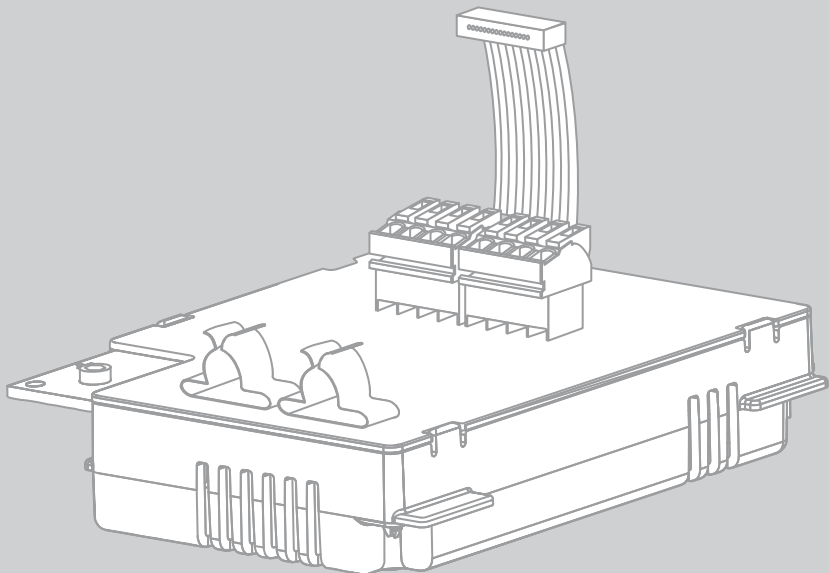




Communication Interface for SMA Inverters

485 Data Module

Installation Manual



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Important Safety Instructions

SAVE THESE INSTRUCTIONS

This manual contains important instructions for the following products:




- 485 Data Module

This manual must be followed during installation and maintenance.

The product is designed and tested in accordance with international safety requirements, but as with all electrical and electronic equipment, certain precautions must be observed when installing and/or operating the product. To reduce the risk of personal injury and to ensure the safe installation and operation of the product, you must carefully read and follow all instructions, cautions and warnings in this manual.

Warnings in this document

A warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the SMA equipment and/or other equipment connected to the SMA equipment or personal injury.

Symbol	Description
 DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	NOTICE is used to address practices not related to personal injury.

General Warnings

⚠ WARNING

All electrical installations must be made in accordance with the local and *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1. This document does not and is not intended to replace any local, state, provincial, federal or national laws, regulations or codes applicable to the installation and use of the product, including without limitation applicable electrical safety codes. All installations must conform with the laws, regulations, codes and standards applicable in the jurisdiction of installation. SMA assumes no responsibility for the compliance or noncompliance with such laws or codes in connection with the installation of the product.

The product contains no user-serviceable parts.

For all repair and maintenance, always return the unit to an authorized SMA Service Center.

Before installing or using the product, read all of the instructions, cautions, and warnings in this manual.

Wiring of the product must be made by qualified personnel only.

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1 Information on this Document

1.1 Validity


This document is valid for device type "485I-MOD-G1 BGCB" (485 Data Module) from hardware version B5 and firmware version 4.00.

1.2 Target Group

The tasks described in this document must be performed by qualified persons only. Qualified persons must have the following skills:

- Training in the installation and commissioning of electrical devices and plants
- Knowledge of how to deal with the dangers and risks associated with installation and operation of electrical devices and plants
- Knowledge of all applicable standards and directives
- Knowledge of how an inverter works and is operated
- Knowledge of and adherence to this document and all safety precautions

1.3 Symbols

Symbol	Explanation
	Information that is important for a specific topic or goal, but is not safety-relevant
<input type="checkbox"/>	Indicates an essential requirement for achieving a specific goal
<input checked="" type="checkbox"/>	Desired result
x	A problem that could occur

1.4 Typographies

Typography	Explanation	Example
bold	<ul style="list-style-type: none"> • Display texts • Elements on a user interface • Connections • Elements to be selected • Elements to be entered 	<ul style="list-style-type: none"> • The value can be found in the Energy field. • Select Settings. • Enter the value 10 in the Minutes field.
>	<ul style="list-style-type: none"> • Connects several elements to be selected 	<ul style="list-style-type: none"> • Select Settings > Date.
[Button/Key]	<ul style="list-style-type: none"> • The button or key to be selected or pressed 	<ul style="list-style-type: none"> • Select [Next].

1.5 Nomenclature

Full designation	Designation in this document
PV plant	Plant
SMA America Production, LLC	SMA
SMA Solar Technology Canada Inc.	SMA
SMA inverter	Inverter

1.6 Illustrations

The illustrations in this document may deviate slightly for Sunny Tripower inverters.

2 Safety

2.1 Intended Use

The 485 Data Module enables the setup of wired RS485 communication for SMA inverters.

You are only allowed to install the 485 Data Module in the supported inverters (see Section 2.3). The 485 Data Module is available as a retrofit kit. The inverter still complies with the standard after the product has been installed.

For safety reasons, it is forbidden to modify the product or install components that are not explicitly recommended for this product or distributed by SMA. Only use the 485 Data Module in accordance with the information provided in the enclosed documentation. Any other use can result in personal injury or property damage.

The enclosed documentation is an integral part of this product.

- Read and observe the documentation.
- Keep the documentation in a convenient place for future reference.

2.2 Safety Precautions

This section contains safety precautions that must be observed at all times when working on or with the product. To prevent personal injury or property damage and to ensure long-term operation of the product, read this section carefully and follow all safety precautions at all times.

⚠ DANGER

Danger to life due to electric shock when opening the inverter

High voltages are present in the conductive components of the inverter. Touching live components results in death or serious injury.

- Prior to performing any work on the inverter, always disconnect the inverter from all voltage sources on the AC and DC sides (see inverter installation manual). Observe the waiting time to allow the capacitors to discharge.

⚠ CAUTION

Risk of burns due to hot enclosure parts

The upper enclosure lid and the enclosure body of the inverter may get hot during operation. Touching these components can result in burns.

- Touch only the enclosure lid of the inverter during operation.

NOTICE

Damage to the inverter due to electrostatic discharge

The internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Ground yourself before touching any inverter components.

2.3 Supported Products

SMA inverters

Sunny Boy

- SB 3000TL-US-22
- SB 3800TL-US-22
- SB 4000TL-US-22
- SB 5000TL-US-22
- SB 6000TL-US-22
- SB 7000TL-US-22
- SB 7700TL-US-22

Sunny Tripower

- STP 12000TL-US-10
- STP 15000TL-US-10
- STP 20000TL-US-10
- STP 24000TL-US-10

3 Scope of Delivery

Check the scope of delivery for completeness and any external visible damage. Contact your distributor if the delivery is incomplete or damaged.

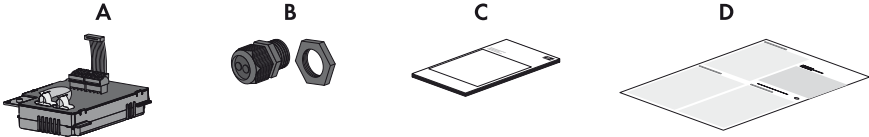


Figure 1: Components included in the scope of delivery

Item	Quantity	Designation
A	1	485 Data Module with the following components: <ul style="list-style-type: none"> • 2 conductive adhesive foil labels • 1 plug • 1 plug with connected terminator
B	1	M32 cable gland with sealing plug, two-hole cable support sleeve and counter nut
C	1	Installation manual
D	1	Technical Description "RS485 Cabling Plan"

4 Product Description

4.1 485 Data Module

The 485 Data Module enables the setup of wired RS485 communication to SMA inverters. It allows you to query, display and store data from the inverters using an SMA communication product (e.g., Sunny WebBox) via RS485 communication. In the Internet portal Sunny Portal, you can visualize and store your plant data (for further details see www.SunnyPortal.com).

A 485 Data Module must be installed in every inverter from which you wish to query data via RS485 communication.

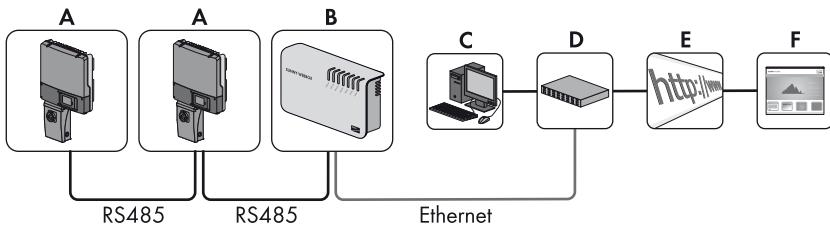


Figure 2: Use of RS485 communication in inverters (example)

Item	Designation
A	Inverter
B	Sunny WebBox
C	Computer

Item	Designation
D	Router
E	Internet
F	Sunny Portal

Design of the 485 Data Module

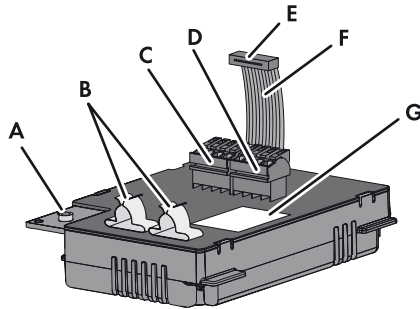


Figure 3: Design of the 485 Data Module

Item	Designation
A	Hexagon socket screw
B	Shield connection terminal
C	4-pole plug
D	4-pole plug with connected terminator
E	Ribbon cable plug
F	Ribbon cable
G	Type label

4.2 Type Label

The type label clearly identifies the product. The type label is located at the bottom right on the back of the product. You can read the following data from the type label:

- Serial number (Serial No.)
- Hardware version (Version)
- Device type (Type)

You will require the information on the type label to use the product safely and when seeking customer support from the SMA Service Line. The type label must be permanently attached to the product.

5 Connection

5.1 Mounting Position and Cable Route

5.1.1 SB 3000TL-US-22/SB 3800TL-US-22/SB 4000TL-US-22/ SB 5000TL-US-22/SB 6000TL-US-22/SB 7000TL-US-22/ SB 7700TL-US-22

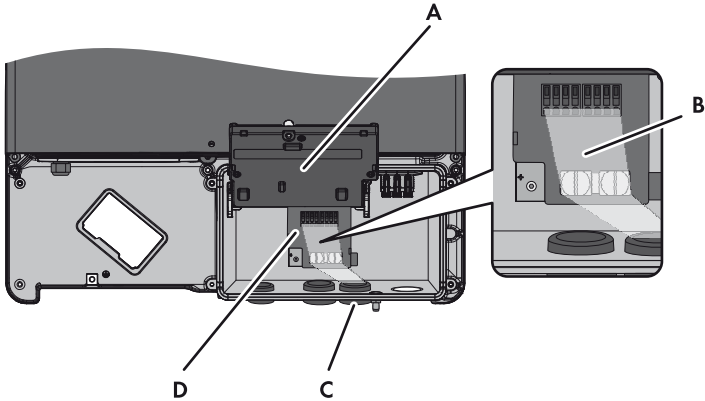


Figure 4: Mounting position and cable route in the inverter with the enclosure lid open

Item	Explanation
A	Flipped up display
B	Cable route to the plugs of the 485 Data Module
C	Inverter enclosure opening for cable gland or sleeve and conduit
D	Mounting position of the 485 Data Module in the inverter

5.1.2 STP 12000TL-US-10/STP 15000TL-US-10/ STP 20000TL-US-10/STP 24000TL-US-10

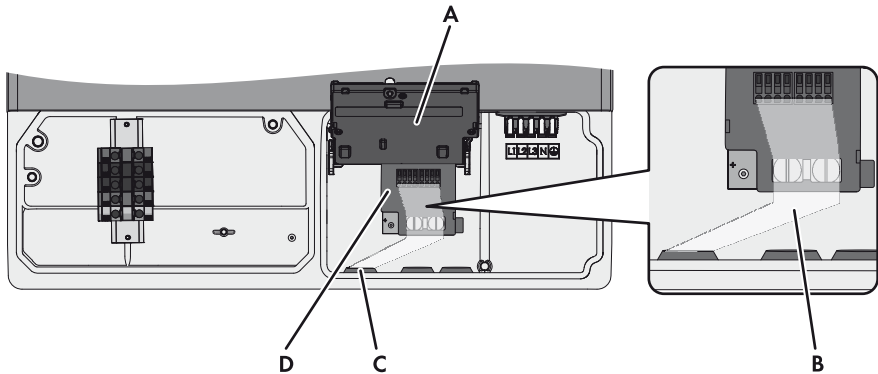


Figure 5: Mounting position and cable route in the inverter with the enclosure lid open

Item	Explanation
A	Flipped up display
B	Cable route to the plugs of the 485 Data Module
C	Inverter enclosure opening for cable gland or sleeve and conduit
D	Mounting position of the 485 Data Module in the inverter

5.2 Installing the 485 Data Module

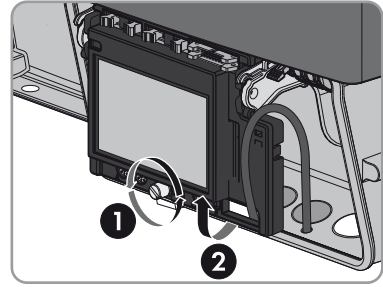
1. **⚠ DANGER**

Danger to life due to electric shock when opening the inverter

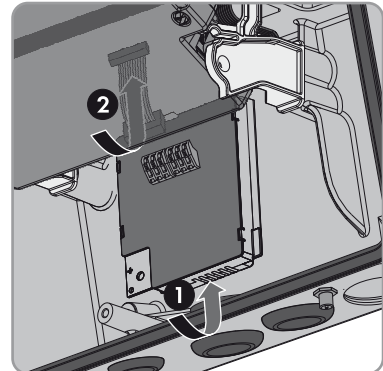
Lethal voltages are present in the conductive components of the inverter.

- Disconnect the inverter from all voltage sources on the AC and DC sides (see inverter installation manual). Observe the waiting time to allow the capacitors to discharge.
2. If a communication interface is already installed in the inverter at the mounting position for the 485 Data Module, take this interface out as follows:
 - Press the left- and right-hand lock hooks outwards and remove the ribbon cable plug from the center connector strip of the inverter.

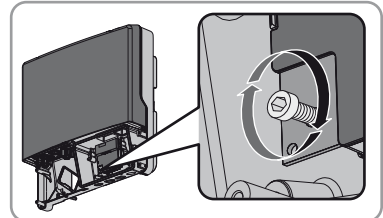
- Release the screw of the display far enough to allow the display to be flipped up. Flip the display up until it snaps into place. Do not kink the adjacent cable.



- Unscrew the swivel nut of the cable gland.
 - Remove the network cable from the communication interface.
 - Unscrew the counter nut of the cable gland.
 - Pull the cable gland and network cable out of the inverter.
 - Release the hexagon socket screw in the communication interface (AF 3) and remove the communication interface.
3. Insert the 485 Data Module and push the ribbon cable upwards behind the display. The key on the top edge of the 485 Data Module must fit into the hole in the plastic retainer in the inverter.

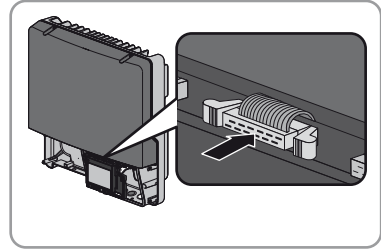


4. Fasten the hexagon socket screw on the 485 Data Module hand-tight (AF 3, torque: 1,5 Nm).



5. Flip the display down. Do not kink the adjacent cable.

6. Plug the ribbon cable plug onto the center connector strip of the display.



7. If you want to connect the 485 Data Module at a later time:
 - Fasten the screw on the display hand-tight (AF 3).
 - Close the inverter (see inverter installation manual).

5.3 Connecting the 485 Data Module

Depending on the location of the inverter in the RS485 communication bus, you must either connect one or two cables to the 485 Data Module:

- If the inverter is located in the center of the RS485 communication bus, connect two cables to the 485 Data Module.
- If the inverter is located at the end of the RS485 communication bus, connect one cable to the 485 Data Module.

For information on the wiring and terminal assignment of the devices in the RS485 communication bus, refer to the Technical Description "RS485 Cabling Plan".

i Interference in data transmission due to unshielded power cables

If unshielded power cables are used, they generate an electromagnetic field which may induce interference in data cables during data transmission.

- When laying data cables, observe the following minimum clearances to unshielded power cables:
 - For installation without separating strip: at least 8 in. (200 mm)
 - For installation with aluminum separating strip: at least 4 in. (100 mm)
 - For installation with steel separating strip: at least 2 in. (50 mm)

Requirements:

- All electrical installations must be carried out in accordance with the electrical standards applicable on site and the *National Electrical Code*® (NE, ANSI/NFPA 70).
- Installations in Canada must be carried out in accordance with the applicable Canadian standards.

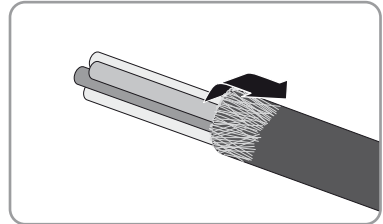
Additionally required material (not included in the scope of delivery):

- Cable for communication (to achieve a good signal quality, observe the cable recommendation in the Technical Description "RS485 Cabling Plan")

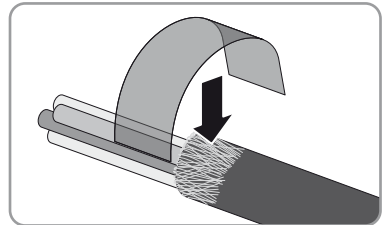
- When routing the cables in a conduit:
 - 1 rain-tight or water-tight sleeve
 - Diameter for SB 3000TL-US-22/SB 3800TL-US-22/SB 4000TL-US-22/SB 5000TL-US-22/SB 6000TL-US-22/SB 7000TL-US-22/SB 7700TL-US-22: 1 in.
 - Diameter for STP 12000TL-US-10/STP 15000TL-US-10/STP 20000TL-US-10/STP 24000TL-US-10: $\frac{3}{4}$ in.
 - 1 conduit
 - Diameter for SB 3000TL-US-22/SB 3800TL-US-22/SB 4000TL-US-22/SB 5000TL-US-22/SB 6000TL-US-22/SB 7000TL-US-22/SB 7700TL-US-22: 1 in.
 - Diameter for STP 12000TL-US-10/STP 15000TL-US-10/STP 20000TL-US-10/STP 24000TL-US-10: $\frac{3}{4}$ in.

Procedure:

1. Remove $1\frac{1}{2}$ in. (40 mm) of the cable sheath at the end of the cable which is to be connected to the 485 Data Module.
2. Shorten the cable shield to $\frac{5}{8}$ in. (15 mm).
3. Fold the surplus cable shield back over the cable sheath.



4. Wrap the cable shield with conductive adhesive foil.



5. Strip $\frac{1}{4}$ in. (6 mm) insulation off three insulated conductors. The two insulated conductors used for communication must be a twisted pair.
6. Shorten all other conductors flush with the cable sheath.

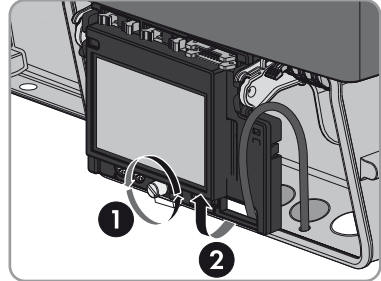
7. **⚠ DANGER**

Danger to life due to electric shock when opening the inverter

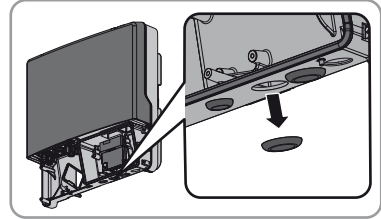
Lethal voltages are present in the conductive parts of the inverter.

- Disconnect the inverter from all voltage sources on the AC and DC sides (see inverter installation manual). Observe the waiting time to allow the capacitors to discharge.

8. Open the inverter (see inverter installation manual).
9. Loosen the screw on the display and flip the display up until it clicks into place. Do not kink the adjacent cable.



10. Push the filler plug from the inside out of the second hole from the left at the bottom of the inverter enclosure and retain for later decommissioning.

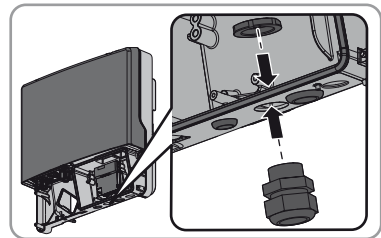


11. If a conduit is to be used, proceed as follows:

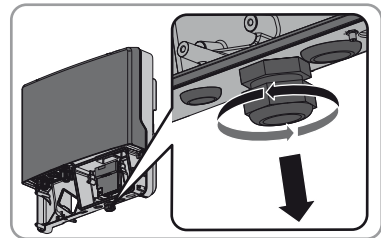
- Insert one rain-tight or water-tight sleeve into the enclosure opening and fasten from the inside with a counter nut.
- Route the conduit through the enclosure opening into the inverter and screw the conduit fitting tight.
- Lead one or two cables through the conduit into the inverter.

12. If no conduit is to be used, proceed as follows:

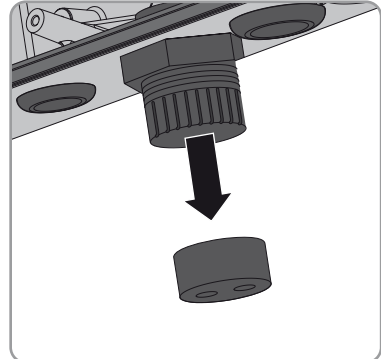
- Attach the cable gland to the enclosure opening using the counter nut.



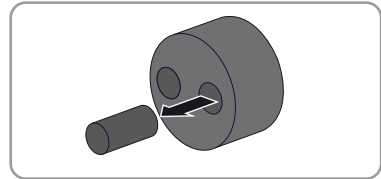
- Unscrew the swivel nut of the cable gland on the inverter.



- Press the seal out of the cable gland from the inside.



- For each cable remove one filler plug from the seal and retain for later decommissioning.





- Lead one or two cables through the swivel nut into the seal.
- Lead the cable ends through the cable gland into the inverter and to the plugs of the 485 Data Module.
- Push the seal into the cable gland. Make sure that any unused cable openings are sealed with filler plugs.
- Screw the swivel nut of the cable gland on loosely.

13. Remove or connect the terminator of the 485 Data Module as follows:

- If two cables are connected, open the spring-cage terminals of the plug with the connected terminator and remove the terminator.
- If one cable is connected, make sure that the terminator is connected in one of the plugs in terminals **2** and **7** and that the plug is connected to the 485 Data Module.

14. Open the spring-cage terminals on the plug.

15. Insert conductors into the spring-cage terminals and note the conductor colors. The allocation of cables to plugs can be done in any order.

Signal	485 Data Module	RS485 bus	Insulated conductor color
GND	5	5	
 Data+	2	2	
 Data-	7	7	

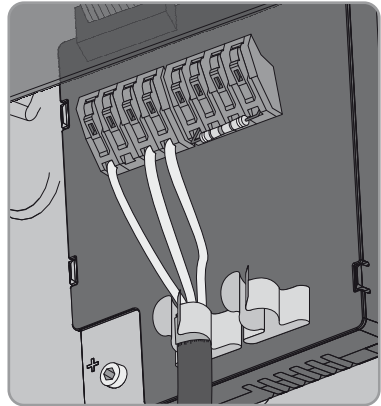
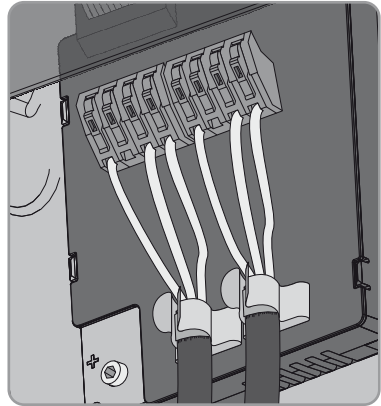
16. Close the spring-cage terminals.

17. Push the cable with the cable shield into the shield connection terminal on the 485 Data Module.

- Two cables are connected to the 485 Data Module.

or

- One cable is connected to the 485 Data Module.



18. If no conduit is required, fasten the swivel nut of the cable gland hand-tight. This relieves pull strains on the cables.
19. Flip the display down. Do not kink the adjacent cable.
20. Fasten the screw on the display hand-tight.
21. Close the inverter (see inverter installation manual).
22. Connect the other cable end to the RS485 communication bus (for information on terminal assignment and wiring in the system, see Technical Description "RS485 Cabling Plan").

6 Commissioning

Requirements:

- The 485 Data Module must be installed in the inverter (see Section 5.2).
- The 485 Data Module must be connected (see Section 5.3).

Procedure:

- Commission all inverters (see inverter installation manual).

7 Decommissioning

7.1 Removing the 485 Data Module

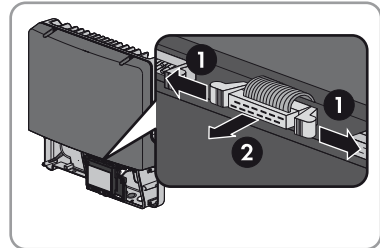
1. **⚠ DANGER**

Danger to life due to electric shock when opening the inverter

Lethal voltages are present in the conductive parts of the inverter.

- Disconnect the inverter from all voltage sources on the AC and DC sides (see inverter installation manual). Observe the waiting time to allow the capacitors to discharge.

2. Open the inverter (see inverter installation manual).
3. Press the left- and right-hand lock hooks outwards and remove the ribbon cable plug from the center connector strip of the inverter.



4. Loosen the screw on the display and flip the display up until it clicks into place. Do not kink the adjacent cable.
5. Unscrew the swivel nut of the cable gland or the sleeve.
6. Open the spring-cage terminals of the plug on the 485 Data Module.
7. Remove the cables from the 485 Data Module.
8. Unscrew the counter nut of the cable gland or the sleeve.
9. Remove the cable gland or the sleeve with conduit and the cables from the inverter.
10. Release the hexagon socket screw on the 485 Data Module (AF 3).
11. Remove the 485 Data Module.
12. Close the spring-cage terminals of the plugs on the 485 Data Module.
13. Flip the display down. Do not kink the adjacent cable.
14. Fasten the screw on the display hand-tight.
15. Seal the enclosure opening of the inverter with the corresponding filler plug.
16. Close the inverter (see inverter installation manual).

7.2 Packaging the 485 Data Module for Shipping

- Pack the 485 Data Module. To do so, use the original packaging or packaging that is suitable for the weight and size of the 485 Data Module (see Section 9 "Technical Data", page 21).

7.3 Disposing of the 485 Data Module

- Dispose of the 485 Data Module in accordance with the regulations for the disposal of electronic waste applicable at the installation site.

8 Troubleshooting

Problem	Cause and corrective measures
<p>The emergency channel list Emergency or EmergencyXX is displayed in the communication product (e. g. Sunny WebBox).</p> <p>The inverter is displayed with the device class Others in Sunny Portal.</p>	<p>The 485 Data Module has been installed in an inverter without first disconnecting the inverter on the AC and DC sides. This prevents the inverter detecting the new 485 Data Module.</p> <p>Corrective measures:</p> <ul style="list-style-type: none"> Prior to performing any work on the inverter, disconnect the inverter from all voltage sources on the AC and DC sides (see inverter installation manual). Observe the waiting time to allow the capacitors to discharge.

9 Technical Data

Mechanical Data	
Width x height x depth	2 ⁷ / ₈ in. x 3 ⁷ / ₁₆ in. x 1 ³ / ₈ in. (73 mm x 88 mm x 34 mm)
Weight	2 ¹ / ₂ oz. (71 g)
Communication	
Communication interface	RS485
Maximum cable length	3,937 ft. (1,200 m)
Connections	
Type of plug	4-pole with spring-cage terminal
Number of RS485 connections	2
Ambient Conditions during Operation	
Ambient temperature	- 13 °F to +185 °F (- 25 °C to +85 °C)
Relative humidity, non-condensing	5% to 95%
Maximum height above sea level (MSL)	9,842 ft. (3,000 m)
Ambient Conditions for Storage/Transport	
Ambient temperature	- 40 °F to +185 °F (- 40 °C to +85 °C)
Relative humidity, non-condensing	5% to 95%
Maximum height above sea level (MSL)	9,842 ft. (3,000 m)

10 Compliance Information

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The user is cautioned that changes or modifications not expressly approved by SMA America, LLC could void the user's authority to operate this equipment.

IC Compliance

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

11 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We require the following information in order to provide you with the necessary assistance:

- Inverter:
 - Type
 - Serial number
 - Firmware version
- 485 Data Module:
 - Quantity
 - Type
 - Serial number
 - Hardware version
 - Firmware version

United States/ Estados Unidos	SMA America, LLC Rocklin, CA	+1 877-MY-SMATech (+1 877-697-6283)* +1 916 625-0870**
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Canada/ Canadá	SMA Canada, Inc. Toronto	+1 877-MY-SMATech (+1 877-697-6283)***
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* toll free for USA, Canada and Puerto Rico / Llamada gratuita en EE. UU., Canadá y Puerto Rico

** international / internacional

*** toll free for Canada / gratuit pour le Canada

SMA Solar Technology

www.SMA-Solar.com

