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OCTOBER 2023

# Eagle

## Self powered single-phase recloser

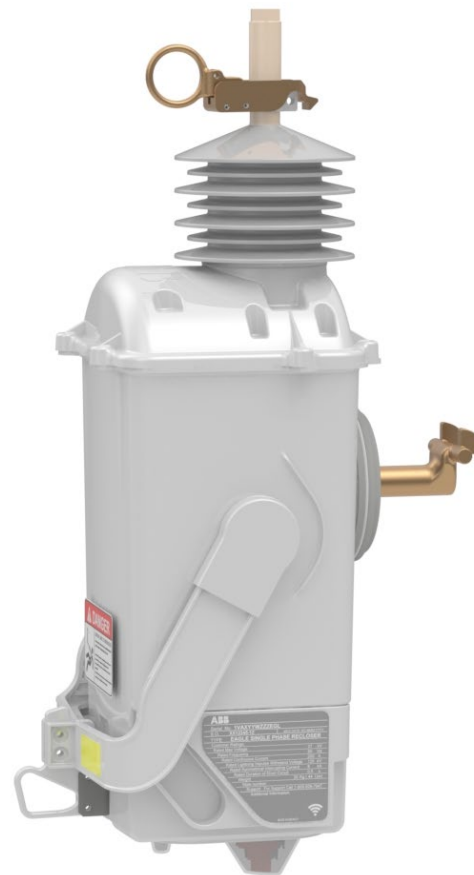
9AKK108468A7313 REV A OCTOBER 2023



# Eagle

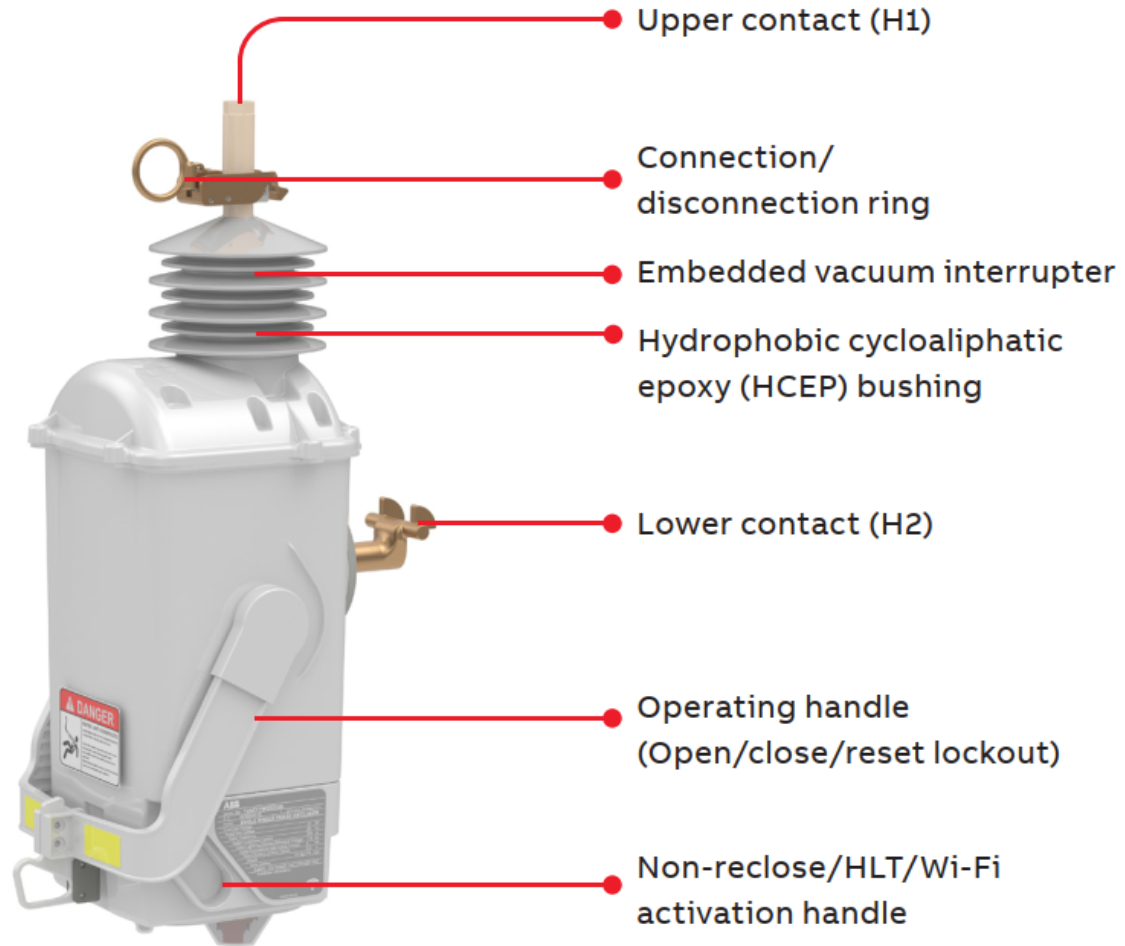
Self powered, single-phase, vacuum interrupting recloser for up to 27kV

- 15 / 27kV
- 125 kV BIL
- 200 A continuous current
- **8 kA interrupting duty**
- IEEE C37.60 / IEC 62271-111 single phase recloser classification
- **3 reclosing shots**
- 10,000 mechanical operations
- Self powered
- No battery - no maintenance
- Arc-free design
- **Manual open/close operation**
- **Encrypted, wireless communication for local operation and data retrieval**
- **Flexible mounting options**
- Simple, platform independent, web browser-based HMI



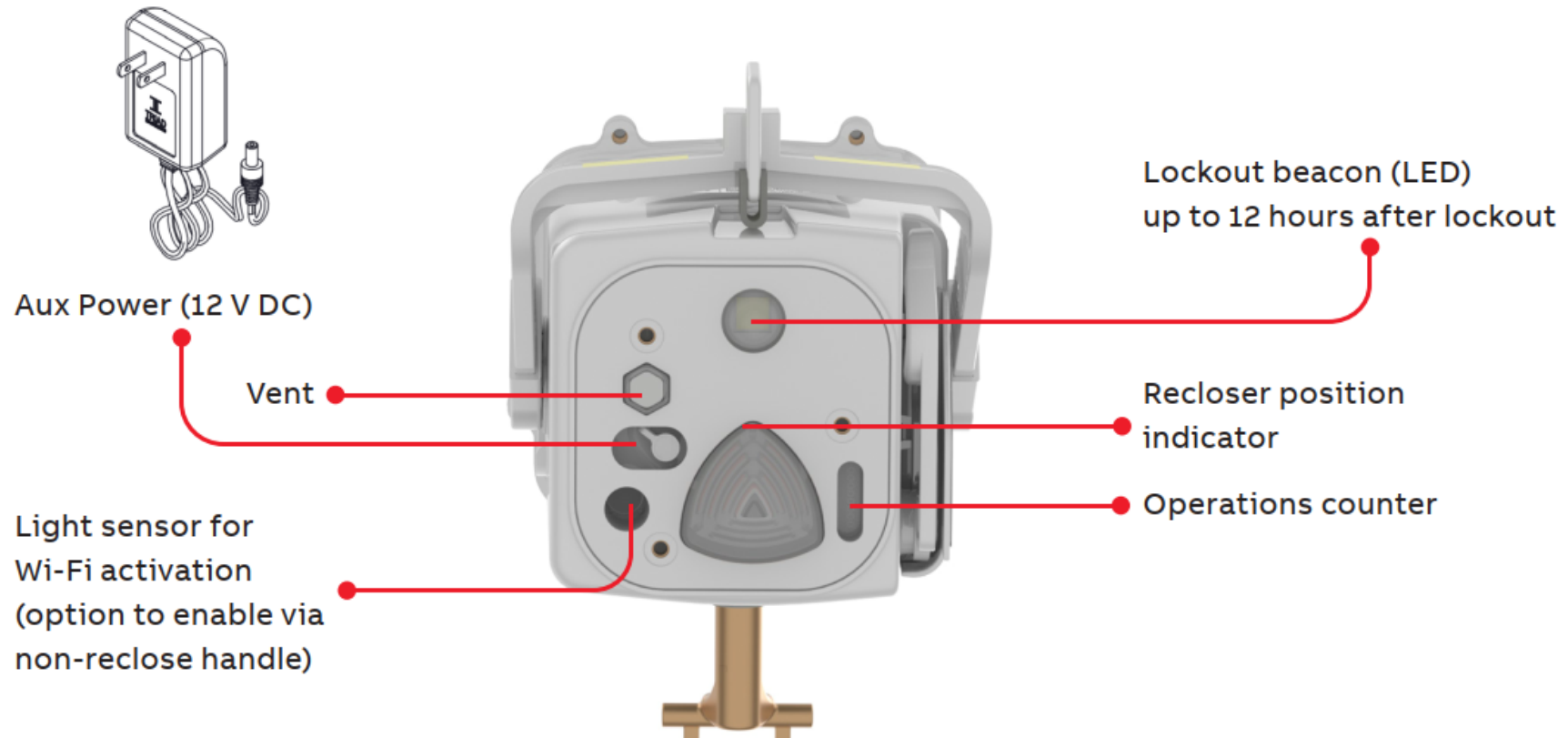
# Interfaces

Intuitive and easy to use



# Interfaces

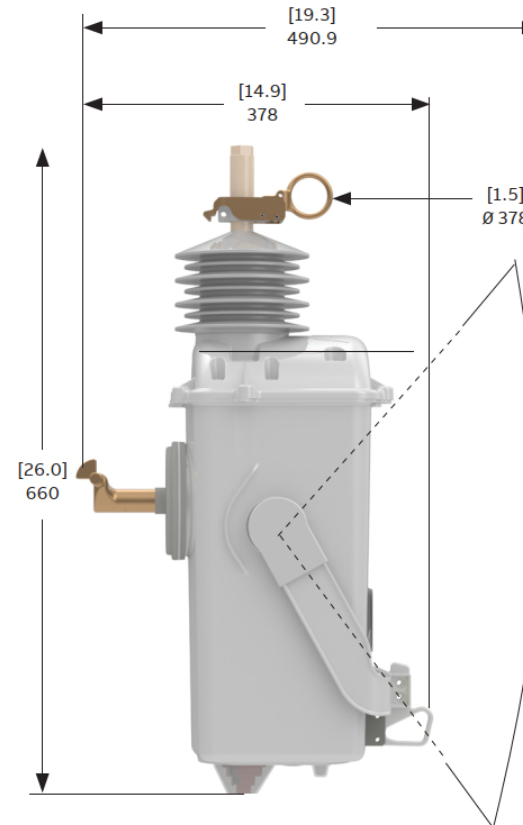
Intuitive and easy to use





# Dimensions

Eagle recloser dimensions



Note: Dimensions shown on drawings above are in mm [in].

# Where and how is ABB Eagle deployed?

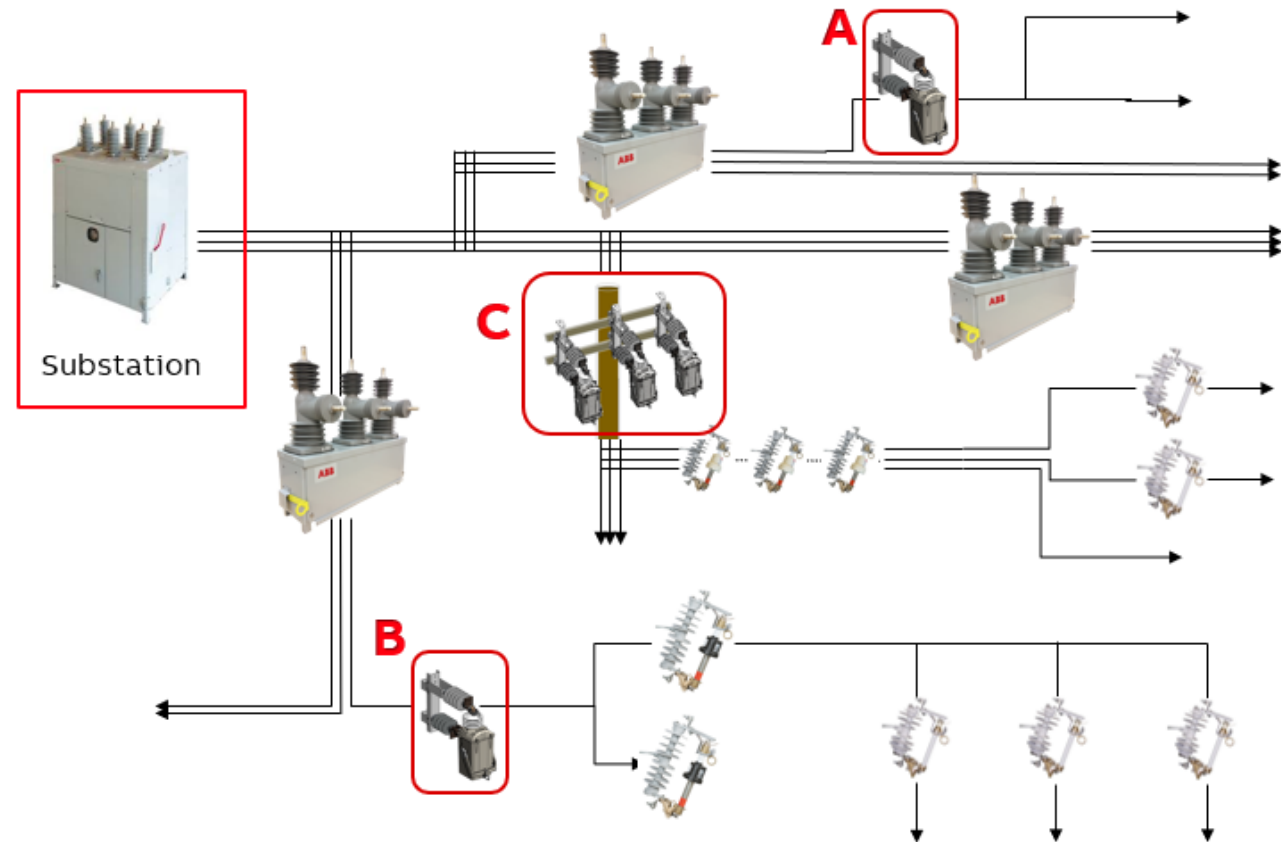
## Application on a Typical Distribution Feeder

### Single phase laterals

- A** Replacing fuse cutouts at the worse performing areas in the feeder.
- B** Retrofitting traditional hydraulic reclosers that are either demanding heavy maintenance or approaching the end of its life.

### Three phase laterals

- C** Employing Eagle on lightly loaded feeders as a substitute for three phase reclosers (leveraging the robust ratings and recloser based type testing).



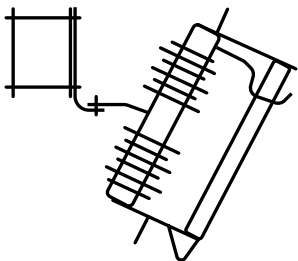


# Recloser Mounting

Retrofitting fused cutouts and hydraulic reclosers

## Cutout style fuse replacement

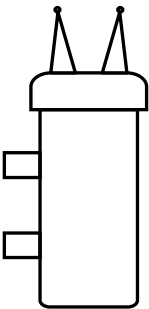
- Wants cutout style leaning mount
- Values visual disconnection
- Cares about weight of the unit
- End of the 1-ph feeder
- Wants low current performance and rating



VS

## Hydraulic recloser retrofit

- Wants double insulator pole mount
- Ok with indicator cup
- Weight is not a big concern
- Start to midway of 1-ph feeder
- Wants higher current and interruption rating

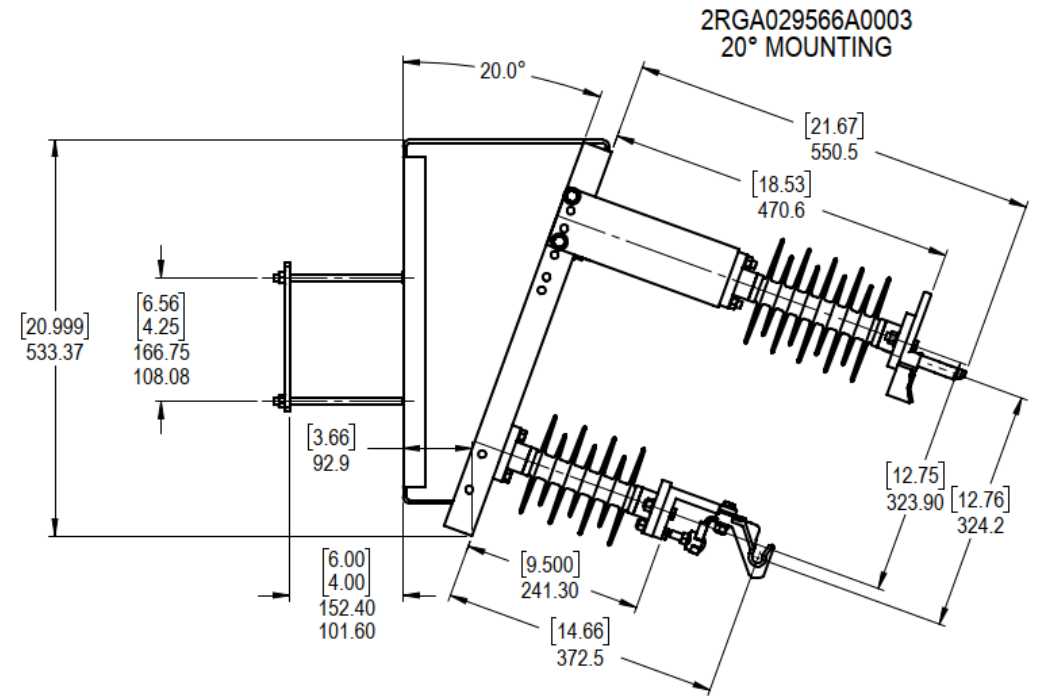
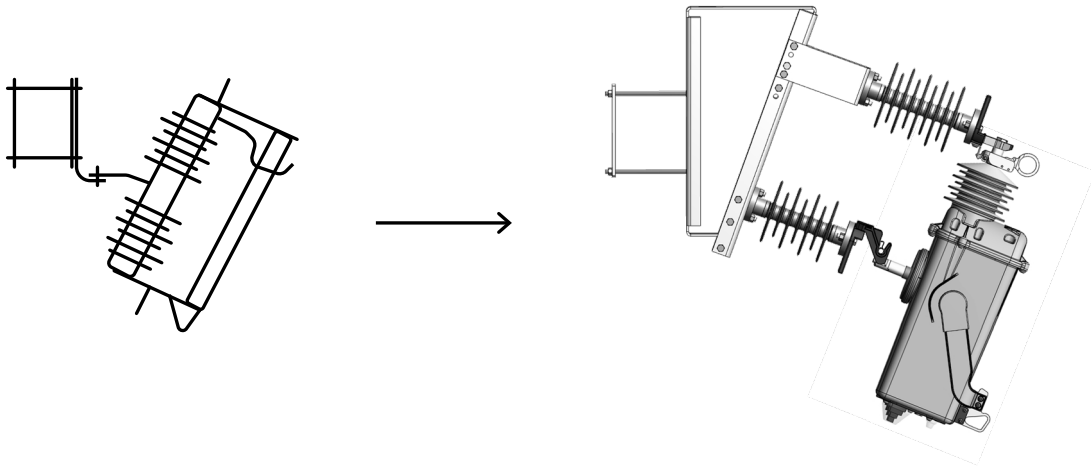


# Recloser Mounting

## 20° Double Insulator Pole / Crossarm Mounting

Improve the reliability of your network by upgrading from a cutout fuse to the ABB Eagle recloser

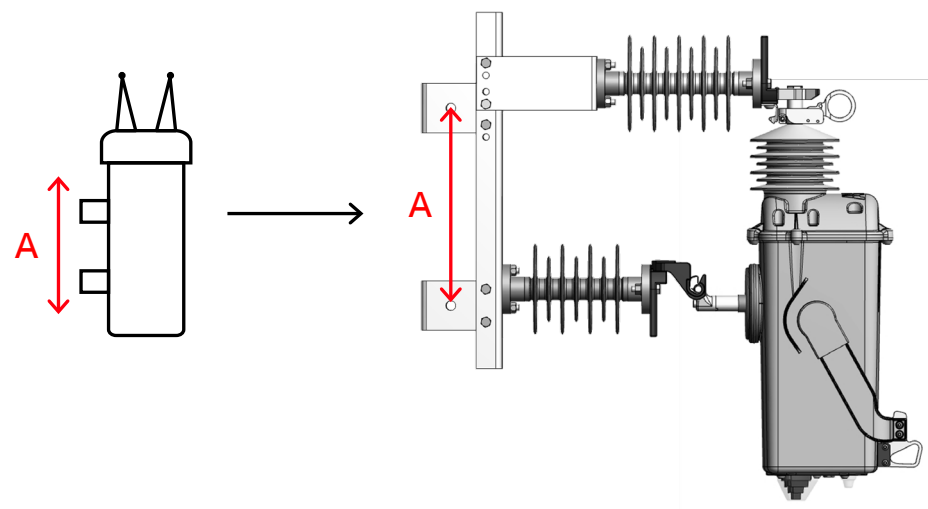
- Reduce truck rolls / O&M expense
- Improve reliability (SAIDI / SAIFI)
- Requires no routine maintenance



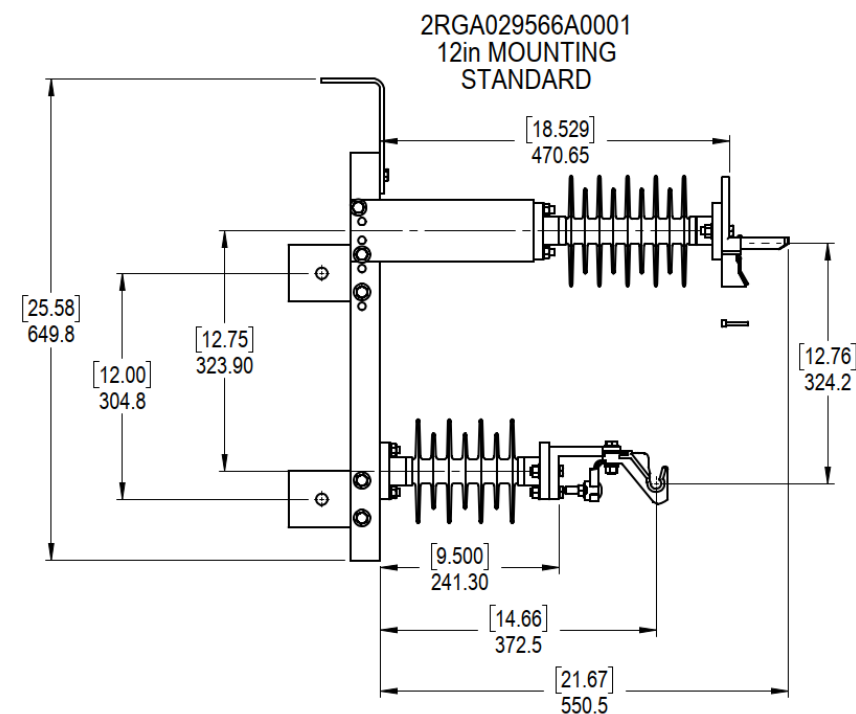
# Recloser Mounting

## Double Insulator Pole Mounting

Easy replacement of a conventional single-phase recloser to ABB Eagle recloser with adjustable mounting options



Dimension “A”	Replaceable Cooper reclosers
12 in.	Type E, 4E, V4E, 4H, V4H, L, V4L
11.25 in.	Type D
23.25 in.	Type DV

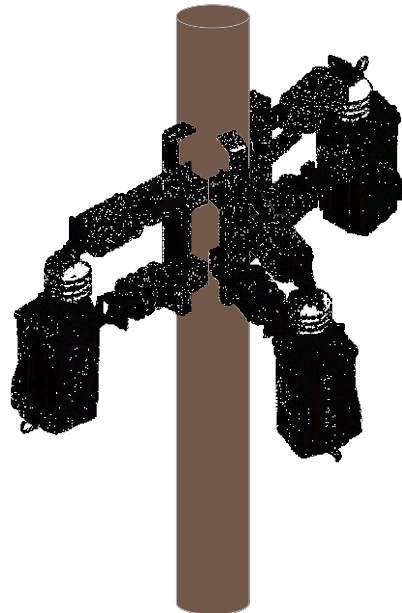


# Recloser Mounting

Mounting 3 reclosers together

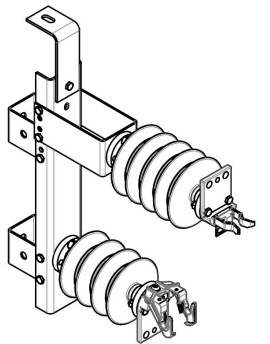
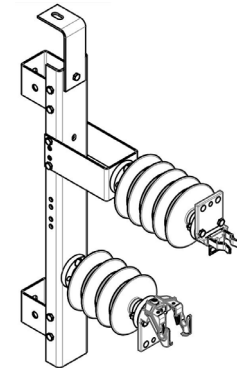
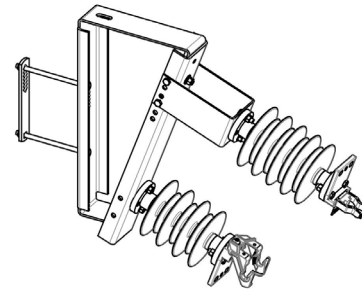


Three-phase cross-arm mount configuration



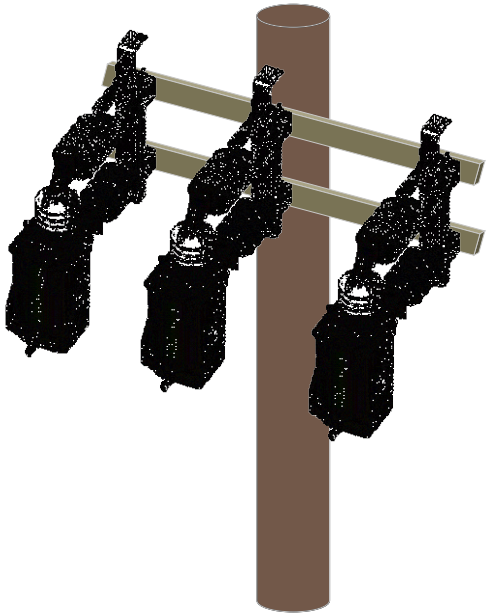
Three-phase wrap around frame mount configuration

Available in cross-arm mount, pole mount, and 20° leaning designs

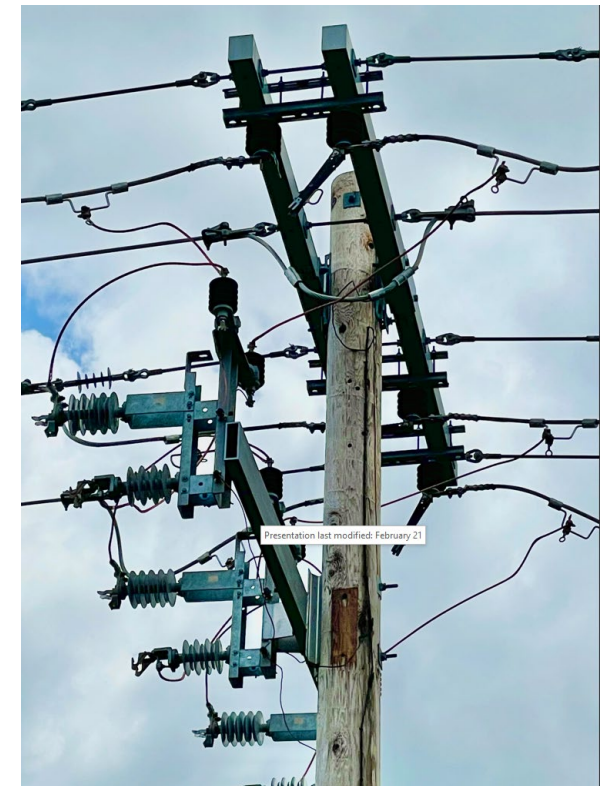


# Recloser Mounting

Mounting 3 reclosers together



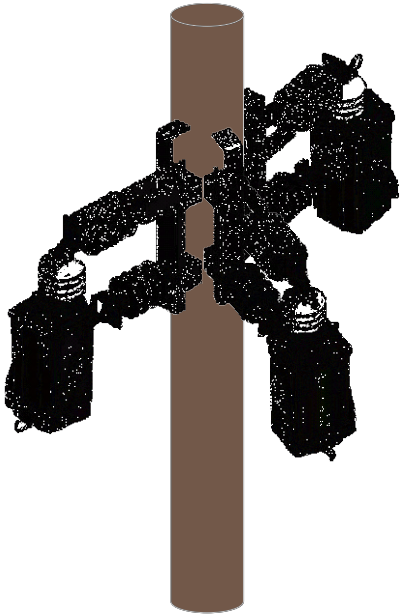
Three-phase '**cross-arm frame**'  
mount configuration





# Recloser Mounting

Mounting 3 reclosers together



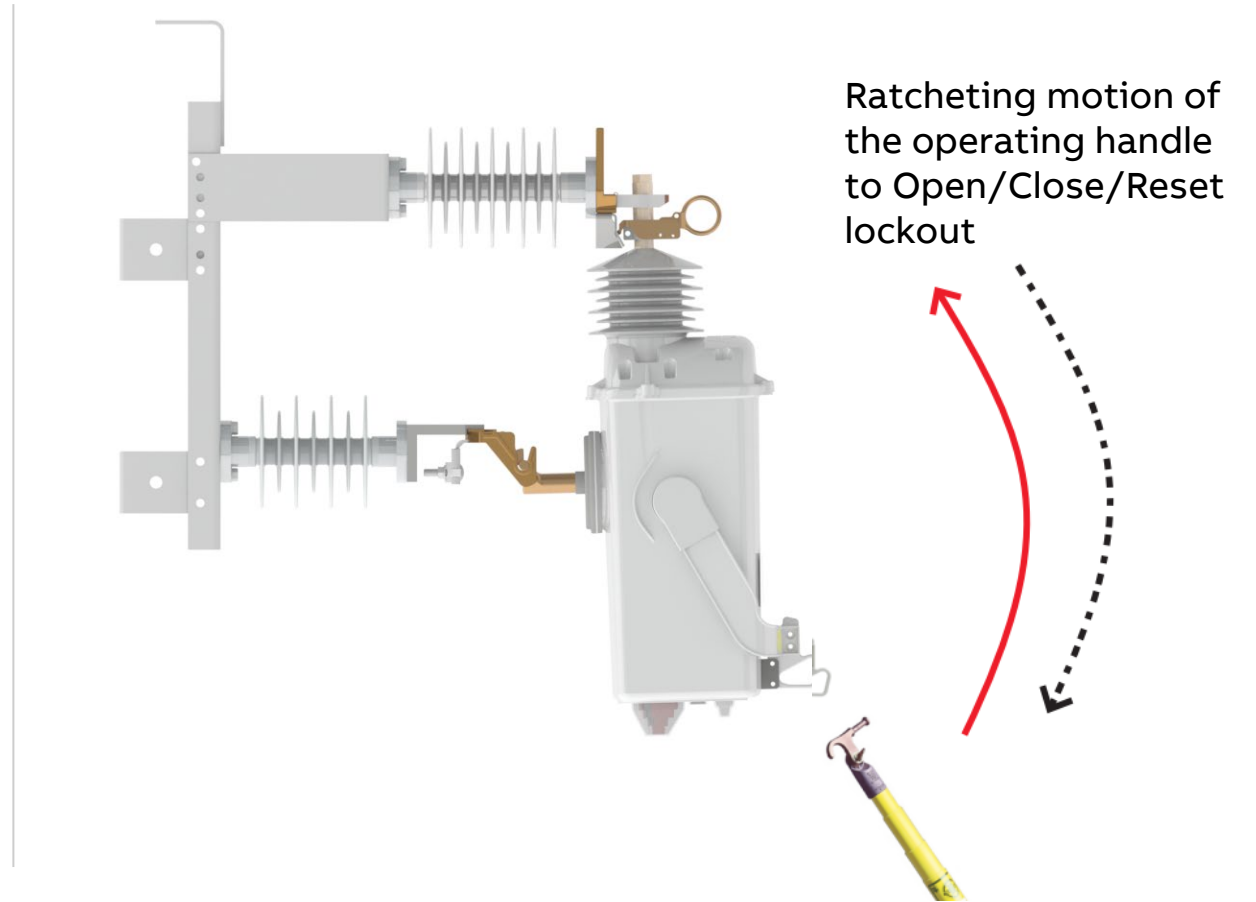
Three-phase '**wrap around frame**'  
mount configuration



# Open/Close operation

Only upwards motion for opening and closing

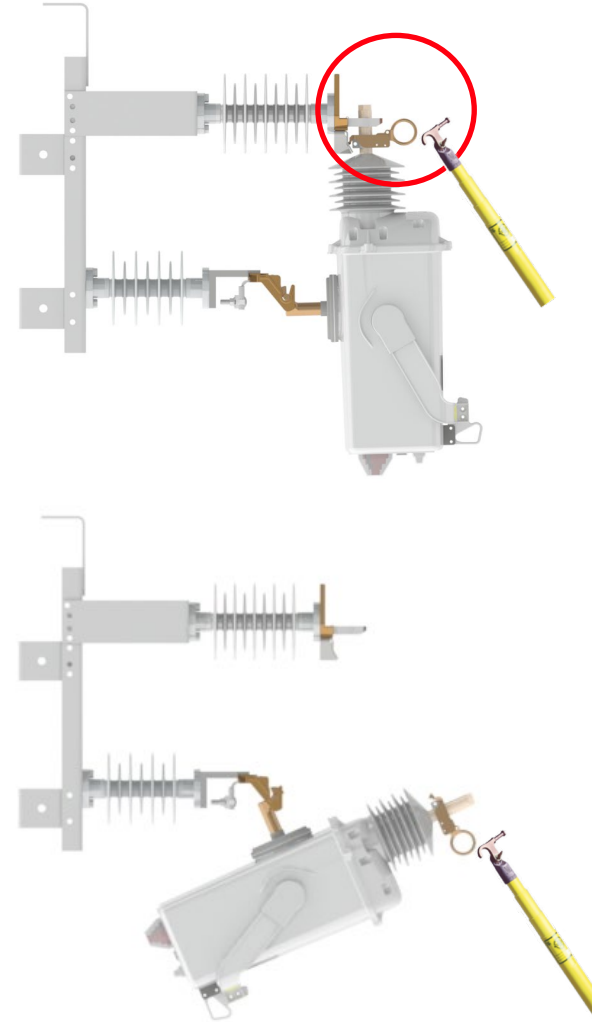
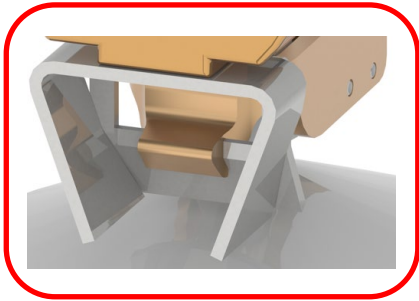
- Alternate between opening / closing
- No accidental disconnection by pulling down
- Ratcheting motion



# Creating a visual disconnect

Swing open the Eagle for creating a visual disconnect from the live terminal (H1)

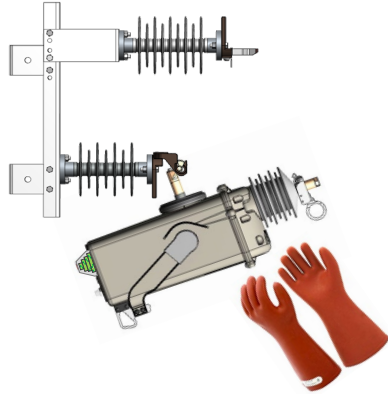
- Pull down the H1 ring to disengage latch.
- Upon disengagement, the Eagle will swing out of its H1 mount



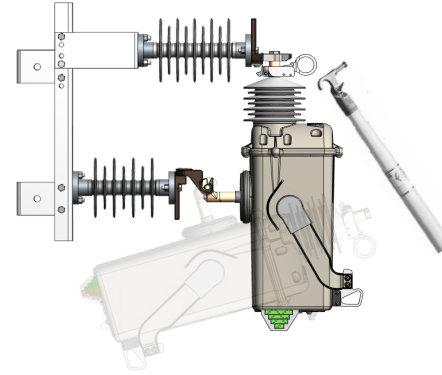
# Installation and Closing



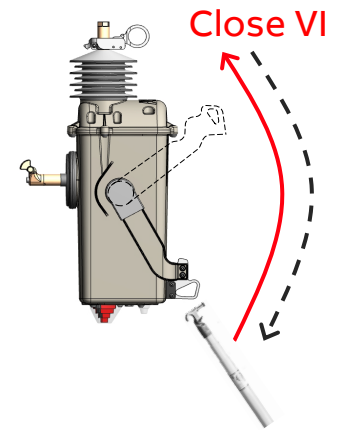
**1. Prepare**



**2. Hang**

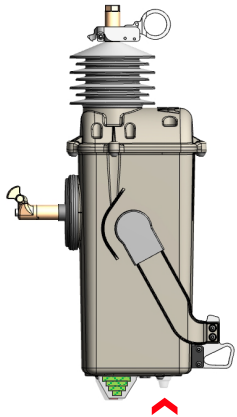


**3. Connect**

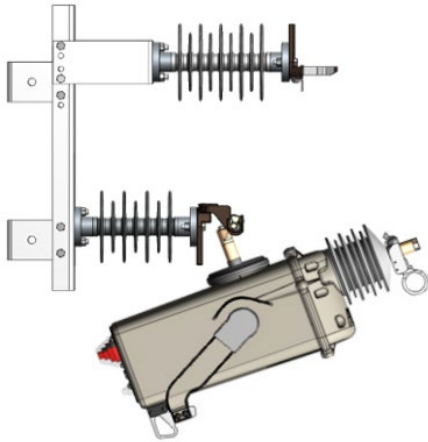


**4. Close**

# Resetting after a Lockout event



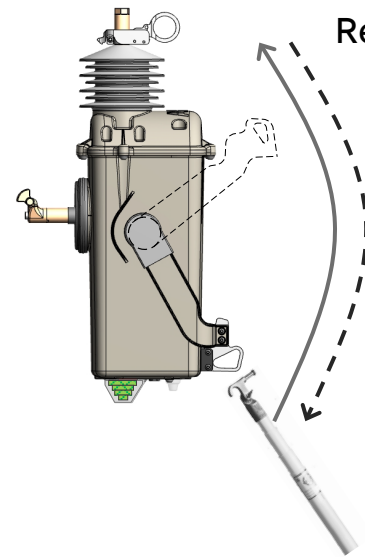
**1. Identify the recloser in LO mode**



**2. Create a visual break (optional)**

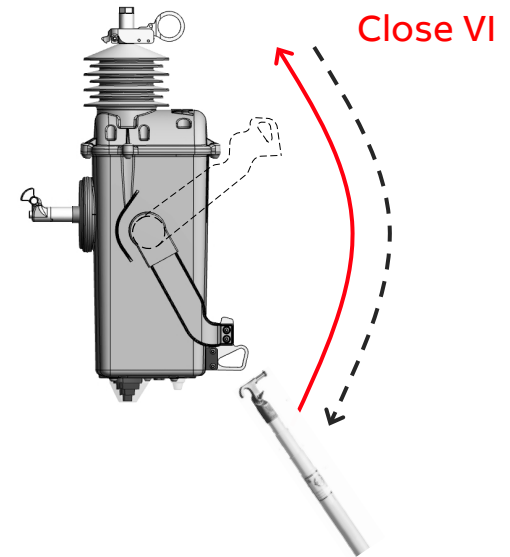


**Fix Fault**



**Reset Lockout**

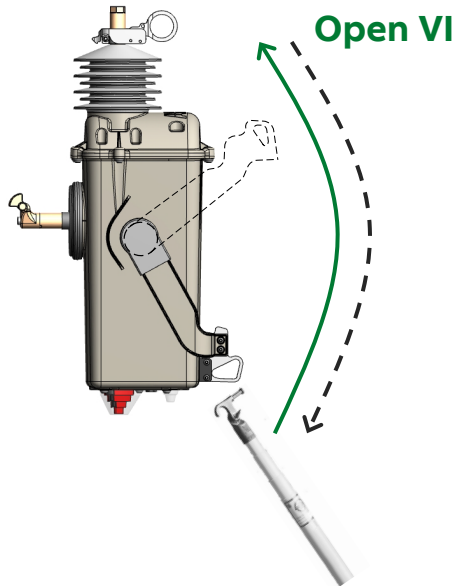
**3. Reset L.O mode**



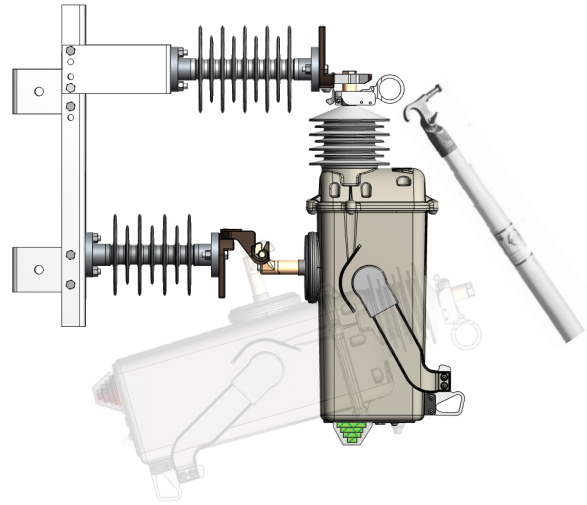
**Close VI**

**4. Close VI**

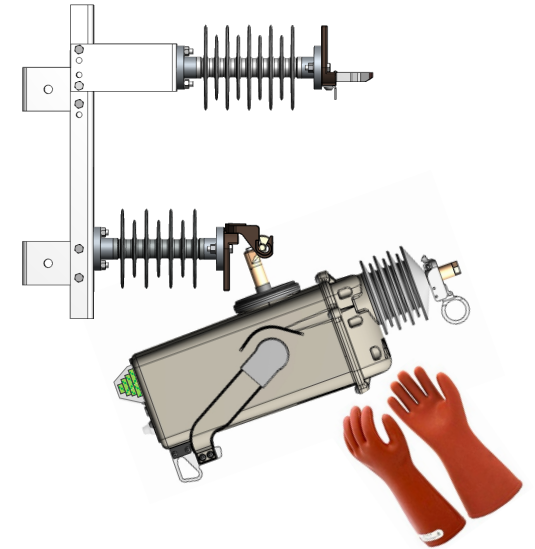
# Manual Opening and Removal



**1. Open**



**2. Disconnect**



**3. Remove**



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# Eagle installations

**Custer Public Power, Nebraska**



**Orangeburg DPU, South Carolina**



**Jeff Davis EC, Louisiana**





# Arc-Free Operation

- **Opening** happens in vacuum before disconnection
- **Closing** happens in vacuum **after** connection
  - Vacuum interrupter is open while connecting the recloser in the holder. No arcing during multiple attempts at connecting
  - If switching on to fault, the protection will trip the recloser without the need to drop open



# Battery-Free Design

- ABB Eagle recloser has an operating handle for **mechanically closing** the recloser without relying on a backup battery source
- Lockout indication LED that can last up to 14 hours after lockout without battery backup
- Fault data is recorded and available immediately after the unit is closed back into operation
- **Disadvantages** of having a built-in battery:
  - Need to replace it every few years. Guaranteed maintenance.
  - Performance / life varies drastically in extreme temperatures
  - Need to keep spare batteries in stock. Shelf-Life + Inventory
  - Need to buy additional battery kit/hardware
  - Need special hot stick tools to install / remove / replace
  - Need special training for linemen
  - No way to close manually if battery fails. Must take it down

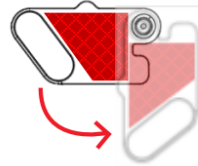


# Non-Reclose (NR) and/or Hot Line Tag (HLT) Operations

- HLT pickup multiplier: 0.1 to 1.0 times the nominal pickup setting
- No need for an optional tag clip

Non-reclose mode

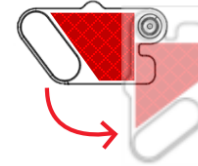
$$X_{HLT} = 1.0$$
$$t_{HLT} = 1.0$$



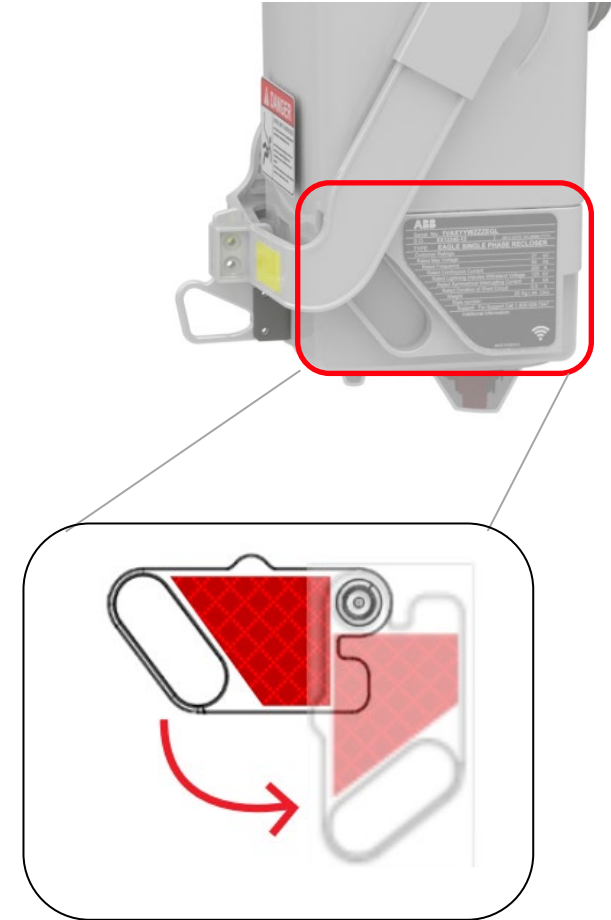
Non-reclose mode

Non-reclose mode

$$X_{HLT} < 1.0$$
$$t_{HLT} < 1.0$$

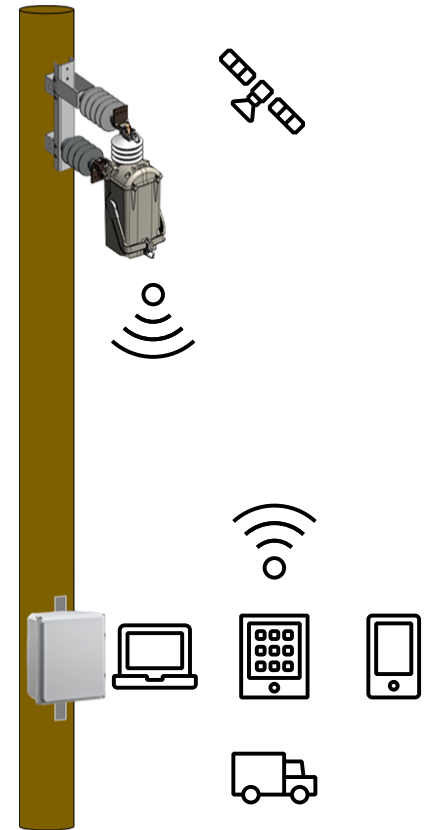


Hot line tag mode



# Local Communications

- **Platform independent, web-based user interface**
  - No need to install / update software
  - No need for approval from IT department
- **No communications kit (extra \$ in addition to recloser)**
  - No communication attachment to the recloser
  - No special tools on hot stick needed to enable communications
  - No USB dongle or transceiver for laptop
  - No installation of drivers
  - Recloser can be accessed by all assigned personnel – not just those with HV/hot stick certification
- **Secure Wi-Fi Communication with GPS**
  - 128-Bit WPA2 Encryption
  - Option to auto-disable after 15 min of inactivity
  - Option to hide SSID
  - Option to always keep it ON
  - Get accurate timestamp on every event



# Secure Wi-Fi Communication

WiFi Connection Configuration

Wireless Interface ?

Max Clients Connected

SSID name

Hide SSID ☒

WPA2 password

URL address

WiFi Auto Off ☒



128 Bit encryption with WPA2 level security



Non-broadcasting SSID hidden from public access



Wi-Fi Auto Off after 15 min of inactivity



Engage NR handle or light pulses to activate Wi-Fi

# Product Features – Recloser Classification

**Table 11 – Performance characteristics – Standard operating duty**

				Standard operating duty <sup>a,b</sup>							
				T20		T50		T100			
				Percentage of interrupting rating							
				20 <sup>c,d</sup>		55 <sup>d</sup>		100 <sup>d</sup>			
Line	<sup>e</sup>	Equipment type	Short-circuit breaking current kA	<i>X/R</i>	Number of unit operations	<i>X/R</i>	Number of unit operations	<i>X/R</i>	Number of unit operations	Total number of unit operations	
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	
1	–	Cutout mounted recloser	All	2	32	4	24	8	12	68	
2	–	Reclosers	≤ 2,0	2	52	5	68	10	18	138	
3	–	Reclosers	> 2,0 and < 8,0	3	48	7	60	14	16	124	
4	–	Reclosers	≥ 8,0	4	44	8	56	<sup>f</sup>	16	116	

<sup>a</sup> These are performance characteristics specified as test requirements in this document.

<sup>b</sup> The standard operating duty for lines 2, 3 and 4 represents the expected half-life of the interrupter. Refer to the manufacturer for method(s) used to verify full contact life. See Annex F and Annex G.

<sup>c</sup> For simulation of multi-earthed wye circuits, 25 % to 30 % of the operations in column 6 are to be performed with both load and source earthed and a *k<sub>pp</sub>* of 1,0. See 7.103.1.3.

<sup>d</sup> Refer to Annex E for test tolerances.

<sup>e</sup> Column 2 is not used in this table; it is included to provide consistency with Table H.3 and Table H.4.

<sup>f</sup> Ref. Line 4, Col. 9: *X/R* = 14 for 50 Hz and 17 for 60 Hz for a standard time constant of 45 ms. A DC time constant up to 120 ms may occur in some applications. These applications are outside the scope of this document and shall be discussed with the manufacturer. Additional information on this subject can be found in IEC 62271-306 [13].

# Product Features – Hardware

## Trip, Close and Non-Reclose

Hook stick operated levers for  
a) Trip / Close / Lockout Reset  
b) Non-reclosing/Hot Line Tag mode

<b>Clear Visual Indicators</b>	Visual indicator shows Open / Close Lockout Beacon (LED)
<b>10,000 Operations</b>	ABB's proven vacuum bottle technology
<b>Mechanical Counter</b>	8-digit electromechanical counter for number of operations
<b>No Battery Backup Required</b>	No maintenance as battery is not required
<b>No Arcing Design</b>	Recloser does not drop open after tripping. Closing happens internally in VI to avoid arcing
<b>MV Connections</b>	3-hole terminal pads for multiple connection points
<b>Flexible Mounting</b>	Direct to pole mount and cross-arm mount Upright and Cutout Style 20° Leaning Mounts Direct replacement for conventional hydraulic recloser mounts
<b>Install Ready</b>	Pre-assembled at the factory. No field assembly required
<b>Visible disconnect</b>	Unit can be dropped open to create visible disconnect
<b>Built-in WiFi</b>	Short range (50ft) fixed IP Wi-Fi with WPA2 (128-bit encryption) security Auto-Disable and Hide SSID feature
<b>Built-in GPS</b>	Built-in GPS for accurate timestamp and location data



# Product Features – Operation

## Modes of Operation

## Recloser, Sectionalizer, Breaker

### Reclose Shots

Up to three reclosing attempts (4 total shots)  
Min O 0.2s CO 2s CO 2s CO Lockout  
Max O 5s CO 5s CO 20s CO Lockout

### Reset Time

Reset/Reclaim time from 1s to 300s for auto reclose cycle to reset

### Easy Initial Programming

Power up with 12VDC wall adapter for settings and configuration  
Communication with recloser done via Wi-Fi

### Low Current Operation

Capable of tripping on faults from a powered off state.  
Needs 5-6A for Wi-Fi to power up and communicate  
Minimum fault current pickup of 10A

### Wi-Fi Activation

Wi-Fi can be enabled/disabled via Non-Reclose Lever  
Wi-Fi can be toggled with Light Sensor (Two light pulses 3s long within 10s)

### SCADA Connectivity

Optional SCADA connectivity through a separate communications cabinet and its own power  
Recloser connects via Wi-Fi. 2<sup>nd</sup> phase of product release

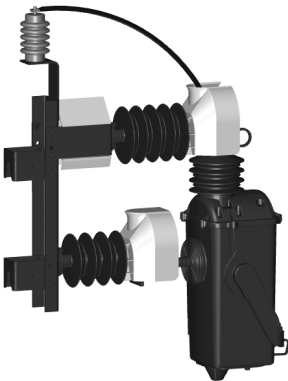
### Status Reporting on Lockout

Recloser has enough power for 20s after lockout to give lockout status to SCADA. 2<sup>nd</sup> phase of product release

# Product Features – Environmental

Item	Rating
Standards Compliance	IEEE C37.60/IEC 62271-111 Single-Phase Recloser Classification
Operating Temperature	-40°C to +60°C
Creep Distance (H1 to H2)	668 mm (26.3 in)
Ingress Protection	IP65 (NEMA 4)
Windspeed	At least 143 kph (89 mph)
Altitude	Up to 1000 m (derated after that)
Ice Breaking	Not applicable
Exposure	UV Stabilized Housing

FR Rated Animal Guards for Eagle



# Product Features – Software

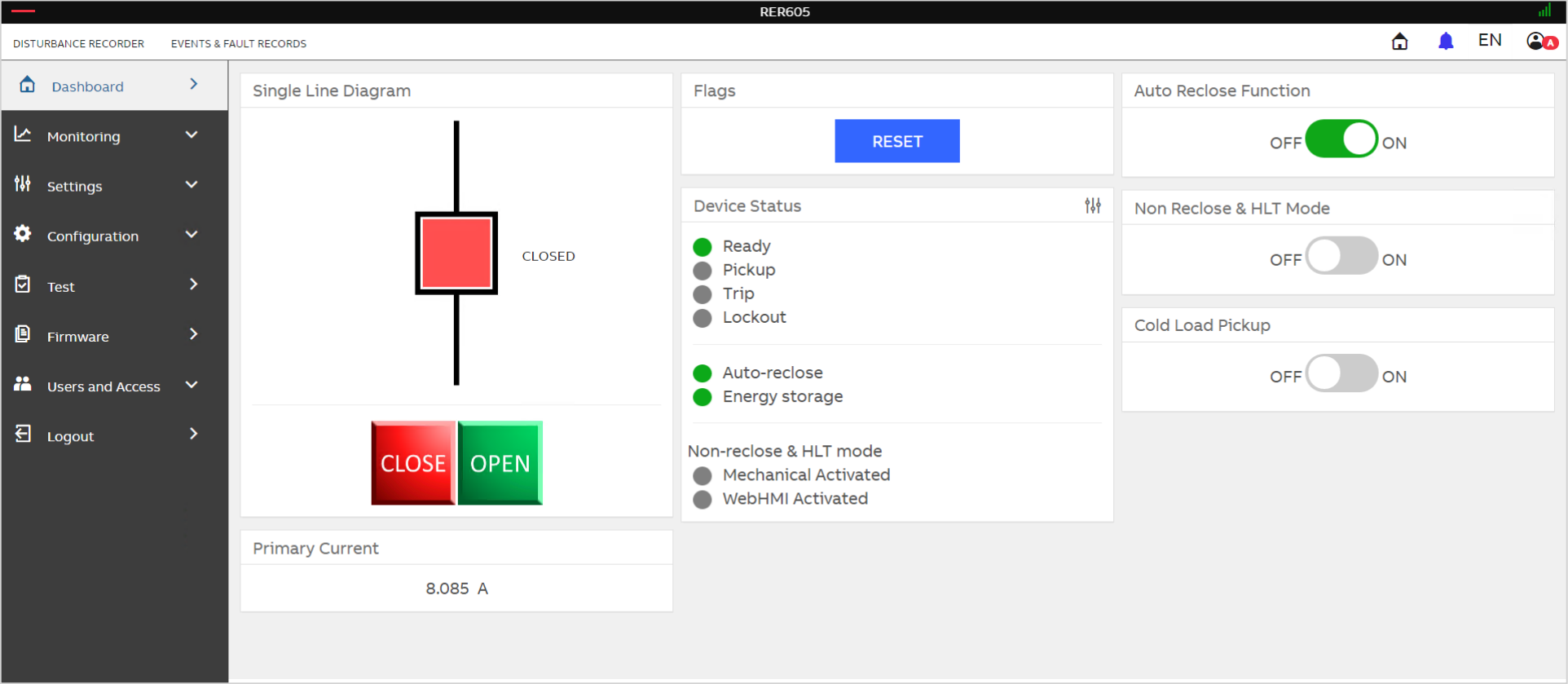
<b>Current Protection Functions</b>	Three selectable delayed curves (51P) with time dial, time delay, and blocking <ul style="list-style-type: none"><li>– ANSI/IEEE curves and Definite Time</li><li>– Cooper Recloser Curves</li><li>– Fuse Curves</li><li>– Custom Curves</li></ul>
<b>Cold Load and Inrush Blocking</b>	Cold Load protection and Inrush Inhibit (2 <sup>nd</sup> Harmonic) feature available for each curve
<b>Convenient Dashboard View</b>	Gives bird's eye view on status and allows operations right from the home screen Single Line Diagram with breaker status in ANSI or IEC style
<b>Self-Supervision</b>	Operation counter, diagnostics and wear monitoring
<b>Records</b>	Events + Fault Records (1000) Device Events (100) Disturbance Records (250) Load Profile (60 days) – Fundamental, RMS, Max RMS – Max 5 records
<b>Security Log</b>	Record of logins and changes (1000 events)
<b>Role Based Access</b>	Permissions based on user roles <ul style="list-style-type: none"><li>(1) Viewer – Log on and view status</li><li>(2) Operator – Operate the unit</li><li>(3) Engineer – Setting changes</li><li>(4) Administrator – Access Management</li></ul>
<b>Firmware Upgrade</b>	Firmware upgrade over Wi-Fi





# Eagle Web HMI

## Interface – Dashboard



Simple, platform independent, web browser based intuitive interface



# Interface – Live Data

The screenshot displays the 'Live Data' interface of an ABB system. The left sidebar contains navigation options: Dashboard, Monitoring, Self Supervision, Events & Fault Records, Live Data (selected), Disturbance Recorder, Load Profile, Security Log, Settings, Configuration, Test, Firmware, Users and Access, and Logout. The main content area is divided into several panels:

- Parameter Display Configuration:** A table showing trip and pickup settings for three phases (51P-1, 52P-2, 53P-3) and a Sectionalizer Trip. Each entry has a 'Self-Reset' toggle and a 'Latched' status.
- OC Functions - status:** A table showing the status of Open Circuit (OC) functions for three phases (51P-1, 51P-2, 51P-3) for Trip and Pickup.
- Non Reclose Mode - status:** A table showing the status of the Non Reclose Mode general setting and its activation by Mechanical Lever, WiFi - Web HMI, and Remote communication.
- Inrush - status:** A table showing the status of the Inrush detected function.
- Sectionalizer - status:** A table showing the status of the Sectionalizer Trip and Fault Current Activated functions.
- Measurements:** A table showing fundamental measurement, 2nd Harmonic, and True RMS values.
- CB Monitoring - ALARMS:** A table showing the status of KSI Open Alarm and KSI Close Alarm.
- CB Monitoring - Counters:** A table showing the status of KSI Open Counter and KSI Close Counter.
- Counter - status:** A table showing the status of the Open Operation Counter.
- Cold Load Pickup - status:** A table showing the status of the CLP activated function.
- Location Details:** A table showing the status of Latitude and Longitude.
- Cold Load Pickup - actions (for Testing Purpose only):** A section with SET and RESET buttons.

# Interface – Protection Settings

Inrush

Inrush Ratio

- 30 +

I<sub>inr</sub> Max [A]

- 7500 +

DASHBOARD

Monitoring

Settings

Protection

CB Monitoring

Recloser

Cold Load Pickup

Hot Line Tag

Disturbance Recorder

Import/Export

Configuration

Test

Firmware

Protection Settings

51P-1

Pickup value [A]

- 100 +

Pickup current

(min 10, max 7500)

Curve

RECL\_A\_101

Block

Block protection function

Block during inrush

Block protection function

CLP apply

Cold load pickup condition application to respective 51P protection function

Trip Delay [s]

- 0 +

Minimum trip delay time for IDMT curve

(min 0, max 0.25)

51P-2

Pickup value [A]

- 100 +

Curve

ANSI\_VI

k (time dial)

- 1.6 +

Block

Block during inrush

CLP apply

Trip Delay [s]

- 0 +

51P-3

Pickup value [A]

- 100 +

Curve

ANSI\_NI

k (time dial)

- 1.6 +

Block

Block during inrush

CLP apply

Trip Delay [s]

- 0 +





# Interface – Recloser Settings

Operation and Timing ?

Number of Reclose Attempts: 3 ▼

	79-1	79-2	79-3	Final
51P-1	1- ▼	1- ▼	0- ▼	T- ▼
51P-2	0- ▼	1- ▼	0- ▼	T- ▼
51P-3	0- ▼	0- ▼	1- ▼	T- ▼
	t1	t2	t3	
Dead time [s]	0.2	2	5	

Parameters ?

Reclaim time [s] - 30 +   
Reclaim time (min 1, max 300)

Auto reclosure block time [s] - 60 +   
Auto reclosure block time (min 1, max 300)

Prolong Trip ☒

Prolong Trip - enable/disable

Maximum prolong trip time [s] - 1 +   
Maximum prolong trip time (min 0, max 10)

- 0- Cycle will block protection function
- 1- Protection function active and capable to initiate AR cycle
- L- Protection function active, trip will lead to lock out of CB => stop of AR function and before closing of CB, the protection must be reseted (over Web HMI or via remote communication)
- T- Protection function active, trip of CB => stop of AR function. No restriction to close CB (reset of protection not required)



# Interface – Events and Disturbance Records

Events

List

AllFault RecordsExternalDevice

Download

Filtering:

Q

Event type	▼ Date (YYYY/MM/DD)	Time	Event
External	2017/07/23	09,23,42,453	Setting File change
External	2017/07/23	08,23,52,657	Lockout ↓
Fault	2017/07/23	00,02,35,423	Lockout ↑, 251.2A
External	2017/07/23	00,02,31,873	79 cycle 3 ↓
Fault	2017/07/23	00,02,29,873	79 cycle 3 ↑, 251.2A

Disturbance

Records

Download All DRsClear All

Filtering:

Q

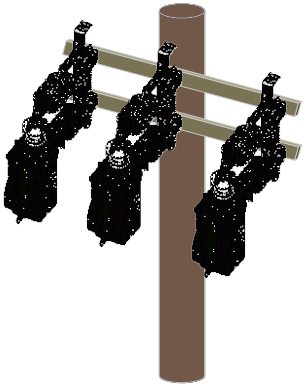
▼ Date (yyyy/MM/dd)	Time	File	
2020/09/29	06:20:43.602	RER605_DR_200929062043602	<div>ZIPDATCFG</div>
2020/09/29	06:01:51.087	RER605_DR_200929060151087	<div>ZIPDATCFG</div>
2020/09/29	05:45:38.914	RER605_DR_200929054538914	<div>ZIPDATCFG</div>
2020/09/29	05:37:02.562	RER605_DR_200929053702562	<div>ZIPDATCFG</div>



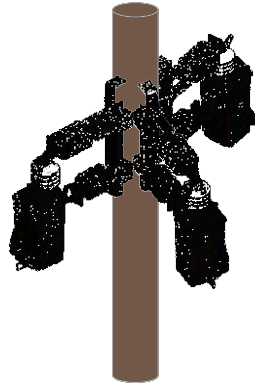
# Long Range Communications Cabinet

## Product features

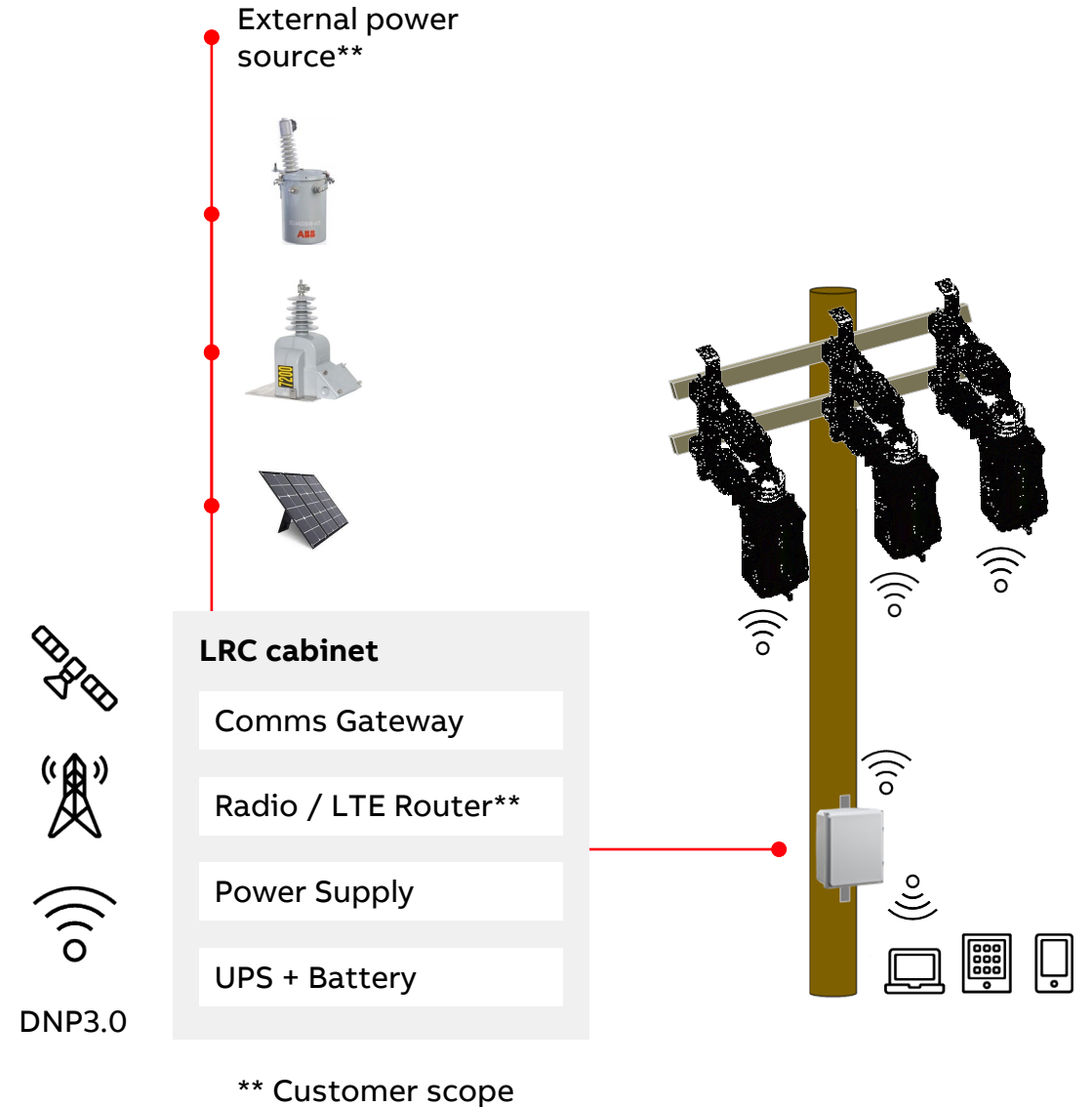
- DNP 3.0 SCADA communication
- Provision to add communication medium of customer's choice (cellular modem, 900 MHz radio, ethernet)
- Interfaces with upto three Eagle reclosers via Wi-Fi connection
- Three phase trip mode.
- Single phase reclose/ three phase lockout mode.



Three-phase cross-arm mount configuration



Three-phase wrap around frame mount configuration



# Long Range Communications Cabinet

## Cabinet interface





# Long Range Communications Cabinet

## Gateway interface

- Communication interface in Advantech gateway
  - Two (2) Ethernet interfaces for local and SCADA communication
  - Two (2) Wi-Fi access points for accessing Web HMI and connect Eagle devices

#	Item/Caption	Type	Description
1	LEDs	-	Status LED indication; see Chapter 2.6.
2	RST	-	Button to reboot the router or to restore the default configuration; see Chapter 2.7.
3	PWR	2-pin	Power supply 2-pin terminal socket; see Chapter 2.3.
4	ETH0, ETH1	RJ45	100 MB Ethernet connection for the first and second LAN; see Chapter 2.2.
5	WiFi	R-SMA	Two connectors for the WiFi antennas. See Chapter 2.1 for more information and Chapter 4.4 for WiFi parameters.
6	DIN clip	-	DIN rail clip, included as standard accessories; see Chapter 1.10.
7	Grounding screw	M3	Pay attention to proper grounding; see Chapter 2.3.
8	SERIAL I/O	10-pin terminal	RS232, RS485, binary inputs, and binary outputs interfaces. See Chapter 2.5 for more information.
9	Wall clips	-	Wall mounting clips, included as standard accessories; see Chapter 1.9.



# Long Range Communications Cabinet Dashboard

- Monitor all connection and device status
- Access all Eagle reclosers directly through the Gateway Web HMI

Gateway Status	LED Status	Description
Ready	<div></div>	Gateway is in Normal operating condition
	<div></div>	Gateway needs user attention (Hardware failure of Wi-Fi chip or Ethernet-1 cable not connected)
Cabinet Alarm	<div></div>	Normal Cabinet status
	<div></div>	Cabinet door open / General Cabinet Alarm
Battery Alarm	<div></div>	Battery status is normal
	<div></div>	Battery needs attention (Battery failure)

Gateway Status	LED Status	Description
WIFI Interface	<div></div>	Wi-Fi communication is Up
	<div></div>	Wi-Fi communication is Down
	<div></div>	No Signal
Ethernet Interface	<div></div>	Ethernet-1 interface (ETH1) Remote/SCADA communication) Connected
	<div></div>	Ethernet-1 interface (ETH1) Remote/SCADA communication) Disconnected

Connected EAGLE Status	LED Status	Description
CB Status	<div></div>	CB Closed
	<div></div>	CB Opened
Trip Status	<div></div>	EAGLE Tripped
	<div></div>	EAGLE Trip not active
Lockout Status	<div></div>	EAGLE Lockout active
	<div></div>	EAGLE Lockout not active

Dashboard

Monitoring

Archive Files

Settings

Configuration

About

Users and Access

Logout

Device Status

Ready

Cabinet Alarm

Battery Alarm

Ethernet Interface(ETH1) Remote/SCADA

Connected

Battery Voltage

27.182 V

WIFI Interface

User

Up

Eagle-1 : PHASE A

Connected

Eagle-2 : PHASE C

Connected

Eagle-3 : PHASE B

Connected

PHASE A

CB-Opened

Trip

Lockout

Open Eagle WebHMI

PHASE C

CB-Opened

Trip

Lockout

Open Eagle WebHMI

PHASE B

CB-Opened

Trip

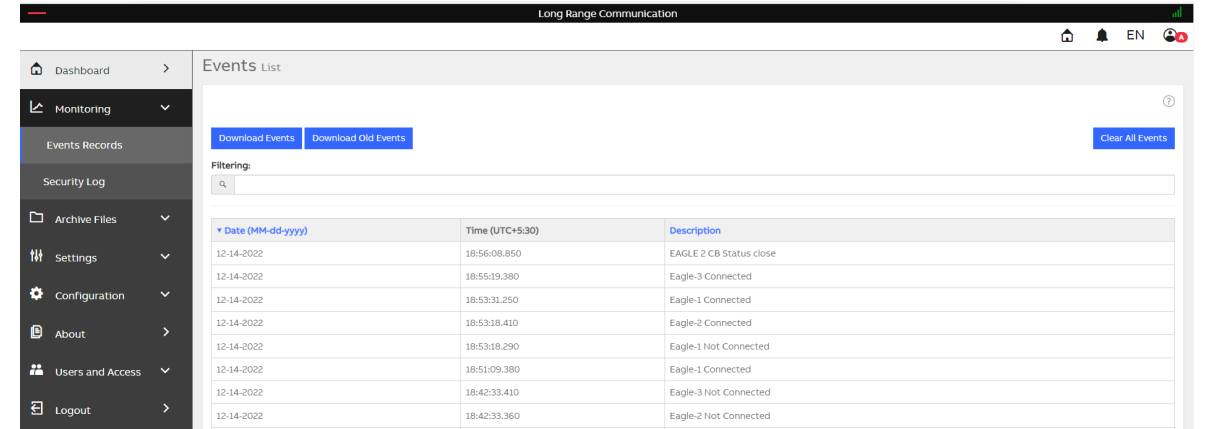
Lockout

Open Eagle WebHMI



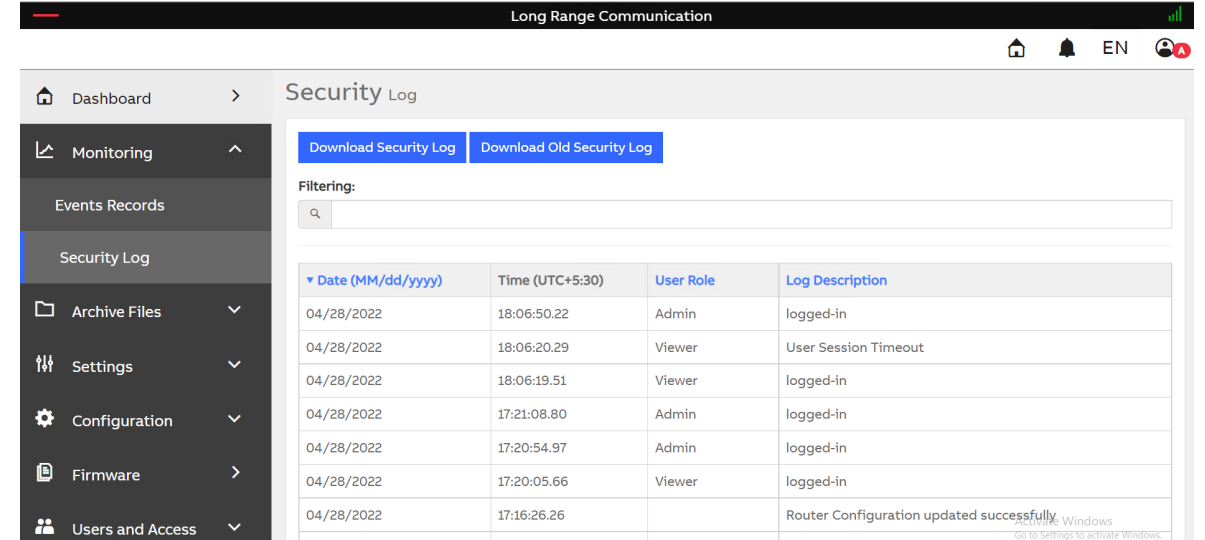
# Long Range Communications Cabinet Monitoring

- Monitor Gateway status, event logs and security logs
- Stores the data in the non-volatile memory of Gateway
  - 6 Event log files, each with 20KB of memory.
  - 6 Security log files, each with 20KB of memory



The screenshot shows the 'Events List' page of the Long Range Communication interface. The left sidebar contains navigation options: Dashboard, Monitoring (selected), Events Records, Security Log, Archive Files, Settings, Configuration, About, Users and Access, and Logout. The main content area has buttons for 'Download Events', 'Download Old Events', and 'Clear All Events'. Below these is a 'Filtering:' section with a search bar. The table below displays event data with columns for Date, Time, and Description.

Date (MM-dd-yyyy)	Time (UTC+5:30)	Description
12-14-2022	18:56:08.850	EAGLE 2 CB Status close
12-14-2022	18:55:19.380	Eagle-3 Connected
12-14-2022	18:53:31.250	Eagle-1 Connected
12-14-2022	18:53:18.410	Eagle-2 Connected
12-14-2022	18:53:18.290	Eagle-1 Not Connected
12-14-2022	18:51:09.380	Eagle-1 Connected
12-14-2022	18:42:33.410	Eagle-3 Not Connected
12-14-2022	18:42:33.360	Eagle-2 Not Connected



The screenshot shows the 'Security Log' page of the Long Range Communication interface. The left sidebar contains navigation options: Dashboard, Monitoring, Events Records, Security Log (selected), Archive Files, Settings, Configuration, Firmware, and Users and Access. The main content area has buttons for 'Download Security Log' and 'Download Old Security Log'. Below these is a 'Filtering:' section with a search bar. The table below displays security log data with columns for Date, Time, User Role, and Log Description.

Date (MM/dd/yyyy)	Time (UTC+5:30)	User Role	Log Description
04/28/2022	18:06:50.22	Admin	logged-in
04/28/2022	18:06:20.29	Viewer	User Session Timeout
04/28/2022	18:06:19.51	Viewer	logged-in
04/28/2022	17:21:08.80	Admin	logged-in
04/28/2022	17:20:54.97	Admin	logged-in
04/28/2022	17:20:05.66	Viewer	logged-in
04/28/2022	17:16:26.26		Router Configuration updated successfully

# Long Range Communications Cabinet

## Archive files

- Rich dataset archived and saved into LRC
  - Device internal events (80)
  - External protection and control events (800)
  - Load profile oscillograms (250)
  - Disturbance record oscillograms (500)
  - Latest curve and settings file

Long Range Communication

Events List

Phase A Phase B Phase C Download All Events

External Events & FR Count : 937  
Device Events Count : 100

Download External Events Download Device Events Clear All Events

Display:  
All Fault Records External Device

Filtering:

Date (MM-dd-yyyy)	Time (UTC+5:30)	Event Type	Description
12-16-2022	19:09:02.141	External	MQTT connection Successfull 39.7992 A
12-16-2022	18:47:40.797	External	MQTT connection Successfull 39.3877 A
12-16-2022	18:45:45.527	External	MQTT connection Successfull 39.5691 A

Long Range Communication

Disturbance Records

Phase A Phase B Phase C Download All

Count : 34

Download All DBs Clear All

Filtering:

Date (MM-dd-yyyy)	Time	File	ZIP	DAT	CFG
12-14-2022	10:26:11.341	RER605_DR_221214102611341	ZIP	DAT	CFG
12-14-2022	10:16:11.350	RER605_DR_221214101611350	ZIP	DAT	CFG
12-14-2022	08:49:04.033	RER605_DR_221214084904033	ZIP	DAT	CFG
12-14-2022	08:40:54.597	RER605_DR_221214084054597	ZIP	DAT	CFG

# Long Range Communications Cabinet

## SCADA / DNP3 mapping

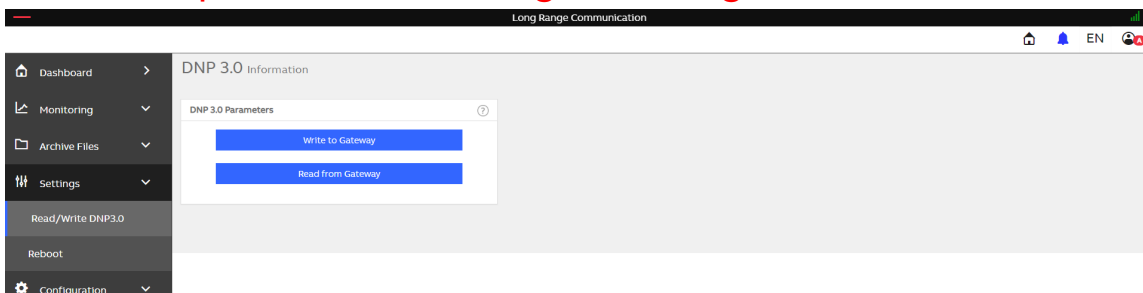
### – Control commands from DNP3 communication

#### • Write commands:

- Set/disable EAGLE to NR/HLT Mode
- Set/reset Cold load pickup
- Set/reset Auto reclose mode
- Circuit breaker Open/Close
- Reset EAGLE lockout mode

### – Read/Write DNP3 datapoints

DNP3 datapoints can be configured using .XML file.



#### ○ Read commands:

#### 4.1 LRC Cabinet Datapoints

S.No	Index number	Datapoint name	Datatype
1	1	Common Cabinet Alarm	Binary Input
2	2	Battery Alarm	Binary Input
3	11	Temperature from GW	Analog Input
4	12	Battery Capacity	Analog Input

#### Eagle Datapoints

S.No	Index Number	Datapoints information	Datatypes
1	101	Eagle-1 NRM	Binary Input
2	102	Eagle-1 CLP	Binary Input
3	103	Eagle-1 Auto Reclose	Binary Input
4	104	Eagle-1 51P-1_Trip	Binary Input
5	105	Eagle-1 51P-1_Pickup	Binary Input
6	106	Eagle-1 51P-2_Trip	Binary Input
7	107	Eagle-1 51P-2_Pickup	Binary Input
8	108	Eagle-1 51P-3_Trip	Binary Input
9	109	Eagle-1 51P-3_Pickup	Binary Input
10	110	Eagle-1 General Trip	Binary Input
11	111	Eagle-1 General Pickup	Binary Input
12	112	Eagle-1 Energy Storage	Binary Input
13	113	Eagle-1 NRM_Handle	Binary Input
14	114	Eagle-1 NRM_Local	Binary Input
15	115	Eagle-1 NRM_Remote	Binary Input
16	116	Eagle-1 Inrush_Detected	Binary Input
17	117	Eagle-1 Sectionalizer Trip	Binary Input
18	118	Eagle-1 Unit Ready	Binary Input
19	119	Eagle-1 KSL_Open_Alarm	Binary Input
20	120	Eagle-1 KSL_Close_Alarm	Binary Input

21	121	Eagle-1 Lockout_Status	Binary Input
22	122	Eagle-1 CBOpenPosition	Binary Input
23	131	Eagle-1 Measurement_IL1	Analog Input
24	132	Eagle-1 2nd Harmonics	Analog Input
25	133	Eagle-1 True RMS	Analog Input
26	134	Eagle-1 superVision_events_Error	Analog Input
27	135	Eagle-1 superVision_events_Warning	Analog Input
28	136	Eagle-1 General mode selection	Analog Input
29	141	Eagle-1 SET NRM Remote	Control Command
30	142	Eagle-1 RESET NRM Remote	Control Command
31	143	Eagle-1 SET CLP Remote	Control Command
32	144	Eagle-1 RESET CLP Remote	Control Command
33	145	Eagle-1 SET AR Remote	Control Command
34	146	Eagle-1 RESET AR Remote	Control Command
35	147	Eagle-1 Breaker Open Close	Control Command
36	148	Eagle-1 Lockout Reset	Control Command
37	151	Eagle-1 Sectionalizer Count	Binary Counter
38	152	Eagle-1 Trip operation counter	Binary Counter
39	161	Eagle-1 Location Latitude	Octet String
40	162	Eagle-1 Location Longitude	Octet String
41	163	Eagle-1 Firmware version	Octet String

# Long Range Communications Cabinet

## Setting up communication

- Ethernet #1 configuration (SCADA)
  - IP address, Gateway IP Address and Subnet mask of the gateway needs to be set by end user.
- Ethernet #2 configuration (Eagle)
  - Gateway assigns IP address to every connected Eagle
  - Eagle paired to the gateway via MAC address

The screenshot displays the 'Router Configuration' page of the ABB Mobile HMI v00.1.19. The interface is divided into several sections:

- Network Address:** Eagle's Network Address is set to 192.168.3.
- MAC Address:** A table lists MAC addresses for three eagles:

Eagle	MAC Address	IP Address
Eagle-1	50:f1:4a:66:36:e3	192.168.3.1
Eagle-2	50:f1:4a:66:17:6e	192.168.3.2
Eagle-3	50:f1:4a:66:6e:4c	192.168.3.3
- DeviceAdmin Password Configuration:** Passwords are set for Eagle-1 (abb123@), Eagle-2 (ssk123@), and Eagle-3 (mms123@).
- Country Code and Channel:** Country Code is set to India, and Channel is set to 7.
- Access Point-2 (CIM605-Eagle Communication):** AP-2 SSID name is CIM605\_Eagle36, and AP-2 WPA2 password is qwerty123.
- Ethernet-1 Configuration (Remote SCADA/DNP3):** IP Address is 10.40.40.251, Subnet Mask is 255.255.255.0, and Gateway IP Address is 10.40.40.251.
- Access Point-1 (CIM605-User Communication):** AP-1 SSID name is CIM605\_User36, and AP-1 WPA2 password is qwerty123.

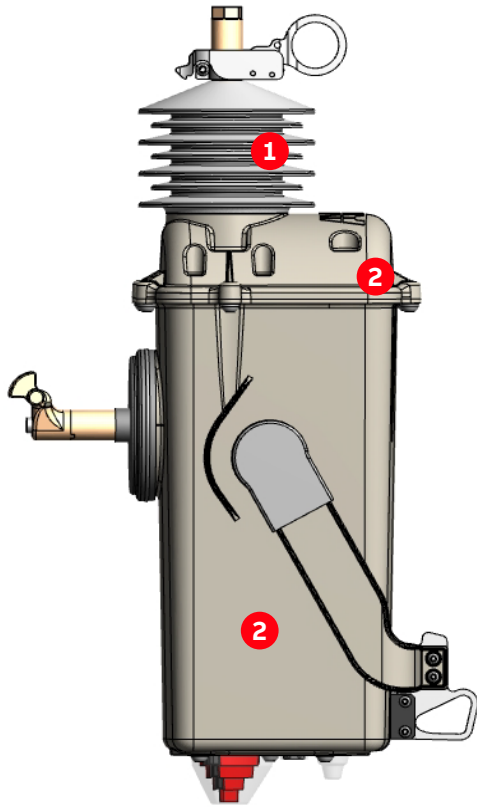
At the bottom, there are buttons for 'Discard changes', 'Save', and 'Send to Device'. An 'Activate Windows' watermark is visible in the bottom right corner.



# So why ABB?



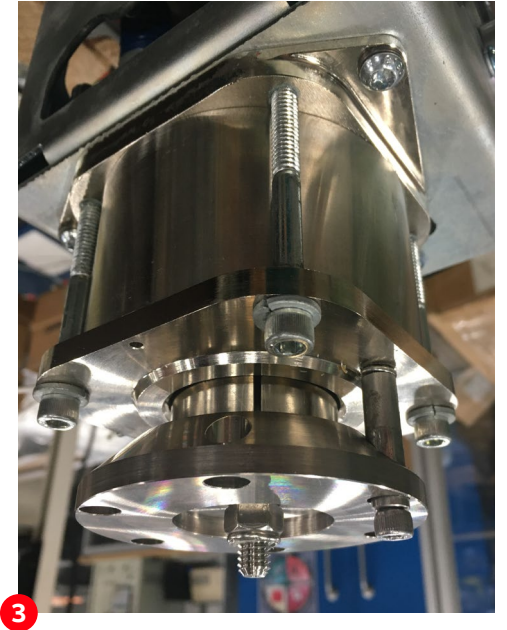
# Key components ... Leveraging ABB experience



1. Existing Vacuum Interrupter design used in 3ph reclosers  
ABB Germany – Experience of 5M+ interrupters in service

2. Power harvesting CT  
ABB Pinetops, NC design & manufacturing

3. Bi-stable magnetic actuation technology used  
on multiple products  
Energy, size, weight optimized for this application





# ABB Vacuum Interrupters

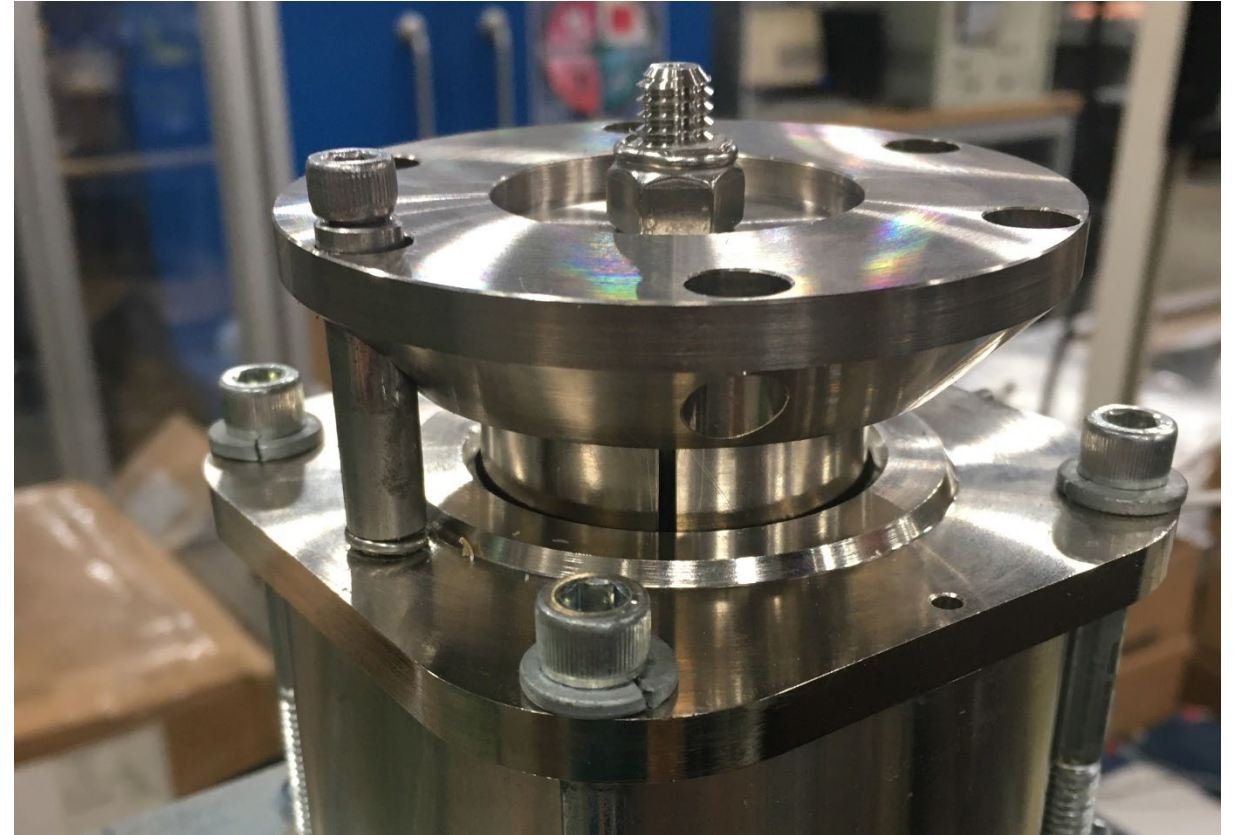
Vacuum interruptor	Rated voltage (kV)	Rated current (A)	Rated short-circuit breaking current (kA)	Mechanical operating cycles
Type				
Vacuum Interrupters for Circuit-Breaker Applications				
VGE5 <sup>2)</sup>	12 / 17,5 <sup>1)</sup>	...630	...16	...30.000
VG5 <sup>2)</sup>	12	...1250	...20	...30.000
	17,5 <sup>1)</sup> / 24 <sup>1)</sup>	...1250	...16	...30.000
VGE4 <sup>2)</sup>	12 / 17,5 <sup>1)</sup>	...1250	...25	...30.000
VG4 <sup>2)</sup>	12 / 17,5 <sup>1)</sup>	...2500	...25	...30.000
	24 <sup>1)</sup>	...2500	...20	...30.000
VG4-S <sup>2)</sup>	12 / 17,5 <sup>1)</sup>	...2500	...31,5	...30.000
	24 <sup>1)</sup>	...2500	...25	...30.000
VG6 <sup>2)</sup>	12 / 17,5	...3150	...40	...30.000
	24 <sup>1)</sup> /36 <sup>1)</sup>	...3150	...31,5	...30.000
VG7	12 / 17,5 <sup>1)</sup>	...3150	...50	...30.000
VG7-S	12	...3150	...63	...10.000
VG10 <sup>2)</sup>	36 <sup>1)</sup>	...2000	...20	...30.000
VG8 <sup>2)</sup>	36 <sup>1)</sup>	...2000	...31,5	...30.000
VG8-S <sup>2)</sup>	36 <sup>1)</sup>	...3150	...40	...30.000
Vacuum Interrupters for Contactor Applications				
VS1	7,2	...400	...4	1.000.000
VS2	12	...400	...4	1.000.000
Vacuum Interrupters for Switch-Disconnecter Applications				
VS4	24 <sup>1)</sup>	...630	(...4)	30.000
VS5 <sup>3)</sup>	27	...800	(...4)	30.000
VG5-L <sup>4)</sup>	27	...800	(...4)	30.000



Over 30 years of experience in vacuum technology  
Worldwide more than 5 million ABB vacuum interrupters  
in service

# ABB Magnetic Actuators

- Bi-stable magnetic actuators
- No lubrication, maintenance or adjustments needed



**ABB**

# ABB Power Harvesting CT



Power Harvesting CT designed and manufactured in Pinetops, NC

ABB Instrument Transformers factory has expertise in CTs, and PTs used in utility environments

Minimum bolted fault current needed to guarantee minimum recloser response?

Minimum fault pickup is 10A

If pre-fault current is higher than 5A, then the caps have enough charge to do a full auto reclosing cycle for fault currents 10A and greater.

# Bypassing Eagle

- Installing Eagle in parallel with an existing fuse cutout
- Swing Eagle open and engage the existing fuse link in the cutout
- Connect Eagle and open Fuse Cutout when placing it back in service

