

DEH41550 R06

EntelliGuard*R Retrofill Circuit Breakers 800-5000A

Installation Manual for R7 & R8 Type Retrofill Circuit Breakers replacing WavePro Legacy Circuit Breakers used in AKD-10 & Substructures.

AKD-10 Low Voltage Switchgear is a free-standing assembly of metal-enclosed power circuit breakers. It may also be a part of a single-ended or double-ended load center unit substation. It uses WavePro type ANSI Low Voltage Power Circuit Breakers. This manual applies to both EntelliGuard R breakers for AKD-10 switchgear and OEM substructures.

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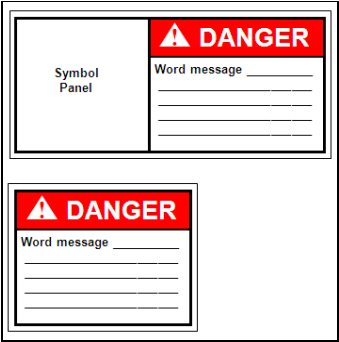
Preface

Hazards

The following important highlighted information appears throughout this document to warn of potential hazards or to call attention to information that clarifies a procedure. Carefully read all instructions and become familiar with the devices before trying to install, operate, service, or maintain this equipment.



Danger

This indicates a hazardous situation which, if not avoided, results in death or serious injury. A variety of electrical hazards warnings are displayed here and are applied to installation manuals. These are standard or generic alerts and labels that must be taken quite seriously when installing Retrofill circuit breakers in AKD switchgear and when working with potentially dangerous electrical equipment (Table 1). There are also dangers, pertaining to product safety, that need to be custom-written for particular or specific circumstances (Table 2).

<p>Table 1. Generic Danger Alerts and Labels Used for Documentation and Dangerous Equipment</p> 	<p>Table 2. Custom Danger Alerts and Labels Used for Documentation and Dangerous Equipment</p> 
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Warning

This indicates a hazardous situation, which, if not avoided, would result in death or serious injury. A variety of electrical hazards warnings are displayed here and are applied to installation manuals. These are standard or generic alerts and labels that must be taken quite seriously when installing Retrofill circuit breakers in AKD switchgear and when working equipment that can cause injury, but may not be necessarily fatal (*Table 3*). There are also warnings, pertaining to product safety, that need to be custom-written for particular or specific circumstances (*Table 4*).

<p>Table 3. <u>Generic</u> Warning Alerts and Labels Used for Documentation and Dangerous Equipment</p> <div><div><p>WARNING Potential Arc-Flash hazards exist while working on this energized equipment.</p></div><div><p>WARNING</p><p>Potential arc flash hazards. Wear proper personal protective equipment while working inside energized cabinet. (See NFPA 70E).</p></div></div>	<p>Table 4. <u>Custom</u> Warning Alerts and Labels Used for Documentation and Dangerous Equipment</p> <div><div><p>Two Symbol Panel</p><p>Second Symbol</p></div><div><p>WARNING</p><p>Word message _____</p><p>_____</p><p>_____</p><p>_____</p></div></div>
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Caution

This pertains to a hazard that has a low level of risk, which means that if not avoided, it could result in minor or moderate injury. It also indicates that failure to comply with instructions may result in product damage. The label here requires a specific message that targets a special product or procedure (*Table 5*).

<p>Table 5. <u>Custom</u> Caution Alerts and Labels Used for Documentation and Operating Equipment</p> <div><div><p>CAUTION</p><div><p>Symbol Panel</p></div><div><p>Word message _____</p><p>_____</p><p>_____</p><p>_____</p></div></div></div>

Notice or Note

This indicates important information in that it aids in job performance, that is, a notice or note is used to notify practices not related to personal injury (Table 6).

Table 6. Custom Notice Alerts and Labels Used for Documentation and Operating Equipment
<div>Not considered a safety label</div> <div><div>NOTICE</div><div>Word message _____ _____ _____ _____</div></div>

Warranty

This document is based on information available at the time of its publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, not does it provide for every possible contingency in connection with installation, operation, and maintenance.

Features may be described herein that are not present in all hardware and software systems. ABB assumes no obligation of notice to holders of this document with respect to changes subsequently made. ABB makes no representation or warranty, expressed, implied, or statutory, with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained here-in. No warranties of merchantability or fitness for purpose shall apply.

Contact your local sales office if further information is required concerning any aspect of EntelliGuard R Circuit Breaker operation or maintenance.

Trademarks and Patents

EntelliGuard* R
EntelliGuard* TU
EntelliGuard* TripUnit
EntelliGuard* G

Standards

Agency Certification	
Standard Number	Title
ANSI C37.13,16,17,20.1,50,51,59	Low-Voltage AC Power Circuit Breakers
NEMA SG 3,5	Low-Voltage Power Circuit Breakers
NEMA AB1	--
UL 1066	Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

Document Conventions

Topics and text are divided into primary, secondary, and tertiary paragraph headings.

Related Publications

Publication	Publication Number
Brochure	DEA-532
Snapshot	DEE-543
Installation Manual AKD-10	DEH-41550
Installation Manual AKD8	DEH-41549
Installation Manual AKD6 (800A-2000A)	DEH-41548
Installation Manual AKD5 (600A-2000A)	DEH-41547
Installation Manual AKD-5/6 (3000A/3200A/4000A)	DEH0005240
Accessory: Door Interlock (Door Interlock Kit)	DEH-41529
Accessory Retrofill Doors Assembly	DEH-41563
Accessory: Position Switch Plate & Position Switch Assembly & Wiring (Position Switch Kit)	DEH-41530
Accessory: Neutral Rogowski CT Disconnect (Neutral Assemblies)	DEH-41531
Accessory: Programmer Disconnects	DEH-41532
Accessory: Finger Clusters (Cluster Assemblies)	DEH-41533
Accessory: Secondary Disconnects	DEH-41534
FAQ	DEQ-171
Application Guide	DET-753
Guideform Spec	DET-754
Spare/Renewal Parts Guide	DET-755
Neutral CT Adapters	DEH0002400

Service and Support

Service and support always available from ABB.

Estimated Time to Complete Tasks

Verify the secondary disconnects and match the switchgear cubicle which may take up to 1Hr depending on the complexity of the original breaker. Once the retrofill breaker is fully prepared, it should take about 20 minutes to swap out the old breaker and rack in the new EntelliGuard R retrofill circuit breaker if the proper lifting bar and hoist are available, it may take an additional 30 Min to replace the Door.

The EntelliGuard R retrofill, when ordered with 4 wire ground fault, will be equipped with a Neutral CT adapter. The adapter will modify the MicroVersaTrip type Neutral CT output to a Rogowski sensor output compatible with the EntelliGuard R's Trip Unit. With this device, it will **not** be necessary to change the neutral CT in the switchgear to a Rogowski sensor.

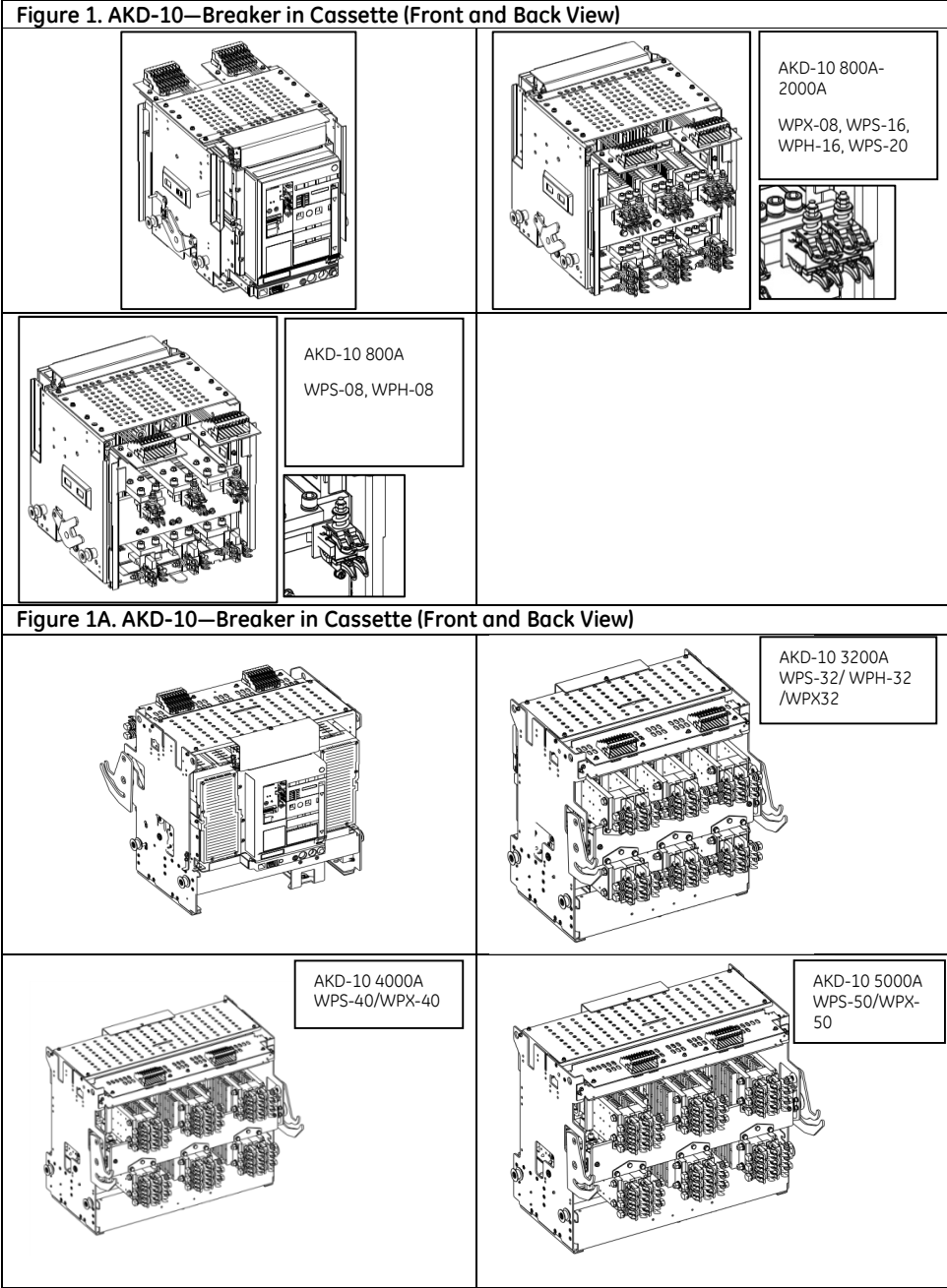
Product Specs

Weight (lbs.)

Retrofill Breaker	Weight	Box Wt. 10101655P1	Pallet 10101650P1 Wt.	Accessories Wt.	Total Weight
WPS-08, WPH-08	230	11	24	2	267
WPX-08, WPS-16 WPH-16, WPS-20	270	11	24	2	307
WPS-32, WPH-32 WPX-32	600	15	30	2	647
WPS-40, WPX-40	625	15	30	2	672
WPS-50, WPX-50	700	15	38	2	759

Views

AKD-10 Low Voltage Switchgear is a free-standing assembly of metal-enclosed units of power circuit breakers and other auxiliary power circuit protective devices. It may also be a part of a single-ended or double-ended load center unit substation. The AKD-10 EntelliGuard R Retrofill breaker is defined as a draw-out breaker. *Figure 1* (front and back views with finger clusters) presents an AKD-10 EntelliGuard R Retrofill breaker, permanently encased in a cassette-like structure.



The EntelliGuard R Circuit Breaker is suitable for application on power systems up to 635 VAC 50/60 Hz .

History and Types

AKD

AK—Power Circuit Breaker Equipment
D—Drawout circuit breaker construction

Manufactured from 1951 to 1975, all bolted, copper bus design, all drawout breakers—AK-1, -2, -3, -15 / 25 / 50 / 75 / 100; the 4000A-max bus rating. Breakers had a ratcheting drawout mechanism, with an open-door drawout. Breakers were painted ANSI 61, light gray, manufactured in Philadelphia from 1951 to the mid-60s and in Burlington, Iowa from the mid-60s to 1975.

The breaker compartment was a welded assembly, and the equipment frame was bolted. Breaker boxes were stacked to make a vertical section with equipment frame around the breaker boxes. There were no bus compartment barriers, just an open bus design. Ring silver-plating was applied to bolted connections.

AKD-5—AK25/AK50

Manufactured from 1960 until 1977, the aluminum bus had copper that was “flash-butt welded” to the aluminum at bolted connections. During that time, AK-2A, 3A -25 / 50 / T50 / 75 / 100 (“A” signifies AKD-5 drawout) were produced. Breakers up to 2000A had primary finger clusters. 3000 & 4000A breakers had a circular primary finger cluster arrangement in the switchgear compartment. Pull-lanyard drawout mechanism in the switchgear on early designs was replaced by a single jackscrew mechanism and then later replaced by a double jack-screw mechanism. Featured is a closed-door, drawout with inner house breaker compartment, where door moves out with the breaker as it is racked in or out. Two bus levels are available with a ring bus used at 4000A. Particulars include: welded/riveted frame, bus compartment barriers, line/load separation barriers on mains and ties, isolation barriers on transformer transitions, copper runbacks on feeder breakers, ring silver-plating on copper, and aluminum bus un-plated (welded connections). The switchgear is painted sand-gray (beige), with some instrument doors painted blue. AKR-30/50 in 22"-wide sections were introduced in AKD-5 construction, early 70s. AK25s and AK50s were also available as substructure kits for OEMs to build around customer gear.

Note: All legacy AK & AKR breakers have a draw out letter code “A”. EntelliGuard R retrofill breakers for this gear will have a catalog number beginning with **R1** for AK replacements or **R2** for AKR-30/50 replacements.

AKD-6—AKR30H/AKR30L/AKR50H/AKRT50H

AKD-6 was manufactured in Salisbury, NC from 1977 to 1981. Some AKD-5s, which were built in Salisbury from 1975 until 1977, got name-plated as AKD-6. There is no “flash-butt” welded aluminum to copper. Aluminum bus is tin-plated and bolted at shipping splits (but welded everywhere else). Copper bus design has ring silver plating at bolted joints. AKR-75 / 100s were introduced during this time. Stab-and-finger connections on 3200A and 4000A breakers were improvements, versus the round the primary disconnects on the AKD-5. The 4000A breaker was also narrowed to same width and phase-phase spacing as the 3200A.

The AKD-6 uses inner-house drawout breaker compartments on the 800—2000A breaker compartments. They are painted ANSI 61 light gray and breakers have ECS or SST trip units.

AKD-6 should mark a shift away from all AK breakers and to AKR breakers. The AKR-30/50/50H/T50 breakers used in AKD6 have a shallow 1" steel front escutcheon are drawout letter code “A” i.e. AKR-4A-30 and will be replaced by an EntelliGuard R with a catalog number beginning with **R2**. The AKR-30/50/50H/T50/75/100 breakers sold to OEMs for their switchgear have a 5" deep plastic front escutcheon & spring loaded sliding “picture frame”. These are draw out letter code “B” i.e. AKR-4B-30 which will be replaced by an EntelliGuard R with a catalog # beginning with **R5** up to 2000A frame size and **R6** for 3200 & 4000A frame sizes.

The AKR-75/100 breakers used in AKD-6 have a shallow 1" steel front escutcheon and vertical primary fingers. They are drawout letter code "C" i.e. AKR-4C-75 and will be replaced by EntelliGuard R with catalog number beginning with R2

AKD-8—AKR30H/AKR30L/AKR50H/AKRT50H/AKR75/AKR75H/AKR100/AKR125

The AKD-8 was manufactured in Salisbury, NC from 1980 to 1984 and in Burlington, Iowa from 1984 to 1999. It was mostly replaced by AKD-10 in 1999 to 2000 but was available thru 2015. Model 1 and 2 have extruded vertical bus. Model 2 was introduced in 1983 to accommodate revised wire harness routing. Model 3 was introduced in 1991, using a flat bar vertical bus. AKR breakers use MicroVersaTrip 9, MVT RMS9, EPIC, MVT Plus, MVT PM, or EntelliGuard TU trip units. Aluminum bus was removed from the design in 1996 in favor of the standard tin-plated copper bus (silver plated optional).

The AKR-30/50/50H/T50 breakers used in AKD8 have 5" deep plastic front escutcheon & spring loaded sliding "picture frame". They are drawout letter code "D" i.e. AKR-7D-30. In AKD-8, most 800-2000A breakers are "feeder" breakers with vertical lower stud & primary disconnect fingers clusters, but 800-2000A breakers designated as "Main" breakers, have horizontal lower finger clusters, which is the same as "D" letter code breakers sold to OEM's. A lower stud rejection bracket differentiates between lower stud orientations. EntelliGuard R breakers with a catalog number beginning with **R3** replace an AKR-30/50/50H/T50 breaker with vertical lower stud & fingers. EntelliGuard R breakers with a catalog number beginning with **R6** replace an AKR-30/50/50H/T50 breaker with horizontal lower stud & fingers.

AKR-75/100/125 circuit breakers used in AKD-8 switchgear have a 5" deep plastic front escutcheon & spring loaded sliding "picture frame" similar to the small frame breakers. The positions DISC/TEST/CONN are shown on the side of the front escutcheon by position of the sliding "picture frame". The AKD-8 breakers have a drawout letter code "D". OEM versions are drawout letter code "B" and Switchboard versions are drawout letter code "F". "B" & "F" breakers only differed by appearance items. All Primary disconnect stabs are vertically oriented. The AKR-125 is a 5000A breaker that had cooling fan. It was release in 1995. None of the retrofill breakers utilize fans.

EntelliGuard R breakers with a catalog number beginning with **R3** replace and AKR-75/100/125 breakers in AKD-8 switchgear. EntelliGuard R breakers with a catalog number beginning with **R6** replace and AKR-75/100/125 breakers in OEM switchgear or switchboards or first party Switchboard which all utilize an OEM substructure mounted on a shelf. The **R6** breakers will require a different door with a "bump inward" as the original compartment depth is 1.4" greater than AKD-8.

AKD-10—WPS-08, WPH-08, WPX-08, WPS-16, WPH-16, WPS-20, WPS-32, WPH-32 WPX-32, WPS-40, WPX-40, WPS-50, WPX-50

AKD-10 was manufactured in Burlington, IA from 1999 thru 2015. The switchgear compartment sizes and main & vertical bus arrangements are the same as AKD-8 Model 3. The compartments have pull-out rails. AKD-10 uses WavePro * drawout-only style breakers. All breakers have 4 rollers which align with the compartment rails. The secondary control wiring for all functions is connected thru either one or two 36 point secondary disconnects with gold plated contacts. Secondary control wiring terminates at fixed standard locations on the 36 point disconnects. Each breaker has a pump style manual charging handle and manual push OPEN and Push CLOSE buttons. The front escutcheon is 5" deep with a sliding picture frame, but is wide enough so the trip unit and new style bell alarm are visible thru the front door of the switchgear. EntelliGuard R breakers with a catalog number beginning with **R7** will replace a WavePro breaker with a catalog number beginning with WE or W1. EntelliGuard R breaker with a catalog number beginning with **R8** will replace a WavePro breaker with a catalog number beginning with WS or W2. Note our Switchboard plants initially shipped "WS" style breakers and later shifted to "WE" style breakers to be consistent with our Switchgear from Burlington, Iowa. The 5000A breaker had cooling fans. None of the retrofill breakers utilize fans.

AKD-10—Retrofill Breaker

AKD-10—Mechanical Drawings

The following engineering or assembly drawings describe the layout and dimensions of the AKD-10 Retrofill breaker (*Figure 2, Figure 3*).

Figure 2. AKD-10 800A Retrofill Breaker Dimensioning (WPS-08, WPH-08)

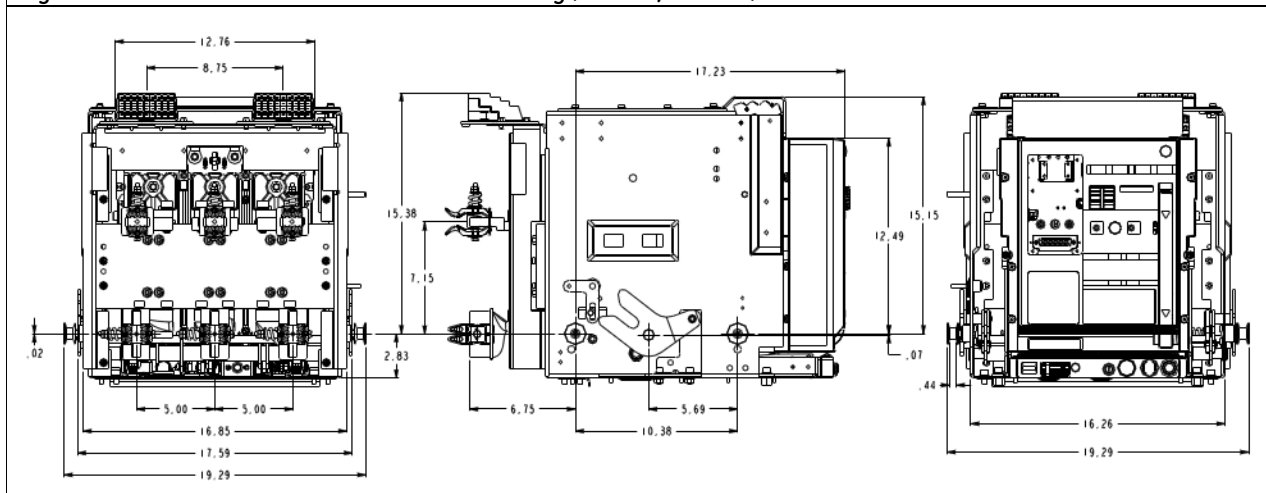


Figure 3. AKD-10 800-2000A Retrofill Breaker Dimensioning (WPX-08, WPS-16, WPH-16, WPS-20)

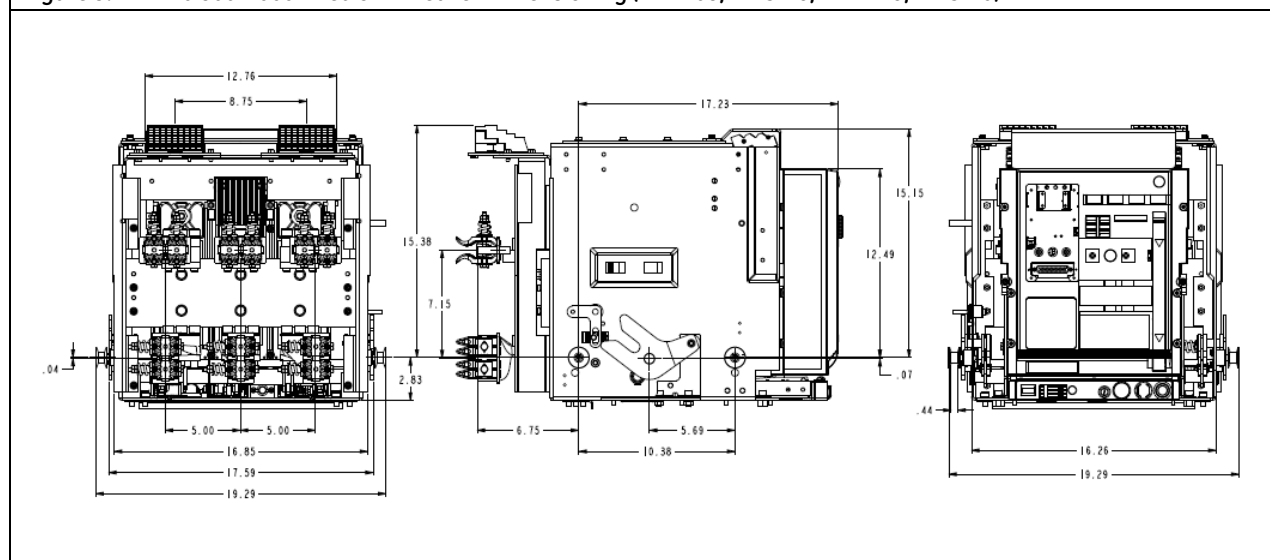


Figure 2A. AKD-10 800A Retrofill Breaker Dimensioning (WPS-32, WPH-32 WPX-32, WPS-40, WPX-40)

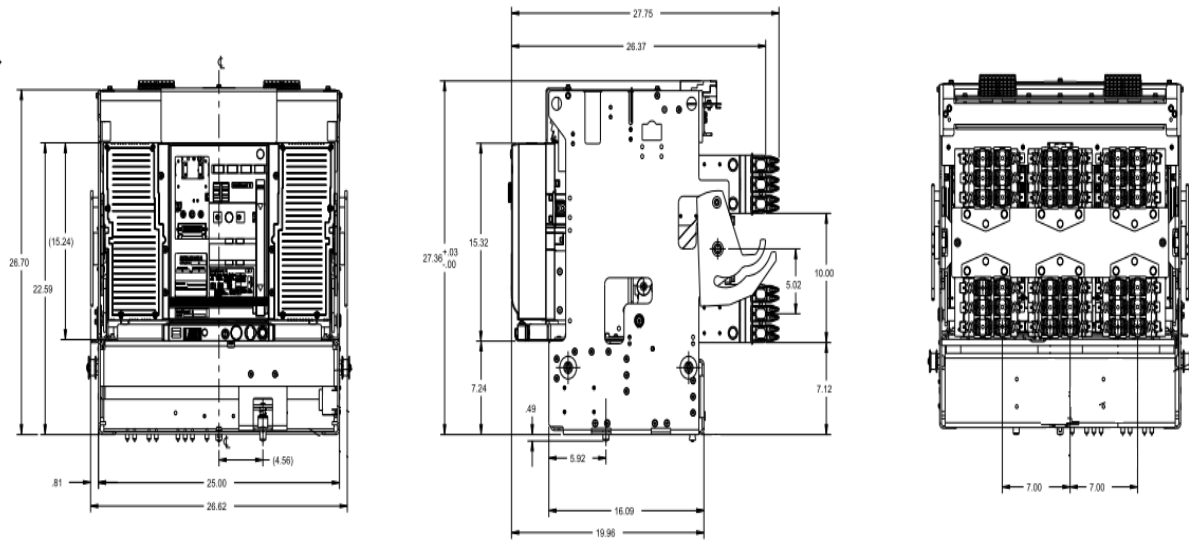
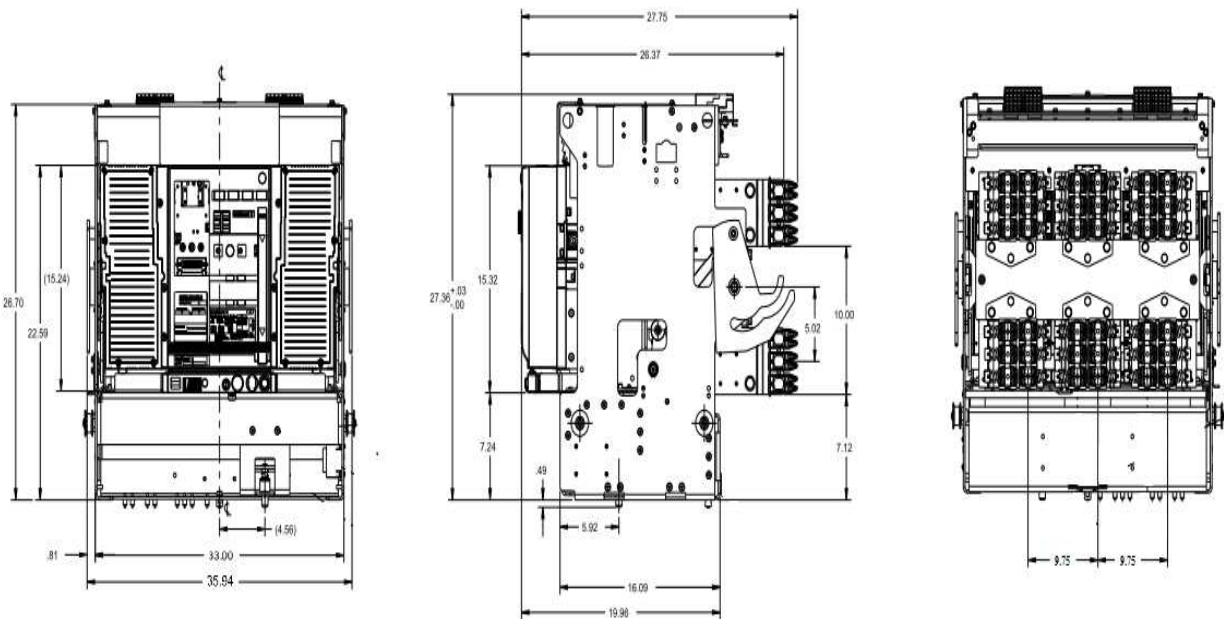


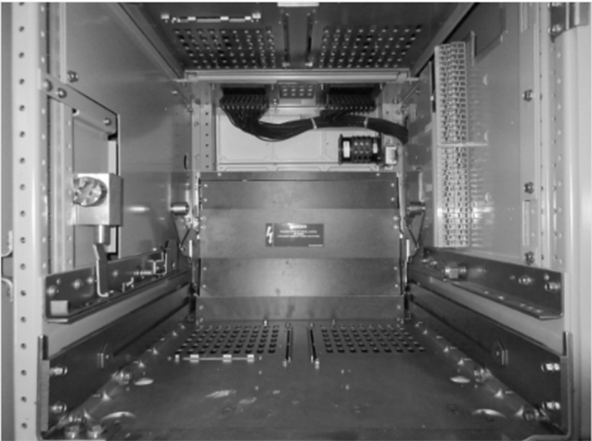

Figure 3A. AKD-10 800-2000A Retrofill Breaker Dimensioning (WPS-50, WPX-50)



AKD-10 Compartment

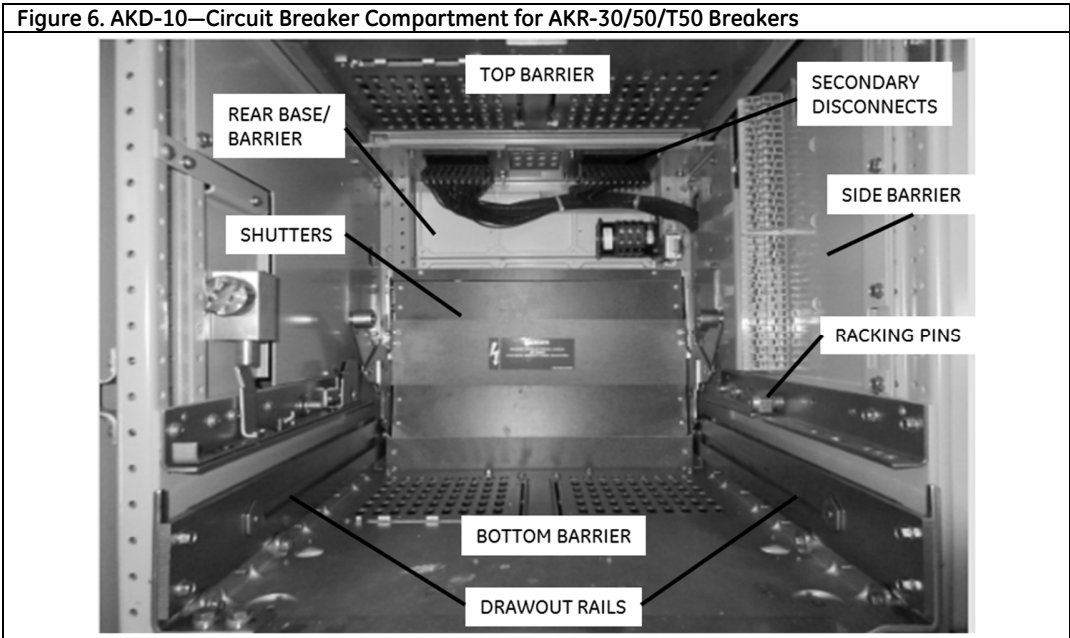
Interior View

The figures (Figure 4) and (Figure 5) below present a new AKD-10 compartment, with one photo showing the rails extended.

<p>Figure 4. AKD-10—Empty Compartment with Shutters</p> 	<p>Figure 5. AKD-10—Empty Compartment with Racks/Rails Extended</p> 
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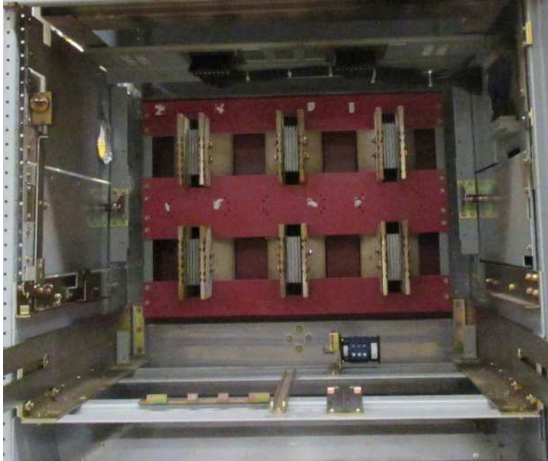

Interior Components

Figure 6 points out the major components of an AKD-10 compartment.



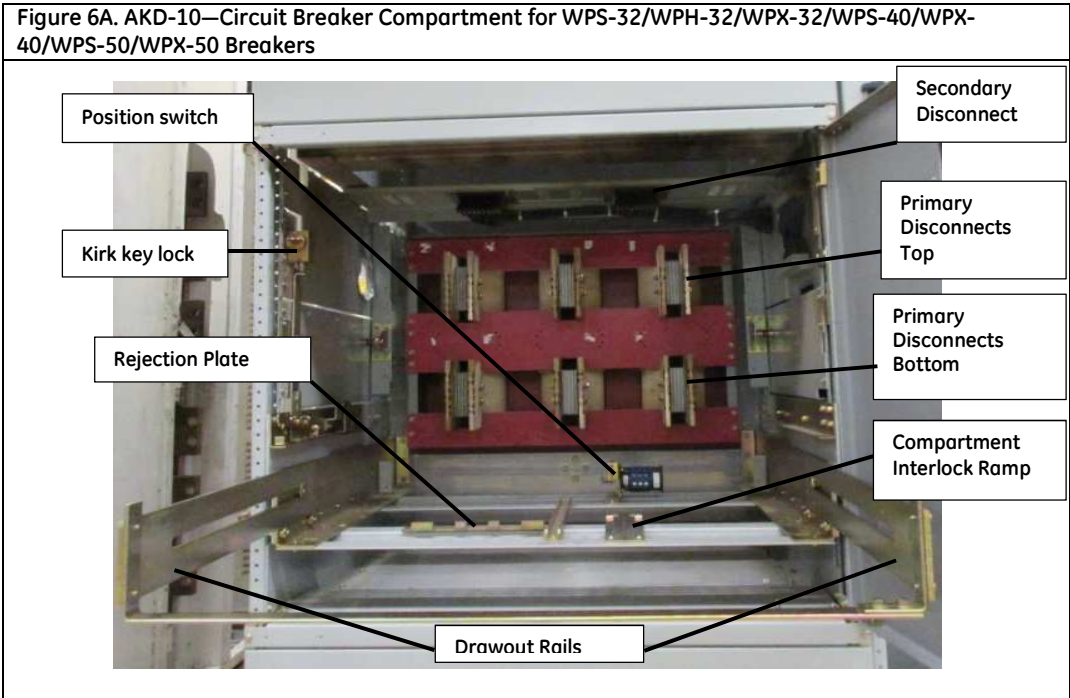
Interior View

The figures (Figure 4A) and (Figure 5A) below present a new AKD-10 compartment, with one photo showing the rails extended.

Figure 4A. AKD-10—Empty Compartment	Figure 5A. AKD-10—Empty Compartment with Racks/Rails Extended
	

Interior Components

Figure 6A points out the major components of an AKD-10 compartment.



Unpack CB



- Turn off all power to switchgear. Tagout and lockout main source, up-stream or main breaker.
 - Failure to comply with these instructions will result in death or serious injury from severe burns caused by arc flashing that has exceedingly high temperatures.
 - Always wear personal protection equipment according to OSHA standards and appropriate to the severity of potential burns.
-
- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.



Falling Object

- Do not walk or remain under any heavy assembly while hoisted above head as the chains securing the assembly may give way
-
- Ensure lifting equipment has capability for device being lifted.
 - Wear hard hat, gloves, and safety shoes.
 - Failure to comply with these instructions could result in serious injury.



PRODUCT DAMAGE

- Ensure circuit breaker and its accessories are always used within their designated ratings.
 - Do not allow the circuit breaker to hit a hard surface while handling.
 - Do not drag or slide the circuit breaker across a hard or rough surface
-
- A factory-installed rejection feature prevents mismatching circuit breakers and cassettes/substructure, preventing the insertion of a circuit breaker with a lower rating into a higher rated cassette/substructure, or the insertion of a higher rated circuit breaker into a lower rated cassette/substructure.

By following the procedures below, you should be able to install the breaker with minimum effort and time.

Quality

All EntelliGuard R circuit breakers have been designed and manufactured to ANSI standards. The design was based on the original requirements of the legacy switchgear and breaker. The product is manufactured in Burlington, Iowa; and is inspected using some of the same master gauges used on the legacy AK, AKR breakers to confirm electrical and mechanical performance, including rejections-features.

Information Label

On the side wall of each circuit breaker there is a factory-assembled label that details all features included on both the circuit breaker and on the trip unit.

Product and Catalog Serial Numbers

Product and catalog serial numbers should be kept handy when communicating about the circuit breaker. Each circuit breaker has a unique serial number located on the left side (viewed from front) of the front fascia.

Remove Circuit Breaker from Container


Inspect and Prepare

1. Inspect the shipping container for obvious signs of rough handling and/or external damage incurred during transportation.
2. Record any observed damage for reporting to the carrier. Ensure all recorded reports and claims include the order number and name plate information.
3. Remove the banding straps and lift the top cover.
4. Remove all packaging material.
5. Remove all product documentation and store properly.
6. Unscrew the mounting screws that fasten the circuit breaker to the bottom of the shipping pallet and remove the circuit breaker.
7. Reverse the orientation of two shipping plates with flanges inward and reinstall on breaker. These flanges will keep the breaker from resting on the rejection pins and centering guide pin whenever it is placed on a flat surface.

Use Lifting Truck

1. Use a lifting truck for moving circuit breaker in order to avoid personal injury and damaging the breaker.
2. Uses a proper overhead lifting device to mount the breaker into the switchgear, refer to Page 22.
3. Contact the nearest sales office for availability of a hoisting device.

Store Circuit Breaker

	<p>PRODUCT DAMAGE</p> <ul style="list-style-type: none">• Do not store circuit breaker in corrosive environments above LC1 (sea salt mist) and G1 as per ANSI/ISA-S71.04-1985.• Ensure circuit breakers are stored in a clean, dry location, in their original packaging.• Failure to comply with these instructions may result in product damage.
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If you decide not to install the Retrofill breaker until a later time, then you can store it away for installing it later.

1. Store the circuit breakers in a clean, dry location in an upright position.
2. Make sure that the breakers are properly supported to prevent bending of the studs or damage to any of the breaker parts. Do not remove any protective grease until the assemblies are ready to be installed. Cover to prevent dust from settling on the breakers.
3. If breakers are not to be placed in service at once, remove them from their shipping cartons and thoroughly inspect them.
4. If everything is in satisfactory condition, replace the breakers in their shipping cartons for storage. If it is necessary to store the equipment for any length of time, use the following precautions to prevent corrosion or deterioration:
 - Uncrate the equipment and check thoroughly for damage.
 - Store in a clean, dry, rodent-free location with moderate temperature and provide protective coverings to prevent dirt, water, or other foreign substances from entering the breaker.
 - If dampness or condensation is encountered in the storage location, heaters can be used to prevent moisture damage.

Check Before Installing



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
 - During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks.
- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

These breakers are supported on two extendable rails; each breaker has four rollers. Racking arms on both sides of the breaker frame engage the drawout mechanism pins fastened to both sides of the compartment.

1. Check to see that the breaker or breakers match their respective compartments. Look on the breaker summary sheet, the front view drawings, breaker nameplate, and on the identification card on the breaker shipping carton.
2. To locate the breaker for its proper compartment, refer to the breaker location list on the front view drawing. Find the proper breaker by the identification card on the breaker carton, or the mark number on the breaker nameplate. All identical legacy breakers have the same mark number.
3. If the Retrofill breaker is meant to replace a WavePro breaker with catalog number beginning with WE or W1, **check to be sure the breaker has a wider racking cam slot on the right side which works with the larger diameter pin on the right side of switch gear compartment.**
4. If the Retrofill breaker is meant to replace a WavePro breaker with catalog number beginning with WS or W2, check to be sure the breaker has equal sized racking cam slots on both sides.

NOTE: our Switchboard plants initially shipped “WS” style breakers and later shifted to “WE” style breakers to be consistent with our Switchgear from Burlington, Iowa

Clean and Grease Breaker

1. Before installing or operating a breaker, refer to the breaker instruction manual for pre-operation inspection and test.
2. Check thoroughly for any damaged or loose parts and for any dirt or foreign matter which may be in the breaker.
3. Clean those areas if necessary with a clean, lint-free rag and isopropyl alcohol or acetone.
4. Be sure to apply a thin film of electrical grease DH0HD38 (Mobilgrease 28) to the primary disconnect fingers (Figure 7 and 7A). part #193A1751P1 is a 1 oz. tube of Mobilgrease 28.

Figure 7. AKD-10—Primary Contacts or “Fingers” (Apply Grease)

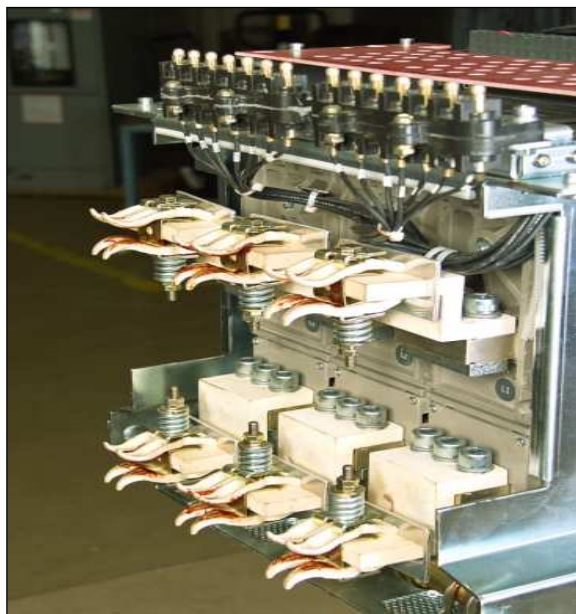


Figure 7A. AKD-10—Primary Contacts or “Fingers” (Apply Grease)



Install AKD-10 Retrofill Breaker



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks.
- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

After the existing breaker is removed and the compartment modified, the pre-wired Retrofill breaker can now be installed in the AKD-10 switchgear.

1. Verify that the breaker is in the disconnected and OPEN position before mounting it on rails.
2. Pull out the cubicle rails, horizontal to the ground.
3. The rails can now support and secure the Retrofill breaker in the switchgear.
4. For WavePro Retrofill Breaker (WPS-08, WPH-08, WPS-16, WPH-16, WPS-20): Insert eyebolts in the eye bolt weld nuts as shown in *Figure 7*. Use a chain and hook to lift the breaker from above.

Use part number 0247B8961G002 lifting bar and suitable hoist to lift from above as shown in *Figure 8*.



5. Make sure the J hook of lifting bar is secured in the front window on both side sheets of the breaker as shown in fig 8A. This will ensure the breaker is better balanced when lifted.



6. The Size of the slot at the top of the lifting bar is 0.7" wide and 1" high. Hook used in the hoist should be suitable to engage with this slot size.
7. As an alternate to above lifting process, eye bolts, chain attached to eye bolts through S hook, and connector can be used to lift the WavePro Retrofill Breaker. Examples of an eye bolt and connector are shown in fig's 8B and 8C. Insert M10 eyebolts of rating minimum 250lbs in the eye bolt weld nuts as shown in *Figures 7 & 8D*. Use four eye bolts, chain and suitable "S" hooks or chain connectors to safely lift the breaker onto the rails. "S" hooks with a locking feature as shown in Figure 8D are preferred to basic "S" hooks. Each chain should be rated minimum 500lbs. Mount a connector to join both chains in the center. Connector should be rated minimum 1000lbs. The connector is then attached to a hoist hook as shown in Fig 8D to lift the breaker.

Note: Eye bolts, chain and connectors are not supplied. If used, remove before installing breaker.



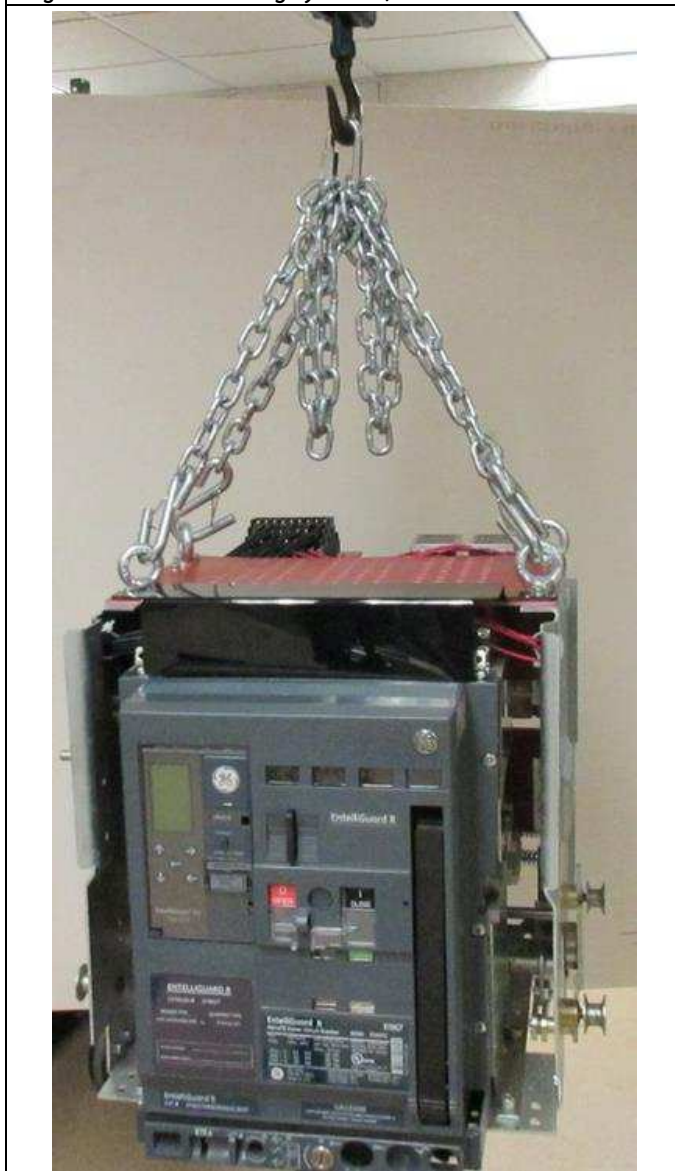
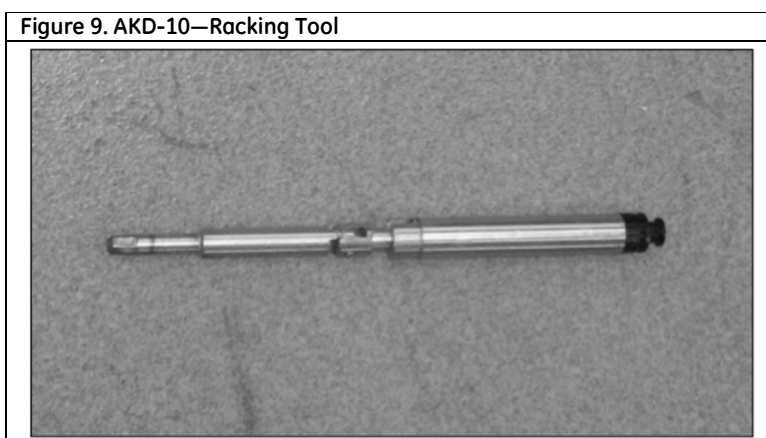
<p>Figure 8B. Eye bolt Ex: McMaster CARR part # 3107T43</p> 	<p>Figure 8C. Chain connector Ex: Lowes item #184600 Reese Model : 74602HD</p> 
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Figure 8D. AKD-10—Using eye bolts, chain and connector.

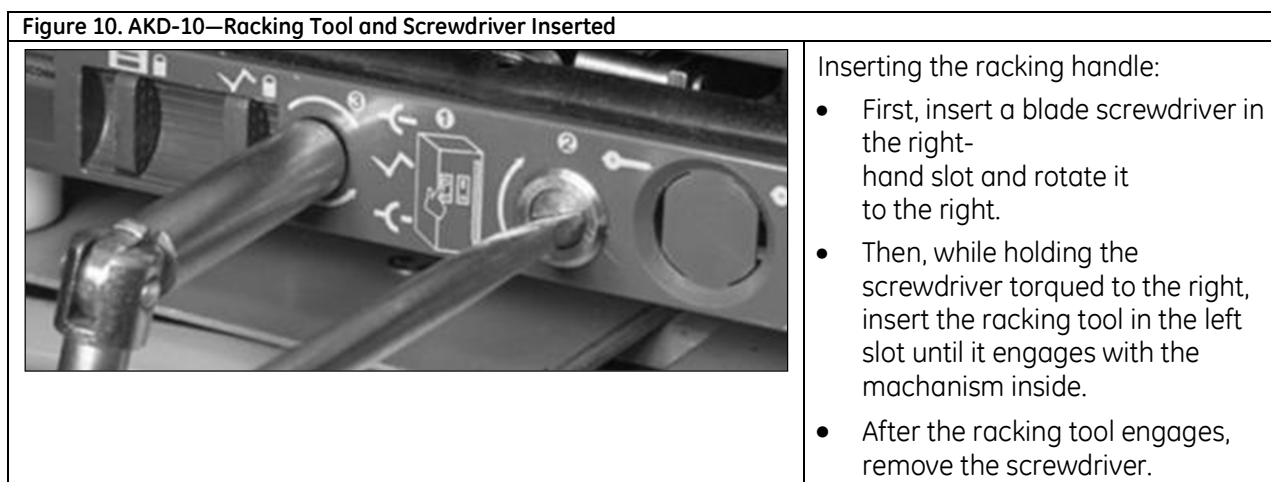


8. Check that the breaker is free from obstruction inside the compartment.
9. When the breaker is lined up with the compartment, raise the breaker only slightly higher than the compartment floor.
10. Keep the breaker steady. Continue to guide the breaker, while checking both sides and underneath, so that both sets of rollers are lined up with the rails.
11. Once the breaker is resting on the rails, unhook the lifting hooks from the circuit breaker. Move the hoisting apparatus out of the way.
12. Push the breaker in until the compartment racking pins engage with the breaker racking cams.

13. Remove the racking tool (*Figure 9*) from the storage location on the breaker front panel and extend the torque bar from inside the handle.



14. Use a blade-type screwdriver in the slot or rack out lock of the breaker (*Figure 10*), and turn it clockwise to the right so that the racking handle shutter opens



15. While turning the screwdriver to the right with the shutter open, insert the racking tool in the handle insertion hole so that it engages with the racking mechanism, and remove the screwdriver (*Figure 10*).
16. With the racking tool inserted crank clockwise so that the Retrofill starts to move in, slowly sliding forward into the compartment. Rotating clockwise racks the circuit breaker all the way into the enclosure.
17. Rotating clockwise ~37 turns racks the circuit breaker all the way into the enclosure.
18. As the breaker approaches the TEST position, check the alignment of the fixed and moving parts of the secondary disconnect contacts. If a spring charging motor or under voltage-release is installed, these may operate when approaching the TEST position.
19. Continue rotating the racking handle clockwise until the position indicator first shows TEST, then CONNECTED.
20. When approaching the CONNECTED position, more torque for turning the racking handle is normal as the primary finger clusters engage with the AKD-10 primary bus stabs.

21. At the end of 37 rotations, the breaker is in its maximum travel position. At this point, the primary disconnect fingers have completely engaged with the primary bus stabs.
22. Remove and store the racking handle in its storage location.

AKD-10—Racked-In

The photo below shows one example of a racked-in AKD-10 Retrofill (*Figure 11*).

Figure 11. AKD-10— Racked-In CB

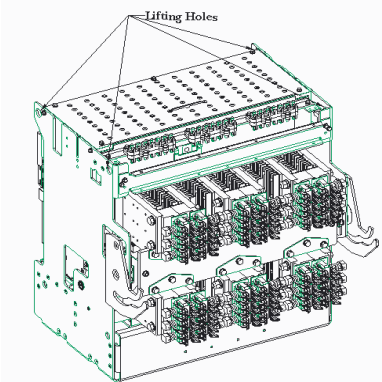




Install AKD-10 & substructure type 3200, 4000 & 5000A Retrofill Breaker.

To remove the exiting breaker follow instructions provide with the legacy breaker and or switchgear/ switchboard. Note that one must remove the two ½-13 bolts holding the breaker down on the drawout tray assembly found at the front of the tray. Notice how the breaker is located at the rear by two pins passing thru the old breaker frame. Notice how the rejection plates underneath the legacy breaker align with rejection pins on the drawout tray assembly. Verify the correct breaker is being used. Compare the rejection plate arrangement on the new breaker to those on the old breaker

After the existing breaker is removed and the compartment updated with any added features, the pre-wired breaker can be installed in the AKD-10 Switchgear, Switchboard or OEM Equipment.

- 1. Verify that the new breaker is in the disconnected and OPEN position.
- 2. For WPS-32/WPH-32/WPX-32/WPS-40/WPX-40/WPS-50/WPX-50 Retrofill Breaker.
 - A. It is best to use Lifting Bar Part number **0247B8961G001** for 3200-4000A and **0247B8961G003** for 5000A and a suitable hoist to lift from above as shown in Figure 12A. (These lifting bars have been tested to 200% of their 700 lb ratings.)
 - B. Alternate method, use a lifting chain and hooks rated at least 1400 lbs to lift the breaker from above as shown in Figure 12B. (chains must not be at an angle less than 45 degrees from the horizontal plane.) Installation in upper compartments may not be possible with limited overhead space or the switchgear hoist.

Figure 12. AKD-10—Location of Hooks	Figure 12A. AKD-10—Using Lifting bar and hoist	Figure 12B. AKD-10—Using Chain And Hook
		

- 3. Make sure that the lifting bar or generic chain-hooks are secured and locked in place. **Dropping a breaker can result in injury or death.**
- 4. Line up the breaker in front of the compartment where it will be installed; then raise it slightly above the height of the drawout Rail assembly.
- 5. Pull out the Rail assembly beneath the breaker.
- 6. Lower the breaker down on the Rails. .
- 7. Remove the lifting bar and or chains.
- 8. Push the breaker into the compartment slowly while observing the alignment of the secondary disconnects and opening of the optional shutter. A compartment interlock rod in the right front will ride over a cam and drop into position in the DISCONNECT position.

9. When fully installed to the DISCONNECT position, the racking cams will stop on the racking pins in the compartment and the breaker will be ready to rack in.
10. Remove the racking tool. (Figure 9) from the storage location on the breaker front panel and extend the torque bar from inside the handle.
11. Use a blade-type screwdriver in the slot or rack-out-lock of the breaker (Figure 10), and turn it clockwise (to the right) so that the racking handle shutter opens.
12. While turning the screwdriver to the right with the shutter open, insert the racking tool in the handle insertion hole so that it engages with the racking mechanism, and remove the screwdriver (Figure 10).
13. Rotating clockwise ~37 turns racks the circuit breaker all the way into the compartment.
14. As the breaker approaches the TEST position, a spring charging motor or undervoltage release if installed may operate. (~ 9 racking turns).
15. Continue rotating the racking handle clockwise until the position indicator first shows TEST; then CONNECTED.
16. When approaching the CONNECTED position, more torque for turning the racking handle is normal as the primary finger clusters engage with the primary bus stabs.
17. At the end of 37 to 37-1/2 rotations, the breaker is in its maximum travel position. At this point the primary disconnect fingers have completely engaged with the primary bus stabs.
18. Remove and store the racking handle in its storage location.

AKD-10 Retrofill Breaker Racked-In

The photo below shows one example of a racked-in AKD-10 Retrofill (Figure 13).



AKD-10—Install Accessories

NOTICE

WIRING

- Before installing the breaker, the secondary disconnects must be wired to the EntelliGuard R Breaker.
- Wires with wire markers are provided on the breaker . Make sure that the switchgear wiring connection points match up with the original wiring of the cubicle. This ensures that all wiring connections are properly made.
- Wrong connections will cause the breaker to malfunction.

AKD-10—Secondary Disconnects

This section deals with installing and wiring the legacy secondary disconnect assemblies onto the EntelliGuard R breaker . Installing the secondary disconnect assembly consists of doing these tasks:

- Installing the secondary disconnect assembly (*Figure 14, Figure 15, and Figure 16*).
- Wiring the secondary disconnect assembly (*Table 8 shows the WavePro secondary disconnect terminals*).

The EntelliGuard R Retrofill Breaker has these three options:

- One secondary disconnect installed
- Two secondary disconnects installed
- No secondary disconnects installed

Figure 14. AKD-10 Secondary Disconnects View 1

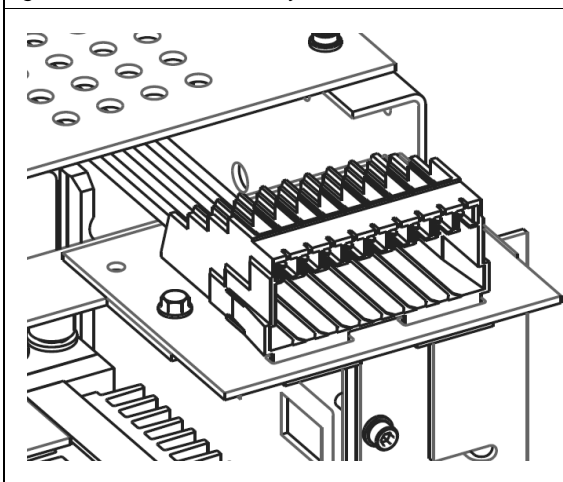
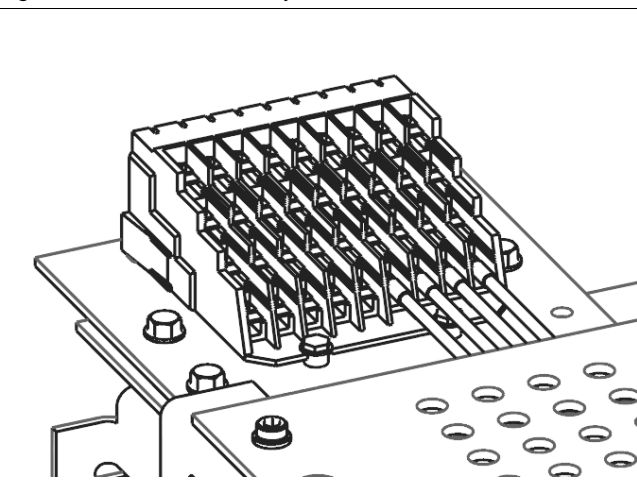
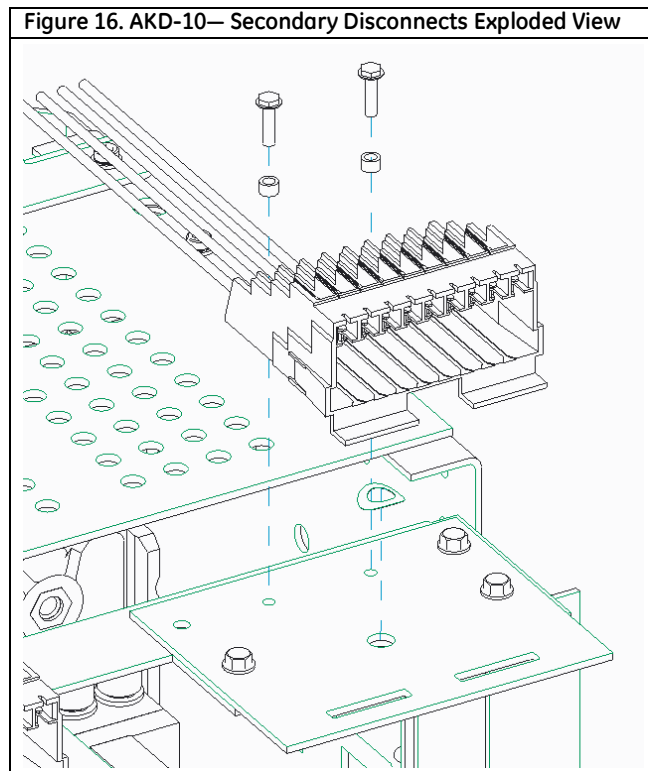


Figure 15. AKD-10 Secondary Disconnects View 2





Inputs and outputs to the circuit breaker are wired through secondary disconnects located on the top of the breaker. The plug-style secondary disconnects engage mating disconnects in the breaker cubicle when the breaker is in the TEST or CONNECT position. Up to 72 dedicated points are available so that all breaker accessories can be wired to dedicated disconnect points. Refer to *Table 7* for the secondary disconnect kit catalog numbers.

Table 7. AKD-10 Secondary Disconnect Kit Catalog Numbers

	WP-08 / 16 / 20
Breaker side	WPSDSUBF1
Cell side	WPSDSUBM1

Table 8 shows the WavePro secondary disconnect terminals and standard connections. Refer to *Table 9* for an example showing wiring from AKD-10 to the EntelliGuard breaker.

Table 8. WavePro secondary disconnect terminals and standard connections.

A Disconnect Block (left side from front)			C Disconnect Block (right side from front)		
10	Aux Switch (NO contact)		10	Aux Switch (N.O. contact)	
1	Aux Switch		1	Aux Switch	
2	Aux Switch		2	Aux Switch	
11	Aux Switch (NC contact)		11	Aux Switch (NC contact)	
12	Aux Switch (NO contact)		12	Aux Switch (NO contact)	
3	Aux Switch		3	Aux Switch	
4	Aux Switch		4	Aux Switch	
13	Aux Switch (NC contact)		13	Aux Switch (NC contact)	
5	Aux Switch (NO contact)		14	Second Shunt Trip	
6	Aux Switch (NC contact)		5	Second Shunt Trip2	
7	Aux Switch (common)2		OR		
OR			14	Aux Switch (NO contact)	
5	Shunt Trip (NO contact)		5	Aux Switch2	
6	Shunt Trip (NC contact)				
7	Shunt Trip (common)2		6	Aux Switch	
14	Bell Alarm (NO contact)		15	Aux Switch (N.C. contact)	
15	Bell Alarm (NC contact)		8	Remote Charge Indicator	
16	Bell Alarm (common)		17	Remote Charge Indicator	
19	Bell Alarm (NO contact)		16	WP-50 Fan Motor- 120Vac (H)	
20	Bell Alarm (NC contact)		7	WP-50 Fan Motor- 120Vac (N)	
21	Bell Alarm (common)		9	CMD PH	
8	Closing Spring Charging Motor		18	NI Set	
17	Closing Spring Charging Motor		19	NI Set	
9	Close Circuit1		20	NI Reset	
18	Close Circuit1		21	NI Reset	
22	Undervoltage or Electric Lockout		22	OFLO (phase A)	
23	Undervoltage or Electric Lockout		23	OFLO (phase A)	
24	Neutral Sensor – tap (+)		24	OFLO (phase B)	
25	Neutral Sensor – common (-)		25	OFLO (phase B)	
26	Modbus RX (-)		26	OFLO (phase C)	
27	Modbus TX (+)		27	OFLO (phase C)	
28	Zone Selective Interlock (In+)		28	Output 2	
29	Zone Selective Interlock (In-)		29	NI NO	
30	Zone Selective Interlock (Out+)		30	NI COMM	
31	Zone Selective Interlock (Out-)		31	Input 2	
32	Va (voltage conditioner)		32	Output 2	
33	Vb (voltage conditioner)		33	Output1/ RELT/GFA ³	
34	Vc (voltage conditioner)		34	Output1/ RELT/GFA ³	
35	Trip Unit Aux Pwr (24 Vdc+)		35	Input 1/RELT ³	
36	Trip Unit Aux Pwr (24 Vdc-)		36	Input COMM ³	

¹ For electrically operated breaker; Remote Close accessory on manually operated breaker.

² Auxiliary Switch contacts are wired out if Shunt Trip is not provided.

³ 33, 34, 35 & 36 – If RELT is optioned, then 33, 34, 35 & 36 are permanently assigned as RELT Output and Input.

Note : A small number of specially wired WavePro breakers had a Normally Closed Remote Charge Indicator switch contact wired out to WavePro 36 Pt secondary disconnect points C9 & C18 for use in a motor protection circuit in AKD-10 switchgear. This functionality is not required by the Retrofill breaker. The NMICV timer and MC control relay's 4 parallel contacts in the switchgear should be eliminated from the circuit. 120VAC continuous power should be applied to WavePro/ AKD-10 36-point secondary disconnect terminals A8 & A17

Table 9. AKD-10— Secondary Disconnects Example Wiring Diagram

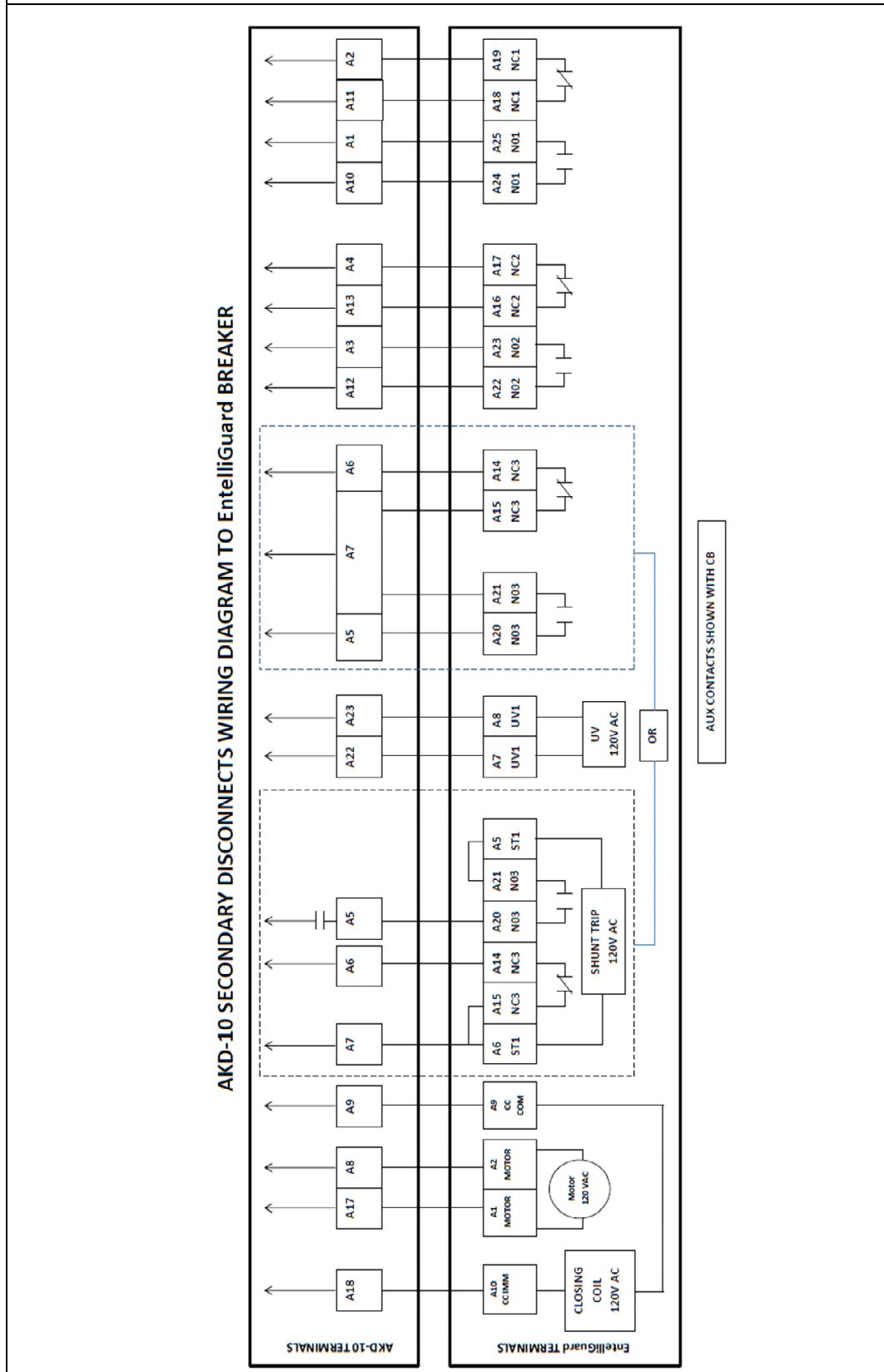


Table 9A. WavePro to EntelliGuard R wiring.

WAVEPRO AUX SW						ENTELOGUARD R AUX SW					
WP AUX SW STAGES	AUX SW CONTACT #	SECONDARY DISCONNECT	SECONDARY DISCONNECT	CONTACT TYPE	# OF STAGES REQ'D						
4 STAGE AUX SW	1	A10	A24	↑	WP 4-STAGE AUX SW = ENTELOGUARD R 3NO, 3NC	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED
	1C	A1	A25	↑							
	2	A11	A18	↑							
	2C	A2	A19	↑							
	3	A12	A22	↑							
	3C	A3	A23	↑							
	4	A13	A16	↑							
	4C	A4	A17	↑							
	5	A5	A20	↑							
	5C	A7	A21	↑							
	6	A6	A14	↑							
	6C	A7	A15	↑							
	7	THIS WP AUX SW STAGE USED FOR TRIP UNIT INPUT	B25	↑							
	7C		B26	↑							
	8		B12	↑							
7 STAGE AUX SW	8C		B13	↑	WAVEPRO 7-STAGE AUX SW = ENTELOGUARD R 8NO, 8NC	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED
	9	C10	B23	↑							
	9C	C1	B24	↑							
	10	C11	B10	↑							
	10C	C2	B11	↑							
	11	C12	B21	↑							
	11C	C3	B22	↑							
	12	C13	B8	↑							
	12C	C4	B9	↑							
	13	C14	B19	↑							
	13C	C5	B20	↑							
	14	C15	B6	↑							
	14C	C6	B7	↑							
			B17	↑							
			B18	↑							
			B4	↑							
			B5	↑							

WAVEPRO	ENTELOGUARD R
BELL ALARM	BELL ALARM
2NO, NC	2NO, NC
A15	A33
A16	A35
A14	A34
A20	B14
A21	B16
A19	B15
REMOTE CHARGE INDICATOR SWITCH	SPRINGS CHARGED / READY-TO-CLOSE SW
C8	A3
C17	A4
UNDervOLTAGE DEVICE	UNDervOLTAGE DEVICE
A22	A7
A23	A8
NEUTRAL SENSOR	NEUTRAL SENSOR
(+)A24	(+)A37
(-)A25	(-)A36
VOLTAGE CONDITIONER	VOLTAGE CONDITIONER
Va → A32	Va → B37
Vb → A33	Vb → B38
Vc → A34	Vc → B39
ZONE SELECTIVE INTERLOCK	ZONE SELECTIVE INTERLOCK
IN+ → A28	IN+ → B29
IN- → A29	IN- → B30
OUT+ → A30	OUT+ → B27
OUT- → A31	OUT- → B28
24VDC TRIP UNIT AUX PWR	24VDC TRIP UNIT AUX PWR
24V+ → A35	24V+ → A31
24V- → A36	24V- → A32
COMMNET COMMS	MODBUS COMMS
(+) → A26	(+) TX → B35
(-) → A27	
MODBUS COMMS	
→ A26	(-) RX → B34
→ A27	

WAVEPRO	ENTELOGUARD R
SHUNT TRIP #1	SHUNT TRIP #1
A6	A14
A5	A20
A7	A21
	A5
	A6
SHUNT TRIP #2	SHUNT TRIP #2
C14	B19
C5	B20
	A12
	A13
CHARGING MOTOR	CHARGING MOTOR
A17	A1
A8	A2
CLOSE COIL & 1-SHOT	CLOSE COIL & 1-SHOT
A18	A10
A9	A9
RELT INPUT	RELT INPUT
C35	B1
C36	B3
RELT OUTPUT	RELT OUTPUT
C33	A27
C34	A28

NOTES

1. USE ENTELOGUARD R AUX SWITCH WITH 3NO, 3NC CONTACTS FOR WAVEPRO 4-STAGE AUX SWITCH
2. USE ENTELOGUARD R AUX SWITCH WITH 8NO, 8NC CONTACTS FOR WAVEPRO 7-STAGE AUX SWITCH
3. USE MOMENTARY-RATED SHUNT TRIPS ON ENTELOGUARD R. ADD AUX CONTACT IN SERIES WITH SHUNT TRIP VIA EXTERNAL JUMPERS

4. Aux contacts B25/B26 and B17/18 are used for Shunt trip 1 and or >125V dc only.

SEE NOTE 3

AUX CONTACT REQ'D FOR MOMENTARY-RATED SHUNT TRIP FOR >125VDC ST REFER LAST COLUMN
DASHES INDICATE EXTERNAL JUMPERS

SEE NOTE 3

AUX CONTACT REQ'D FOR MOMENTARY-RATED SHUNT TRIP FOR >125VDC ST REFER LAST COLUMN

@ - NEED ENTELOGUARD R 4NO, 4NC AUX SWITCHES

% - NEED ENTELOGUARD R 8NO, 8NC AUX SWITCHES

Table 9A. WavePro to EntelliGuard R wiring - Continued

WAVEPRO	ENTELLIGUARD R	WAVEPRO	ENTELLIGUARD R
COMMAND CLOSE COIL 	COMMAND CLOSE COIL 	SHUNT TRIP #1 @ (ONLY FOR >120VDC) 	SHUNT TRIP #1 @ (ONLY FOR >120VDC)
SECOND UV 	SECOND UV 		
SECOND I/P 	SECOND I/P 	SHUNT TRIP #2 % (ONLY FOR >120VDC) 	SHUNT TRIP #2 % (ONLY FOR >120VDC)
SECOND O/P 	SECOND O/P 		
NET WORK INTERLOCK 	NET WORK INTERLOCK 	NI STATUS SWITCH 	NI STATUS SWITCH

DASHES INDICATE
EXTERNAL JUMPERS

@ - NEED ENTELLIGUARD R 4NO, 4NC AUX
SWITCHES

% - NEED ENTELLIGUARD R 8NO, 8NC AUX
SWITCHES

NOTICE

WIRING

- Do not pinch/damage the wires while installing the secondary disconnect blocks.

AKD-10—Primary Disconnects (Contacts) or “Fingers”

The [Finger Clusters Accessory Manual DEH-41533](#) covers the primary disconnects or fingers.

The primary disconnects are flexible connections between the breaker line and load terminals and between the equipment line and load terminals. All primary disconnect fingers are factory-installed and are assembled on EntelliGuard R Retrofill circuit breakers. Use this instruction sheet if damaged fingers need to be replaced. It takes about 5 minutes to install a finger cluster, defined as a double pair of fingers on a breaker.

Figure 17 shows finger clusters or primary disconnects on a Retrofill circuit breaker. Figure 18 details the finger-cluster assembly.

Figure 17. Circuit Breaker Removed, Featuring Primary Disconnects “Fingers” (Contacts)

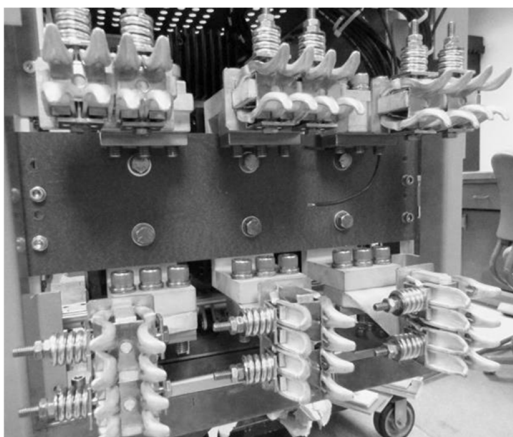
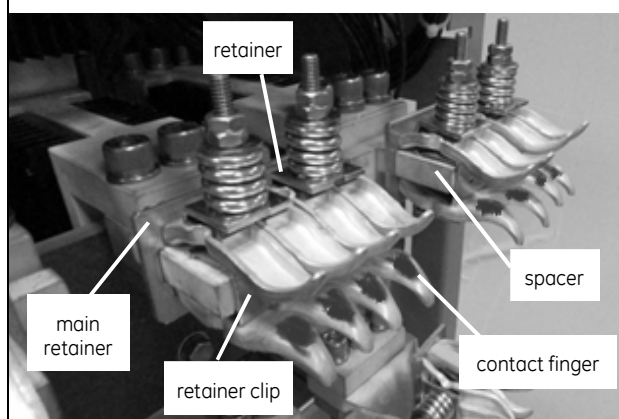


Figure 18. Circuit Breaker, Finger Details



Remove and Replace

The primary disconnect assembly is factory-adjusted with a gage to apply a 95 ± 10 lb. force to a 1/2-inch thick copper bar, inserted between the upper and lower fingers. Set this force range, in the field, by tightening the nuts to set the spring dimension shown in Figure 19. Note that this dimension is measured between the top of the retainer and the underside of the washer. Also note that no bar is inserted between the fingers when setting this dimension. Figure 20 shows the cluster components.

Figure 19. Adjustment

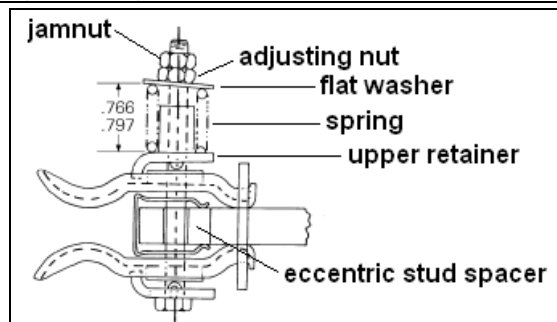
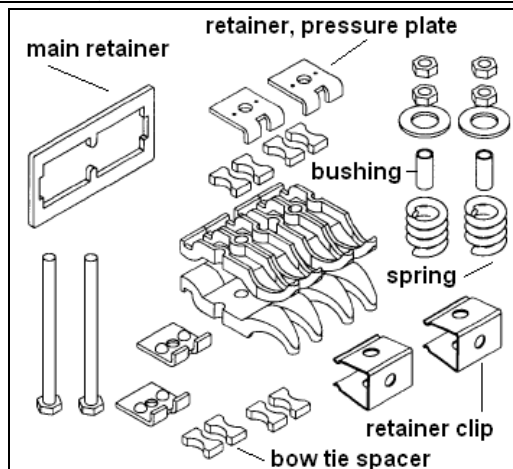
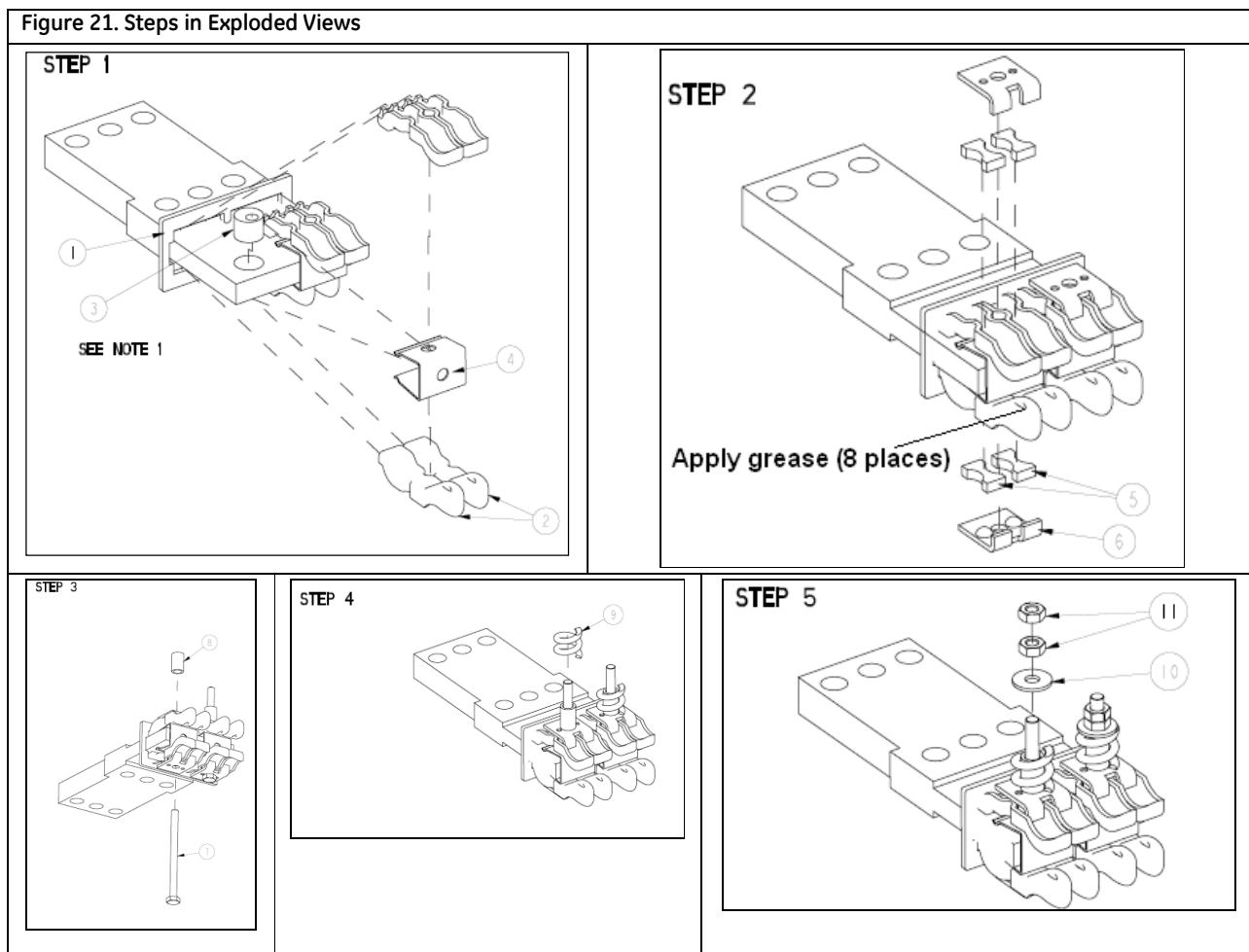


Figure 20. Components



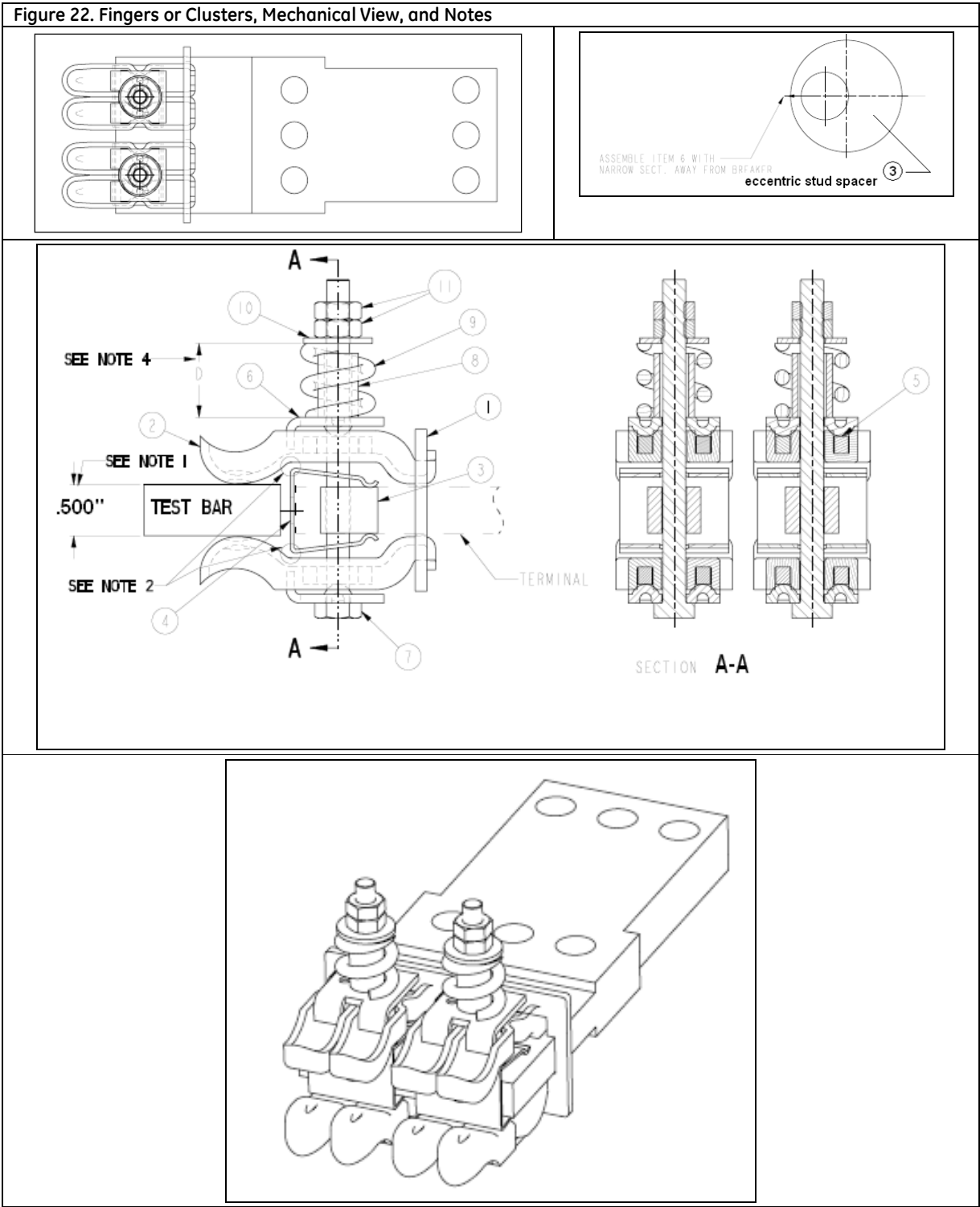
1. Using proper safety procedures and wearing required Personal Protective Equipment (PPE), remove breaker from compartment, and place it on a solid work surface in a well-lit location.
2. To uninstall the primary disconnects, remove the two nuts from one of the long bolts holding the primary disconnect assembly together.
3. Carefully slide out the bolt while removing the flat washer, spring, bushing, upper retainer, bow-tie spacers, lower retainer, and fingers from the bottom of the assembly.
4. Do the same for the other assembly bolt and components.
5. Slide off the retainer clips.
6. Take off the main retainer from the stud.
7. Slide the main retainer over the stud.
8. Install eccentric spacer and position spring clips on the stud.
9. Set a pair of bow-tie spacers into a pair of fingers, place a pressure plate retainer over the spacers to hold them in position, and then turn the subassembly over. Hook them into the main retainer.
10. Slide a long bolt through the hole in the retainer, between the finger, and then through the clip and eccentric stud spacer.
11. Hold the bottom finger subassembly in place.
12. Place two fingers around the bolt from the top, hooking the fingers into the main retainer. Then place a bow-tie spacer in each finger and hold them in position with a pressure plate retainer.
13. Place a spring, bushing, and flat washer over the bolt, then secure with the two nuts.
14. Repeat Steps 7 through 13 for each set of fingers.
15. Adjust the nut to get a spacing of 0.766—0.797 inch between the top of the upper retainer and the bottom of the flat washer.
16. Tighten the jam nut to lock in the adjustment.
17. Clean finger assemblies, if necessary, with a clean, lint-free rag and isopropyl alcohol or acetone.
18. Be sure to apply a thin film of Mobilgrease 28 (D50HD38) to the contact areas which slide onto the switchgear stabs (See *Figure 21*, Step 2). This product is available in a 1-oz tube, Part #193A1751P1.

Figure 21 summarizes the steps for working with the primary contacts.



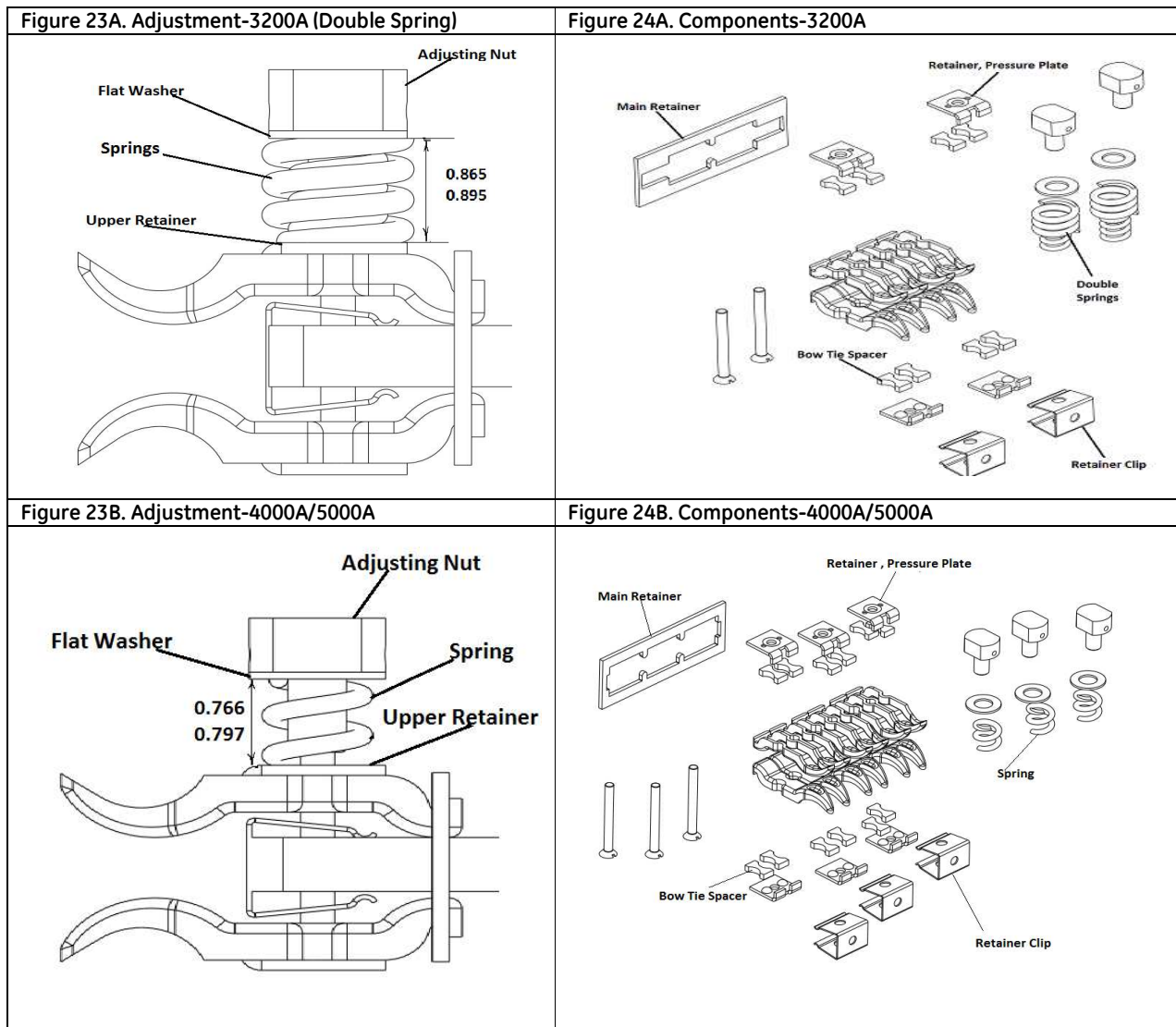
Mechanical Views

Figure 22 provides further details.



Remove and Replace- WPS-32/WPH-32/WPX-32/WPS-40/ WPX-40/WPS-50/WPX-50

The primary disconnect assembly is factory-adjusted to apply a 95 ± 10 lb. force to a 1/2-inch thick copper bar, inserted between the upper and lower fingers. Set this force range, in the field, by tightening the nuts to set the spring dimension shown in *Figure 23A/23B*. Note that this dimension is measured between the top of the retainer and the underside of the washer. Also note that no bar is inserted between the fingers when setting this dimension. *Figure 24B /24B* shows the cluster components.



1. Using proper safety procedures and wearing required Personal Protective Equipment (PPE), remove breaker from compartment, and place it on a solid work surface in a well-lit location.
2. To uninstall the primary disconnects, remove the Adjusting nut from one of the long bolts holding the primary disconnect assembly together.
3. Carefully slide out the bolt while removing the flat washer, spring, upper retainer, bow-tie spacers, lower retainer, and fingers from the bottom of the assembly.
4. Do the same for the other assembly bolt and components.

5. Slide off the retainer clips.
6. Take off the main retainer from the stud.
7. Slide the main retainer over the stud.
8. Set a pair of bow-tie spacers into a pair of fingers, place a pressure plate retainer over the spacers to hold them in position, and then turn the subassembly over. Hook them into the main retainer.
9. Slide a long bolt through the hole in the retainer, between the finger, and then through the clip and stud spacer.
10. Hold the bottom finger subassembly in place.
11. Place two fingers around the bolt from the top, hooking the fingers into the main retainer. Then place a bow-tie spacer in each finger and hold them in position with a pressure plate retainer.
12. Place a spring, bushing, and flat washer over the bolt, then secure with the Adjusting nut.
13. Repeat Steps 7 through 13 for each set of fingers.
14. Adjust the nut to get a spacing of **0.865-0.895** inch for WPS-32/WPH-32/WPX-32 with Double springs and **0.766—0.797** inch for WPS-40/ WPX-40/WPS-50/WPX-50 between the top of the upper retainer and the bottom of the flat washer.
15. Clean finger assemblies, if necessary, with a clean, lint-free rag and isopropyl alcohol or acetone.
16. Be sure to apply a thin film of Mobilgrease 28 (D50HD38) to the contact areas which slide onto the switchgear stabs (See Figure 25/26, Step 2). This product is available in a 1-oz tube, Part #193A1751P1.
17. *Figure 25 (WPS-32/WPH-32/WPX-32) and figure 26 (WPS-40/ WPX-40/WPS-50/WPX-50) summarizes the steps for working with the primary contacts.*

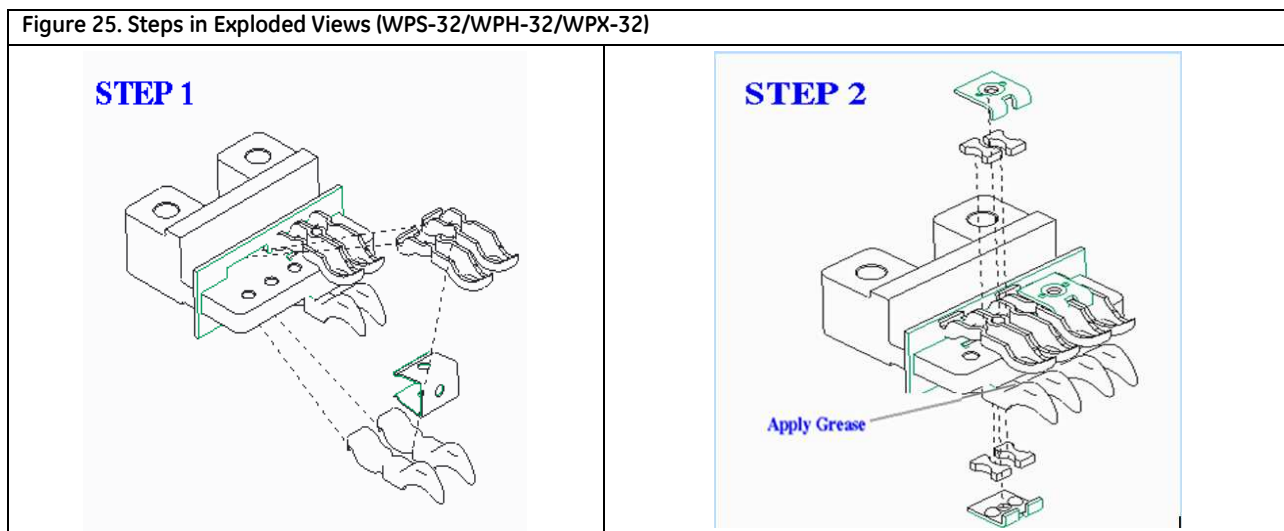


Figure 25. Steps in Exploded Views (WPS-32/WPH-32/WPX-32)

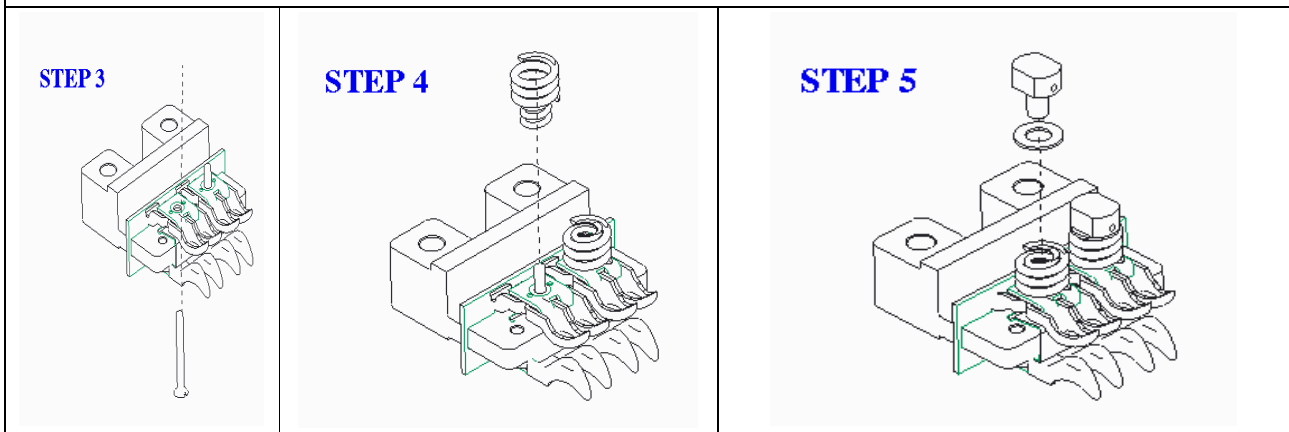
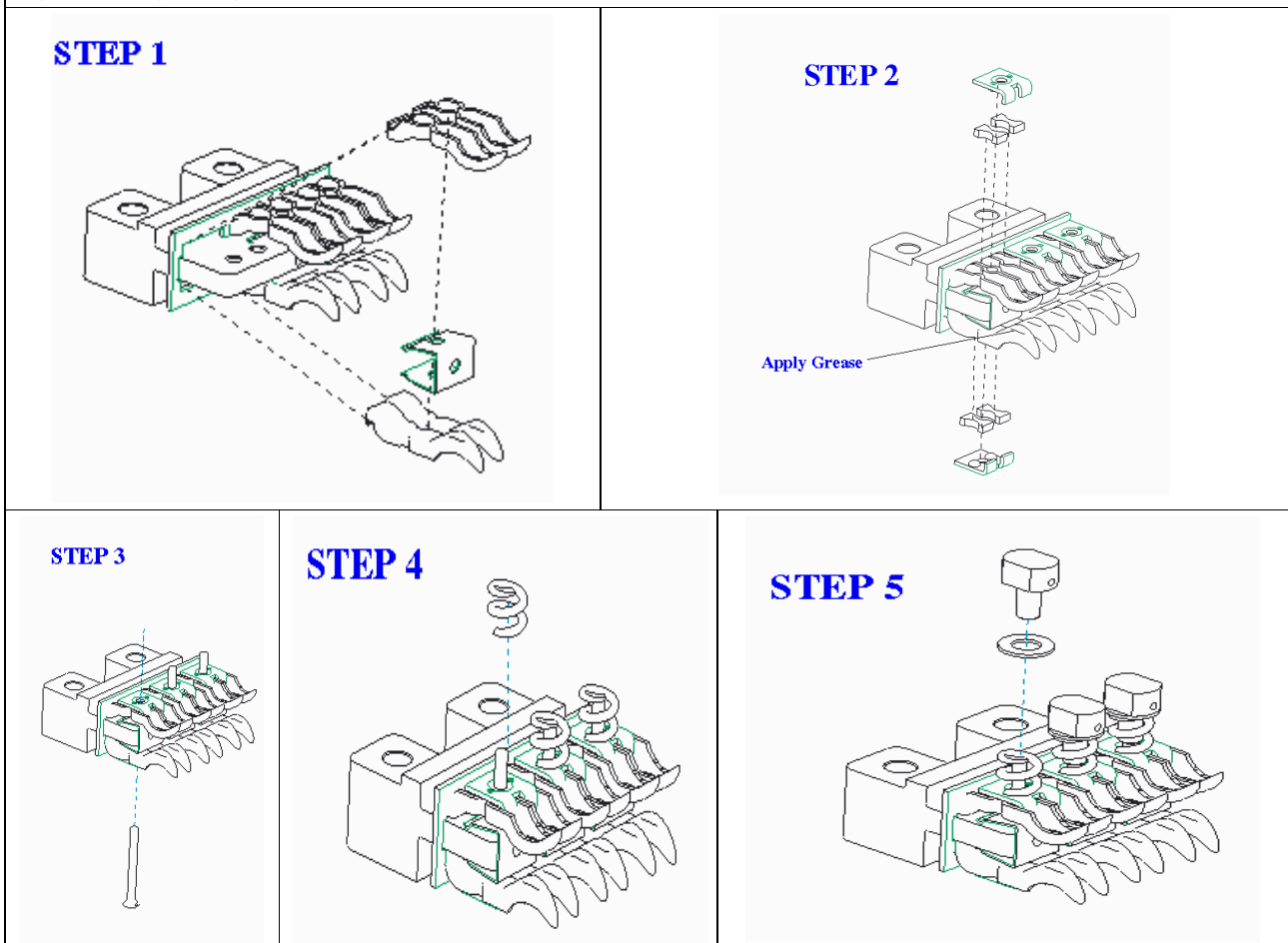
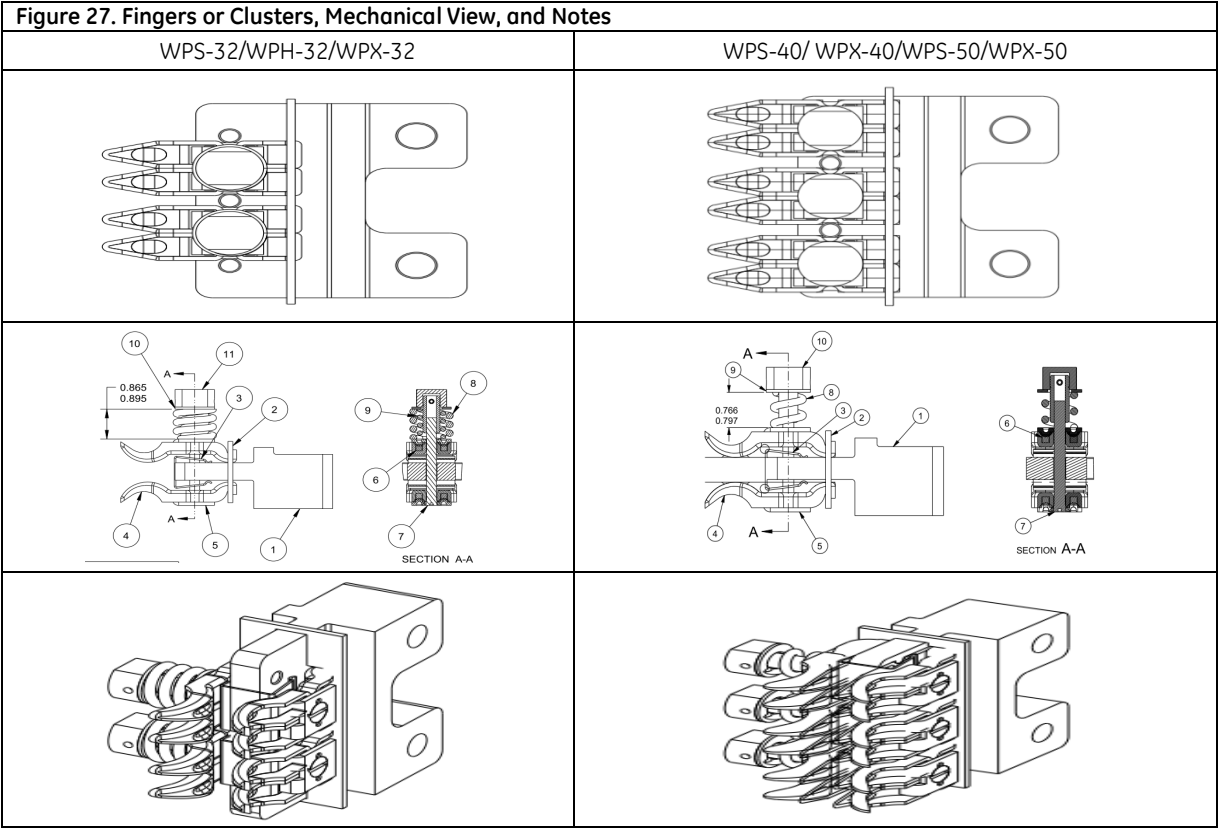


Figure 26. Steps in Exploded Views (A WPS-40/ WPX-40/WPS-50/WPX-50)



Mechanical Views-AKR-75/100/125

Figure 27 provides further details.



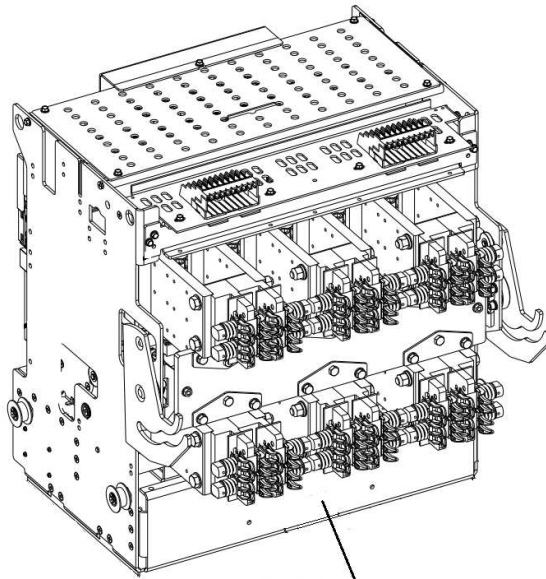
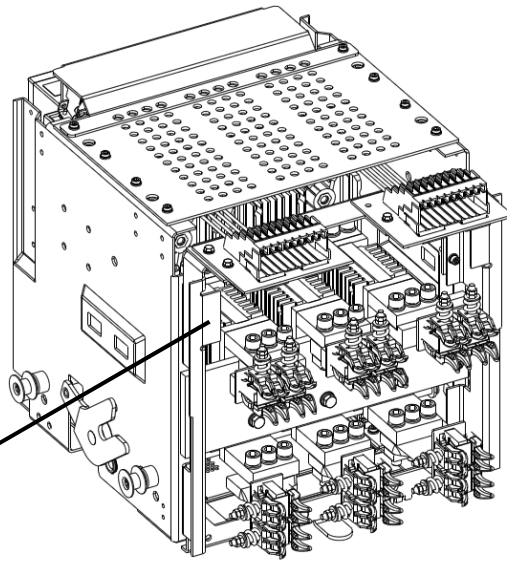
AKD-10—Position Switch Actuator

Position switch actuator comes pre-installed on all versions of Retrofill EntelliGuard ACB. Hence, no installation is required. Retrofills provide the same electrical indication scheme as the WavePro breaker.

- A customer can choose to install a position switch if it's not already installed, although this is infrequent, or the existing assembly is damaged.
- *Figure 28* shows the surface on the Retrofill which activates the position switch.

Figure 28. AKD-10 Breaker Surfaces Activate Position Switch.

Surface activating the
position switch for WPS-
08, WPH-08, WPX-08,
WPS-16, WPH-16, WPS-20

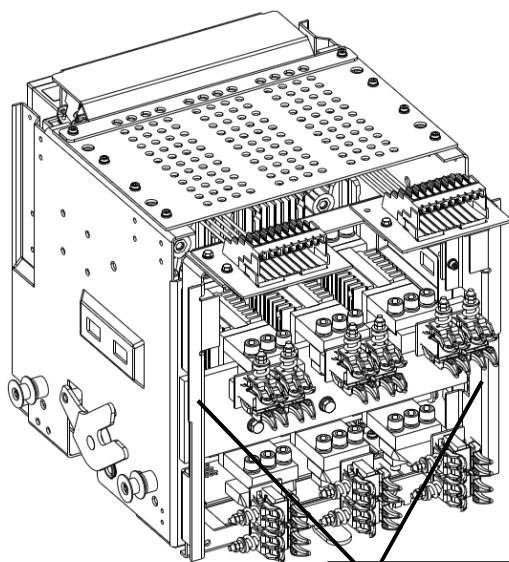


Surface Activating The Position Switch
For WPS-32/WPH-32/ WPX-32/ WPS-40,
WPX-40/WPS-50 / WPX-50

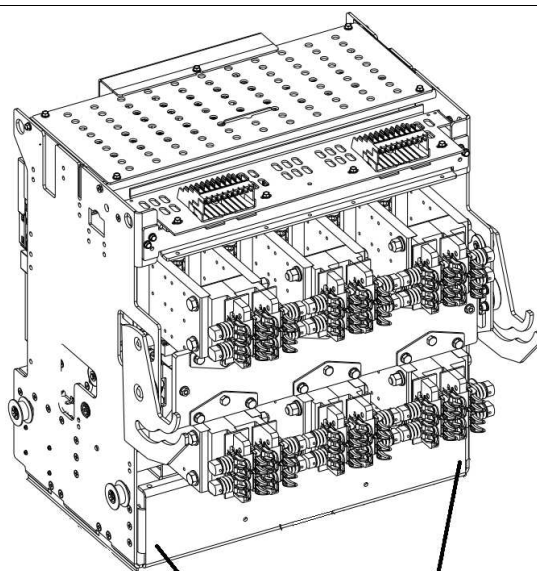
AKD-10—Shutter Actuation

AKD-10 LVS may be equipped with optional shutter assemblies for protection of the live bus bars. EntelliGuard R breakers come with pre-installed shutter actuators which operate the opening of the shutters as shown in *Figure 29*.

Figure 29. AKD-10—Breaker Surfaces Activate Shutter.



Surfaces activating the shutters
for WPS-08, WPH-08, WPX-08,
WPS-16, WPH-16, WPS-20



Surfaces activating the shutter for
WPS-32/WPH-32/WPX-32/WPS-40/ WPX-40/WPS-50/WPX-50

Door Interlock System



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks.
- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

Details regarding installation of the door interlock system are shown below in *Figure 30A and 30B*.

Figure 30A. AKD-10—Door Interlocking Components for WPS-08/ WPH-08/WPX-08/WPS-16/WPH-16/WPS-20 Breaker.

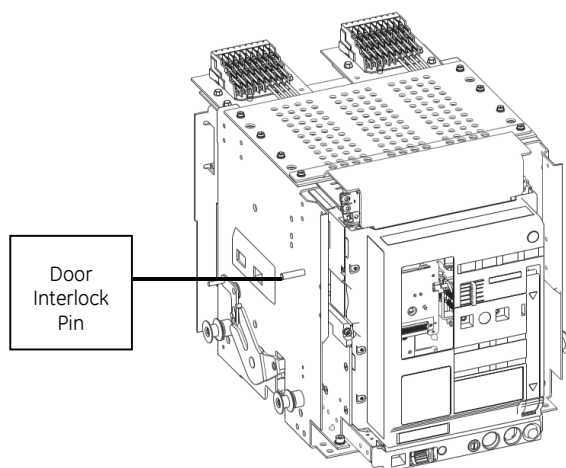
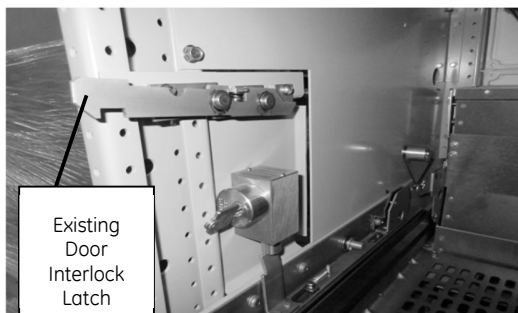
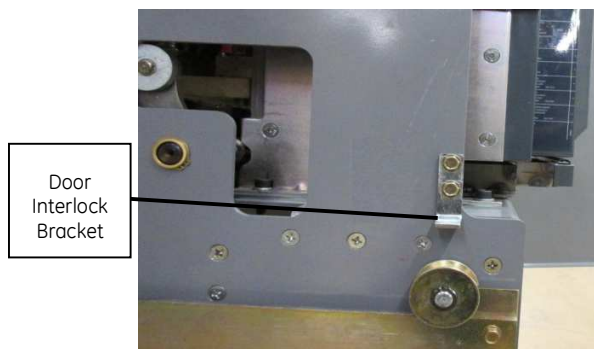


Figure 30B. AKD-10—Door Interlocking Components for WPS-32/WPH-32/WPX-32/WPS-40/ WPX-40/WPS-50/ WPX-50 Breaker.



AKD-10—Key Interlock

The EntelliGuard R retrofill circuit breakers provided as replacements for WavePro 800-5000A frame circuit breakers have a trip interlock feature which will function using the AKD-10 compartment mounted Key Interlock. A label is provided with full instructions on how to operate the Legacy Key Interlock. It is suggested to apply the label on the inside of the compartment door. Following is a brief summary of how the Key Interlock system is operated.

To activate the key interlock:

1. OPEN the breaker.
2. Rotate the screw on the lower front panel of the breaker which normally allows access to the racking screw. This will hold the breaker trip free.
3. While the screw is held rotated Clockwise, the Key Interlock slide in the switchgear is pushed inward, elevating a pin on the left side of the breaker.
4. Turn the key to the key removal position, extending the bolt and lock the breaker in the OPEN position.

Modify AKD-10—Switchgear Compartment

Cut Power to AKD-10—Switchgear



- It must be ensured that the supply power to the compartment is turned off/ compartment is de-energized for all the incoming and outgoing circuits of the LVS prior to any work being conducted on it.
- During the installation and related work on the equipment, it must be ensured that the operator is using the prescribed PPE for the specified tasks.

- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

1. Before modifying the switchgear compartment, de-energize/switch off the breaker. If the circuit breaker is ON and the springs are charged, to turn it off, press the OPEN button on the circuit breaker fascia, and ensure that the circuit breaker contacts are open.

Rack Out AKD-10—Legacy/Existing CB

1. To rack-out legacy (old or original) breaker from compartment, refer to your legacy-breaker's manual on how to remove the existing breaker.

Check, Clean, Grease AKD-10—Compartment

1. Inspect the compartment for damage or rework.
2. Check the cabinet for suitability of the EntelliGuard R Retrofill breaker.
3. Check each breaker compartment for bolted joints in the primary disconnect bars. Where such joints exist, check the bolts for tightness.

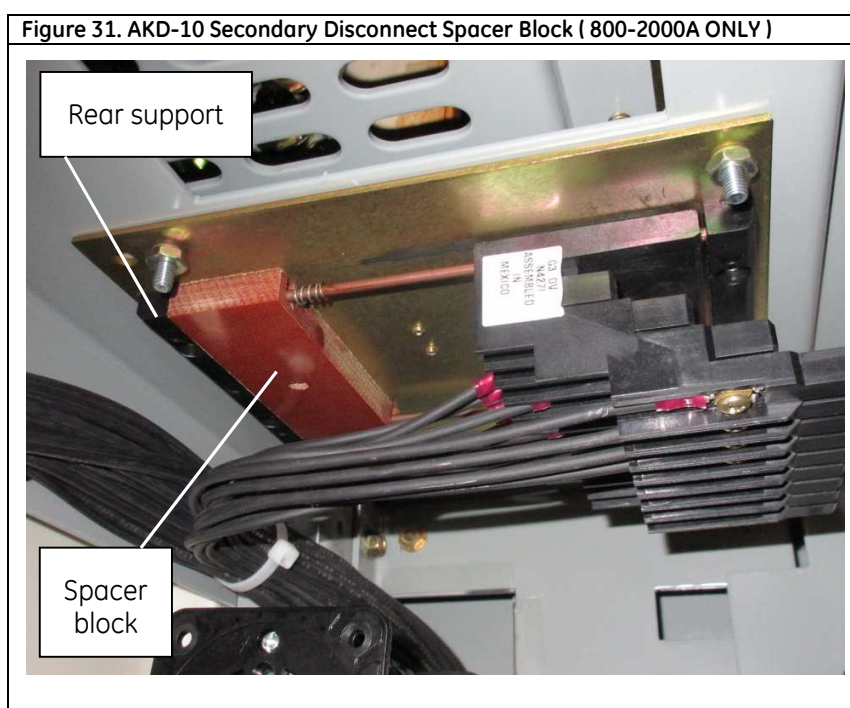
4. Inside the compartment, check the contact areas on each primary disconnect bar or cluster of fingers for foreign matter that may have accumulated. Clean those areas if necessary with a clean, lint-free rag and isopropyl alcohol or acetone.
5. Be sure to apply a thin film of red Mobilgrease 28 to the primary disconnect contact areas for better electrical connections inside the compartment. This is available in 1 oz. tubes, part # 193A1751P1.

Install Secondary Disconnect Spacer Block (800-2000A ONLY)

Install the spacer block provided as shown in *Figure 31*, below. Remove the protective tape on the block and stick it on the secondary disconnect mounting plate as shown in *Figure 31*. Be sure the spring is moved to the front of the spacer block.

Optional: The hole in the spacer block can be used to add a 10-32 screw. Drill a 0.177"(4.5mm) hole in the steel plate above and install 10-32 tap-tite thread forming screw (part: N722P16012B6)

Note: Use a #16 Std or 4.5mm metric drill bit Use 5/16" hex to install screw to 45-50 in-lbs Torque.



Install New Door

1. To remove existing compartment door(s), refer to your manual on how to remove the legacy doors.
2. To install the new door, refer to the [Retrofit Doors Assemblies for AKD-5, AKD-6, AKD-8 & AKD-10, DEH-41563](#).

Install AKD-10—Neutral Rogowski Current Transformer (CT)



- Turn off all power to switchgear. Tagout and lockout main source, up-stream or main breaker.
 - Failure to comply with these instructions will result in death or serious injury from severe burns caused by arc flashing that has exceedingly high temperatures.
 - Always wear personal protection equipment according to OSHA standards and appropriate to the severity of potential burns.
-
- Ensure only qualified personnel install, operate, service, and maintain all electrical equipment.

AKD-10—Neutral CT Assembly, Bus Compartment

The AKD-10 EntelliGuard R Circuit Breaker uses an air-core Rogowski Current sensor to measure current level. Legacy AK and AKR breakers used iron core CTs. For the Retrofill breaker to calculate the current levels on a 4-wire circuit, the Neutral Iron Core CT in the cable compartment needs to be replaced with a Rogowski style CT **or** have iron core CT output modified by a neutral CT adapter See **Neutral CT Adapter**.

The Rogowski CT comes mounted on copper bars matching the same hole-pattern as the existing neutral bar. Neutral CT wires from the Rogowski coil to the AKD-10 gray terminal blocks must be run as a “twisted pair”. Existing wires from the gray block to the 36 pt. secondary disconnect may remain as they are. *Table 10* shows the Rogowski assembly part numbers for AKD-10 Switchgear.

AKD-10—Rogowski Assembly Part Numbers

Table 10. AKD-10—Rogowski Assemblies (Neutral Bus Part Numbers)		
Switchgear/Breaker	Rogowski Assembly or Neutral Bus Bar Part Number	Figure References for Assembly Drawings
AKD-10 400A	10108266G1	<i>Figure 25. Neutral Bus Rogowski ASM 10108266</i>
AKD-10 800A	10108266G3	<i>Figure 25. Neutral Bus Rogowski ASM 10108266</i>
AKD-10 1600A	10108266G6	<i>Figure 25. Neutral Bus Rogowski ASM 10108266</i>
AKD-10 2000A	10108266G7	<i>Figure 25. Neutral Bus Rogowski ASM 10108266</i>

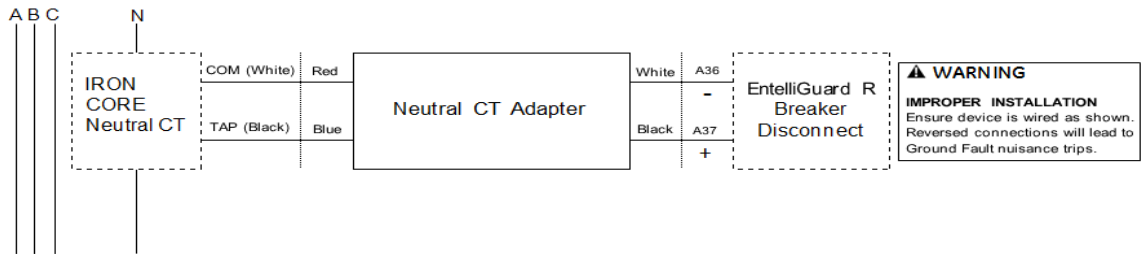
Neutral CT Adapter 150A-5000A

This is a miniature Rogowski coil. It mounts between the incoming Neutral CT and the breaker trip unit. It converts the signal from an iron Core Neutral sensor to a Rogowski voltage output which is wired to the Breaker's Trip Unit Neutral input connections.

The Neutral CT Adapter supports iron core Neutral sensors compatible with MicroVersa Trip, MVT RMS-9, Power Plus, Pro Trip and EntelliGuard TU rated from 150 to 5000Amps as used in switchboards and switchgear. It is available in five variations (shown in below Table).

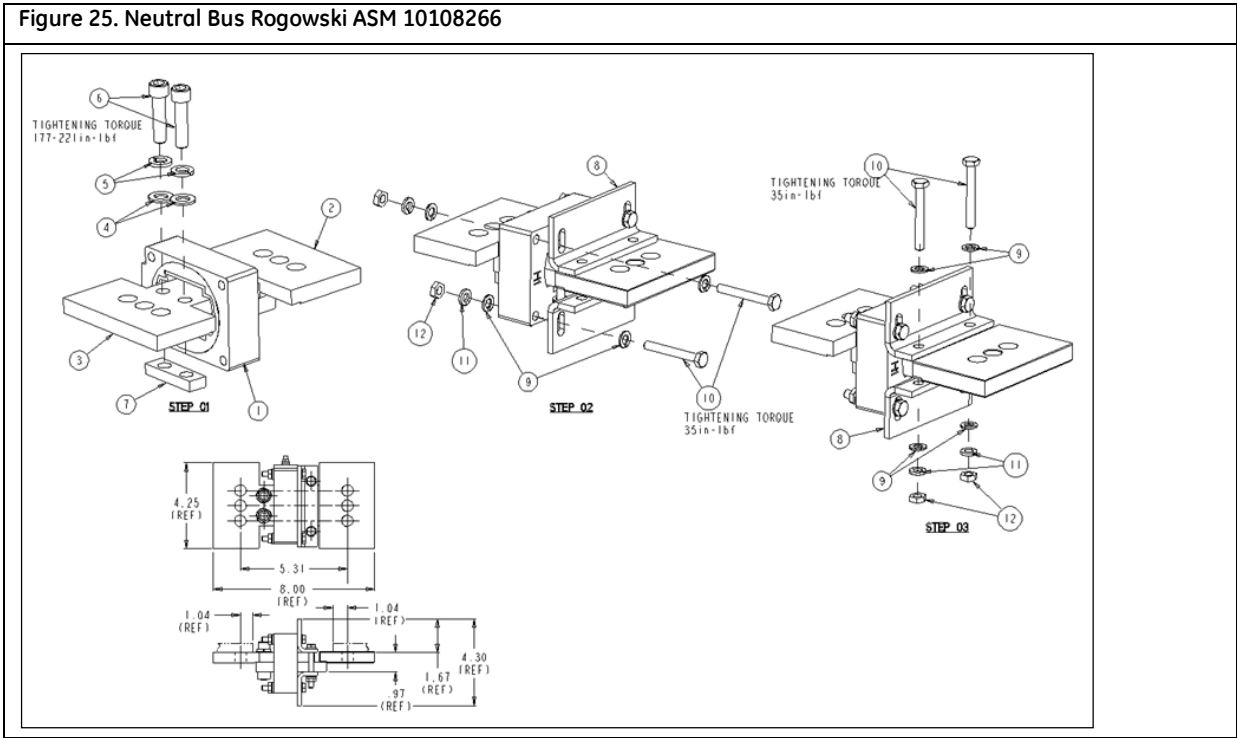
Catalog Number	Supported Neutral CT ratings (A)
RNCTA1200 (R)	600, 1200
RNCTA2000 (R)	150, 200, 400, 800, 1000, 1600, 2000
RNCTA3000 (R)	3000
RNCTA4000 (R)	2500, 3200, 4000
RNCTA5000 (R)	5000

Wiring Diagram




AKD-10—Rogowski Assemblies, Mechanical Views

Figure 25 shows a typical Rogowski assembly.



Procedures

	<p>NEUTRAL CT ORIENTATION</p> <ul style="list-style-type: none">• Write down the orientation of the existing Iron core CT and the polarity of the connections. The orientation and polarity needs to be matched when the air core Rogowski is assembled in the cable compartment.
---	--

1. Ensure that the LVS has been de-energized and the breaker in the compartment being retrofit is switched off and removed from the LVS.
 2. Open the door on the rear of the compartment to access the Cable/ Bus compartment of the LVS
 3. Note that the existing neutral CT assemblies are usually mounted vertically on two copper bus bars placed horizontally.
 4. Disconnect the wires that are attached to the existing CT assemblies and place them such that they do not interfere with the replacement of the CT assemblies.
 5. Unfasten and remove the bolts that hold the neutral disconnect assemblies to the horizontal bus bars. Keep the hardware in a secure location for reassembly.
 6. Be careful while handling the CT assemblies such that they do not fall down or damage other components within the LVS.
 7. Replace the old CT assembly with the new Rogowski assembly on the horizontal bus bars and fasten it using the hardware previously removed.
 8. Connect a twisted pair of wires back to the Rogowski CT assembly leads.
 9. Check for continuity from the CT leads to the A24 and A25 secondary disconnect screw terminal within the LVS compartment. NEVER push probes into the front of the secondary disconnect.
- The new Rogowski assemblies are installed and ready for use.
 - Tools required: Wrenches, wire stripper, wire cutter, continuity tester.

AKD-10—Multi-Source Ground Fault

Retrofills can be used in the following ground fault applications:

- Single Source Feeder breakers, 3 wire or 4 wire
- Main Circuit breakers, 3 wire or 4 wire
- Main or Tie breakers 3 or 4 wire multi source ground fault scheme-using original iron core neutral CT and the neutral CT adapter on each Retrofill breaker.

DEH41550 R06



NOTES:

These instructions do not cover all details or variations in equipment nor do they provide for every possible contingency that may be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise that are not covered sufficiently for the purchaser's purposes, the matter should be referred to the ABB Inc.

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