606 Tussing Road
Reynoldsburg, OH 43068

Subject: Support for Petition to update the referenced National Electrical Code to the 2020 Edition

Dear Secretary Hanshaw,

We at Underwriters Laboratories (UL) are deeply committed to advancing the safety of the citizens of the state of Ohio. UL believes that the National Electrical Code (NEC®), NFPA 70, serves as an important tool in advancing that safety. Adoption of the most current edition of the code, in this case the 2020 NEC®, by the Ohio Board of Building Standards, is critical to keeping pace with safety science. Pursuant to the Ohio Revised Code 3781.12, I am writing on behalf of UL to request that the State of Ohio move forward with the adoption of the 2020 NEC as requested in the petition filed by the Ohio Electrical Coalition.

UL is driven by our global safety Mission – promoting safe living and working environments by the application of safety science and hazard-based safety engineering. Founded in 1894, UL has earned a reputation as a global leader in product safety standards development, testing and certification, especially in the areas of fire and electrical safety, the basis of UL's founding. UL therefore works closely with the electrical installation community to coordinate product safety standardization/certification with installation safety practice to achieve the most desirable safety outcomes.

In conclusion, UL urges the Ohio Board of Building Standards to ensure the safety of its citizens by adopting the latest electrical safety requirements as represented by the 2020 edition of the NEC®.

Should you have any questions, please contact our UL representative for Ohio, Tom Lichtenstein, at thomas.r.lichtenstein@ul.com or by phone at (847) 664-2160.

Sincerely,

A handwritten signature in black ink that reads "Blewitt".

Thomas Blewitt
Vice President and Chief Technical Officer
UL LLC, Connected Technologies
Phone: +1 631 546 2332
Thomas.V.Blewitt@ul.com

CC: Tom Lichtenstein, UL Senior Regulatory Engineer

UL LLC
1285 Walt Whitman Rd.
Melville, NY 11747
W: UL.com



**INDEPENDENT ELECTRICAL
CONTRACTORS**

Independent Electrical Contractors of Greater Cincinnati
586 King's Run Dr.
Cincinnati, OH 45232
Ph 513-542-0400
www.iec-cincy.com

January 27, 2020

Regina Henshaw, Executive Secretary
Ohio Board of Building Standards
6606 Tussing Rd.
Reynoldsburg, OH 43068-9009

RE: 2020 National Electrical Code Adoption

Dear Regina,

The Independent Electrical Contractors of Greater Cincinnati request a rule change to update the 2017 edition of NFPA 70 with the 2020 edition of NFPA 70 in accordance with ORC 3781.12.

The 2020 NEC provides numerous changes that will enhance public safety and advance new methods, materials and installation practices. It also includes important changes to rules used for certain calculations which modernize and acknowledge improvements in energy efficiency which may account for and contribute savings in the overall cost of an electrical system.

Living in a strong, technology-driven consumer world that regularly sees advancements, in said technologies, warrants regular and up-to-date standards for implementation to help ensure the safety of the end-user and their property. Updating to the 2020 NEC provides a critical and necessary step towards continued consumer health preservation and evolution of safely implementing technologies in electrical systems.

The NEC is the most widely adopted consensus Code in the world. Consensus is a key word when developing the document. The NFPA provides the document rules and governing procedures that stipulate all NEC changes have had public input and public review. Technical committee membership classifications are used to maintain balanced Code Making Panels that represent their Principal interest to ensure changes are necessary and in the best interest of public safety.

I urge the state of Ohio to adopt the 2020 NEC without delay or modifications to the document.

Sincerely,

Matthew Hittinger

Matthew Hittinger
Executive Director
Independent Electrical Contractors of Greater Cincinnati



January 23, 2020

Regina Hanshaw, Executive Secretary
Board of Building Standards
6606 Tussing Rd
P. O. Box 4009
Reynoldsburg, OH 43068-9009

Re: Greater Cincinnati Electrical Association (GCEA) support for timely adoption of the entire "2020 NEC"

Dear Regina,

I am writing on behalf of the GCEA. The GCEA is an association that represents the interest of our members who are electrical industry companies in the greater Cincinnati area. Our mission is to provide "Quality electric service" to our community. We pursue this mission by providing on-going training, by stressing safety, and by providing a venue for communications across the different electrical company divisions necessary for a complete electrical community. GCEA membership includes electrical contractors, electrical material distributors, manufacturers, manufacturer reps, utilities, and electrical safety inspectors.

The GCEA's Board of Trustees would like to state it is in full support of the Ohio Code Coalition's petition in regards to the timely adoption of the "2020 National Electrical Code" (2020 NEC) for all electrical installations including 1, 2, and 3 – family dwellings.

Typically our members are working daily on multiple jobs in various stages of completion and having two versions of the NEC active at one time is awkward and causes an additional concern on each project. The GCEA strongly supports the alleviation of this burden on our industry.

Sincerely

A handwritten signature in black ink, appearing to read "Terrence J. Eibel", is written over a light gray background.

Terrence J. Eibel

Executive Director, GCEA
P.O. Box 58183
Cincinnati, OH 45258
513-922-6501

Ohio Board of Building Standards

6606 Tussing Rd.

Reynoldsburg, OH 43068

Regina Henshaw, Executive Director and esteemed members of the Board.

In response to the Ohio Board of Building Standards Stakeholder notification requesting comment to proposed updates to the Ohio Building, Mechanical and Plumbing Codes, I respectfully request the OBBS include updating the NFPA 70 from the 2017 edition to the 2020 edition as part of that rule package update. This would include updating the following Sections:

4101:1-35-01 Referenced standards: (70-17 National Electrical Code) to the 70-20 National Electrical Code.

4101:2-15-01 Referenced standards: (70-17 National Electrical Code) to the 70-20 National Electrical Code.

4101:3-15-01 Referenced standards: (70-17 National Electrical Code) to the 70-20 National Electrical Code.

Updating to the 2020 NEC is a vitally important and a proactive step for the economic savings, consumer protection and the safety advancements of new electric system technology. Using and referencing the most current codes and standards is necessary for a progressive state and its citizens to keep pace with changes to technology and safety enhancements.


Up-to-date safety standards promote the use of new technology, which has immeasurable societal benefits from an economic perspective. Additionally, this helps to promote and spur new business opportunities and economic growth for Ohio and its citizens.

New requirements have been added to help communities accomplish the goal of making buildings safer, more energy efficient, and reliable in the event of disasters or emergencies. Advancement of technology requires up to-date standards for safe implementation, to ensure that the end-user can take advantage of these innovations without endangering themselves, others, or their property.

Code development includes stakeholders from all facets of society and the National Electrical Code Panels are made up of individuals who represent all interests of the manufacturing, safety, electrical, and construction industries. Their collected experience and expertise are utilized in the formation and adoption of the most current codes and standards.

The citizens of Ohio deserve and expect the best that is offered for their homes, occupations, places we work at, worship at, play and entertain. The intent of the National Electrical Code is the 'practical safeguarding of persons and property from the hazards arising from the use of electricity'. All of the changes and new technology that we are witnessing require proper installation and safety requirements found in the most current code. They need to be adopted and utilized for the protection of the public. We need to do all that we can to accomplish that.

Respectfully submitted,



Michael J. Farrell III

Assistant Chief Building Official
City of Toledo, Division of Building Inspection
Member of IAEL, IBEW, ICC, NFPA, OBOA

Secretary/Treasurer
Northwest Division
OHIO Chapter IAEL



January 29, 2020

Ms. Regina Hanshaw
Executive Secretary
Ohio Board of Building Standards
6606 Tussing Road
Reynoldsburg, OH 43068

Re: NEMA Supports Adoption of 2020 Edition of the National Electrical Code

Dear Ms. Hanshaw:

On behalf of the National Electrical Manufacturers Association (NEMA), I am writing to express support for the update of the Residential Code of Ohio from the 2017 edition of the National Electrical Code® (NEC) to the 2020 edition of the NEC. For many years, Ohio has championed the standard of excellence by being one of the first states in the nation to adopt the newest edition of the NEC—putting the safety of its citizens first and prioritizing the economic well-being of its businesses and industry.

As the association representing over 325 electrical and medical imaging manufacturers that make the equipment used in a variety of sectors—electric transmission and distribution, commercial and residential buildings, water treatment and delivery, transportation, industrial processes, food, healthcare, agriculture, and manufacturing—NEMA supports regulatory action and programs that efficiently provide affordable, safe, and reliable electricity to the American public. NEMA member companies have a significant presence in the state of Ohio, representing 69 companies with 142 manufacturing and engineering facilities that support the state’s economy. Member companies in Ohio collectively employ over 70,000 state residents.

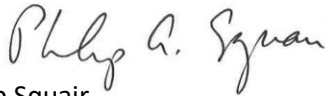
NEMA has long supported timely adoption of the National Electrical Code® (NEC) by state and local jurisdictions. We maintain that prompt adoption of the most current edition of the NEC is the best way to ensure a uniform and up-to-date standard of safety for all occupants in the built environment. Current codes mean safer and more economically prosperous communities.

The NEC focuses on the proper installation of electrical systems and equipment to protect people and property from hazards arising from the use of electricity in the built environment. The code also allows for the safe use of new technologies including electric vehicle charging equipment and distributed generation such as solar photovoltaic panels.

Through adoption of the 2020 NEC, businesses today will be able to take advantage of lower infrastructure start-up and operational costs through new and improved technology. For instance, modernized rules in the 2020 NEC, used for the calculations of improvements in energy efficiency, may provide relief for the overall cost of the electrical system. Additionally, requirements relating to alternative energy continue to stay relevant so as to not become a barrier to the implementation of those technologies as they evolve.

Once again, NEMA urges the Ohio Board of Building Standards to maintain this tradition of excellence by adopting the 2020 edition of the NEC. If you have any questions, please contact Tim McClintock at Tim.McClintock@nema.org or (303) 749-9782.

Sincerely,



Philip Squair
Vice President of Government Relations
National Electrical Manufacturers Association (NEMA)



January 27, 2020

Ms. Regina Hanshaw
Executive Secretary
Ohio Board of Building Standards
6606 Tussing Road
Reynoldsburg, OH 43068

Re: Schneider Electric Supports the Ohio Electrical Coalition Petition to Adopt the 2020 Edition of the National Electrical Code for commercial structures.

Dear Ms. Hanshaw:

I am writing to inform you of Schneider Electric's **support of the Ohio Electrical Coalition Petition to Adopt the 2020 Edition of the National Electrical Code for Commercial Structures.**

As a global specialist in energy management, Schneider Electric offers integrated solutions across multiple market segments, including leadership positions in Utilities & Infrastructures, Industrial & Machine manufacturers, Non-residential buildings, Data Centers & Networks. Focused on making energy safe, reliable, efficient, productive and green, Schneider Electric 750 plus Ohio employees are located in various offices and four manufacturing facilities across the state. We support thousands of additional direct and indirect jobs in Ohio by working with over 400 vendors and suppliers located in the state.

Schneider Electric continues to advocate for timely adoption of the National Electrical Code (NEC). The NEC focuses on the proper installation of electrical systems and equipment supporting safe electrical infrastructure installations which establishes the safe use of electricity. Our products are designed and manufactured to comply with the most current edition of the National Electrical Code. Electrical infrastructure that does not utilize the most current electrical code restricts the use of the most current technology and can be less efficient and more costly for not only Schneider Electric to manufacturer, but also for the construction industry to implement.

The adoption of the 2020 NEC will permit the construction industry to take advantage of the most cost-effective infrastructure solution and utilize emerging technological advancements while enhancing safety in commercial buildings in the state. A few of the emerging technologies include microgrids, energy efficiency in reduction in lighting calculations, and new type P cable for petrochemical installations.

Once again, Schneider Electric urges the OBBS to promptly initiate the review and adoption of the 2020 NEC for commercial structures.

Sincerely,

Don Iverson
Manager of Industry Codes & External Affairs

Schneider Electric
1415 S. Roselle Road
Palatine, Illinois 60067-7399
Tel. (847) 397-2600 Fax (847) 925-7500
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January 29, 2020

Ms. Regina Hanshaw
Executive Secretary
Ohio Board of Building Standards
6606 Tussing Road
Reynoldsburg, OH 43068

Re: Eaton Supports Ohio Electrical Coalition Petition to update the 2017 edition of the National Fire Protection Association (NFPA) 70 with the 2020 edition of NFPA 70.

Dear Ms. Hanshaw:

I am writing to express Eaton's support of the State of Ohio to update the 2017 edition of NFPA 70 with the 2020 edition of NFPA 70.

Eaton employs over 2500 people at 8 locations in the State of Ohio and spends over \$450 million with Ohio-based businesses every year. Eaton's electrical business is a global leader with expertise in power distribution and circuit protection; backup power protection; control and automation; lighting and security; structural solutions and wiring devices; solutions for harsh and hazardous environments; and engineering services.

For many years, Ohio has championed the standard of excellence by being one of the first states in the nation to adopt the newest edition of the National Electrical Code® - putting the safety of its citizens and economic well-being of its industry first. Updating NFPA 70 makes sure communities continue to provide an acceptable level of public safety while supporting the latest technological advances, which is core to the Ohio Board of Building Standards (OBBS) mission.

Eaton has long supported timely and un-amended adoption of the National Electrical Code® (NEC) by state and local jurisdictions. We believe that adoption of the most current edition of the NEC® promotes a uniform and up-to-date standard of safety for all occupants in the built environment. Current codes produce safer and more economically prosperous communities.

Once again, Eaton urges the OBBS to maintain this tradition of excellence by adopting the 2020 edition of NFPA 70.

If you have any questions, please contact me at (636) 515-6083. Thank you for your time and consideration of this important matter.

Sincerely,

Kevin S. Arnold, P.E.
Manager of Codes & Standards

January 29, 2020

Ms. Regina Hanshaw
Executive Secretary
Ohio Board of Building Standards
6606 TUssing Road
Reynoldsburg, OH 43068

Re: Support Adoption of 2020 Edition of the National Electrical Code

Dear Ms. Hanshaw,

I am writing in support of updating the Residential Code of Ohio from the 2017 edition of the National Electrical Code® (NEC) to the 2020 edition of the NEC. For many years, Ohio has been one of the first states to adopt the entire current electrical code on a regular revision schedule, demonstrating that the safety of its citizens and economic well-being of its industry is of utmost importance.

Siemens employs 1,959 people throughout Ohio who, along with their families, would be impacted by this update. There are 21 Siemens locations reporting \$611M in sales last year. Income tax paid to the state exceeds \$450k with employee wages exceeding \$226M.

Updating the National Electric Code® to the current 2020 edition with no amendments would help to keep Ohio residents safe.

Thank you for your consideration on this important issue.

With kind regards,



Ashley Bryant
Senior Product Manager, Electronic Circuit Breakers
Siemens Industry, Inc.
5400 Triangle Parkway
Norcross, GA 30092-2450, USA
Tel.: +1 404 697-1587
<mailto:ashley.bryant@siemens.com>

Hanshaw, Regina

From: tmoore1767@aol.com
Sent: Friday, June 5, 2020 3:40 PM
To: Hanshaw, Regina
Cc: Timmclintock@gmail.com; adam@anrelectricco.com
Subject: Fwd: OBBS Code Committee Meeting
Attachments: 0602DB2001 Arc Energy Reduction Procedure for PowerPact Circuit Breakers.pdf; Proposal- Tom Moore.pdf; OBBS Code Committee 5-28-2020-L027.pdf

Hello Regina,

Thanks again for inviting us to the OBBS Code Committee meeting on May 28th. We thought the meeting was productive with excellent discussion and questions. Per your request, please find attached a copy of the cost impact proposal prepared by ANR Electric in Akron, Ohio for the mixed occupancy building. Additionally, included is the PPT presentation. The quote and the PPT have both been updated to reflect that the original building design included Type 1 surge protection in the main 3000 ampere service and the quote reflects optional Type 2 surge protection for each of the 88 dwelling unit panelboards.

During the meeting, one of the Board Members raised the question on the potential cost impact of complying with new Section 240.87(C), which requires performance testing for circuit breakers that are rated or can be adjusted is 1200 amperes or higher. While this requirement did not impact the case study, it was a very good question and we have conducted further research on this topic that we would like to share with you. The issue raised and cost associated therewith relates to testing on the primary side. Upon further review of the applicable code section, NFPA 70 does permit "another approved method." Accordingly, there are test methods that employ testing on the secondary side of the system and consultation with manufacturers have revealed their recommendation for these is for secondary current injection which is much more cost effective than primary current injection. Also included with this new section is the requirement for the testing to be conducted in accordance with the manufacturer's instructions, which aligns with their recommendations.

Attached you'll find a sample from Schneider Electric providing guidance on testing to meet this new requirement. Additionally, below is an excerpt from a white paper currently under development by Eaton:

Performance testing

Checking your work is an important part of the electrical industry and Arc Energy Reduction protection systems are no different. In order to achieve full compliance with this requirement in NEC[®] 240.67 or 240.87, the system must undergo performance testing in order to verify a safe environment to those authorized to design, install, operate, or inspect the installation as to the location of the equipment. One means specifically called out in the code as an approved means of performance testing is Primary Current Injection.

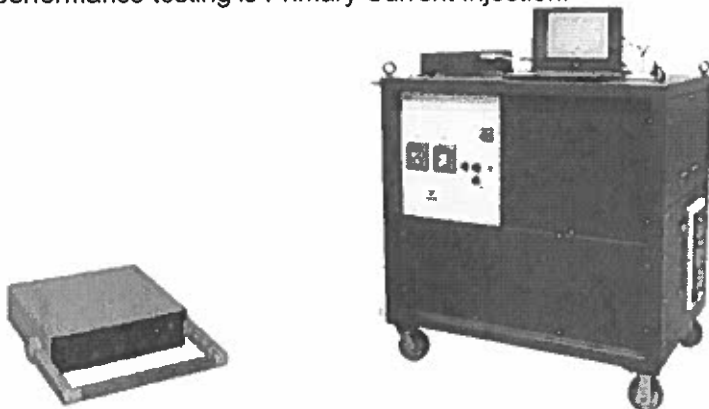


Figure 1 - Eaton MTK200 Trip Unit Test Kit for Secondary Current Injection
Figure 2- Phenix HC-75C for Primary Current Injection

This method of testing introduces a sequence of fault and overload currents through the system while recording the clearing time of the equipment. It is typical to introduce the fault and overload currents simultaneously to each of the three poles of

the tested equipment. It is important to have a qualified professional conduct this performance testing for the Arc Energy Reduction protection system as it is possible to damage the equipment during the testing process. Eaton provides a range of services for field performance testing including Primary Current Injection for 240.67, 240.87, and the ground-fault protection of equipment performance testing required in Article 230.95 through the Eaton Electrical Services and Systems division.

However, the NEC® does allow for other approved methods alternative to Primary Current Injection to provide Performance Testing to the installation falling under the purview of Articles 240.67 and 240.87. Secondary Current Injection is a highly recommended alternative means of satisfying this requirement. Secondary Current Injection is more portable and much less power demanding in order to operate as it only requires a 120V source to conduct the procedure. With the nature of certain equipment like fuses, Secondary Current Injection is the preferred method of testing as it is less likely to cause damage or activate the device itself possibly causing the need to replace the equipment. Both Primary Current Injection and Secondary Current Injection Performance Testing can be achieved by contacting the Eaton Electrical Services and Systems Division @ Eaton.com/services.

Thanks again and please advise on what the next steps will be and potential adoption timeline.

Best regards,

Tom Moore

Tim McClintock

CAUTION: This is an external email and may not be safe. If the email looks suspicious, please do not click links or open attachments and forward the email to csc@ohio.gov or click the Phish Alert Button if available.

Ohio Board of Building Standards Code Committee Meeting

May 28, 2020

- Review of 2020 NEC Cost Impact Analysis
- Questions/Discussion

Cost Impact Analysis

2020 Edition of NFPA 70

- Introduces important changes that not only advance new methods, materials and installation practices for safely distributing electrical power and safe interaction with electrical systems, but also changes to rules used for calculations to modernize and reflect improvements in energy efficiency which may provide relief on the overall cost of the electrical system.
- Design of a building and incorporation of optional elements will impact the overall cost of a project.

Cost Impact Analysis

The OBBS statement of fiscal analysis generally has stated in the past:

- “Due to the variance in allowed building designs, it is nearly impossible to ascertain whether there would be an increase or decrease in the design cost of a building as a result of this proposed rule change.”

Source: OBBS Code Scoring Report

Cost Impact Case Study – MIXED-USE DEVELOPMENT

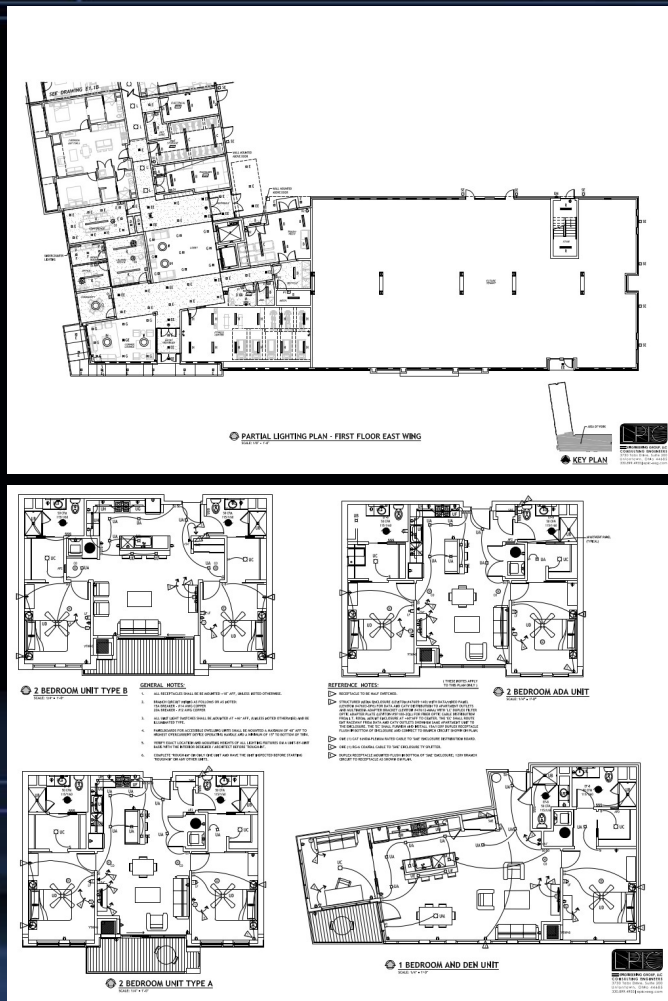
CODE INFORMATION:

1. DESIGN AND CONSTRUCTION CODE:
OHIO BUILDING CODE (OBC) - NOVEMBER 2017, LAST REVISED AUGUST 2018
2. BASIC ASSUMPTION
NEW BUILDING FULLY SPRINKLED PER CHAPTER 9
3. USE AND OCCUPANCY CLASSIFICATION (CHAPTER 3)
PROPOSED OCCUPANCY: NON-SEPARATED USE GROUPS
- R-2 (APARTMENTS)
- B (OFFICE TENANT)
R-2 IS MOST RESTRICTIVE
4. CONSTRUCTION CLASSIFICATION TYPE VA

Unit Types	Floors				Total	%	Unit Areas	
	1st	2nd	3rd	4th			Rentable	Total Rentable
Studios	1	6	6	6	19	21.6%	535 sf	10,165 sf
1 Bedroom	7	15	15	15	52	59.1%	698 sf	36,296 sf
2 Bedroom A	3	3	3	3	12	13.6%	1,033 sf	12,396 sf
2 Bedroom B		1	1	1	3	3.4%	1,037 sf	3,111 sf
1 Bedroom & Den		1	1		2	2.3%	1,217 sf	2,434 sf
Total Units	11	26	26	25	88			64,402 sf
Net Rentable Area*	8,520 sf	19,033 sf	19,033 sf	17,816 sf	64,402 sf			
Ground Floor Leasable Area	6,472 sf				6,472 sf			
Total Leasable + Net Rentable Area	14,992 sf	19,033 sf	19,033 sf	17,816 sf	70,874 sf			
TOTAL GROSS BUILDING AREA**	22,724 sf	23,235 sf	23,235 sf	22,893 sf	92,087 sf			



Cost Impact Case Study – MIXED-USE DEVELOPMENT



Summary of Changes 2020 NEC Mixed Use Project

Purpose: The following information is to assist in the design of and cost analysis of plans developed based on the 2020 NEC vs 2017 NEC. The SOC can also assist in additional cost analysis although those 2020 analysis as presented herein are directly related to this project.

2020 NEC Section	2017 NEC Section	SOC	Resulting Factor	Comments
*Table 220.12	Table 220.12	Reduction in general lighting load va/ft to update unit values to reflect current luminaire power consumption.	2017 NEC 3.5 va/ft *2020 NEC 1.3 va/ft	This should result in smaller sizing of components throughout electrical system service.
New 230.67		Requires Surge protection for all dwelling units.	Requires SPD Type 1 at service location or Type 2 downstream panels of dwelling units.	Plans indicate SPD located in MDP. No need to include under the 2017 estimate.
210.8(A)	210.8(A)	Increases threshold of 125-volt, single phase, 15- and 20-ampere receptacle GFCI protection to 125-volt through 250-volt receptacles in designated locations for dwelling units.	Will require additional GFCI protection for 240-volt receptacles in those areas under 210.8(A).	Affected areas could consist of ranges and dryers.
210.52(C)(2)	210.52(C)(2)	Revised to determine the minimum number of receptacles for island and peninsula counter tops based on a square footage calculation.	Additional island receptacles may need to be added depending upon the square footage.	Include additional receptacles where applicable.
314.27(C)	New	Requires outlet boxes installed in ceilings of habitable rooms where fans could be installed indwelling occupancies must be listed for the sole support of ceiling-suspended paddle fans or other type boxes in 314.27 where structurally supported.	Requires fan boxes where applicable.	Will need to include additional cost for fan approved boxes.



Trust our family to power yours

PROPOSAL

05/27/2020

FROM: ANR Electric LLC
3783 State Road
Akron, Ohio 44319

PROPOSAL SUBMITTED FOR:
C/O Tom Moore

Mixed Use Cleveland, OH

Thank you for the opportunity to prepare a proposal for the above referenced project. Our proposal is based on plans and specifications date 12/30/2019. Additional price based on the 2020 National Electric Code. Extras include the cost of the extra material/labor minus base costs.

Total Price: **\$827,640- Base Bid (provided by others)**

Extras: **\$14,784- SPDs (optional method)**
\$2,592- Range GFCI
\$11,757- Dryer GFCI
\$11,050- Island Receptacles
\$1,252- Fan Boxes
(\$7,520)- Lighting Load Reduction

Proposal Inclusions by NEC section:

- 230.67- Requires SPD, Type 2 at dwelling unit panels (Type 1 included in base bid)
- 210.8(A)- Range and Dryer GFCI protection
- 210.52 (C) (2)- Additional Island Receptacles
- 314.27 (C)- Required Fan Boxes

Proposal Exclusions:

- LV Cable, Equipment & Terminations, Low voltage transformers, Low Voltage, Security & Cameras
- Any Concrete or Asphalt Cutting/Patching by others
- Utility Company fees

Acceptance of Proposal: If the above prices and conditions are satisfactory and are hereby accepted, please sign and return.

Acceptance of Proposal Signature: _____ Date of Acceptance: _____
Acceptance of Proposal Print Name: _____

anrelectricco.com | adam@anrelectricco.com
(330) 644-4454 | 3783 State Street Akron, OH 44319
Ohio Lic. # 46490

230.67(B) Location.

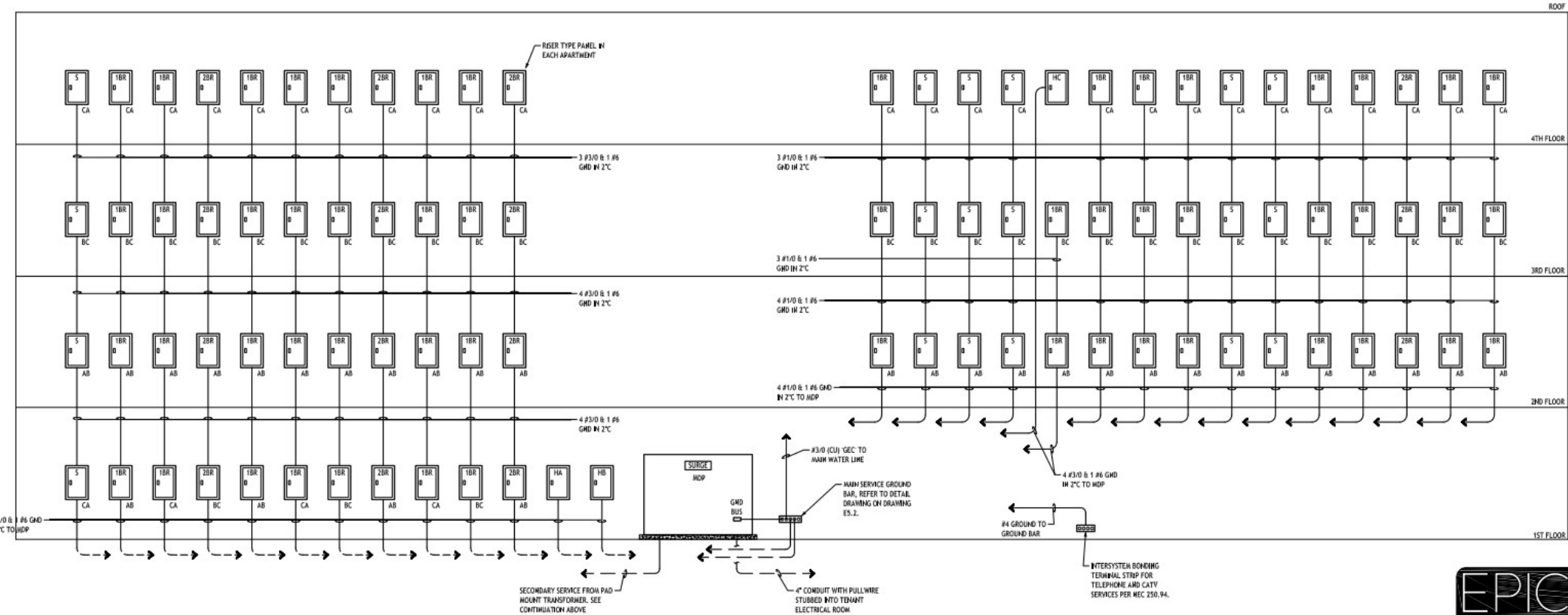
The SPD shall be an integral part of the service equipment or shall be located immediately adjacent thereto.

Exception: The SPD shall not be required to be located in the service equipment as required in (B) if located at each next level distribution equipment downstream toward the load.

A Type 1 SPD for a 3000-amp service costs is \$3000 or less, not including labor. Labor would only include installation of one device vs 88. Included in this quote is a design option for a Type 2 SPD at each dwelling unit panelboard.

Design option for SPD at the service could translate to additional savings: \$14,784 - \$3,000 = \$11,784 savings

Prepared By:
John Williamson, Operations Supervisor
Construction Codes and Licensing
Minnesota Department of Labor and Industry



POWER RISER DIAGRAM
NO SCALE

Ohio Board of Building Standards Code Committee Meeting

May 28, 2020

Questions/Discussion



Trust our family to power yours

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05/27/2020

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Acceptance of Proposal Signature: _____ Date of Acceptance: _____
Acceptance of Proposal Print Name: _____



Trust our family to power yours

Authorized Signature: *Adam Maimone*

Printed Name: Adam Maimone

Title: Commercial Service Manager

TERMS AND CONDITIONS: All work to be completed in a workmanlike manner according to standard practices. Any alteration or deviation from above specifications involving extra costs will be executed only upon written orders, and will become an extra charge over and above the proposal. All agreements contingent upon strikes, accidents or delays beyond our control. Owner to carry fire, tornado and other necessary insurance. Our workers are fully covered by workmen's compensation insurance. Payment terms are net due upon receipt. A late payment charge at the rate of 2% per month on accounts outstanding commencing from completion of work. This contract is subject to credit approval. Proposal void after 30 days. Proposals are subject to material price escalation clause if quoted price exceeds 5% after proposal date.

Notwithstanding any provision herein to the contrary, in the event that, during the performance of this agreement, the price of PVC CONDUIT, STEEL CONDUIT, COPPER CONDUCTORS, ALUMINUM CONDUCTORS and/or any other necessary commodities significantly increases, through no fault of ANR Electric, Inc., the price of any materials, components, or goods to be furnished under this agreement shall be equitably adjusted by an amount reasonably necessary to cover any such significant price increases. As used herein, a significant price increase shall mean any increase in price exceeding FIVE percent (5%) experienced by ANR Electric, Inc. from the date of the proposal of this project. Such price increases shall be documented through commercial quotes, invoices, receipts or other such documentation.

Where the delivery of materials, components, or goods required under this agreement is delayed, through no fault of ANR Electric, Inc., as a result of price escalation and/or the shortage or unavailability of commodities, raw materials, components and/or products, ANR Electric, Inc. shall not be liable for any additional costs or damages associated with such delay(s). Should ANR Electric, Inc. incur fuel or delivery charges from vendors or delivery services, the agreement shall be equitably adjusted by the amount reasonably necessary to cover the cost. Any credits shall be held by ANR Electric, Inc. as a contingency to the project until the project completion and pricing/retainage is finalized.

Arc Energy Reduction Procedure for PowerPact Circuit Breakers Using FFTK (Full-Function Test Kit)

0602DB2001

User Guide

03/2020

Addendum to Field Testing and Maintenance Guide 0600IB1201

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Maintenance Switch Testing Procedures

Table 1 - Maintenance Switch Testing Procedures—Simplified Table

	ERMS Energy Reducing Maintenance Setting	MMS¹ Maintenance Mode Setting	Instantaneous Trip Adjustment
Products Offered	PowerPact P PowerPact R MasterPact NT MasterPact NW	PowerPact P PowerPact R	PowerPact P PowerPact R MasterPact NT MasterPact NW
Trip Units	5.0P, 6.0P 5.0H, 6.0H	5.0A, 6.0A 5.0P, 6.0P 5.0H, 6.0H	ET1.0 All 3.0, 5.0, 6.0
Needed for Testing	Minimum available arcing current FFTK	Minimum available arcing current FFTK M2CTEST Jumper Wire	Minimum available arcing current FFTK
Control Power	Must be applied to IO Module and ERMS Switch	For 5.0A and 6.0A trip units 24 Vdc must be applied to terminals F1 (-) and F2 (+). The 24 Vdc is not necessary for the P and H trip units.	None
Ground Fault Jumper applied	—	For 6.0 trip units, install jumper wire between M1 and F1/T4 terminals.	—
Test Device	FFTK	FFTK + M2CTEST Adapter	FFTK
Device parameters	Some fields are pre-populated	Manually Enter	Some fields are pre-populated
Test Value	Minimum available arcing current	Minimum available arcing current	Minimum available arcing current
Test	Manually Test Trip Curve	Manually Test Trip Curve Enter 5.0 for 6.0 trip units.	Manually Test Trip Curve
Trip Curve Test Mode	Instantaneous	Short Time	Instantaneous
Passing Result	< 50 ms with ERMS ON	< 80 ms with MMS ON	< 50 ms
Reset Trip Unit Alarm	Press button on top right corner to clear trip unit fault indicator.	Press button on top right corner to clear trip unit fault indicator.	Press button on top right corner to clear trip unit fault indicator.
Additional Test	Switch ERMS OFF and complete the same test.	Switch MMS OFF and complete the same test.	—
Final Step	Clear trip unit fault on trip unit.	Remove jumper from 6.0 trip unit (ground fault). Clear trip unit fault on trip unit.	Clear trip unit fault on trip unit.

1. Same test procedure as used for AMS,(Alternate Maintenance Setting), which is no longer available.

Safety Requirements

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, CSA Z462, NOM 029-STPS, or local equivalent.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Unless specified otherwise in the commissioning procedures, all operations (inspection, test, and preventive maintenance) must be carried out with the device, the cradle, and the auxiliary circuits de-energized.
- Check that the device and the cradle are de-energized on the upstream and downstream terminals.
- Always use a properly rated voltage sensing device to confirm that the device, the cradle, and the auxiliary circuits are de-energized.
- Install safety barriers and display a danger sign.
- During the tests, it is strictly forbidden for anyone to touch the device, the cradle, or the conductors while voltage is applied.
- Before putting the equipment back into operation, it is mandatory to check that all connections are made with the correct tightening torque, there are no tools or objects inside the equipment, all devices, doors, and protective covers are in position, and the device is off (open position).

Failure to follow these instructions will result in death or serious injury.

ERMS Testing

ERMS Tripping Test Requirements

The system should be tested upon initial start-up and:

- in accordance with your facility maintenance schedule.
- if any of the components in the system are replaced.
- if any work is done in the area of the system wiring.
- if required per installation requirements.

ERMS Tripping Test Necessary Tools

The following is needed to perform a tripping test (order separately).

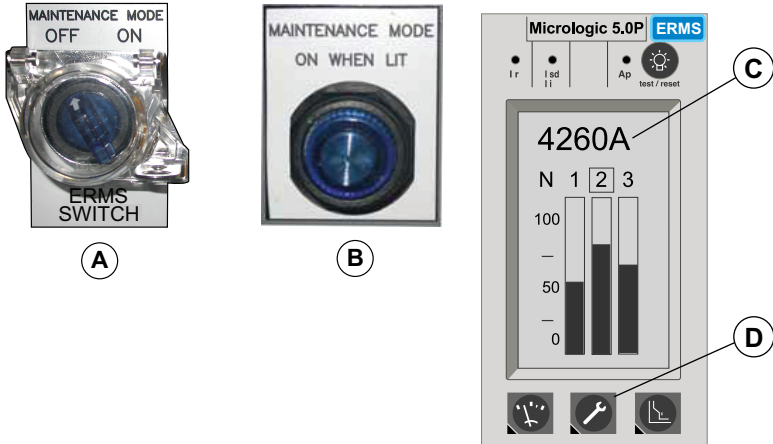
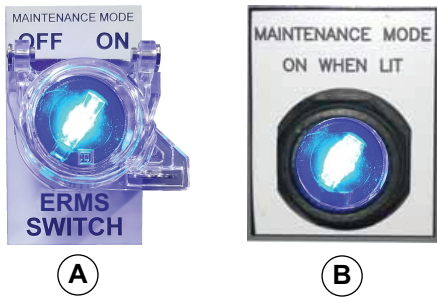
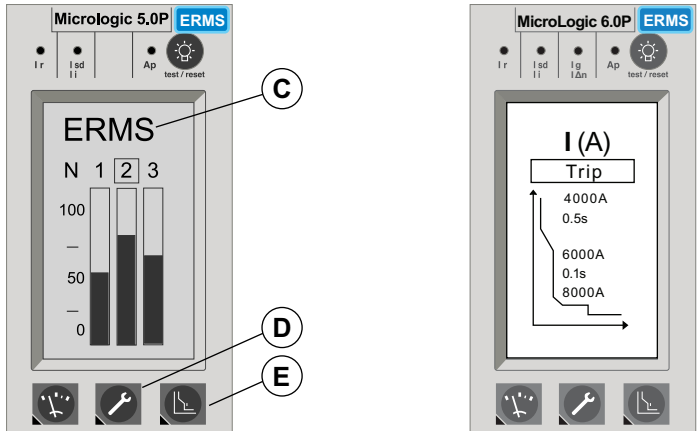
- S33595 Full-Function Test Kit (FFTK)

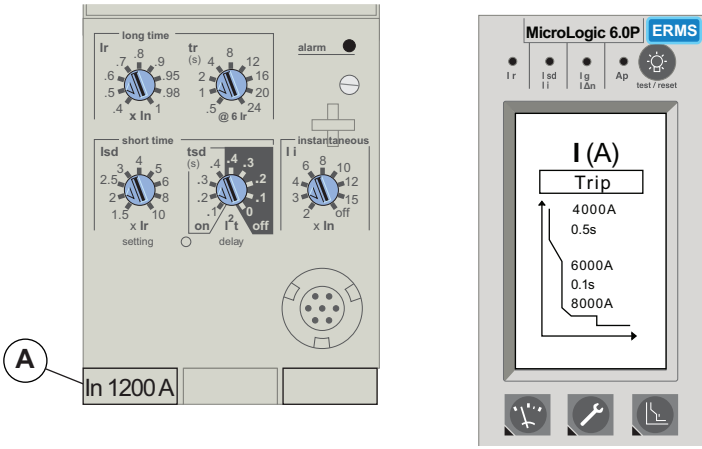
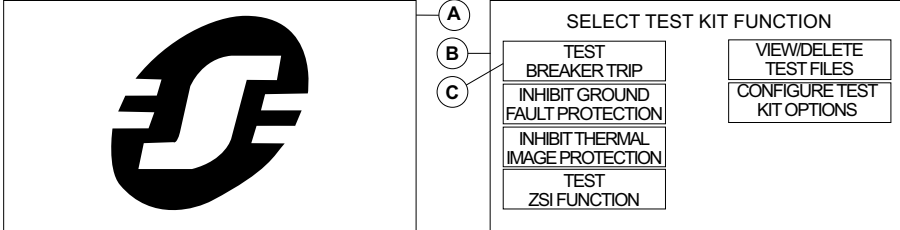
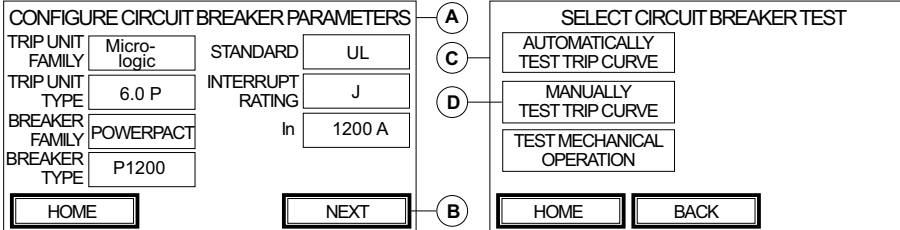
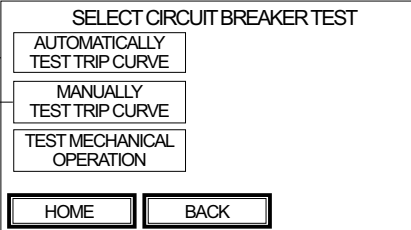
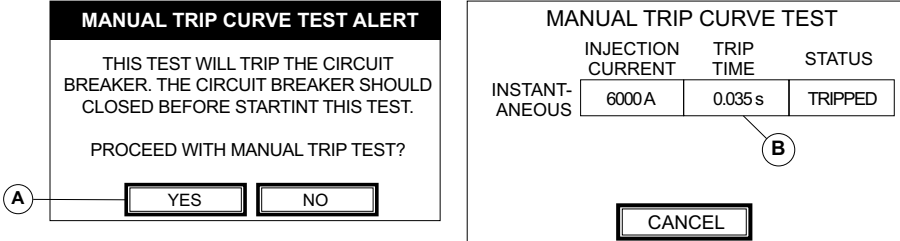
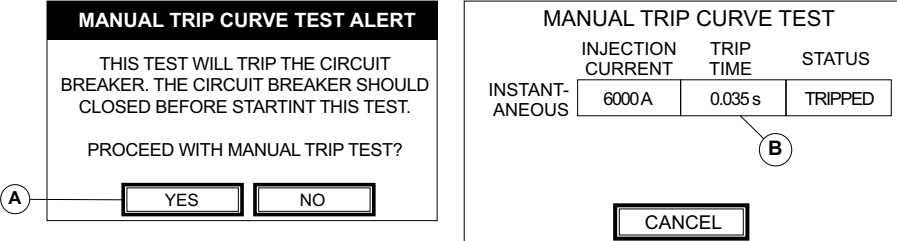
ERMS Full-Function Test Kit (FFTK) Setup

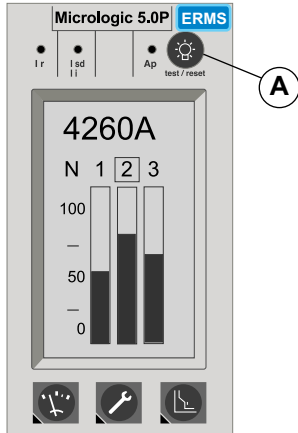

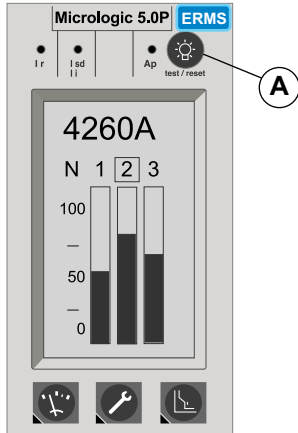
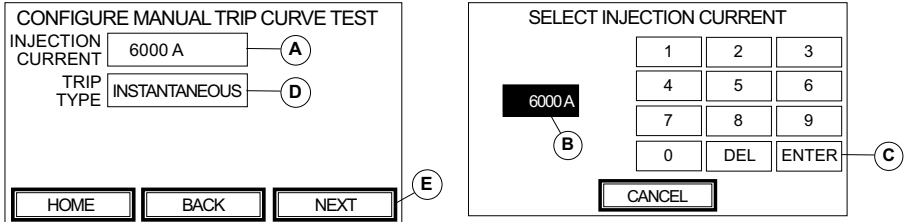
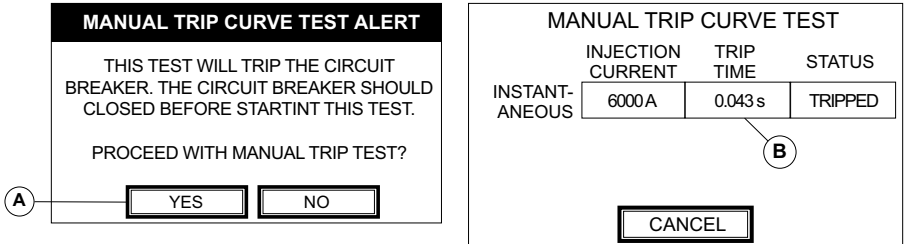
See the Full Function Test Kit (FFTK) Instruction Bulletin for information on operation of the test kit.

Energy Reduction Maintenance Setting (ERMS) Tripping Test

NOTE: The circuit breaker Energy Reduction Maintenance Setting (ERMS) instantaneous tripping can be tested with the circuit breaker Open or Closed. If the circuit breaker is closed, make sure all downstream loads are off. The circuit breaker cannot be carrying current for this test to be accurate.

<p>1 Turn on all control power to the trip unit, IO module and IFE.</p>	
<p>2 Make sure the ERMS switch is in the OFF position (A). The blue maintenance mode indicator light on the ERMS switch (A) must be off (not illuminated). If using the remote ERMS switch option, then the blue remote indicator light (B) must be off as well.</p>	
<p>3 Observe the load bar graph screen. If another screen is visible, press the wrench key (maintenance button) (D) on the trip unit. Make sure that "ERMS" is NOT displayed (C).</p>	
<p>4 Turn the ERMS switch to the ON position. The blue ERMS mode indicator light on the ERMS switch (A) must be illuminated. If using the remote ERMS switch option, then the remote indicator light (B) must be on as well.</p>	
<p>5 Press the wrench key (maintenance button) (D) on the trip unit to return to the load bar graph screen. After a short delay, check that the letters "ERMS" are displayed and flashing as shown (C). Go to the Ii setting by pressing the trip curve key (protection button) (E) on the trip unit. Select amperage protections and then I (A).</p>	

<p>6 Check that the I (A) value is the desired ERMS setting and not the Normal setting value.</p> <p>The ERMS system is programmed to default to an Instantaneous (Ii setting) of 2 x In. If this value is not correct, it can be adjusted using EcoStruxure Power Commission software and an IFE module. If there is no IFE module installed, one must be installed using the instructions shipped with the module.</p> <p>NOTE: The In value is shown at the bottom left of the trip unit (A).</p>	
<p>7 Connect FFTK to the MicroLogic trip unit with 7-pin test cable. Turn the Full Function Test Kit (FFTK) on and wait for the Power On test and for the Full-Function Test Kit Title screen (A) to come up. Select language as required.</p>	
<p>8 Click Next to go to the Select Test Kit Function screen (B). Wait for the Test Circuit Breaker Trip box to load on the screen.</p>	
<p>9 Press Test Breaker Trip box (C).</p>	
<p>10 The FFTK will communicate with the Micrologic P or H trip unit and populate most of the fields in the parameters screen (A). Enter the remaining fields manually from the nameplate of the circuit breaker being tested.</p>	
<p>11 Press the NEXT key (B) to go to the Select Circuit Breaker Test screen (C). Press Manually Test Trip Curve (D).</p>	
<p>12 Using numerical keypad, enter Minimum Available Arcing Current (if available) as amperage value to be tested (A). If Minimum Available Arcing Current is not available, enter a test value which is above the ERMS instantaneous pickup value and below the NORMAL instantaneous pickup value.</p> <p>Using keypad, enter Injection Current (B). Press ENTER (C).</p> <p>Use trip type touch key to select Instantaneous Trip option (D) to conduct the test. DO NOT use Long Time or Short Time setting to conduct the test as it injects different RMS values and can influence the trip time. Press NEXT (E).</p>	
<p>13 Click YES (A) to conduct the test. Record the values. For ERMS On mode, the trip time (B) should be < 50 ms (0.050 s). If the circuit breaker is in the ON position, the test will cause it to mechanically trip.</p> <p>Record the value manually or save the test file if desired. See the FFTK instruction bulletin for information on how to save the test file.</p>	

<p>14 Reset the trip indicator on the MicroLogic Trip Unit (A). The FFTK records trip time and evaluates the trip time to the trip curve to determine Pass or Fail.</p>	
<p>15 Turn the ERMS switch to the OFF position. Verify that The blue ERMS mode indicator light on the ERMS switch (A) is not illuminated. If using the remote ERMS switch option (B), verify that it is not illuminated either.</p>	
<p>16 Check the li setting on the trip unit screen. Make sure the li setting shown on this screen is the Normal setting and not the value for ERMS. (ERMS will be 2 x In or to the adjusted setting for ERMS, while the normal settings should be higher and would be recorded in the coordination study documents.)</p>	
<p>17 Using numerical keypad, enter Minimum Available Arcing Current (if available) as amperage value to be tested (A). If Minimum Available Arcing Current is not available, enter a test value which is above the ERMS instantaneous pickup value and below the NORMAL instantaneous pickup value. Using keypad, enter Injection Current (B). Press ENTER (C). Use trip type touch key to select Instantaneous Trip option (D) to conduct the test. DO NOT use Long Time or Short Time setting to conduct the test as it injects different RMS values and can influence the trip time. Press NEXT (E).</p>	
<p>18 Click YES (A) to conduct the test. Record the values (B). If the circuit breaker is in the ON position, the test will cause it to mechanically trip.</p>	
<p>19 Record the value manually or save the test file if desired. See the FFTK instruction bulletin for information on how to save the test file.</p>	
<p>20 Reset the trip unit.</p>	
<p>21 Turn off FFTK and disconnect from the trip unit.</p>	
<p>22 Verify NORMAL settings with ERMS disengaged (OFF position).</p>	
<p>23 Turn off all control power to the trip unit, IO module and IFE</p>	

MMS Testing

MMS Tripping Test Requirements

The system should be tested upon initial start-up and:

- in accordance with your facility maintenance schedule.
- if any of the components in the system are replaced.
- if any work is done in the area of the system wiring.

Tripping Test Necessary Tools

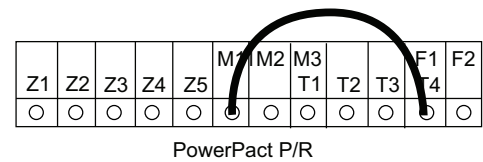
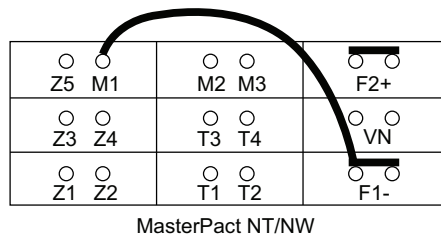
The following is needed to perform a tripping test (order separately).

- S33595 Full-Function Test Kit (FFTK)
- M2CTEST Special Tool Adapter for Full-Function Test Kit

Before Testing Maintenance Mode Switch (MMS)

NOTE: For MicroLogic™ A trip units, 24 Vdc power must be available at F1(-) and F2(+) of the trip unit. The 24 Vdc power is not necessary for MicroLogic P and H trip units.

1. Complete the testing of the Maintenance Mode Switch (MMS) system wiring and indicator lights.
2. Verify that the MMS switch is in the OFF position.
3. If testing a MicroLogic 6.0 trip unit, install a jumper between trip unit terminals M1 and F1. This will assure that the residual ground-fault function will not interfere with this test.



NOTE: On MDGF or SGR systems, the normal system wiring makes this M1 to F1 connection internally without the use of a jumper.

Full-Function Test Kit Connections

NOTE: The M2CTEST special adapter disables communication between the FFTK and MicroLogic A, P and H trip units so that some of the normal FFTK functions are intentionally disabled. These include:

- Trip unit parameter automatic population (trip unit type and In)
- Inhibit functions (thermal imaging and ground-fault)
- ZSI test
- Powering the trip unit

When using the M2CTEST special adapter, all advanced protections, logging of trips, logging of alarms, activation of alarms and incrementing the contact wear counter are enabled during the secondary injection test.

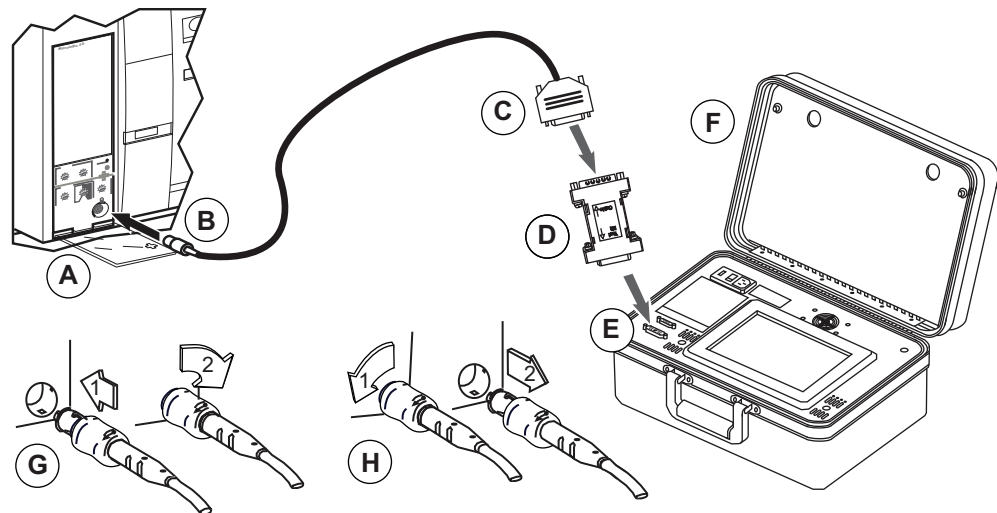
NOTICE

HAZARD OF EQUIPMENT DAMAGE

Pins on seven-pin test cable connector can bend or break if forced. Avoid using excessive force when connecting to trip unit test ports.

Failure to follow these instructions can result in equipment damage.

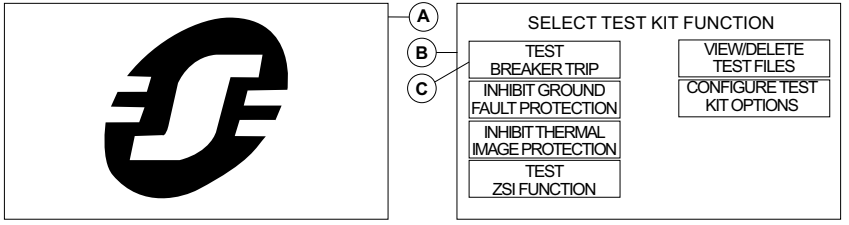
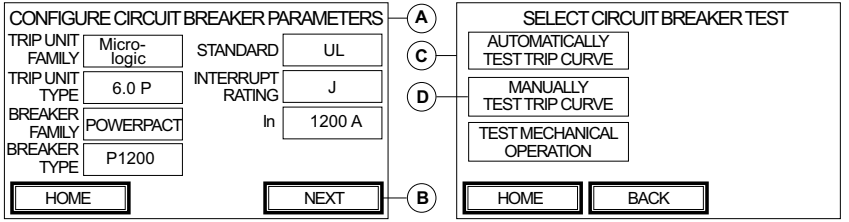
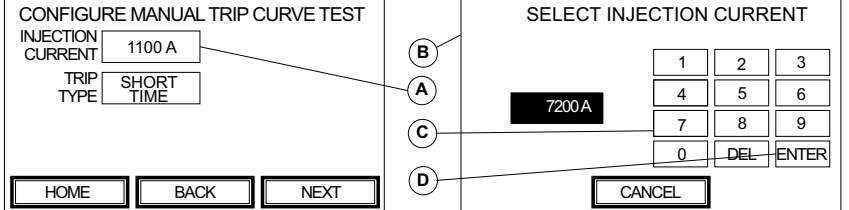
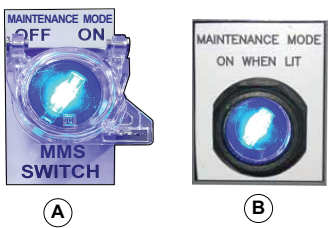
- A. Trip Unit
- B. Full-Function Test Kit Cable
- C. Ten Pin Test Cable Connector
- D. M2C Test Adapter Tool
- E. Ten Pin Port
- F. Full Function Test Kit
- G. Plugging in the 7-Pin Connector
- H. Unplugging the 7-Pin Connector



Maintenance Mode Switch (MMS) Testing

NOTE: This test allows manual current injection values regardless of trip unit settings. The Full-Function Test Kit monitors and displays trip time associated with selected current. Trip times reported by the Full-Function Test Kit must be manually compared to a published trip unit time-current curve for the trip unit being tested. Based on the trip unit settings, select an injection current that is just above the short time pickup (I_{sd}) trip curve pickup point. This will assure that sufficient current is injected to allow the trip unit to trip in the short time delay (T_{sd}) tripping curve.

See the Full-Function Test Kit (FFTK) Instruction Bulletin for information on operation of the test kit

1	Turn the Full Function Test Kit (FFTK) on and wait for the Power On test and for the Full-Function Test Kit Title screen (A) to come up. Select language as required.	
2	Click Next to go to the SELECT TEST KIT FUNCTION screen (B). Wait for the TEST BREAKER TRIP box to load on the screen.	
3	Press TEST BREAKER TRIP box (C).	
4	Press the boxes in the CONFIGURE CIRCUIT BREAKER PARAMETERS screen (A) to populate each field. Refer to the FFTK instruction bulletin for details on each parameter. NOTE: The trip unit type selections with the M2CTEST adapter will only be 2.0, 3.0 and 5.0. If the trip unit you are testing is a Micrologic 6.0, select 5.0 for these tests.	
5	Press the NEXT key (B) to go to the SELECT CIRCUIT BREAKER TEST screen (C). Press MANUALLY TEST TRIP CURVE (D).	
6	Press INJECTION CURRENT (A) to select Injection Current screen (B).	
7	Use numerical keypad (C) to type in desired fault current in amperes, which should be the minimum available arcing current. (If the minimum available arcing fault current value is not available, choose a value in the short time delay band of the time-current characteristic curve of the device which is being tested.)	
8	Press ENTER (D) to return to CONFIGURE MANUAL TIP CURVE TEST screen (A).	
9	Turn the MMS switch to the ON position. The blue MMS mode indicator light on the ERMS switch (A) must be illuminated. If using the remote switch option, then the remote indicator light (B) must be on as well.	

<p>10</p>	<p>From the CONFIGURE MANUAL TRIP CURVE TEST screen (A), scroll the TRIP TYPE touch key to select "SHORT TIME" (B).</p>	
<p>11</p>	<p>Press NEXT (C) to proceed to the MANUAL TRIP CURVE TEST ALERT screen (D).</p>	
<p>12</p>	<p>Read the alert message, verify the circuit breaker is closed, and press YES (E) to initiate the test.</p>	
<p>13</p>	<p>The MANUAL TRIP CURVE TEST screen displays a table with three columns:</p> <ul style="list-style-type: none"> • INJECTION CURRENT—shows magnitude of current, in amperes, during testing of each segment of time-current curve. • TRIP TIME—displays time, in seconds, until circuit breaker trips. • STATUS—indicates testing progress for each protective function. The following variables can appear in the status column: <ul style="list-style-type: none"> ◦ TESTING: injecting test signal ◦ STOPPING (blinking): exiting test mode ◦ TRIPPED: test signal caused circuit breaker to trip <p>The Full-Function Test Kit records the amount of time required to trip the circuit.</p>	
<p>14</p>	<p>Trip time (A) with MMS switch ON should be less than 80 ms.</p>	
<p>15</p>	<p>Locate the Maintenance Mode Setting (MMS) switch for the intended circuit breaker. If the MMS switch is in the ON position (A), turn it off (B). Verify that the maintenance mode indicator light located on the MMS switch is not illuminated (B).</p>	
<p>16</p>	<p>Press CANCEL on the MANUAL TRIP CURVE TEST screen (A) to return to the CONFIGURE MANUAL TRIP CURVE TEST screen (B).</p>	

17	Press NEXT (A) to proceed to MANUAL TRIP CURVE TEST ALERT screen (B). Read the alert message, verify circuit breaker is closed, and press YES (C) to initiate manual trip curve test with MMS switch OFF.	<div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p style="text-align: center; margin: 0;">CONFIGURE MANUAL TRIP CURVE TEST</p> <p>INJECTION CURRENT <input type="text" value="7200 A"/></p> <p>TRIP TYPE <input type="text" value="SHORT TIME"/></p> <p style="text-align: center; margin-top: 10px;"> <input type="button" value="HOME"/> <input type="button" value="BACK"/> <input type="button" value="NEXT"/> </p> </div> <div style="width: 45%;"> <div style="border: 1px solid black; padding: 5px; background-color: #f0f0f0;"> <p style="text-align: center; margin: 0; font-weight: bold;">MANUAL TRIP CURVE TEST ALERT</p> <p style="text-align: center; font-size: small;">THIS TEST WILL TRIP THE CIRCUIT BREAKER. THE CIRCUIT BREAKER SHOULD BE CLOSED BEFORE STARTING THIS TEST</p> <p style="text-align: center; font-weight: bold; font-size: small;">PROCEED WITH MANUAL TRIP TEST</p> <p style="text-align: center; margin-top: 5px;"> <input type="button" value="YES"/> <input type="button" value="NO"/> </p> </div> </div> </div>								
18	Once the circuit breaker trips, check the value recorded in the TRIP TIME column. This is the tripping time with MMS switch OFF.	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p style="margin: 0; font-weight: bold;">MANUAL TRIP CURVE TEST</p> <table style="margin: 0 auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;"></th> <th style="padding: 5px; border: 1px solid black;">INJECTION CURRENT</th> <th style="padding: 5px; border: 1px solid black;">TRIP TIME</th> <th style="padding: 5px; border: 1px solid black;">STATUS</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px; text-align: right;">SHORT TRIP TIME</td> <td style="padding: 5px; border: 1px solid black; text-align: center;">7200 A</td> <td style="padding: 5px; border: 1px solid black; text-align: center;">1.100 s</td> <td style="padding: 5px; border: 1px solid black; text-align: center;">TRIPPED</td> </tr> </tbody> </table> <p style="margin-top: 10px; text-align: center;"> <input type="button" value="CANCEL"/> </p> </div>		INJECTION CURRENT	TRIP TIME	STATUS	SHORT TRIP TIME	7200 A	1.100 s	TRIPPED
	INJECTION CURRENT	TRIP TIME	STATUS							
SHORT TRIP TIME	7200 A	1.100 s	TRIPPED							
19	Compare the reduced tripping time with the MMS switch ON with the normal tripping time with the MMS switch OFF. This testing shows the tripping time reduction that MMS provides.									

Remove Trip Unit Jumper

⚠️ ⚠️ WARNING

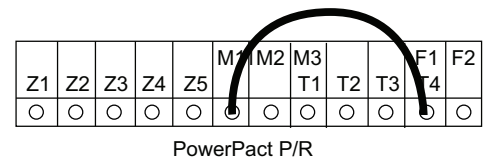
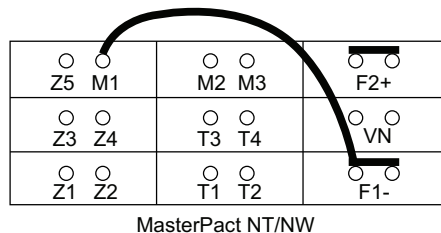
HAZARD OF LOSS OF GROUND-FAULT PROTECTION

Leaving the jumper installed between M1 and F1 will result in the circuit breaker no longer providing residual ground-fault protection

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If a jumper was installed between terminals M1 and F1 before testing (see *Before Testing Maintenance Mode Switch (MMS)*, page 11), remove the jumper now. If a jumper was installed and is not removed after testing, the circuit breaker will not provide residual ground-fault protection.

NOTE: On MDGF or SGR systems, the normal system wiring makes the M1 to F1 connection internally without the use of a jumper.



Instantaneous Trip Testing

Tripping Test Necessary Tools

The following is needed to perform a tripping test (order separately).

- S33595 Full-Function Test Kit (FFTK)

Full-Function Test Kit Connection

NOTICE

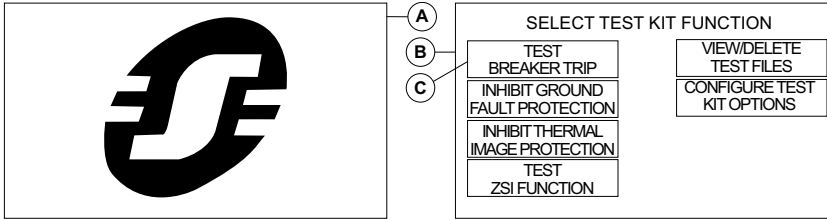
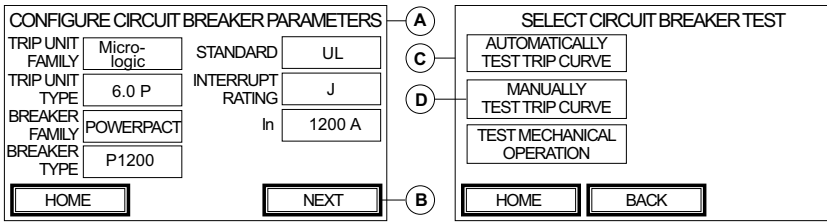
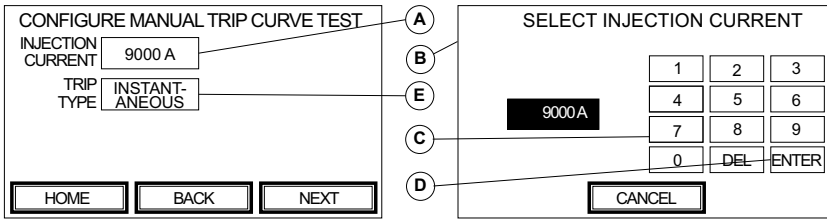
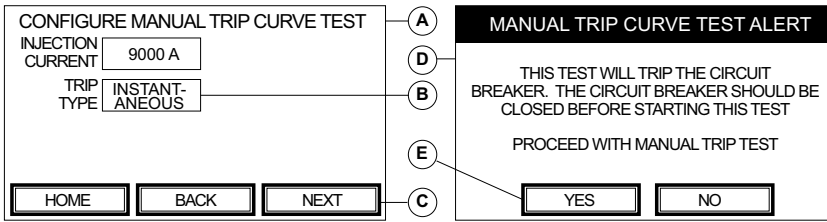
HAZARD OF EQUIPMENT DAMAGE

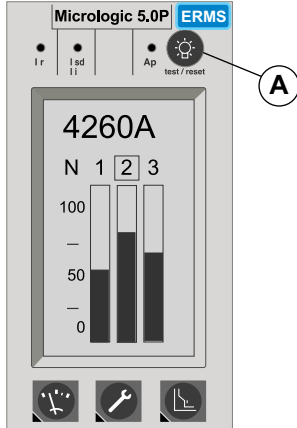
Pins on seven-pin test cable connector can bend or break if forced. Avoid using excessive force when connecting to trip unit test ports.

Failure to follow these instructions can result in equipment damage.

Instantaneous Testing

See the Full-Function Test Kit (FFTK) Instruction Bulletin for information on operation of the test kit

1	Make sure that the equipment is de-energized before conducting the test.	
2	Confirm that the circuit breaker is adjusted to the proper settings according to the coordination study. Use the dials on the trip unit to set long time, short time, and instantaneous trip setting. The Instantaneous adjustment (Ii) must be below the Minimum Available Arcing Current.	
3	It is recommended to have the circuit breaker in the OFF position, but it is not required to perform the test. The circuit breaker will trip during the test sequence.	
4	Turn the Full Function Test Kit (FFTK) on and wait for the Power On test and for the Full-Function Test Kit Title screen (A) to come up. Select language as required.	
5	Click Next to go to the SELECT TEST KIT FUNCTION screen (B). Wait for the TEST BREAKER TRIP box to load on the screen.	
6	Press TEST BREAKER TRIP box (C).	
7	Once the FFTK is powered, enter the circuit breaker parameters into the CONFIGURE CIRCUIT BREAKER PARAMETERS screen. The information can be found on the faceplate of the circuit breaker.	
8	Press the NEXT key (B) to go to SELECT CIRCUIT BREAKER TEST screen (C). Press MANUALLY TEST TRIP CURVE (D).	
9	Press INJECTION CURRENT (A) to select Injection Current screen (B).	
10	Use numerical keypad (C) to type in desired fault current in amperes (which should be above the instantaneous pickup level).	
11	Press ENTER (D) to return to CONFIGURE MANUAL TIP CURVE TEST screen (A).	
12	From the CONFIGURE MANUAL TRIP CURVE TEST screen (A), scroll the TRIP TYPE touch key to select "INSTANTANEOUS" (B).	
13	Press NEXT (C) to proceed to the MANUAL TRIP CURVE TEST ALERT screen (D). DO NOT use Long Time or Short Time setting to conduct the test as they inject different RMS values and can influence the trip time.	
14	Read the alert message and press YES (E) to initiate the test.	

<p>15</p>	<p>The MANUAL TRIP CURVE TEST screen displays a table with three columns:</p> <ul style="list-style-type: none"> • INJECTION CURRENT—shows magnitude of current, in amperes, during testing of each segment of time-current curve. • TRIP TIME—displays time, in seconds, until circuit breaker trips. • STATUS—indicates testing progress for each protective function. The following variables can appear in the status column: <ul style="list-style-type: none"> ◦ TESTING: injecting test signal ◦ STOPPING (blinking): exiting test mode ◦ TRIPPED: test signal caused circuit breaker to trip <p>The Full-Function Test Kit records the amount of time required to trip the circuit.</p>	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>MANUAL TRIP CURVE TEST</p> <table border="1" style="margin: auto;"> <thead> <tr> <th></th> <th>INJECTION CURRENT</th> <th>TRIP TIME</th> <th>STATUS</th> </tr> </thead> <tbody> <tr> <td>INSTANT-ANEOUS</td> <td>9000 A</td> <td>0.038 s</td> <td>TESTING</td> </tr> </tbody> </table> <p style="margin-top: 10px;"><input type="button" value="CANCEL"/></p> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>MANUAL TRIP CURVE TEST</p> <table border="1" style="margin: auto;"> <thead> <tr> <th></th> <th>INJECTION CURRENT</th> <th>TRIP TIME</th> <th>STATUS</th> </tr> </thead> <tbody> <tr> <td>INSTANT-ANEOUS</td> <td>9000 A</td> <td>0.038 s</td> <td>TRIPPED</td> </tr> </tbody> </table> <p style="margin-top: 10px;"><input type="button" value="CANCEL"/></p> </div> </div>		INJECTION CURRENT	TRIP TIME	STATUS	INSTANT-ANEOUS	9000 A	0.038 s	TESTING		INJECTION CURRENT	TRIP TIME	STATUS	INSTANT-ANEOUS	9000 A	0.038 s	TRIPPED
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INSTANT-ANEOUS	9000 A	0.038 s	TRIPPED															
<p>16</p>	<p>Once the circuit breaker trips, the trip time should be < 50 ms (0.050 s).</p>																	
<p>17</p>	<p>Reset the trip indicator on the MicroLogic Trip Unit (A).</p>	 <p>The image shows the MicroLogic 5.0P ERMS control panel. It features a digital display showing '4260A' and a bar chart with three bars labeled 'N 1 2 3'. The bar for '2' is the tallest, reaching approximately 100 on the scale. Above the display are three indicator lights labeled 'I r', 'I sd II', and 'Ap'. To the right of the 'Ap' light is a 'test/reset' button, which is circled in red and labeled with a circled 'A'.</p>																

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