



Installation / User Manual

APsystems OPT700 DC Optimizer

Rev 1.3

ALTENERGY POWER SYSTEM Inc.
www.APsystems.com

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Important Safety Instructions

This manual contains important instructions to be followed during installation and maintenance of the APsystems DC Optimizer. To reduce the risk of electrical shock and ensure the safe installation and operation of the optimizer, the following symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

Specifications are subject to change without notice - please ensure you are using the most recent update found at www.APsystems.com

WARNING

This symbol indicates a situation where failure to follow instructions may cause a serious hardware failure or personal danger if not applied appropriately. Use extreme caution when performing this task.

NOTICE

This symbol indicates information that is important for OPT700-RS operation. Follow these instructions closely.

Safety Instructions

- ✓ **Do NOT** disconnect the PV module from the APsystems DC Optimizer without first disconnecting the AC power.
- ✓ Only qualified professionals should install and/or replace the APsystems optimizer.
- ✓ Perform all electrical installations in accordance with local codes.
- ✓ Before installing or using the APsystems DC Optimizer, please read all instructions and cautionary markings in the technical documents and on the APsystems microinverter system and the solar array.
- ✓ Be aware that the body of the running APsystems DC Optimizer is the heat sink and can reach high temperatures. To reduce risk of burns, do not touch the body of the optimizer.
- ✓ **Do NOT** attempt to repair the APsystems DC Optimizer. If it fails, contact APsystems Customer Support to obtain an RMA number and start the replacement process. Damaging or opening the APsystems DC Optimizer will void the warranty.
- ✓ **Connect the PV module to the OPT700 INPUT1 interface when the OPT700 connects with one solar module. Also, use the DC extension cable to make the INPUT2 short-circuited, otherwise the OPT700 maybe destroyed.**

Radio interference statement



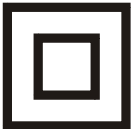


The equipment could radiate radio frequency energy and this might cause harmful interference to radio communications if not following the instructions when installing and using the equipment. But there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, the following measures might resolve the issues:

- A) Relocate the receiving antenna and keep it well away from the equipment.
- B) Consult the dealer or an experienced radio / TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance may void the user's authority to operate the equipment.

Important Safety Instructions

Symbols replace words on the equipment, on a display, or in manuals

 Trademark	
	Caution, risk of electric shock
	Equipment protected throughout by double insulation or reinforced insulation
	Refer to the operating instructions
	Caution, hot surface.

APsystems DC Optimizer System Introduction

The APsystems DC Optimizer is a DC-DC converter installed between PV modules and a central string inverter to maximize the energy harvested from each module. It can achieve module-level Maximum Power Point Tracking (MPPT) and plays a critical part in the whole power system. The APsystems DC Optimizer built in rapid shutdown. Rapid shut-down function meets the NEC690.12 requirements. So as to eliminate the high voltage on the DC bus and improve the security of the system.

The APsystems DC Optimizer system is comprised of four key elements:

- APsystems DC Optimizer (OPT700)
- Inverter
- APsystems Energy Communication Unit (ECU-R-RS)
- APsystems Energy Monitor and Analysis (EMA) web-based monitoring and analysis system

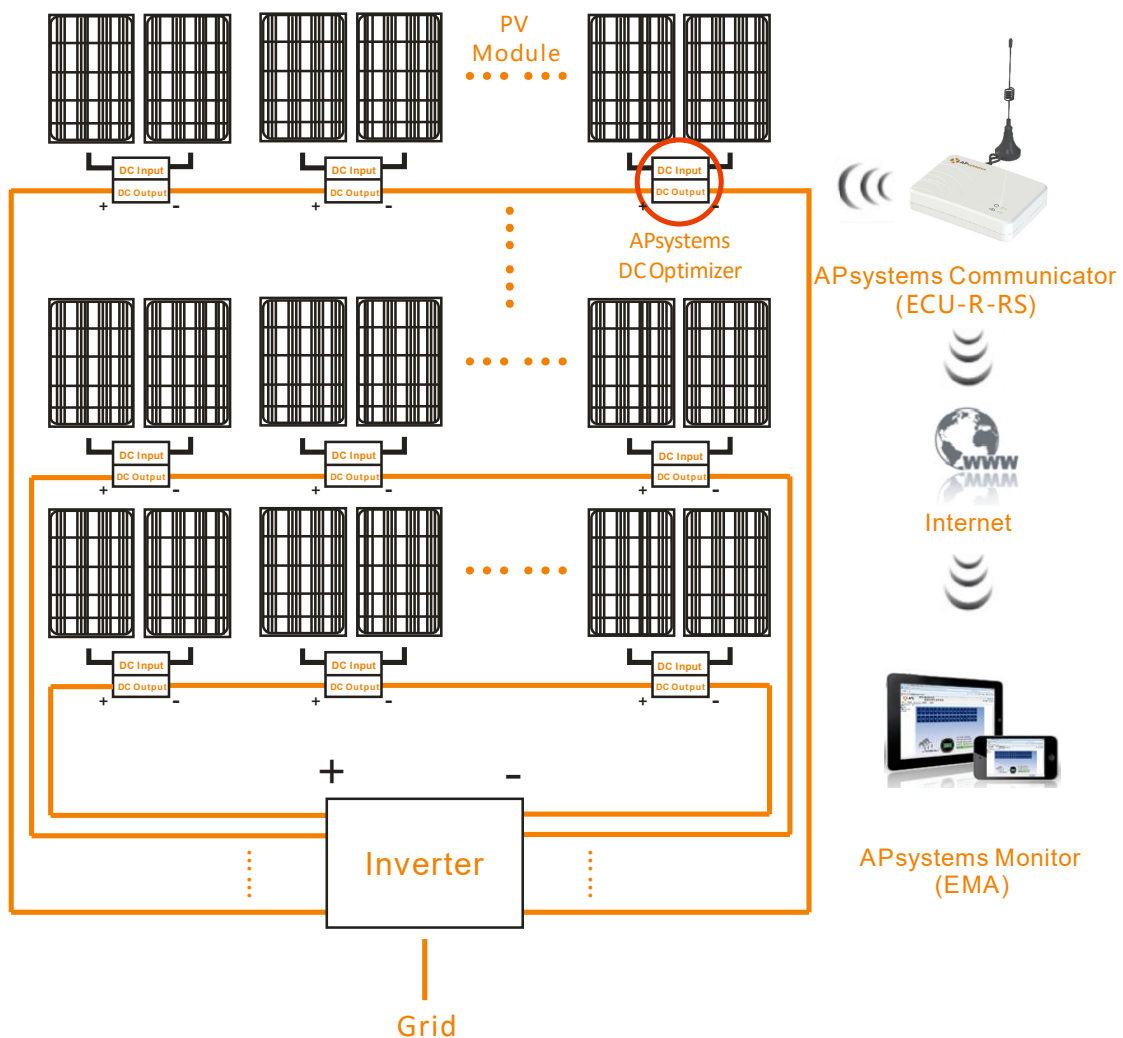


Figure 1

APsystems DC Optimizer System Introduction

This integrated system improves safety, maximizes solar energy harvest, and increases system reliability; besides, The integrated system realizes the rapid shutdown and improves the security.

The APsystems DC Optimizer increases PV energy production by 5%-25%

Each APsystems DC Optimizer is individually connected to one or two solar modules. Each PV module has individual Maximum Power Point Tracking (MPPT) controls, which ensures that the optimum power is exported to the utility grid regardless of the performance of the other PV modules in the array. When PV modules in the array are affected by shade, dust, orientation, or any situation in which one module underperforms compared with the other units, the APsystems DC Optimizer ensures top performance from the array by maximizing the performance of each module.

The APsystems DC Optimizer system is reliable, safe and simple to install

APsystems DC Optimizers are installed to work with a string / central inverter. They are designed to operate at full power at ambient outdoor temperatures of up to 149°F (65°C). The inverter case is designed for outdoor installation and complies with the IP67/NEMA 6P environmental enclosure rating.

Smart system performance monitoring and analysis

The performance trends and data of APsystems DC Optimizers can be monitored and analyzed with the APsystems Energy Communication Unit (ECU-R-RS) and APsystems Energy Monitor and analysis (EMA). The EMA software informs you of abnormal events and shuts down the systems rapidly if needed.

OPT700 with the function of rapid shutdown

APsystems DC Optimizers is built in with RSD function, which meets the NEC690.12 standard. When in an emergency, Energy Communication Unit (ECU-R-RS) stops sending signals and the OPT700 shuts down the power output and eliminate the high voltage on DC bus by switching off the AC breaker in the cabinet. The system will be much safer.

APsystems DC Optimizer System Installation

A PV system using APsystems DC Optimizers is simple to install. Each optimizer easily mounts on the PV racking directly beneath the PV module(s) or the module frame. Low-voltage DC wires connect from the PV module directly to the optimizer, eliminating the risk of a high-voltage DC charge.

Installation **MUST** comply with local regulations and technical rules.

WARNING

- ① Perform all electrical installations in accordance with local codes.
- ② Be aware that only qualified professionals should install and/or replace the OPT700.
- ③ Before installing or using an OPT700, please read all instructions and warnings in the technical documents and on the inverter system itself as well as on the PV array.
- ④ Be aware that installation of this equipment includes the risk of electric shock.
- ⑤ Do not touch any live parts in the system, including the PV array, when the system has been connected to the electrical grid.
- ⑥ Ensure the solar module and inverter has been disconnected before installing an OPT700.
- ⑦ Connect the PV module to the OPT700 INPUT1 interface when the OPT700 connects with one solar module. Also, use the DC extension cable to make the INPUT2 short-circuited, otherwise the OPT700 maybe destroyed.

Additional installation components from APsystems

- DC extension cable (sold separately)

Required parts and tools to complete the installation

In addition to your PV array and its associated hardware, you will need the following items:

- APsystems DC Optimizers installation kit (screw, nut)
- A torque wrench and a Phillips screwdriver
- A multimeter

WARNING

- ① Be sure to verify the voltage and current specifications of your PV module match with those of the OPT700.
- ② You must match the DC operating voltage range of the PV module with the allowable input voltage range of the OPT700.
- ③ The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the APsystem OPT700.

Installation Procedures

⚠ WARNING

Do NOT connect inverters until you have completed all of the installation procedures as described in the following sections.

Step 1 - Attaching the APsystems DC Optimizer to the Racking or the PV Module Frame

a) Attaching to the Racking.

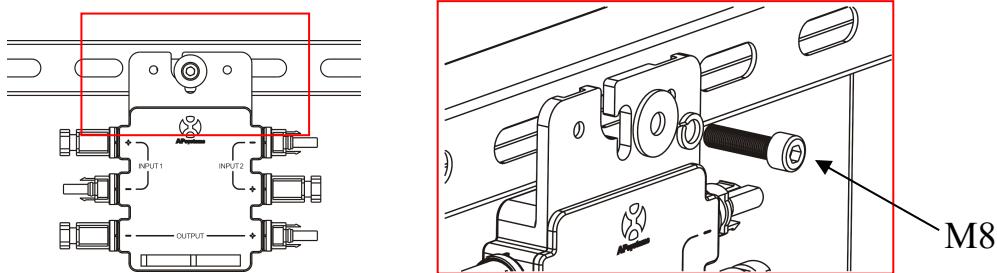


Figure 2

b) Attaching to the PV Module Frame.

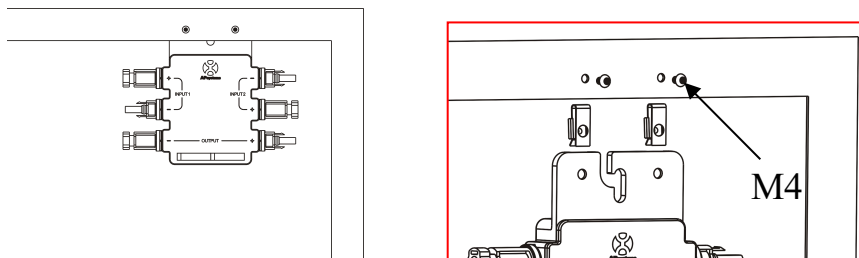


Figure 3

Step 2 - Connecting the APsystems DC Optimizer to the PV Module

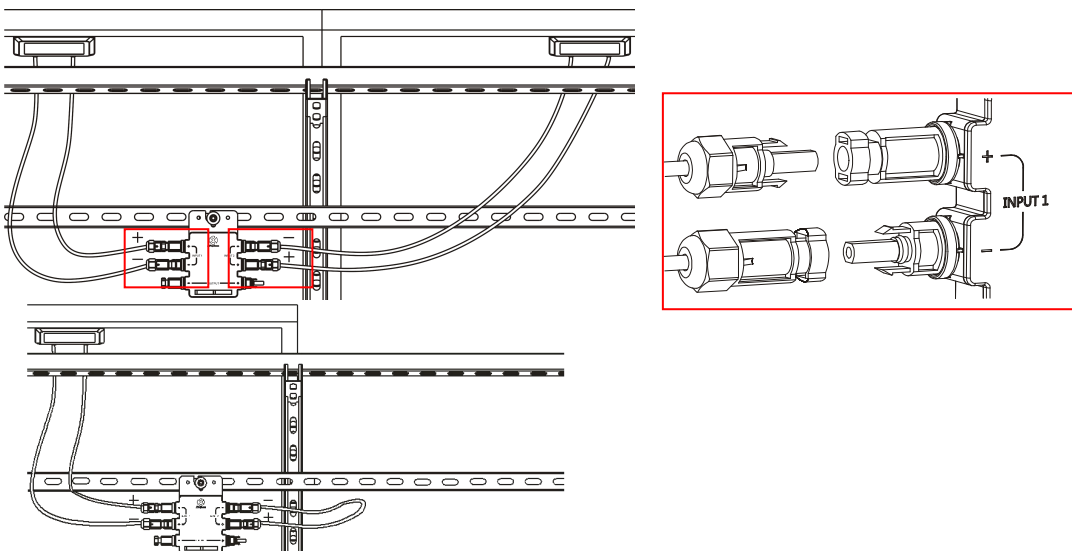


Figure 4

⚠ WARNING

- ① Connect the PV module to the optimizer INPUT1 interface when the optimizer connects with one solar module, then connect DC Extension Cable to INPUT2 interface shorted.
- ② The output connect to the inverter, the input connect to PV module after Attaching the APsystems DC Optimizer to the racking or the PV module frame.
- ③ Electrical Installation & Maintenance shall be conducted by licensed electrician and shall comply with Australia National Wiring Rules.

Installation Procedures

Step 3 - Connecting the APsystems DC Optimizer DC output Cables

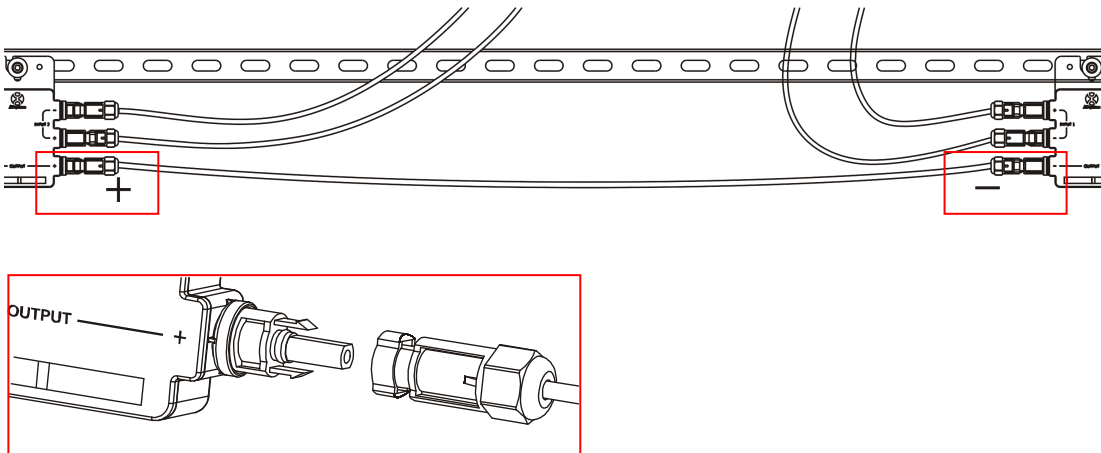


Figure 5



NOTICE

- ① Make sure that all DC cables are connected correctly.
- ② DC extension cable length can be customized based on the actual installation environment. Please contact APsystems to purchase the cables.

Step 4 - Completing the APsystems Installation Map

Fill in the APsystems registration cards, which provide system information and the installation map. Feel free to provide your own layout if a larger or more intricate installation map is required. The layout map provided is designed to accommodate labels in vertical or horizontal orientation to meet all the field PV connections.

- Each APsystems DC Optimizer has removable serial number labels. Peel the labels off, affix one to the respective location on the APsystems installation map, then affix another label to the PV module frame so that it can be easily seen. The warranty cards can be found in the appendix of this manual or at the APsystems website, www.APsystems.com
- Fill in the warranty cards and email to APsystems at emasupport@altenergy-power.com
- APsystems will create the EMA account and email you the account information. Then you can use the EMA website to view detailed performance of your PV system. You can learn more information on energy monitoring and analysis system from APsystems website www.APsystems.com

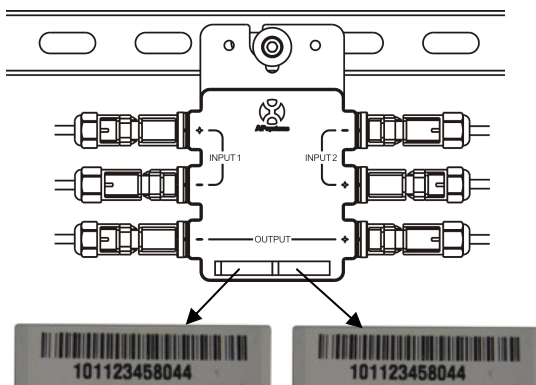


Figure 6

NOTICE

- ① Step 1~4 can change sequence for convenience of installation.
- ② System installation layout diagram is located in Appendix last page of this manual.

Step 5 - Connecting the APsystems DC Optimizer to inverter

Once verification is correct, connect the OPT700 to the inverter. Pay attention to polarity.

Step 6 - Install ECU-R-RS

Power on ECU-R-RS with the DC adapter.

1. ECU-R-RS installed on the wall

The antenna wire of ECU-R-RS is connected to the antenna port of ECU-R-RS. Plug the power adapter into the DC input on the ECU-R-RS, and then plug the other end into a outlet.

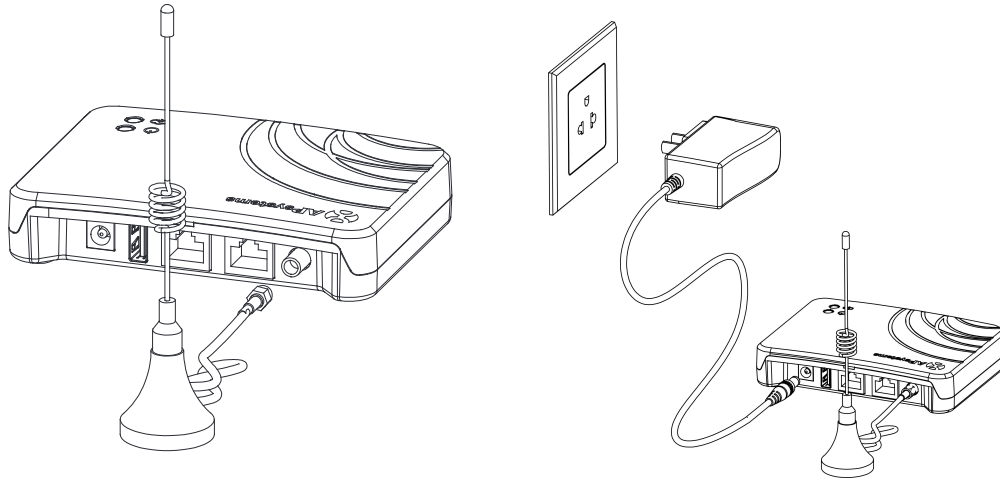


Figure 7

2. ECU-R-RS installed in the distribution box

- Install the guide socket on the guide rail of the distribution box (the guide socket is not provided by APsystems, please prepare by yourself).
- Connect the power adapter to the power connection port at the top of the ECU-R-RS.

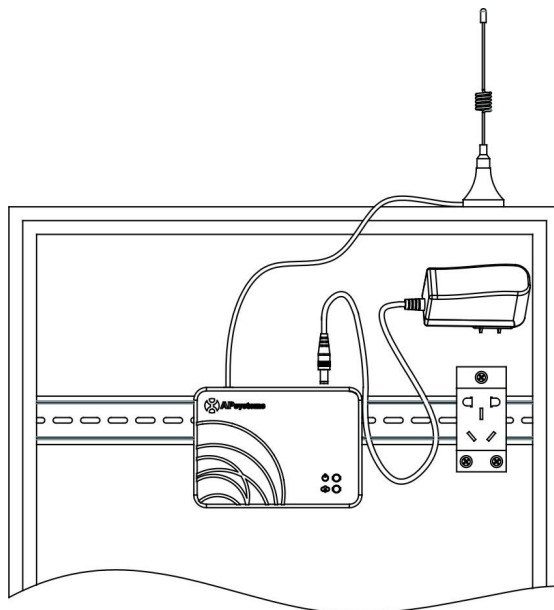


Figure 8

Installation Procedures

Step 7 - Registered the OPT700

1.Connecting the OPT700 to inverter

Install 'ECU APP' on your mobile or ipad. Connect the ECU-R-RS WIFI hotspot ,which is 'ECU-R-XXXXXXXXXXXX(ID NO.)'.Check the corresponding ECU ID matched in the homepage.

Manually add OPT700 UID to the ID management page. Monitor and manage OPT700 by using ECU APP.The registration process is refer to 《APsystems Energy Communication Unit ECU-R-RS user manual》.

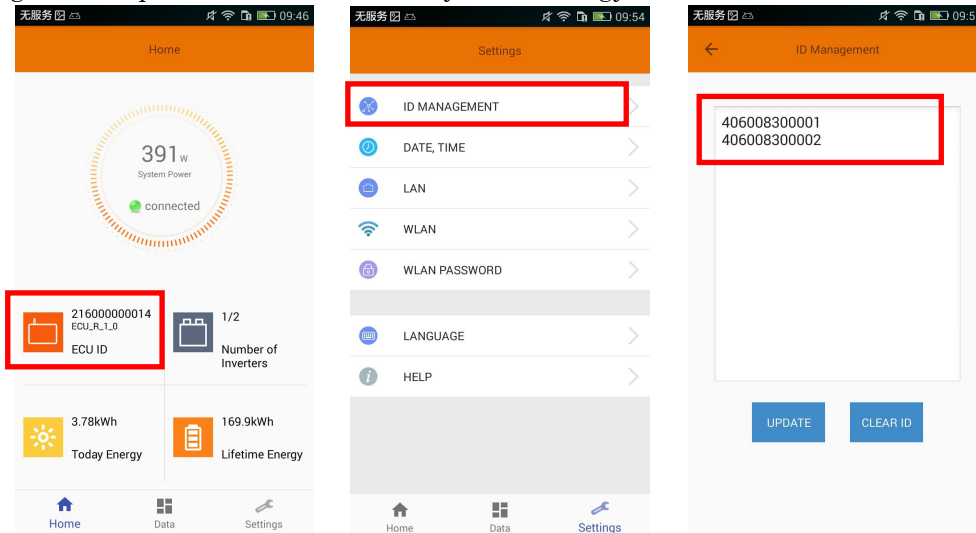


Figure 9

2.After completing the registration step of OPT700 , wait for some minutes. OPT700 can receive the control signal of ECU-R-RS and then power output.

NOTICE

The waiting time is depended on the number of APsystems DC optimizer and the communication quality of the line .

Step 8 - System Detection

After registering, you can check the system state by ECU APP. If the colour of module turns green, which means the communication is good. But if it is gray,which means failure.

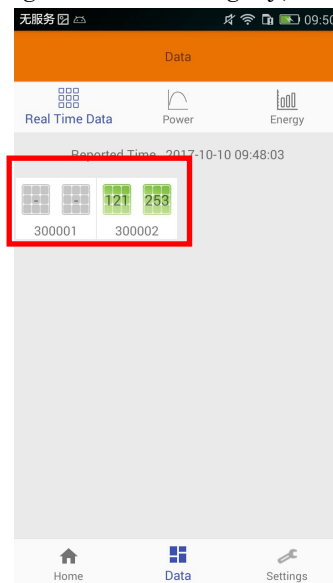


Figure 10

NOTICE

OPT700 defaults to the rapid shutdown function when the optimizer can only register the ECU-R-RS and communicate with it to produce the normal output voltage.

Rapid Shutdown Function Introduction

Rapid shutdown function introduction

APsystems DC optimizer has the function of power optimization and component monitoring of the general optimizer, and has the function of rapid shutdown meets the NEC690.12 standard. When in an emergency, Energy Communication Unit (ECU-R-RS) stops sending signals and the OPT700 shuts down the power output and eliminate the high voltage on DC bus by switching off the AC breaker in the cabinet. The system will be much safer.

The adjustment steps of the RSD function

1. Install OPT700 in system.
2. Install the ECU-R-RS in the distribution box and input the OPT700 UID.
3. After registering and communicating, the voltage will be output by OPT700, which means the system is normal.
4. When in an emergency, Energy Communication Unit (ECU-R-RS) stops sending signals and the OPT700 shuts down the power output and eliminate the high voltage on DC bus by switching off the AC breaker in the cabinet.
5. Power on the AC breaker and recover the system.

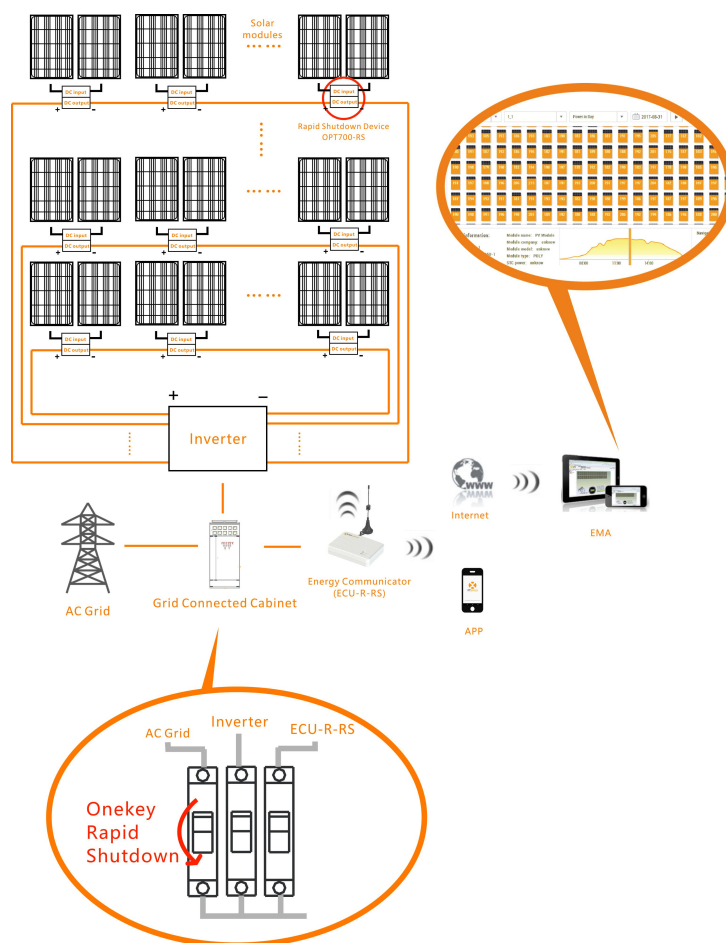


Figure 11

Replace a APsystems DC Optimizer

Follow the procedure to replace an APsystems DC Optimizer:

- A. In the order shown below:
 1. Switch off the supply of ECU-R-RS.
 2. Disconnect the AC by turning off the inverter switch.
 3. Disconnect the DC by turning off the inverter switch.
 4. Wait for more than 5 minutes, then disconnect the PV module DC wire connectors from the optimizer and disconnect the optimizer output cables.
 5. Remove the optimizer from the PV array racking.
- B. Install a replacement optimizer to the rack.
- C. ECU-R-RS switch on power supply, registers the new optimizer, waiting for its communication and output the voltage.
- D. Turn on the DC side switch and then turn on the AC side switch and recover the system.



NOTICE

The layout on APsystems Energy Monitor and Analysis (EMA) will be changed after the replacement of one or more optimizers. Please login the EMA and reset the system.

APsystems DC Optimizer OPT700 Technical Data

Model

OPT700

Input Data (DC)

Recommended PV Module Power (STC)Range	60cell/72cell
Maximum Input Power	310W × 2
Maximum Input Voltage	50VDC
MPPT Voltage Range	16-40VDC
Operation Voltage Range	12-50VDC
Maximum Input Current	10A x 2
Maximum Input Short Circuit Current(DC)	10A x 2

Output Data (DC)

Maximum Output Voltage	90VDC
Maximum Output Current	10.3A
Maximum Output Power(DC)	600W

Efficiency

Peak Efficiency	99.5%
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Mechanical Data

Operating Ambient Temperature Range	-40 °C to +65 °C (-40 °F to +149 °F)
Storage Temperature Range	-40 °C to +85 °C (-40 °F to +185 °F)
Dimensions (with connectors)	191mm x 160mm x 26.4mm (7.52" x 6.30" x 1.04")
Weight	0.5kg/1.1lbs
Enclosure Rating	IP67 , NEMA 6P
Protection Class	II
Overvoltage Category	II
Operational environment	Outdoor Use
Pollution Degree Classification	PD3
Wet Locations Classification	For Wet Locations
Relative Humidity Ratings	0-95%
Maximum Altitude Rating	<2000m
Cooling	Natural Convection - No Fans

Features & Compliance

Communication	Zigbee (Wireless)
Monitoring	Via EMA Software
Emissions & Immunity (EMC) Compliance	FCC Part15; ANSI C63.4; ICES-003; EN 61000-6-1,EN 61000-6-2,EN 61000-6-3,EN 61000-6-4,AS/NZS 61000.6.3
Safety Class Compliance	UL1741,CSA C22.2 No.107.1-01; EN 62109-1,EN 62479
Radio Spectrum	EN 301489-1, EN 301489-17, EN 300328,,AS/NZS 4268
Rapid Shutdown Function	Default Open
Maximum System Voltage	1000V

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System Installation Layout Diagram

The APsystems Installation Map is a diagram of the physical location of each optimizer in your PV installation. Each APsystems DC Optimizer has a removable serial number label located on the mounting plate. Peel the label and affix it to the respective location on the APsystems installation map.

Installation Map Template

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

To register your APsystems DC Optimizer, please mail this warranty registration card to: emasupport@altenergy-power.com