



Installation / User Manual

APsystems YC1000-3 3-Phase Microinverter



ALTENERGY POWER SYSTEM Inc.
WEB: usa.APsystems.com
WEB: canada.APsystems.com

APsystems America
600 Ericksen Ave NE, Suite 200 Seattle, WA 98110
TEL: 844-666-7035 EMAIL: info.usa@APsystems.com

APsystems Canada
600 Ericksen Ave NE, Suite 200 Seattle, WA 98110
TEL: 844-666-7035 EMAIL: info.canada@APsystems.com

Tips: If you need to inquire about related technical issues, please email to the info mailbox of your area.

Please scan the QR code to get mobile app and more support to help the installation.

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Table of Contents

Important Safety Instructions.....	2
Radio interference statement.....	2
Safety Instructions.....	3
APsystems YC1000-3 System Introduction.....	4
APsystems Three-phase Microinverter YC1000-3.....	6
APsystems Microinverter System Installation.....	7
Additional Installation components from APsystems.....	7
Required Parts and Tools from you.....	7
PV Rapid Shut Down Equipment.....	8
Installation Procedures.....	9
Step 1 - Lay the AC bus according to the arrangement of APsystems Microinverter... 9	
Step 2 - Attaching the APsystems Microinverters to the Racking.....	9
Step 3 - Connecting the APsystems Microinverter Cables to the AC bus cable.....	10
Step 4 - Connecting APsystems Microinverters to the PV Module.....	11
Step 5 - Install a Bus Cable End Cap at the end of AC bus cable.....	11
Step 6 - Installing the AC Branch Circuit Junction Box.....	12
Step 7 - Completing the APsystems Installation Map.....	13
APsystems microinverter system operating instructions.....	14
Troubleshooting.....	15
Status Indications and Error Reporting.....	15
Troubleshooting a non-operating APsystems Microinverter.....	16
Technical Data.....	18
YC1000-3 3-Phase Microinverter Datasheet.....	19
Wiring Diagram.....	21
Sample Wiring Diagram - 208Y/120V Three Phase.....	21
Sample Wiring Diagram - 480Y/277V Three Phase.....	22
YC1000-3 Accessory.....	23
Wiring Diagram.....	23
Accessories Summary.....	24

Important Safety Instructions

This manual contains important instructions to follow during installation and maintenance of the APsystems Photovoltaic Grid-connected Inverter (Microinverter). To reduce the risk of electrical shock and ensure the safe installation and operation of the APsystems 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/YC1000-3-480 that must be followed during Installation and maintenance of the Photovoltaic Grid-connected Inverter.*

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

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.

NOTICE

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

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.

Safety Instructions

- ✓ **Do NOT** disconnect the PV module from the APsystems Microinverter without first disconnecting the AC power.
- ✓ Only qualified professionals should install and/or replace APsystems Microinverters.
- ✓ Perform all electrical installations in accordance with local electrical codes.
- ✓ Before installing or using the APsystems Microinverter, 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 APsystems 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** attempt to repair the APsystems Microinverter. If it fails, contact APsystems Customer Support (206-855-5100) to obtain an RMA number and start the replacement process. Damaging or opening the APsystems 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.

APsystems YC1000-3 System Introduction

The APsystems Microinverter is used in utility-interactive grid-tied applications, comprised of three key elements:

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

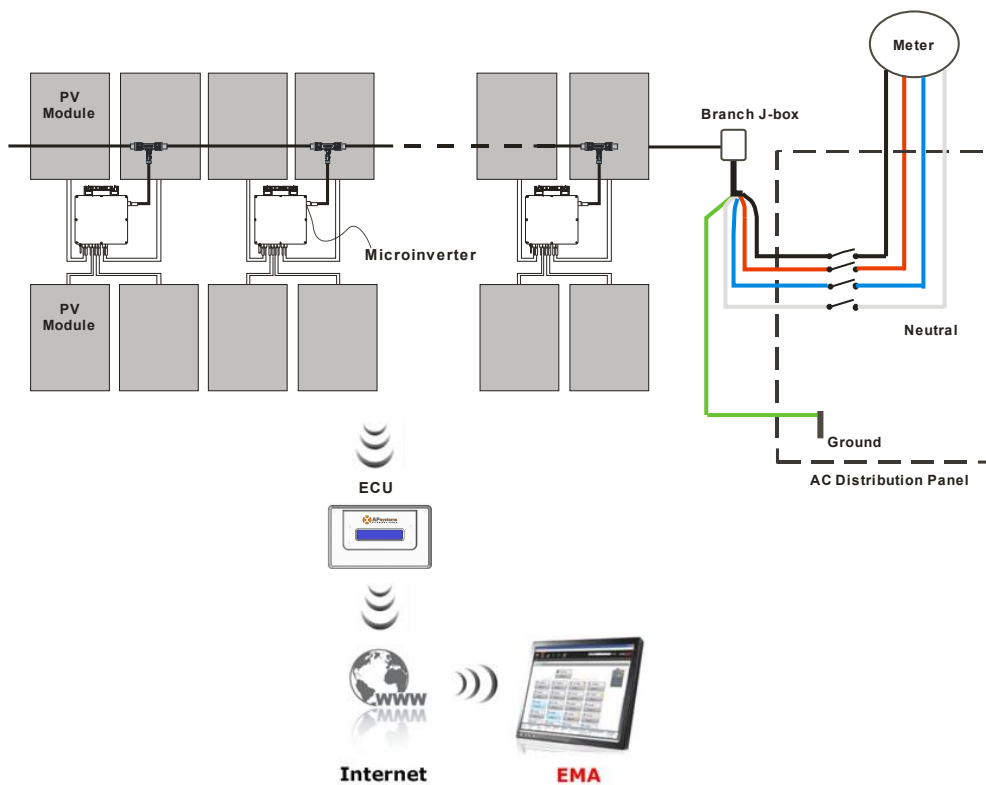


Figure 1

APsystems YC1000-3 System Introduction

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

APsystems Microinverters maximize PV energy production

The Apsystems microinverter ensures top performance from the array by maximizing the performance of the module within the array when PV modules in the array are affected by shading.

More reliable than centralized or string inverters

The distributed microinverter system ensures that no single point of system failure exists across the PV system. Apsystems microinverters are designed to operate at full power at ambient temperatures of up to +65°C (+149° F). The inverter housing is designed for outdoor installation and complies with the Type 6 environmental enclosure rating.

Simple to install

You can install individual PV modules in any combination of module quantity, orientation, different type and power rate (check on-line module compatibility or contact Apsystems).

Smart system performance monitoring and analysis

The Apsystems Energy Communication Unit (ECU) is installed by simply plugging it into any wall outlet and providing it with an Ethernet or Wi-Fi connection to a broadband router. After installing and setting the ECU (see ECU manual), the full network of Apsystems Microinverters automatically reports to the Apsystems 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. Reference the ECU Manual for installation and operation instructions.

APsystems Three-phase Microinverter YC1000-3

The APsystems YC1000-3 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 Technical Data page (p.16) of this manual.

Model Number	AC grid	PV Module	Module Connector
YC1000-3-208	208Y/120V	60,72,84,96 Cell	MC-4 Compatible or Customize
YC1000-3-480	480Y/277V	60,72,84,96 Cell	MC-4 Compatible or Customize

APsystems Microinverter System Installation

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

Special Statement! *An AC GFCI device **should not** be used to protect the dedicated circuit to the Apsystems 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

- ① Perform all electrical installations in accordance with local electrical codes.
- ② Be aware that only qualified professionals should install and/or replace Apsystems Microinverters.
- ③ Before installing or using an Apsystems Microinverter, please read all instructions and warnings in the technical documents and on the Apsystems Microinverter 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.

NOTICE

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

Additional Installation components from Apsystems

- Bus Cable End Cap (sold separately)
- Bus Cable T-CONN Cap (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

NOTICE

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).

PV Rapid Shut Down Equipment

This product is PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12, for AC and DC conductors, when installed according to the following requirements:

- Microinverters and all DC connections must be installed inside the array boundary.
- The array boundary is defined as 305 mm (1 ft.) from the array in all directions, or 1 m (3 ft.) from the point of entry inside a building.

This rapid shutdown system must be provided with an initiating device and (or with) status indicator which must be installed in a location accessible to first responders, or be connected to an automatic system which initiates rapid shutdown upon the activation of a system disconnect or activation of another type of emergency system.

The initiator shall be listed and identified as a disconnecting means that plainly indicates whether it is in the “off” or “on” position. Examples are:

- Service disconnecting means
- PV system disconnecting means
- Readily accessible switch or circuit breaker

The handle position of a switch or circuit breaker is suitable for use as an indicator. Refer to NEC for more information.

Additionally, in a prominent location near the initiator device, a placard or label must be provided with a permanent marking including the following wording:

'PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN' The term 'PHOTOVOLTAIC' may be replaced with 'PV.'

The label requires reference NEC 690.65 to meet the audit requirements.

Installation Procedures

APsystems Microinverters are designed to only operate when they can sense power coming from the grid. Even if they are plugged into the solar array, they will not turn themselves on until they can read power from the grid.

WARNING

Do NOT connect APsystems 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 APsystems Microinverter.

Step 2 - Attaching the APsystems Microinverters to the Racking.

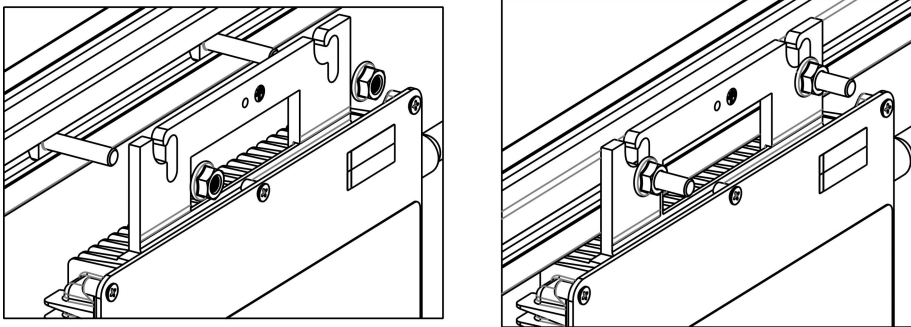


Figure 2

- Mark the location of the Microinverter on the rack, with respect to the PV module junction box or any other obstructions.
- 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 place the inverters (including DC and AC connectors) Where exposed to the sun, rain or snow, even gap between modules. Allow a minimum of 3/4”(1.5cm.) between the roof and the bottom of the Microinverter to allow proper air flow.

Installation Procedures

Step 3 - Connecting the APsystems Microinverter Cables to the AC bus cable.

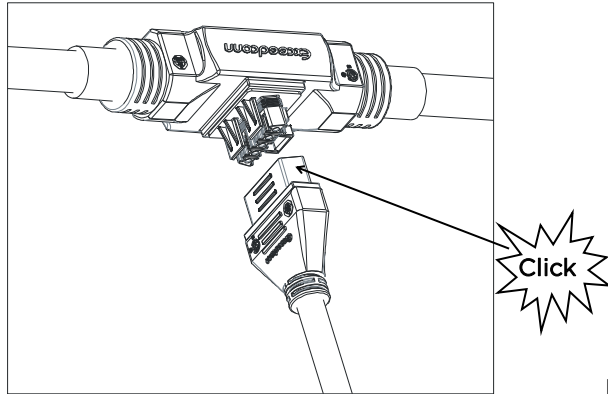
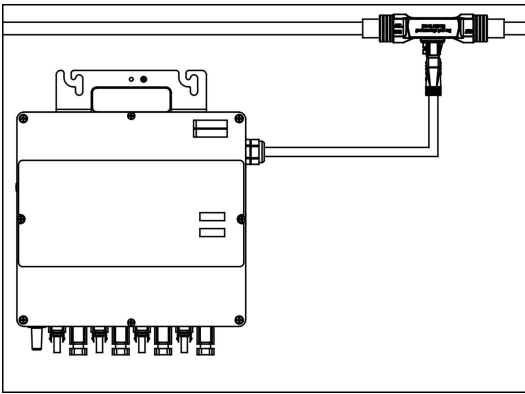


Figure 3

Cover all unused T connectors with Bus Cable T-CONN Cap to protect the T connectors.

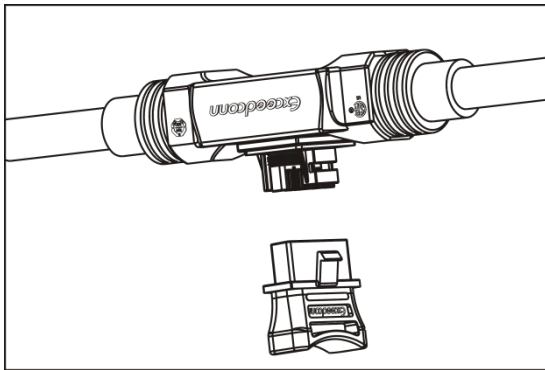


Figure 4

AC connector interface as follows, from left to right PE, N, L3, L2, L1.

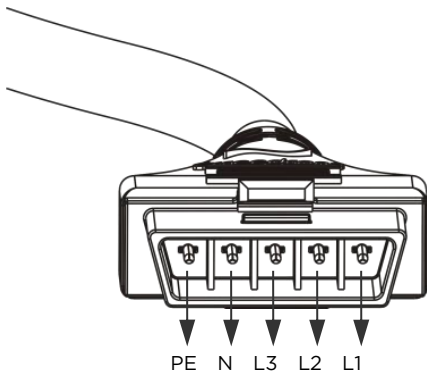


Figure 5

Installation Procedures

Step 4 - Connecting APsystems Microinverters to the PV Module.

Place the PV modules into position on the racking and connect the DC input cables to the microinverters based on optimum layout configuration (up to four PV modules per microinverter).

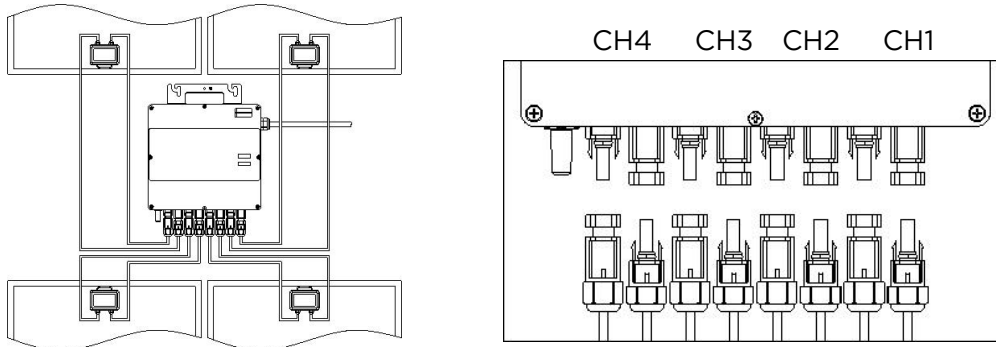


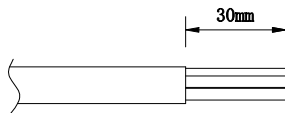
Figure 6

NOTICE

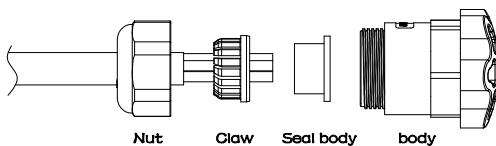
The status LED for on each microinverter will blink green three (3) times to indicate normal operation once DC power is applied. It is important to understand that this “start up” sequence occurs once the first module is connected to the microinvert and is successfully generating DC power. The “start up” sequence does NOT reoccur as additional modules are connected to the same microinverter.

Step 5 - Install a Bus Cable End Cap at the end of AC bus cable.

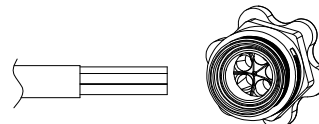
a. Wire stripping



b. Set the parts on the cable.



c. Insert five wires into the core wires hole of the body.



d. Insert seal and Clamp Finger into the body ,then tighten the nut, torque $2.5 \pm 0.5 \text{NM}$.

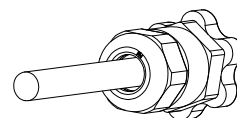


Figure 7

Installation Procedures

Step 6 - Installing the AC Branch Circuit Junction Box.

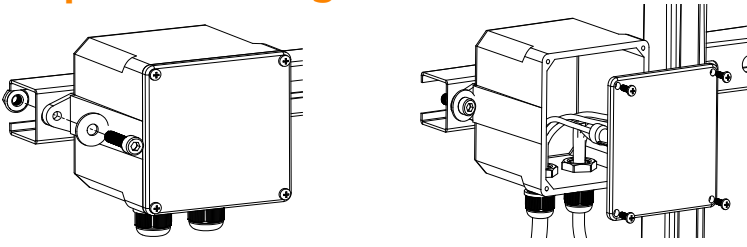


Figure 8

- 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 of the AC bus: L1- BLACK; L2 - RED; L3 - BLUE; N - WHITE; PE - GREEN.**
- d. Connect the AC branch circuit junction box to the point of utility Interconnection.



NOTICE

The neutral line from the inverter is NOT allowed to be floating, MUST be connected to grid.



WARNING

Wiring colour code can be different according local regulation, check all the wires of the installation before connecting to the AC bus to be sure they match. Wrong cabling can damage irreparably the microinverters, such an issue is not covered by the warranty.



WARNING

Double check to make sure all of the AC and DC wiring has been correctly installed. Ensure that none of the AC and/or DC wires are pinched or damaged. Make sure that all of the junction boxes are properly closed.

Installation Procedures

Step 7 - Completing the APsystems Installation Map

Fill in the APsystems Warranty 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.

- a. Each APsystems microinverter has removable serial number labels. Peel labels off, and affix one to the respective location on the APsystems 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 APsystems website: www.APsystems.com
- b. Fill out the warranty cards and email to APsystems at support@APsystems.com.
- c. Register the system using your Installer Account on the APsystems EMA. You can then use the EMA website to view detailed performance of the PV system.

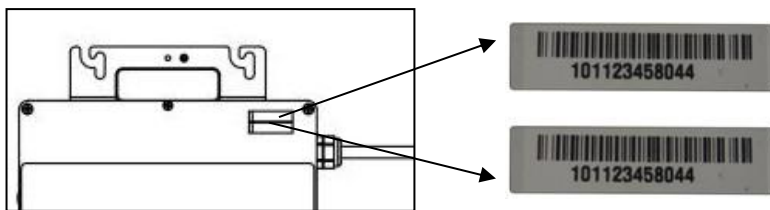


Figure 9



NOTICE

1. Step 1~7 can change sequence for convenience of installation.
2. Installation card is located in Appendix last page of this manual.

To operate the APsystems 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 safety delay period.
3. The APsystems microinverters will start to send performance data over 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 APsystems microinverters via the ECU. See the ECU Installation and Operation Manual for more information.

Troubleshooting

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

Status Indications and Error Reporting

Start up LED

Three (3) short green blinks, when DC power is first applied to the microinverter, indicates a successful microinverter start up. It is important to understand that this “start up” sequence occurs once the first module is connected to the microinvert and is successfully generating DC power. The “start up” sequence does NOT reoccur as additional modules are connected to the same microinverter.

Operation LED

Flashing Slow Green (10 sec. gap) - Producing power and communicating with ECU

Flashing Fast Green (2 sec. gap) - Producing power and not communicating with ECU over 60 minutes

Flashing Red - Not producing power

Steady Red - Electrode assembly ground fault protection

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

Only qualified personnel should directly handle the APsystems Microinverter.

WARNING

- ①. Never disconnect the DC wire connectors under load. Ensure that no current is flowing in the DC wires prior to disconnecting.
- ②. Always disconnect AC power before disconnecting the PV module wires from the APsystems Microinverter.
- ③. The APsystems Microinverter is powered by DC current of the PV module. AFTER reconnecting DC, please check that the LED behaves as in 6.1.1 above.

Troubleshooting a non-operating APsystems Microinverter

To troubleshoot a non-operating APsystems Microinverter, Follow the steps below in order:

1. Verify the utility voltage and frequency are within ranges shown in the Technical Data section 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 Technical Data of this manual.
7. If the problem persists, please call APsystems Technical Support.

WARNING

Do not attempt to repair the APsystems microinverter. If troubleshooting methods fail, please call APsystems Customer Support.

Replace a microinverter

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

Follow the procedure to replace a failed APsystems Microinverter.

- A. Remove the APsystems microinverter from the PV Module, in the following order:
 1. Disconnect the AC by turning off 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.

- B. Remove the opaque cover, install a replacement Microinverter to the rack. Remember to observe the flashing LED light as soon as the new Microinverter is plugged into the DC cables.

- C. Connect the AC cable of the replacement Microinverter.

- D. Close the branch circuit breaker, and verify operation of the replacement Microinverter.

WARNING

- ①. Be sure to verify the voltage and current specifications of your PV module. It should match with those of the Microinverter. Please refer to the datasheet or usermanual which can be download from APsystems website www.APsystems.com.
- ②. You must match the DC operating voltage range of the PV module with the allowable input voltage range of the APsystems Microinverter.
- ③. The maximum open circuit voltage of the PV module must not exceed the specified maximum input voltage of the APsystems.

YC1000-3 3-Phase Microinverter Datasheet

Region

USA Canada

Input Data (DC)

MPPT Voltage Range	16V-55V
Operation Voltage Range	16V-55V
Maximum Input Voltage	60V
Startup Voltage	22V
Maximum Input Current	14.8A x 4

Output Data (AC)

	208Y/120V	480Y/277V
3-Phase Grid Type	208Y/120V	480Y/277V
Rated Output Power	900W	900W
Maximum Output Power	1130W	1130W
Maximum Output Current	3.14Ax3	1.35Ax3
Nominal Output Voltage/Range	120Vx3/105.6V-132V*	277Vx3/243.8V-304.7V*
Adjustable Output Voltage Range	82V-152V	190V-350V
Nominal Output Frequency/Range	60Hz/59.3Hz-60.5Hz*	60Hz/59.3Hz-60.5Hz*
Adjustable Output Frequency Range	55.1Hz-64.9Hz	55.1Hz-64.9Hz
Maximum output fault current (ac) and duration	124.23 Apk, 12.10ms of duration, 4.97 Arms, over 3 cycles	6.57 Apk, 40 ms of duration, 1.32 Arms, over 3 cycles
Power Factor	>0.99	>0.99
Total Harmonic Distortion	<3%	<3%
Maximum Units per Branch	3units per 15AX3 AC breaker**	8units per 15AX3 AC breaker**

Efficiency

Peak efficiency	95.5%
CEC Weighted efficiency	95%
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	+/- 2VL-N
	Frequency	+/- 0.05 Hz
	Alternate Trip Time	See NOTE 1 below

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 (W x H x D)	259mm X 242mm X 36mm (10.2" X 9.5" X 1.4")
AC Bus Maximum Current	15A (14AWG)
Weight	3.5kg/7.7lbs
Enclosure rating	Type 6
Cooling	Natural Convection - No Fans

Features

Communication	Wireless
Transformer Design	High Frequency Transformers, Galvanically Isolated
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.
Safety And EMC Compliance	UL1741; CSA C22.2 No.107.1; FCC Part15; ICES-003
Grid Connection Compliance	IEEE1547

Note 1

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	$< 0.50 V_{nor}$	Rated	80ms
B	$0.50 V_{nor} \leq V < 0.88 V_{nor}$	Rated	200ms
C	$1.10 V_{nor} < V < 1.20 V_{nor}$	Rated	200ms
D	$1.20 V_{nor} \leq V$	Rated	80ms
E	Rated	$f > 60.5$	160ms
F	Rated	$f < 59.3$	160ms

*Programmable through ECU in field to meet customer need.

**Depending on the local regulations.

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

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Wiring Diagram

Sample Wiring Diagram - 208Y/120V Three Phase

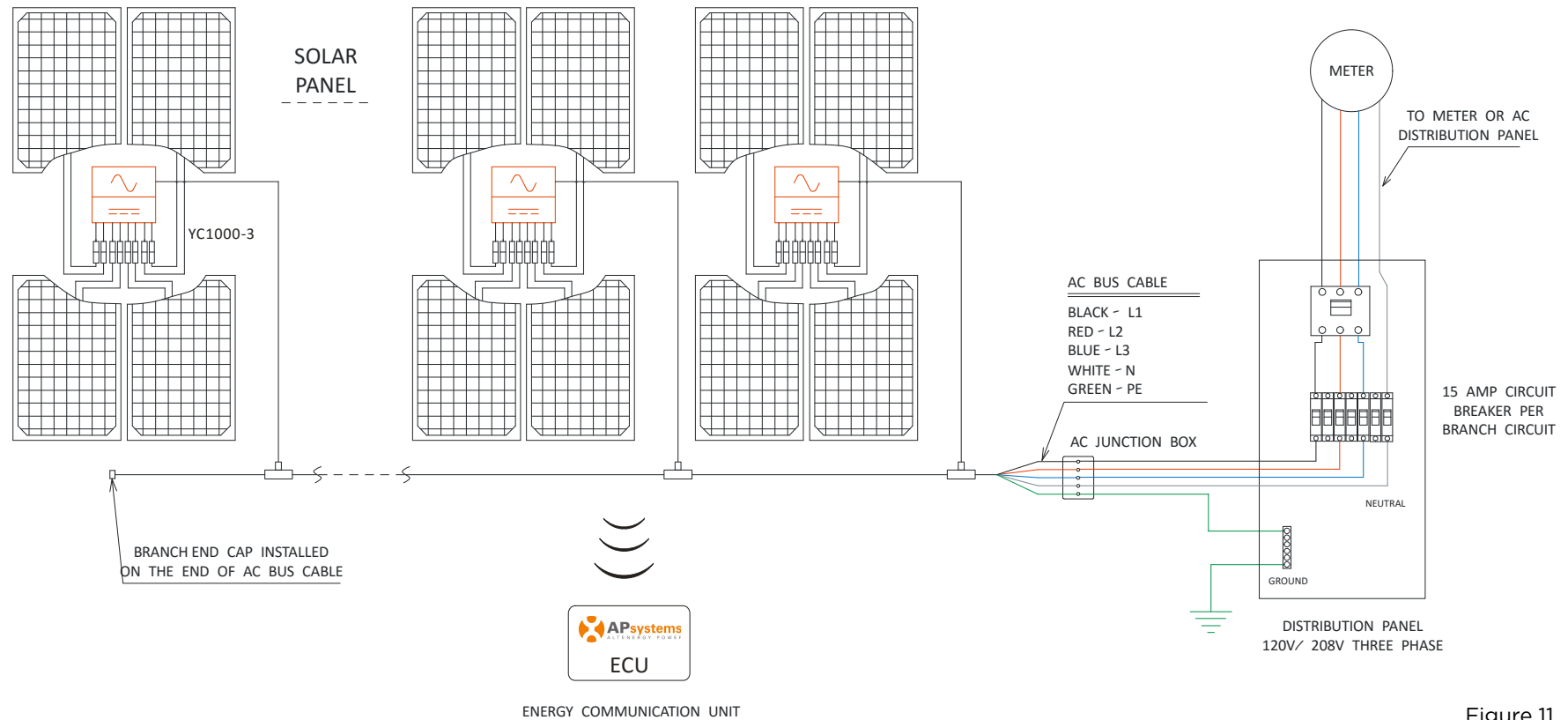


Figure 11

Wiring Diagram

Sample Wiring Diagram - 480Y/277V Three Phase

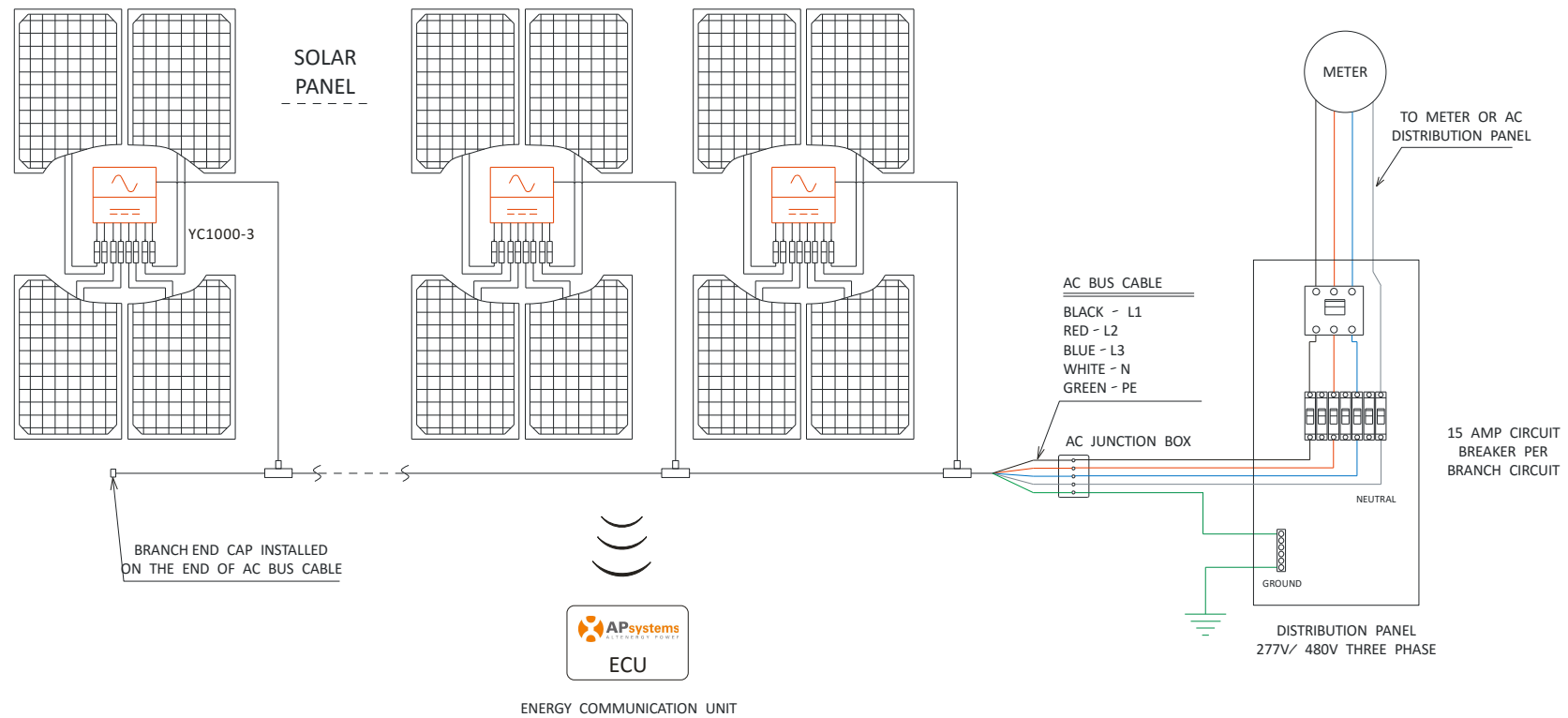
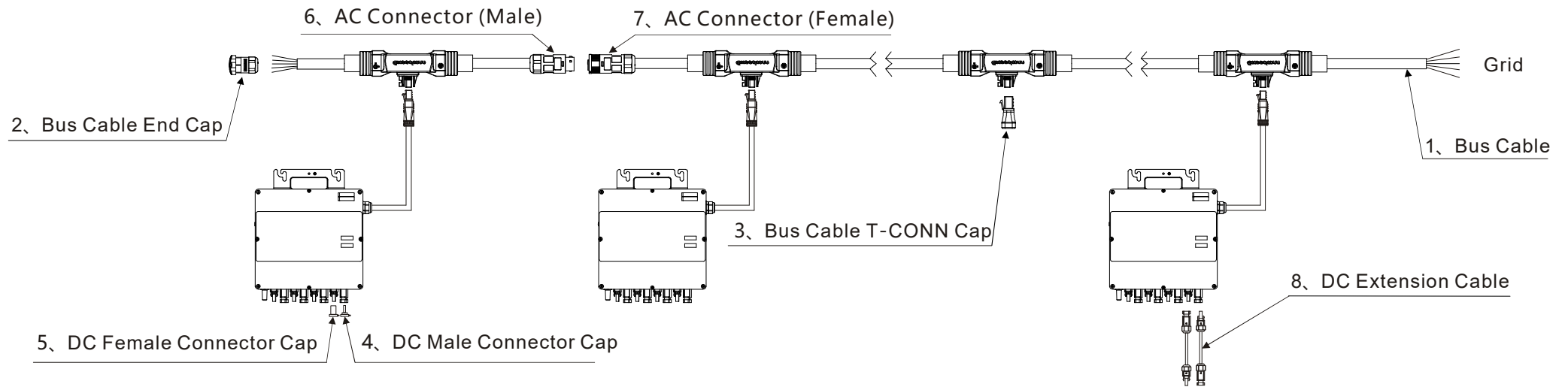


Figure 12

YC1000-3 Accessory

Wiring Diagram



Accessories Summary

	Category	Part NO.	Name	Pic
1	Bus Cable (Mandatory)	2322302552	5-wire Bus Cable(14AWG,TC-ER,2m, BK-RD-BU-WT-GN)	
		2322402552	5-wire Bus Cable(14AWG, TC-ER,4m, BK-RD-BU-WT-GN)	
2	Bus Cable End Cap (Mandatory)	2062050005	5-wire Bus Cable End Cap	
3	Bus Cable T-CONN Cap (Optional)	2061252032	5-wire Bus Cable T-CONN Cap	
4	DC Male Connector Cap (Optional)	2060401006	DC Male Connector Cap (MC4)	
5	DC Female Connector Cap (Optional)	2060402006	DC Female Connector Cap (MC4)	
6	AC Connector (Male) (Optional)	2300711032	25A AC Male Connector (EN,5-wire)	
7	AC Connector (Female) (Optional)	2300812032	25A AC Female Connector (EN,5-wire)	
8	DC Extension Cable (Optional)	2310310274	1m DC Extension Cable (MC4)	
		2310360214	2m DC Extension Cable (MC4)	

APsystems Microinverter & Energy Communication Unit Installation Card

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