

APS YC200-NA Micro-inverter Installation and User Manual

Version 2.0



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1. IMPORTANT SAFETY INSTRUCTIONS

This manual contains important instructions to follow during installation and maintenance of the ALTENERGY POWER SYSTEM (APS) micro-inverter. To reduce the risk of electrical shock and ensure the safe installation and operation of the APS micro-inverter, 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 YC200-NA that shall be followed during installation and maintenance of the micro-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 optimal operation. Follow these instructions closely.

Safety Instructions

- Only qualified professionals should install and/or replace APS Micro-inverters.
- Perform all electrical installations in accordance with local electrical codes.
- Before installing or using the APS Micro-inverter, please read all instructions and cautionary markings in the technical documents and on the APS Micro-inverter system and the PV-array.
- Be aware that the body of the APS Micro-inverter is the heat sink and can reach a temperature of 80°C. To reduce risk of burns, do not touch the body of the micro-inverter.
- Do NOT disconnect the PV module from the APS Micro-inverter without first disconnecting the AC power.
- Do NOT attempt to repair the APS Micro-inverter. If it fails, contact APS Customer Support to obtain an RMA number and start the replacement process. Damaging or opening the APS Micro-inverter will void the warranty.

2. APS micro-inverter System introduction

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

- Altenergy Power Systems Micro-inverter
- 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; simplifies photovoltaic (PV) system design, installation, maintenance, and management.

PV systems using APS Micro-inverters are safe to install and use. Micro-inverter eliminates the high DC voltage (600V~1000V) in conventional PV inverter system. This high DC voltage is lethal to installer and users. It also may cause DC arcing and result in fires.

PV systems using APS Micro-inverters 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 Micro-inverter, eliminating the installation of grounding wire.***

The APS Micro-inverters 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 Micro-inverter ensures top performance from the array by maximizing the performance of each module within the array.

The APS Micro-inverter system is more reliable than centralized or string inverters. The distributed Micro-inverter system ensures that no single point of system failure exists across the PV system. APS Micro-inverters 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.

The APS Micro-inverter 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 Micro-inverters 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 Micro-inverter System Installation

A PV system using APS Micro-inverters is simple to install. Each micro-inverter easily mounts on the PV racking, directly beneath each PV module. Low voltage DC wires connect from the PV module directly to the micro-inverter, eliminating the risk of high DC voltage.



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



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



WARNING: Before installing or using an APS Micro-inverter, please read all instructions and warnings in the technical documents and on the APS Micro-inverter 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.

Installation Kits from APS

- AC interconnect cable to branch junction box
- Branch cable Protective end caps

Required Parts and Tools

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

- 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 Procedure

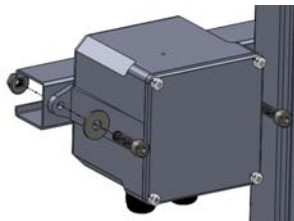
Installing the APS Micro-inverter System involves 10 key steps:



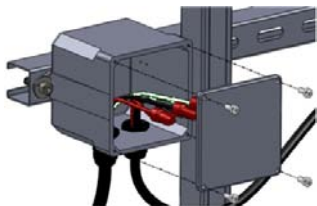
WARNING: Do NOT connect APS Micro-inverters to the utility grid or energize the AC circuit until you have completed all of the installation procedures as described in the following sections.

Step 1. Verify the grid voltage to match with micro-inverter rating

Step 2. Install the AC Branch Circuit Junction Box



Step 3. Connect the cables to the branch junction box



- Put the unused end of the AC interconnector cable into the branch junction box. The other end has a Female connector.
- Place cable connecting to the point of utility interconnection into the branch junction box.
- Wire the conductors: **L1- RED; L2 - BLACK; N – WHITE.**

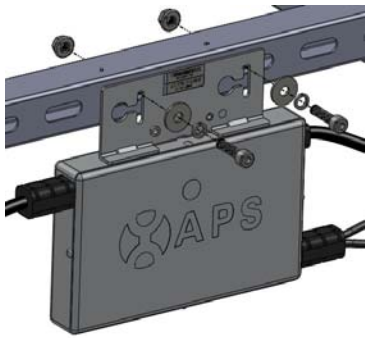


NOTE: Be sure to size the AC wire to account for voltage drop between the AC branch circuit junction box and the point of utility interconnection.

The table below provides recommendations for wire size from the junction box at the beginning of the Micro-inverter branch to the main load center based on distance.

Maximum external wiring distance (feet)						
	Module number in branch					
Wire (AWG)	10	11	12	13	14	15
14	77	54	45	37	30	23
12	122	86	72	59	47	37
10	194	137	114	94	75	58
8	308	218	182	149	120	93
6	490	347	289	237	190	148

Step 4. Attach the APS Micro-inverters to the Racking



- Mark the location of the micro-inverter on the rack, with respect to the PV module junction box or any other obstructions.
- If using grounding washers to ground the micro-inverter chassis to the PV module racking, choose a grounding washer that is approved for the racking manufacturer. Install a minimum of one grounding washer per micro-inverter.
- Mount one micro-inverter at each of these locations using hardware recommended by your module racking vendor.



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

Step 5. Connect the APS Micro-inverter AC Cables



Each micro-inverter comes with a set of female and male connectors. Through female and male connectors, the micro-inverters can be connected to form one continuous AC branch circuit.

- Orient the first micro-inverter in each branch, which will be connected to junction box, with its male connector facing the junction-box. The AC cable connecting junction-box has a female connector. The micro-inverter can be mounted with either side facing up depending on cable routing. Connect AC interconnect cable to the first micro-inverter.
- Check the micro-inverter rating label for the maximum allowable number of micro-inverters on one AC branch circuit.
- Plug the AC female connector of the first micro-inverter into the male connector of the next micro-inverter, and so on, to form a continuous AC branch circuit.



WARNING: Do NOT exceed the maximum number of micro-inverters in an AC branch circuit, as displayed on the unit label. Each micro-inverter AC branch must be a dedicated branch circuit protected by a 15A maximum breaker.

Step 6. Install branch protective end cap

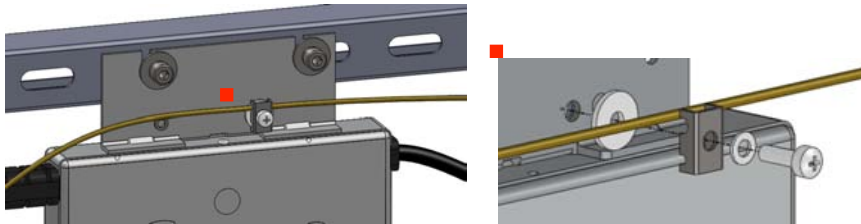


- Install a protective end cap on the open female AC connector of the last micro-inverter in the AC branch circuit.
- Make sure all unused AC connectors are covered by protective end caps.

Step 7. Ground the micro-inverters



NOTE: If you already use grounding washers to ground the micro-inverter chassis to the PV module racking as described in step 4, skip this step.

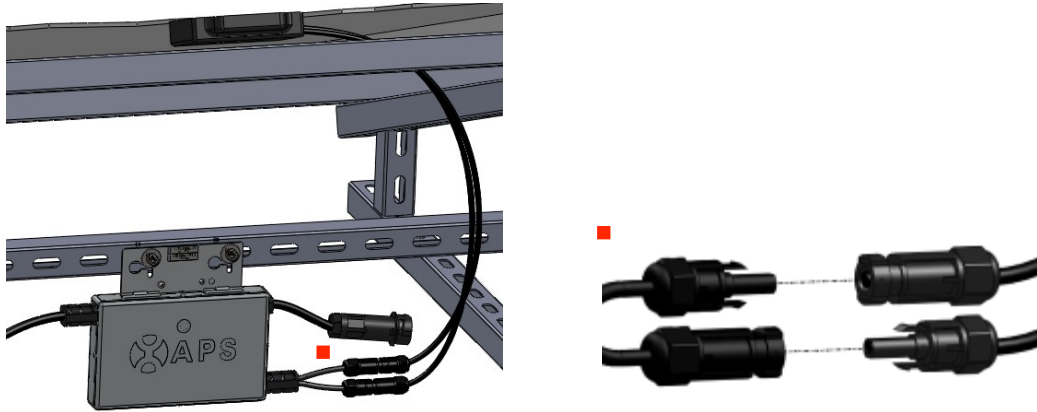


Each APS micro-inverter comes with a ground clamp that can accommodate a single 1.5mm², 6mm², or 16mm² conductor. Check your local electrical code for grounding conductor sizing requirement. Connect the grounding electrode conductor to the micro-inverter ground clamp.



NOTE: The AC output neutral is not bonded to ground inside the micro-inverter.

Step 8. Place the PV modules and connect Micro-inverter to PV Module



First connect the positively marked DC connector (female) from the PV module to the negatively marked DC connector (male) of the micro-inverter. Then connect the negatively marked DC connector (male) from the PV module to the positively marked DC connector (female) of the micro-inverter. Repeat for all PV modules using one micro-inverter for each module.

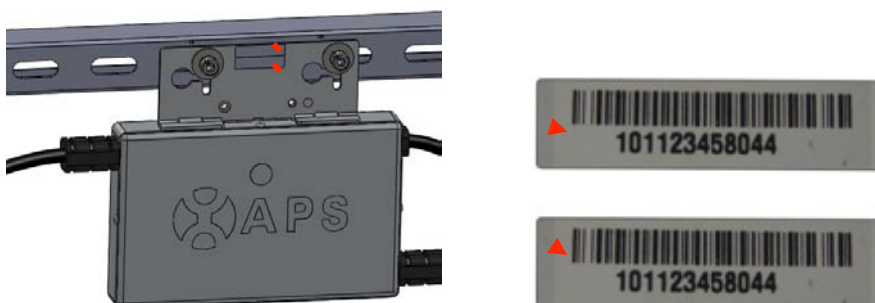


WARNING: Watch LED closely during connection

Three short GREEN blinks indicate a successful Micro-inverter startup. If LED is OFF, reconnect DC connectors to get good contact. If still OFF, DO NOT USE THIS MICRO-INVERTER.

Step 9. Complete the APS Installation Map

Each APS Micro-inverter has a removable serial number label located on the mounting plate. Peel the label off, and affix it to the respective location on the APS installation map.



The APS Installation Map is a diagram of the physical location of each micro-inverter in your PV installation. You can use the blank map in the Appendix to record micro-inverter placement for your system. When your map is complete, send it to APS as described below. APS uses this information to provide you with detailed information about the performance of your PV system and to allow you to see a graphic representation of your PV system on APS's

EMA web-based monitoring and analysis system. Feel free to provide your own layout if a larger or more intricate installation map is required.

To complete your map:

- a. Each APS Micro-inverter has a removable serial number label located on the micro-inverter. Peel the label off, and affix it to the respective location on the APS installation map, which is available in the warranty card.
- b. Send the installation map to APS after completion. See the contact information at the beginning of this manual for a fax number, email address, and mailing address.
- c. After APS creates a graphical view of your PV system on the EMA website, use the EMA website to view detailed performance information for your PV system. Please go to www.solaraps.com for more information on APS's EMA web-based monitoring and analysis system.

Step 10. Start the operation

1. Turn ON the AC circuit breaker on each Micro-inverter AC branch circuit.
2. Turn ON the main utility grid AC circuit breaker. Your system will start producing power in minutes.
3. The APS Micro-inverters will start to send performance data to the ECU. The time required for all the micro-inverters in the system to report to the ECU will vary with the number of micro-inverters in the system. You can verify proper operation of the APS Micro-inverters via the ECU. See the *ECU Installation and Operation Manual* for more information.

4. Troubleshooting

Qualified professionals 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 micro-inverter:

- Three short green blinks occur when DC power is first applied to the micro-inverter indicating the successful startup of a micro-inverter.

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 micro-inverter 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 Errors

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



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 Micro-inverter. The AC connector of the first micro-inverter 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 Micro-inverter 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 Micro-inverter

To troubleshoot a non-operating APS Micro-inverter, follow the steps below:

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



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

5. Replacing a Micro-inverter

Follow this procedure to replace a failed APS micro-inverter.

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

6. Technical Data

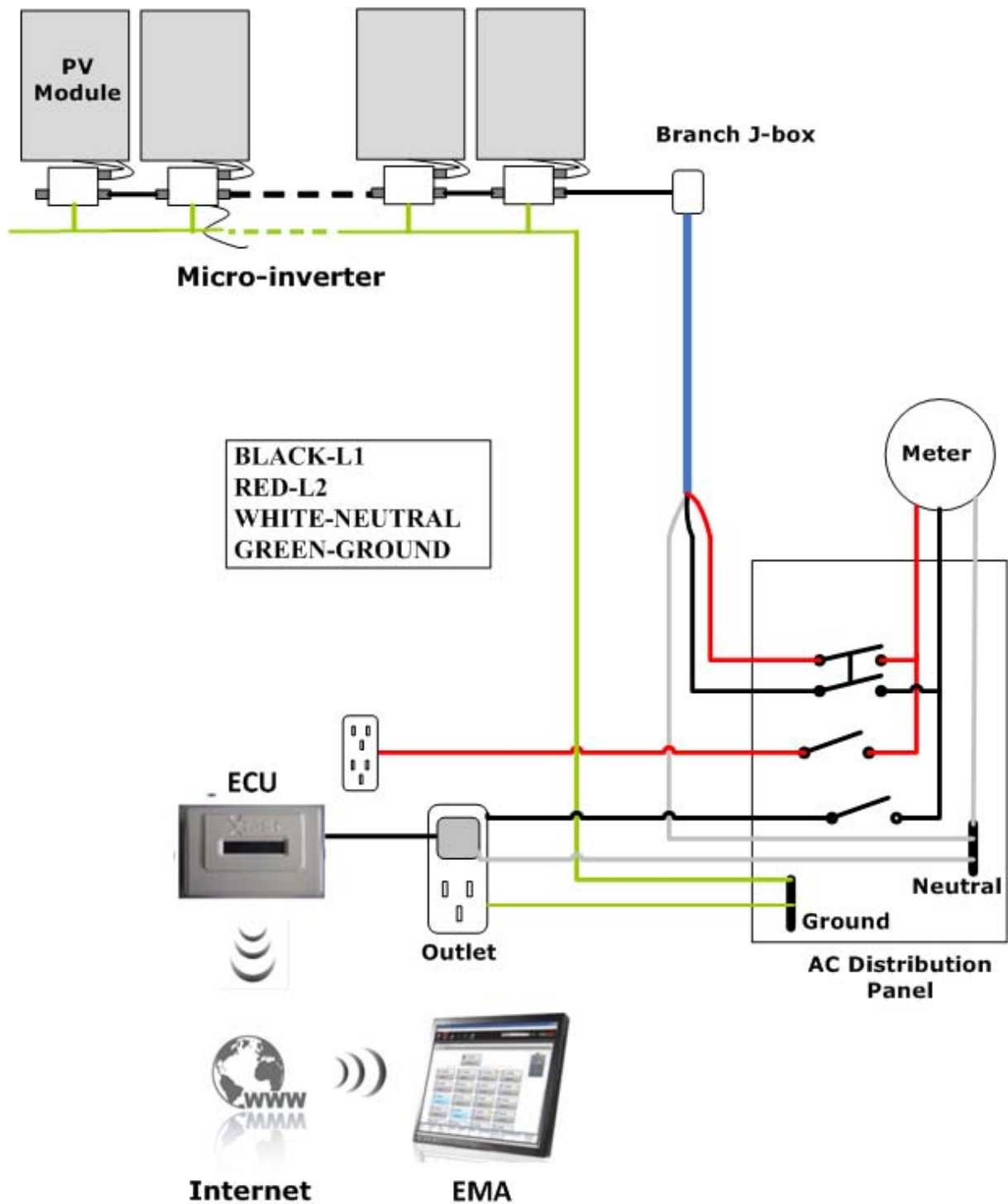


WARNING: The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the APS Micro-inverter.

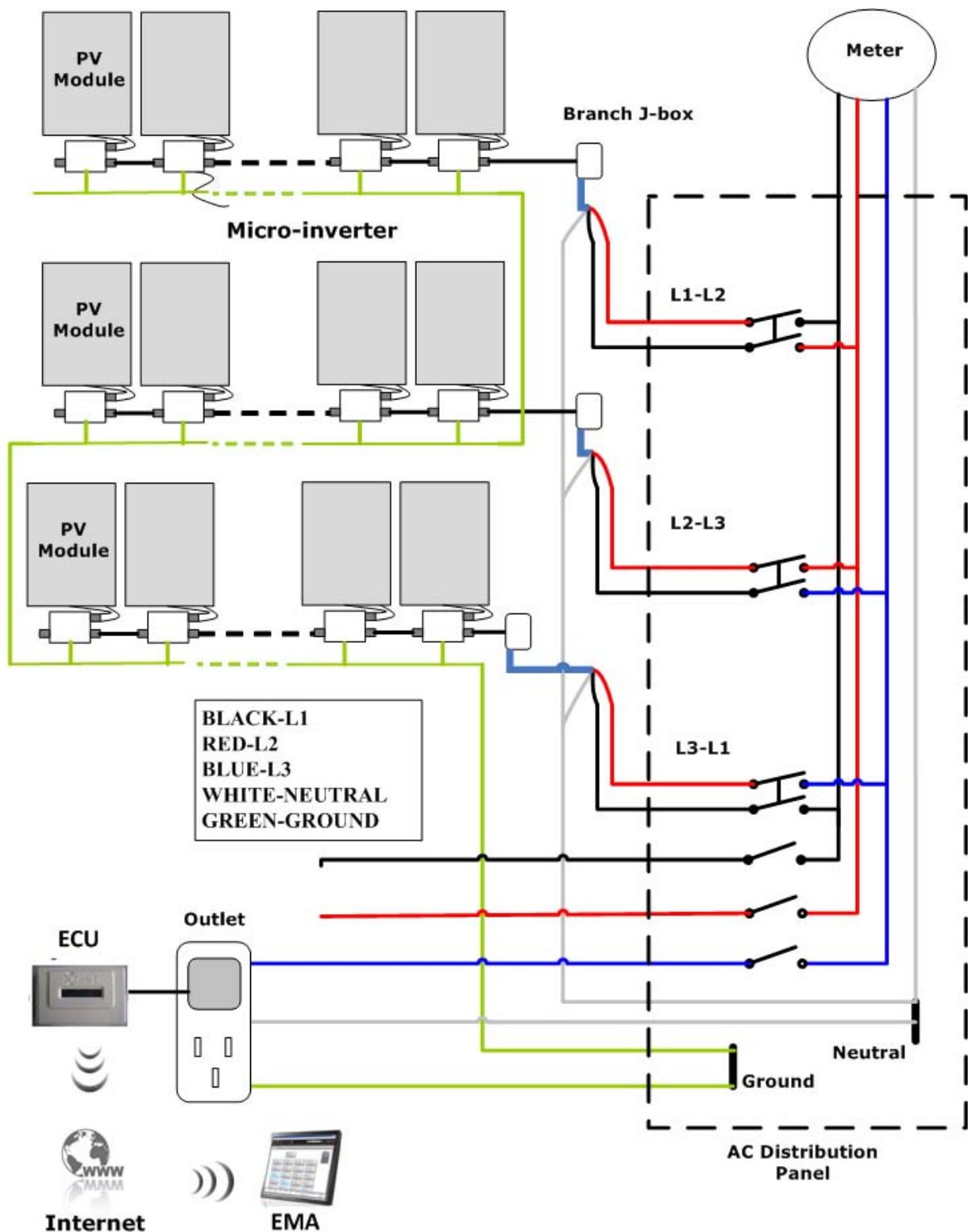
Type	YC200-NA
Input Data (DC)	
Recommended PV Module Power Range (STC)	180-280W
MPPT Voltage Range	22-45V
Maximum Input Voltage	55V
Minimum Start-up Voltage	21V
Maximum Input Current	12A
Output Data (AC)	
Maximum Output Power	220W
Maximum Output Current	1.2A
Nominal Output Voltage/Range	240V / 211V-264V ¹
Nominal Output Frequency/Range	60Hz / 59.3Hz-60.5Hz ¹
Power Factor	>0.99
Total Harmonic Distortion	<3%
Maximum Units Per Branch	15
Efficiency	
Peak Efficiency	95.0%
CEC Weighted Efficiency	94.0%
Nominal MPP Tracking Efficiency	99.0%
Night-time Power Consumption	80mW
Mechanical Data	
Operating Temperature Range (Ambient)	-40°C to +65°C
Storage Temperature Range	-40°C to +85°C
Dimensions (WxHxD)	218 mm x 137 mm x 35 mm
Weight	2.5kg
Enclosure Rating	NEMA 3R
Cooling	Natural Convection
Features & Compliance	
Communication	Powerline
Design lifetime	25 years
Emissions & Immunity (EMC) Compliance	FCC PART 15 B
Safety Class Compliance	UL 1741
Grid Connection Compliance	IEEE 1547
¹ Programmable to meet customer need.	

7. Appendix

7.1 Sample Wiring Diagram-240V Single Phase



7.2 Sample Wiring Diagram - 208V Three-Phase



Note: The ECU functions properly when connected any one of L1, L2, and L3.

7.3 Installation Map Template

	1	2	3	4	5	6	7	8	9
A									
B									
C									
D									
E									
F									
G									
H									
I									
J									
K									
L									
M									
N									
O									