01.SUP.51200B PowlVac-AR® Switchgear

Accessibility Type 2C

Supplement to Instruction Bulletin 01.4IB.51200B
Contact Information

Powell Electrical Systems, Inc.
powellind.com
info@powellind.com

Service Division
PO Box 12818
Houston, Texas 77217-2818

Tel: 713.944.6900
Fax: 713.948.4569
Signal Words

As stated in ANSI Z535.4-2007, the signal word is a word that calls attention to the safety sign and designates a degree or level of hazard seriousness. The signal words for product safety signs are “Danger”, “Warning”, “Caution” and “Notice”. These words are defined as:

- **DANGER**
  
  *DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*

- **WARNING**
  
  *WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.*

- **CAUTION**
  
  *CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.*

- **NOTICE**
  
  *NOTICE is used to address practices not related to personal injury.*

Qualified Person

For the purposes of this manual, a qualified person, as stated in NFPA 70E®, is one who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved. In addition to the above qualifications, one must also be:

1. trained and authorized to energize, deenergize, clear, ground, and tag circuits and equipment in accordance with established safety practices.
2. trained in the proper care and use of personal protective equipment (PPE) such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.
3. trained in rendering first aid if necessary.
This page is left blank intentionally
Contents

Ch 1 General Information ................................................................................................................. 1
  A. SCOPE .............................................................................................................................................. 2
  B. PURPOSE ........................................................................................................................................ 2

Ch 2 Safety ........................................................................................................................................... 3
  A. SAFE WORK CONDITION ................................................................................................................. 3
  B. GENERAL ........................................................................................................................................ 3
  C. SPECIFIC ......................................................................................................................................... 4
  D. SAFETY LABELS ............................................................................................................................... 4

Ch 3 Equipment Description .................................................................................................................. 5
  A. GENERAL ........................................................................................................................................ 5
  B. DIMENSIONS .................................................................................................................................. 5
  C. DOORS .......................................................................................................................................... 6
  D. RATINGS ....................................................................................................................................... 8

Ch 4 Installation ...................................................................................................................................... 9
  A. POSITIONING THE METAL-CLAD SWITCHGEAR ........................................................................... 9
     1) Assembly of Shipping Splits ........................................................................................................ 9
  B. PRESSURE RELIEF VENTS ............................................................................................................... 11
  C. CIRCUIT BREAKER/AUXILIARY COMPARTMENT ..................................................................... 11
  D. MAIN BUS COMPARTMENT .......................................................................................................... 12
  E. CABLE COMPARTMENT ............................................................................................................... 13
  F. FIELD WIRING AND CONTROL CABLE ...................................................................................... 14
Figures

Figure 1 Tie-Down Bolts on Rear Door ................................................................. 6
Figure 2 Gasket Layout on Rear Door ................................................................. 7
Figure 3 Main Bus Access Panels Fully Assembled .............................................. 9
Figure 4 Exploded View of Main Bus Access Cover ......................................... 10
Figure 5 Detail of Venting on Circuit Breaker/Auxiliary Compartment .......... 11
Figure 6 Exploded View of Venting on Circuit Breaker/Auxiliary Compartment .. 11
Figure 7 Fully Assembled Main Bus Venting Inside the Vent Area
   Under the Plenum ...................................................................................... 12
Figure 8 Exploded View of Venting on Main Bus Compartment ....................... 12
Figure 9 Venting on Cable Compartment Fully Assembled .............................. 13
Figure 10 Section View Showing Venting on Main Bus Compartment ............. 14

Tables

Table A Standard Dimensions ........................................................................ 6
Table B Type 2C Arc Resistant Ratings .......................................................... 8
Ch 1 General Information

⚠️ WARNING

The equipment described in this document may contain high voltages and currents which can cause serious injury or death.

The equipment is designed for use, installation, and maintenance by qualified users of such equipment having experience and training in the field of high voltage electricity. This document and all other documentation shall be fully read, understood, and all warnings and cautions shall be abided by. If there are any discrepancies or questions, the user shall contact Powell immediately at 1.800.480.7273.

⚠️ WARNING

Before any adjustment, servicing, part replacement, or any other act is performed requiring physical contact with the electrical working components or wiring of this equipment, the power supply must be disconnected. Failure to follow this warning may result in injury or death.

NOTICE

The information in this instruction bulletin is not intended to explain all details or variations of the Powell equipment, nor to provide for every possible contingency or hazard to be met in connection with installation, testing, operation, and maintenance of the equipment. For additional information and instructions for particular problems, which are not presented sufficiently for the user’s purposes, contact Powell at 1.800.480.7273.

NOTICE

Powell reserves the right to discontinue and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.
A. Scope

The information in this supplemental Instruction Bulletin is specific to PowlVac-AR® Switchgear designated as Type 2C. This document should be used in conjunction with instruction bulletin for PowlVac-AR. This document supersedes the PowlVac-AR bulletin only when duplicate information is presented.

B. Purpose

This document provides the supplemental instructions necessary for a qualified person to install PowlVac-AR Type 2C equipment, perform maintenance on the Type 2C equipment, and add customer control wiring to the equipment without compromising the Type 2C construction features.

WARNING

This document is incomplete without the instruction bulletin specific to the ground and test device being used, and instruction bulletin 01.4IB.51200A.
Ch 2  Safety

A. Safe Work Condition

The information in Section A is quoted from NFPA 70E 2004 - Article 120, 120.1 Establishing an Electrically Safe Work Condition.

120.1 Process of Achieving an Electrically Safe Work Condition

1. Determine all possible sources of electrical supply to the specific equipment. Check applicable up-to-date drawings, diagrams, and identification tags.

2. After properly interrupting the load current, OPEN the disconnecting device(s) for each source.

3. Wherever possible, visually verify that all blades of the disconnecting devices are fully OPEN or that drawout type circuit breakers are withdrawn to the fully disconnected position.

4. Apply lockout/tagout devices in accordance with a documented and established policy.

5. Use an adequately rated voltage detector to test each phase conductor or circuit part to verify they are deenergized. Test each phase conductor or circuit part both phase-to-phase, and phase-to-ground. Before and after each test, determine that the voltage detector is operating satisfactorily.

6. Where the possibility of induced voltages or stored electrical energy exists, ground the phase conductors or circuit parts before touching them. Where it could be reasonably anticipated that the conductors or circuit parts being deenergized could contact other exposed energized conductors or circuit parts, apply ground connecting devices rated for the available fault duty.

B. General

1. Only supervised and qualified personnel trained in the usage, installation, operation, and maintenance of the circuit breaker shall be allowed to work on this equipment. It is mandatory that this instruction bulletin, any supplements, and service advisories be studied, understood, and followed.

2. Maintenance programs must be consistent with both customer experience and manufacturer’s recommendations, including service advisories and instruction bulletin(s). A well planned and executed routine maintenance program is essential for circuit breaker’s reliability and safety.

3. Service conditions and circuit breaker applications shall also be considered in the development of safety programs. Variables include ambient temperature; humidity; actual continuous current; thermal cycling; number of operations; interrupting duty; and any adverse local conditions including excessive dust, ash, corrosive atmosphere, vermin and insect infestations.
C. SPECIFIC

1. **DO NOT WORK ON ENERGIZED SWITCHGEAR.** If work must be performed on the switchgear, remove it from service and place it in an electrically safe condition.

2. **EXTREME CARE MUST BE EXERCISED TO KEEP ALL PERSONNEL, TOOLS, AND OTHER OBJECTS CLEAR OF MECHANISMS WHICH ARE TO BE OPERATED, DISCHARGED, OR RELEASED.**

3. **DO NOT USE AN OPEN CIRCUIT BREAKER AS THE SOLE MEANS OF ISOLATING A HIGH VOLTAGE CIRCUIT.** For complete isolation, the circuit breaker shall be in the disconnected position or shall be withdrawn completely.

4. **ALL COMPONENTS SHALL BE DISCONNECTED BY MEANS OF A VISIBLE BREAK AND SECURELY GROUNDED FOR SAFETY OF PERSONNEL.**

5. Interlocks are provided to ensure the proper operating sequences of the circuit breakers and for the safety of the user. If for any reason an interlock does not function as described, do not make any adjustments, modification, or deform the parts. **DO NOT FORCE THE PARTS INTO POSITION. CONTACT POWELL FOR INSTRUCTIONS.**

D. **SAFETY LABELS**

The equipment described in this document has **DANGER, WARNING, CAUTION, and instruction labels** attached to various locations. All equipment **DANGER, WARNING, CAUTION, and instruction labels** shall be observed when the equipment is handled, operated, or maintained.

---

**NOTICE**

Warning and Caution labels are located in various places in and on the switchgear and on the circuit breaker removable element. Always observe these warnings and caution labels. Do NOT remove or deface any of these warning/caution labels.

---

**DANGER**

Using a ground and test device on arc resistant switchgear removes all the safety related arc resistant design features and exposes the operator to the full fault energy.
Ch 3 Equipment Description

A. General

Suffix C is the designation for equipment where isolation from the effects of an internal arcing flash is desired between all adjacent compartments within a switchgear assembly. It does not imply that the equipment may be operated with doors, covers, or panels opened or removed and maintain its intended degree of protection.

Arc Resistant Type 2C switchgear meets the requirements for the 2B rating and further extends the arc resistant features to each internal compartment. This level of arc fault construction limits the configurations and ratings available. This bulletin identifies the available ratings, configurations, and construction and operational differences between Type 2B and Type 2C PowlVac-AR® switchgear.

B. Dimensions

Type 2C Arc Resistant switchgear is only available as one-high construction. Table A, Standard Dimensions gives the ratings and dimensions for the switchgear.
### Table A  Standard Dimensions

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Lower Circuit Breaker</th>
<th>Lower Auxiliary</th>
<th>Maximum Continuous Current (amperes)</th>
<th>Internal Arcing Short-Circuit Current (kA)</th>
<th>Width (inches)</th>
<th>Height (inches)</th>
<th>Depth (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-High</td>
<td>X</td>
<td></td>
<td>1200</td>
<td>40</td>
<td>36</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>One-High</td>
<td>X</td>
<td></td>
<td>1200</td>
<td>40</td>
<td>36</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>One-High</td>
<td>X</td>
<td></td>
<td>2000</td>
<td>40</td>
<td>36</td>
<td>95</td>
<td>105</td>
</tr>
<tr>
<td>One-High</td>
<td>X</td>
<td></td>
<td>2000</td>
<td>40</td>
<td>36</td>
<td>95</td>
<td>105</td>
</tr>
</tbody>
</table>

### C. Doors

The rear doors used on Type 2C equipment contain Tie-Down bolts (Figure 1) and two types of gaskets (Figure 2). Otherwise, all doors used on the equipment are identical to the doors described in the PowlVac-AR® instruction bulletin.

**Figure 1  Tie-Down Bolts on Rear Door**
Figure 2  Gasket Layout on Rear Door

a. Gasket on Door Frame
b. Standard Gasket on Weather-proof Flange
D. Ratings

PowlVac-AR® medium voltage switchgear has been tested to and conforms to the requirements of IEEE C37.20.7 for the arc resistant rating. *Table B Ratings of Medium Voltage PowlVac-AR Circuit Breakers in 01.4IB.51200B* contains the information and ratings for the PowlVac® Circuit Breakers that may be used in Type 2C PowlVac-AR equipment. *Table B Type 2C Arc Resistant Ratings* below shows the ratings available for Type 2C Arc Resistant equipment.

<table>
<thead>
<tr>
<th>Table B Type 2C Arc Resistant Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility Type</td>
</tr>
<tr>
<td>Internal Arcing</td>
</tr>
<tr>
<td>Short-Circuit Current</td>
</tr>
<tr>
<td>Arcing Duration</td>
</tr>
</tbody>
</table>
**Ch 4 Installation**

**A. Positioning the Metal-Clad Switchgear**

1) Assembly of Shipping Splits

   a. Accessing the Main Bus Compartment
   The main bus compartment is not part of the rear cell assembly like PowlVac® and PowlVac-AR® Type 2B construction. It is segregated into a full height, bolt-on component in Type 2C designs.

   The main bus access cover (rear cable compartment) consists of multiple interlocking panels which must be assembled/disassembled in a specific sequence. This is important when making the main bus connections during the initial installation and if any maintenance is required on the main bus.

   Reference *Figure 3 Main Bus Access Panels Fully Assembled* for the following procedure to remove the main bus access panels.

   The figure shows the main bus compartment isolated from the other parts of the assembly for clarity. The interlocking panels are labeled 1-5.

   ![Main Bus Access Panels Fully Assembled](image)

   - a. Upper Curved Barrier
   - b. Panel 5
   - c. Panel 4
   - d. Panel 3
   - e. Panel 2
   - f. Panel 1
To Disassemble:
1. Remove the panels in order beginning with number 4 and working down to number 1.
2. Panel number 5 may be removed if necessary at any time after panel 4 is removed.
3. The curved barriers may be removed as required after panels 1-5 are removed.

To re-assemble:
1. Replace the curved barriers, if missing. Fully tighten all hardware on these panels at this time.
2. Replace panel number 5, if removed. Install, but leave the 6 bolts that run across the upper curved barrier loose.
3. Starting with panel number 1, install in order completing the assembly with panel number 4. Install the hardware on each side but do not tighten.
4. Once all panels are in place, install the three bolts that run across the interlocking panels on each panel and tighten. Then fully tighten all the hardware on each side of the panel assembly. And finally, fully tighten the 6 bolts across the upper curved barrier and panel number 5.
B. Pressure Relief Vents

In Type 2C designs, fault gases are not allowed to move into adjacent compartments during the arcing event, therefore the pressure relief venting has been modified from the Type 2B design to include retainers and specialized covers that prevent gas ingress. The horizontal vents remain U-bolt hinged welded boxes and the vertical vents are non-hinged, 14 gauge steel panels.

Special modifications are made to the pressures relief vent covers:

- Vertical covers are shielded with a light gauge steel that will:
  - Collapse over the vent when a fault occurs in another compartment
  - Break away when the vent opens due to a fault in its compartment
- Horizontal vents are latched so they will not bounce open from the shock wave caused by a fault in other sections of the equipment

C. Circuit Breaker/Auxiliary Compartment

The Circuit Breaker/Auxiliary Compartment uses an overlapping set of vent covers held in place by two tie-down screws (Figure 6). A small barrier surround the vent cover assembly to prevent escaping gases from lifting adjacent vent covers.

Figure 5 Detail of Venting on Circuit Breaker/Auxiliary Compartment

Figure 6 Exploded View of Venting on Circuit Breaker/Auxiliary Compartment

Tie Down Screws
D. **MAIN BUS COMPARTMENT**

The main bus pressure relief exhaust through the front of the compartment only. Special vent covers are used to prevent exhaust gases from entering the compartment below and to prevent gases from that compartment from entering the main bus.

*Figure 7  Fully Assembled Main Bus Venting Inside the Vent Area Under the Plenum*

*a. Special Cover Over Main Bus Pressure Relief Venting  
b. Top of Circuit Breaker Compartment*

*Figure 8  Exploded View of Venting on Main Bus Compartment*
E. **Cable Compartment**

The cable compartment pressure relief exhausts through the top of the compartment only. Overlapping vents with tie-down screws are used. Small barriers to prevent escaping gases from lifting the adjacent vent covers are placed between each set of top vents.

*Figure 9  Venting on Cable Compartment Fully Assembled*

- **a. Vent Barrier**
- **b. Cable Compartment Vents**
- **c. Tie-Down Screws**
- **d. Bus Compartment Vents**
F. **FIELD WIRING AND CONTROL CABLE**

The Suffix C designation mandates no communication of fault gases between any compartments, therefore any entry between high voltage compartments or from a high voltage compartment to a low voltage compartment is required to be sealed using either a compression type (CGB) fitting at the point of entry or a bushing or a conduit filled with a barrier material.

Connections made between instrument compartments are not required to be sealed unless their route takes them through a high voltage area.

The guidelines found in the PowlVac-AR® Instruction Bulletin for making a connection from a high voltage area to the instrument compartment apply to all compartments in a Type 2C design.

*Figure 10  Section View Showing Venting on Main Bus Compartment*
01.SUP.51200B
PowlVac-AR® Switchgear
Accessibility Type 2C

Supplement to Instruction Bulletin 01.4IB.51200B

January 2015