Installation and User Manual

YC1000-3-208

Photovoltaic 3-Phase Grid-connected Microinverter

(For USA/Canada)

ALTENERGY POWER SYSTEM, INC.

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1. IMPORTANT SAFETY INSTRUCTIONS

This manual contains important instructions that must be followed during installation and maintenance of the APS Photovoltaic Grid-connected Inverter (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.

SAVE THESE INSTRUCTIONS– This manual contains important instructions for Models YC1000-3-208 that must be followed during installation and maintenance of the Photovoltaic Grid-connected Inverter.

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.

➢ *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.
- **Do NOT** expose the connection to directed, pressurized liquid (water jets, etc.).
- **Do NOT** expose the connection to continuous immersion.
- **Do NOT** expose the AC connector to continuous tension (e.g., tension due to pulling or bending the cable near the connection).
- Use only the connectors and cables provided.
- **Do NOT** allow contamination or debris in the connectors.
- Use the cable and connectors only when all parts are present and intact.
- Use the terminator to seal the conductor end of the Engage Cable; no other method is allowed.
- To reduce the risk of fire, connect only to a circuit provided with 25 amperes maximum branch circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.

- a) Both AC and DC voltage source are terminated inside this equipment. Each circuit must be individually disconnected before servicing. b) When the photovoltaic array is exposed to light, it supplies a DC voltage to this equipment.
- Warranty void if cover removed.
- This Utility-Interactive Inverter contains active anti-islanding protection(IEEE1547) and is tested per FCC/IC.

➢ *Radio interference statement*

FCC Compliance： The equipment can comply with the limits for a class B digital device, pursuant to part 15 of the FCC Rules, 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

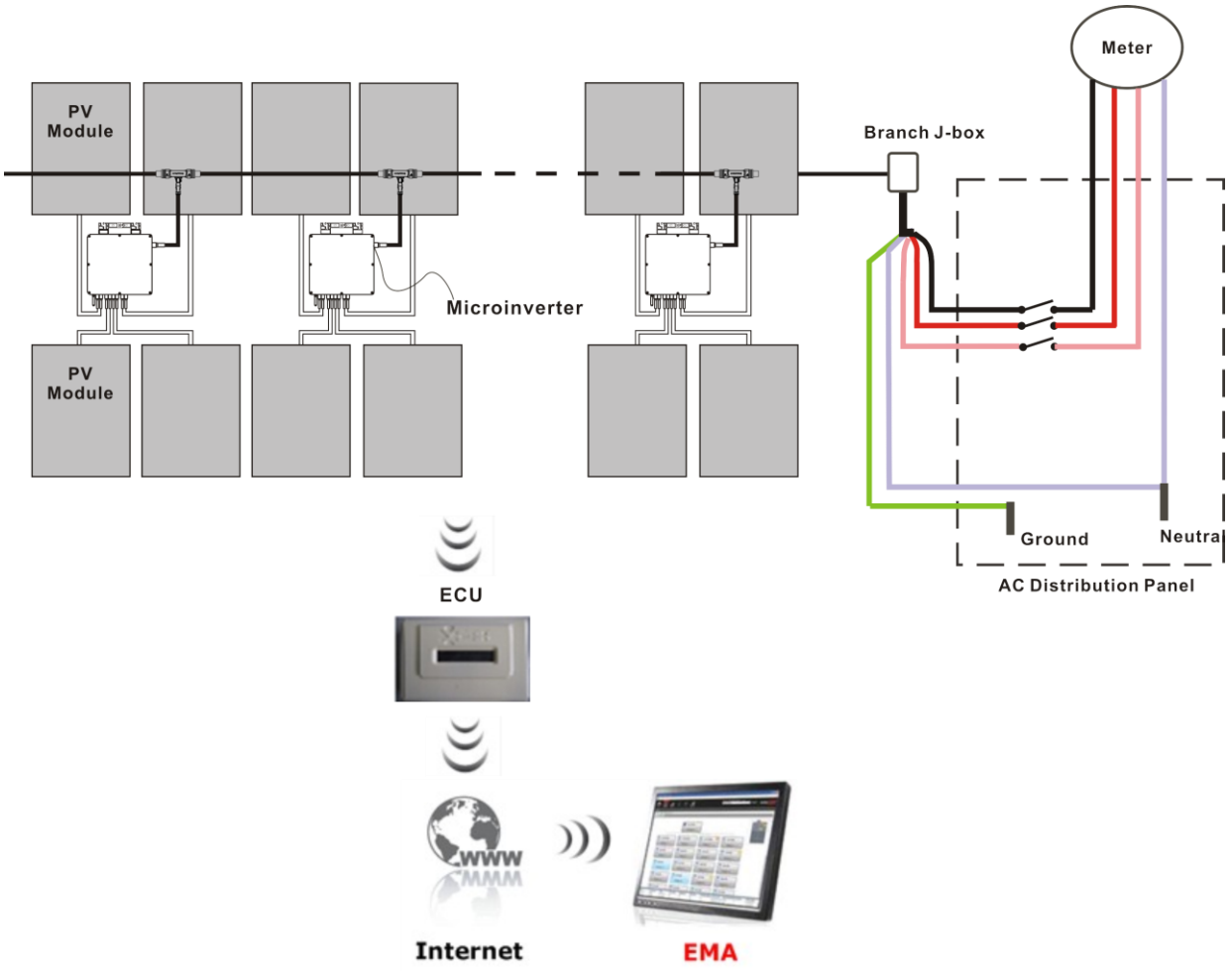
B） Consult the dealer or an experienced radio/TV technical for help。

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 photovoltaic (PV) system design, installation, maintenance, and management.

The APS Microinverters maximize energy production from photovoltaic (PV) arrays. Each PV module is operating at the maximum peak power point, which ensures that the maximumpower is exported to the utility grid. When PVmodules 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 the 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 NEMA 6 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 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 Three-phase Microinverter YC1000-3-208 Introduction

The APS YC1000-3-208 Microinverters connect with the Three-phase grid, and operate with most 60,72,84 and 96 cell PV modules.For more information, please see the section 8 Technical Date of this manual.

Model Number	AC grid	PV Module	Module Connector
YC1000-3-208	120V/208V	60,72,84,96 Cell	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 end cap (sold separately)
- *sealling caps* (sold separately)

➢ *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

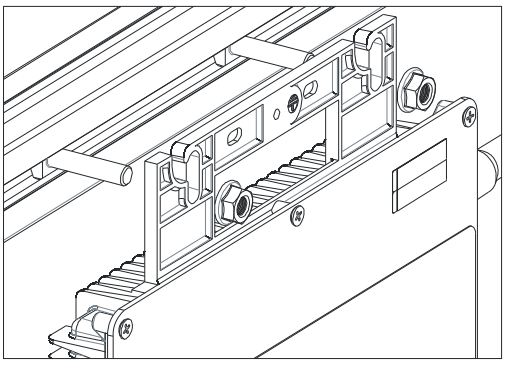
NOTE: The AC output is bonded to ground, but the neutral is not. Overcurrent protection for the AC output circuit shall be provided in the end installation. A disconnect switch shall be provided by others for the AC output circuit. (May be required by local code or AHJ).

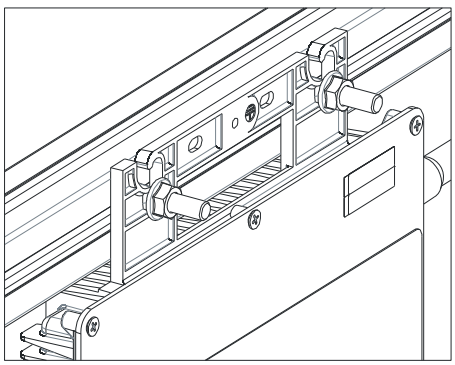
➢ *Installation Procedures*

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.

Step 1 – Lay the AC bus according to the arrangement of APS Microinverter.

Step 2 – Attaching the APS Microinverters to the Racking.



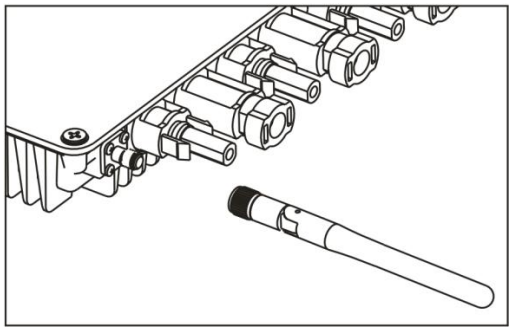


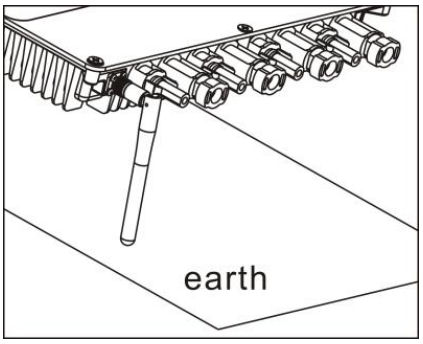
a. Mark the location of the Microinverter on the rack, with respect to the PV module junction box or any other obstructions.
b. Mount one Microinverter at each of these locations using hardware recommended by your module racking vendor.

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.

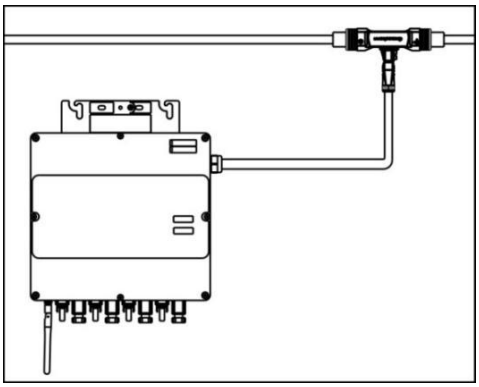
WARNING: Do not mount the Microinverter in a location that allows exposure to direct sunlight. Allow a minimum of 1.5 centimeters between the top of the roof and the bottom of the Microinverter.

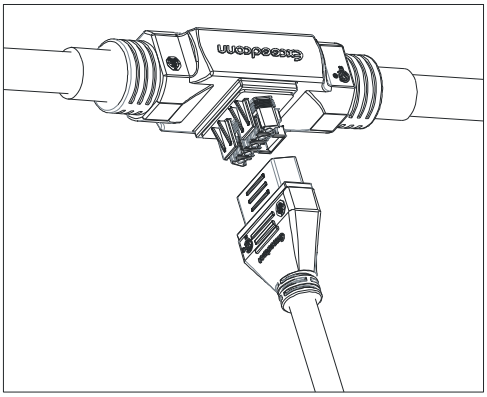
Step 3 – Attaching the antenna to the Microinverter, and keep the antenna vertical to the earth.



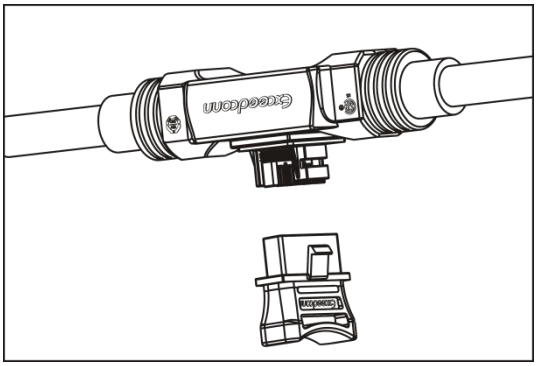


Step 4 – Connecting the APS Microinverter AC Cables to the AC bus cable.



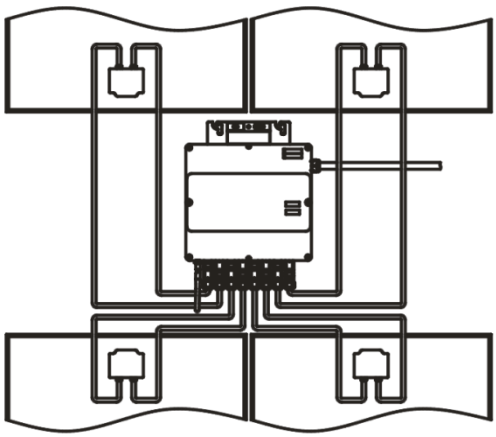


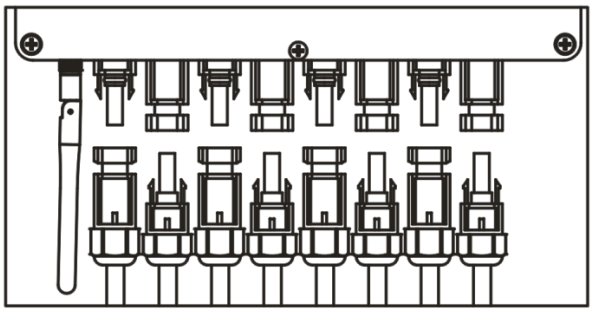
NOTE: Cover all unused T connectors with sealling caps to protect the T connectors.



Step 5 – Connecting APS Microinverters to the PV Module.

Photovoltaic panels and microinverter DC input cable connection according to demand.

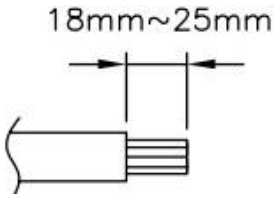




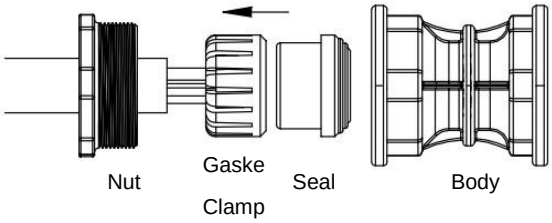
WARNING: Ensure that all AC and DC wiring is correct. Ensure that none of the AC and DC wires are pinched or damaged. Ensure that all junction boxes are properly closed.

Step 6 – Install a protective end cap at the end of AC bus cable.

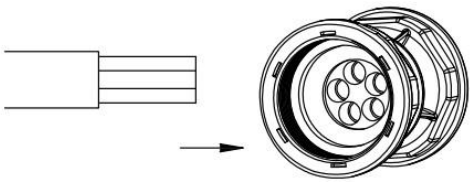
a. Wirestripping



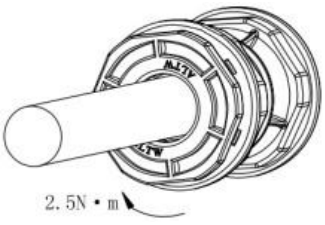
b. Insert the cable end into the gasket clamp.



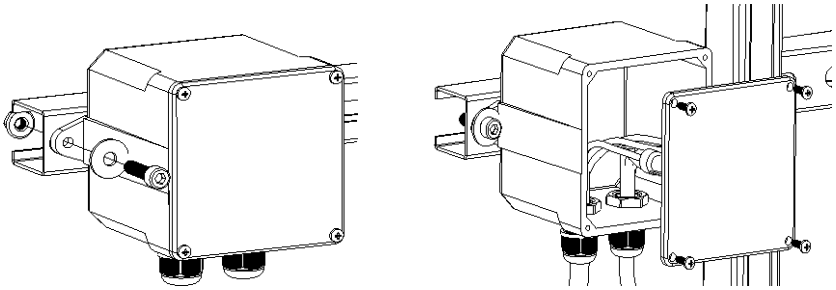
c. Insert five wires into five cable clamps



d. Rotate the nut with 2.5N·m until the latching mechanism meets the base.



Step 7 – 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 bus cable into the junction box using an appropriate gland or strain relief fitting.
c. Wire the conductors: L1- RED; L2 - BLACK; L3 - PINK; N - WHITE; PE – GREEN.
d. Connect the AC branch circuit junction box to the point of utility interconnection.

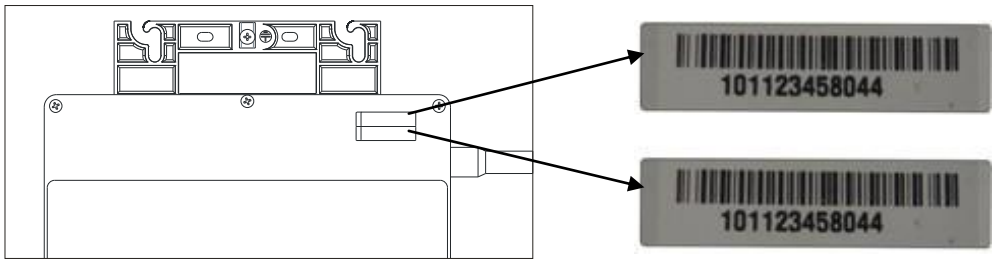
Step 8 – Completing the APS Installation Map.

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. Peel labels off, affix one to the respective location on the APS installation map and affix another to the PV module frame which is easy to see. 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.



NOTE: 1. Step 1 ~ 8 can change sequence for convenience of installation.
2. Warranty card is located in Appendix last page of this manual.

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 five-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.

3. The APS microinverters will start to send performance data over Wired or wireless 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

Operating LED

Flashing Slow Green (10s gap) – Producing power and communicating with ECU
Flashing Fast Green (2s gap) – Producing power and not communicating with ECU after 60min
Flashing Red – Not producing power

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 troubleshootingprocedures.

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 DCwires 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. Replace a Microinverter

Follow the procedure to replace a failed APS microinverter.

1. Remove 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.

8. 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.

➢ *YC1000-3-208 Technical Specifications*

Type	YC1000-3-208 (4 DC inputs)	
Input Data (DC)		
Recommended PV Module Power (STC)Range	180W-310W	
MPPT Voltage Range	16V-55V	
Operation Voltage Range	16V-55V	
Maximum Input Voltage	60V	
Startup Voltage	22V	
Maximum Input Current	14.8A×4	
Output Data (AC)		
Maximum Continuous Output Power	900W	
Peak Output Power	1000W	
3-Phase Grid Type	120V/208V	
Nominal Output Current	2.50A×3	
Nominal Output Voltage	120V×3	
Default Output Voltage Range	105.6V-132V[1]	
Extended Output Voltage Range	82V-152V	
Nominal Output Frequency	60Hz	
Default Output Frequency Range	59.3Hz-60.5Hz[1]	
Extended Output Frequency Range	55.1Hz-64.9Hz	
Maximum output fault current (ac) and duration	124.23 Apk, 12.10ms of duration, 4.97 Arms, over 3 cycles	
Power Factor	>0.99	
Total Harmonic Distortion	<3%	
Maximum Units per Branch	4 for 15A× 3 Breaker[2]	
Efficiency		
Peak efficiency	95%	
CEC Weighted efficiency	94.5%	
Nominal MPPT efficiency	99.9%	
Night Power Consumption	300mW	
Utility interconnection voltage and frequency trip limits and trip times	+/- 5% but not less than 160ms	
Trip limit and trip time accuracy	Voltage	+/- $2V_{L-N}$
	Frequency	+/- 0.05 Hz
	Alternate Trip Time	See NOTE 1 below
Mechanical Data		
Operating Ambient temperature range	-40 °F to +149 °F (-40 °C to +65 °C)	
Operating Internal temperature range	-40 °F to +185 °F (-40 °C to +85 °C)	
Storage Temperature Range	-40 °F to +185 °F (-40 °C to +85 °C)	
Dimensions (W x H x D) inches	10.2” X 9.5” X 1.4”	
Dimensions (W x H x D) mm	259mm X 242mm X 36mm	
AC Bus	14AWG	

Weight	8.4lbs/3.8kg
Enclosure rating	NEMA 6
Cooling	Natural Convection
Features	
Communication	Zigbee
Design Lifetime	25yrs
Integrated ground	The DC circuit meets the requirements for ungrounded PV arrays in NEC690.35. Equipment ground is provided by the PE in the AC cable. No additional ground is required. Ground fault protection (GFP) is integrated into the microinverter.
Emissions & Immunity (EMC) Compliance	FCC Part15; ANSI C63.4;ICES-003
Safety Class Compliance	UL1741，CSA C22.2 No.107.1-01
Grid Connection Compliance	IEEE1547
[1] Programmable through ECU in field to meet customer need. [2]Depending on the local regulations.	

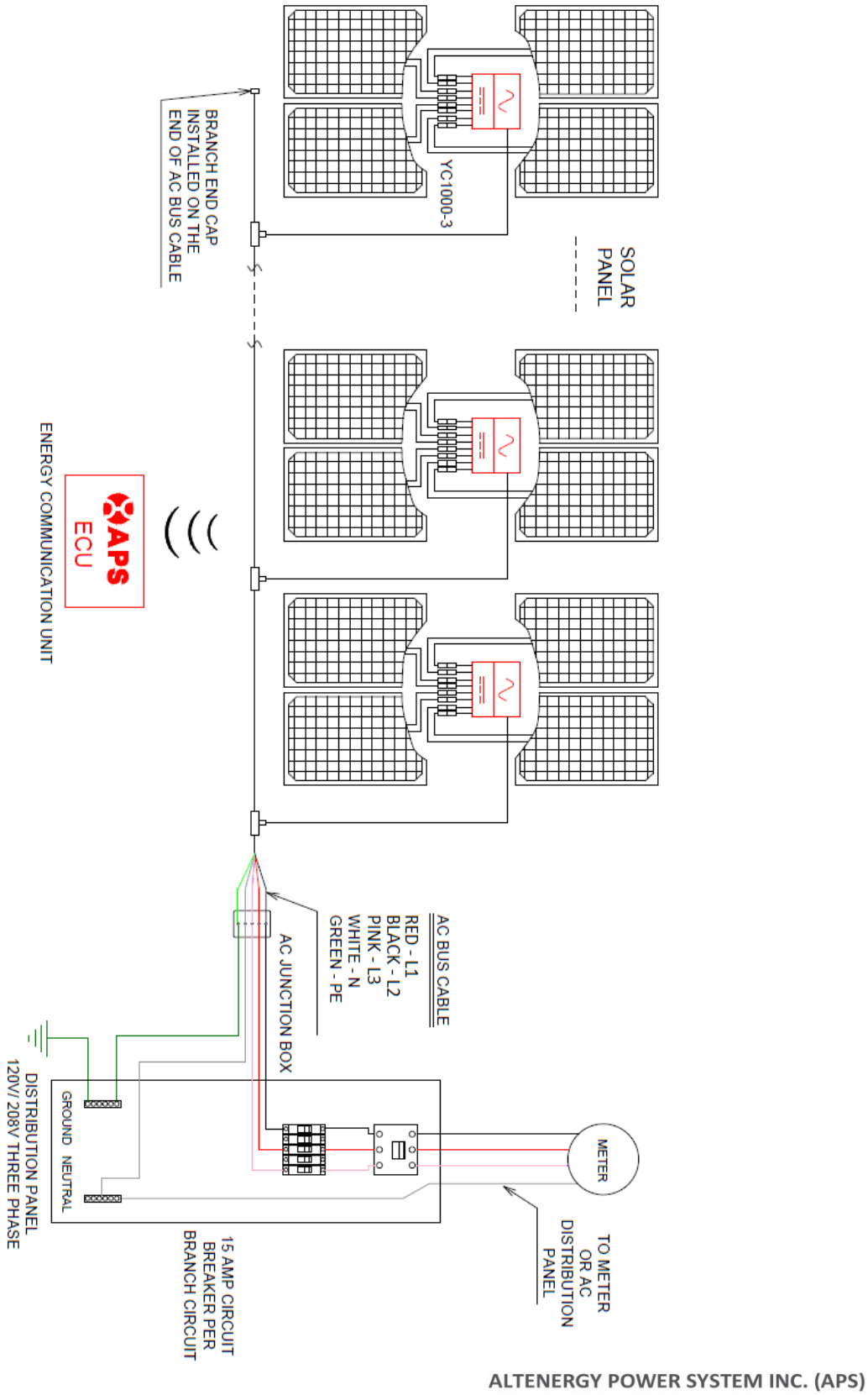
The specifications are subject to change without notice.

Note 1: Utility Interconnection Voltage and Frequency Trip Limits and Trip Times

Voltage and frequency limits for utility Interaction			
Condition	Simulated utility source		Maximum time (sec) (cycles) at 60 Hza before cessation of current to the simulated utility
	Voltage (V)	Frequency (Hz)	
A	< 0.50 Vnor	Rated	0.08
B	0.50 Vnor ≤ V < 0.88 Vnor	Rated	0.20
C	1.10 Vnor < V < 1.20 Vnor	Rated	0.20
D	1.20 Vnor ≤ V	Rated	0.08
E	Rated	f > 60.5	0.16
F	Rated	f < 59.3	0.16

9. Wiring Diagram

➢ ***Sample Wiring Diagram-120V/208V Three Phase***



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microinverter solar technology

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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
A														
B														
C														

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