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- 7.4 Connecting the cables
The Quick Start Guide contains instructions on how to setup the Relion 670/650 series IED to get started. The guide provides instructions to setup with a preconfigured IED, however, it is also useful for the customized version of the IED.

The guide describes basic instructions only. For complete information, see the IED manuals.

Figure 1: Sample of an IED
Section 2      Safety information

2.1  Symbols on the product

All warnings must be observed.

Read the entire manual before doing installation or any maintenance work on the product.

Class 1 Laser product. Take adequate measures to protect your eyes and do not view directly with optical instruments.

Do not touch the unit in operation. The installation shall take into account the worst case temperature.

2.2  Warnings

Observe the warnings during all types of work related to the product.

Only electrically skilled persons with the proper authorization and knowledge of any safety hazards are allowed to carry out the electrical installation.

National and local electrical safety regulations must always be followed. Working in a high voltage environment requires serious approach to avoid human injuries and damage to equipment.

Do not touch circuitry during operation. Potentially lethal voltages and currents are present.
Always use suitable isolated test pins when measuring signals in open circuitry. Potentially lethal voltages and currents are present.

Never connect or disconnect a wire and/or a connector to or from a IED during normal operation. Hazardous voltages and currents are present that may be lethal. Operation may be disrupted and IED and measuring circuitry may be damaged.

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

Always connect the IED to protective ground, regardless of the operating conditions. This also applies to special occasions such as bench testing, demonstrations and off-site configuration. This is class 1 equipment that shall be grounded.

Never disconnect the secondary connection of current transformer circuit without short-circuiting the transformer’s secondary winding. Operating a current transformer with the secondary winding open will cause a massive potential build-up that may damage the transformer and may cause injuries to humans.

Never remove any screw from a powered IED or from a IED connected to powered circuitry. Potentially lethal voltages and currents are present.

Take adequate measures to protect the eyes. Never look into the laser beam.

The IED with accessories should be mounted in a cubicle in a restricted access area within a power station, substation or industrial or retail environment.

2.3 Caution signs

Whenever changes are made in the IED, measures should be taken to avoid inadvertent tripping.
The IED contains components which are sensitive to electrostatic discharge. ESD precautions shall always be observed prior to touching components.

![Warning]

Always transport PCBs (modules) using certified conductive bags.

![Warning]

Do not connect live wires to the IED. Internal circuitry may be damaged.

![Warning]

Always use a conductive wrist strap connected to protective ground when replacing modules. Electrostatic discharge (ESD) may damage the module and IED circuitry.

![Warning]

Take care to avoid electrical shock during installation and commissioning.

![Warning]

Changing the active setting group will inevitably change the IEDs operation. Be careful and check regulations before making the change.

![Warning]

Avoid touching the enclosure of the coupling capacitor REX061 unit and the shunt resistor REX062 unit. The surface may be hot during normal operation. The temperature can rise 50°C in REX061 and 65°C in REX062 above the ambient temperature.
Section 3  Unpacking and inspecting

3.1  Removing transport packaging

IEDs require careful handling.

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

The cardboard packaging material is 100% recyclable.

3.2  Inspecting the product

3.2.1  Identifying the product

1. Locate the IED’s order number from the label attached to the IED’s case.
2. Compare the IED’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 the IED

• Check the IED to see if any damage occurred during transportation.

3.2.4  Returning an IED 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.
Section 4  IED hardware

4.1  Overview

4.1.1  Variants of case size with local HMI display

Figure 2:  1/2 19" case with local HMI display.
Figure 3: 3/4 19” case with local HMI display.

Figure 4: 1/1 19” case with local HMI display.
### 4.1.2 Case from the front and rear sides

#### Table 1: Designations for 1/2 x 19" casing with 1 TRM slot

<table>
<thead>
<tr>
<th>Front view</th>
<th>Rear position</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2x19&quot;</td>
<td>X11</td>
<td>PSM</td>
</tr>
<tr>
<td></td>
<td>X31 and X32 etc. to X51 and X52</td>
<td>BIM, BOM, SOM, IOM or MIM</td>
</tr>
<tr>
<td></td>
<td>X301, X302, X303, X304</td>
<td>SFP</td>
</tr>
<tr>
<td></td>
<td>X305</td>
<td>LDCM</td>
</tr>
<tr>
<td></td>
<td>X306</td>
<td>LDCM or OEM</td>
</tr>
<tr>
<td></td>
<td>X3061, X3062</td>
<td>SFP if OEM is selected</td>
</tr>
<tr>
<td></td>
<td>X311: A, B, C, D</td>
<td>SLM</td>
</tr>
<tr>
<td></td>
<td>X312</td>
<td>LDCM, IRIG-B, GTM</td>
</tr>
<tr>
<td></td>
<td>X313</td>
<td>LDCM, IRIG-B, GTM, RS485</td>
</tr>
<tr>
<td></td>
<td>X401</td>
<td>TRM</td>
</tr>
</tbody>
</table>

**Rear position**

**Module**

- PSM
- BIM, BOM, SOM, IOM or MIM
- SFP
- LDCM
- LDCM or OEM
- SFP if OEM is selected
- SLM
- LDCM, IRIG-B, GTM
- LDCM, IRIG-B, GTM, RS485
- TRM
### Table 2: Designations for 3/4 x 19” casing with 1 TRM slot

<table>
<thead>
<tr>
<th>Rear position</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>X11</td>
<td>PSM</td>
</tr>
<tr>
<td>X31 and X32 etc. to X101 and X102</td>
<td>BIM, BOM, SOM, IOM or MIM</td>
</tr>
<tr>
<td>X301, X302, X303, X304</td>
<td>SFP</td>
</tr>
<tr>
<td>X305</td>
<td>LDCM</td>
</tr>
<tr>
<td>X306</td>
<td>LDCM</td>
</tr>
<tr>
<td>X3061, X3062</td>
<td>SFP if OEM is selected</td>
</tr>
<tr>
<td>X311: A, B, C, D</td>
<td>SLM</td>
</tr>
<tr>
<td>X312</td>
<td>LDCM, IRIG-B, GTM</td>
</tr>
<tr>
<td>X313</td>
<td>LDCM, IRIG-B, GTM, RS485</td>
</tr>
<tr>
<td>X401</td>
<td>TRM</td>
</tr>
</tbody>
</table>
### Table 3: Designations for 3/4 x 19" casing with 2 TRM slot

<table>
<thead>
<tr>
<th>Front View</th>
<th>Rear position</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4x19&quot;</td>
<td>X11</td>
<td>PSM</td>
</tr>
<tr>
<td></td>
<td>X31 and X32 etc. to X71 and X72</td>
<td>BIM, BOM, SOM, IOM or MIM</td>
</tr>
<tr>
<td></td>
<td>X301, X302, X303, X304</td>
<td>SFP</td>
</tr>
<tr>
<td></td>
<td>X305</td>
<td>LDCM</td>
</tr>
<tr>
<td></td>
<td>X306</td>
<td>LDCM</td>
</tr>
<tr>
<td></td>
<td>X3061, X3062</td>
<td>SFP if OEM is selected</td>
</tr>
<tr>
<td></td>
<td>X311: A, B, C, D</td>
<td>SLM</td>
</tr>
<tr>
<td></td>
<td>X312</td>
<td>LDCM, IRIG-B, GTM</td>
</tr>
<tr>
<td></td>
<td>X313, X322, X323</td>
<td>LDCM, IRIG-B, GTM, RS485</td>
</tr>
<tr>
<td></td>
<td>X401</td>
<td>TRM 1</td>
</tr>
<tr>
<td></td>
<td>X411</td>
<td>TRM 2</td>
</tr>
</tbody>
</table>

670/650 series
Quick start guide
Table 4: Designations for 1/1 x 19” casing with 1 TRM slot

<table>
<thead>
<tr>
<th>Rear position</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>X11</td>
<td>PSM</td>
</tr>
<tr>
<td>X31 and X32 etc. to X161 and X162</td>
<td>BIM, BOM, SOM, IOM or MIM</td>
</tr>
<tr>
<td>X301, X302, X303, X304</td>
<td>SFP</td>
</tr>
<tr>
<td>X305</td>
<td>LDCM</td>
</tr>
<tr>
<td>X306</td>
<td>LDCM</td>
</tr>
<tr>
<td>X3061, X3062</td>
<td>SFP if OEM is selected</td>
</tr>
<tr>
<td>X311: A, B, C, D</td>
<td>SLM</td>
</tr>
<tr>
<td>X312</td>
<td>LDCM, IRIG-B, GTM</td>
</tr>
<tr>
<td>X313</td>
<td>LDCM, IRIG-B, GTM, RS485</td>
</tr>
<tr>
<td>X401</td>
<td>TRM</td>
</tr>
</tbody>
</table>
Table 5: Designations for 1/1 x 19” casing with 2 TRM slots

Rear position

<table>
<thead>
<tr>
<th>Module</th>
<th>X11</th>
<th>X31 and X32 etc. to X131 and X132</th>
<th>X301, X302, X303, X304</th>
<th>X305</th>
<th>X306</th>
<th>X3061, X3062</th>
<th>X311: A, B, C, D</th>
<th>X312</th>
<th>X313, X322, X323</th>
<th>X401</th>
<th>X411</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSM</td>
<td></td>
<td>BIM, BOM, SOM, IOM or MIM</td>
<td>SFP</td>
<td>LDCM</td>
<td>LDCM</td>
<td>SFP if OEM is selected</td>
<td>SLM</td>
<td>LDCM, IRIG-B, GTM</td>
<td>TRM 1</td>
<td>TRM 2</td>
<td></td>
</tr>
<tr>
<td>SLM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDCM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IRIG-B, GTM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS485</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SLM and LDCM modules not used in RES670.
Section 5  Powering up the IED

All Relion 670/650 series IEDs have either low or high power supply ranges.

Low-range: 24-60 V DC

High-range: 90-250 V DC

5.1 How to know the voltage level

1. See the label on the right-hand side of the IED to know the voltage level for the IED.

The label also contains data such as, IED serial number and analog input ranges.

For example, see Figure 5.

![Figure 5: Example of Relion 670 IED label]

1. QR-code containing the complete ordering code
2. Power supply module (PSM)
3. mA input module (MIM)
4. Ordering and serial number
5. Manufacturer
5.2 How to connect to the power supply

The power supply module is on the leftmost side (rear view) of the IED. The connector X11 is a 5-input phoenix type contact. See Figure 6 for example.

![Figure 6: Rear view of the 1/2 x 19" IED](image)

1. Connect wires or cables to the IED terminals (see Figure 7 for PSM connection diagram) in accordance with the established guidelines for this type of equipment.

   ![Warning](image)

   Insert only the corresponding male connector to the female connector. Inserting anything else (such as a measurement probe) may violate the female connector and prevent a proper electrical contact between the printed circuit board and the external wiring connected to the screw terminal block.


**Figure 7: Power supply module (PSM)**

The auxiliary power wiring should have a minimum cross-sectional area of 1.0 mm² and a voltage rating of 250 V. Branch circuit protection must be provided in the auxiliary power supply wiring to the IED, and if necessary it must be possible to disconnect manually from the power supply. Fuse or circuit breaker up to 6 A and 250 V should be close to the equipment.

Ensure that the IED is grounded before starting it.

### 5.3 Energizing the IED

Before connecting the auxiliary power, check that the terminal strip is wired and placed correctly. Remove the protective film from the top side of the unit.

During IED start-up, you can observe the following sequence:

1. The Green Normal LED starts to flash.
2. The LCD lights up and *starting...* is displayed.
3. The main menu is displayed. A final steady green Normal LED indicates a successful start-up of the device.

If the self supervision of the IED detects a diagnostic error during the start-up process, the green Normal LED flashes. Further information on the error may be visible on the local HMI under **Main menu/Diagnostics/IED status/General**. Note down the displayed information as reference when contacting ABB technical support.
Section 6  LHMI overview

6.1 Local HMI

The LHMI of the IED contains the following elements

- Keypad
- Display (LCD)
- LED indicators
- Communication port for PCM600

The LHMI is used for setting, monitoring and controlling.

6.1.1 Keypad

The LHMI keypad contains push-buttons which are used to navigate in different views or menus. The push-buttons are also used to acknowledge alarms, reset indications, provide help and switch between local and remote control mode.

The keypad also contains programmable push-buttons that can be configured either as menu shortcut or control buttons.
Figure 8: LHMI keypad with object control, navigation and command push-buttons and RJ-45 communication port

1...5 Function button
6 Close
7 Open
8 Escape
9 Left
10 Down
11 Up
12 Right
13 Key
14 Enter
15 Remote/Local
16 Uplink LED
17 Not in use
18 Multipage
19 Menu
20 Clear
21 Help
22
23
24
Object control

If the control position of the IED is set to local with the R/L button, the controlled objects can be opened and closed using the object control buttons.

Object to be controlled is selected from the single line diagram.

Table 6: Object control push-buttons

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close</td>
<td>Closing the object. The LED indicates the current object state.</td>
</tr>
<tr>
<td>Open</td>
<td>Opening the object. The LED indicates the current object state.</td>
</tr>
</tbody>
</table>

Navigation

The arrow buttons are used for navigation. To scroll information, press the arrow button several times or simply keep it pressed down.

Table 7: Navigation push-buttons

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESC</td>
<td>Leaving setting mode without saving the values. Cancelling certain actions. Adjusting the display contrast in combination with ↑ or ↓. Running the display test in combination with . Deleting a character in combination with when editing a string. Inserting a space in combination with when editing a string.</td>
</tr>
<tr>
<td>Enter</td>
<td>Entering parameter setting mode. Confirming a new value of a setting parameter. Confirming selection in dialogs and alarm panel.</td>
</tr>
<tr>
<td>Up Down</td>
<td>Moving up and down in menus. Selecting objects in the SLD. Moving selection in dialogs and alarm panel. Scrolling active digits of a parameter when entering a new setting value.</td>
</tr>
<tr>
<td>Left Right</td>
<td>Moving left and right in menus. Selecting pages in the SLD. Changing the active digit of a parameter when entering a new setting value.</td>
</tr>
<tr>
<td>Key</td>
<td>Activating the authorization procedure, when the user is not logged in. Logging out, when the user is currently logged in.</td>
</tr>
</tbody>
</table>
Commands

Table 8: Command push-buttons

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu</td>
<td>• Moving directly to Main menu, if currently in any other menu or view.</td>
</tr>
<tr>
<td></td>
<td>• Moving to the default view, if currently in Main menu.</td>
</tr>
<tr>
<td>R/L</td>
<td>Changing the control position (remote or local) of the device.</td>
</tr>
<tr>
<td></td>
<td>• When the R LED is lit, remote control is enabled and local control disabled.</td>
</tr>
<tr>
<td></td>
<td>• When the L LED is lit, local control is enabled and remote control disabled.</td>
</tr>
<tr>
<td></td>
<td>• When none of the LEDs are lit, both control positions are disabled.</td>
</tr>
<tr>
<td>Clear</td>
<td>• Activating the Clear/Reset view.</td>
</tr>
<tr>
<td>Help</td>
<td>Showing the help menu.</td>
</tr>
<tr>
<td>Multipage</td>
<td>Opening alarm panel and selecting alarm page from the view.</td>
</tr>
</tbody>
</table>

Function buttons

Table 9: Function buttons

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function button</td>
<td>Executing the defined function: OFF, menu short cut or binary control.</td>
</tr>
</tbody>
</table>

6.1.2 Display

The LHMI includes a graphical monochrome liquid crystal display (LCD) with a resolution of 320 x 240 pixels. The character size can vary.

The display view is divided into four basic areas.
Figure 9: Display layout

1 Path
2 Content
3 Status
4 Scroll bar (appears when needed)

- The path shows the current location in the menu structure. If the path is too long to be shown, it is truncated from the beginning, and the truncation is indicated with three dots.
- The content area shows the menu content.
- The status area shows the current IED time, the user that is currently logged in and the object identification string which is settable via the LHMI or with PCM600.
- If text, pictures or other items do not fit in the display, a vertical scroll bar appears on the right. The text in content area is truncated from the beginning if it does not fit in the display horizontally. Truncation is indicated with three dots.
Figure 10: Truncated path

The function key button panel shows on request what actions are possible with the function buttons. Each function button has a LED indication that can be used as a feedback signal for the function button control action. The LED is connected to the required signal with PCM600.

Figure 11: Function button panel

The indication LED panel shows on request the alarm text labels for the indication LEDs. Three indication LED pages are available.
The function button and indication LED panels are not visible at the same time. Each panel is shown by pressing one of the function buttons or the Multipage button. Pressing the ESC button clears the panel from the display. Both panels have a dynamic width that depends on the label string length.

### 6.1.3 LEDs

The LHMI includes three protection status LEDs above the display: Normal, Pickup and Trip.

There are 15 programmable indication LEDs on the front of the LHMI. Each LED can indicate three states with the colors: green, yellow and red.

There are 3 separate panels of LEDs available. The 15 physical three-color LEDs in one LED group can indicate 45 different signals. Altogether, 135 signals can be indicated since there are three LED groups. The LEDs are lit according to priority, with red being the highest and green the lowest priority. For example, if on one panel there is an indication that requires the green LED to be lit, and on another panel there is an indication that requires the red LED to be lit, the red LED takes priority and is lit. The LEDs can be configured with PCM600 and the operation mode can be selected with the LHMI or PCM600.

Information panels for the indication LEDs are shown by pressing the Multipage button. Pressing that button cycles through the three pages. A lit or un-acknowledged LED is indicated with a highlight. Such lines can be selected by using the Up/Down arrow buttons. Pressing the Enter key shows details about the selected LED. Pressing the ESC button exits from information pop-ups as well as from the LED panel as such.

The Multipage button has a LED. This LED is lit whenever any LED on any panel is lit. If there are un-acknowledged indication LEDs, then the Multipage LED Flashes. To acknowledge LEDs, press the Clear button to enter the Reset menu (refer to description of this menu for details).

There are two additional LEDs which are next to the control buttons and . These LEDs can indicate the status of two arbitrary binary signals by configuring the OPENCLOSE_LED function block. For instance, OPENCLOSE_LED can be connected to a circuit breaker to indicate the breaker open/close status on the LEDs.
6.1.4 Local HMI functionality

6.1.4.1 Protection and alarm indication

Protection indicators

The protection Target LEDs are Normal, Pickup and Trip.

The yellow and red status LEDs are configured in the digital fault recorder function, DRPRDRE, by connecting a pickup or trip signal from the actual function to a BxRBDR binary input function block using the PCM600 and configure the setting to Disabled, Pickup or Trip for that particular signal.

Table 10: Normal LED (green)

<table>
<thead>
<tr>
<th>LED state</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>Auxiliary supply voltage is disconnected.</td>
</tr>
<tr>
<td>Enabled</td>
<td>Normal operation.</td>
</tr>
<tr>
<td>Flashing</td>
<td>Internal fault has occurred.</td>
</tr>
</tbody>
</table>

Table 11: PickUp LED (yellow)

<table>
<thead>
<tr>
<th>LED state</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>Normal operation.</td>
</tr>
<tr>
<td>Enabled</td>
<td>A protection function has picked up and an indication message is displayed. The pick up indication is latching and must be reset via communication, LHMI or binary input on the LEDGEN component. To open the reset menu on the LHMI, press [Reset].</td>
</tr>
<tr>
<td>Flashing</td>
<td>The IED is in test mode and protection functions are blocked, or the IEC61850 protocol is blocking one or more functions. The indication disappears when the IED is no longer in test mode and blocking is removed. The blocking of functions through the IEC61850 protocol can be reset in Main menu/Test/Reset IEC61850 Mod. The yellow LED changes to either Enabled or Disabled state depending on the state of operation.</td>
</tr>
</tbody>
</table>
Table 12: Trip LED (red)

<table>
<thead>
<tr>
<th>LED state</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>Normal operation.</td>
</tr>
</tbody>
</table>
| Enabled    | A protection function has tripped. An indication message is displayed if the auto-
|            | indication feature is enabled in the local HMI. The trip indication is latching and
|            | must be reset via communication, LHMI or binary input on the LEDGEN component. To
|            | open the reset menu on the LHMI, press .                                    |
| Flashing   | Configuration mode.                                                         |

Alarm indicators

The 15 programmable three-color LEDs are used for alarm indication. An individual alarm/status signal, connected to any of the LED function blocks, can be assigned to one of the three LED colors when configuring the IED.

Table 13: Alarm indications

<table>
<thead>
<tr>
<th>LED state</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disabled</td>
<td>Normal operation. All activation signals are Disabled.</td>
</tr>
<tr>
<td>Enabled</td>
<td>• Follow-S sequence: The activation signal is Enabled.</td>
</tr>
<tr>
<td></td>
<td>• LatchedCol-S sequence: The activation signal is Enabled, or it is off but the indication has not been acknowledged.</td>
</tr>
<tr>
<td></td>
<td>• LatchedAck-F-S sequence: The indication has been acknowledged, but the activation signal is still Enabled.</td>
</tr>
<tr>
<td></td>
<td>• LatchedAck-S-F sequence: The activation signal is Enabled, or it is off but the indication has not been acknowledged.</td>
</tr>
<tr>
<td></td>
<td>• LatchedReset-S sequence: The activation signal is Enabled, or it is off but the indication has not been acknowledged.</td>
</tr>
<tr>
<td>Flashing</td>
<td>• Follow-F sequence: The activation signal is Enabled.</td>
</tr>
<tr>
<td></td>
<td>• LatchedAck-F-S sequence: The activation signal is Enabled, or it is off but the indication has not been acknowledged.</td>
</tr>
<tr>
<td></td>
<td>• LatchedAck-S-F sequence: The indication has been acknowledged, but the activation signal is still Enabled.</td>
</tr>
</tbody>
</table>
Section 7 Connecting to the PCM600 software

The software suite used for communicating to the IED is the PCM600. This tool enables to read and modify the settings in the IED, and to view the events register, Digital fault recorder (oscillography), and other monitoring tasks.

7.1 PCM600 tool

Protection and Control IED Manager PCM600 offers all the necessary functionality to work throughout all stages of the IED life cycle.

- Planning
- Engineering
- Commissioning
- Operation and disturbance handling
- Functional analysis

When using PCM600 for writing to the IED, ensure that the LHMI is not in a menu position where settings can be made. Only one active transaction, from LHMI or PCM600, is allowed at a time.

With the individual tool components, you can perform different tasks and functions and control the whole substation. PCM600 can operate with many different topologies, depending on the customer needs.

For more information, see PCM600 documentation.

7.1.1 Connectivity packages

A connectivity package is a software component that consists of executable code and data which enables system tools to communicate with an IED. Connectivity packages are used to create configuration structures in PCM600. The latest PCM600 and connectivity packages are backward compatible with older IED versions.

A connectivity package includes all of the data which is used to describe the IED, for example, it contains a list of the existing parameters, data format used, units, setting range, access rights and visibility of the parameter. In addition, it contains code which allows software packages that consume the connectivity package to properly communicate with the IED. It also allows for localization of text even when its read from the IED in a standard format such as COMTRADE.

Update Manager is a tool that helps in defining the right connectivity package versions for different system products and tools. Update Manager is included with products that use connectivity packages. Update Manager is a part of PCM600 and is delivered with it.
7.2 **Preparing for the connection**

1. Keep a crossover RJ45 cable ready to connect between the PC and IED. Most modern PCs can automatically ‘crossover’ the straight connection RJ45 cables. For example, if a Gigabit Ethernet is used in the system, a crossover cable is not required. If it is unsure whether the PC has this functionality, then use a crossover cable.

7.3 **Installing the PCM600 software**

1. Download the latest version of PCM600 software from ABB Software Library.
2. Follow the instructions in the installation wizard to install the software.

7.4 **Connecting the cables**

1. Connect the RJ45 Ethernet cable between the front port of the IED and the PC.

![Image of RJ45 cable connection to the front port of the IED](IEC18000031-1-en.vsdx)

*Figure 14: RJ45 cable connection to the front port of the IED*

The default IP address of the front port of the IED, 10.1.150.3, is used to establish a connection.
Before starting the PCM600 program, edit the network settings of the computer system. The computer system and the IED should be configured to communicate correctly because both will be available on the same network. This is possible when the IED and the computer system have the same Subnet Mask but different IP addresses.

Figure shows this concept and the addresses are used as an example; other addresses can also be used.

![Network settings to connect PC with an IED](image)

**Figure 15**: Network settings to connect PC with an IED

Based on the version of the Windows operating system, follow the instructions to edit network settings.

The PCM600 software version 2.8 or later is used to connect to the IED that supports Windows XP, 7, 8, 8.1, and 10.

### 8.1 Setting up communication between PCM600 and the IED

The communication between the IED and PCM600 is independent of the communication protocol used within the substation or to the NCC.
The communication media is always Ethernet and the used transport layer is TCP/IP.

Each IED has an RJ-45 Ethernet interface connector on the front. The front Ethernet connector is recommended to be used for communication with PCM600.

When an Ethernet-based station protocol is used, PCM600 communication can use the same Ethernet port and IP address.

To connect PCM600 to the IED, two basic variants must be considered.

- Direct point-to-point link between PCM600 and the IED front port.
- A link via a station LAN or from remote via a network.

The physical connection and the IP address must be configured in both cases to enable communication.

The communication procedures are the same in both cases.

1. If needed, set the IP address for the IEDs.
2. Set up the PC or workstation for a direct link (point-to-point), or
3. Connect the PC or workstation to the LAN/WAN network.
4. Configure the IED IP addresses in the PCM600 project for each IED to match the IP addresses of the physical IEDs.

**Setting up IP addresses**

Communication between the IED and PCM600 is enabled from the LHMI. The IP address and the corresponding communication subnetwork mask must be set via the Ethernet configuration tool (ECT) for each available Ethernet interface in the IED. Each Ethernet interface has a default factory IP address when the IED is delivered. The IP address and the subnetwork mask might have to be reset when an additional Ethernet interface is installed or an interface is replaced.

DHCP is available for the front port, and a device connected to it can thereby obtain an automatically assigned IP address via the local HMI path `Main menu/Configuration/Communication/Ethernet configuration/Front port/DHCP`.

Alternatively the default IP address for the IED front port is 10.1.150.3 and the corresponding subnetwork mask is 255.255.255.0, which can be set via the local HMI path `Main menu/Configuration/Communication/TCP-IP configuration/ETHFRNT:1Main menu/Configuration/Communication/Ethernet configuration/AP_FRONT`.

**Setting up the PC or workstation for point-to-point access to IEDs front port**

An ethernet cable (max 2 m length) with RJ-45 connectors is needed to connect two physical Ethernet interfaces together without a hub, router, bridge or switch in between.

If an IED is equipped with optical LC interface, a converter between RJ-45 and LC is needed.

1. Select **Search programs and files** in the **Start menu** in Windows.
Figure 16: Select: Search programs and files

2. Type **View network connections** and click on the **View network connections** icon.
Figure 17: Click View network connections

3. Right-click and select Properties.

Figure 18: Right-click Local Area Connection and select Properties

4. Select the TCP/IPv4 protocol from the list of configured components using this connection and click Properties.
5. Select **Use the following IP address** and define **IP address** and **Subnet mask** if the front port is used and if the **IP address** is not set to be obtained automatically by the IED, see **Figure 20**. The IP address must be different from the IP address chosen for the IED.

6. Close all open windows and start PCM600.
The PC and IED must belong to the same subnetwork for this set-up to work.

Setting up the PC to access the IED via a network

The same method is used as for connecting to the front port.

The PC and IED must belong to the same subnetwork for this set-up to work.
Section 9  Working with the PCM software

The Protection and Control IED Manager, PCM600, tool provides versatile functionalities for the complete life-cycle of all Relion IEDs at all voltage levels. It enables to read or write the configuration and settings from and to the IED.

After connecting the PCM software and modified network settings, the system is ready to connect to the IED.

To operate with PCM600, there must be at least one IED Connectivity Package installed and selected to be used with the PCM600 version installed. See the PCM600 getting started guide for detailed information about working with PCM600.