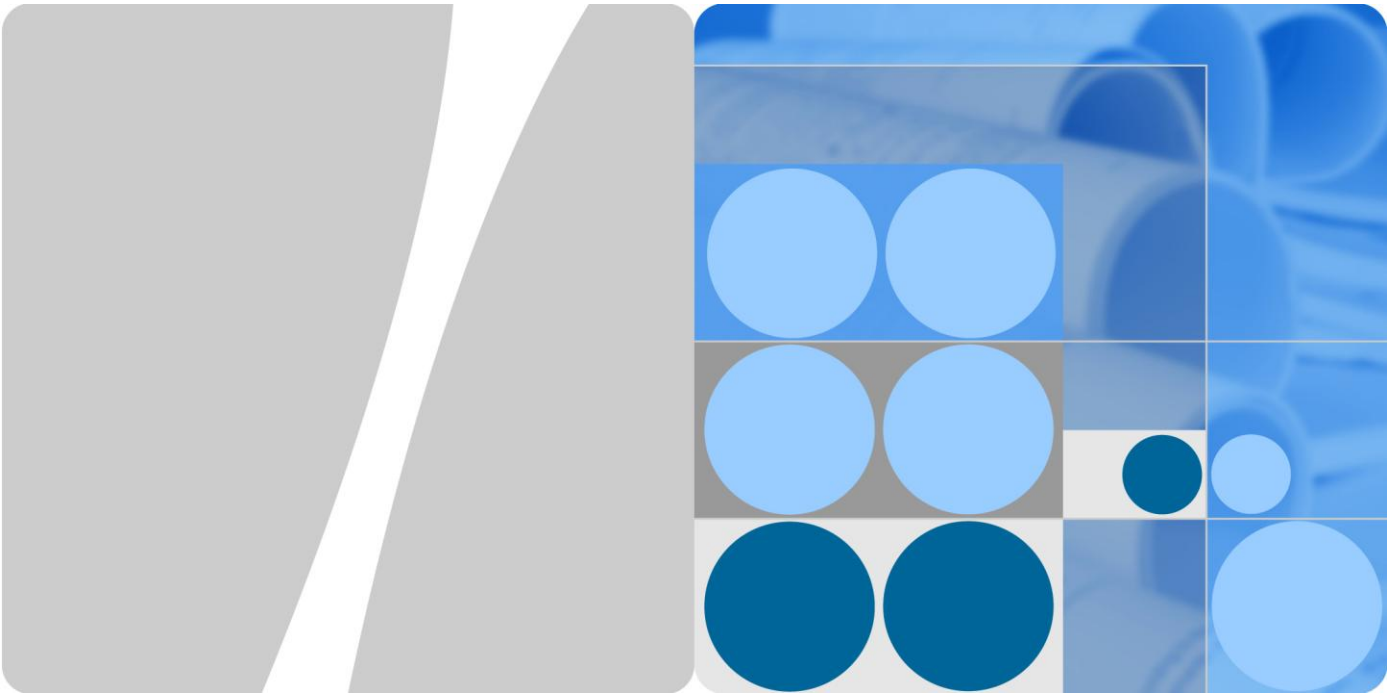


Part Number: 31010VJY



PLC CCO01A

User Manual

Issue 01
Date 2015-08-15

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About This Document

Purpose

This document introduces the installation, operation, maintenance, and troubleshooting of the PLC CCO01A (PLC CCO for short). Get familiar with the PLC CCO features, functions, and safety precautions provided in this document before installing and operating the PLC CCO.



NOTICE

For details about how to install the PLC CCO inside a Huawei communications cabinet and perform electrical connections, see the *SUN2000 Communications Cabinet User Manual*. For other installation scenarios, see the descriptions in this manual.




Keep the hard copy of this document properly for future reference. You can also download the latest manual from <http://support.huawei.com>.



Intended Audience

This document is intended for photovoltaic (PV) power station personnel and qualified electrical technicians.

Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
 DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Symbol	Description
 NOTICE	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results. NOTICE is used to address practices not related to personal injury.
 NOTE	Calls attention to important information, best practices and tips. NOTE is used to address information not related to personal injury, equipment damage, or environment deterioration.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 01 (2015-08-15)

This issue is the first official release.

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1 Safety Precautions

This chapter describes the precautions for installing and using the PLC CCO.

Personnel Requirements

- Only qualified and trained electrical technicians are allowed to install and operate the PLC CCO.
- Operators should understand the components and functioning of a grid-tied PV power system, and they should be familiar with relevant local standards.

Label Protection

Do not remove or damage the bar code and label on the PLC CCO because they contain important product information.

Installation



NOTICE

Read this document before installation. Huawei shall not be liable for any consequence caused by violation of the regulations specified in this document.

- Before installation and cable connections of the PLC CCO, ensure that the PLC CCO is not connected to a power supply and is not powered on.
- Before connecting cables, ensure that the switch to be connected to the PLC CCO AC power cable is off.
- Install the PLC CCO in an environment with good ventilation to ensure efficient and long-term system performance.
- Ensure that the PLC CCO is free from strong electromagnetic interference.
- Ensure that the PLC CCO is away from heat sources.
- Ensure that the PLC CCO air exhaust vents are free from blockage.

Operation



NOTICE

Perform operations in strict accordance with safety precautions specified in this document and other relevant documents.

Follow local laws and regulations when operating the device.

Maintenance and Replacement

- A faulty PLC CCO requires overall maintenance. If the PLC CCO is faulty, contact the supplier or Huawei technical support.
- Maintain the PLC CCO with sufficient knowledge of this document and proper tools and testing equipment.
- When maintaining the PLC CCO, observe ESD precautions.
- Before replacing the PLC CCO and maintaining PLC CCO cables, power off the PLC CCO.

2 Overview

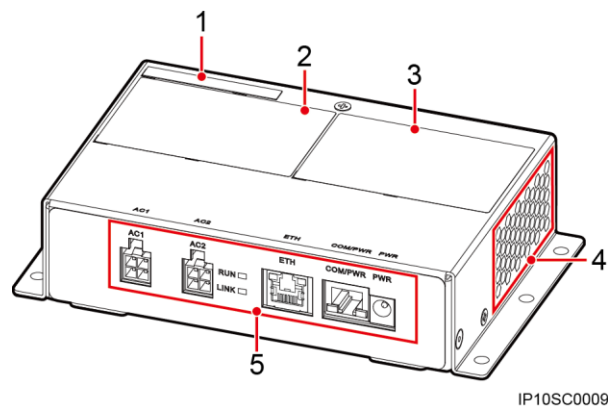
This chapter describes the appearance, functions, features, and networking of the PLC CCO.

2.1 Product Overview

Exterior

Figure 2-1 shows a PLC CCO.

Figure 2-1 PLC CCO exterior



- | | | |
|-----------------------|--------------------------|-------------------------------|
| (1) ESN label | (2) Product label | (3) Qualification certificate |
| (4) Air exhaust vents | (5) Ports and indicators | |

Functions

- The PLC CCO can connect to SUN2000 inverters that support power line communication (PLC) functions to transmit data over the power line.
- The PLC CCO can connect to the data collector using an RS485 communications cable to transmit data and convert between PLC and RS485 communication.

Benefits

The PLC networking mode uses the existing power line for communication and does not require additional communications cable, which reduces the construction and maintenance costs and improves communication reliability and efficiency.

2.2 Networking

Typical Scenarios

A PLC module consists of the station (STA) and central coordinator (CCO). [Figure 2-2](#) and [Figure 2-3](#) show the typical application scenarios of the PLC networking.

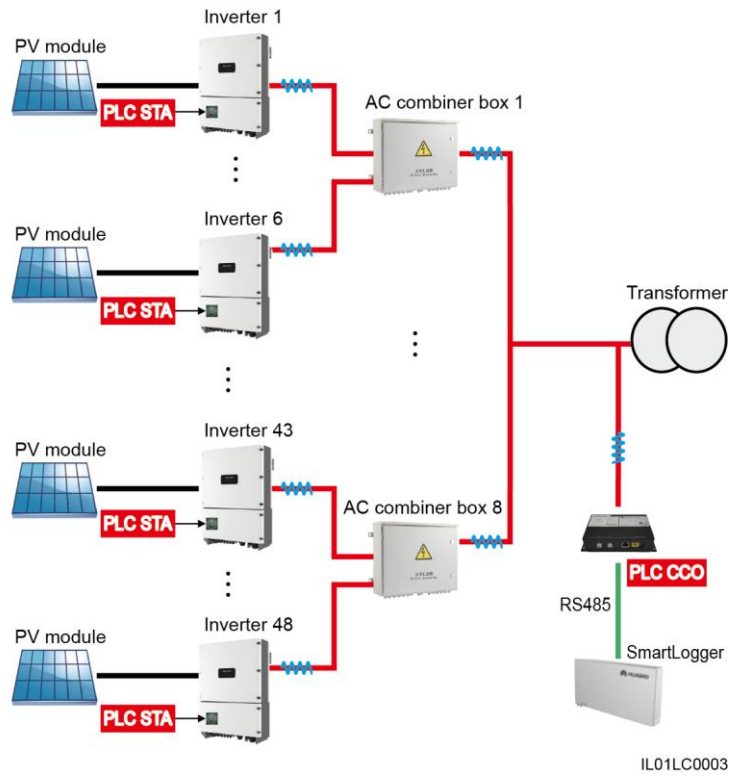
- As the slave unit of the PLC, the STA is installed inside the SUN2000 as a communications board. The STA converts the RS485 communications data received from the inverter monitoring board and sends the converted data to the power cable. In addition, it converts the data received from the power cable and sends the converted data to the inverter monitoring board.
- As the master unit of the PLC, the CCO is installed in an AC PDC, box-type transformer, or communications cabinet as a standalone device. The CCO converts RS485 communications data received from the data collector and sends the converted data to the power cable. In addition, it converts the data received from the power cable and sends the converted data to the data collector.



NOTE

- The PLC CCO can connect to a maximum of 80 PLC STAs. Generally, a PLC CCO is configured for each grid-tied point.
- The PLC CCO supports only the Modbus protocol.

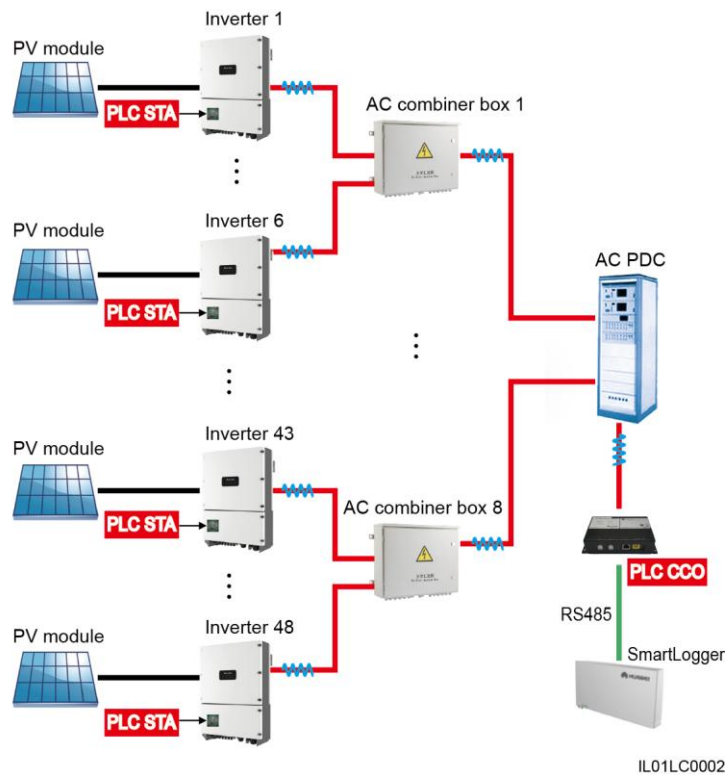
Figure 2-2 PLC networking applied to typical medium-voltage grid-tied scenarios



NOTE

In typical medium-voltage grid-tied scenarios, the PLC CCO can be installed in a box-type transformer or communications cabinet.

Figure 2-3 PLC networking applied to typical low-voltage grid-tied scenarios



NOTE

In typical low-voltage grid-tied scenarios, the PLC CCO can be installed in the AC PDC.

Restriction



NOTICE

- The PLC networking applies to low-voltage grid-tied scenarios only in China.
- For grid-tied scenarios in which an inverter is connected to an isolation transformer, the transformer isolates PLC signals. Therefore, PLC networking is not applicable to such scenarios.

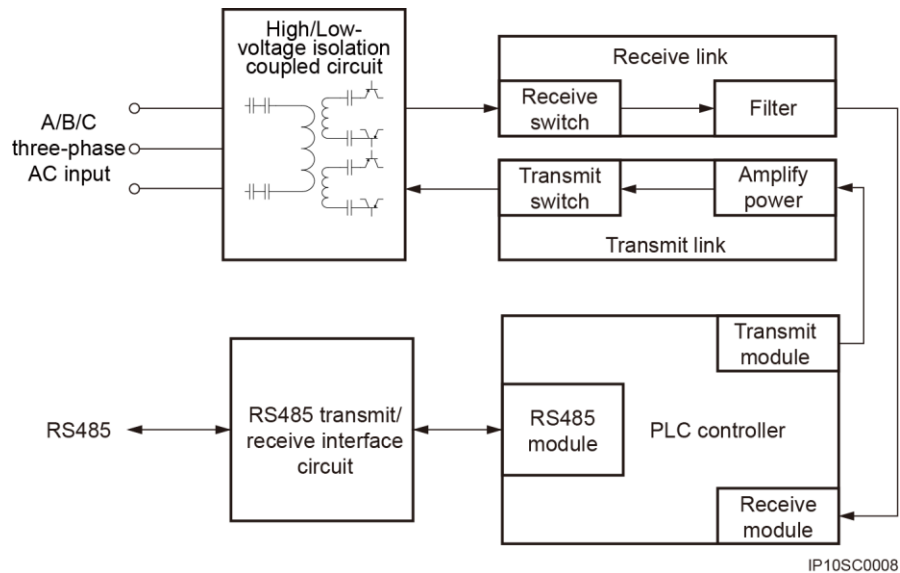
The PLC networking applies to medium-voltage grid-tied scenarios. If it needs to be used in low-voltage grid-tied scenarios, the following three conditions must be met:

- There is no load between the PLC STA and the PLC CCO.
- The maximum distance between the PLC STA and PLC CCO is less than 1000 m. That is, the AC output circuit from the farthest inverter to the low-voltage grid-tied point must be less than 1000 m long.
- The distance between the PLC CCO and loads is greater than 20 m. That is, the power distribution circuit from the low-voltage grid-tied point to the closest load must be greater than 20 m long. Loads include air conditioners, machine tools, and motors in the plant.

2.3 Working Principles

Figure 2-4 shows the PLC CCO circuit diagram.

Figure 2-4 Circuit diagram



The working principles of the PLC CCO are as follows:

- Uses the high/low voltage isolation coupled circuit to isolate low-frequency three-phase AC power from board low voltages, thereby ensuring board safety. In addition, the PLC CCO provides the high-frequency circuit for injecting and extracting PLC signals.
- Filters and processes PLC signals over the receive link. The signals are extracted from the AC power cable.
- Amplifies the power of PLC signals and injects the PLC signals into the AC power cable over the transmit link.
- Converts between PLC and RS485 signals through the PLC controller.
- Provides the channel for sending and receiving RS485 signals over the RS485 transmit/receive interface circuit to communicate with the data collector.

3 Equipment Installation

3.1 Checking Before Installation

Before unpacking, check that the product is intact. After unpacking, check that product and accessories are complete.

Checking Outer Packing Materials

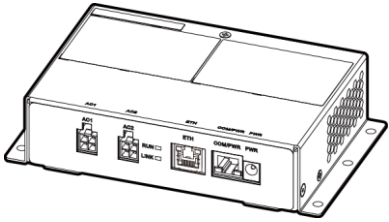
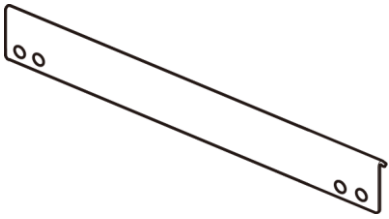
Check the outer packing materials for damage, such as holes and cracks, before unpacking the PLC CCO. If any damage is found, do not unpack the PLC CCO and contact the supplier or Huawei technical support promptly.

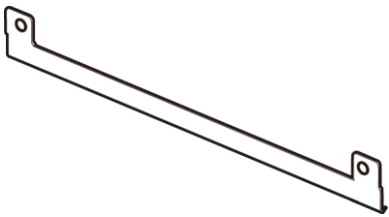
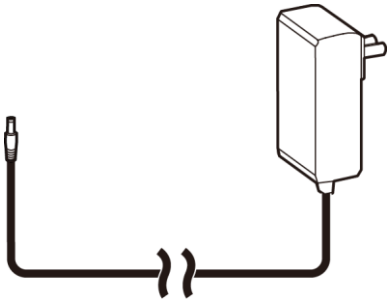
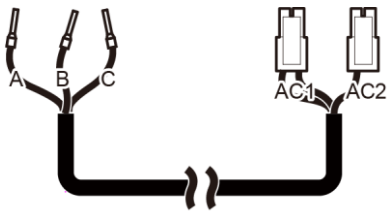

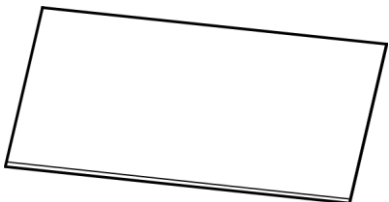
Checking the Product and Accessories

After unpacking the PLC CCO, check whether the product and accessories are intact and complete. If any item is missing or damaged, contact the supplier or Huawei technical support.

Table 3-1 shows the product and accessories included in the delivery.


Table 3-1 PLC CCO product and accessories


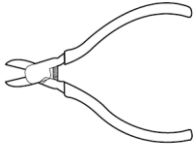

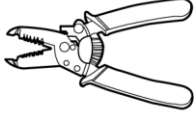

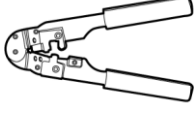
Name	Exterior	Quantity/ Length	Description
PLC CCO		1 PCS	N/A
Support 1		1 PCS	Applies when a guide rail is used for the installation.

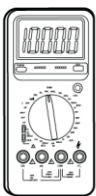
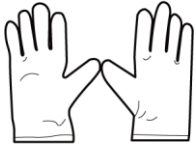
Name	Exterior	Quantity/ Length	Description
Support 2		1 PCS	Applies when a guide rail is used for the installation.
Power adapter		1 PCS/1.5 m	The PLC CCO power adapter cable is 1.5 m long. When installing the PLC CCO, ensure that the PLC CCO is less than 1.5 m away from the AC power port.
AC power cable		1 PCS/1 m	The AC power cable is 1 m long. When installing the PLC CCO, ensure that the PLC CCO is less than 1 m away from the switch to be connected to the AC power cable.
M4x8 screw		8 PCS	Used for device mechanical installation.
Manual		1 PCS	Provides guidance for installing and using the PLC CCO.

3.2 Preparing Tools

Before installing the PLC CCO, prepare tools required for installation and cable connections.

Tool	Model	Function
Torque screwdriver 	Phillips head: M4	Installs and removes PLC CCO screws.

Tool	Model	Function
<p>Flat-head screwdriver</p> 	<p>3 mm x 100 mm</p> <ul style="list-style-type: none"> • Head width: 3–3.5 mm • Pole length (excluding the handle): at least 100 mm 	<p>Tightens or loosens screws when installing cables.</p>
<p>Diagonal pliers</p> 	<p>N/A</p>	<p>Cuts cable ties.</p>
<p>Cable tie</p> 	<p>N/A</p>	<p>Binds cables.</p>
<p>Wire stripper</p> 	<p>N/A</p>	<p>Peels cable jackets.</p>
<p>Utility knife</p> 	<p>N/A</p>	<p>Removes packages.</p>
<p>RJ45 crimping tool</p> 	<p>N/A</p>	<p>Prepares an RS485 communications cable.</p>

Tool	Model	Function
Multimeter 	N/A	Checks cable connections.
ESD gloves 	N/A	Protect your hands during installation.

3.3 Determining the Installation Position

Before installing the PLC CCO, determine an appropriate position to ensure that the PLC CCO works properly and efficiently.



NOTE

- In most cases, the PLC CCO is installed in an AC PDC, box-type transformer, or communications cabinet.
- For details about the PLC CCO used in a communications cabinet, see the *SUN2000 Communications Cabinet User Manual*.

Basic Requirements

- The installation mode and position must be suitable for the weight (550 g) and dimensions (H x W x D) (100 mm x 169 mm x 39 mm) of the PLC CCO.
- Do not install the PLC CCO in areas with flammable or explosive materials.

Installation Environment Requirements

- The ambient temperature must be below 70 °C, which ensures optimal PLC CCO operation and extends the service life of the PLC CCO.
- The PLC CCO must be installed in a well-ventilated environment to ensure good heat dissipation.

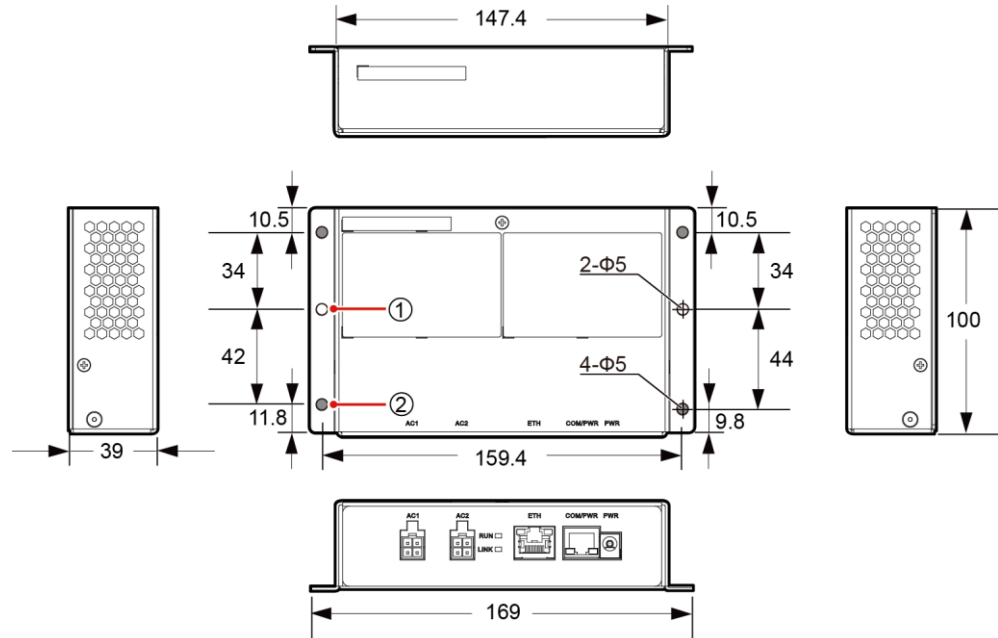
Carrier Requirements

- The carrier where the PLC CCO is installed must be fireproof.
- Do not install the PLC CCO on flammable building materials.
- Ensure that the surface on which the PLC CCO is to be installed is strong enough to bear the weight of the PLC CCO.

Installation Dimensions

Figure 3-1 shows the PLC CCO installation dimensions.

Figure 3-1 Installation dimensions (unit: mm)



IP10SC0006

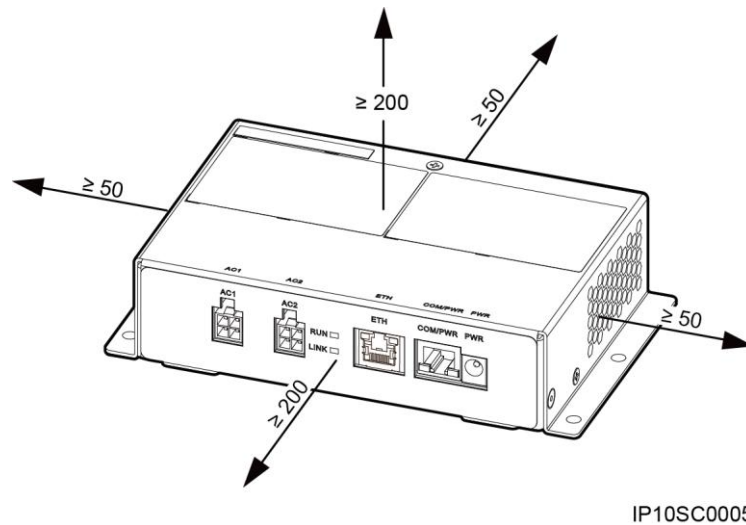
(1) Guide rail mounting hole

(2) Ear mounting hole

Installation Space Requirements

Reserve clearance around the PLC CCO to ensure sufficient space for installation and maintenance. Figure 3-2 shows the recommended installation space.

Figure 3-2 Recommended installation space (unit: mm)



3.4 Installing the PLC CCO Using Mounting Ears

Prerequisites

The holes planned for installing the PLC CCO meet the installation position requirements.



NOTE

This installation mode applies when the PLC needs to be secured inside a Huawei communications cabinet.

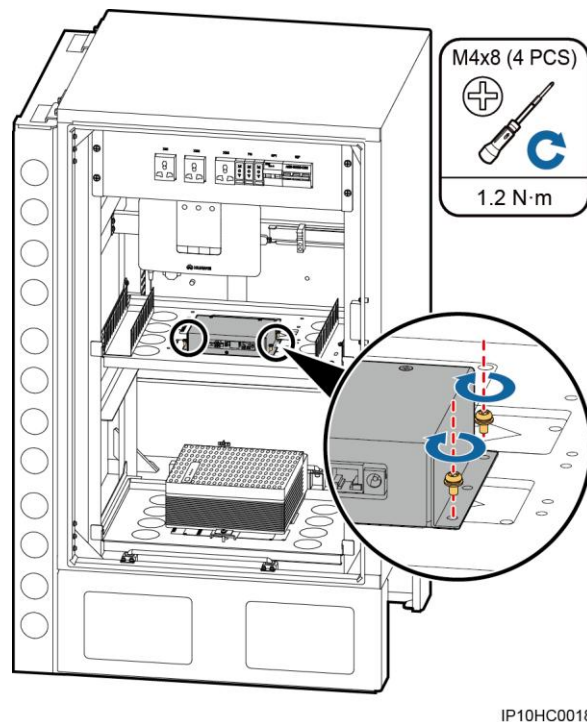
Context

Installing the PLC CCO in a communications cabinet is used as an example to illustrate the ear-mounting installation method.

Procedure

- Step 1** Use four M4x8 screw assemblies to secure the PLC CCO to a torque of 1.2 N m, as shown in [Figure 3-3](#).

Figure 3-3 Ear-mounting the PLC CCO



----End

3.5 Installing the PLC CCO Using a Guide Rail

Prerequisites

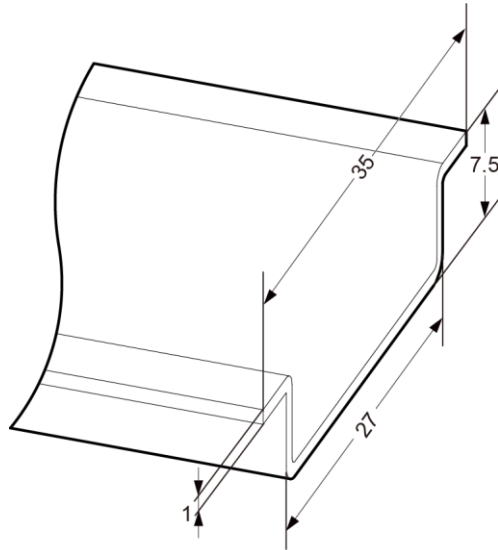
The guide rail planned for installing the PLC CCO meets the installation position requirements.



NOTE

- This installation mode applies when the PLC CCO needs to be installed in an AC power distribution cabinet or a box-type transformer produced by a third party. If this installation mode is selected, the PLC CCO installation space and securing method need to be planned.
- A guide rail is not delivered with the PLC CCO. If you need to install the PLC CCO using a guide rail, prepare a 35 mm wide guide rail. For details about the guide rail dimensions, see [Figure 3-4](#).

Figure 3-4 Guide rail dimensions (unit: mm)

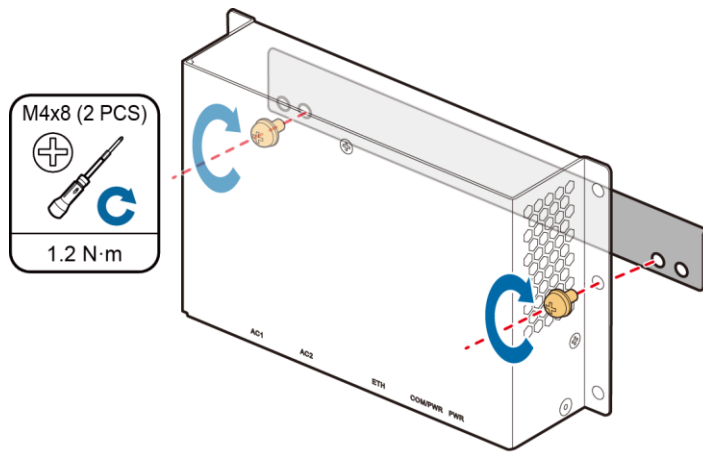


IP10SC0007

Procedure

- Step 1** Use two M4x8 screw assemblies to secure the PLC CCO to support 1 to a torque of 1.2 N·m, as shown in [Figure 3-5](#).

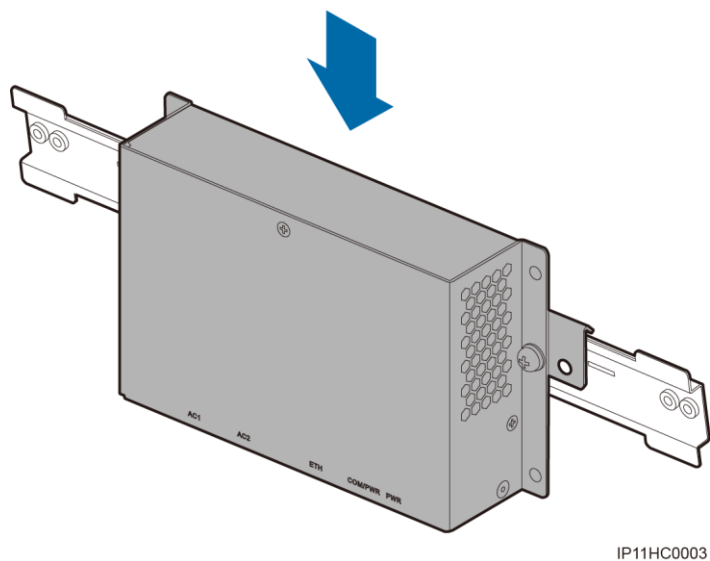
Figure 3-5 Securing the PLC CCO



IP11HC0002

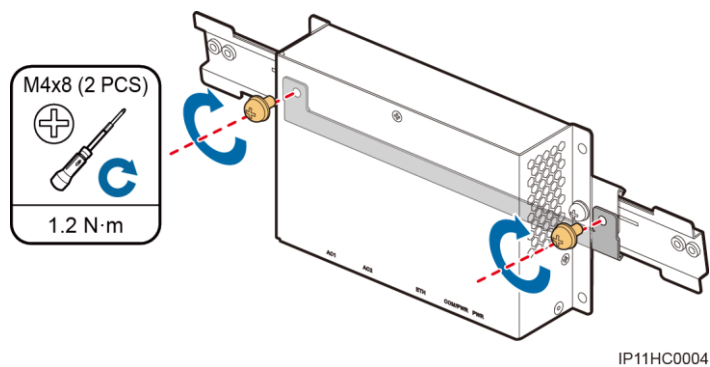
- Step 2** Snap support 1 in the guide rail, as shown in [Figure 3-6](#).

Figure 3-6 Clipping support 1



Step 3 Use two M4x8 screw assemblies to secure support 2 to support 1 to a torque of 1.2 N·m, as shown in Figure 3-7.

Figure 3-7 Securing support 2



----End

4 Electrical Connections



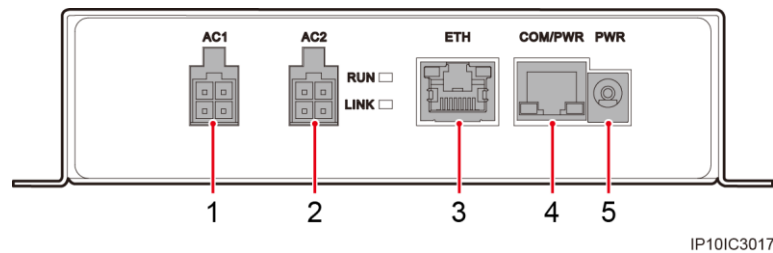
NOTICE

The cable colors and models shown in cable connections in this chapter are for reference only. Select cables according to local cable specifications.

4.1 Port Description

Figure 4-1 shows the PLC CCO ports and Table 4-1 describes them.

Figure 4-1 PLC CCO ports



IP10IC3017

Table 4-1 Port description

No.	Port Name (Silk Screen)	Description
1	AC power cable port 1 (AC1)	Connects phase A input and phase B input.
2	AC power cable port 2 (AC2)	Connects phase C input.
3	FE communications port (ETH)	Protected by a security mechanism.
4	RS485 communications port (COM/PWR)	Receives and sends communication data.

No.	Port Name (Silk Screen)	Description
5	Power port (PWR)	Power input connector

4.2 Cable Connection



NOTE

For details about the PLC CCO used in a communications cabinet, see the *SUN2000 Communications Cabinet User Manual*

4.2.1 Connecting the AC Power Cable

Procedure

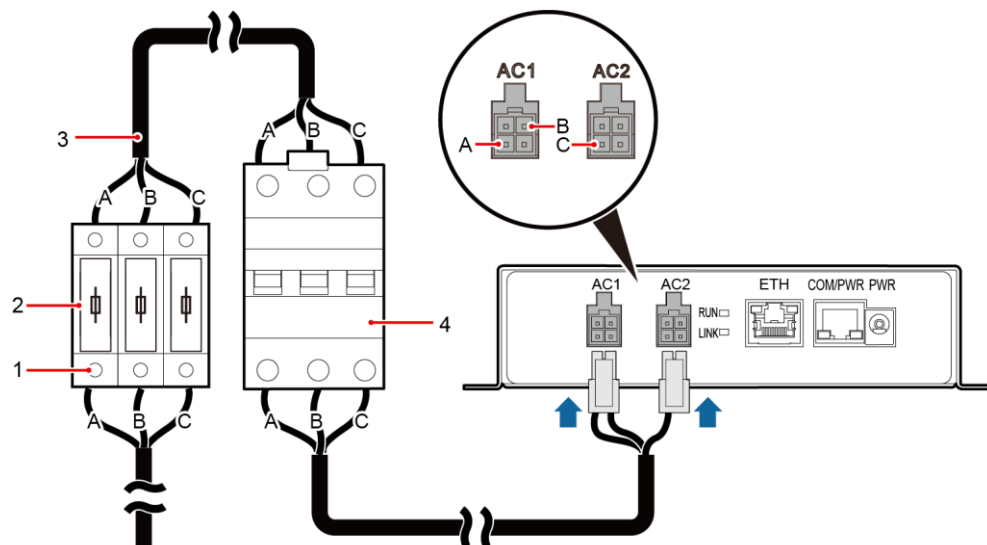
Step 1 Connect the PLC CCO AC power cable, as shown in [Figure 4-2](#).



NOTE

- The PLC CCO AC power cable is mandatory and 1 m long. Before connecting the cable, ensure that the PLC CCO is less than 1 m away from the switch to be connected to the AC power cable.
- Ensure that the PLC CCO AC power cable is securely connected.

Figure 4-2 Connecting the AC power cable



IP11ZC0005



NOTICE

Before connecting the three-phase AC power cable to the PLC CCO, connect fuses and the disconnector to prevent device damage caused by short circuits. The recommended material specifications are provided in [Table 4-2](#).

Table 4-2 Customer-prepared materials

No.	Material	Specifications	Quantity/Length
1	Fuse box	690 V/32 A	1 PCS
2	Fuse	600 V/6 A/50 kA	3 PCS
3	Three-phase cable	YJV22 0.6/1 kV 3 x 1.0 mm ²	1 PCS/3 m
4	Disconnecter	690 V/16 A	1 PCS

----End

4.2.2 Connecting the RS485 Communications Cable

Procedure

- Step 1** Prepare an RJ45 connector on one end of the network cable. [Figure 4-3](#) shows the connector when the surface without the fastener faces upwards. [Table 4-3](#) defines the cable sequence numbers, colors, and pins.



NOTE

The network cable needs to be prepared by the customer. A CAT 5E outdoor shielded network cable is recommended.

Figure 4-3 Preparing an RJ45 connector

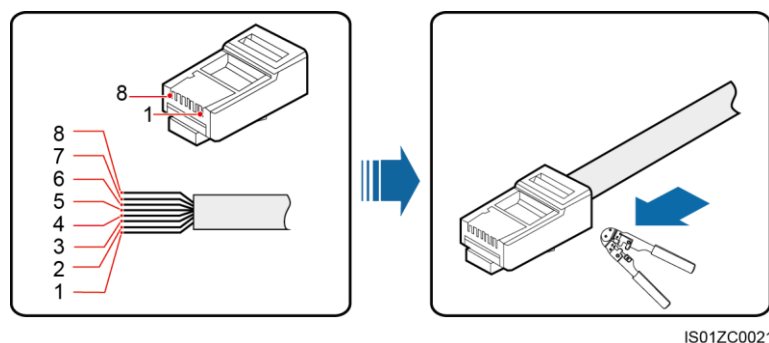


Table 4-3 Pin definitions

No.	Color	Pin Definition	Description
1	White and orange	Reserved	N/A
2	Orange	Reserved	N/A
3	White and green	12 Vin, power	N/A

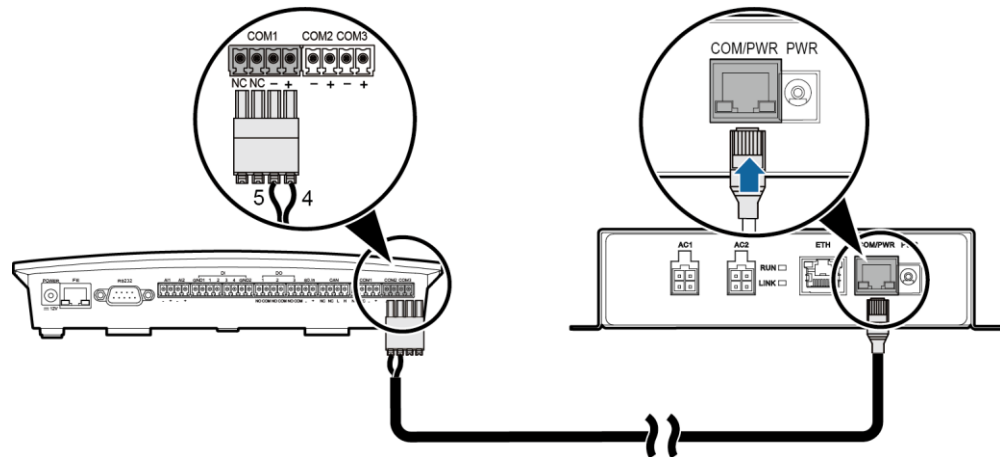
No.	Color	Pin Definition	Description
4	Blue	RS485A, RS485 differential signal +	Connects to the COM port (+) on the data collector.
5	White and blue	RS485B, RS485 differential signal -	Connects to the COM port (-) on the data collector.
6	Green	Reserved	N/A
7	White and brown	Reserved	N/A
8	Brown	PGND	N/A

Step 2 Connect the RS485 communications cable for the PLC CCO. Connecting the cable to the SmartLogger is used as an example, as shown in [Figure 4-4](#).

NOTE

- The PLC CCO supports only the Modbus protocol.
- Ensure that the RS485 communications cable is securely and reliably connected.
- Connect the blue core wire to the positive COM port (+) on the SmartLogger, and connect the white and blue core wire to the COM port (-) on the SmartLogger.
- The SmartLogger cannot automatically identify a PLC. You need to manually add the PLC using the monitoring panel or embedded WebUI. For details about how to add a PLC, see the *SmartLogger1000 User Manual*.

Figure 4-4 Connecting the RS485 communications cable



IP11ZC0001

----End

5 System Operation

5.1 Indicator Position and Meaning

Figure 5-1 shows the position of indicators, and Table 5-1 describes the indicators.

Figure 5-1 Indicator position

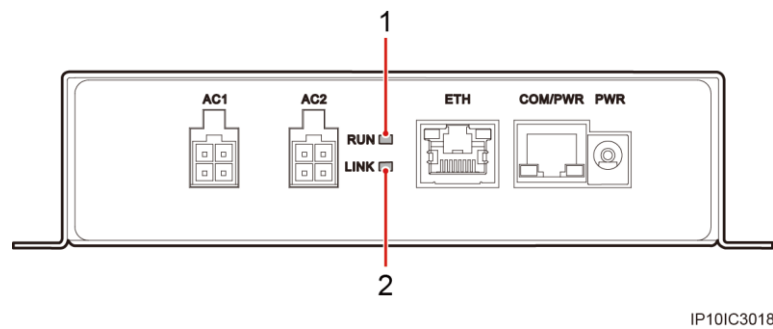


Table 5-1 Meaning

No.	Indicator	Status	Meaning
1	RUN	Off	The power supply is disconnected.
		Steady green	The PLC CCO is running properly.
2	LINK	Off	No data is transmitted.
		Steady green or blinking	The PLC CCO received or transmitted data.

5.2 Checking Before Power-On

To ensure the normal running of the PLC CCO, check the PLC CCO before powering it on.



NOTE

For details about the power-on and power-off of the PLC CCO used in a communications cabinet, see the *SUN2000 Communications Cabinet User Manual*.

Check the PLC CCO according to [Table 5-2](#).

Table 5-2 Checking before power-on

No.	Check Item	Check Result
1	The PLC CCO is properly installed.	<input type="checkbox"/> Compliant <input type="checkbox"/> Incompliant
2	The PLC CCO AC power cable is securely and reliably connected.	<input type="checkbox"/> Compliant <input type="checkbox"/> Incompliant
3	The RS485 communications cable is securely and reliably connected.	<input type="checkbox"/> Compliant <input type="checkbox"/> Incompliant
4	The upstream fuse (if any) of the PLC CCO AC power cable is connected.	<input type="checkbox"/> Compliant <input type="checkbox"/> Incompliant
5	The switch connected to the PLC CCO AC power cable is off.	<input type="checkbox"/> Compliant <input type="checkbox"/> Incompliant
6	Routing for the power cable and signal cable meets the requirements for routing strong-current and weak-current cables and complies with the cable routing plan.	<input type="checkbox"/> Compliant <input type="checkbox"/> Incompliant
7	Cables are bound neatly, and cable ties are secured evenly and properly in the same direction.	<input type="checkbox"/> Compliant <input type="checkbox"/> Incompliant
8	There are no unnecessary adhesive tape or cable ties on cables.	<input type="checkbox"/> Compliant <input type="checkbox"/> Incompliant

5.3 Powering On and Commissioning the PLC CCO

Context

This section uses a PLC CCO to be connected to the SmartLogger as an example to illustrate how to power on and commission the PLC CCO.



NOTE

- The PLC cannot be automatically identified by the SmartLogger. It must be manually added on the SmartLogger.
- The Huawei PLC supports auto-negotiation of baud rate 9600/115200 bps. If the PLC networking is used, you are advised to set **Baud rate** to **115200 bps** for the RS485 ports of the SmartLogger to achieve better communication performance.

Procedure

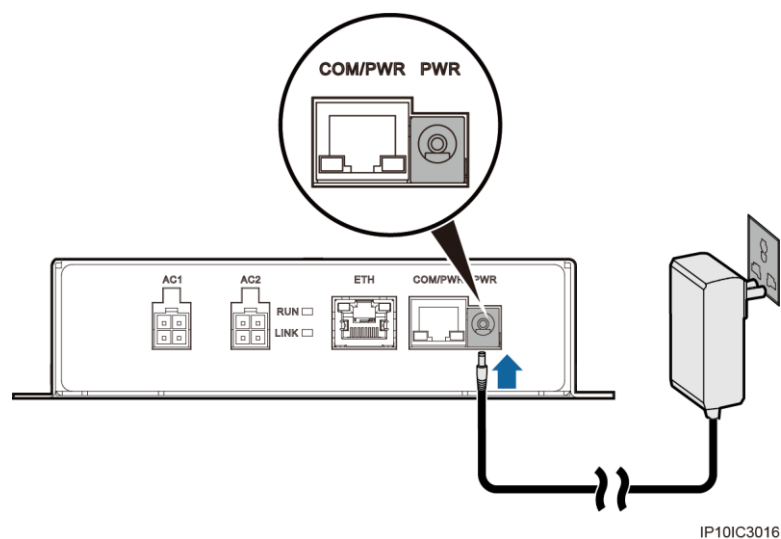
Step 1 Connect the PLC CCO power cable, as shown in [Figure 5-2](#).



NOTE

- The PLC CCO power adapter is mandatory. The PLC CCO power cable is 1.5 m long. Before connecting the cable, ensure that the PLC CCO is less than 1.5 m away from the AC power port.
- Ensure that the PLC CCO power cable is securely connected, the RUN indicator (green) is on, and the PLC CCO power system is running properly.

Figure 5-2 Connecting the power cable



Step 2 Turn on the switch connected to the PLC CCO AC power cable.

Step 3 Add the PLC device on the data collector. For details, see *SmartLogger1000 User Manual*.

----End

5.4 Powering Off the PLC CCO

Context

Power off the PLC CCO before you replace it, maintain its cables, or stop using it.

Procedure

Step 1 Turn off the switch connected to the PLC CCO AC power cable.

Step 2 Disconnect the PLC CCO input power cable.

----End

6 Maintenance and Troubleshooting

This chapter describes the routine maintenance, parts replacement, and typical troubleshooting of the PLC CCO.

6.1 Routine Maintenance

You need to maintain the PLC CCO periodically so that it works properly for a long service life.

Maintenance Interval

An interval of three to six months is recommended for maintaining the PLC CCO.

Maintenance Items



NOTICE

- Before maintaining PLC CCO cables, power off the PLC CCO.
- When maintaining the PLC CCO, observe ESD precautions.
- Ensure that the PLC CCO is free from strong electromagnetic interference.
- Ensure that the PLC CCO is away from heat sources.
- Ensure that the PLC CCO air exhaust vents are free from blockage.
- Periodically clean up the dirt and dust on the PLC CCO.
- Periodically check that the PLC CCO cables are securely and reliably connected.

6.2 Troubleshooting

This section describes typical PLC CCO faults and troubleshooting methods.

Table 6-1 Typical faults

No.	Symptom	Cause	Measure
1	The PLC CCO cannot be powered on.	The DC output terminal of the power adapter is not connected to the PWR port on the PLC CCO.	Connect the DC output terminal of the power adapter to the PWR port on the PLC CCO.
		The AC input terminal of the power adapter is not connected to the AC power port.	Connect the AC input terminal of the power adapter to the AC power port.
		The power adapter is faulty.	Replace the power adapter.
		The PLC CCO is faulty.	Contact the supplier or Huawei technical support.
2	Failed to search for inverters on the SmartLogger through the PLC CCO.	The COM port of the PLC CCO is not connected to any devices or the cable is disconnected, loose, or reversely connected.	Check the connection of the RS485 communications cable. Re-connect the cable if it is disconnected, loose, or reversely connected.
		The RS485 communications parameter values are incorrect.	Correctly set RS485 communications parameters, and ensure that the baud rate and the communication address are correctly set.
3	The device status on the SmartLogger is displayed as disconnected.	The RS485 cable between the PLC CCO and the SmartLogger is loose or disconnected.	Check the RS485 cable connection between the PLC CCO and the SmartLogger. Re-connect the cable if it is loose or disconnected.
		The PLC CCO is powered off.	Check that the PLC CCO is connected properly and power on the device.
		The PLC CCO AC power cable is not properly connected.	Re-connect the PLC CCO AC power cable if it is not connected or disconnected.

6.3 Parts Replacement

A PLC CCO requires overall maintenance. Replace the PLC CCO if it is faulty.



NOTICE

- Before replacing the PLC CCO, power off the PLC CCO.
 - Before replacing the PLC CCO, confirm the PLC CCO installation mode and prepare required tools.
 - When replacing the PLC CCO, observe ESD precautions.
-

7 PLC CCO Disposal

If the PLC CCO service life has expired, dispose of the PLC CCO in accordance with local rules for disposal of electrical equipment waste.

8 Technical Specifications

This chapter describes technical specifications of the PLC CCO.

Table 8-1 Technical specifications

Item	Specifications
Input voltage of the power adapter	100 V AC to 240 V AC, 50/60 Hz
Power consumption	2 W (maximum: 4 W)
Input cable voltage of the AC port	380 V AC to 480 V AC
Dimensions (H x W x D)	100 mm x 169 mm x 39 mm
Weight	550 g
Operating temperature	-20 ℃ to +70 ℃
Relative humidity (non-condensing)	5% to 95%
Altitude	0 m to 4000 m
Protection level	IP20
Installation mode	Installed using mounting ears or a guide rail
Number of indicators	2 PCS
Maximum number of PLC STAs that can be connected	80 PCS
Maximum transmission rate	115200 bps
Maximum transmission distance	1000 m
Safety/EMC	EN61000-6-2, EN61000-6-3, EN61000-3-11, EN61000-3-12, EN/IEC62109-1, EN/IEC62109-2

A Acronyms and Abbreviations

A

AC alternating current

C

CCO central coordinator

D

DC direct current

E

EMC electromagnetic compatibility

ESD electrostatic discharge

ESN equipment serial number

P

PDC power distribution cabinet

PLC power line communication

PV photovoltaic

S

STA station