Installation and maintenance guide

Emax 2 Retrofill Circuit Breakers
Direct Replacement Replacing legacy
GE WaveProTM 800A - 5000A Circuit
Breakers used in AKD-10 & Substructures

General Electric 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 Emax 2 Retrofill breakers for AKD-10 switchgear and OEM substructures.
Preface

1 - Hazards

Overview
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 GE & OEM switchgear and when working with potentially dangerous electrical equipment (Table 1).

Table 1
<table>
<thead>
<tr>
<th>Generic Danger Alerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Danger Signs]</td>
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</tbody>
</table>

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 GE & OEM switchgear and when working equipment that can cause injury, but may not be necessarily fatal (Table 2).

Table 2
<table>
<thead>
<tr>
<th>Generic Warning Alerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Warning Signs]</td>
</tr>
</tbody>
</table>
**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. (Table 3).

**Table 3**

<table>
<thead>
<tr>
<th>Custom Caution Alerts</th>
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<tr>
<td>!CAUTION</td>
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<td>Symbol</td>
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<td>Panel</td>
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</tbody>
</table>

**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 4).

**Table 4**

<table>
<thead>
<tr>
<th>Custom Notice Alerts</th>
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<tbody>
<tr>
<td></td>
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<td>Not considered a safety label</td>
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<td>Word message</td>
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</table>
2 - Warranty

Warranty requirements
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, nor 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 Inc USA assumes no obligation of notice to holders of this document with respect to changes subsequently made. ABB Inc USA makes no representation or warranty, expressed, implied, or statutory, with respect to the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warranties of merchantability or fitness for purpose shall apply.

Contact your local sales office if further information is required concerning any aspect of Emax 2 Retrofill Circuit Breaker operation or maintenance.

3 - Trademarks and Patents

Details
- Emax 2 Retrofill
- Emax 2 Retrofill TU, Ekip DIP, Ekip Touch, Ekip Hi-Touch, Ekip G Touch, Ekip G Hi-Touch, Kip Measuring, Ekip Measuring Pro
- Emax 2 Retrofill Trip Unit
- Emax 2

4 - Standards

<table>
<thead>
<tr>
<th>Agency Certification</th>
<th>Standard Number</th>
<th>Title</th>
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<tr>
<td></td>
<td>ANSI C37.13,16,17,20.1,50,51,59</td>
<td>Low-Voltage AC Power Circuit Breakers &amp; switchgears</td>
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<tr>
<td></td>
<td>NEMA SG 3,5</td>
<td>Low-Voltage Power Circuit Breakers</td>
</tr>
<tr>
<td></td>
<td>NEMA AB1</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>UL 1066</td>
<td>Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures</td>
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5 - Document Conventions

Details
Topics and text are divided into primary, secondary, and tertiary paragraph headings.
### 6 - Related Publications

<table>
<thead>
<tr>
<th>Publication</th>
<th>Publication Number</th>
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</thead>
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<tr>
<td>Installation Manual AKD 10</td>
<td>2TSA4S1010P0000</td>
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<tr>
<td>Installation Manual AKD 8</td>
<td>2TSA4S1009P0000</td>
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<td>Installation Manual AKD 6</td>
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<td>Installation Manual AKD 5</td>
<td>2TSA4S1011P0000</td>
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<tr>
<td>Accessory: Door Interlock (Door Interlock Kit)</td>
<td>2TSA4S1017P0000</td>
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<tr>
<td>Accessory: Kirk Key Installation Manual</td>
<td>2TSA4S1013P0000</td>
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<td>Accessory Retrofill Direct Replacement / CIC Full Door Kits AKD-5, 6, 8 &amp; 10</td>
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<td>2TSE431967R1000</td>
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<td>2TSE431996R1000</td>
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<td>Accessory: Position Switch Plate, Assembly &amp; Wiring</td>
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<td>E2.2, 4.2, 6.2 Breakers Installation, Operation &amp; Maintenance Manual</td>
<td>1SDH001000R0002</td>
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<td>Instructions for using Ekip touch protection releases &amp; accessories</td>
<td>1SDH001316R0002</td>
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<td>Emax 2 Family Trip units Engineering manual</td>
<td>1SDH001330R0002</td>
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</table>

### 7 - Service and Support

Service and support are available from ABB Inc USA.
Email: eppc.support@us.abb.com
Phone: 888-385-1221

### 8 - 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 retrofit breaker is fully prepared, it should take about 20 minutes to swap out the old breaker and rack in the new Emax 2 Retrofill circuit breaker if the proper lifting bar and hoist are available, it may take an additional 30 min to replace the door.

The Emax 2 Retrofill, when ordered with 4 wire ground fault, will be equipped with a Neutral CT adapter. The adapter will modify the GE MicroVersaTrip type Neutral CT output to a Rogowski sensor output compatible with the Emax 2 Retrofill Trip Unit. With this device, it will not be necessary to change the neutral CT in the switchgear to a Rogowski sensor.
## 9 - Product Specs

<table>
<thead>
<tr>
<th>Weight (lbs.)</th>
<th>Retrofill Breaker, which replaces</th>
<th>Weight</th>
<th>Box Wt</th>
<th>Pallet Wt</th>
<th>Accessories Wt</th>
<th>Total Wt</th>
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<tr>
<td>WPS-08, WPH-08</td>
<td>230</td>
<td>11</td>
<td>24</td>
<td>2</td>
<td>267</td>
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<tr>
<td>WPX-08, WPS-16, WPH-16, WPS-20</td>
<td>270</td>
<td>11</td>
<td>24</td>
<td>2</td>
<td>307</td>
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<tr>
<td>WPS-32, WPH-32, WPX-32</td>
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<td>15</td>
<td>30</td>
<td>2</td>
<td>647</td>
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<td>WPS-40, WPX-40 (&gt;3600A) w/o Fans</td>
<td>625</td>
<td>15</td>
<td>30</td>
<td>2</td>
<td>672</td>
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<tr>
<td>WPS-40, WPX-40 w/Fans</td>
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<td>15</td>
<td>30</td>
<td>2</td>
<td>675</td>
<td></td>
</tr>
<tr>
<td>WPS-50, WPX-50</td>
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**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 Emax 2 Retrofill breaker is defined as a draw-out breaker. With least modifications to be made to existing switchgear, Emax 2 Retrofill breakers are cost effective solution to upgrade the existing electrical system. Direct Replacement is the solution where the legacy WavePro circuit breaker is removed and a new circuit breaker is provided, which racks into the existing Switchgear Compartment. The direct replacement retrofitting kit allows a reliable upgrade of the old GE legacy breakers to new Emax 2 Retrofill Breakers.

Below figures (front and back views with finger clusters) present Emax 2 Retrofill breakers, which can replace WavePro breakers.

**Figure 1**

AKD-10 800A to 2000A WPX-08, WPS-16, WPH-16 & WPS-20 Front View
Figure 2
AKD-10 800A to 2000A WPX-08, WPS-16, WPH-16 & WPS-20 Back View
Primary Finger Clusters

Figure 3
AKD-10 800A WPS-08 & WPH-08 Front View
Primary Finger Clusters

Figure 4
AKD-10 3200A WPS-32, WPH-32, WPX-32, WPS-40 & WPX-40 Front View
Emax 2 Retrofill Circuit Breaker is suitable for application on power systems up to 635 VAC 50/60 Hz.
History and Types

10 - History of AKD

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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 ANSI61, 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.

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AKD - 5

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 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".

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AKD - 6

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. 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. 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.
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. 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.

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 GE AKD-8 breakers have a drawout letter code “D”. OEM versions are drawout letter code “B” and GE Switchboard versions are drawout letter code “F”. “B” & “F” breakers only differed by appearance items. All Primary disconnect stabs are vertically oriented.

The 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.

Note GE Switchboard plants initially shipped “WS” style breakers and later shifted to “WE” style breakers to be consistent with GE Switchgear from Burlington, Iowa. The 5000A breaker had cooling fans. None of the Emax 2 Retrofill breakers utilize fans except the 4000A rating only.

(W1 & W2 Catalog numbers on legacy WavePro breakers designate additional dead front shields)
The following engineering or assembly drawings describe the layout and dimensions of the AKD-10 Retrofill breaker.

**Figure 9**
AKD-10, 800A Retrofill Breaker Dimensions (WPS-08, WPH-08)

**Figure 10**
AKD-10, 800-2000A Retrofill Breaker Dimensions (WPX-08, WPS-16, WPH-16, WPS-20)

**Figure 11**
AKD-10, 3200A Retrofill Breaker Dimensions (WPS-32, WPH-32 WPX-32)
Figure 12

AKD-10, 4000A with forced cooling (w/fans) Retrofill Breaker Dimensions (WPS-40, WPX-40)

Forced cooling (w/Fans) for 4000A Rating Only. Fans Turn ON at 3600A and OFF at 3400A.

For other detail related to Trip unit config and wiring refer to Fan control section

Breakers ordered with a 3600A Rating plug for max 90% load do not require fans.

Figure 13

AKD-10, 5000A Retrofill Breaker Dimensions (WPS-50, WPX-50)

The legacy WavePro 5000A breaker was equipped with fans. The Emax 2 5000A retrofit does NOT require fans.
The figures below present a new AKD-10 compartment, with one photo showing the rails extended.

**Figure 14**
AKD-10: Empty Compartment with Shutters
NOTE: Section width 22”-800-2000A

**Figure 15**
AKD-10: Empty Compartment with Racks/Rails Extended
13 - Interior Components

Major components of an AKD-10 compartment.

AKD-10, Circuit Breaker Compartment for Wave Pro breakers

Figure 16

⚠️ CAUTION

All 800, 1600, 2000 compartments See “Modify AKD-10 Switchgear Compartment”

⚠️ DANGER

Once spacer Blocks are added behind Secondary disconnects the Legacy WavePro circuit breakers must not be installed

14 - Interior View

The figures below present a new AKD-10 compartment, with one photo showing the rails extended.

Figure 17

AKD-10, Empty Compartment

NOTE: Section width 30”-3200-4000A; 38”-5000A
15 - Interior Components

**Figure 19**

Major components of an AKD-10 compartment.


- Position switch
- Kirk key lock
- Rejection Plate
- Secondary Disconnect
- Primary Disconnects Top
- Primary Disconnects Bottom
- Compartment Interlock Ramp
- Racking Pins
- Drawout Rails
Modify AKD-10, Switchgear Compartment

16 - Cut Power to AKD-10 Switchgear

**Danger**

- 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.

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.

17 - Rack Out AKD-10 Legacy/Existing CB

To rack-out legacy old breaker from compartment, refer to your legacybreaker's manual on how to remove the existing breaker.

18 - Check, Clean, Grease AKD-10 Compartment

1. Inspect the compartment for damage or signs of overheating.
2. Check the orientation of primary finger clusters match the switchgear stabs.
3. Check racking pin diameters agree with breaker racking cam slots (AKD-10 has a large diameter pin and cam slot on right side).
4. Check the secondary disconnect integrity & their mounting supports for any damage or cracks.
5. If switchgear parts show cracks or damage contact ABB post sales service 888-437-3765.
6. Check each breaker compartment for bolted joints in the primary disconnect bars. Where such joints exist, check the bolts for tightness.
7. Inside the compartment, check the contact areas on each primary disconnect bar for foreign matter that may have accumulated. Clean those areas if necessary with a clean, lint-free rag and isopropyl alcohol or acetone.
8. Be sure to apply a thin film of red Mobilgrease 28 to the primary disconnect contact areas for better electrical connections inside the compartment.
19 - Install Secondary Disconnect Spacer Block (800-2000A ONLY)

Install the spacer block provided as shown in Figure 20, below. Remove the protective tape on the block and stick it on the secondary disconnect mounting plate as shown in Figure 20. 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, ¾” inch long. Drill a 0.177”(4.5mm) hole in the steel plate above and install 10-32 taptite thread forming screw (ABB part: N722P16012B6).

Note: Use a #16 Std (Ø.177”) or 4.5mm metric drill bit Use 5/16” hex to install screw to 45-50 in-lbs Torque.

Figure 20

AKD-10 Secondary Disconnect Spacer Block (800-2000A ONLY)

Rear support
Spacer block
Spring

20 - Quality

All Emax 2 Retrofill 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 ABB Inc USA, Senatobia, Mississippi (MS) and is inspected using some of the same master gauges used on the legacy WavePro breakers to confirm electrical and mechanical performance, including rejection-features.

21 - Information Label

On the front of each circuit breaker there is a factory-assembled label that details all electrical accessories included on the circuit breaker.
22 - Product and Catalog Serial Numbers

Product catalog and serial numbers should be kept handy when communicating about the circuit breaker. Each circuit breaker has a unique serial number (S/N) located on the front fascia.

23 - 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 (3200A, 4000A & 5000A only). 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 Device

1. Use a lifting device for moving circuit breaker in order to avoid personal injury and damaging the breaker.

2. Use a proper overhead lifting device to mount breaker into the switchgear. Contact the nearest sales office for availability of a hoisting device.
Unpack Circuit Breaker

| Danger | • 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. |
| --- | --- |
| Caution | • 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. |
| Notice | 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.
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 (Mobilgrease 28) to the primary disconnect fingers (Figure 21 and 22).

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**Figure 21**

Primary Contacts or “Fingers” (Apply Grease to sliding surfaces)

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**Figure 22**

Primary Contacts or “Fingers” (Apply Grease to sliding surfaces)
Check Before Installing

**Danger**

- 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 Low Voltage Switchgear 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.
**Notice**

**PRODUCT DAMAGE**

- 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 for damage.
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.
5. Store in a clean, dry, rodent-free location with moderate temperature & provide protective coverings to prevent dirt, water, or other foreign substances from entering the breaker.
6. If dampness or condensation is encountered in the storage location, heaters installed in the switchgear can be used to prevent moisture damage.
7. After prolonged storage, Level 1 maintenance is needed under two years of storage. While Level 2 maintenance is needed over two years of storage. Refer to circuit breaker manual in maintenance L1-L2 descriptions.

Refer to Emax2 Installation, Operation and Maintenance Instructions – Publication #1SDH001000R0002 pages 99-112.
Install AKD-10 & Substructure type 800, 1600 & 2000A Retrofill Breaker

**Danger**

- 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, the compartment modified and secondary wiring verified, the Retrofill breaker can now be installed in the AKD-10 switchgear, OEM switchgear or switchboard.

Note: the preferred lifting method is always to use proper ABB lifting (spreader) bar. It will provide the best chance of installing breakers, especially into the upper compartments, without damaging the breakers. The WavePro small frame lifting bar had a 3rd lifting hook at the front and it will not fit on the retrofit breaker. Any time eye bolts (small frame breakers) or large diameter holes (large Frame breakers) and generic lifting chains are used, caution must be used to keep the chains to no less than 45 degree angle from horizontal to avoid damaging the breaker side frames)

800A – 2000A Breakers: ABB Lifting Bar #2TSE431929R1000, old GE #0247B8961G002
3200A – 4000A Breakers: ABB Lifting Bar #2TSE431931R1000, old GE #0247B8961G001
5000A Breakers: ABB Lifting Bar #2TSE431932R1000, old GE #0247B8961G003

1. Verify that the breaker is in the DISCONNECTED and OPEN position before mounting it on the rails. Refer to figure 23

![Cassette Position Indicator](image)

**Figure 23**

2. Using the chosen lifting method, raise the breaker to a height slightly above the rails.
3. Pull out the two rails being cautious not to position anyone underneath the suspended load. Pulling from the middle of the tie bar connecting the two rails and lifting up slightly will help the rails to slide out more easily.
4. Carefully lower the breaker onto the rails, making sure both rollers on each side land centrally on each rail such that the full weight of the breakers is fully supported by the rails.

5. Remove the lifting bar, any lifting eye hooks and chains.

**Figure 24**

AKD-10, Using ABB Lifting bar and hoist

**Note 1:** Make sure the J hook of the lifting bar is secured in the front window on both Side sheets of the breaker as shown in fig 25. This will ensure the breaker is better balanced when lifted.

**Figure 25**

AKD-10, Using ABB Lifting bar and hoist

**Use FRONT Rectangular cut to insert J - lifting bar**

**Note 2:** The size of the slot at the top of the lifting bar is 0.7" wide and 1" high. Hooks used in the hoist should be suitable to engage with this slot size. After loading on rails of fully withdrawn position remove the eye bolts or lifting means.

**Note 3:** Use of Lifting bar or spreader bar allows to reach the top most switchgear Compartment easily, so it is the recommended method.

**Note 4:** 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 26 and 27. Insert M10
eyebolts of rating minimum 250lbs in the eye bolt weld nuts as shown in Figure 28. 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 28 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 28 to lift the breaker.

Note: Eye bolts, chain & connectors are not supplied. If used, remove before installing breaker into the compartment.

Figure 26

Eye bolt Ex: McMaster CARR Part # 3107T43

Figure 27

Chain connector Ex: Lowes item #184600 Reese Model : 74602HD
6. Check that the breaker is free from obstruction while pushing it inside the compartment, especially the rejection features below the breaker.
7. Check the secondary disconnects are aligning while pushing the breaker into the compartment from fully withdrawn to DISCONNECT position
8. Push the breaker in until the compartment racking pins engage with the breaker racking cams.
9. Remove the racking tool from the storage location on the breaker front panel and extend the torque bar from inside the handle.
10. Use a blade-type screwdriver in the slot or rack out lock of the breaker (Figure 30), and turn it clockwise to the right so that the racking handle shutter opens.

![Figure 30](image)

**Inserting the racking handle:**
- First, insert a blade screwdriver in the right-hand slot and rotate it to the right.
- Then, while holding the screwdriver torqued to the right, insert the racking tool in the left slot until it engages with the mechanism inside.

After the racking tool engages, remove the screwdriver.

11. 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 30).

12. With the racking tool inserted, crank clockwise so that the Retrofill starts to move in, slowly sliding forward into the compartment.

13. Rotating clockwise ~37 turns racks the circuit breaker all the way into the enclosure.

![Figure 31](image)

14. 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. Fig 31.

15. Continue rotating the racking handle clockwise until the position indicator first shows TEST, then CONNECTED. Fig 31.

**NOTE:** 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.

**NOTE:** 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.

16. Remove and store the racking handle in its storage location. Fig 29.
Figure 32

Emax 2 Retrofill 800, 1600 & 2000A Frames

Emax 2 RetroFill, AKD-10, CONNECT POSITION
Install AKD-10 & substructure type 3200, 4000 & 5000A Retrofill Breaker

Danger

- 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.

To remove the exiting breaker follow instructions provide with the legacy breaker and or switchgear/switchboard. Notice how the rejection plates on the floor of the switchgear compartment align with rejection pins on the circuit breaker. Verify the correct breaker is being used. Compare the rejection pin 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 GE AKD-10 Switchgear, GE Switchboard or OEM Equipment

1. Verify that the new breaker is in the DISCONNECTED and OPEN position.
   a. It is best to use ABB Lifting Bar Part number 2TSE431931R1000 for 3200-4000A and 2TSE431932R1000 for 5000A and a suitable hoist to lift from above as shown in Figure 34. (These lifting bars have been tested to 200% of their 700 lb ratings.)
   b. Use of Lifting (Spreader) bar allows to reach the top most switchgear compartment easily, so it is the recommended method.
   c. Alternate method, use a lifting chain and hooks rated at least 1400 lbs to lift the breaker from above as shown in Figure 33. (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 GE switchgear hoist.

Figure 33

AKD-10 Location of Lifting Holes for Alternate method
3. Make sure that the lifting bar “J” hooks or generic chain-hooks are secured and locked in place.

⚠️ **DANGER** 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 two rails being cautious not to position anyone underneath the suspended load. Pulling from the middle of the tie bar connecting the two rails and lifting up slightly will help the rails to slide out more easily.

6. Lower the breaker down on the Rails.

7. Remove the lifting bar or chains.

8. Push the breaker into the compartment slowly while observing the alignment of the rejection pins, 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 29) 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 30), 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 30).

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.
The photo below shows an example of a racked-in AKD-10 Retrofill.

Figure 35

Emax 2 RetroFill, AKD-10, CONNECT POSITION
### Notice

**WIRING**

- Before installing the breaker, the secondary disconnects must be wired to the Emax 2 Retrofill 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.

---

26 - AKD-10: Secondary Disconnects

This section deals with installing and wiring the legacy secondary disconnect assemblies onto the Emax 2 Retrofill breaker. Installing the secondary disconnect assembly consists of doing these tasks:

- Installing the secondary disconnect assembly (Figure 36, Figure 37, and Figure 38).
- Wiring the secondary disconnect assembly (Table 6 shows the WavePro secondary disconnect terminals).

The Emax 2 Retrofill Breaker has these three options:

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

**NOTE:** Wires shall be routed **below** the vented cover (Fig. 36) and wire tied to the side frames, do **not** route wires over arcchutes, allow slack in wires so secondary disconnect sits level and lifted by the spring washer (Fig. 38).
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 5 for the secondary disconnect kit catalog numbers.

**Table 5**

<table>
<thead>
<tr>
<th>Breaker side</th>
<th>WP-08 / 16 / 20</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>WPSDSUBF1</td>
</tr>
<tr>
<td>Cell side</td>
<td>WPSDSUBM1</td>
</tr>
</tbody>
</table>

Available from GEXPRO

Table 6 shows the WavePro secondary disconnect terminals and standard connections. Refer to Table 7 for an example showing wiring from AKD-10 to the Emax 2 Retrofill breaker.
**Legacy Wave-Pro secondary disconnect terminals and standard connections.**

### Table 6

#### A-Disc Block (left side from front)

<table>
<thead>
<tr>
<th>10</th>
<th>Aux Switch (NO contact)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>8</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>7</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>6</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>5</td>
<td>Aux Switch (NC contact)</td>
</tr>
<tr>
<td>4</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>3</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>2</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>1</td>
<td>Aux Switch</td>
</tr>
</tbody>
</table>

#### C-Disc Block (right side from front)

<table>
<thead>
<tr>
<th>14</th>
<th>Second Shunt Trip</th>
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</thead>
<tbody>
<tr>
<td>13</td>
<td>Aux Switch (NC contact)</td>
</tr>
<tr>
<td>12</td>
<td>Aux Switch (NO contact)</td>
</tr>
<tr>
<td>11</td>
<td>Aux Switch (NC contact)</td>
</tr>
<tr>
<td>10</td>
<td>Aux Switch (N.O. contact)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
</tr>
</tbody>
</table>

| 6  | Aux Switch             |
| 5  | Aux Switch (NC contact) |

<table>
<thead>
<tr>
<th>15</th>
<th>Bell Alarm (NO contact)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Bell Alarm (N.C. contact)</td>
</tr>
<tr>
<td>19</td>
<td>Bell Alarm (NO contact)</td>
</tr>
<tr>
<td>20</td>
<td>Bell Alarm (NC contact)</td>
</tr>
<tr>
<td>21</td>
<td>Bell Alarm (common)</td>
</tr>
<tr>
<td>17</td>
<td>Remote Charge Indicator**</td>
</tr>
<tr>
<td>18</td>
<td>Remote Charge Indicator**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>19</th>
<th>Closing Spring Charging Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Closing Spring Charging Motor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9</th>
<th>Close Circuit (electric bkr)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Close Circuit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>22</th>
<th>Undervoltage or Electric Lockout</th>
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</thead>
<tbody>
<tr>
<td>23</td>
<td>Undervoltage or Electric Lockout</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24</th>
<th>Neutral Sensor – Tap (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Neutral Sensor – Common (-)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>26</th>
<th>Modbus (+) commnet (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>Modbus (-) commnet (-)</td>
</tr>
<tr>
<td>28</td>
<td>Zone Selective Interlock (In+)</td>
</tr>
<tr>
<td>29</td>
<td>Zone Selective Interlock (In-)</td>
</tr>
<tr>
<td>30</td>
<td>Zone Selective Interlock (Out+)</td>
</tr>
<tr>
<td>31</td>
<td>Zone Selective Interlock (Out-)</td>
</tr>
<tr>
<td>32</td>
<td>Va (voltage conditioner)</td>
</tr>
<tr>
<td>33</td>
<td>Vb (voltage conditioner)</td>
</tr>
<tr>
<td>34</td>
<td>Vc (voltage conditioner)</td>
</tr>
<tr>
<td>35</td>
<td>(Note2) Trip Unit Aux Power (24 Vdc+)</td>
</tr>
<tr>
<td>36</td>
<td>(Note2) Trip Unit Aux Power (24 Vdc-)</td>
</tr>
</tbody>
</table>

**Notes**

1. Auxiliary switch contacts are wired out if shunt trip is not provided.

2. 24VDC auxiliary power required for RELT.

3. This drawing shows all breaker accessories. Refer to breaker catalog number for accessories included with the breaker.

4. 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 Retrofitfill breaker. The NMCV 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.

---

* Remote Close Accessory on manual breaker  
** Remote Charge Indicator (closing springs) applies to E/O breakers only
Emax 2 & Wave-Pro secondary disconnect terminals and standard connections.

### Table 7

<table>
<thead>
<tr>
<th>Emax</th>
<th>WP</th>
<th>Table 7</th>
</tr>
</thead>
</table>

#### A - Disconnect Block (left side from front)

<table>
<thead>
<tr>
<th>Emax2</th>
<th>WP</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>10</td>
<td>Aux Switch (NO contact)</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>24</td>
<td>11</td>
<td>Aux Switch (NC contact)</td>
</tr>
<tr>
<td>21</td>
<td>12</td>
<td>Aux Switch (NO contact)</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>VN</td>
<td>13</td>
<td>Aux Switch (NC contact)</td>
</tr>
</tbody>
</table>

#### B - Disconnect Block (right side from front)

<table>
<thead>
<tr>
<th>Emax2</th>
<th>WP</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>10</td>
<td>Aux Switch (N.O. contact)</td>
</tr>
<tr>
<td>32</td>
<td>1</td>
<td>Aux Switch</td>
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<tr>
<td>34</td>
<td>2</td>
<td>Aux Switch</td>
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<tr>
<td>44</td>
<td>11</td>
<td>Aux Switch (NC contact)</td>
</tr>
<tr>
<td>41</td>
<td>12</td>
<td>Aux Switch (NO contact)</td>
</tr>
<tr>
<td>31</td>
<td>3</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>D4</td>
<td>4</td>
<td>Aux Switch</td>
</tr>
<tr>
<td>D3</td>
<td>5</td>
<td>Aux Switch (NC contact)</td>
</tr>
</tbody>
</table>

#### C - Disconnect Block (right side from front)

<table>
<thead>
<tr>
<th>Emax2</th>
<th>WP</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>14</td>
<td>Aux Switch (NO contact)</td>
</tr>
<tr>
<td>45</td>
<td>5</td>
<td>Aux Switch</td>
</tr>
</tbody>
</table>

#### Notes:

1. 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.
4. WP 40 for 4000A is provided with fans that need to be supplied: If 16-7 are not connected to 120Vac, connect to 8-17 Motor (if 110 - 60 Hz). The 5000A Emax 2 Retrofit does NOT require fans.
5. Not an input for Emax 2, install Ekip voltage modulation breaker.
6. Open Fuse Lock Out not supported for Emax2 Retrofit.

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 Retrofit 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.
- RELT: It requires a dedicated RELT-Signaling 2K-3 module + Relt blu switch "GTUTRSK" ISDH0010000R0524
- IGF: will require NCT adapter ISDH0010000R0530
- Zone selectivity: Reuse of external existing wiring by rewiring the internal ZSi, "Legacy zone selectivity is not compatible with Emax2. In case the functions is used, it is necessary to replace all legacy breakers connected with Emax2 retrofit" ISDC0071000G0205
- Dialogue Module: "Emax2 offers multiple communication modules, like Ekip Com Modbus TCP, Ekip Com EtherNet/IP™, Ekip Com Profinet, Ekip Com IEC 61850, Ekip Com Modbus RTU, Ekip Com Profibus DP, Ekip Com DeviceNet™; Integration with Emax2 integrated communication modules with different protocols requires the adaptation of existing supervision system to accept new connections with dedicated new system interfaces refer the following document for details ISDH001140R0001
NOTES:
1. WP - WavePro fixed connection point
2. "*B" refers to the mixed Auxiliary Contacts, like Q1 & Q2 are of 400 V while Q3 & Q4 are of 24 V.
3. This is a sample wiring diagram. For exact connection points on the fixed side, refer the wiring diagram supplied with original breaker. Refer Emax 2 catalogue for all other available connection schemes.

Note: To refer all the other/different option connections refer Emax 2 manual 1SDH001000R0002 page no 48-50.
NOTES:
1. WP - WavePro fixed connection point
2. "B" refers to the mixed Auxiliary Contacts, like Q5, Q6 & Q7 are of 400 V while Q8, Q9 & Q10 are of 24V.
NOTES:
WP - WavePro fixed connection point
51. EKIP COM MODBUS RS-485
52. EKIP COM MODBUS TCP
53. EKIP COM PROFIBUS
NOTES:

1. 77(YC)–78(YC, EKIP COM ACTUATOR) as an alternative to each other
2. 73A(YU2 or YO2) out of 2 only one can be supplied
3. "M*" indicates when the circuit breaker has two or three applications but only one can be supplied.
4. Emax 2 standard offering ST1, UVR1, CC or CCC & UV2
5. This is a sample wiring diagram.
For exact connection points on the fixed side, refer the wiring diagram supplied with original breaker.
### NOTES:

1. WP - WavePro fixed connection point
NOTES:
1. WP - WavePro fixed connection point

Notice

WIRING

- Do not pinch/damage the wires while installing the secondary disconnect blocks.
The Finger Clusters Accessory Manual 2TSA451012P0000 covers the primary disconnects. 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 Emax 2 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 38 shows finger clusters or primary disconnects on a Retrofill circuit breaker. Figure 39 details the finger-cluster assembly.

**Figure 38**
Circuit Breaker Removed, Featuring Primary Disconnects "Fingers" (Contacts)

**Figure 39**
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 40. 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 41 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 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 to the contact areas which slide onto the switchgear stabs (See Figure 42, Step 2).
Mechanical Views

Below pictures provide further details

Figure 43

Assemble item 6 with narrow sect away from breaker

Eccentric stud spacer

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

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2TSA451010P0000 Rev-B
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 44/45. 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 46/47 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/ WPS-40/ WPX-40 with Double springs and 0.766—0.797 inch for 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 (DS0HD38) to the contact areas which slide onto the switchgear stabs (See Figure 48/49, Step 2). This product is available in a 1-oz tube, ABB Part #193A1751P1.

17. Figure 48 (WPS-32/WPH-32/WPX-32), Figure 49(WPS-40/ WPX-40) and figure 50 (WPS-50/WPX-50) summarizes the steps for working with the primary contacts.
Steps in Exploded Views for 3200A (WPS-32/WPI-32/WPX-32)

1. 
2. 
3. 
4. Only for 3200A
5.
Steps in Exploded Views for 4000A (WPS-40/WPX-40)

1

2

3

4

Only for 3200A

5
Figure 50

Steps in Exploded Views for 5000A (WPS-50/WPX-50)

1. 

2. 

3. 

4. Only for 3250A

5.
### Mechanical Views
**AKR 75/100/125**

**Figure 51**

Below pictures provide further details on (Fingers or Clusters, Mechanical views)

<table>
<thead>
<tr>
<th>WPS-32/WPH-32/WPX-32</th>
<th>WPS-40/WPX-40/WPS-50/WPX-50</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram 1" /></td>
<td><img src="image2.png" alt="Diagram 2" /></td>
</tr>
<tr>
<td><img src="image3.png" alt="Diagram 3" /></td>
<td><img src="image4.png" alt="Diagram 4" /></td>
</tr>
<tr>
<td><img src="image5.png" alt="Diagram 5" /></td>
<td><img src="image6.png" alt="Diagram 6" /></td>
</tr>
</tbody>
</table>

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2TSA451010P0000 Rev-B
Position switch actuator comes preinstalled on all versions of Emax 2 Retrofill ACB. Hence, no installation is required. Retrofills provide same electrical indication scheme as WavePro breaker.

- A customer can choose to install a position switch if it’s not already installed or if the existing assembly is damaged.

- Figure 52 & 53 shows the surface on the Retrofill which activates the position switch.

**Figure 52**

![Surface activating the position switch for WPS-08, WPH-08, WPX-08, WPS-16, WPH-16, WPS-20](image)

**Figure 53**

![Surface activating the position switch for WPS-32/WPH-32 WPX-32/WPS-40, WPX-40/WPS-50/WPX-50](image)
AKD-10 LVS may be equipped with optional shutter assemblies for protection of the live bus bars. Emax 2 Retrofill circuit breakers come with pre-installed shutter actuators which operate the opening of the shutters as shown in Figure 54 & 55.

**Figure 54**
AKD-10, Breaker Surfaces Activate Shutter

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

**Figure 55**
Surfaces activating the shutter for WPS-32/WPH-32/WPX-32/WPS-40/WPX-40/WPS-50/WPX-50
Door Interlock System

**Danger**

- 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 door interlock system are shown in Figure 56 & 57.

**Figure 56**
AKD-10, Door Interlocking Components for WPS-08/ WPH-08/WPX-08/WPS-16/WPH-16/WPS-20 Breaker

![Existing Door Interlock Latch](image1)

![Door Interlock Pin](image2)

**Figure 57**

![Door Interlock Bracket](image3)
The Emax 2 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.
Install New Door OR Door Adaptor

1. Remove existing compartment door(s) and remove hinge block using #2 Phillips headed screw driver.

2. To install new door follow the instructions below:
   - De-energize/switch off the LVS section that is to be retrofitted.
   - Open the compartment door that is to be retrofitted.
   - Rack out the existing legacy AKR breaker from the LVS.
   - Keep the door open for accessing the door mounting pads placed on the right side wall in the LVS compartment.
   - Loosen the screws holding the mounting pads to the compartment frame.
   - Note that this will provide access for removing the old door from the LVS compartment.
   - Unpack the new door assembly and mount it on the compartment and secure via placing the hinges and tightening the screws.
   - Insert the new retrofitted Emax 2 Retrofill circuit breaker into the compartment and slide the breaker into the disconnected condition.
   - Close the new door and secure it to the compartment.
   - Rack-in the new retrofitted Emax 2 Retrofill circuit breaker.
   - For ordering the new door depending on door size refer to document 2TSA451008P0000

3. To install OEM Door Adaptor Follow the instructions below:
   - De-energize/switch off the LVS section that is to be retrofitted.
   - Open the compartment door that is to be retrofitted.

Figure 58
- Rack out & Remove the existing legacy WavePro breaker from the LVS.
- Unpack the new door Adaptor kit assembly
- Modify the door cut out as per the new door cutout template.
- Check the through-door racking with the new door assembly.
- Insert the new retrofitted Emax 2 Retrofill circuit breaker into the compartment and slide the breaker into the disconnected condition.
- Close the door and secure it to the compartment.
- Rack-in the new retrofitted Emax 2 Retrofill Breaker.
- For detail instructions refer document 2TSE431967R1000, 2TSE431968R1000 & 2TSE431996R1000

Figure 59
OEM Adaptor (Show as Example)
Install AKD-10, Neutral Sensing for 4 Wire Ground Fault

### Danger

- 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.

31 - Neutral CT Adapter upto 5000A

This is a miniature Rogowski coil. It mounts on the breaker between the breaker's Neutral Disconnect 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, Emax 2 TU rated from 250 to 5000 Amps as used in GE switchboards and switchgear from 1979-2015. It is available in seven variations (shown in table below).

<table>
<thead>
<tr>
<th>Kit Number</th>
<th>Supported Neutral CT ratings</th>
<th>Supported T.U.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCTA0250</td>
<td>250A</td>
<td>Ekip</td>
</tr>
<tr>
<td>ENCTA0800</td>
<td>400A,800A</td>
<td>Ekip</td>
</tr>
<tr>
<td>ENCTA1200</td>
<td>600A,1200A</td>
<td>Ekip</td>
</tr>
<tr>
<td>ENCTA1000</td>
<td>1000A</td>
<td>Ekip</td>
</tr>
<tr>
<td>ENCTA3200</td>
<td>1600A,3200A</td>
<td>Ekip</td>
</tr>
<tr>
<td>ENCTA4000</td>
<td>2000A,4000A</td>
<td>Ekip</td>
</tr>
<tr>
<td>ENCTA5000</td>
<td>2500A,5000A</td>
<td>Ekip</td>
</tr>
</tbody>
</table>
32 - Procedures

For Detail instructions on NCT Adaptor refer installation manual No 2TSA451018P0000

NEUTRAL CT ORIENTATION
- 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 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.
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.

Figure 61: Wiring with pin number diagram for Wave-Pro Retrofill
WavePro 4000A, Fan Control Unit Wiring & Trip unit Programming
instructions

Wiring Diagram
- Follow the below circuit diagram to make the connections between the 2k-1 signalling unit, relay and fans.
- Refer Relay diagram & 1SDH001000R0524 to identify the terminal marking in circuit diagram.
- Note: U1 & U2 Emax 2 motor operator (120 V~) terminal.
- NOTE 1: In the absence of motor or if motor voltage rating is different than 120 V~, connect 120 V directly to T1 and T2.

Figure 60

Figure 61
Figure 62: Wiring of WP 4000A breaker with FAN control unit

Routing wire to the fans
31 - Connecting Ekip Touch

Connect Ekip Touch or Hi Touch Trip unit using Ekip connect 3.0.357.9 (or later) software and Ekip T&P unit.

Figure 63

Scan devices

- Connect your device by selecting one of the available communication channels.
- Found devices.
Synchronizing 2K-1 signalling module with the trip unit

- The activation of local bus – essential to start the communication between the module and the Trip unit.

Once the local bus is activated 2K module should synchronize with the Ekip touch trip unit.

Check the following for synchronization status.

Power LED reports ON status and correct communication with Ekip Touch:

- Off: module off
- Fixed or flashing light synchronized on power LED of Ekip Touch: module ON and communication with Trip unit present
- Flashing not synchronized with power LED of Ekip Touch (two fast flashes per second): module ON and communication with Trip unit absent

If the Ekip Signalling 2K module is detected correctly by Ekip Touch the specific configuration area in the Modules Settings menu is activated.

For each Ekip Signalling 2K module detected by Ekip Touch, a specific menu is available containing the submenus of all the available and configurable inputs and outputs.
The current thresholds allow you to set controls on current lines, to be combined with the programmable contacts of the Ekip Signalling modules.

Two pairs of programmable contacts are available:

- Threshold 1 I1 and Threshold 2 I1, with control referred to I1
- Threshold Iw1 and Threshold Iw2, with control referred to In

For fan control configure Iw1 and Iw2.

Considering 4000A as a rated current (In), fans will activate when the current crosses 3600 amps & will stop if the current drops below 3400 amps.

<table>
<thead>
<tr>
<th>Threshold Iw1</th>
<th>Enable: Activate protection and availability of protection threshold on menu</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direction: enables you to choose to have the signal when the current is higher (Up) or lower (Down) than the threshold.</td>
<td>Down</td>
</tr>
<tr>
<td></td>
<td>Threshold: The value is expressed both as an absolute value (Ampere) and as a relative value (In), settable in a range: 0.1 In .. 10 In, with 0.01 step In</td>
<td>3 In</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threshold Iw2</th>
<th>Enable: Activate protection and availability of protection threshold on menu</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direction: enables you to choose to have the signal when the current is higher (Up) or lower (Down) than the threshold.</td>
<td>Up</td>
</tr>
<tr>
<td></td>
<td>Threshold: The value is expressed both as an absolute value (Ampere) and as a relative value (In), settable in a range: 0.1 In .. 10 In, with 0.01 step In</td>
<td>3 In</td>
</tr>
</tbody>
</table>
The output of 2K-1 module consists of 2 contacts K11-K12 and K13-K14. Configure these two output contacts as per following to control the fans.
The output of 2K-1 module consists of 2 contacts K11-K12 and K13-K14. Configure these two output contacts as per following to control the fans.

Autotest command that activates the automatic sequence of output tests (contacts and LEDs) and input test (LED), and includes the following operations:

1. Reset output contacts (= open) and LEDs (= off).
2. Turn on all the LEDs in sequence (output and input)
3. Closure and shutdown of the two output contacts in sequence, switching on the relative LEDs.
4. Restore initial conditions

The Autotest command closes the contacts regardless of the configuration set by the user.
<table>
<thead>
<tr>
<th>Overhaul</th>
<th>ECN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>ECN000122590</td>
<td>Second version</td>
</tr>
</tbody>
</table>
You can find the address of your local sales organisation on the ABB home page.

http://new.abb.com/low-voltage/service/service-breakers-switches