APS M1P-EU

Grid-connected Microinverter

Installation and User Manual

(For Europe)

ALTENERGY POWER SYSTEM INC.

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www.APSmicroinverter.com

Table of Contents

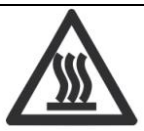
1. Important Safety Information

This manual contains important instructions that must be followed during installation and maintenance of the APS Photovoltaic Grid-connected Microinverter. To reduce the risk of electrical shock and ensure the safe installation and operation of the APS Microinverter, the following symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

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

NOTE: This indicates information that is important for optimized Microinverter operation. Follow these instructions closely.

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

APS	Trademark
	Caution, risk of electric shock
	Caution, hot surface
	Symbol for the marking of electrical and electronics devices according to Directive 2002/96/EC. Indicates that the device, accessories and the packaging must not be disposed as unsorted municipal waste and must be collected separately at the end of the usage. Please follow Local Ordinances or Regulations for disposal or contact an authorized representative of the manufacturer for information concerning the decommissioning of equipment.
CE	CE mark is attached to the solar inverter to verify that the unit follows the provisions of the European Low Voltage and EMC Directives
	Refer to the operating instructions
Qualified personnel	Person adequately advised or supervised by an electrically skilled person to enable him or her to perceive risks and to avoid hazards which electricity can create. For the purpose of the safety information of this manual, a "qualified person" is someone who is familiar with requirements for safety, refrigeration system and EMC and is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures. The inverter and endues system may only be commissioned and operated by qualified personnel.

Safety Instructions

- Only qualified professionals should install and/or replace APS Microinverters.
- Perform all electrical installations in accordance with local electrical codes.
- Before installing or using the APS Microinverter, please read all instructions and cautionary markings in the technical documents and on the APS Microinverter system and the solar-array.
- Be aware that the body of the APS Microinverter is the heat sink and can reach a temperature of 80°C. To reduce risk of burns, do not touch the body of the Microinverter.
- **Do NOT** disconnect the PV module from the APS Microinverter without first disconnecting the AC power.
- **Do NOT** attempt to repair the APS Microinverter. If it fails, contact APS Customer Support to obtain an RMA number and start the replacement process. Damaging or opening the APS Microinverter will void the warranty.
- Caution!
  The external protective earthing conductor is connected to the inverter protective earthing terminal through AC connector.
  When connecting, connect the AC connector first to ensure the inverter earthing then do the DC connections.
  When disconnecting, disconnect the AC by opening the branch circuit breaker first but maintain the protective earthing conductor in the branch circuit breaker connect to the inverter ， then disconnect the DC inputs.
- In any circumstance, do not connect DC input when AC connector is unplugged.

Radio interference statement

CE EMC Compliance： The equipment can comply with CE EMC, which are designed to protect against harmful interference in a residential installation. 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

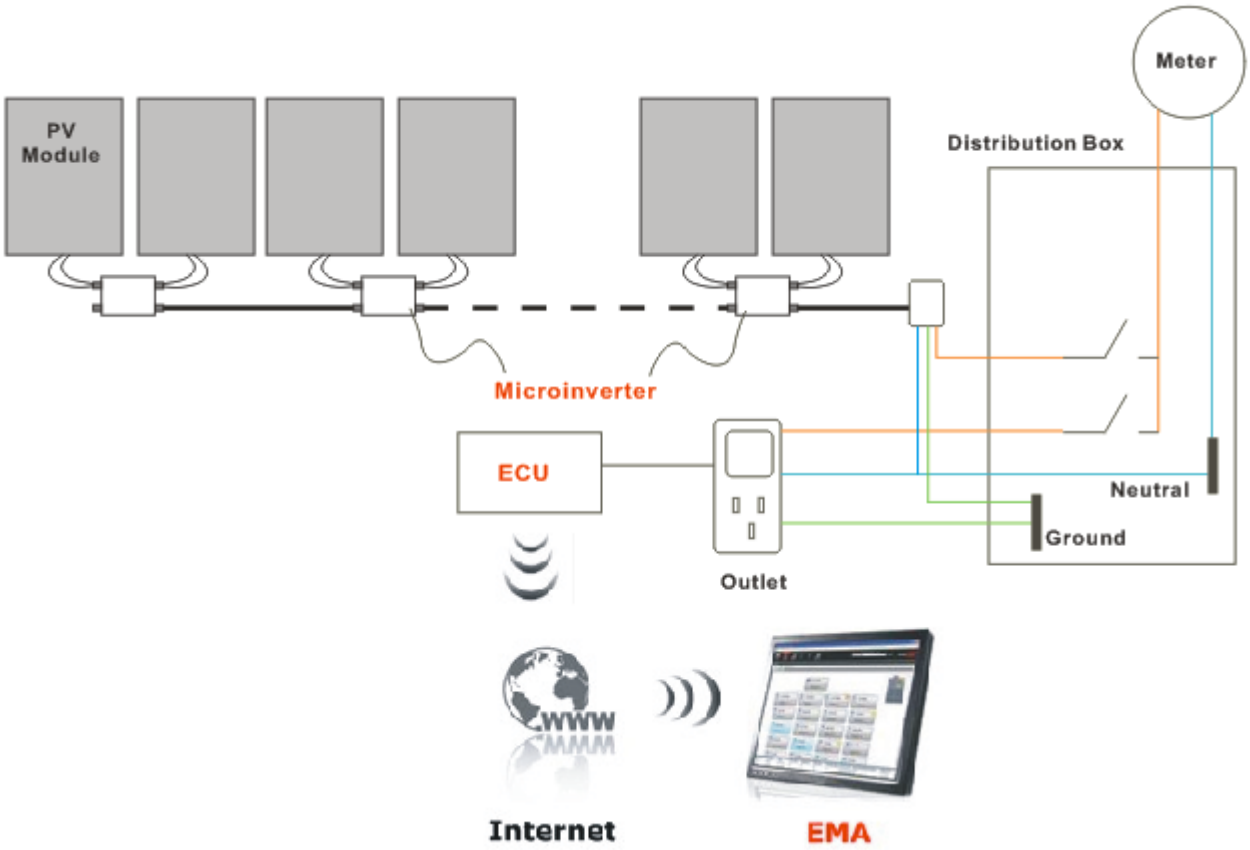
B） Consult the dealer or an experienced radio/TV technical for help。

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

2. APS Microinverter System Introduction

The APS Microinverter is an inverter system for use in utility-interactive applications, comprised of three key elements:

- Altenergy Power Systems Microinverter
- Altenergy Power Systems Energy Communication Unit (ECU)
- Altenergy Power Systems Energy Monitor and Analysis (EMA) web-based monitoring and analysis system



This integrated system improves safety; maximizes solar energy harvest; increases system reliability, and simplifies solar system design, installation, maintenance, and management..

The APS Microinverters maximize energy production from photovoltaic (PV) arrays. Each PV module has individual Maximum Peak Power Tracking (MPPT) controls, which ensures that the maximum 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 shading, soiling, orientation, or mismatch, the APS Microinverter ensures top performance from the array by maximizing the performance of each module within the array.

The APS Microinverter system is more reliable than centralized or string inverters. The distributed Microinverter system ensures that no single point of system failure exists across the PV system. APS Microinverters are designed to operate at full power at ambient temperatures of up to 65°C. The inverter housing is designed for outdoor installation and complies with the IP65 environmental enclosure rating.

PV systems using APS Microinverters are very simple to install. You can install individual PV modules in any combination of module quantity, orientation, type, and power rate. ***The Ground wire (PE) of the AC cable is connected to the chassis inside of the Microinverter, eliminating the installation of grounding wire.***

The APS Microinverter system provides smart system performance monitoring and analysis. The APS Energy Communication Unit (ECU) is installed by simply plugging it into any wall outlet and providing an Ethernet or Wi-Fi connection to a broadband router or modem. After installing the ECU, the full network of APS Microinverters automatically reports to the APS Energy Monitor and Analysis (EMA) web server. The EMA software displays performance trends, informs you of abnormal events, and controls system shutdown when it is needed.

3. APS Microinverter M1P series Introduction

The APS M1P series Microinverters connect with the single-phase grid, and can also use multiple APS Microinverters in the form of single-phase grid to achieve three-phase grid, and operate with most 60 , 72 cell solar modules. For more information, please see the section 9 Technical Date of this manual, or sign in APS website to obtain a solar panel list which can match with APS Microinverters：www.APSmicroinverter.com

Model Number	AC grid	PV Module	Max. # Per branch	Module Connector
YC250A	50Hz/230V	60,72 Cell	14 per Branch	MC-4 Type or Customize
YC250I	50Hz/230V	60,72 Cell	14 per Branch	MC-4 Type or Customize
YC500A	50Hz/230V	60,72 Cell	7 per Branch	MC-4 Type or Customize
YC500I	50Hz/230V	60,72 Cell	7 per Branch	MC-4 Type or Customize

4. APS Microinverter System Installation

A PV system using APS Microinverters is simple to install. Each Microinverter easily mounts on the PV racking, directly beneath each PV module. Low voltage DC wires connect from the PV module directly to the Microinverter, eliminating the risk of high DC voltage.
Installation shall comply with local regulations and technical rules.

Special Statement： An AC GFCI device ***should not*** be used to protect the dedicated circuit to the APS microinverter even though it is an outside circuit. None of the small GFCI devices (5ma-30 ma) are designed for back feeding and will be damaged if back feed. In a similar manner, AC AFCIs have not been evaluated for back feeding and may be damaged if back feed with the output of a PV inverter。

WARNING: Perform all electrical installations in accordance with local electrical codes.

WARNING: Be aware that only qualified professionals should install and/or replace APS Microinverters.

WARNING: Before installing or using an APS Microinverter, please read all instructions and warnings in the technical documents and on the APS Microinverter system itself as well as on the PV array.

WARNING: Be aware that installation of this equipment includes the risk of electric shock.

WARNING: Do not touch any live parts in the system, including the PV array, when the system has been connected to the electrical grid.

NOTE: Strongly recommend to install Surge protection Devices in the dedicated meter box.

Additional Installation Components from APS

- Protective branch end cap(sold separately, 1 per branch)
- AC branch end cable(sold separately, 1 per branch)

Required Parts and Tools from you

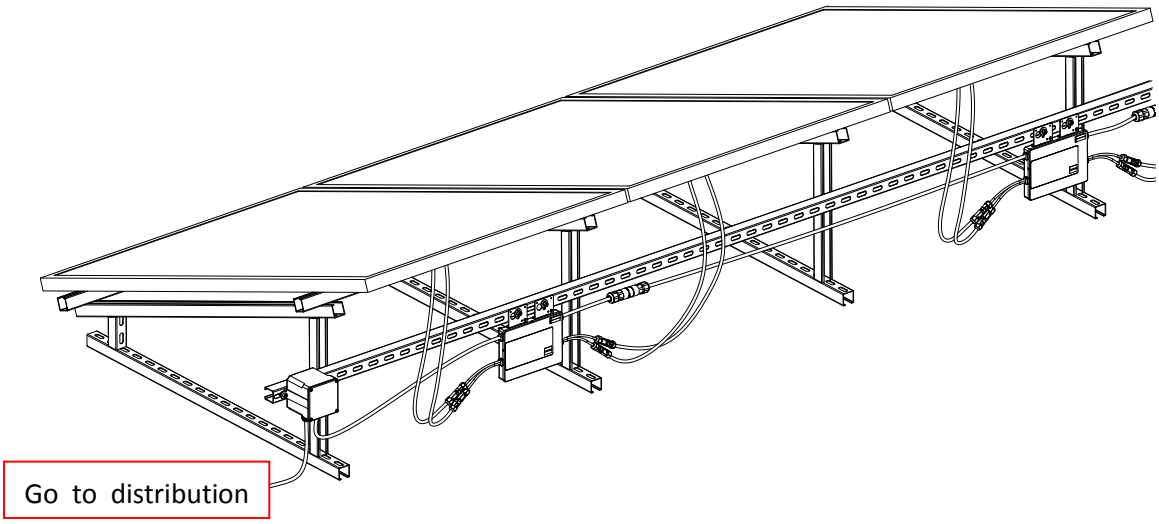
In addition to your PV array and its associated hardware, you will need the following items:

- An AC connection junction box
- Mounting hardware suitable for module racking
- Sockets and wrenches for mounting hardware
- Continuous grounding conductor and grounding washers
- A Phillips screwdriver
- A torque wrench

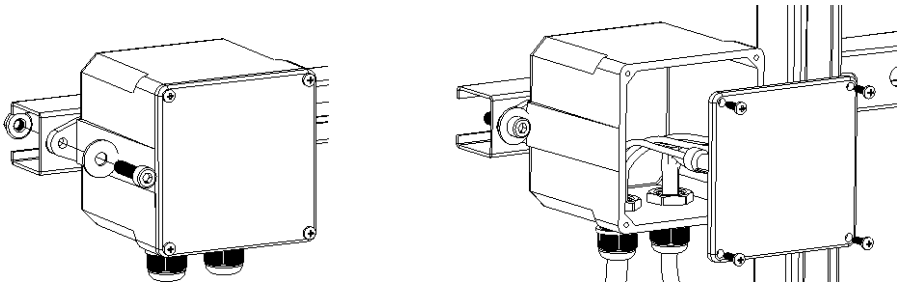
Installation Procedures

WARNING: Do NOT connect APS Microinverters to the utility grid or energize the AC circuit until you have completed all of the installation procedures as described in the following sections..

For bracket installation, after the completion of system installation rendering as follows:

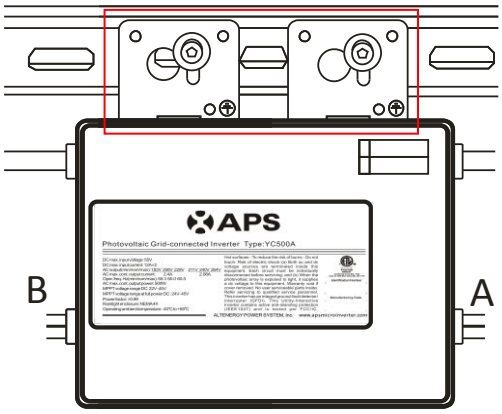


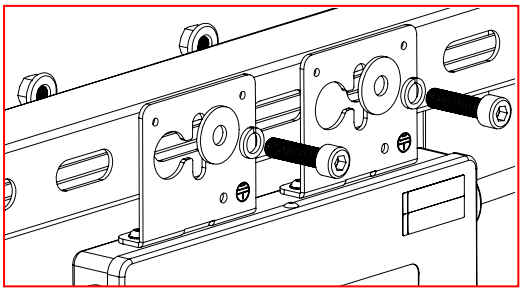
Step 1 - Installing the AC Branch Circuit Junction Box



a. Install an appropriate junction box at a suitable location on the PV racking system (typically at the end of a branch of modules).
b. Connect the open wire end of the AC branch end cable into the junction box using an appropriate gland or strain relief fitting.
c. Wire the conductors: L- BROWN; N - BLUE; PE – YELLOW GREEN.
d. Connect the AC branch circuit junction box to the point of utility interconnection.

Step 2 - Attaching the APS Microinverters to the Racking or the PV Module Frame



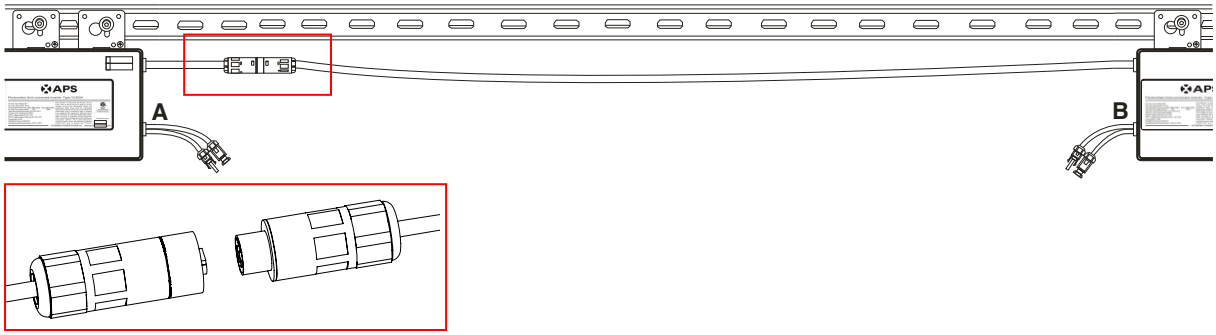


a. Mark the location of the Microinverter on the rack, with respect to the PV module junction box or any other obstructions.
b. Mount one Microinverter at each of these locations using hardware recommended by your module racking vendor.

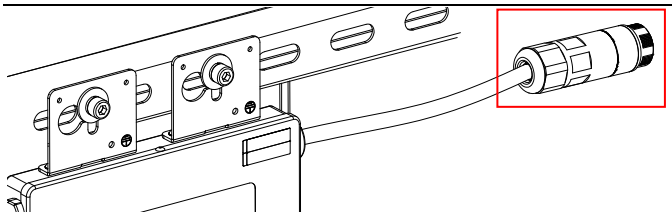
WARNING: Prior to installing any of the microinverters, verify that the utility voltage at the point of common connection matches the voltage rating on microinverter label.

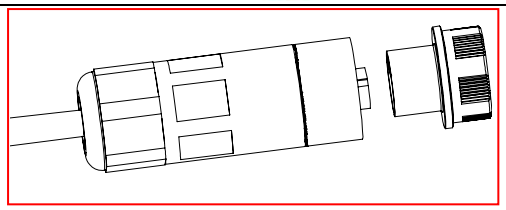
WARNING: Do not mount the Microinverter in a location that allows exposure to direct sunlight. Allow a minimum of 1.5 centimeters between the top of the roof and the bottom of the Microinverter.

Step 3 - Connecting the APS Microinverter AC Cables



a. Check the Microinverter rating label for the maximum allowable number of Microinverters on each AC branch circuit.
b. Plug the AC female connector of the first Microinverter into the male connector of the next Microinverter, and so on, to form a continuous AC branch circuit.
c. Install a protective end cap on the open AC connector of the last Microinverter in the AC branch circuit.



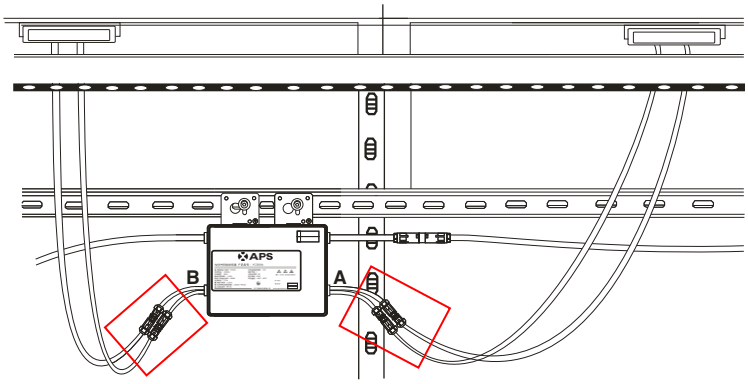


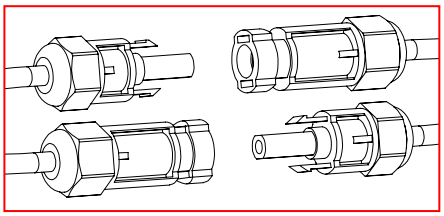
WARNING: Do NOT exceed the maximum number of Microinverters in an AC branch circuit, as displayed on the unit label.

NOTE: Please contact with ALTENERGY POWER SYSTEM Inc for the purchase of AC extended cables when microinverters which are installed space far and AC cable is not long enough.

Step 4 - Connecting APS Microinverters to the PV Module

Connect panels and microinverters according to the demand.





The inverter YC250's DC input positive pole connect to earthed enclosure inside the enclosure.
The inverter YC500's DC input negative pole connect to earthed enclosure inside the enclosure.

WARNING: Ensure that all AC and DC wiring is correct. Ensure that none of the AC and DC wires are pinched or damaged. Ensure that all junction boxes are properly closed.

NOTE: About A and B Sides corresponding the location of modules, EMA registration show acquiesce in this installation. if there are different connection methods, please email the detail installation drawings to us to register, or the A, B Sides corresponding component location will not correspond to the EMA position.

Step 5 - Completing the APS Installation Map

You need to fill-in APS Warranty Cards, which provide system information and installation map. Feel free to provide your own layout if a larger or more intricate installation map is required.

a. Each APS Microinverter has removable serial number labels. Once the inverters are installed, please peel the lables off and affix them on the warranty card,fill in A,B in each of the labels below（as Figure2）according to the layout on the roof（as Figure1）. The warranty cards can be obtained from the appendix of this manual or APS website：www.APSmicroinverter.com

b. Fill the warranty cards and email to APS at emasupport@altenergy-power.com.

c. APS will setup the EMA account and email you information, and 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 APS website：www.APSmicroinverter.com

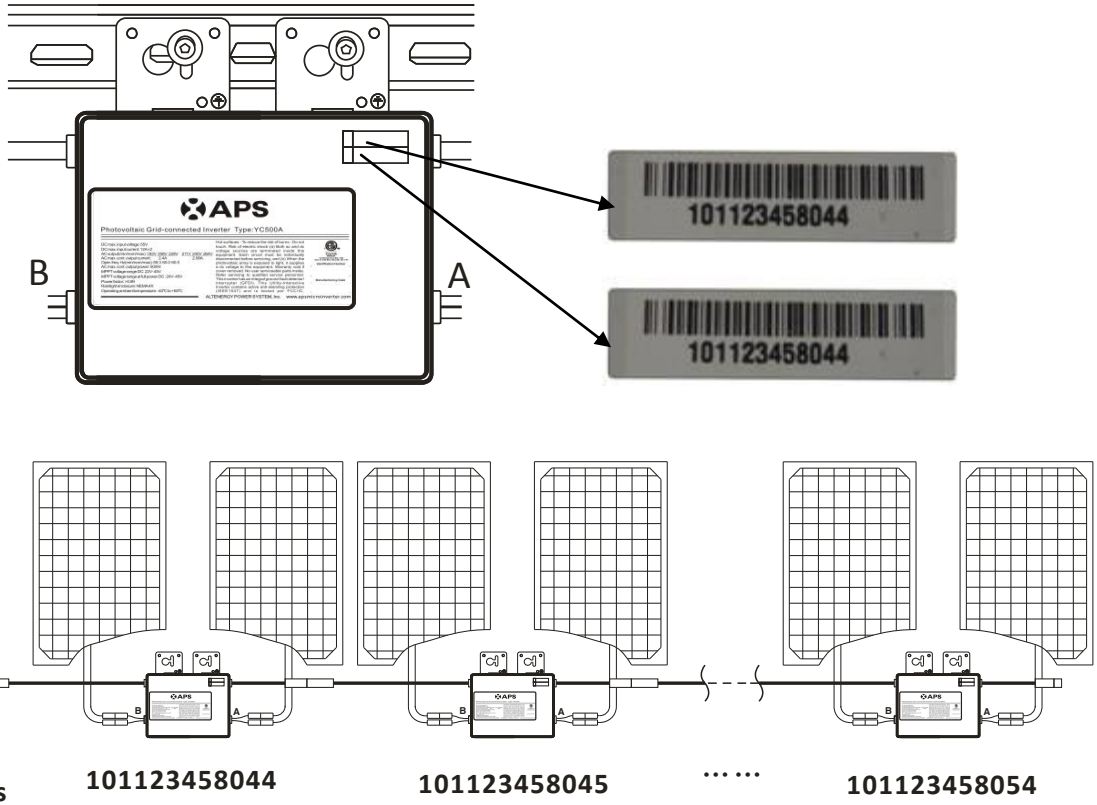


Figure1 APS Microinverter installation schematic arrangement

APS MicroInverter &Energy Communication Unit

Warranty Card

The APS Installation Map is a diagram of the physical location of each microinverter in your PV installation. Each APS microinverter has a removable serial number label located on the mounting plate. Peel the label and affix it to the respective location on the APS 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
		→																			
B A	B A									B A											

To register your APS microinverter, please mail this warranty registration card to: emasupport@altenergy-power.com

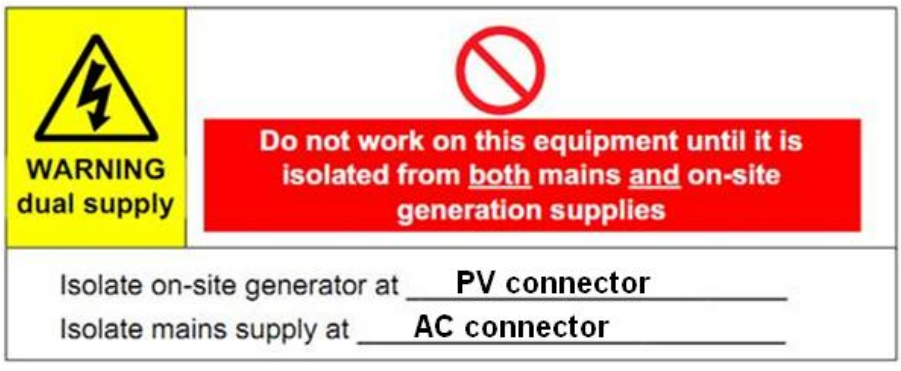
Figure2 Schematic diagram of The warranty cards

NOTE: 1. The layout of the inverters' serial numbers on the warranty card is only suitable for general arrangement.
2. Step 1～5 can change sequence for convenience of installation.
3. Warranty card is located in Appendix last page of this manual.

Step 6 - Placing a Warning Notice

A warning notice shall be placed in such a position that any person gaining access to live parts will be warned in advance of the need to isolate those live parts from all points of supply. Special attention should be paid that the power supply, measuring circuits (sense lines) and other parts may not be isolated from the network when the switch of the interface protection is open.
As a minimum, warning labels shall be placed:

- On the switchboard (DNO panel and consumer unit) that has the micro-generator connected to it;
- On all switchboards in between the consumer unit and the micro-generator itself;
- On, or in the micro-generator itself;
- At all points of isolation for the micro-generator.



ALTENERGY POWER SYSTEM INC. (APS)

5. APS microinverter system operating instructions

To operate the APS microinverter PV system:
1. Turn ON the AC circuit breaker on each microinverter AC branch circuit.
2. Turn ON the main utility-grid AC circuit breaker. Your system will start producing power after a two-minute waiting time.

NOTE: Once DC power is applied, the Status LED of each microinverter will blink green three times to indicate normal start-up operation.

NOTE: Once AC power is applied, about 0.1A current and 25VA(W) power for each microinverter may be measured with a meter. This Current and Power are Reactive. The inverters ARE NOT operating. After an over 60s waiting time, the inverters will start operation.

3. The APS microinverters will start to send performance data over the power line to the ECU. The time required for all the microinverters in the system to report to the ECU will vary with the number of microinverters in the system. You can verify proper operation of the APS microinverters via the ECU. See the *ECU Installation and Operation Manual* for more information.

6. Troubleshooting

Qualified personnel can use the following troubleshooting steps if the PV system does not operate correctly.

Status Indications and Error Reporting

Startup LED

When DC power is first applied to the microinverter:

- Three short green blinks when DC power is first applied to the microinverter indicate a successful microinverter startup.

Operation LED

Flashing Slow Green (10s gap) - Producing power and communicating with ECU
Flashing Fast Green (2s gap) – Producing power and not communicating with ECU
Flashing Red – Not producing power

GFDI Error

A solid red LED indicates the microinverter has detected a ground fault (GFDI) error in the PV system. Unless the GFDI error has been cleared, the LED will remain red and the ECU will keep reporting the fault.

After the ground fault error is fixed, follow the instructions in the *ECU Installation and Operation Manual* to clear this GFDI error reporting.

Other Faults

All other faults are reported to the ECU. Refer to the *ECU Installation and Operation Manual* for a list of additional faults and troubleshooting procedures.

WARNING: Be aware that only qualified personnel should troubleshoot the APS microinverter.

WARNING: Never disconnect the DC wire connectors under load. Ensure that no current is flowing in the DC wires prior to disconnecting. An opaque covering may be used to cover the module prior to disconnecting the module.

WARNING: Always disconnect AC power before disconnecting the PV module wires from the APS microinverter. The AC connector of the first microinverter in a branch circuit is suitable as a disconnecting means once the AC branch circuit breaker in the load center has been opened.

WARNING: The APS microinverter is powered by PV module DC power. Make sure you disconnect and reconnect the DC connections to watch for the three short LED flashes.

Troubleshooting a non-operating APS microinverter

To troubleshoot a non-operating APS microinverter, follow the steps below in order:

1. Verify the utility voltage and frequency are within ranges shown in the in section 8 Technical Data of this manual.
2. Check the connection to the utility grid. Verify utility power is present at the inverter in question by removing AC, then DC power. **Never disconnect the DC wires while the microinverter is producing power.** Re-connect the DC module connectors and watch for three short LED flashes.
3. Check the AC branch circuit interconnection between all the microinverters. Verify each inverter is energized by the utility grid as described in the previous step.
4. Make sure that any AC breaker are functioning properly and are closed.
5. Check the DC connections between the microinverter and the PV module.
6. Verify the PV module DC voltage is within the allowable range shown in the Section 8 Technical Data of this manual.
7. If the problem persists, please call APS Energy customer support.

WARNING: Do not attempt to repair the APS microinverter. If troubleshooting methods fail, please return the microinverter to your distributor for replacement.

7. Maintenance

No need to Maintenance.

8. Replace a microinverter

Follow the procedure to replace a failed APS microinverter.

1. Disconnecting the APS microinverter from the PV Module, in the order shown below:
   1) Disconnect the AC by opening the branch circuit breaker.
   2) Cover the module with an opaque cover.
   3) Disconnect the first AC connector in the branch circuit.
   4) Disconnect the PV module DC wire connectors from the microinverter.
   5) Remove the microinverter from the PV array racking.
2. Install a replacement microinverter to the rack.
3. Connect the AC cable of the replacement microinverter and the neighboring microinverters to complete the branch circuit connections.
4. Close the branch circuit breaker, and verify operation of the replacement microinverter.

9. Technical Data

WARNING: Be sure to verify the voltage and current specifications of your PV module match with those of the microinverter.

WARNING: You must match the DC operating voltage range of the PV module with the allowable input voltage range of the APS microinverter.

WARNING: The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the APS microinverter.

YC250-EU Technical Specification

Type	YC250A/I-EU
Input Data (DC)	
Recommended PV Module Power (STC)Range	180-310W
MPPT Voltage Range	22-45VDC
MPPT Voltage Range @ Full Power	26-45VDC
Operation Voltage Range	16-52VDC
Maximum Input Voltage	55VDC
Startup Voltage	22V
Maximum Input Current	10.5A
Maximum DC Short Circuit Current	15A
Output Data (AC)	
Maximum Continuous Power	250W
Maximum Continuous Current	1.08A
Rated Grid Voltage	230VAC
Default Output Voltage Range	184-253VAC[1]
Extended Output Voltage Range	149-278VAC
Rated Grid Frequency	50Hz
Default Output Frequency Range	48-51Hz[1]
Extended Output Frequency Range	45.1-54.9Hz
Power Factor	>0.99
Total Harmonic Distortion	<3%
Maximum Units per Branch	14 per Branch
Efficiency	
Max. Inverter Efficiency	95.5% (With HF Transformer)
Mechanical Data	
Operating Ambient Temperature	-40 °C to +65°C
Operating Internal Temperature	-40 °C to +85°C
Storage Temperature Range	-40 °C to +85°C
Dimensions (W x H x D)	160mm X 150mm X 29mm
Weight	1.5kg
AC BUS	12AWG
Waterproof Level	IP65
Cooling	Natural Convection
Wet Locations Classification	For Wet Locations
Pollution Degree Classification	PD3
Relative Humidity Ratings	0-95%
Maximum Altitude Rating	All data at this technical Specifications has been tested under <2000m
Overvoltage Category	OVC II for PV input circuit, OVC III for mains circuit
Features & Compliance	
Communication	Power Line
Design lifetime	25 yrs
Monitoring	Life monitoring via EMA software
Grid Connection Compliance	EN50438

Safety and EMC Compliance	EN 62109-1; EN 62109-2;EN61000-6-1; EN61000-6-2; EN61000-6-3; EN61000-6-4;

[1]Programmable through ECU to meet customer need.

The specifications are subject to change without notice.

YC500-EU Technical Specification

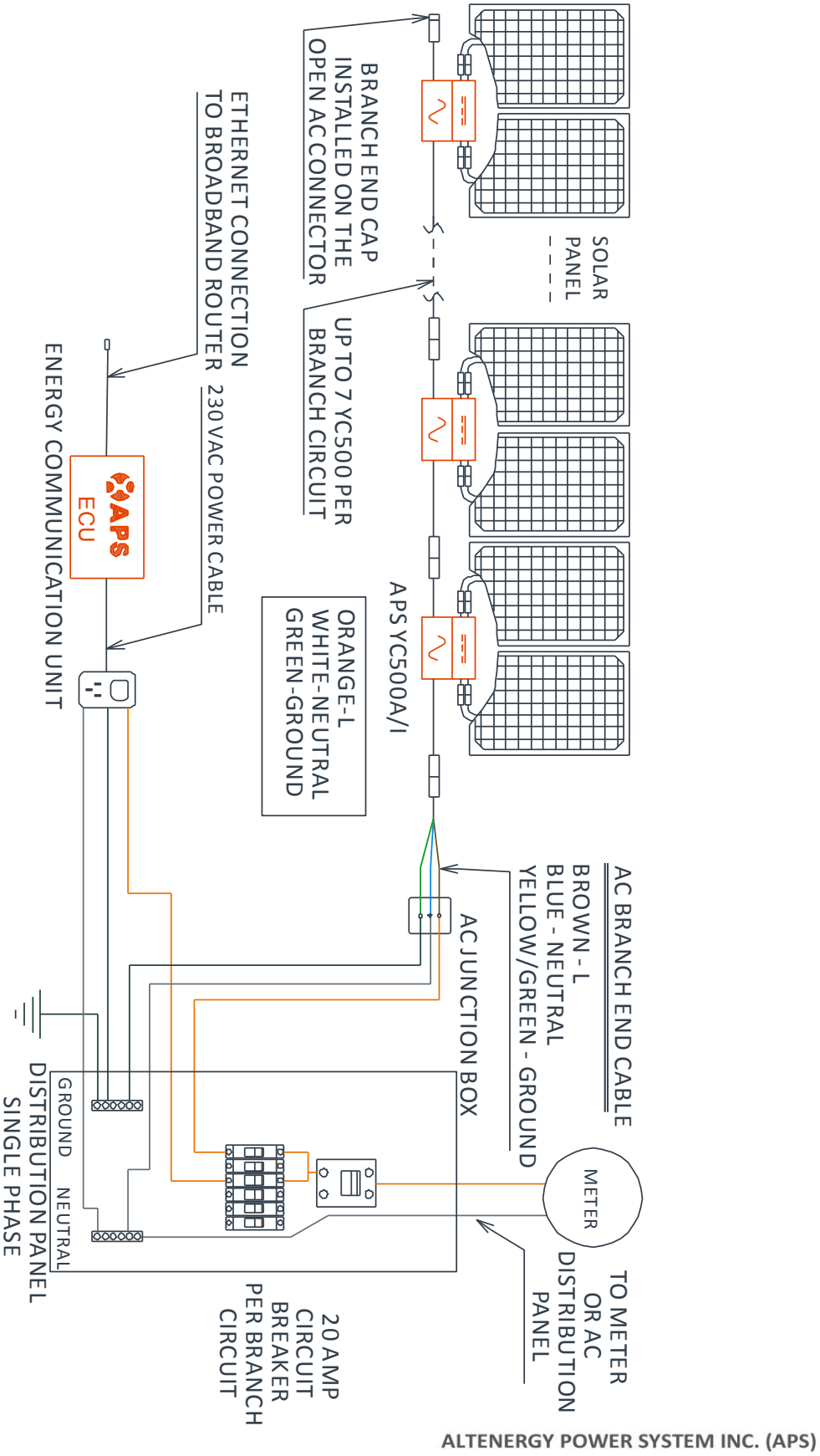
Type	YC500A/I-EU(for 2 independent MPPT)
Input Data (DC)	
Recommended PV Module Power (STC)Range	180-310W
MPPT Voltage Range	22-45VDC
MPPT Voltage Range @ Full Power	26-45VDC
Operation Voltage Range	16-52VDC
Maximum Input Voltage	55VDC
Startup Voltage	22V
Maximum Input Current	10.5AX2
Maximum DC Short Circuit Current	15A
Output Data (AC)	
Maximum Continuous Power	500W
Maximum Continuous Current	2.17A
Rated Grid Voltage	230VAC
Default Output Voltage Range	184-253VAC[1]
Extended Output Voltage Range	149-278VAC
Rated Grid Frequency	50Hz
Default Output Frequency Range	48-51Hz[1]
Extended Output Frequency Range	45.1-54.9Hz
Power Factor	>0.99
Total Harmonic Distortion	<3%
Maximum Units per Branch	7 per Branch
Efficiency	
Max. Inverter Efficiency	95.5% (With HF Transformer)
Mechanical Data	
Operating Ambient Temperature	-40 °C to +65°C
Operating Internal Temperature	-40 °C to +85°C
Storage Temperature Range	-40 °C to +85°C
Dimensions (W x H x D)	221mm X167mm X 29mm
Weight	2.5kg
AC BUS	12AWG
Waterproof Level	IP65
Cooling	Natural Convection
Wet Locations Classification	For Wet Locations
Pollution Degree Classification	PD3
Relative Humidity Ratings	0-95%
Maximum Altitude Rating	All data at this technical Specifications has been tested under <2000m
Overvoltage Category	OVC II for PV input circuit, OVC III for mains circuit
Features & Compliance	

Communication	Power Line
Design lifetime	25 yrs
Monitoring	Life monitoring via EMA software
Grid Connection Compliance	EN50438
Safety and EMC Compliance	EN 62109-1; EN 62109-2;EN61000-6-1; EN61000-6-2; EN61000-6-3; EN61000-6-4;
[1]Programmable through ECU to meet customer need.	

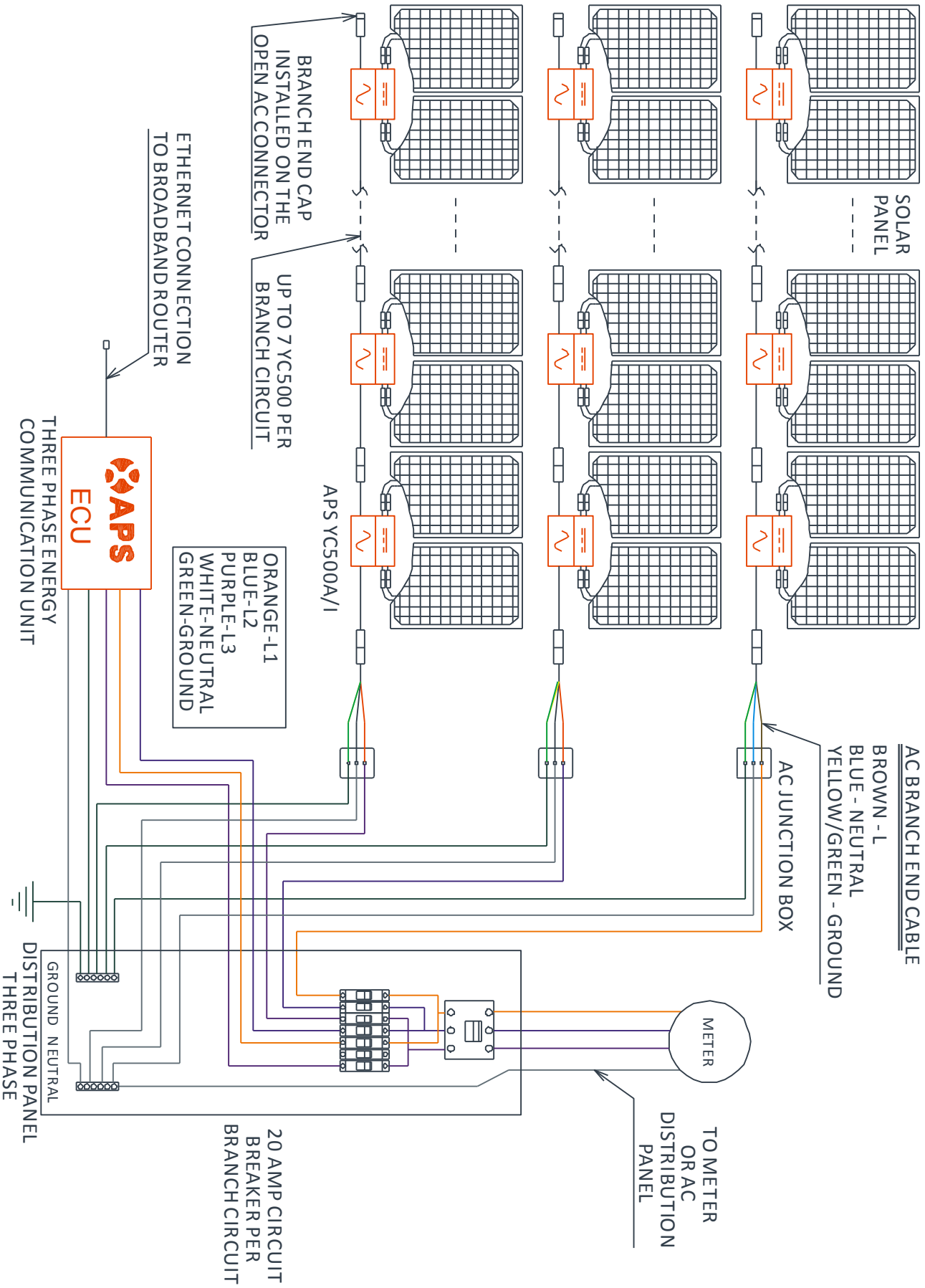
The specifications are subject to change without notice.

10. Wiring Diagram

10.1 Sample Wiring Diagram – Single Phase



10.2 Sample Wiring Diagram – Three Phase



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APS Microinverter &Energy Communication Unit

Warranty Card

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

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