

RELION® PROTECTION AND CONTROL

REF615R

Installation Manual





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Conformity

This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2004/108/EC) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2006/95/EC). This conformity is the result of tests conducted by ABB in accordance with the product standards EN 50263 and EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. The product is designed in accordance with the international standards of the IEC 60255 series and ANSI C37.90. This product complies with the UL 508 certification.

Safety information



Dangerous voltages can occur on the connectors, even though the auxiliary voltage has been disconnected.



Non-observance can result in death, personal injury or substantial property damage.



Only a competent electrician is allowed to carry out the electrical installation.



National and local electrical safety regulations must always be followed.



The frame of the protection relay has to be carefully grounded.



When the plug-in unit has been detached from the case, do not touch the inside of the case. The relay case internals may contain high voltage potential and touching these may cause personal injury.



The protection relay contains components which are sensitive to electrostatic discharge. Unnecessary touching of electronic components must therefore be avoided.



Whenever changes are made in the protection relay, measures should be taken to avoid inadvertent tripping.

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Section 1 Introduction

1.1 This manual

The installation manual contains instructions on how to install the protection relay. The manual provides procedures for mechanical and electrical installation. The chapters are organized in the chronological order in which the relay should be installed.

1.2 Intended audience

This manual addresses the personnel responsible for installing the product hardware.

The installation personnel must have basic knowledge of handling electronic equipment.

1.3 Product documentation

1.3.1 Product documentation set

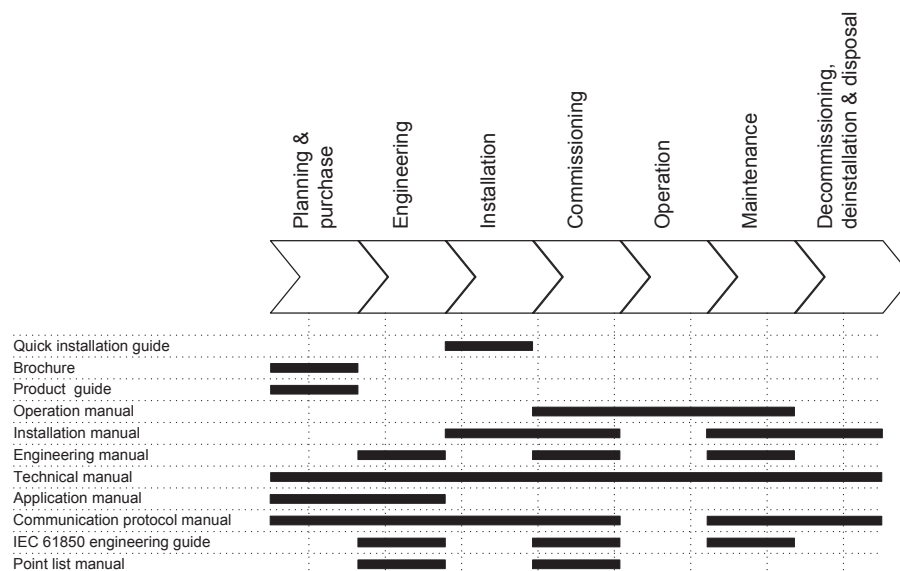


Figure 1: The intended use of documents during the product life cycle

1.3.2 Document revision history

Document revision/date	Product version	History
A/2013-11-22	4.0	First release
B/2019-07-02	4.1	Content updated



Download the latest documents from the ABB Web site
<http://www.abb.com/substationautomation>.

1.3.3 Related documentation

Product series- and product-specific manuals can be downloaded from the ABB Web site
<http://www.abb.com/substationautomation>.

1.4 Symbols and conventions

1.4.1 Symbols



The electrical warning icon indicates the presence of a hazard which could result in electrical shock.



The warning icon indicates the presence of a hazard which could result in personal injury.



The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.



The information icon alerts the reader of important facts and conditions.





The tip icon indicates advice on, for example, how to design your project or how to use a certain function.


Although warning hazards are related to personal injury, it is necessary to understand that under certain operational conditions, operation of damaged equipment may result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.4.2 Document conventions

A particular convention may not be used in this manual.

- Abbreviations and acronyms are spelled out in the glossary. The glossary also contains definitions of important terms.
- Push button navigation in the LHMI menu structure is presented by using the push button icons.
To navigate between the options, use  and .
- Menu paths are presented in bold.

Select **Main menu/Settings**.

- WHMI menu names are presented in bold.
Click **Information** in the WHMI menu structure.
- LHMI messages are shown in Courier font.
To save the changes in nonvolatile memory, select `Yes` and press .
- Parameter names are shown in italics.
The function can be enabled and disabled with the *Operation* setting.
- Parameter values are indicated with quotation marks.
The corresponding parameter values are "Enabled" and "Disabled".
- Input/output messages and monitored data names are shown in Courier font.
When the function picks up, the `PICKUP` output is set to `TRUE`.
- Dimensions are provided both in inches and mm. If it is not specifically mentioned, the dimension is in mm.

Section 2 Environmental aspects

2.1 Sustainable development

Sustainability has been taken into account from the beginning of the product design including the pro-environmental manufacturing process, long life time, operation reliability and disposing of the protection relay.

The choice of materials and the suppliers have been made according to the EU RoHS directive (2002/95/EC). This directive limits the use of hazardous substances which are the following:

Table 1: *Maximum concentration values by weight per homogeneous material*

Substance	Proposed maximum concentration
Lead - Pb	0.1%
Mercury - Hg	0.1%
Cadmium - Cd	0.01%
Hexavalent Chromium Cr (VI)	0.1%
Polybrominated biphenyls - PBB	0.1%
Polybrominated diphenyl ethers - PBDE	0.1%

Operational reliability and long life time have been assured with extensive testing during the design and manufacturing processes. Moreover, long life time is supported by maintenance and repair services as well as by the availability of spare parts.

Design and manufacturing have been done under a certified environmental system. The effectiveness of the environmental system is constantly evaluated by an external auditing body. We follow environmental rules and regulations systematically to evaluate their effect on our products and processes.

2.2 Disposal of a protection relay

Definitions and regulations of hazardous materials are country-specific and change when the knowledge of materials increases. The materials used in this product are typical for electric and electronic devices.

All parts used in this product are recyclable. When disposing of a protection relay or its parts contact a local waste handler who is authorized and specialized in disposing of electronic waste. These handlers can sort the material by using dedicated sorting processes and dispose of the product according to the local requirements.

Table 2: *Materials of the protection relay parts*

Protection relay	Parts	Material
Case	Metallic plates, parts and screws	Steel, aluminium
	Plastic parts	PC ¹⁾ , LCP ²⁾
	Electronics plug in module	Various
Plug-in unit	Electronics plug in modules	Various
	Electronics LHMI module	Various
	Plastic parts	PC, PBT ³⁾ , LCP, PA ⁴⁾
	Metallic parts	Aluminium
Package	Box	Cardboard
Attached material	Manuals	Paper

- 1) Polycarbonate
- 2) Liquid crystal polymer
- 3) Polybutylene terephthalate
- 4) Polyamide

Section 3 Unpacking, inspecting and storing

3.1 Removing transport packaging

Protection relays require careful handling.

1. Examine the delivered products to ensure that they have not been damaged during the transport.
2. Remove the transport packaging carefully without force.



The cardboard packaging material is 100% recyclable.

3.2 Inspecting product and delivery items

3.2.1 Identifying product

1. Locate the protection relay's order number from the label on top of the plug-in unit.
2. Compare the protection relay's order number with the ordering information to verify that the received product is correct.

3.2.2 Checking delivery items

Check that all items are included in the delivery in accordance with the delivery documents.

3.2.3 Inspecting product

Protection relays require careful handling before installation on site.

- Check the protection relay to see if any damage occurred during transportation.

If the protection relay has been damaged during transportation, make a claim against the transport contractor, and notify the local ABB representative.

3.2.4 Returning a product damaged in transit

If damage has occurred during transport, appropriate actions must be taken against the latest carrier. Please inform the nearest ABB office or representative. Notify ABB immediately if there are any discrepancies in relation to the delivery documents.

3.3 Storing

If the protection relay is stored before installation, it must be done in the original transport casing in a dry and dust free place in accordance with ANSI C37.90.0.

Observe the environmental requirements stated in the technical manual.

Section 4 Mounting

4.1 Checking environmental conditions and mounting space

The mechanical and electrical environmental conditions at the installation site must be within the limits described in the technical manual.

- Avoid installation in dusty, damp places.
Avoid places susceptible to rapid temperature variations, powerful vibrations and shocks, surge voltages of high amplitude and fast rise time, strong induced magnetic fields or similar extreme conditions.
- Check that sufficient space is available.
Sufficient space is needed at the front and rear of the IED to allow access to wires and optical fibers and to enable maintenance and future modifications.
For more details of the checks required for different type of mounting methods, see the respective chapters, such as rack mounting or flush mounting.

4.2 Detaching and installing the plug-in unit

4.2.1 Detaching the plug-in unit



Before detaching the plug-in unit from the case, the auxiliary voltage must be disconnected. Hot swapping may be done only under special circumstances, see the application manual for details.

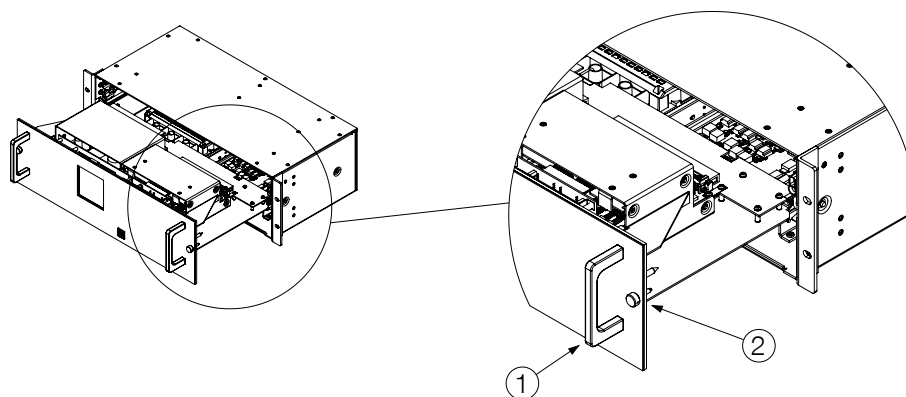


Figure 2: Plug-in unit partially withdrawn after opening the knurled screw and pulling the unit partly using the handle provided in the front of the unit

- 1 Handle
- 2 Knurled screw with provision for seal wire

1. Turn off the power.
2. Open the seal on the front panel by removing the sealing wire, if found.
3. Loosen the knurled screws on the face of the unit and gently remove the face and attached circuit board by grasping the handles on either side of the front panel and pulling the unit straight forward.

Pulling the board out at an angle or otherwise stressing the board on extraction may damage the unit. Once removed from the case, position the unit face down on a static secured mat.



Do not touch terminals inside the case after removing the plug-in unit. Live terminals can be inside the case.



The signal connectors are left open when the plug-in unit is detached. The CT inputs are still connected to auxiliary current transformers in the analog input module mounted in the case. Thus, CTs are not disconnected or open-circuited. The VT connections are not affected either.

4.2.2 Installing the plug-in unit

1. To reinstall the unit into the case, align and insert the lips on both sides of the tray into the guide rails on the inside walls of the case.

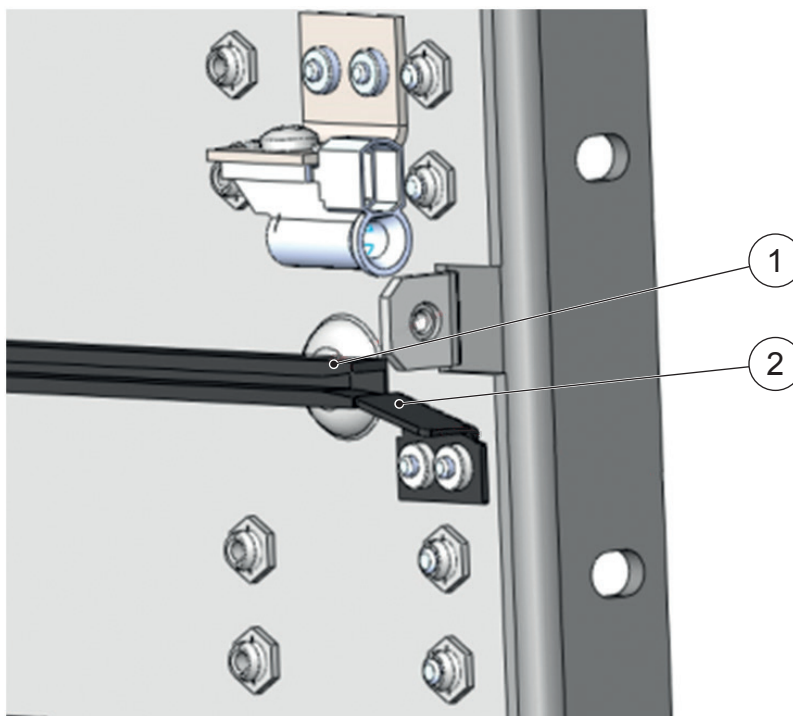


Figure 3: Guide rail inside the case

- 1 Tray (plug-in unit) guide rail
 - 2 Tray guide bracket
2. Push the unit straight inward until it fully seats in the case.
 3. Secure the knurled screws.
 4. Push in the sealing wires and secure, if necessary.
Make sure that the unit plugged-in corresponds to the case in which it is inserted based on application requirements.



Check that the plug-in unit and the case have the same serial number or compatible order code numbers before fitting the plug-in unit into the case.



Forcing a non-suitable plug-in unit into the case can break the plug-in unit and the case, and can cause danger.

4.3 Mounting the IED

4.3.1 Required tools



Use only adjustable torque screwdrivers, 5/16" wrench, 1/16" wrench or hex nut driver.

4.3.2 Rack mounting the IED

REF615R is supplied with mounting brackets attached for direct mounting on 19 inch rack system. The IED occupies 3U height in the rack system. No additional components are required.

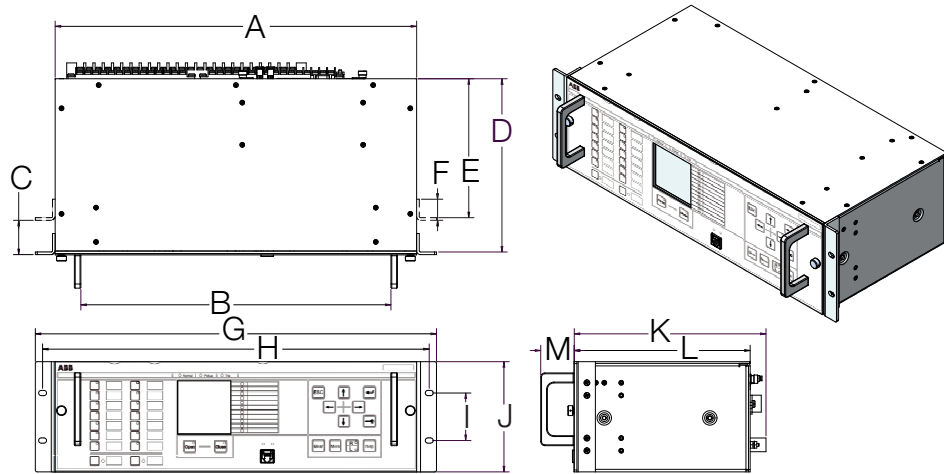


Figure 4: *Dimensions and isometric view of the IED*

A	17.12 in. (434.9 mm)	H	18.312 in. (465.1 mm)
B	14.69 in. (373.1 mm)	I	2.25 in. (57.2 mm)
C	1.625 in. (41.3 mm)	J	5.22 in. (132.6 mm)
D	8.21 in. (208.5 mm)	K	9.08 in. (230.6 mm)
E	6.58 in. (167.1 mm)	L	8.33 in. (211.6 mm)
F	1.00 in. (25.4 mm)	M	1.59 in. (40.4 mm)
G	19.00 in. (482.6 mm)		

1. Check the mounting space and environmental conditions.
 - When mounting on a swing rack, check that the depth of the unit along with connected wires (depth about 9 inches/225 mm and additional depth for the wires, fiber optic cables) can easily swing out from the panel.
 - Provide at least 2U space above and below the unit to provide adequate ventilation for the IED as well as for the other units in the neighbourhood.
 - Check that either the rack is in a dust-proof panel or the room in which the rack is mounted is well-insulated from environmental dust, water ingress and so on.
2. Mount the rack unit in a 19-inch rack.
3. Tighten the screws.



The IED is supplied with rack-mounting brackets on either side, flush with the IED front LHMI. When there is a limited space available at the back to accommodate the full depth of the IED, it is possible to shift the

brackets on either side of the IED to have semi-flush mounting. Check that there is adequate space on the front of the unit for the semi-projection portion of the unit.

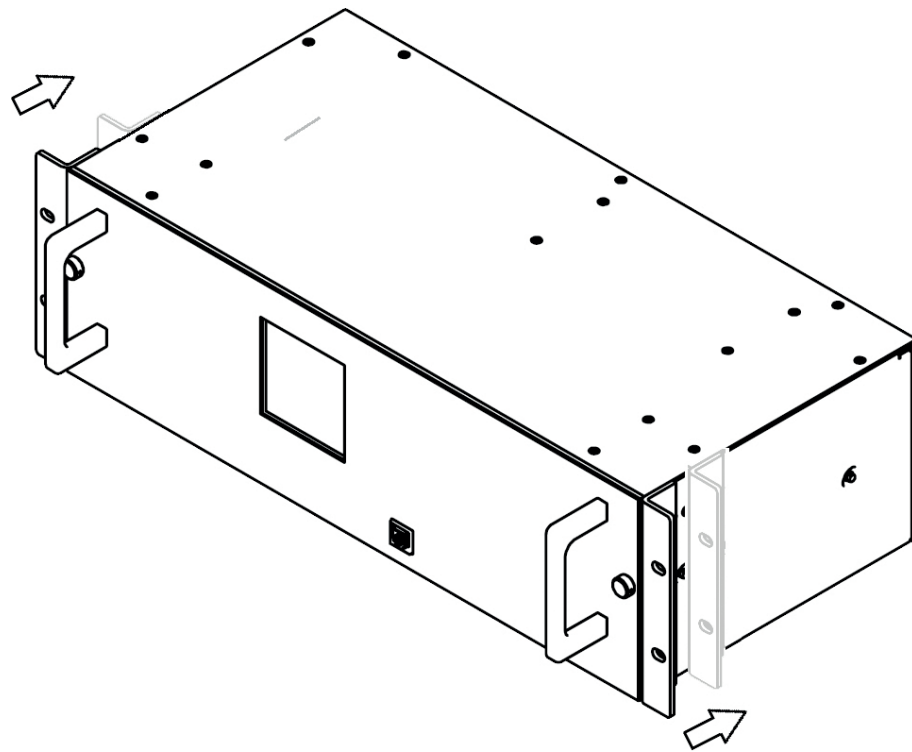


Figure 5: Moving the rack-mounting brackets



Check the allowed minimum bending radius from the optical cable manufacturer.

4.3.3

Flush mounting or semi-flush mounting the IED

A mounting kit is needed, when flush mounting or semi-flush mounting the IED in a panel.

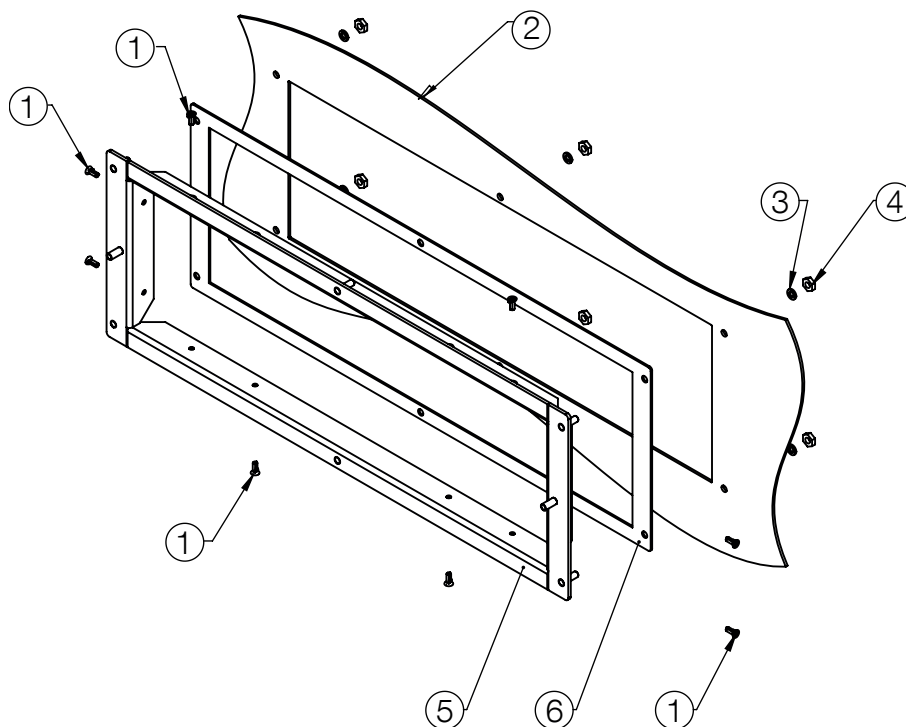


Figure 6: Flush mounting kit details

1	6-32 × 3/8 Flat Hd Philips Mach Screw, 82°, 18-8 SS, B18.6.3	8
2	Mounting panel	
3	#10, Lock washer, medium split, SSTL, ANSI B18.21.1	6
4	10-32 Hex nut, UNC, SSTL, ANSI B18.6.3	6
5	Panel mount bezel	1
6	Bezel gasket ABB #613641	1

Requirements for installation:

- Panel cut-out and holes for mounting screws as shown in [Figure 7](#).
- For flush mounting, depth behind the panel should be about 9 inches (228.6 mm). Add about 2 inches space for wire, cable duct and so on.
- It should be possible to add or replace the flush mounted IED without excessive dismantling.

When space at the rear is a constrain, check if semi-flush mounting can be adopted.

- For semi-flush mounting, depth behind the panel should be about 7.4 inches (188.0 mm). Add about 2 inches space for wire, cable duct and so on.



Check the allowed minimum bending radius from the optical cable manufacturer.

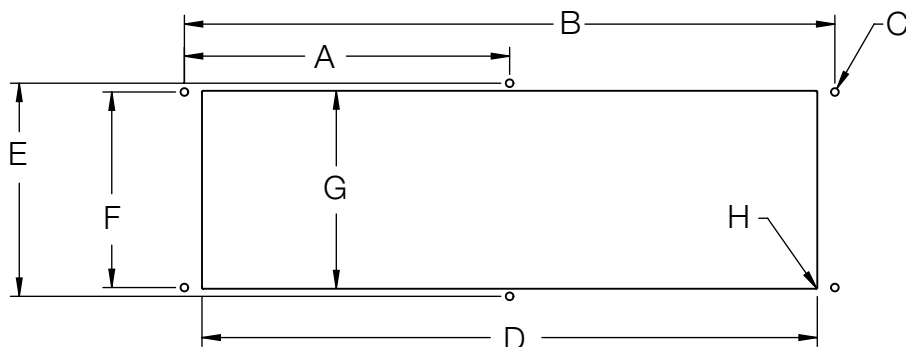


Figure 7: Panel cutout and drilling plan for flush or semi-flush mounting

A 9.250 in. (235.0 mm)	E 6.062 in. (154.0 mm)
B 18.500 in. (469.9 mm)	F 5.562 in. (141.3 mm)
C 6 × Ø 0.220 in. (5.6 mm)	G 5.630 in. (143.0 mm)
D 17.500 in. (444.5 mm)	H 4 × R.030 (0.76) max

- If the IED is with rack mounting brackets on either side, loosen the four #6-32 fixing screws and remove the brackets. Store them away as spares or for future use.
- Remove the set screws from the top of the case.
- Slip the bezel frame over the IED case with flange towards the front of the case. Adjust the position where the bezel has to be fixed as appropriate for flush or semi-flush mounting.

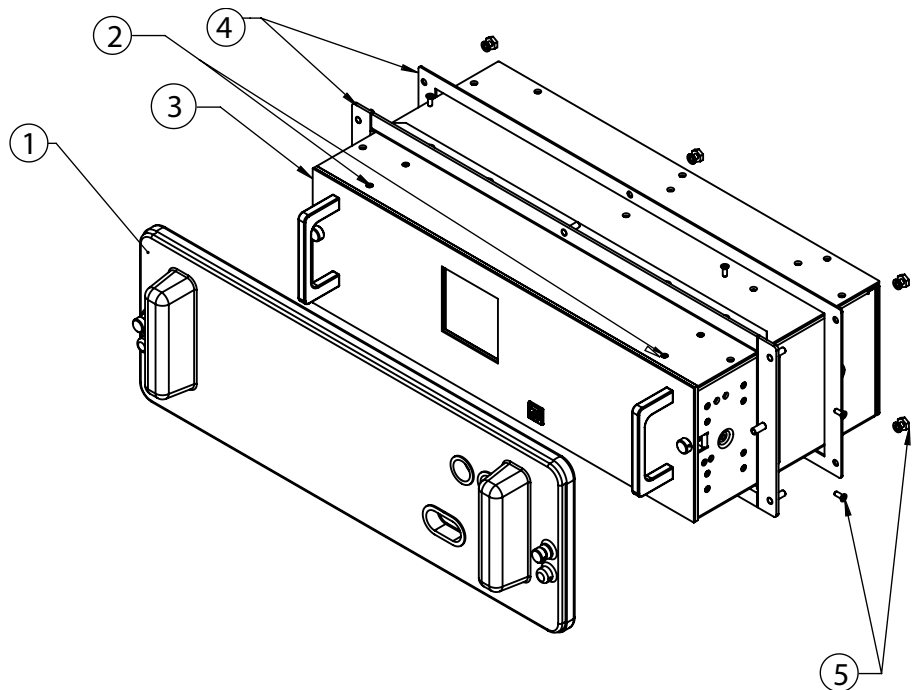


Figure 8: Fixing bezel hardware over the case

- 1 Dust cover assembly
- 2 Set screws removed
- 3 Mounting brackets removed
- 4 Panel mounting bezel
- 5 Bezel hardware

4. Attach the bezel frame to the case using 6-32 flat head screws from the kit and four screws left from the removal of the brackets.
5. Mount case on the panel by inserting the bezel through the panel cut-out.
6. Attach the unit to the panel by inserting bezel studs through the panel's drilled holes. Use 10-32 hex nuts with lock washer from the bezel kit to secure the bezel.
7. Position the clear plastic dust cover (if ordered) on the front of the IED and tighten thumb screws to the bezel studs.
The cover can be used only for flush-mounted installation.



The allowed range for the fixing screws' tightening torque is 6...9 inch-pounds (0.7...1 Nm).

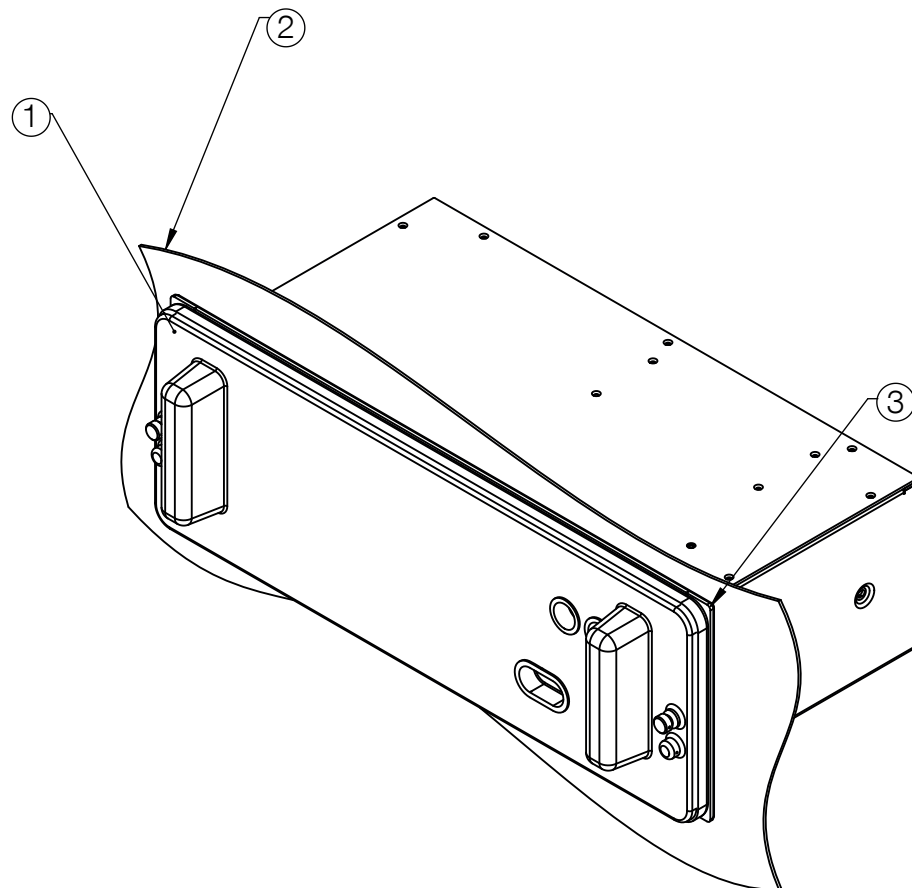


Figure 9: Flush-mounted IED with front dust cover

- 1 Dust cover assembly
- 2 Panel
- 3 Panel mounting bezel

4.3.4 Mounting lens sensors for an arc flash detector system

Arc flash detector is used to detect arc situations in air insulated metal-clad switchgear.

The arc flash detector system determines where in the switchgear cubicle the optional lens sensors are installed. See the application examples in the application manual for further information on the alternatives.

1. Drill a hole \varnothing 0.38 inches (10 mm) in the wall of the supervised space.

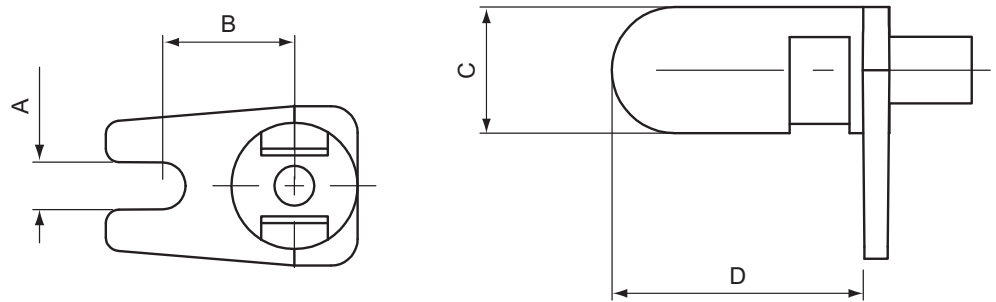


Figure 10: Dimensions of the lens sensor

- A 0.14 inches (3.5 mm)
- B 0.39 inches (9.9 mm)
- C \varnothing 0.37 inches (9.5 mm)
- D 0.75 inches (19.1 mm)

2. Fit the lens sensor into the hole and fasten it with a self-tapping M3 screw. Alternatively, the lens sensor can be fastened with a cable tie. To do this, secure the cable tie to a suitable point of attachment on the cubicle wall and wrap the cable tie tightly around the sensor.

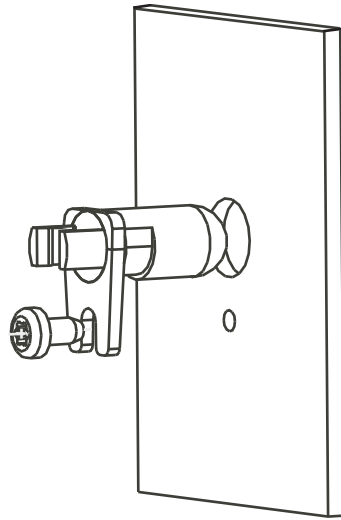


Figure 11: Mounting the lens sensor

3. Make sure that the cable tie lies in the groove of the sensor to prevent it from blocking the light.

Section 5 Connecting

5.1 Required tools

Only use a screwdriver and insert bits for Phillips (PH 2) cross-recessed head screws when handling terminals of screw-compression type.

5.2 Connecting wires

All connections are made on the rear of the case suitable for ring-lug connection. No soldering is needed.

- Connect each signal connector terminal with one 14 or 16 Gauge wire. Use 12 or 14 Gauge wire for CB trip circuit.
- Connect each ring-lug terminal for CTs/VTs with one 12 Gauge wire.



See the application manual for product-specific connection diagrams.

5.3 Connecting protective grounding

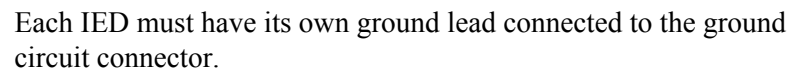
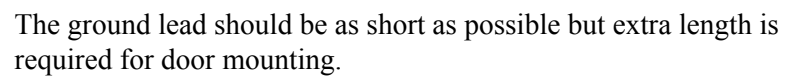
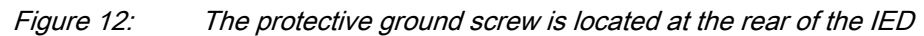


The ground lead must be at least a 10 Gauge wire. If the ground lead is long, the cross section of the wire must be increased.

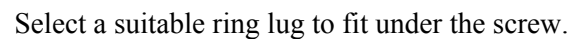


Use fine copper wire as the ground lead.

1. Loosen the protective ground screw to connect a separate ground protection lead.



2. Connect the ground lead to the ground bar.
Use either stripped wire screwed between a washer cup and the protective ground screw or a ring lug.



3. Tighten the protective ground screw.
4. Support the ground lead so that it cannot break or weaken.
Be aware of the mechanical, chemical and electrochemical environment.

Connecting analog signals

A connection diagram is needed to connect the analog signals.

1. Remove the fixing screw.
2. Slide the screw through the terminal lug and screw it back on.

Connecting current and voltage inputs

- Connect the wires from the CTs/VTs to the correct device according to the phase order and the connection diagram.

Each terminal for CTs/VTs is dimensioned for one 10 Gauge wire or for two wires of maximum 12 Gauge.



See the specific card variants from the application manual.

5.5 Connecting IED with a test switch

- When the IED is used with a test switch, connect the current and voltage transformers directly to the switch.

5.6 Connecting binary signals

- Connect the wires for the binary signals to the correct device according to the connection diagram.
Each terminal for binary input and output signal is dimensioned for one 14 or 16 Gauge wire.

5.7 Connecting power supply



Always make sure the IED's ground terminal is connected and grounded effectively.

- Connect the auxiliary voltage of the IED to terminals 1 and 2.
- Connect the positive lead to terminal 1.

The permitted auxiliary voltage range of the IED is marked on top of the IED's LHMI.

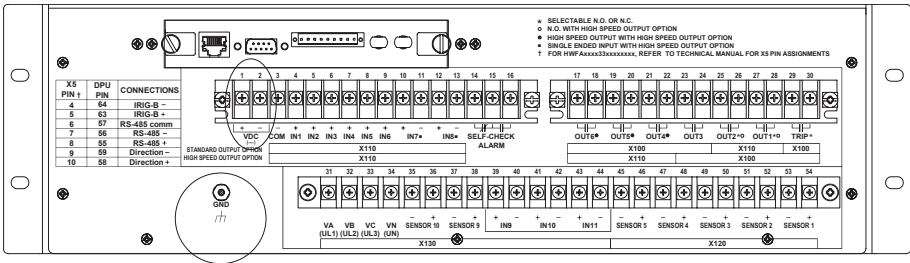


Figure 13: Connecting auxiliary voltage

5.8 Connecting communication

- Before connecting communication, check that the HW module has the correct communication interfaces.
The communication module is located on the left side of the IED when viewing the case from the rear.



See the technical manual for product-specific communication interfaces

5.9 Energizing the IED

- Before connecting the auxiliary power, check that the terminal strip is wired and placed correctly.
- Remove any protective packaging or cover before energizing the unit.

During the start-up all LEDs are lit for a short period.

- Green Normal LED starts to flash
- LCD lights up and IED start-up is displayed
- The main menu is displayed. A steady green Normal LED indicates a successful start-up.

If the IED detects a diagnostic error during start-up, the green Normal LED flashes and the internal fault code is displayed on the LCD.

5.10

Inner assembly of the IED

[Figure 14](#) explains generally how the internal PCB and assemblies are mounted together.



Do not disassemble or assemble the internal components or repair or replace boards at site. For any repairs of boards or assemblies, please contact your local ABB representative.

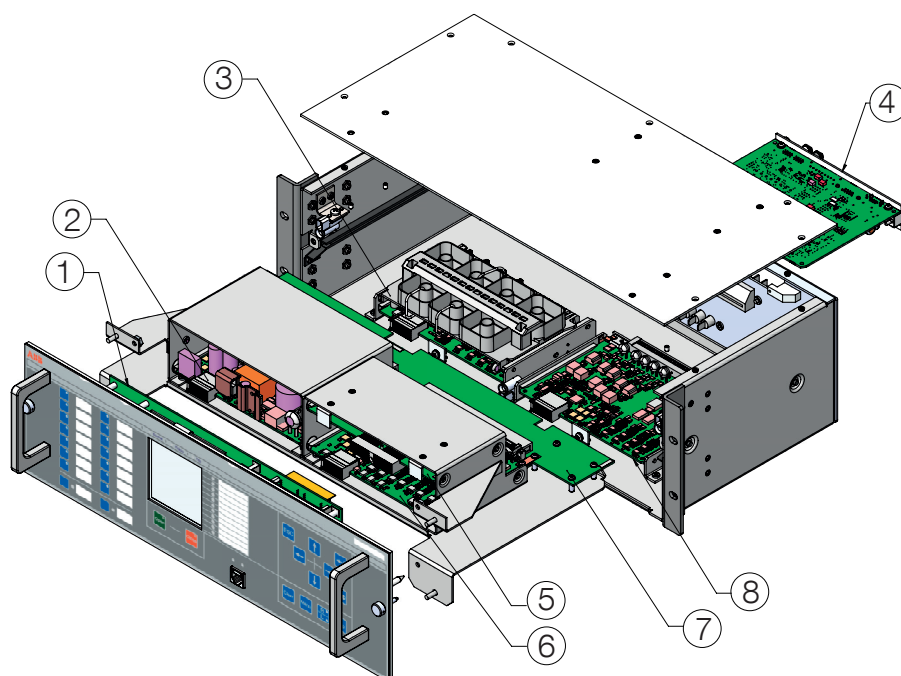


Figure 14: Inner boards and components assembly of REF615R

- | | |
|---------------------|----------------|
| 1 Backplane PCB | 5 CCEB |
| 2 PSM card | 6 BIO card |
| 3 AIM3016/3017 card | 7 Adaptor PCB |
| 4 COM card | 8 AIM3006 card |

Section 6 Removing, repairing and exchanging






6.1 Product lifecycle

At some point of the product lifecycle, the protection relay is upgraded to a next generation unit. When selecting the original product, already consider the upgrading and extension possibilities that the specific product offers for its whole lifecycle.

Protection relay specific options can be found from Retrofit Solutions Database on the Internet www.abb.com by following the links within ABB Service Guide or via ABB Product Guide from the product specific Service & Support sheet.

6.2 Checking protection relay information

The protection relay information includes detailed information about the device, such as version and serial number. The protection relay information is shown on the display for a few seconds when the device starts up. The same information is found also in the protection relay menu.

1. Select **Main Menu/Information**.
2. Select a submenu with  and .
3. Enter the selected submenu with .
4. Browse the information with  and .

The **Product identifiers** submenu contains product related information like product type, serial number, order number, production date, configuration name, SW version, SW date and HW revision.

The **Site identifiers** submenu contains information about the site where the protection relay has been installed.

The **System identifiers** submenu contains the Technical key and IEC 61850 version. The Technical key is unique and cannot be changed.

The **HW modules** submenu contains information about the HW modules.

6.3 Removing the IED

1. Turn off the power.
2. Detach the plug-in unit from the case.
3. Disconnect the wiring.
4. Loosen the four fixing screws.
5. Detach the case from the panel cut-out.

6.4 Sending protection relay for repair

- In case of product problems, contact the nearest ABB office or representative for consultation and instructions.

6.5 Exchanging protection relay

- To exchange the protection relay with another identical unit, remove the protection relay and install the new one.
The exchangeable units can be found from the PartsOnLine system, see www.abb.com/partsonline. Use of PartsOnLine requires user registration.
- To exchange a protection relay to a different unit, change the case and connect the wires.

Section 7 Technical data

7.1 Case and HMI display variants

7.1.1 Front side of the IED

The IED is available with IEC and ANSI display variants.

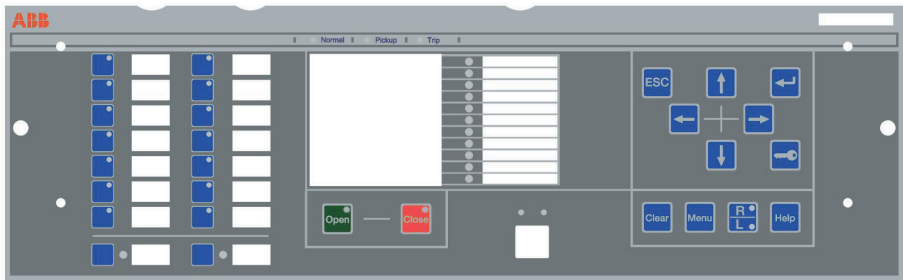


Figure 15: Front view with LHM (ANSI variant)

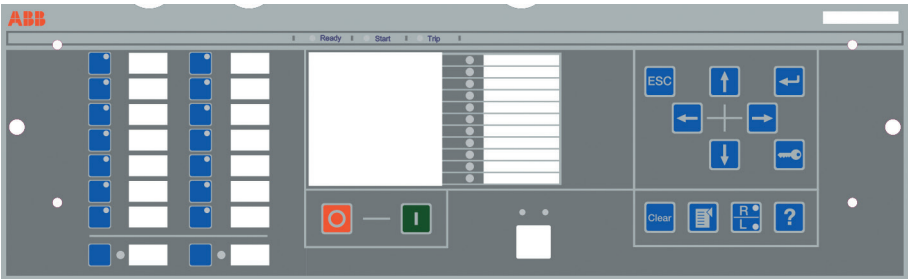


Figure 16: Front view with LHM (IEC variant)

Table 3: Large display

Character size	Rows in the view	Characters per row
Small, mono-spaced (6 × 12 pixels)	10	20

7.1.2

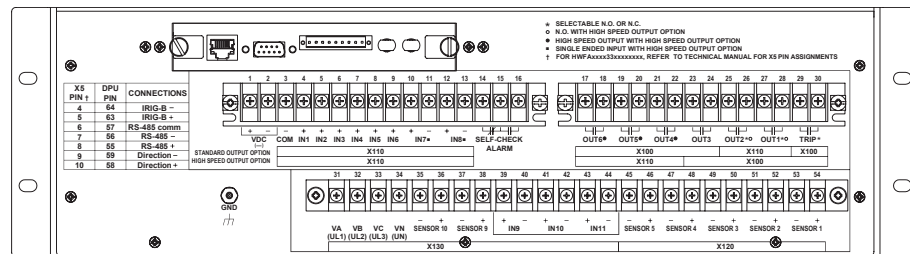


Figure 17: Rear view of the IED with communication module

7.2 Dimensions

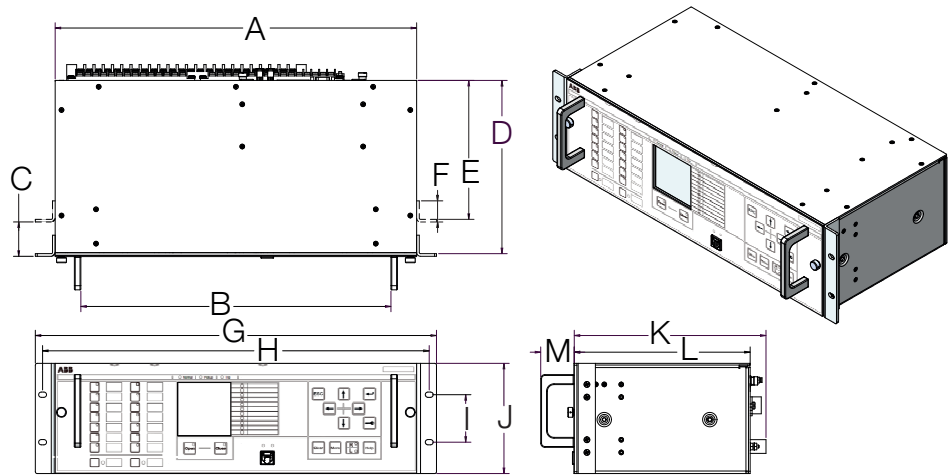


Figure 18: Main dimensions

A	17.12 in. (434.8 mm)	H	18.312 in. (465.1 mm)
B	14.69 in. (373.1 mm)	I	2.25 in. (57.2 mm)
C	1.625 in. (41.3 mm)	J	5.22 in. (132.6 mm)
D	8.21 in. (208.5 mm)	K	9.08 in. (230.6 mm)
E	6.58 in. (167.1 mm)	L	8.33 in. (211.6 mm)
F	1.00 in. (25.4 mm)	M	1.59 in. (40.4 mm)
G	19.00 in. (482.6 mm)		

Table 4: Dimensions

Description	Value	
Width	With mounting ears	19 in. (482.6 mm)
	Without mounting ears	17.12 in. (434.8 mm)
Height		5.22 in. (132.6 mm)
Depth		9.08 in. (230.7 mm)
Weight	Complete protection relay	11.9 lb (5.4 kg)
	Plug-in unit (inner chassis) only	5.1 lb (2.31 kg)

7.3 Enclosure class

Table 5: Degree of protection of flush-mounted protection relay

Description	Value
Front side (with dust cover accessory)	IP 54

Section 8 Accessories and ordering data

Table 6: *Tools*

Item	Order number
PCM600 V2.5 user tool	PCM600-25

Table 7: *Cables*

Item	Order number
Cable for optical sensors for arc protections 1.5 m	1MRS120534-1.5
Cable for optical sensors for arc protections 3.0 m	1MRS120534-3.0
Cable for optical sensors for arc protections 5.0 m	1MRS120534-5.0

Table 8: *Mounting accessories*

Item	Order number
Bezel/cover kit for panel mounting	2RGA018542A0001

Table 9: *Spare parts*

Item	Order number
RJ45 plug	2RGA019358P0001

Table 10: *Test switches*

Item	Order number
FT-1, FT-14 and FT-19 Flexitest switches	See Descriptive bulletins DB 41-077 and DB 41-078 on www.abb.com/substationautomation

Section 9 Glossary

AIM	Analog input module
ANSI	American National Standards Institute
BIO	Binary input and output
CCEB	Communication card extension board
CT	Current transformer
EMC	Electromagnetic compatibility
HW	Hardware
IED	Intelligent electronic device
IP	Internet protocol
LCD	Liquid crystal display
LCP	Liquid crystal polymer
LED	Light-emitting diode
LHMI	Local human-machine interface
PA	Polyamide
PBT	Polybutylene terephthalate
PC	1. Personal computer 2. Polycarbonate
PCB	Printed circuit board
PSM	Power supply module
RoHS	Restriction of hazardous substances
SW	Software
UL	Underwriters Laboratories
VT	Voltage transformer
WHMI	Web human-machine interface



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