



FIELD INSTALLATION GUIDE

Circuit breaker cubicle



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Introduction

This document details the installation and removal of auxiliary position contacts, compartment shutter, Emax terminal blocks/modules, circuit breaker cradle, stab tips, or current transformers within ReliaGear LV SG circuit breaker compartments.

Prior to performing any work on the equipment, ensure the equipment is deenergized and the circuit breaker is removed from the cubicle in which work is to be performed.

Hazard classifications

Read the following hazard classifications carefully, and fully inspect the equipment for any identifiable hazards prior to installation, operation, or maintenance. The following classifications listed below will appear throughout this document or on labels located on the equipment. These are standard symbols defined by ANSI Z535.4-2011 which were established for recognition of potential hazards which pose risk to life and property. The classification is based on the probability and severity of injury if the hazard is not avoided. Please follow instructions, warnings, labels, and codes for proper installation, operation, and maintenance of equipment and devices. Only Qualified Persons, as defined by NFPA 70, should provide installation, operation, and maintenance on this equipment and devices.

Danger symbol/Warning symbol

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists that will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential physical injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Notice is used to address practices not related to physical injury.

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, 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 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 herein. No warranties of merchantability or fitness for purpose shall apply.

Component/sub-system removal for E1.2

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01
Cradle and mounting
hardware

The following procedure shall be utilized to remove auxiliary position contacts, compartment shutter, Emax terminal blocks/modules, circuit breaker cradle, stab tips, or current transformers mounted within a ReliaGear LV SG breaker cubicle. To remove items such as Stab Tips, all preceding steps must be followed prior to these parts being removed. These instructions are intended for use by qualified personnel only.



DANGER: Electrical arc flash hazard. Personal protection equipment required. Turn off power to the equipment before working inside.

Auxiliary position contacts - AUP

To remove the cradle from the circuit breaker compartment, first optional accessories must be removed including the Auxiliary Position Contacts (AUP).

Steps to install the AUP if provided are shown within document 1SDH000999R0603. To remove, steps are to be followed in reverse order. Once removed, the AUP and mounting provisions are to be retained for re-assembly.

Emax terminal blocks and modules

Secondary wiring modules on the top of the Emax cradle which connects wiring from the breaker to devices within the switchgear must be removed.

NOTICE

NOTICE: Module location should be marked/noted prior to removal for ease of re-assembly.

Document 1SDH000999R0820 depicts the steps required to install the modules, steps are to be followed in reverse order. Modules may be removed by retaining the wires within the module and sliding the module towards the front of the equipment. An alternate approach is to remove the individual wires which connect to the module and leaving the modules installed on the cradle.

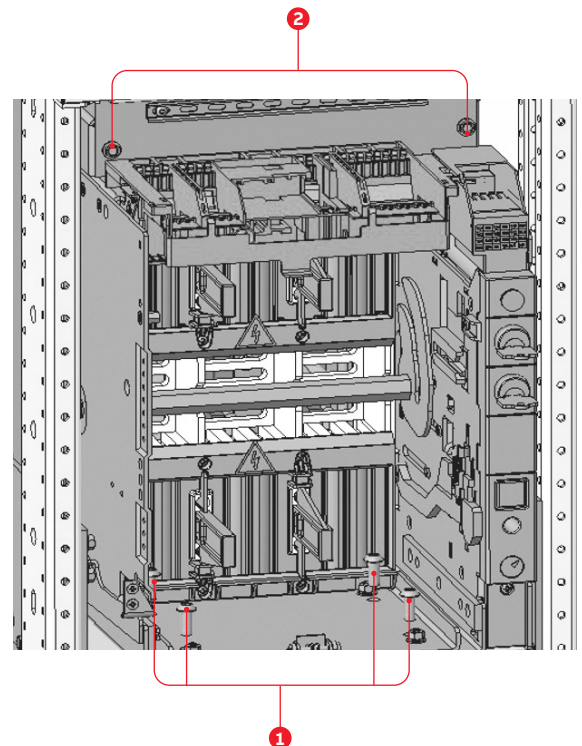
Compartment shutters

Shutters which prevent access to the primary stab tips are to be removed from the inside of the cradle. Shutters are secured using a series of bolts as depicted within document 1SDH001399R0717. Once loosened, top and bottom shutters are to be removed and retained for re-assembly.

Emax Cradle

To remove the cradle from the cubicle a series of bolts secure the cradle to the floor. Location of these bolts are depicted within document 1SDH000999R0820.

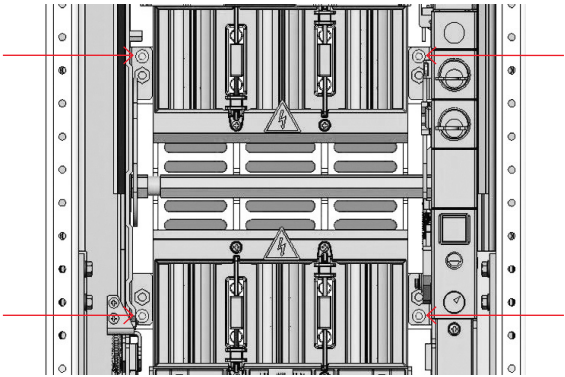
To remove the cradle from the cubicle a series of taptites secure a steel cover plate in front of the cradle. Hardware is to be retained for re-assembly.



1. Bolts securing cradle to floor
2. Taptites securing steel cover plate

- 02 Hardware securing cradle to rear brace
- 03 Hardware securing rear brace to stab tips
- 04 Hardware securing stab tips to busbars

To remove the cradle from the cubicle a series of bolts secure the cradle to the rear bracing within the cradle. Hardware securing the cradle to the rear bracing as depicted below is to be retained for re-assembly.

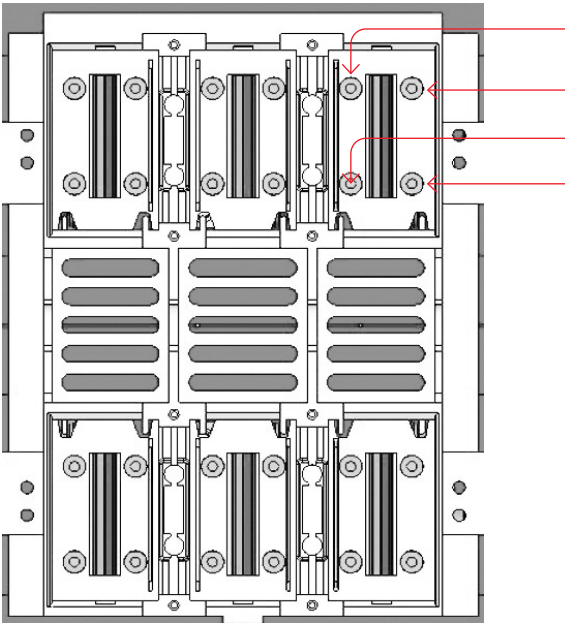


— 02

Once all hardware is removed, the cradle may be removed from the cubicle, retain the cradle for re-assembly.

Stab tip bracing

The remove stab tip bracing, a series of bolts secure the bracing to the front face of the stab tips.

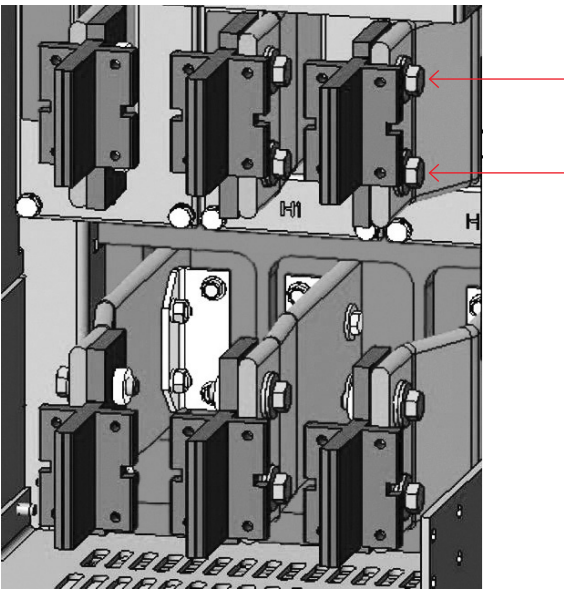


— 03

The stab tip bracing may be removed by pulling the brace towards the front of the compartment. Retain the brace and hardware for re-assembly.

Stab tips

To remove the stab tips, loosen the bolts which secure the stab tip to the run-in busbars. Bolts securing the stab tips to run-in busbars are shown below.



— 04

NOTICE **NOTICE:** Note stab tip placement and orientation relative to busbars for A/B/C phases and location (upper and lower) to ensure proper placement and orientation.

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05
Compartment CT's and
mounting hardware

Remove stab tips and associated bolts and washers, retain for re-assembly.

Compartment current transformers

Compartment Current Transformers (CTs,) if installed, may be positioned on the upper or lower run-ins or runbacks. To remove the CTs, first the nuts securing ring terminals must be removed, located on the end of the CT marked as (1).



WARNING

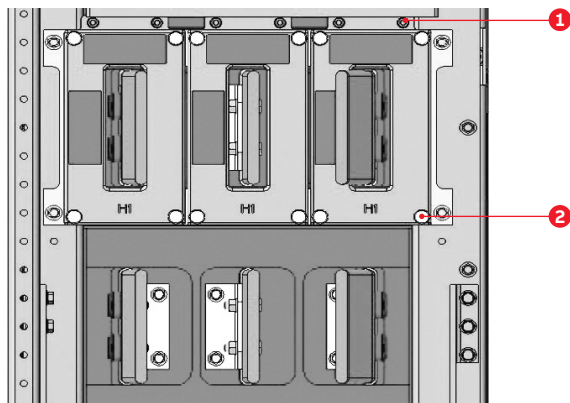
WARNING: Connect CT terminal leads together prior to removal to prevent potential high voltage.



NOTICE

NOTICE: Mark CT terminal leads to ensure proper pairing with CT polarity for re-assembly.

Next bolts which secure the CT to the support must be removed (2). Remove the middle CT first, then left and right CTs, if applicable.



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05

CT supports, if provided, are to remain installed within the cubicle.

Component/sub-system reinstallation for E1.2

06

Setting stab tip height
before securing
to busbars

The following procedure shall be utilized to reinstall the auxiliary position contacts, compartment shutter, Emax terminal blocks/modules, circuit breaker cradle, stab tips, or current transformers mounted within a ReliaGear LV SG breaker cubicle. Instructions depict reassembly from the lowest level entity. These instructions are intended for use by qualified personnel only.

**DANGER**

DANGER: Electrical arc flash hazard. Personal protection equipment required. Turn off power to the equipment before working inside.

Compartment current transformers

To re-install current transformers slide the individual current transformer over the busbars and secure to the support using the bolts, lock washers, and washers from prior disassembly. Where applicable install and wire left and right CTs before installing the middle CT.

CTs when installed on upper run-ins are to be oriented with the CT terminal pointed upwards whereas CTs when installed on lower runbacks are to be oriented with terminals pointed down. Ensure the CT is oriented correctly by referencing the polarity mark near the rating label.

The connection between the CTs and mounting base are to be torqued to 7 to 10 ft-lbs.

Remove the ring terminal shunt and re-connect the ring terminal for each of the CTs making note to re-install terminals based upon marked polarity of the CT. The CT terminal connection is to be torqued to a maximum value of 14 in-lbs.

**CAUTION**

CAUTION: Overtightening of CT terminals or CT mounting bolts may result in damage to the insulating housing.

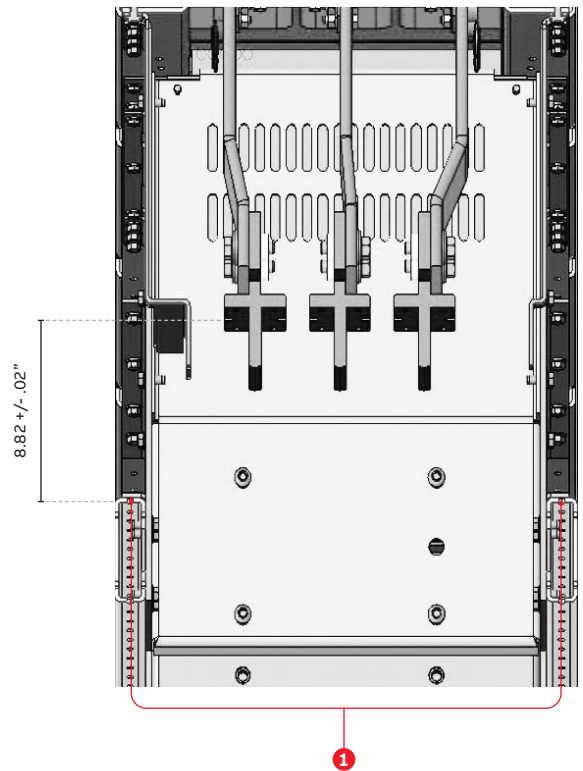
Stab Tips

To reinstall the stab tips proceed one by one, phase by phase positioning the stab tip against the busbar. Stab tips are to be re-installed in the location they were removed with the same surfaces interfacing between stab tip and busbar.

NOTICE

NOTICE: If stab tips are not oriented correctly in assembly, stab tip bracing and the cradle cannot be reinstalled.

Set the height of each stab tip at 8.82" +/- .02" with respect to the front face of the stringer (1) as shown below. Hardware connecting busbars to stab tips are to be torqued to 20-25 ft-lbs.

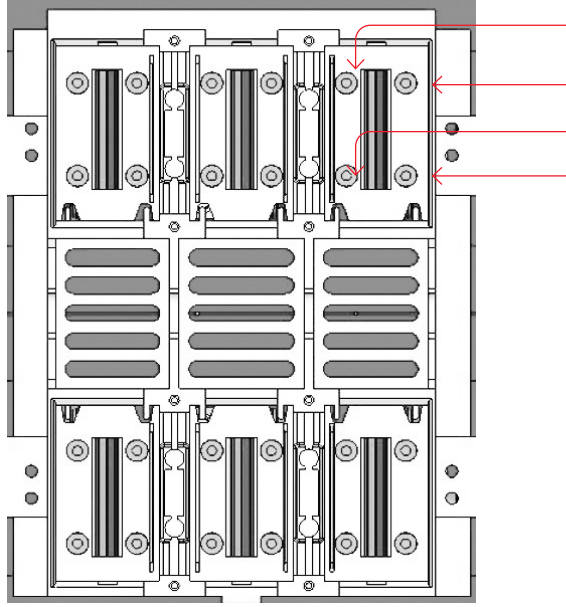


06

Stab tip bracing

To reinstall the stab tip bracing, slide the brace over the stab tips and tighten using hardware retained during removal. Torque all hardware to 7 to 8 ft-lbs.

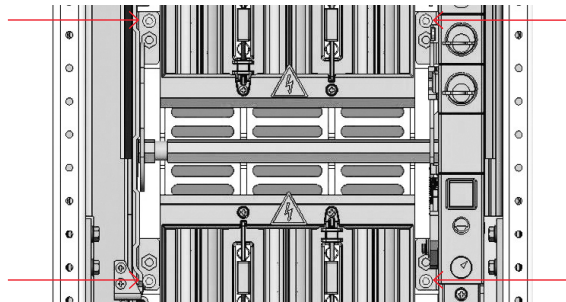
- 07
Hardware securing rear
brace to stab tips
- 08
Hardware securing
cradle to rear brace
- 09
Hardware securing
shutters to compartment



07

Emax Cradle

Slide the Emax Cradle into the compartment. Ensure the back surface of the cradle rests on the front surface of the stab tip bracing to confirm the cradle is positioned correctly. Replace the hardware securing the cradle to the upper and lower stab tip braces and torque to 76 in-lbs (6 ft-lbs) per document 1SDH000999R0820 and as shown below. Secure the cradle the compartment floor using a new bolt (Part #: 3100369458P001) as the thread locking nylon patch is intended as a single use. An alternate is to utilize non-permanent thread locking compound to ensure the hardware does not loosen under vibration. Bolts are to be torqued to 9 ft-lbs.



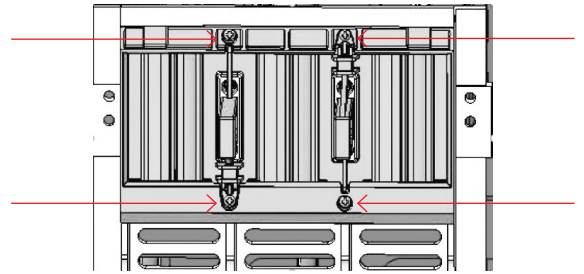
08

NOTICE

NOTICE: Bolts securing the cradle to the floor are not to have a flat washer or lock-washer under the bolt head as this can interfere with breaker operation.

Compartment Shutters

Compartment shutters can be re-installed within the compartment. Document 1SDH001399R0717 depicts the procedure required.



09

Emax terminal blocks and modules

Secondary wiring modules on the top of the Emax cradle which connects wiring from the breaker to devices within the switchgear can now be reinstalled into the cradle.

Document 1SDH000999R0820 depicts how to install the terminal blocks and modules, refer to the As-Built documentation for wire locations.

Auxiliary position contacts – AUP

Lastly, if required, the AUP is to be re-installed within the compartment per document 1SDH000999R0603.

Confirmation of functionality

Prior to re-energization of the equipment, please reference the Installation, Operations and Maintenance Manual for a thorough final check. Confirm function of the installation by installing an Emax circuit breaker within the cubicle. The device should be racked in from the disconnect to connected positions to confirm the breaker can transition between stages.

Component/sub-system removal for E2.2, E4.2, E6.2

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10
Stab tip bracing and
mounting hardware

The following procedure shall be utilized to remove auxiliary position contacts, compartment shutter, Emax terminal blocks/modules, circuit breaker cradle, stab tips, or current transformers mounted within a ReliaGear LV SG breaker cubicle. To remove items such as Stab Tips, all preceding steps must be followed prior to these parts being removed. These instructions are intended for use by qualified personnel only.



DANGER

DANGER: Electrical arc flash hazard. Personal protection equipment required. Turn off power to the equipment before working inside.

Auxiliary position contacts - AUP

To remove the cradle from the circuit breaker compartment, first optional accessories must be removed including the Auxiliary Position Contacts (AUP).

Steps to Install the AUP if provided are shown within document 1SDH001000R0603. To remove, steps are to be followed in reverse order. Once removed, the AUP and mounting provisions are to be retained for re-assembly.

Emax terminal blocks and modules

Secondary wiring modules on the top of the Emax cradle which connects wiring from the breaker to devices within the switchgear must be removed.

NOTICE

NOTICE: Module location should be marked/noted prior to removal for ease of re-assembly.

Document 1SDH001400R0830 depicts the steps required to install the modules, steps are to be followed in reverse order. Modules may be removed by retaining the wires within the module and sliding the module towards the front of the equipment. An alternate approach is to remove the individual wires which connect to the module and leaving the modules installed on the cradle.

Compartment shutters

Shutters which prevent access to the primary stab tips are to be removed from the inside of the cradle. Shutters are secured using a series of bolts as depicted within document 1SDH001400R0831. Once loosened, top and bottom shutters are to be removed and retained for re-assembly.

Emax cradle

To remove the cradle from the cubicle a series of bolts secure the cradle to the floor and rear bracing within the cradle. Location of these bolts are depicted within document 1SDH001400R0830. Hardware securing the cradle to the rear bracing as depicted is to be retained for re-assembly.

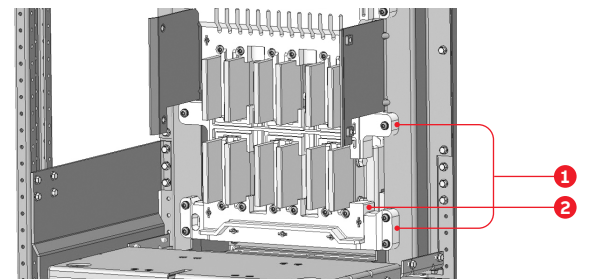
NOTICE

NOTICE: Bolts securing the cradle to the floor are to be discarded and replaced with ABB Part # 3100369458P001 upon re-assembly.

Once all hardware is removed, the cradle may be removed from the cubicle, retain the cradle for re-assembly.

Stab tip bracing

To remove stab tip bracing, a series of bolts secure the bracing to the compartment deadfronts as well as the front face of the stab tips.

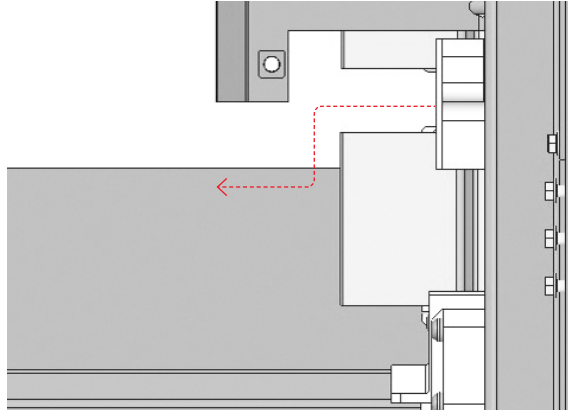


1. Screws securing bracing to steel deadfronts
2. Screws securing bracing to stab tips

- 11
Method to remove
middle brace
- 12
Hardware securing
stab tips to busbars
- 13
Compartment CT's and
mounting hardware

The upper and lower braces may be removed by first removing the screws which secure it and then pulling the brace towards the front of the compartment.

The middle brace, provided for E2.2 and E4.2 2000 A and below compartments may be removed by removing the screws which secure it, pulling forward past the front surface of the stab tips and then pushing down as indicated in Figure 2.



11

All steel barriers are to remain installed within the cubicle. Retain the bracing and hardware for re-assembly.

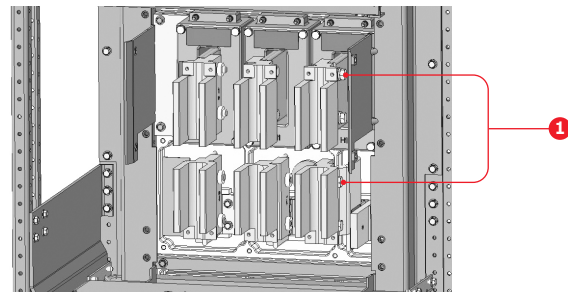
Stab tips

To remove the stab tips, loosen the bolts which secure the stab tip to the run-in busbars. Depending upon the rating of the breaker, the number of bolts required to remove the stab tip may differ.

Bolts securing the stab tips to run-in busbars are shown in Figure 03.

NOTICE

NOTICE: Note stab tip placement and orientation relative to busbars for A/B/C phases and location (upper and lower) to ensure proper placement and orientation.



12

Remove stab tips and associated bolts and washers, retain for re-assembly.

Compartment current transformers

Compartment Current Transformers (CTs,) if installed, may be positioned on the upper or lower runins or runbacks. To remove the CTs, first the nuts securing ring terminals must be removed, located on the end of the CT marked as (1).

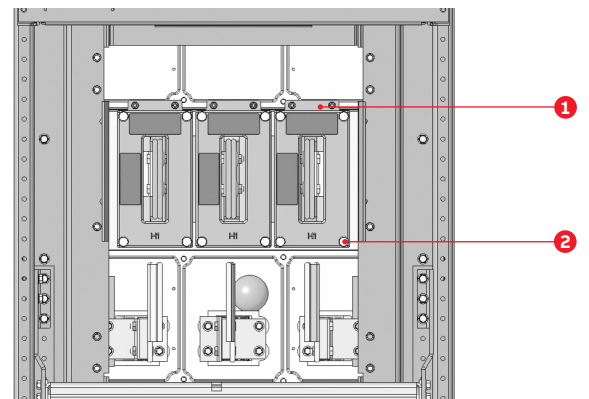
WARNING

WARNING: Connect CT terminal leads together prior to removal to prevent potential high voltage.

NOTICE

NOTICE: Mark CT terminal leads to ensure proper pairing with CT polarity for re-assembly.

Next bolts which secure the CT to the support must be removed (2).



- 1. Nuts securing Ring Terminals to CT
- 2. Bolts securing CT to support

13

CT supports, if provided, are to remain installed within the cubicle.

Component/sub-system reinstallation for E2.2, E4.2, E6.2

14
Stab tip brace
mounting surface

The following procedure shall be utilized to reinstall the auxiliary position contacts, compartment shutter, Emax terminal blocks/modules, circuit breaker cradle, stab tips, or current transformers mounted within a ReliaGear LV SG breaker cubicle. Instructions depict reassembly from the lowest level entity. These instructions are intended for use by qualified personnel only.



DANGER: Electrical arc flash hazard. Personal protection equipment required. Turn off power to the equipment before working inside.

Compartment current transformers

To re-install current transformers slide the individual current transformer over the busbars and secure to the support using the bolts, lock-washers, and washers from prior disassembly.

CTs when installed on upper runins are to be oriented with the CT terminal pointed upwards whereas CTs when installed on lower runins or runbacks are to be oriented with terminals pointed down. Ensure the CT is oriented correctly by referencing the polarity mark near the rating label.

The connection between the CTs and mounting base are to be torqued to 7 to 10 ft-lbs.

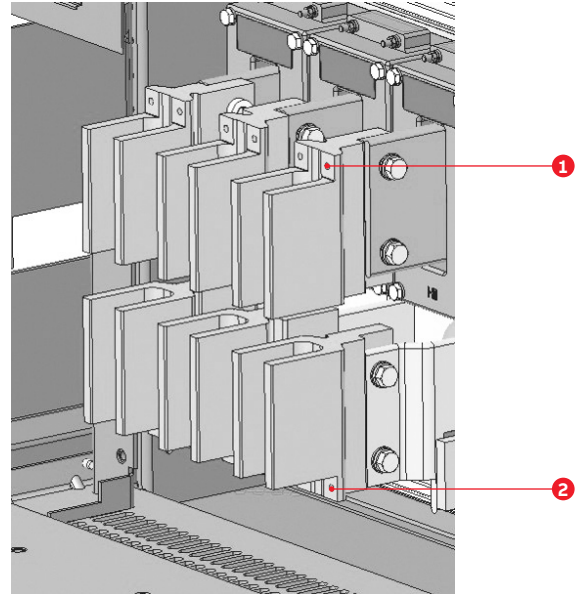
Remove the ring terminal shunt and re-connect the ring terminal for each of the CTs making note to re-install terminals based upon marked polarity of the CT. The CT terminal connection is to be torqued to a maximum value of 14 in-lbs.



CAUTION: Overtightening of CT terminals or CT mounting bolts may result in damage to the insulating housing.

Stab tips

To reinstall stab tips proceed one by one, phase by phase positioning the stab tip against the busbar. For stab tips on upper runins, the threaded holes which interface to the stab tip brace should be on the top side of the stab tip (1), for lower runins/runbacks, this surface should be on the bottom side of the stab tip (2).



14

Stab tips are to be re-installed in the location they were removed with the same surfaces interfacing between stab tip and busbar.

NOTICE

NOTICE: If stab tips are not oriented correctly in assembly, stab tip bracing and the cradle cannot be re-installed.

Start each of the bolts which secure the stab tip to the busbars but do not tighten beyond finger tight. These will be torqued to specification at a later step.

Stab tip bracing

Upper and lower stab tip bracing

To re-install stab tip bracing, proceed by locating the top stab tip brace. Orient the brace such that the stab tip sits within the pockets on the backside of the brace. Secure brace to the sheet metal deadfront parts with previously removed hardware.

The connection between the stab tip brace and sheet metal deadfronts are to be torqued to 7 to 10 ft-lbs.

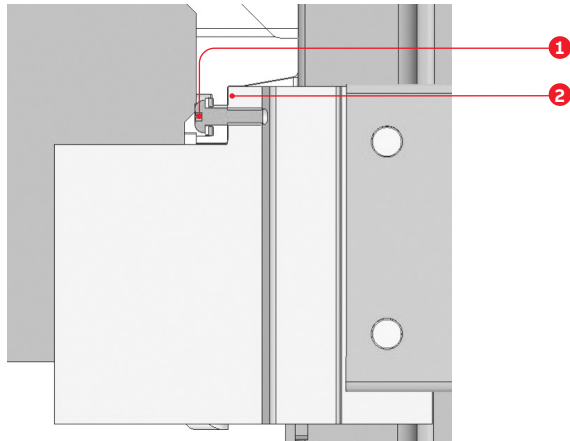
—
15
Stab tip fully
seated against rear
surface of brace

—
16
Locations to confirm
plumb and level
of stab tips

—
17
Middle brace installation
orientation

—
18
Method to install
middle brace

Once the upper stab tip brace is installed to the deadfront, install the $\frac{1}{4}$ -20 bolts which secure the stab tip brace to the stab tip (1). In order to maintain proper engagement between the breaker finger cluster assemblies and stab tips, proceed one stab tip at a time by pulling the stab tip toward the front of the cubicle while threading the $\frac{1}{4}$ -20 bolt by hand. This will cause the stab tip to fully seat against the stab tip brace (2).

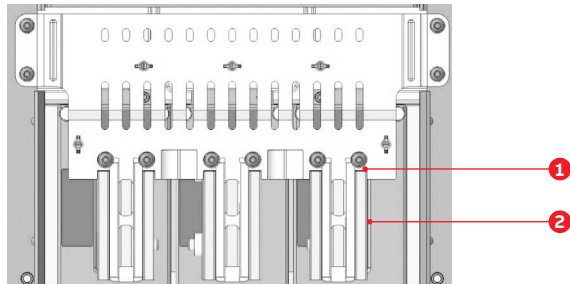


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15

Once the stab tip is fully seated against the brace, ensure it is level and plumb.

To Confirm Level - place a spirit level across the top surface of the stab tip (1). the stab tip should be fully seated vertically within the stab tip brace.

To Confirm Plumb – place the spirit level across the vertical surface of the stab tip (2).



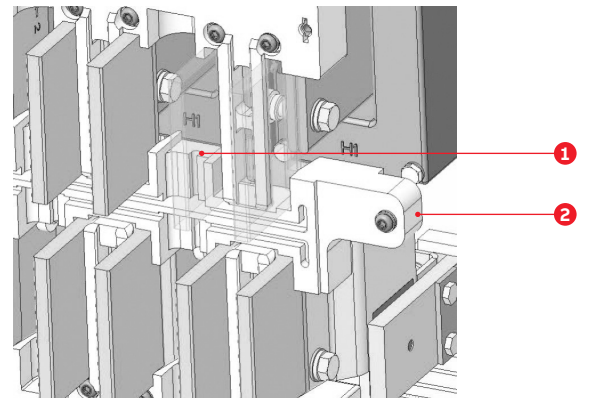
—
16

The connection between the stab tip brace and stab tips are to be torqued to 7 to 8 ft-lbs. Once one stab tip is secured and torqued to specification, the next stab tip can be connected using the same process.

Repeat this process for the lower stab tip bracing to secure it both to the deadfronts and individual stab tips. Hardware connecting busbars to stab tips are to be torqued to 20-25 ft-lbs.

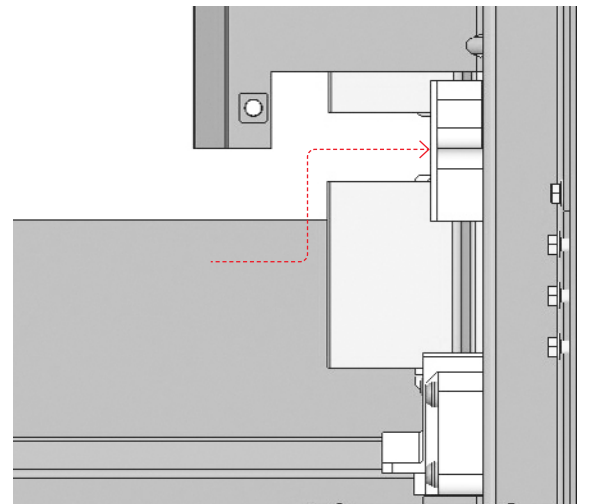
Middle stab tip bracing

To reinstall the middle stab tip brace for E2.2 and E4.2 2000 A and below compartments, first orient the component to have the pockets between phases marked as (1) oriented to face the front of the compartment. The mounting surface (2) should be oriented to be on the top side to ensure the overlap between the middle brace and stab tips are equal for the top and bottom set of stab tips.



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17

The middle brace may be installed by pushing the brace up through the steel deadfront and then back to seat around the stab tips as indicated in Figure 09.



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18

Secure the middle brace to the sheet metal deadfronts with previously removed hardware. The connection between the middle brace and sheet metal deadfronts are to be torqued to 7 to 10 ft-lbs.

Emax cradle

Slide the Emax Cradle into the compartment. Ensure the back surface of the cradle rests on the front surface of the upper and lower stab tip braces to confirm the cradle is positioned correctly. Replace the hardware securing the cradle to the upper and lower stab tip braces and torque to 76 in-lbs (6 ft-lbs) per document [1SDH001400R0830](#).

Secure the cradle the compartment floor using a new bolt (Part #: 3100369458P001) as the thread-locking nylon patch is intended as a single use. An alternate is to utilize non-permanent thread-locking compound to ensure the hardware does not loosen under vibration. Bolts are to be torqued to 9 ft-lbs.

NOTICE: Bolts securing the cradle to the floor are not to have a flat washer or lock-washer under the bolt head as this can interfere with breaker operation.

Compartment shutters

Compartment shutters can be re-installed within the compartment. Document [1SDH001400R0831](#) depicts the procedure required. Note that some breaker frames have unique upper or lower shutter assemblies and will not function if installed in the incorrect location.

Emax terminal blocks and modules

Secondary wiring modules on the top of the Emax cradle which connects wiring from the breaker to devices within the switchgear can now be re-installed into the cradle.

Document [1SDH001400R0830](#) depicts how to install the terminal blocks and modules, refer to the As-Built documentation for wire locations.

Auxiliary position contacts - AUP

Lastly, if required, the AUP is to be re-installed within the compartment per document [1SDH001000R0603](#).

Confirmation of functionality

Prior to re-energization of the equipment, please reference the Installation, Operations and Maintenance Manual for a thorough final check. Confirm function of the installation by installing an Emax circuit breaker within the cubicle. The device should be racked in from the disconnect to connected positions to confirm the breaker can transition between stages.

Refer to the Installation, Operations and Maintenance Manual for ReliaGear LV SG, [1VAL106901-MB](#), for additional testing and inspection that may be required for breaker frame sizes E1.2, E2.2, E4.2, and E6.2.

If more assistance is required, contact ABB Service: North America Customer Service Center: 1-800-HELP-365 (1-800-435-7365) Outside USA and Canada: +1 440 585 7804 Email: contact.center@us.abb.com

Reference document list

Installation manuals additional technical information, instructions and installation manuals can be found in the following documents:

Emax Breaker Frame Size E1.2

[1SDH000999R0603](#) - Emax Auxiliary Position Contacts (AUP) Assembly Instructions
[1SDH000999R0820](#) - Emax Cradle and Terminal Installation
[1SDH001399R0717](#) - Emax Compartment Shutter Installation

Emax Breaker Frame Sizes E2.2, E4.2, E6.2

[1SDH001000R0603](#) – Emax Auxiliary Position Contacts (AUP) Assembly Instructions
[1SDH001400R0830](#) – Emax Cradle and Terminal Installation
[1SDH001400R0831](#) – Emax Compartment Shutter Installation

[1VAL106901-MB](#) – ReliaGear LV SG Installation Operations and Maintenance Manual for E1.2, E2.2, E4.2, E6.2

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