INSTALLATION MANUAL

Q.HOME COMBINER

Q.HOME COMBINER 80 G1

qcells

Table of Contents

1 Safety

IMPORTANT SAFETY INSTRUCTIONS. SAVE THESE INSTRUCTIONS: This manual contains important instructions for Q.HOME COMBINER that shall be followed during installation and maintenance.

IMPORTANT: This product should not be used for any purpose other than the purpose described in this installation manual.

1.1 Intended Use

Q.HOME COMBINER is designed for residential use only and should not be used for commercial or industrial use.

Q.HOME COMBINER performs the following tasks for the AC modules connected to the input/output terminals installed inside the device:

- Collects/distributes AC current generated from the AC modules
- Monitors the power generation of individual AC modules and provides information.

This device should not be used for any purpose other than the ones described in this installation manual. Any substitute use of this device, random change in any of its parts and use of components other than sold or recommended by Qcells will nullify the product's warranty.

For example, Qcells' gateway may not be replaced by other manufacturer's gateway. For further information on proper use of this device, contact the Qcells Customer Support Team.

1.2 Safety Precautions

The following safety precautions and the warning messages described in this section must be observed. If any of the following precautions are not fully understood or if you have any questions, contact the Qcells Customer Support Team for guidance.

WARNING

- These servicing instructions are for use by qualified personnel only.
- Electrical installations must be done in accordance with local standards, national electrical safety standards and the manufacturer's instructions.
- To reduce the risk of electric shock, do not perform any servicing other than that specified in the operating instructions unless you are qualified to do so.
- Install the product at a height that prevents water ingress in areas where flooding is possible. Do not put the product or components in water or liquid.
- Do not touch the terminals when powered and wait a few minutes after switching off the breaker. It may be energized in the open position.
- Do not touch uninsulated part of the wires when the product cover is removed.
- To reduce the risk of accidents, install the Q.HOME COMBINER in mild weather. Electric shock hazard exists if installed in rainy or snowy weather.
- Do not work alone. Someone should be in the range of your voice or close enough to come to your aid when you work with or near electrical equipment.
- To reduce the risk of fire, do not allow or place flammable, sparking or explosive items near the product.
- This unit is not provided with a GFDI device. This inverter or charge controller must be used with an external GFDI device as required by the Article 690 of the National Electrical Code for the installation location.
- A potentially hazardous circumstance such as excessive heat or electrolyte mist may occur due to improper operating conditions, damage, misuse and/or abuse.
- Do not sit on, step on or place heavy objects on this product. It may cause deformation or fracture.
- Disconnect all wiring before attempting maintenance or cleaning and always disconnect the AC branch circuit before servicing.
- Never disconnect a current carrying conductor while the circuit is energized.
- Do not wire unused terminals or terminal block to the GEM Board (Gateway) or EMS.
- Check all wiring again before powering on.
- Wear rubber gloves and protective clothing (including protective glasses and boots) when working on the Q.HOME COMBINER.
- Waste, electrical components, bolts, nuts, conductors or other debris must be removed after installation.
- Do not use any damaged, cracked or grayed electrical cables or connectors. Protect the electrical cables from physical or mechanical abuse, such as being twisted, kinked, pinched, closed in a door or stepped on. Periodically examine the electrical cables of your product. If the appearance indicates damage or deterioration, discontinue use of this product and have the cables replaced with an exact replacement part by qualified personnel.
- Do not use any kind of oil or lubricant on the parts inside the product.
- All circuit breakers in the Q.HOME COMBINER should be in the off position. Make sure the AC power source to the combiner is disconnected prior to connecting the main cables.

CAUTION

- Use proper equipment, connectors, wires and buttresses for the installation of the Q.HOME COMBINER.
- You must install the product only on a suitable wall using the provided wall-mount bracket.
- Before installing or using the product, read all instructions and cautionary markings in this guide and on the equipment.
- Do not install or use the product if it has been damaged in any way.
- Do not drop the product. It must be gently handled and placed down with care.
- Make sure that there are no water sources, such as faucets or sprinklers, near the installation site.
- Do not scratch the surface of the internal component (ex. busbar, GEM Board (Gateway), EMS). It may increase chance of corrosion.
- Adding unnecessary holes may reduce the strength and integrity of the product.
- Store the product in its original package until installation.
- Use the circuit breakers in the product only for serving Qcells equipment. No other loads are allowed.
- Bonding between conduit connections is not automatic and must be provided as part of the installation.

FCC Guideline

You are cautioned that changes or modifications to this unit not expressly approved by Qcells could void the warranty.

FCC Statement This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

1.3 Product Safety Labels

The following symbols appear on the product label and are described here.

Wear eye protection at all times (installation, maintenance, etc.)

Follow the instructions in this manual for service and replacement.

Risk of electric shock

CAUTION: Hot Surface

This product should not be disposed of with other household waste.
Local and national electronic waste disposal regulations should be observed.

CAUTION, risk of DANGER

UL Certified

1.4 Circuit Symbols

Alternating Current Supply

Equipment Grounding Conductor

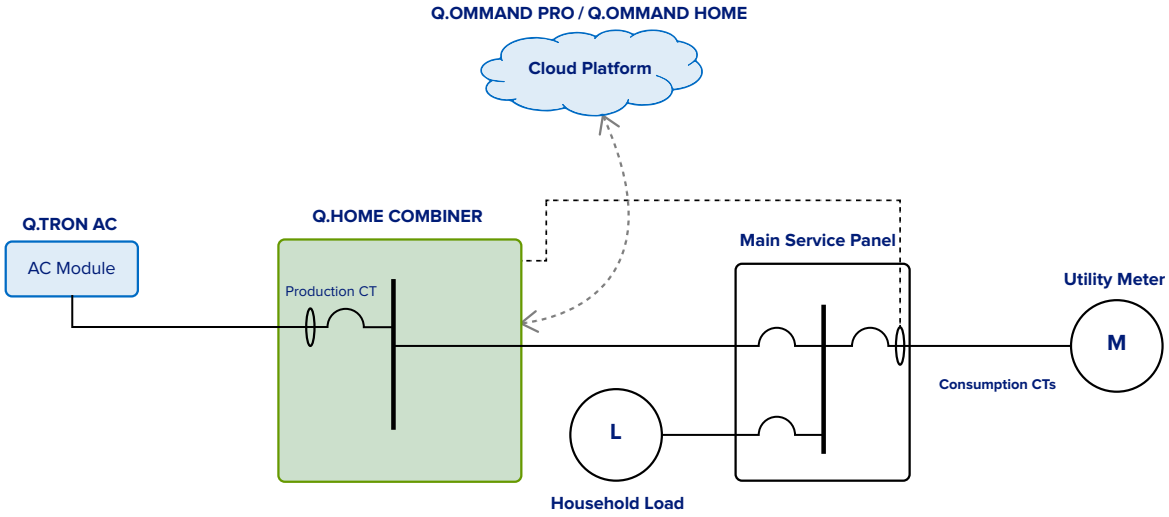
1.5 Disposal

When the product reaches the end of its service life or is defected beyond repair, dispose of it according to your local area's electronic waste regulations. Product disposal must be carried out by qualified personnel only. Contact your authorized dealer or seller for details on handling disposal.

- All electrical products should be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or the local authorities.
- The correct disposal of your old appliance will help prevent potential negative consequences to the environment and human health.
- For more detailed information about disposal of your old appliance, please contact your city office, waste disposal service or the shop where you purchased the product.

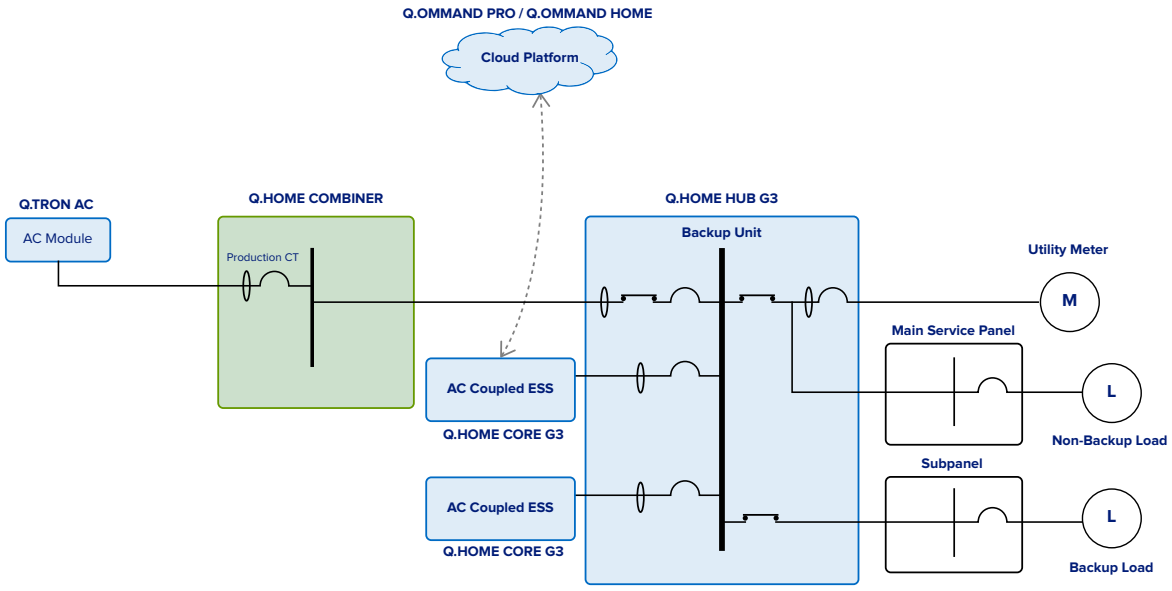
2 System Configuration

2.1 Solar Configuration



The Solar Configuration is comprised of an AC module (microinverter integrated solar module) and combiner, which consolidates solar modules into a single output. This configuration is ideal for the homeowner wishing to minimize their utility bill and carbon footprint without having a backup power source. Installers can easily upgrade the system in the future by adding energy storage.

2.2 Backup Configuration



The Backup Configuration is comprised of an AC module (microinverter integrated solar module), AC combiner, battery system and the backup unit (HUB). This configuration is ideal for the homeowner who wants complete energy independence. It is also the most powerful configuration option available, and ensures that a home can remain powered even when the utility grid shuts down. With care regarding energy utilization, and depending on the size of the solar and battery installed, a backed up home can remain powered during grid outages for several days, or even weeks.

3 Information in this Manual

3.1 About this Manual

This is the installation manual for Q.HOME COMBINER. Please read this manual carefully before installing and operating Q.HOME COMBINER. It contains important safety instructions, and the warranty will be void if you do not follow instructions in this manual precisely. All installations must comply with national and local electrical codes and standards. Only qualified electricians may install, troubleshoot or replace the product.

3.2 Target Group

This manual is written for electricians and qualified technicians who are allowed to install and connect electrical systems.

3.3 Symbols Used in this Manual

To reduce the risk of electric shock and to ensure a safe installation and operation of the Q.HOME COMBINER, the following safety symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

 **WARNING**	This indicates a hazardous situation, which if not avoided, will result in death or serious injury.
 **CAUTION**	This indicates a situation where failure to follow instructions may be a safety hazard or cause equipment malfunction. Use extreme caution and follow instructions carefully.
	Prohibited.
Note	This indicates information particularly important for optimal system operation. Follow instructions carefully.

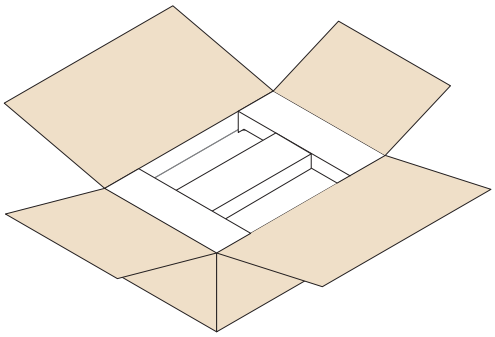
4 Product Overview

4.1 Unpacking

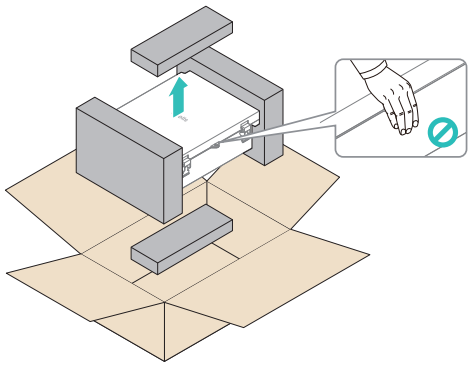
CAUTION

- When removing the product, do not apply excessive force so as to avoid damage.
- Using sharp tools may damage the product.
- Wear protective gloves to avoid injury.

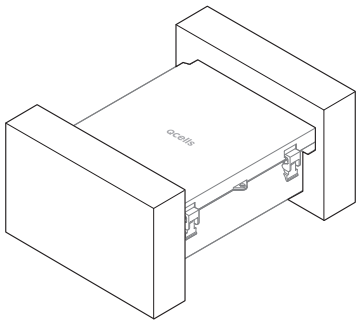
1 Open the box and check for internal damage.

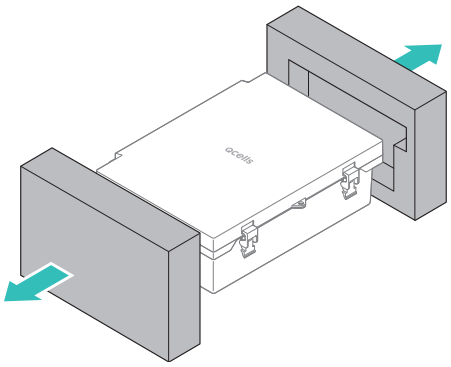


2 Remove the shock absorbing packaging foam on the Q.HOME COMBINER and carefully take the product out of the box.



3 Carefully remove the foam on the left and right sides.



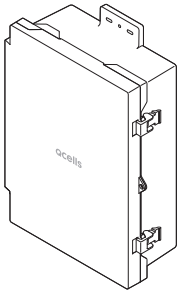


4.2 Package Contents

Check for any damage that may have occurred during transportation. If there is any damage to the product or packaging, please contact your supplier immediately.

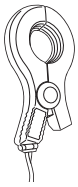
CAUTION

Do not operate with other components not approved by Qcells. Connecting with products outside the Qcells ecosystem may result in abnormal operation.

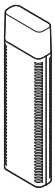


Q.HOME COMBINER 80 G1: 1EA

Quick Start Guide: 1EA

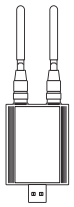


Clamp CT: 2EA
(CT-JS-CLAMP-200A-5.2m)

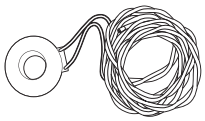


Wi-Fi Dongle: 1EA
(WIFI-HQ-GD-USB)

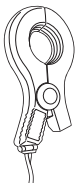
Optional Accessories



Cellular Modem
(CELLULAR-MT-MODEM-CAT4-TN5)



External Production CT
(CT-HQ-SOLID-200A-2m)



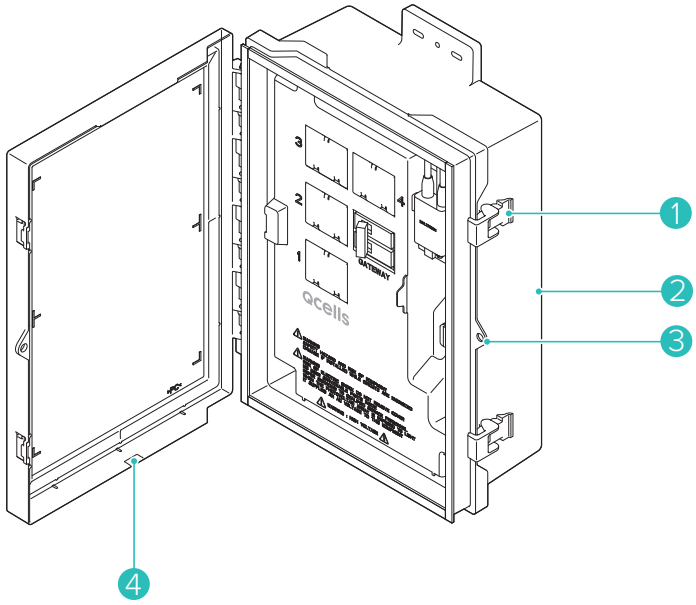
Extension Clamp CT (pair)
(CT-JS-CLAMP-200A-25m)

5-year data plan extension for customers previously using celluar option
(CELLULAR-TN-DP-5Y)

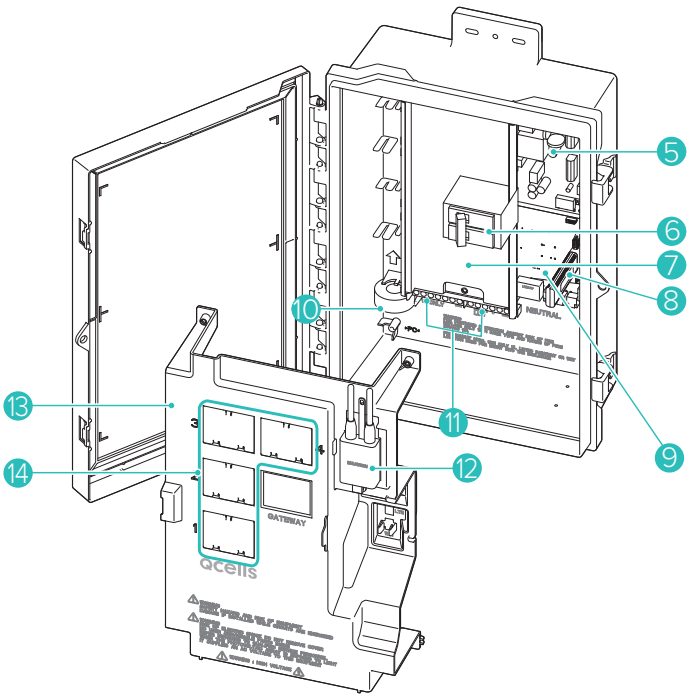
The items in the below table are not provided by Qcells, but can be easily purchased elsewhere.

Off-the-Shelf Items	Manufacturer	Model	Specification	Details
Circuit Breakers (OCPD)	Eaton	2-pole BR series	BR210 ~ BR260	Select the appropriate circuit breaker size based on the rating of the PV/ESS branch.

4.3 Q.HOME COMBINER Overview



1 Door Clasp
2 Enclosure
3 Padlock Staple
4 Front Cover



5 GEM Board (Gateway)
6 Circuit Breaker
7 Main Busbar
8 Wi-Fi Dongle
9 EMS Board
10 Production CT
11 GND / Neutral Bar
12 Cellular Modem (optional accessory)
13 Deadfront
14 Breaker Position Cover

4.4 Specifications

Technical Specifications

For additional information, see the relevant datasheet provided at www.qcells.com/us

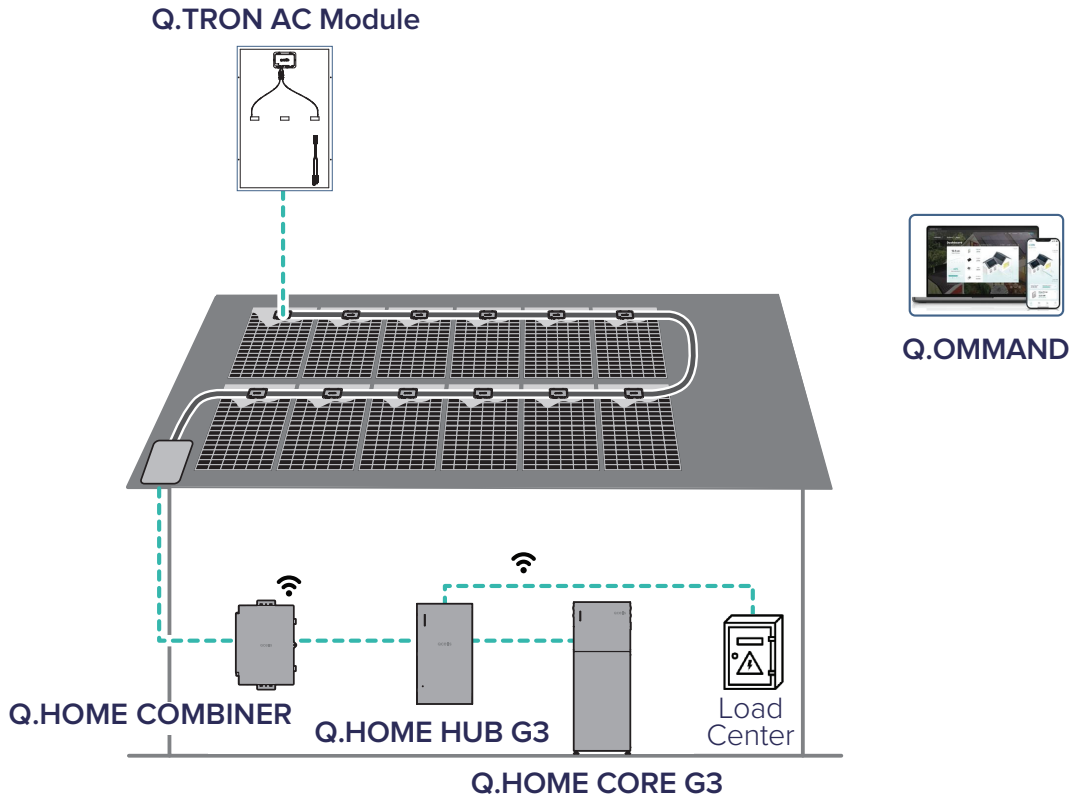
General Product Information	
Model	Q.HOME COMBINER 80 G1
Manufacturer	Hanwha Solutions Corporation
Product Warranty	5 years
Country of Manufacture	Vietnam
Accessories And Replacement Parts	
Supported AC Modules (Microinverter included)	Q.TRON BLK M-G2+/AC, +Q.TRON BLK M-G2.H1+/AC
LTE MODEM (CELLULAR-MT-MODEM-CAT4-TN5)	4G based LTE-CAT4 (+5year data plan)
Wi-Fi Dongle (WIFI-HQ-DG-USB)	FCC Part 15 Subpart C/2412.0 - 2462.0 MHz **
Circuit Breakers	Supports Eaton BR210, BR215*, BR220, BR230, BR240, BR250, and BR260 circ uit breakers
Consumption Monitoring CT (CT-JS-CLAMP-200A-5.2m)	A pair of 200 A clamp type current transformers **
	* pre-assembled/** included in the package (Others are not included, need to be ordered separately)

Electrical Specifications	Unit	
System Voltage	[V]	120/240 VAC, 60 Hz
Eaton BR Series Busbar Rating	[A]	125
Max. Continuous Current Rating (input from PV/storage)	[A]	64
Branch Circuits (Solar or Solar + Storage)	[pcs]	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. Total Branch Circuit Breaker Rating (input)	[A]	80 A of distributed generation/95 A with GEM Board (Gateway) breaker included
Gateway Circuit Breaker	[A]	15 A rating Eaton BR215 included
Consumption Monitoring	[A]	Revenue Grade Metering with a pair of 200 A split core current transformers (accuracy ±2.0 %)
Production Metering	[A]	Metering with 200 A solid core current transformer pre-wired to GEM Board (accuracy ±0.5%)
Over Voltage Class		IV

Mechanical Data	Unit	
Max. AC Module Connection Quantity	[pcs]	▪ Up to 44 AC Modules in 1 combiner (11 in series × 4 strings) ▪ Up to 144 AC Modules using 1 combiner with external subpanel
Dimensions (W × H × D)	[inch]	14.6 × 19.3 × 6.3 / height is 21.7 with mounting brackets (37.0 × 49.0 × 16.0 cm / height is 55.1 cm with mounting brackets)
Weight (without connection cables)	[lb]	11.5 (5.2 kg)
Operating Temperature Range	[°F]	−40 to 140 (−40 to 60 °C)
Storage Temperature Range	[°F]	−4 to 130 (−20 to 45 °C)
Enclosure Enironmental Rating		Outdoor, NRTL-certified, NEMA type 3R
Wire Sizes		- 20 A breaker inputs: 12 to 8 AWG copper conductors - Main lug combined output: 10 to 2 / 0 AWG copper conductors - Neutral and ground: 8 to 6 copper conductors - Always follow local code requirements for conductor sizing.
Cooling		Natural convection
Altitude	[ft]	Up to 6,561 (2,000 m)
Pollution Degree		2
Internet Connection Options		
Wi-Fi		IEEE 802.11b / g / n
Cellular		CELLMODEM-CAT4 (4G based LTE-CAT4)
Ethernet		Optional, IEEE 802.3, CAT5E (or CAT6) STP Ethernet cable
Compliance		
AC Combiner		UL1741 FCC Part 15.B ANSI C 12.20 (production meter) NEMA type 3R IEEE 2030.5 / CSIP Compliant
Monitoring Board		UL 61010-1 / UL 61010-2-030 CSA 22.2 No. 61010-1-12 / CSA 22.2 No. 61010-2-030
CT Sensor		UL 2808 (XOBA)

4.5 System Diagram

Q.HOME SMART



- The Q.HOME COMBINER internally combines Q.TRON AC modules up to four AC branch circuits into a single output.
- Q.HOME CORE G3 can be installed together with Q.TRON AC modules and Q.HOME COMBINER. As a residential energy storage system (ESS), Q.HOME CORE G3 stores energy generated by the AC modules.
- The GEM Borad (Gateway)/EMS boards are placed inside the Q.HOME COMBINER which communicates over the AC power line with the AC modules, providing production and consumption metering for monitoring via Q.OMMAND monitoring app.
- The Q.HOME COMBINER provides Ethernet, Wi-Fi, cellular connectivity to the Q.OMMAND monitoring app.

*EMS: Energy Management System

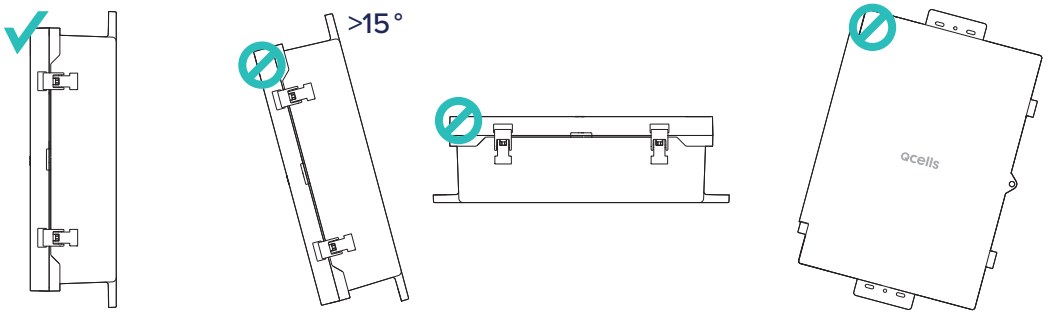
5 Installation Requirements

5.1 Installation Environment

CAUTION

Although Q.HOME COMBINER meets NEMA 3R requirements, it is recommended to install the unit in an area where it will not be exposed to direct sunlight, rain and snow.

- Install the Q.HOME COMBINER at least 3 feet (91 cm) away from the ground and in an easily accessible location.
- When selecting the installation location, consider the dimensions of the Q.HOME COMBINER, ease of access, box height and cable length.
- Mount the Q.HOME COMBINER on a vertical surface.
- Q.HOME COMBINER must be installed within 15 degrees vertically.
- Install under good ventilation conditions.



5.2 Safety Gear

WARNING

All tasks regarding the Q.HOME COMBINER must be performed by qualified personnel. Wear safety gloves and protective clothing while working.

Wear the following safety gear when installing the product. Installers must abide by international standards, including IEC 60364, as well as any applicable national standards.

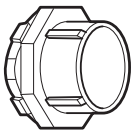

Insulated Gloves


Safety Goggles


Safety Shoes

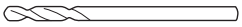
5.3 Tools

These tools are required to install Q.HOME COMBINER.

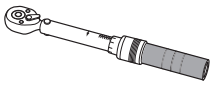


Conduit
(with fittings and fitting tools)

Drill



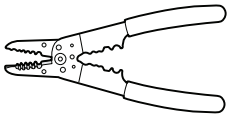
5/32 inch Pilot Bit
(or metric equivalent)

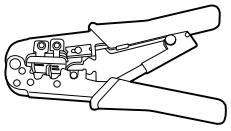


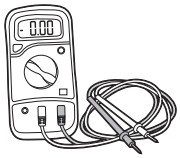
Screwdrivers
Cross & flat head drivers
(large and small sizes)
Note Short length (< 4 in) flat head driver is required for CAN wiring
(refer to page 33)

Socket Wrench

Torque Wrench



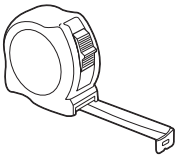


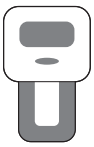


Wire Stripper

Cable Crimper

Multimeter

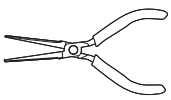




Tape Measure

Level

Stud Finder
(if installing on studs)



Step-drill

Needle Nose Plier

6 Mounting Q.HOME COMBINER

6.1 Wall Mount

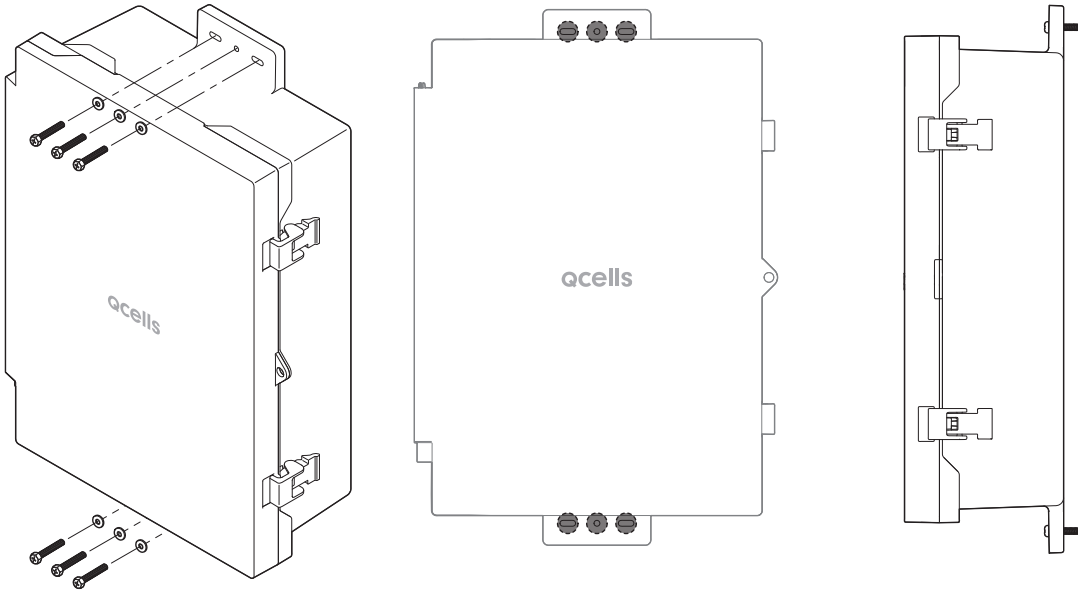
1 Prepare the tools needed for installation in advance.

- Includes: Screwdriver, Stud Finder (if installing on studs), Bolts and Screws

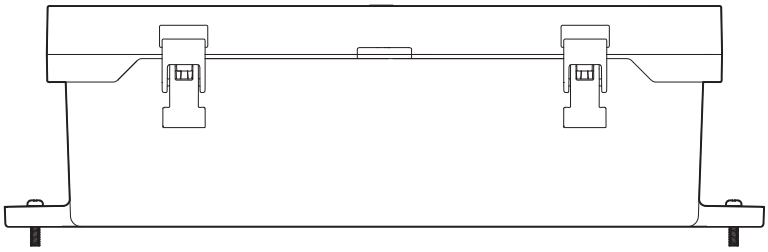
2 Six total bolts or screws (three on top and three on bottom) are required to install Q.HOME COMBINER.

- Three bolts or screws 5.0 cm long (or more, depending on attachment wall), for each single-wide wall-mount bracket. (less than Φ 6 mm)
- Washers for use between screws and mounting bracket.

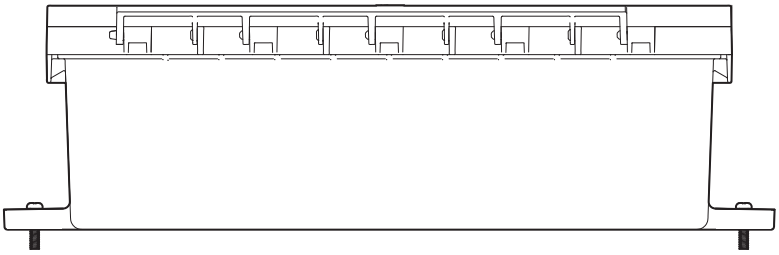
Front Side



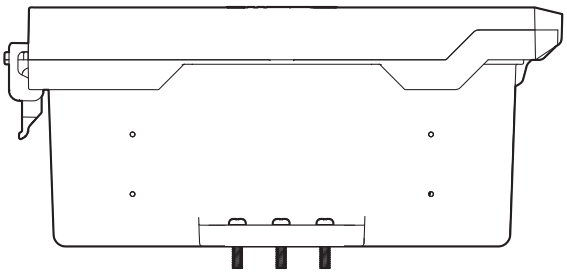
Right Side



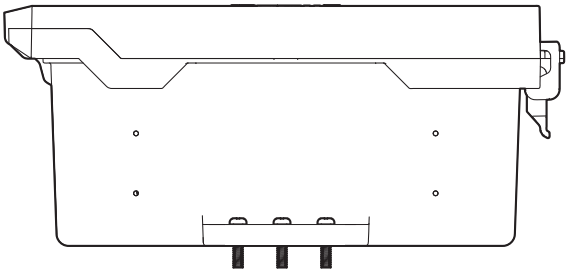
Left Side



Top Side



Bottom Side

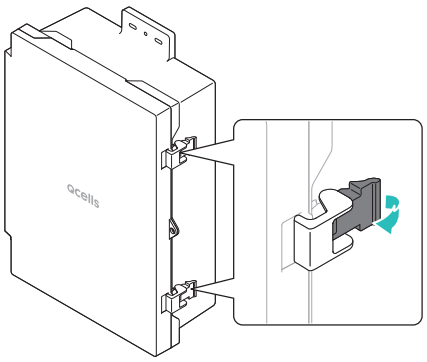


7 Opening / Closing the Covers

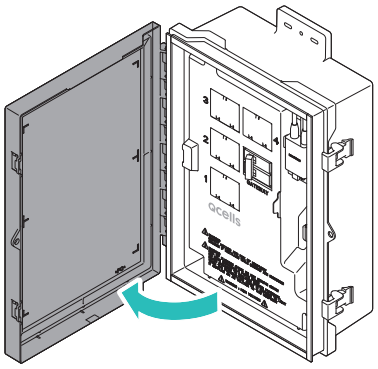
7.1 Opening the Front Cover

To open the front cover of Q.HOME COMBINER:

1 Pull the latches out and forward to release the front cover.



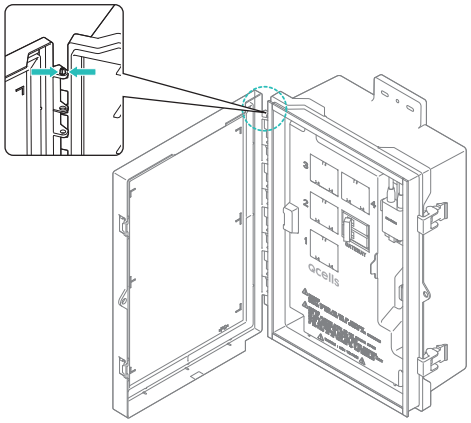
2 Swing the front cover to the left to open it.



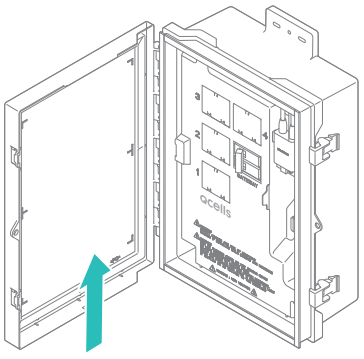
7.2 Detaching the Front Cover

If desired, the front cover may be removed during installation for convenience.

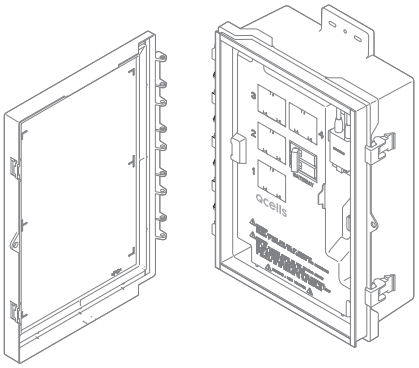
1 Use needle nose pliers to pinch the top of the hinge rod.



2 Slide the front cover up and remove it.



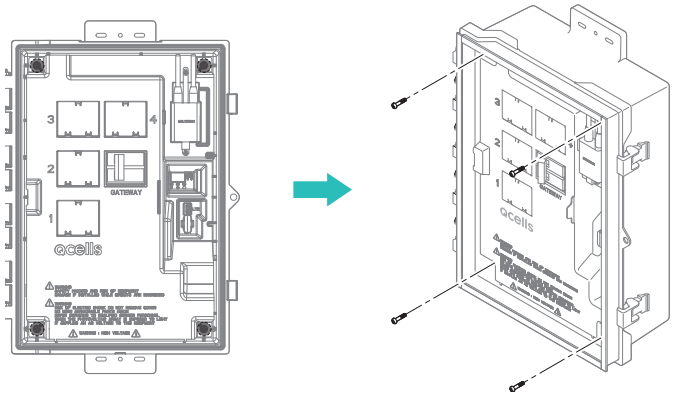
3 Set aside the front cover for re-attachment after installation.



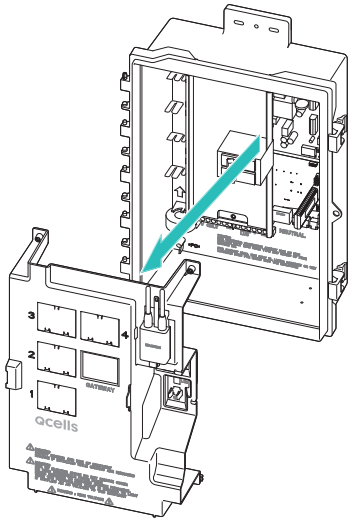
7.3 Opening the Deadfront Cover

To remove the deadfront cover from Q.HOME COMBINER:

1 Loosen the four screws at each corner of the deadfront cover to remove (it is not necessary to completely remove the screws from the deadfront cover itself).



2 Pull the deadfront to remove the part and set aside.



WARNING

Risk of Electric Shock!
To maintain the warranty, do not make changes to the deadfront unless there is a specific reason to. (e.g. removing or replacing the breaker position covers)

7.4 Closing the Deadfront and Front Cover

CAUTION

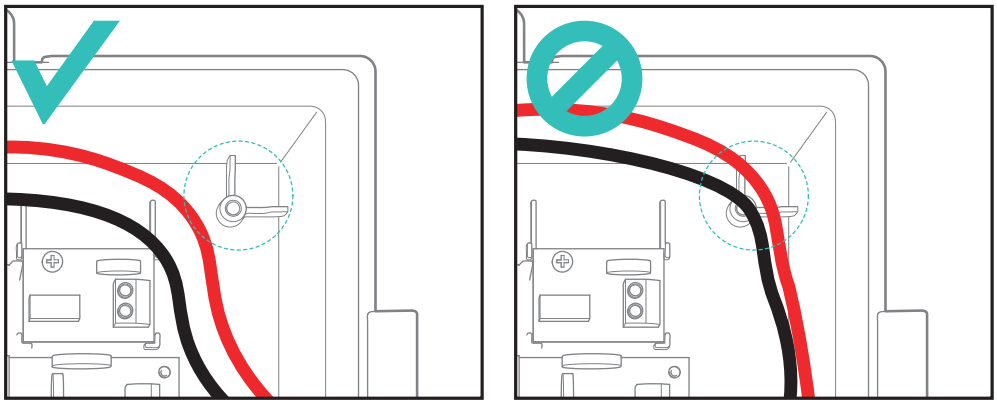
Before energizing for the first time, ensure the deadfront cover is restored and the front cover is restored and closed.

To close the deadfront cover:

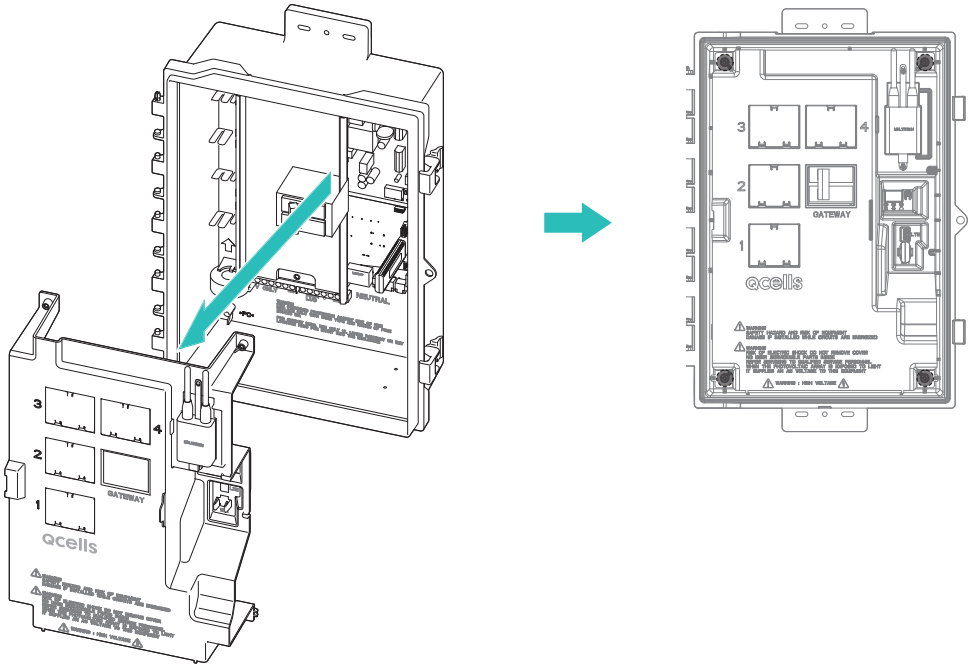
1 Set all the cables going around the edge of the enclosure aside of the deadfront cover assembly hole.

WARNING

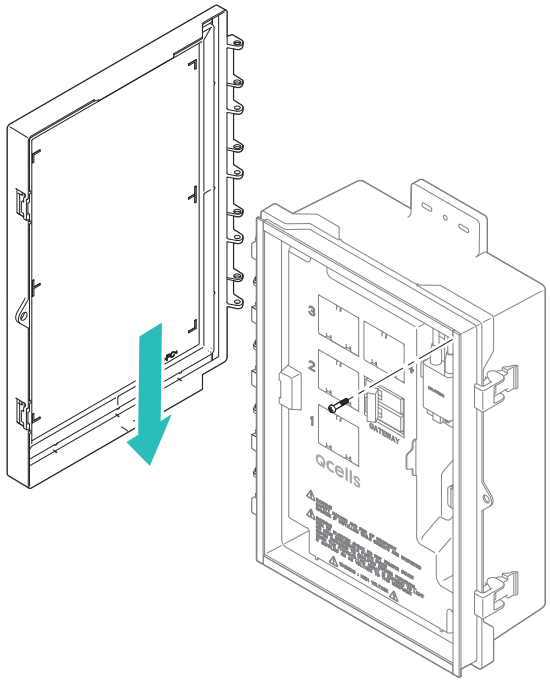
Risk of electric shock!
Please refer to the figure below. The cables can be damaged when they are stuck in screws. This can lead to Q.HOME COMBINER malfunction.



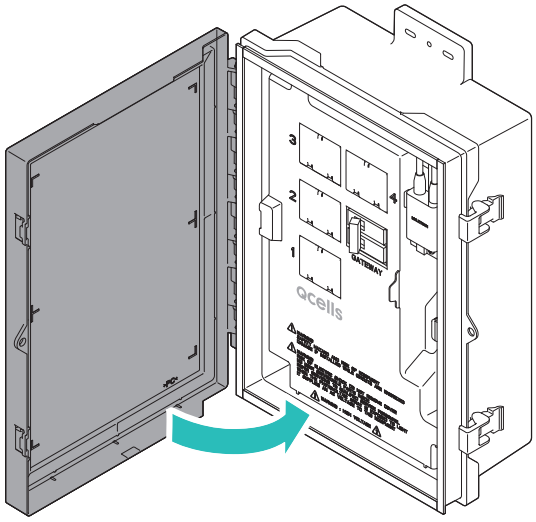
2 Restore the deadfront to the enclosure and secure in place with the four retained screws.

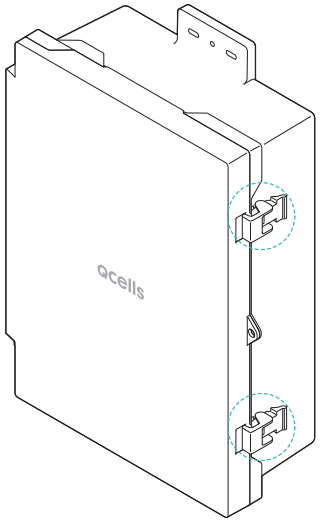


3 Reattach the front cover.



4 Restore, close and fully latch the front cover.





8 Connections

CAUTION

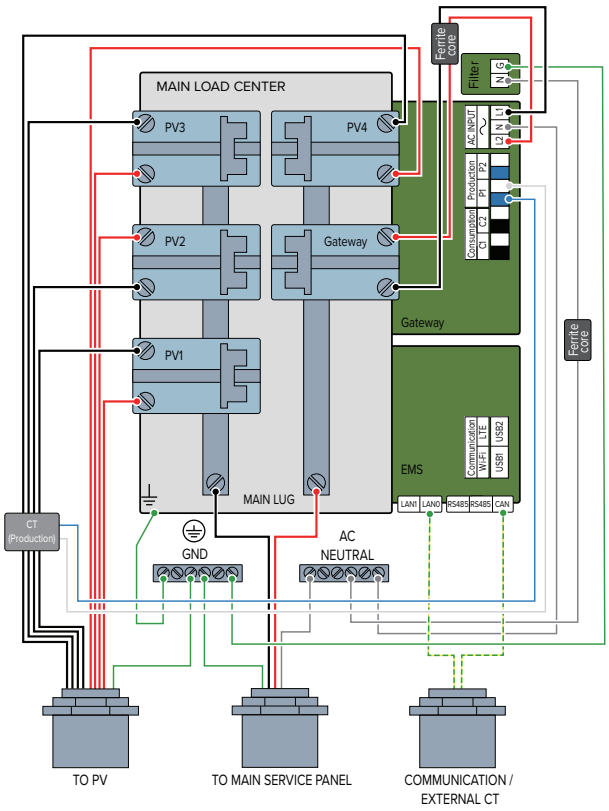
- Make sure to align the phase of the cables properly when installing. Failure to ensure L1/L2 relationship is maintained correctly throughout the system installation process will prevent the system from operating and displaying information on the monitoring portal correctly.
- Work on energized equipment in this system is never required. Always ensure the system is properly shut down and circuits are deenergized before performing work.

Note

Perform all wiring in accordance with all applicable local electrical codes, with the National Electrical Code (NEC) and ANSI/NFPA 70.

8.1 Connectors and Ports Layout

Internal Components



WARNING! FIRE RISK!

Only the AC output conductors should ever come into contact with the AC lugs.

WARNING

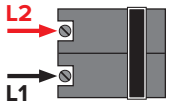
BONDING BETWEEN CONDUIT CONNECTIONS IS NOT AUTOMATIC AND MUST BE PROVIDED AS A PART OF THE INSTALLATION

Cable Coding Chart

	L1
	L2
	GND
	Neutral
	Positive (P_CT) Positive (C_CT)
	Negative (CT)
	Optional Comm. Channels

Note

The wiring connection of PV2 should be as follows.



※ The layout is also demonstrated in the label attached to the front cover inside the combiner.

8.2 Power Conductor Specifications

The power conductors must correspond to the AC input and output specifications for this product.

Note

Perform all wiring in accordance with all applicable local electrical codes, with the National Electrical Code (NEC) and ANSI/NFPA 70.

Connection		Wire Size [AWG]	Torque [Nm/in-lbs]
20 A Circuit Breaker (PV 1 - 4)		12 - 10 8	4.0/35.0 4.5/40.0
40 A Circuit Breaker		6 - 4	5.1/45.0
60 A Circuit Breaker		4	5.1/45.0
Ground Bar/Neutral Bar		8 6	2.8/25.0 4.0/35.0
Main Lug (to grid connection)	20 A	10 - 8	4.5/40.0
	40 A	6 - 4	5.1/45.0
	60 A	4 - 2	5.6/49.5
	80 A	3 - 2/0	5.6/49.5
Gateway (CT Sensor)		20 - 18	0.4/3.5
Copper conductors only, rated 75 - 90˚C. Follow NFPA 70 (NEC) and all local code requirements.			

- You can install AC branch circuit breakers up to 80 A total (sum of breaker ratings, excluding the 10 A/15 A gateway breaker). With individual branch circuits, you will typically use up to four 20 A breakers.
- It is recommended to use 20 A breakers for solar branches and a 40 A breaker for connecting an ESS (Q.HOME CORE G3) unit through the AC Combiner.
- The breaker size of the branch circuits should be properly distributed to avoid exceeding the maximum capacity of 80 A.
- Refer to the case below to avoid exceeding 80 A capacity.
  - Case 1. When installing 44 AC Modules 20 A breakers × 4ea (Solar)
  - Case 2. When installing 22 AC Modules and 1 ESS 20 A breakers × 2ea (Solar) + 40 A breaker × 1 ea (ESS)

8.3 Mounting the Circuit Breakers

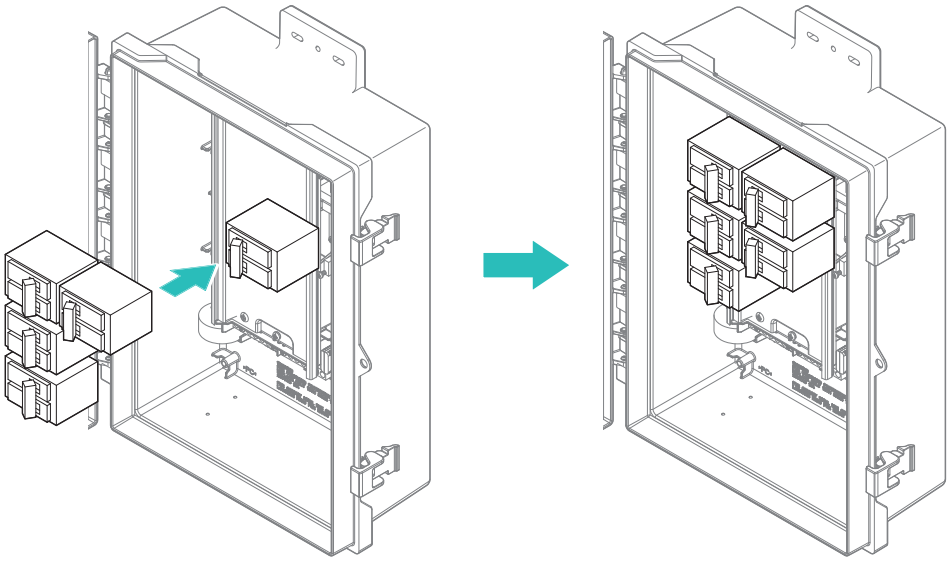
Q.HOME COMBINER contains one two-pole 15 A breaker that supplies the gateway. Additional breakers are required in order to connect each PV string independently.

Ensure all relevant legal and jurisdictional requirements are followed.

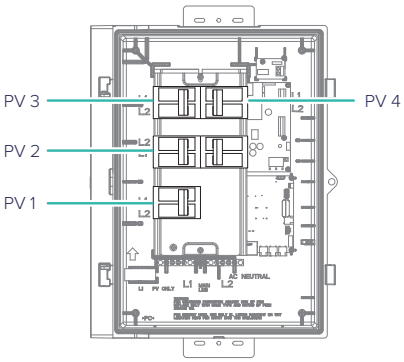
Follow the installation standards to install a circuit breaker satisfying the voltage and current specification of the AC conductor.

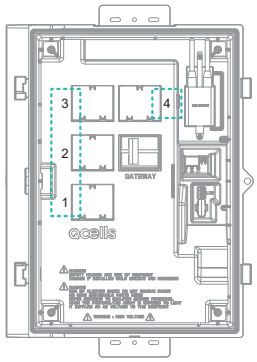
Circuit	OCPD Rating	Short Circuit Current Rating
PV 1 - 4	20 A	10 kAIC
Gateway (pre-installed)	15A	10 kAIC

1. With the front and deadfront covers removed, connect the the breakers onto the busbar in order as indicated on the deadfront. (PV 1~4)
2. Remove the breaker position cover on the deadfront by slightly pressing the single latch inwards and gently sliding the covers. This should be done only for the breaker positions being used.
3. Restore the deadfront cover after connecting all the required conductors.



Refer to the circuit breaker numbering below.



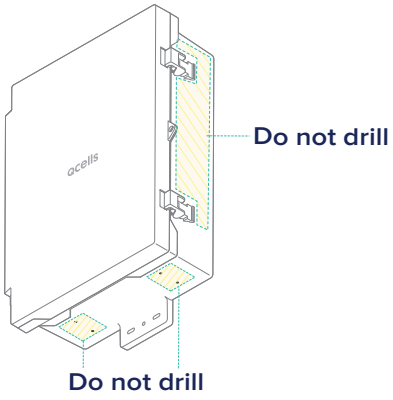


8.4 Drilling Holes for Conduit

Note
Perform all wiring in accordance with all applicable local electrical codes, with the National Electrical Code (NEC) and ANSI/NFPA 70.

Drilling Holes to Install Conduit

Conduit entries are made easily in the Q.HOME COMBINER. Using the guides provided on the following page, locate and mark the desired conduit entry points. Carefully use the pilot and step drill bits to make the desired conduit entry penetrations.



Note
When making conduit entry locations, consider the following:

- Only make conduit entry penetrations in designated locations.
- When making the conduit entry penetrations, drill carefully to avoid cracking the enclosure housing.
- Evaluate appropriate clearance before drilling to ensure no internal hardware is in the path of the penetrating equipment.
- When connecting, ensure the conduit entry point is appropriately sealed against moisture intrusion and is properly bonded.
- Use only UL Listed rain-tight conduit fittings for wire entry penetrations into the enclosure.
- Do not drill or make conduit entry penetrations by blocking any of the four draining holes.

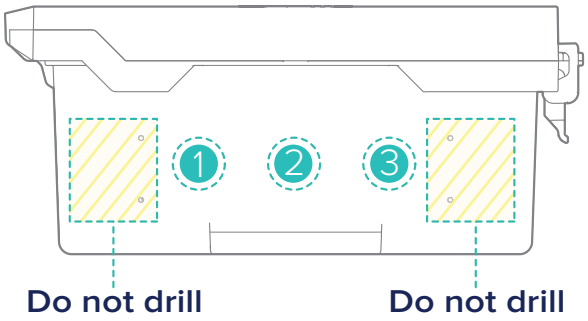
WARNING

- Once drilling is complete, thoroughly clean all debris generated in this process.
- Ensure finishing work is performed using conduit fittings and other necessary components to make sure the product is waterproof and dustproof.

CAUTION

Risk of equipment damage.
Warranty may be voided if installation guidance is not followed.

Bottom

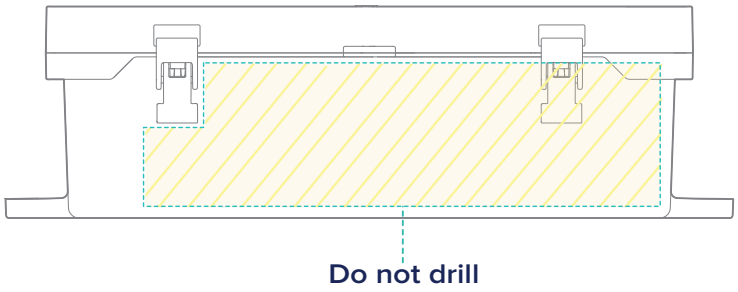


Recommended locations for conduit
[Bottom side of Q.HOME COMBINER]

Note
It is recommended to drill three holes on the bottom side.

1. For DER (PV or battery)
2. For main service panel (or Q.HOME HUB)
3. For other cables (external CT, communication)

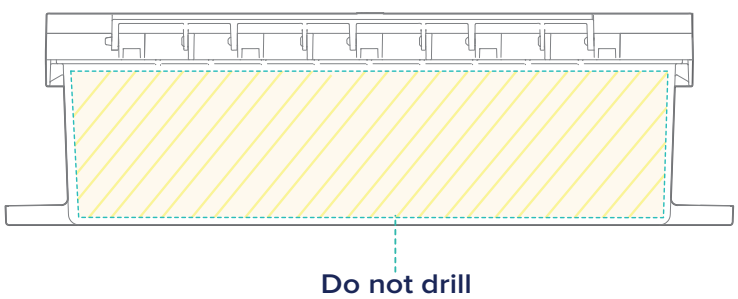
Right Side



Note
Only make side-penetrations if absolutely necessary.

- If installation location requires the use of side-penetrations, consider creating a drip loop to help prevent water intrusion.

Left Side

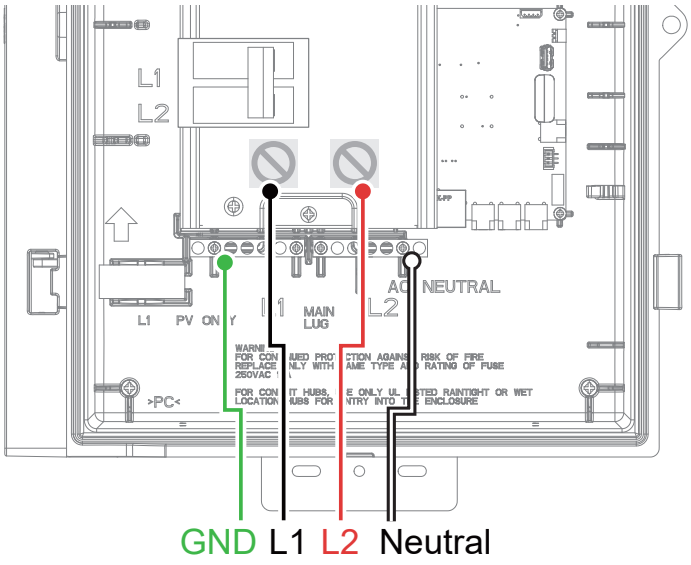


8.5 Wiring DER and Grid Conductors

To connect the Grid Conductors:

1. Use conductors sized per local code requirements, taking into consideration the voltage drop/rise and the upstream breaker or fuse.

2. Connect the L1, L2 grid cables on the main lug. It should be tightened with appropriate amount of torque indicated in the table in 8.2 Power Conductor Specifications section.

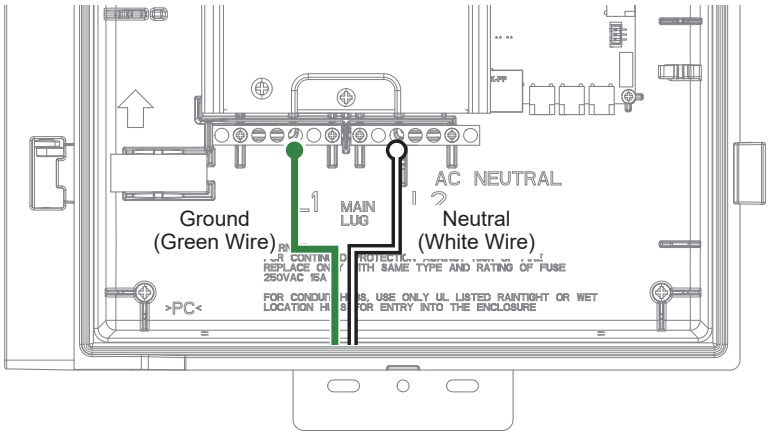


Note

- Qcells AC modules use a two-wire system and do not use a Neutral. However, the GEM Board (Gateway) in the combiner still requires a Neutral.
- When securing the deadfront cover, make sure there is no interference with internal cables.

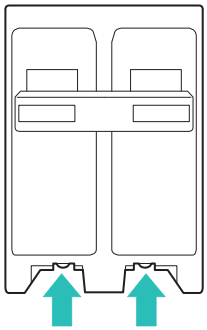
3. Connect the neutral (white) to the neutral bus bar.

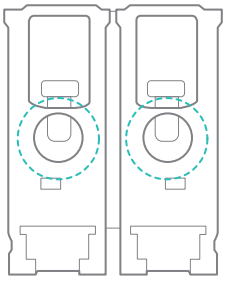
4. Connect the ground (yellow & green) to the ground bus bar.



To connect the AC PV Conductors:

1. Use conductors taking into consideration the voltage drop/rise and upstream breaker or fuse.
2. Bring in the wires from each AC branch circuit.
3. Check L1, L2 phase location indicated on the enclosure and select the appropriate cable color.



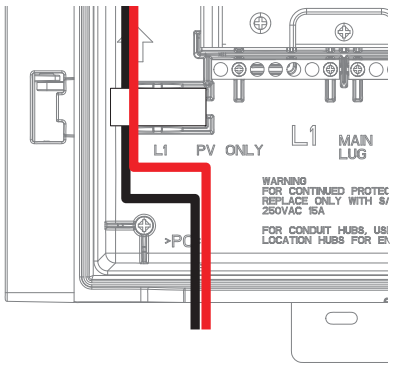


[Bottom side of circuit breaker]

Note

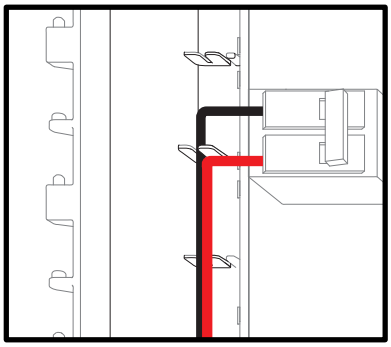
Notice that PV input location #2 L1/L2 locations are flipped as compared to the other PV input circuit locations.

4. Pass the L1 conductor from each PV branch circuit through the Production CT. Each L1 conductor must pass through the pre-installed CT from the bottom.



Note

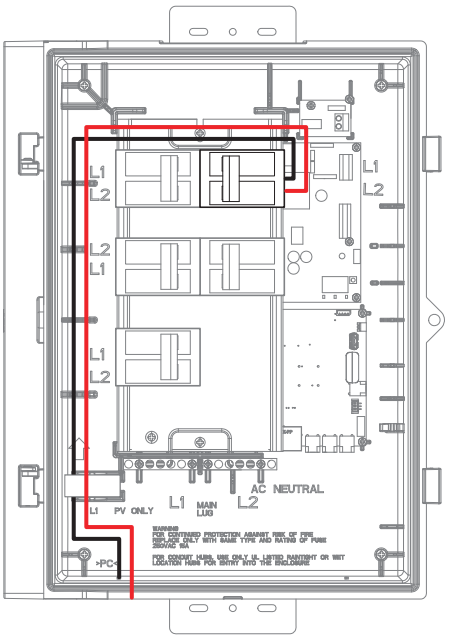
Wire guides are provided along the inside of the enclosure to assist in arranging and guiding conductors.



WARNING

Risk of fire. All wires must be positioned and secured so that they do not come into contact with the main lug or an uninsulated conductor.

5 #4 PV input circuit breaker is located on the other side of the main lug. The L1, L2 conductors should be placed as in the figure below.



6 Connect L1 and L2 (usually one black and one red) from each AC branch circuit to the circuit breaker(s).

Note

Notice that PV input location #2 L1/L2 locations are flipped as compared to the other PV input circuit locations.

8.6 Communication Connection

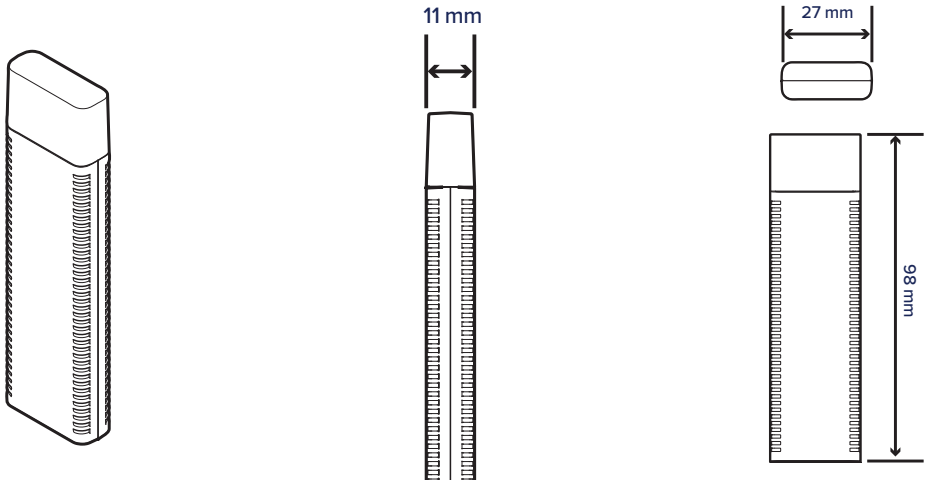
Communication & Commissioning

The Q.HOME COMBINER supports three methods of communication to the Q.OMMAND Cloud Server: via Wi-Fi, LAN (Ethernet) or a Cellular Modem (LTE). A Wi-Fi dongle is provided with the device, and the Cellular Modem is available to order separately.

Regardless of whether the Wi-Fi dongle is utilized for the system's standard internet connection, it is required to create a wireless access point during the commissioning process.

Note
The Q.HOME SMART solution is intended for use with an internet connection. Losing connection will prevent the monitoring system operation, and an extended outage (>25 days) will void the product warranty.

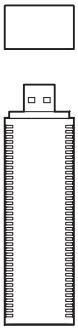
Wi-Fi Dongle



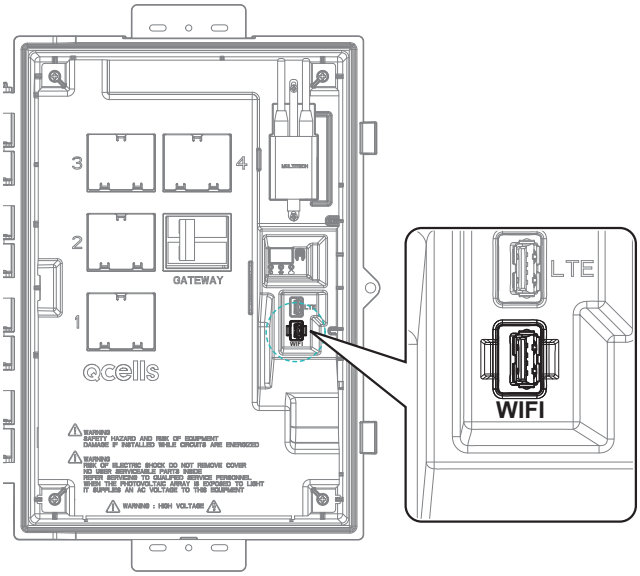
Specifications	Description
Input Voltage	USB 5.0 V (Nominal voltage)
Ambient Temperature	−40 to +65 ˚C
Ambient Humidity	95 % or less
Size	77.05(W) mm × 50.15(L) mm × 8.7(T) mm (±0.2 mm)
Weight	9.1 ± 0.9 g

Install Wi-Fi Dongle

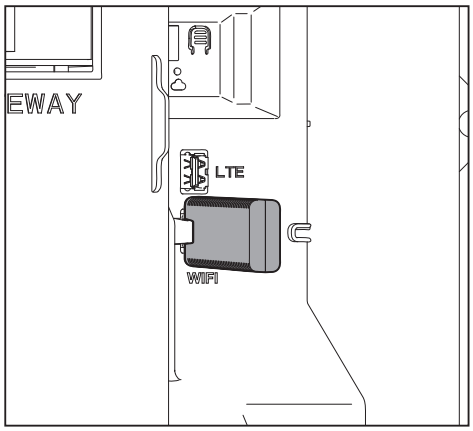
1 Remove the Wi-Fi dongle protective cap.



2 Ensure the deadfront cover is restored, and locate the Wi-Fi Dongle USB port marked "WIFI".

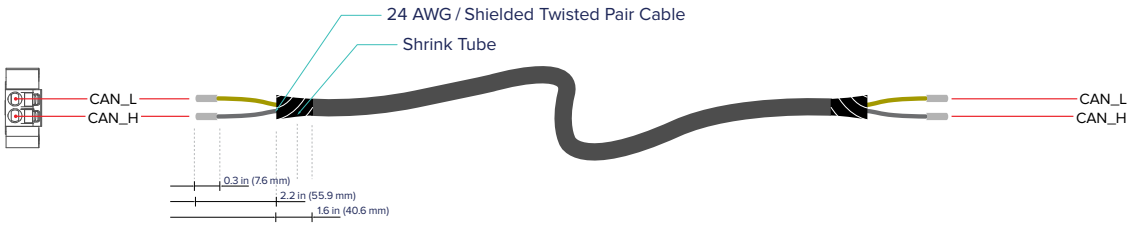


3 Insert the Wi-Fi dongle into the USB port.



Q.HOME COMBINER (optional, used in Q.TRON AC PV applications).

The cable length must be less than 55 m.

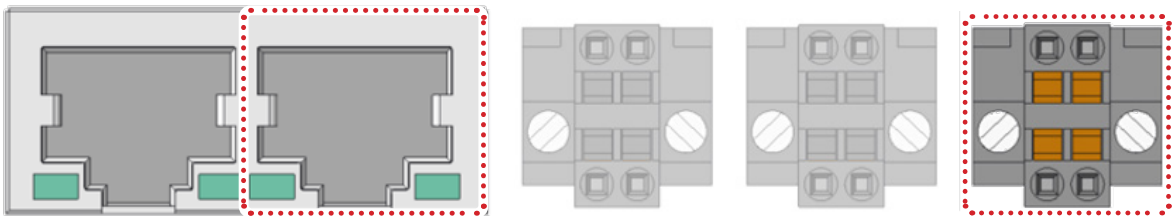


1 PIN : CAN_L

2 PIN : CAN_H

LAN/CAN Connections

LAN & CAN communication connectors are located on the bottom side of the EMS board, behind the dead front cover. If these connections are utilized, they must be made prior to restoring the dead front cover and installing the Wi-Fi dongle.



Note

- The Ethernet cable should always be connected to 'LAN0' port if there is only 1 Ethernet cable connected to the EMS board.
- When connecting two Ethernet cables, refer to the table below for the correct connection options in each system configuration
- When installed as part of the Q.HOME SMART platform in a Grid Support or Backup Configuration, a CAN connection is also made between the Q.HOME COMBINER and the Q.HOME CORE or Q.HOME HUB.

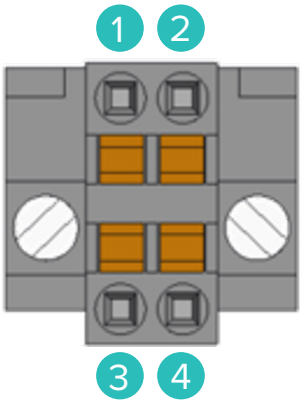
Configuration	LAN1	LAN0	CAN
Solar		to LAN (router)	
Grid Support	*to Q.HOME CORE G3	to LAN (router)	to Q.HOME CORE G3
Backup		*to Q.HOME CORE G3	to Q.HOME HUB G3

* Connection for network bridge

Note

RS485 communication ports are not used.

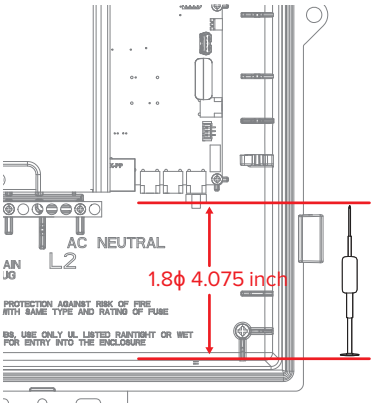
CAN Communication Connector **Required Tool Size**



1. Signal (High)
2. Signal (Low)
3. Ground (Not used)
4. Ground (Not used)

Note

- CAN high/low signal should be connected to pin 1 and 2. Pin 3 and 4 are not in use.
- Check the direction of the connector by referring to the location of the flathead screw.



Note

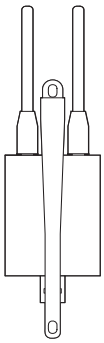
The CAN communication connector is secured by 2 screws. When securing the connector, use a flat head screwdriver which the tool length is equal to or shorter than the specifications above.

Cellular Modem Connection

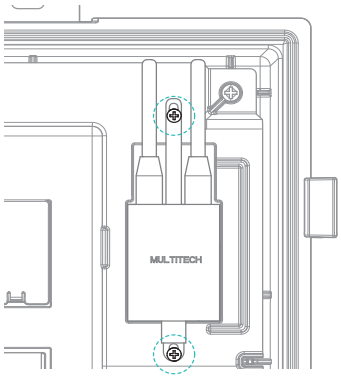
The mounting location for the Cellular Modem is on the dead front cover. If used, mount the Cellular Modem as illustrated below.

For more details, refer to the Q.HOME COMBINER Cellular Modem Installation Manual.

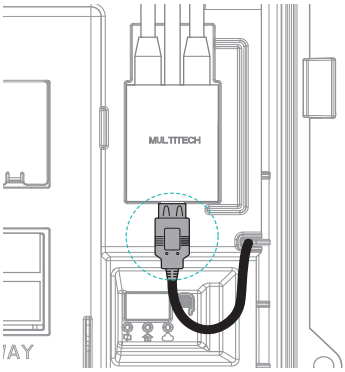
1 Insert the fixture into the middle slot on the back side of the cellular modem.



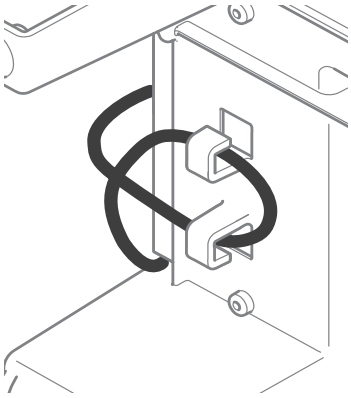
2 Attach the fixture with two screws (M4 - 6 mm) at the cellular attachment part of the deadfront.



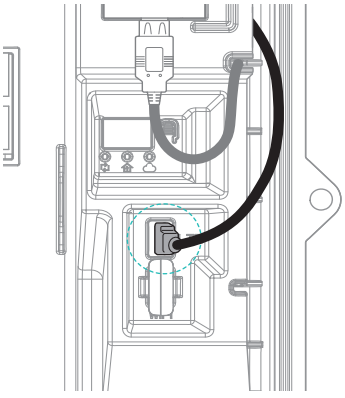
3 Remove the deadfront cover and connect USB 2.0 AF Cable to cellular modem.



4 Use the slot on the back of the deadfront to arrange the cable.



5 Restore the deadfront cover and plug the USB cable on the USB port marked as ‘LTE’ on the deadfront.



9 Single Line Diagrams

In the Solar Configuration, Q.TRON AC Modules are connected to the Q.HOME COMBINER, which combines the AC modules into a single output. The main lines which are L1, L2, Ground and Neutral of the Q.HOME COMBINER are connected to the main service panel (MSP). The Gateway found inside the Q.HOME COMBINER communicates over the AC power line with the microinverters on the modules. There are 4 single line diagrams below based on different locations of the consumption CTs.

Note

Due to bi-directional energy flow, consumption metering has specific polarity to define whether the power is importing or exporting. The consumption CTs should be installed appropriately according to the direction indication label attached on the edge of the clamp CTs. Please refer to image in "13.4 Consumption CT Wiring" on page 54.

9.1 Measuring Grid (PV+Load) Interconnection Point

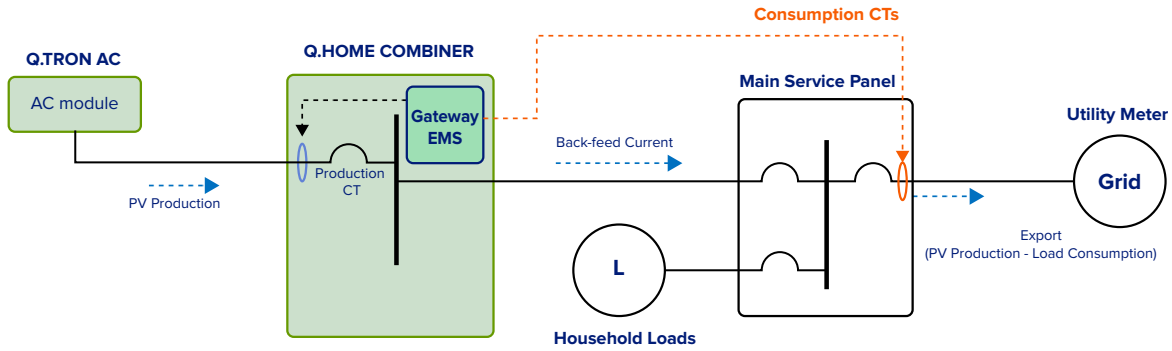


Figure 1. PV + Load measurement (Consumption CTs are installed in MSP at service entrance)

The consumption CTs are installed at the grid interconnection point. Installing the CTs at the service entrance is required at sites where power control settings are necessary.

Note

Installation according to this single line diagram is mandatory for PCS certified features. Refer to "12 Power Control Features" for further details.

9.2 Measuring Household Loads (Load only)

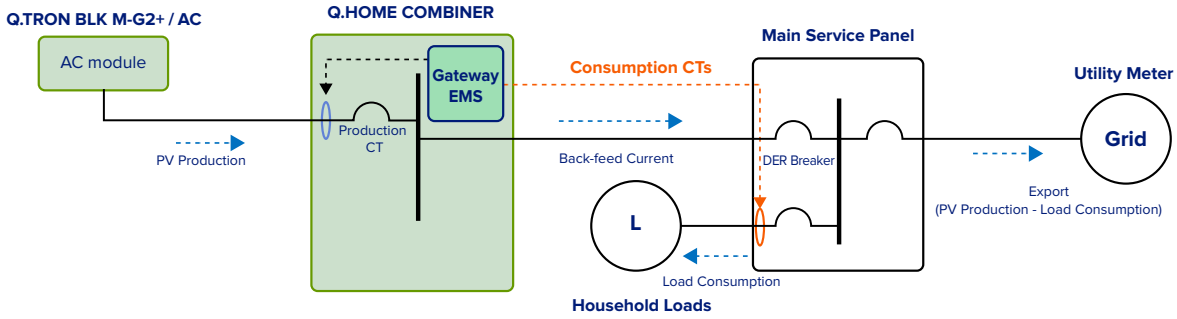


Figure 2. Load only measurement (Consumption CTs are installed in MSP on Household branches)

The consumption CTs are clamped on and measure household loads only. The CTs can be installed at this location in case it's difficult to install them at the service entrance. Make sure the cables of household loads are all clamped in the CTs. If not, the monitoring data in Q.OMMAND will not be accurate.
In case a pair of consumption CTs can't clamp on all the branches of household loads, 2 pairs of CTs can be installed in parallel. The gateway will sum the measured values and show the total consumption data in Q.OMMAND.

9.3 No Consumption Metering

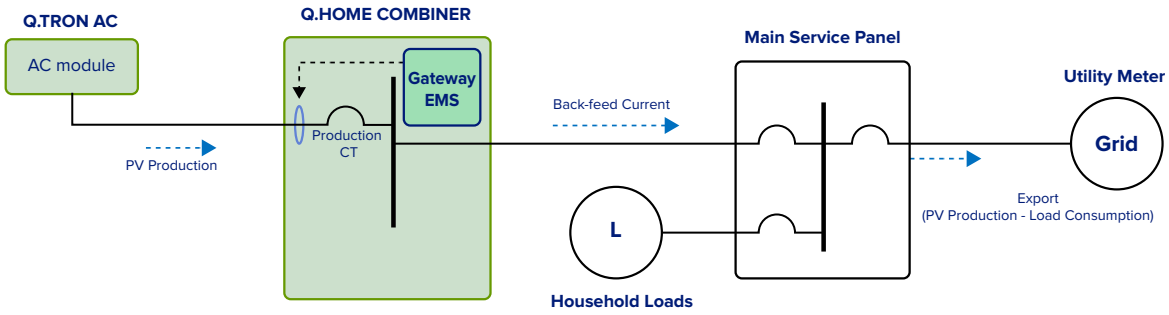


Figure 3. Consumption CTs not installed

In case the customer is not willing to monitor the consumption data nor requires any power control settings, the consumption CTs may not be installed. Monitoring energy flow and setting operation modes in Q.OMMAND PRO/HOME will be limited.

9.4 Expanded System with External Production CT

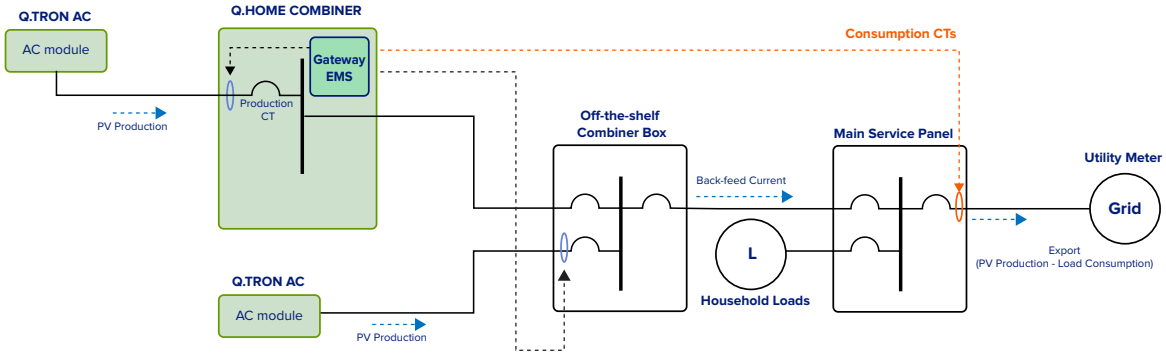


Figure 4. External Production CT installed in Off-the-shelf combiner box

An external production CT is required to be installed in the off-the-shelf combiner box as a solution for the expanded system (>44 AC Modules). The consumption CTs can be installed at the grid interconnection point, household loads, or not installed at all according to customer needs and site environment. However, it is strongly recommended to be installed at the grid interconnection point as shown in Figure 4. The Q.HOME COMBINER and off-the-shelf combiner box should be installed close to each other to secure the accuracy level of production metering. The external production CT (wire leads :2 m, 20 AWG) is provided by Qcells as an optional accessory.

9.5 Installing the Consumption CTs

Install CTs for Consumption Metering

For consumption metering purposes, a pair of clamp CTs are provided. These will be needed for consumption monitoring in the Solar and Grid Support Configurations.

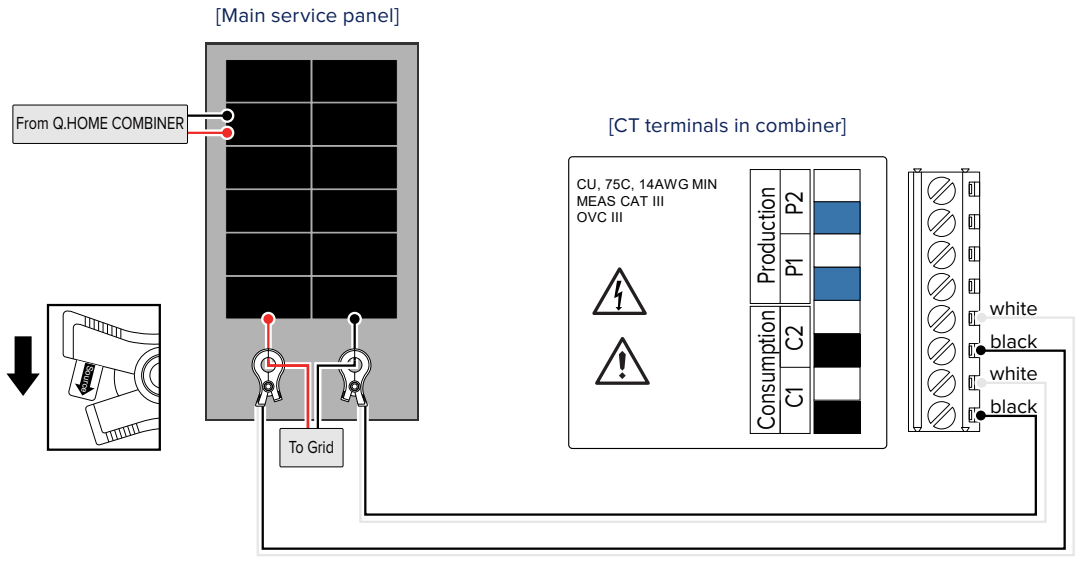
To connect the CTs to the Q.HOME COMBINER, follow the steps provided in the procedure below.

Note

- The L1/L2 relationship is defined by the connection of the Grid Conductors to the Q.HOME COMBINER grid terminals, and applies to the connection of each PV string, as well as the placement of the consumption CTs. Continuity checks should be done throughout the installation process to ensure the L1/L2 relationship is maintained.
- The CT conductors should not be run in the same conduit as power carrying conductors to ensure the highest possible accuracy, especially when installed as part of a Power Control System (PCS).
- Power should always be disconnected from the MSP by opening the Main Service Breaker (MSB) before making conduit intrusions.
- Never place CTs around energized conductors in the Main Service Panel before connecting the CT conductors into the CT inputs on the GEM board.

Procedure

- Establish an independent conduit path from the Q.HOME COMBINER to the MSP.
- Before passing the CT wires through the conduit, mark one set of CT's conductors with colored tape (or some other appropriate means) to ensure that the L1/L2 relationship is maintained. It is recommended to mark both ends to ensure the CTs do not dangle and become confused.
- Connect the L1 CT conductors to the black and white "C1" Consumption CT inputs on the GEM board.
- Connect the L2 CT conductors to the black and white "C2" Consumption CT inputs on the GEB board.
- Tighten all connections to 3.5 pounds.
- Clamp the L1 CT on the load center feed wire Line 1 (matching the Gateway's "L1" voltage terminal) with the CT arrow pointing toward the load (away from the grid).
- Clamp the L2 CT on the load center feed wire Line 2 (matching the Gateway's "L2" voltage terminal) with the CT arrow pointing toward the load (away from the grid).



Extending CT Lead Wires

The wires of the consumption current transformers (CTs) can be extended up to 100 meters for installation in panels located away from the Q.HOME COMBINER by splicing lead wires. To maintain accuracy, the total length of the lead wires must not exceed 100 meters. If the wires extend beyond this limit, the operation modes related to the grid, such as Zero Export mode, cannot be guaranteed.

Recommended cable requirements are as follows.

- Maximum cable length: 100 meters
- Voltage Rating: 300 V or higher for single phase grid installation
- Wire Size: 18 ~ 20 [AWG]
- Number of Core: 2C (2 wire twisted cable)

Installation Locations for Consumption CTs

- **At service entrance (measuring load + PV):** The consumption CTs are installed at the grid interconnection point. From this position the Q.HOME COMBINER is able to measure all current coming and going from the grid, and allows the system to calculate the current being used by household loads. Installing the CTs at the service entrance is strongly recommended at sites where power control settings are required.
- **At household load (measuring load only):** If the CTs cannot be installed upstream of all loads in the Main Service Panel, they may be placed around the current-carrying conductors servicing the home's loads. If the provided CTs cannot enclose all required conductors, they can be connected in parallel at the Gateway terminals.

Note

- In case a pair of consumption CTs cannot clamp on all the branches of household loads, 2 pairs of CTs can be installed by connecting the cables in parallel on the gateway terminals. The gateway will sum the measured values and show the total consumption data in Q.OMMAND.
- Only matching CTs (models: CT-JS-CLAMP-200A-25m, CT-JS-CLAMP-200A-5.2m) provided by Qcells may be paralleled. If additional CTs are required, refer to accessory list in Q.HOME COMBINER datasheet.

9.6 Installing a Larger PV System

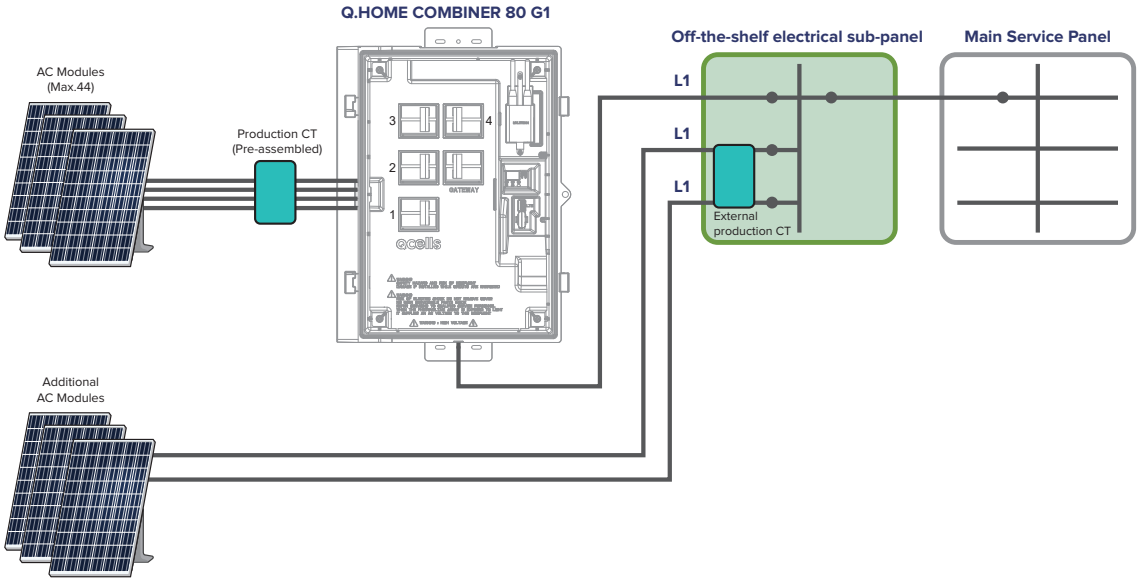
External CT

The External CT cannot be used with BBOC (Busbar Overload Control) protection.

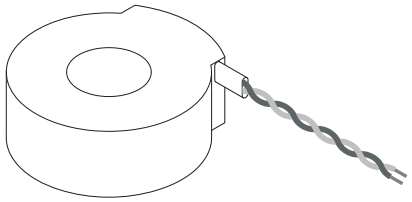
Note

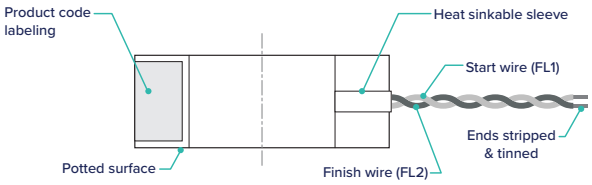
- The Q.HOME COMBINER product can support monitoring PV systems larger than 44 AC Modules (15kW), however the additional strings must be combined in an external sub-panel, separate from the AC Combiner or Main Service Panel.
- Determine the number of breakers considering the capacity of additional AC modules to be installed.
- The External Production CT accessory (CT-HQ-SOLID-200A-2m) is required to meter production of the additional AC modules combined outside of the Q.HOME COMBINER.
- All conduits, fittings and conductors must comply with installation regulations.
- Main lug must be:
  - Have enough spaces to accommodate the number of two-pole breakers required for installing AC modules over 15 kW.
  - Have a total ampacity rating sufficient for the design an off-the-shelf electrical sub-panel.
  - Provide the proper over current protection per code requirements.
- Breaker(s) must be:
  - A two-pole, up to 20 A circuit breaker for connecting additional AC module branch circuits.

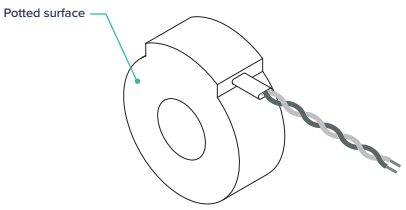
Configuration

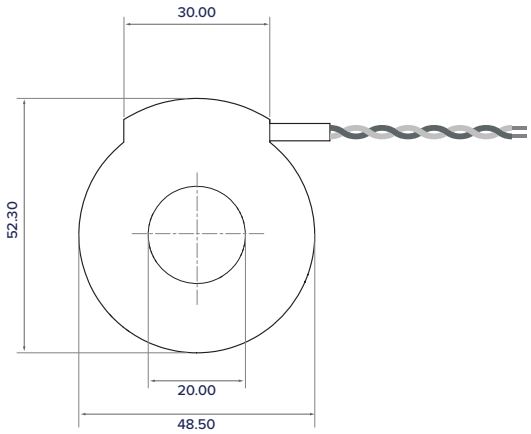


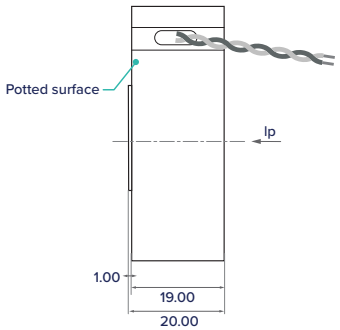
External Production CT (CT-HQ-SOLID-200 A – 2 M)





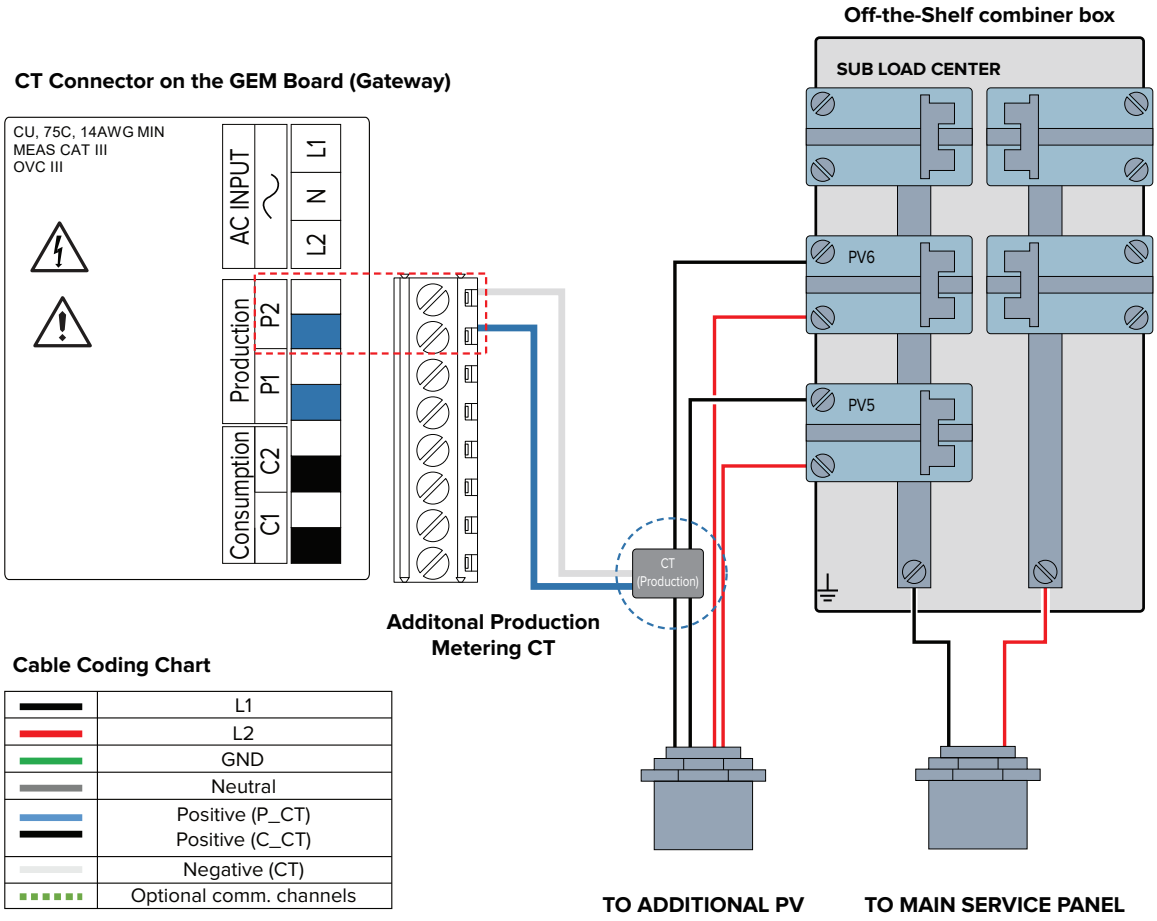






Parameters	Symbol	Value	Unit
Primary Current Range	-	200	A
Secondary Turns	Ns	2500	-
Amplitude Error	AE	±0.1	%
Operating Temperature Range	Topr	−40 to 85	˚C
Certificate		UL2808 (XOBA, XOBA7)	

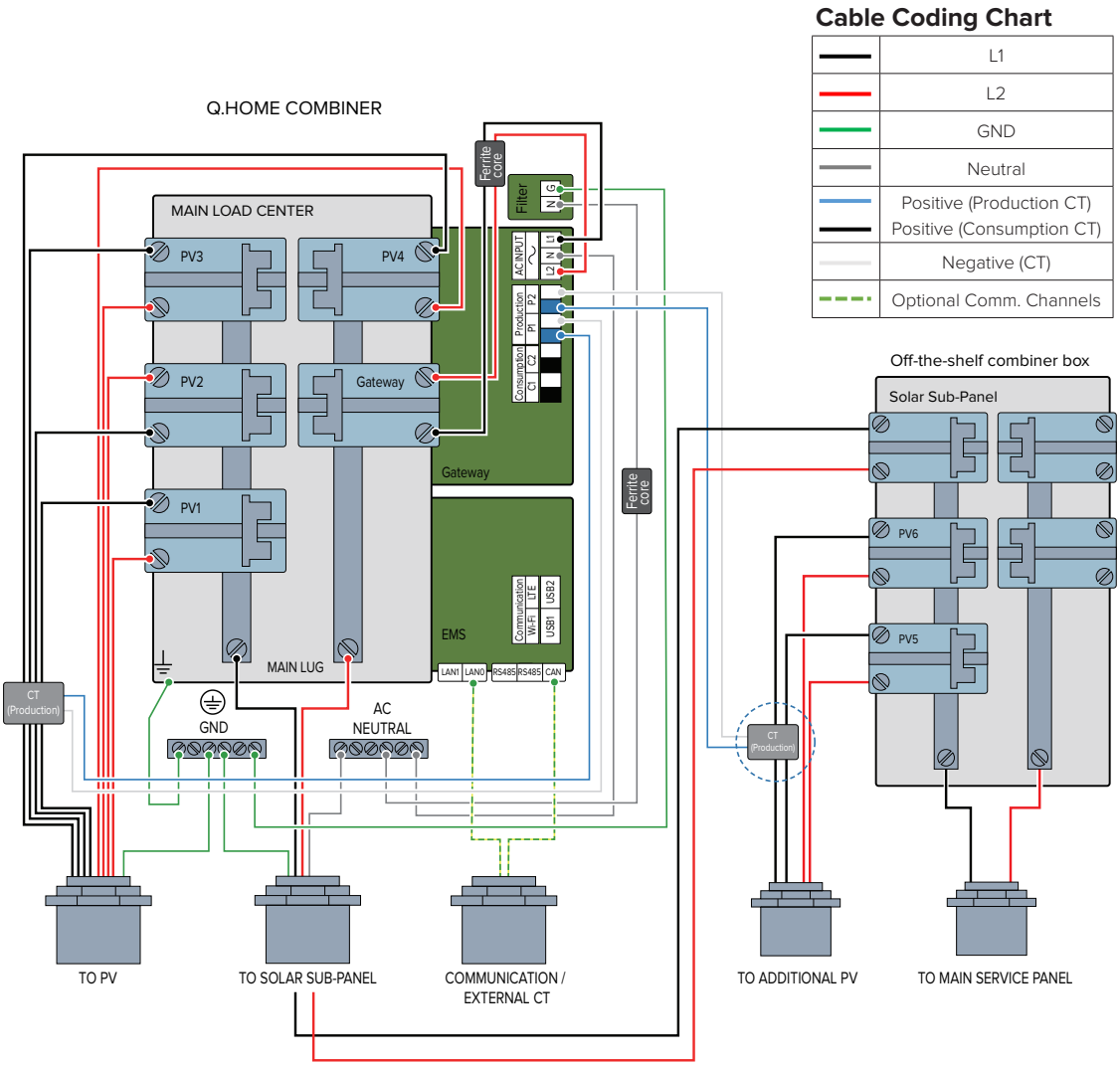
Details for Wiring of Added Production Metering CT



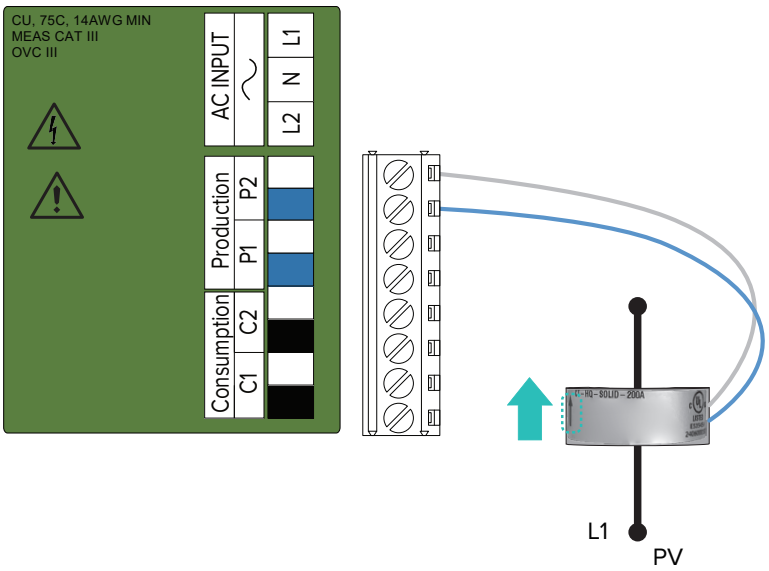
Cable Coding Chart

	L1
	L2
	GND
	Neutral
	Positive (P_CT) Positive (C_CT)
	Negative (CT)
	Optional comm. channels

9.7 External Production CT Wiring for Expanded System (>44 AC Modules)



External production CT wiring on GEM Board (Gateway)



10 Power On

10.1 Turning on Q.HOME COMBINER

To turn on the Q.HOME COMBINER:

1. Once all CTs are installed and conductors are connected between the MSP and the Q.HOME COMBINER, re-energize the MSP by closing the MSB.
2. Close the circuit breaker power source to Q.HOME COMBINER (from the Main Service Panel, Q.HOME HUB, or upstream Sub-panel).
3. Close the Gateway and PV Branch Circuit Breakers in the Q.HOME COMBINER. Once all CTs are installed and conductors are connected between the MSP and the Q.HOME COMBINER, reenergize the MSP by closing the MSB.

10.2 Checking the LED Indicator

After turning on the Q.HOME COMBINER, check the status of the LED indicator on the front.
The significance of the LEDs by color and behavior is as follows :

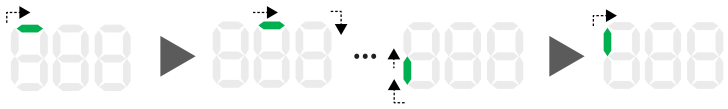
Interface / Indication				Meaning
				User Interface Button: - Turns on display, starts & stops AC module scanning
LED Indications	All LEDs	RED	Blinking	Powering up
		GREEN	Blinking	Power up complete, ready to operate
		RED	Solid	At least one paired AC module is not reporting
		GREEN	Solid	All paired AC modules are reporting
			Blinking	AC module scan is in progress
		OFF	-	No paired AC modules are communicating (low light or night time)
		RED	Solid	At least one paired AC module is not producing power
		GREEN	Solid	All paired AC modules are producing power
			Blinking	AC module firmware update in progress
		OFF	-	No paired AC modules are communicating (low light or night time)
		RED	Solid	No connection to Qcells server
		GREEN	Solid	Connection established with Qcells server
		OFF	-	No network connection

- The FND indicator provides simplified production and reporting indications to allow system operation to be indicated without needing to check the monitoring portal.

When the combiner is powered on, the display turns on for 1 hour and then turns off automatically.
Pressing the button will perform different functions as outlined below.
Display ON: Press shortly to start AC module scanning.
※ If the modules are all scanned within a few minutes, press the button once again to complete scanning. Otherwise, it will run for 15 minutes and then automatically complete scanning. Rescanning will not affect power generation.
Display OFF status: Press shortly to turn on the display.
※ it will turn on for 30 minutes and then turn off automatically.

Display/LED during initialization

Powering Up



All LEDs Blinking

Power Up Completed, Ready to Operate

All LEDs Blinking

Example of display/LED during operation

Scanning

Counting up the number of scanned AC modules (starting from zero)

LED1 Blinking

Display Legend	
P	Power (kW)
E	Error

Scan Completed

The total number of scanned AC modules blinking

※ 3 LEDs will operate within a few minutes after scanning has been completed

Steady State

The display will cycle back and forth between the number of paired AC Modules reporting and the current power being generated.

Error State

The display will cycle repeatedly through the number of AC Modules reporting, the current power being generated, and an error code.

If fault occurs, RED LED will illuminate. Refer to the table on the previous page.

(ex) Assuming 44 AC modules installed

11 Maintenance

11.1 Q.HOME COMBINER Maintenance

CAUTION

- Risk of safety. Do not open the Q.HOME COMBINER unnecessarily.
- Q.HOME COMBINER can present a risk of electrical shock if used inappropriately.
- Remove all conductive accessories (rings, watches, etc.) before servicing.
- Use tools with insulated handles and wear rubber gloves, eye protection glasses and boots when working with the Q.HOME COMBINER systems.
- Do not rest tools or metal parts on top of Q.HOME COMBINER as they may scratch or damage the enclosure.

All maintenance work or service on the Q.HOME COMBINER must be performed by qualified personnel of the authorized service center.

Note

- If an AC Module is replaced, or additional AC Modules are added, rerun the PLC Scan function to ensure all connected AC Modules are paired to the Q.HOME COMBINER's Gateway.
- Any time the number of installed AC modules changes, or an AC Module is replaced, re-commissioning through the Q.OMMAND PRO App (or Web portal) is required.
- Remove the unused AC modules from the Q.OMMAND PRO App/Web following the 'Changes' menu.

12 Power Control Features

This system is equipped with a power control system (PCS). All PCS controlled busbars or conductors shall be protected with suitably rated overcurrent devices appropriately sized for the busbar rating or conductor ampacity.

Note

The maximum operating currents in controlled busbars or conductors are limited by the settings of the power control system and may be lower than the sum of the currents of the connected controlled power sources.

Only qualified personnel shall be permitted to set or change the setting of the maximum operating current of the PCS. The maximum PCS operating current setting shall not exceed the busbar rating or conductor ampacity of any PCS controlled busbar or conductor.

12.1 PEL (Power Export Limit)

Feed-in Limit / Limit Export

This feature controls the power exported from the MSP to the grid to meet requirements from regional utilities. Real-time measurements of PV production and load consumption controls the output generated from the PV system, ensuring that the power exported to the grid never exceeds the power limit set by the installer during commissioning. When the allowed level of power export is set to “zero”, it is called a export limit (non-export) system. Consumption CTs are mandatory for this feature, and must be installed and set properly for accurate operation.

Note

The consumption CTs must be installed at the grid interconnection point.

12.2 Back-Feed Limit

This feature controls the current backfeed from the Q.HOME COMBINER into the MSP, enabling installers to design larger PV systems without performing a main service upgrade. The NEC (National Electric Code, NFPA 70), limits the capacity of any distributed energy resource [DER] (generally meaning PV or Energy Storage System) such that the combined rating of the main service and DER's breakers do not exceed 120% of the service's rating. This can severely limit the size of a DER system which can be installed, and potentially necessitate a Main Panel Upgrade [MPU], or downsizing of the main service breaker.

Qcells' power control system allows installers to set the limit on the backfeed current from the PV system to the MSP, enabling installers and homeowners to avoid the time and cost of an MPU. This function will effectively establish the new "nameplate rating" of the completed system, assuming the current value selected is less than the combined rating of the connected AC Modules.

※ NEC (National Electric Code) 2020 705.12

Backfeed allowed ≤ ((120 % of busbar rating) - Main Service Breaker [MSP] rating) / 125 %.

Ex) MSP Busbar rating 200 A, Main Circuit Breaker 200 A
: ((200 A × 120 %) - 200 A) / 125 % = **32 A**

12.3 BBOC (Busbar Overload Control)

Feature currently unavilable - to be launched in '25.2Q

This feature controls the power by monitoring the combined currents of PV and grid imports to ensure the busbar remains within safe limits. The NEC (National Electric Code, NFPA 70), limits the continuous output current rating of PCS to not exceed 125 % of the DER's breaker rating. Real-time measurements of PV production and load consumption limits the output generated from the PV system when the current flowing through the busbar in the MSP exceeds its capacity. Consumption CTs are mandatory for this feature, and must be installed and set properly for accurate operation. This effectively allows a PV system of any size to be installed, regardless of the rating of the service, MSP busbar, or MSB.

※ NEC (National Electric Code) 2020 705.13

DER's Breaker ≥ 125 % of the continuous output current rating of PCS

Note

The consumption CTs must be installed at the grid interconnection point

12.4 Ratings

PCS Modes	PCS Device	Max Rating for 44 AC modules	PCS Export Range
BBOC (Busbar Overload Control)	Q.TRON BLK M-G2+/AC xxx (w/ Q.MI.349B-G1 (model name))	64 A / 15.36 kVA	64 A to 0 A
PEL (Power Export Limit)	Q.TRON BLK M-G2+/AC xxx (w/ Q.MI.349b-G1 (model name))	64A / 15.36 kVA	15,360 W to 0 W

PCS Device: Q.TRON BLK M-G2+/AC xxx, where xxx is 405, 410,..... representing the DC rated power of the PV module.

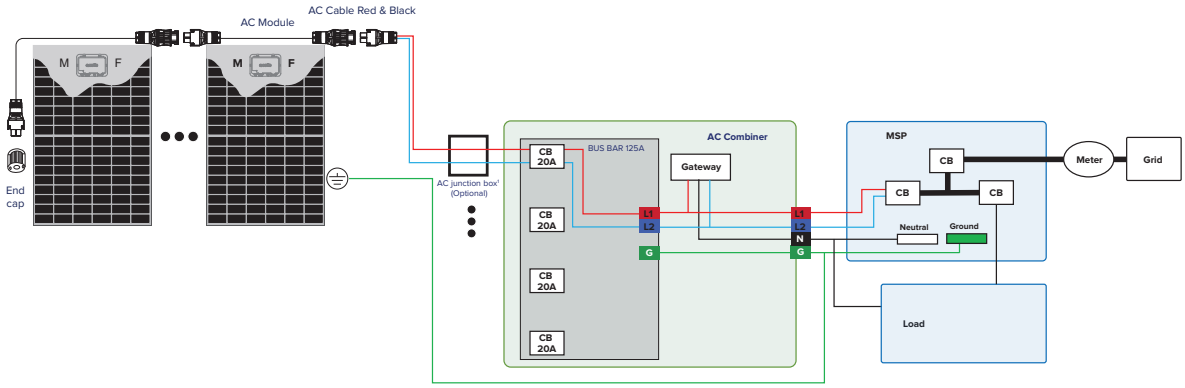
13 System Installation Considerations

13.1 PV Rapid Shutdown Equipment (PVRSE)

The AC module and AC combiner products are UL listed as PV Rapid Shutdown Equipment, and collectively make a PV Rapid Shutdown System (PVRSS); conforming to the requirements of NEC (NFPA 70) section 690.12.

Any other equipment installed in or on this PV system may adversely affect the operation of the PVRSS. It is the responsibility of the installer to ensure that the completed PV system meets all rapid shut down requirements.

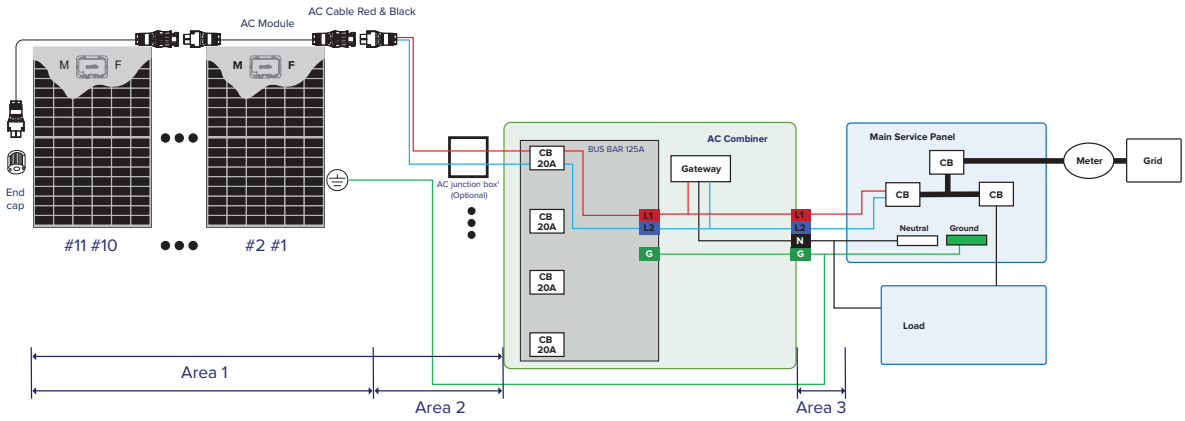
13.2 Solar Configuration Field Wiring Diagram



- Ground the AC modules according to local requirements.
  ※ Qcells AC modules have integrated ground and double insulation, so no GEC (grounding electrode conductors) or EGC (equipment grounding conductors) are required.
- AC junction box is optional and voluntarily determined to be installed based on installer decision. (optional)
- The Q.TRON AC module uses a two-wire system and does not have neutral connection. However, the Q.HOME COMBINER still requires a neutral connection from the main service panel.

13.3 AC Cable and Voltage Rise

AC system configuration with Q.TRON AC Module (w/Q.MI.349B-G1 (model name))



Area	Description
1	Voltage rise of the Qcells AC Cable to the rooftop junction box (or back to the Combiner if ran using the AC raw cable). See the VRise tables for Qcells AC Cable and Qcells AC Raw Cable as applicable.
2	Voltage rise from a rooftop junction box to the AC Combiner. See the VRise of Conductor lengths by wire section tables.
3	Voltage rise from the AC Combiner (or PV subpanel) to the MSP. See the VRise of Conductor lengths by wire section tables.

Calculate and verify that the total voltage rise is less than 2 %. The following sections provide formulas and tables needed to determine the expected voltage rise. Additional losses (at terminals, circuit breakers, etc.) should be minimal and can be ignored.

Calculating Total Voltage Rise

1. Qcells AC Cable

The Qcells AC Cable is a continuous length of 12 AWG stranded copper, outdoor-rated cable, with integrated connectors for the Q.TRON AC Module (w/ Q.MI.349B-G1 (model name)). The following table provides the associated lengths of AC Cables.

Voltage type and conductor count	Item	PV module orientation	Length
240 VAC, two conductors	CAS-HQ-SH-650	Portrait	1.3 m (4.2 ft)
240 VAC, two conductors	CAS-HQ-SH-800	Portrait	1.6 m (5.2 ft)
240 VAC, two conductors	CAS-HQ-LO-1000	Portrait, Landscape	2.0 m (6.5 ft)
240 VAC, two conductors	CAS-HQ-LO-1300	Portrait, Landscape	2.6 m (8.5 ft)

2. Voltage rise formula

All resistances of the system components are in series and are cumulative. Since the same current flows through each resistance, the total VRise is the total current times the total resistance.

The VRise percentage for an AC system is :

% of Total VRise = % VRise Area 1 + % VRise Area 2 + % VRise Area 3

% VRise Area 1 = % by number of Microinverters in Internal VRise of AC Cable longest string
= [$\sum_{1}^{n}$ {(amps/inverter x number of inverters) x (Ω/ft x 2−way wire length)" }] ÷ 240 VAC × 100

"n" is number of Microinverters for longest string

% VRise Area 2 = VRise Section 2 ÷ 240 VAC × 100
= (amps/inverter × number of inverters) × (Ω/ft × 2-way wire length of Area 2)

"number of inverters" is the total number of inverters in longest string connected to the Q.HOME COMBINER

% VRise Area 3 = VRise Section 3 ÷ 240 VAC × 100
= (amps/inverter × number of inverters) × (Ω/ft × 2-way wire length of Area 3)

"number of inverters" is the total number of inverters in longest string connected to the Q.HOME COMBINER

3. VRise of Qcells AC Cable

Use the following tables to determine the voltage rise attributed to the AC Cable.
Reference the module orientation and AC Cable length to select values from the appropriate table.

Qcells AC Cable Vrise (CAS-HQ-SH-650 for Portrait Orientation)											
	1	2	3	4	5	6	7	8	9	10	11
Current [A]	1.45	2.91	4.37	5.82	7.28	8.73	10.18	11.64	13.09	14.55	16.00
Vrise [V]	0.02	0.07	0.14	0.24	0.36	0.51	0.68	0.88	1.10	1.35	1.62
Vrise [%]	0.01	0.03	0.06	0.10	0.15	0.21	0.28	0.37	0.46	0.56	0.68

Qcells AC Cable Vrise (CAS-HQ-SH-800 for Portrait Orientation)											
	1	2	3	4	5	6	7	8	9	10	11
Current [A]	1.45	2.91	4.36	5.82	7.27	8.73	10.18	11.63	13.09	14.54	16.00
Vrise [V]	0.03	0.09	0.18	0.30	0.45	0.64	0.85	1.09	1.36	1.66	2.00
Vrise [%]	0.01	0.04	0.08	0.13	0.19	0.26	0.35	0.45	0.57	0.69	0.83

Qcells AC Cable Vrise (CAS-HQ-SH-1000 for Landscape Orientation)											
	1	2	3	4	5	6	7	8	9	10	11
Current [A]	1.45	2.91	4.37	5.82	7.28	8.73	10.18	11.64	13.09	14.55	16.00
Vrise [V]	0.04	0.12	0.23	0.38	0.57	0.80	1.06	1.36	1.70	2.08	2.50
Vrise [%]	0.02	0.05	0.10	0.16	0.24	0.33	0.44	0.57	0.71	0.87	1.04

Qcells AC Cable Vrise (CAS-HQ-SH-1300 for Landscape Orientation)											
	1	2	3	4	5	6	7	8	9	10	11
Current [A]	1.45	2.91	4.36	5.82	7.27	8.73	10.18	11.63	13.09	14.54	16.00
Vrise [V]	0.05	0.15	0.29	0.49	0.74	1.03	1.38	1.77	2.21	2.70	3.24
Vrise [%]	0.02	0.06	0.12	0.20	0.31	0.43	0.57	0.74	0.92	1.13	1.35

VRise of Qcells AC Raw Cable Lengths

When using Qcells AC Raw Cable (CAB-HQ-KIT-200), reference the count of Q.TRON AC Module (w/Q.MI.349B-G1 (model name)) MIs and the cable length to on the following table to find the voltage rise for this section.

feet	Q.TRON AC Module (w/Q.MI.349B-G1 (model name)) per string										
	1	2	3	4	5	6	7	8	9	10	11
10	0.02	0.05	0.07	0.10	0.12	0.14	0.17	0.19	0.22	0.24	0.26
15	0.04	0.07	0.11	0.14	0.18	0.22	0.25	0.29	0.32	0.36	0.40
25	0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60	0.66
40	0.10	0.19	0.29	0.38	0.48	0.58	0.67	0.77	0.86	0.96	1.06
60	0.14	0.29	0.43	0.58	0.72	0.86	1.01	1.15	1.30	1.44	1.58
80	0.19	0.38	0.58	0.77	0.96	1.15	1.34	1.54	1.73	1.92	2.11
100	0.24	0.48	0.72	0.96	1.20	1.44	1.68	1.92	2.16	2.4	2.64

VRise of Conductor lengths by wire section

Use the following table to help determine the proper wire size based on the number of Q.TRON AC Module (w/Q.MI.349B-G1 (model name)) MIs in the circuit, and the length of the wire section.

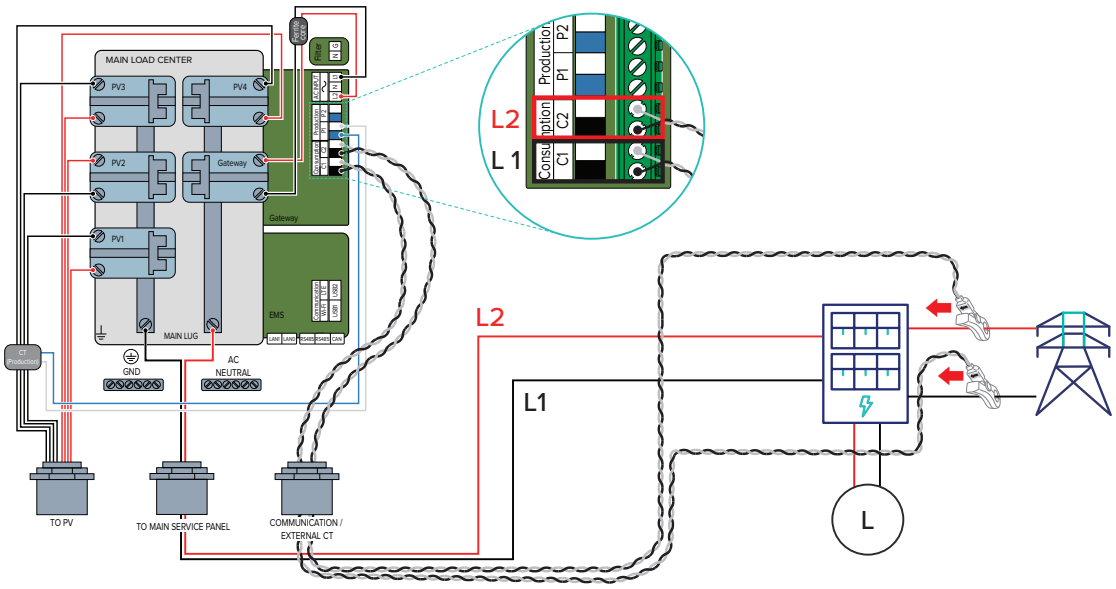
- When determining the VRise in Area1, use the MI count of the longest string.
- When determining the VRise in Area 2 (homerun lines), use the MI count of the longest string.
- When determining the VRise in Area 3, used the combined MI Count (inclusive of all strings).

The tables list the maximum length (ft) a particular conductor can be run to maintain 1% voltage rise for this section of wire. Keep in mind that if multiple sections are combined, then the conductor size should be increased appropriately.

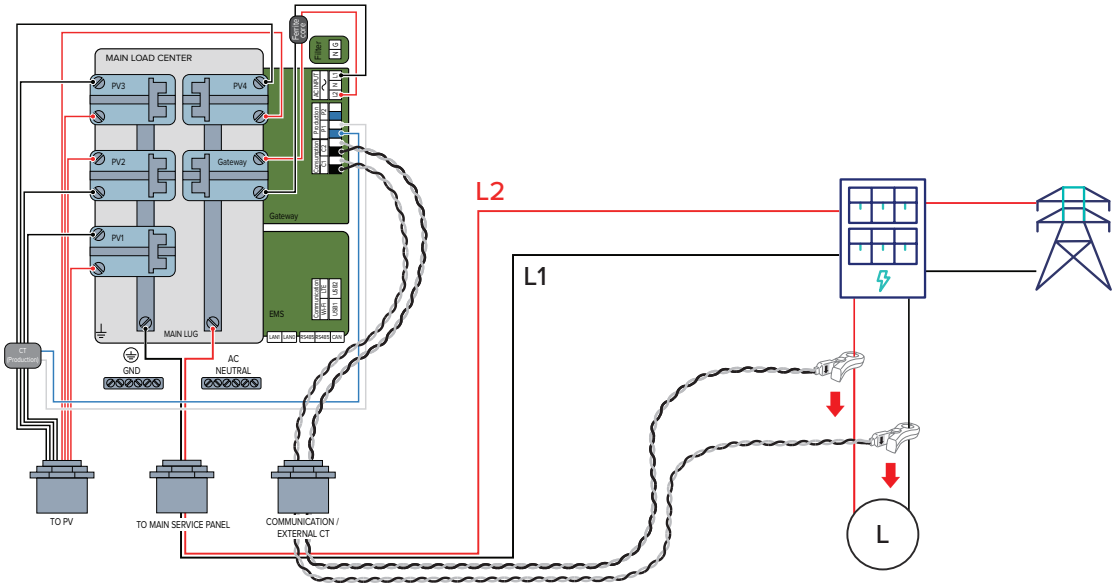
AWG	Number of Q.TRON AC Module (w/Q.MI.349B-G1 (model name))														
	3	6	9	11	14	17	20	23	26	29	32	35	38	41	44
	Max length to maintain ≤1% Vrise (ft)														
12	139	70	46	38	30	24	21	18	16	14	13	12	11	10	9.5
10	222	111	74	61	48	39	33	29	25	23	21	19	17	16	15
8	354	177	117	97	76	63	53	46	41	36	33	30	28	26	25
6	562	281	187	153	120	99	84	73	65	58	53	48	44	41	38
4	895	448	298	244	192	158	134	116	103	92	84	76	70	65	61
3	1125	563	375	307	241	198	165	146	130	116	105	96	89	82	77
2	1420	711	474	388	304	251	213	185	164	147	133	122	112	104	97
1	1790	896	597	488	384	316	268	233	206	185	167	153	141	131	122

13.4 Consumption CT Wiring

Grid (PV + Load) side Installation



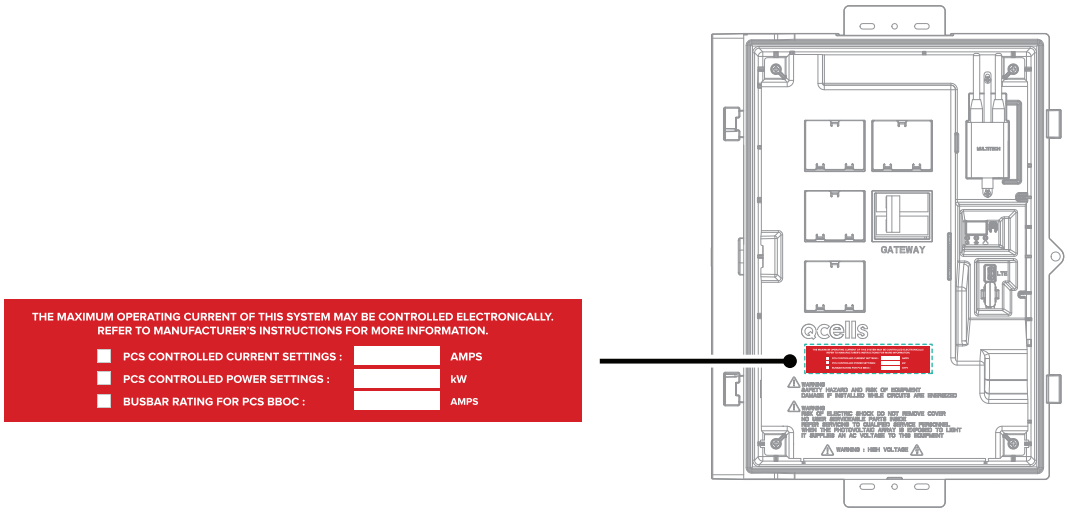
Load side Only Installation



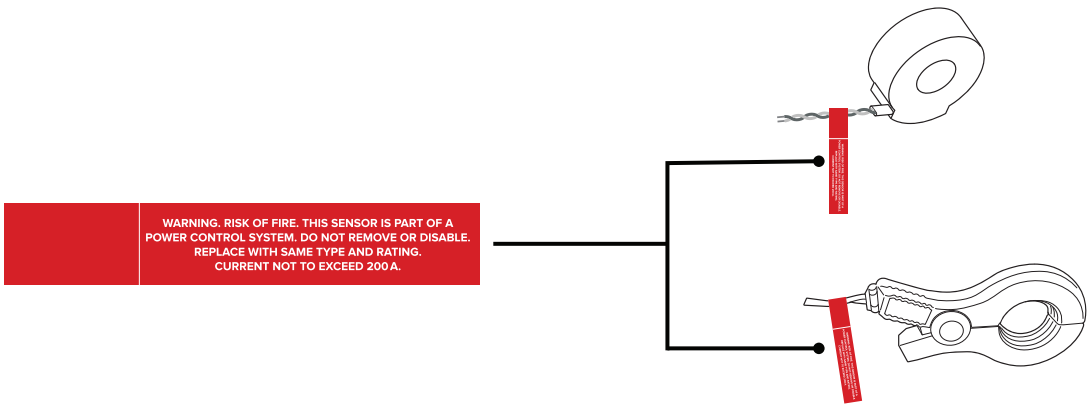
Due to bi-directional energy flow, consumption metering has specific polarity to define whether the power is importing or exporting. The consumption CTs should be installed appropriately according to the direction indication label attached on the edge of the clamp CTs. The red arrow represents the marking on the consumption CTs. Although both the Grid (PV + Load) side and the Load side are acceptable, we recommend using the Grid (PV + Load) side.

13.5 PCS Labels

For site where the system output is limited by the Qcells PCS, a label indicating the configured PCS mode must be attached to the Q.HOME COMBINER. Mark the left white box according to the configured PCS mode. Record the current or power setting value in the right white blank. Apply this label on the Q.HOME COMBINER deadfront at the recommended position shown in the image below. This label is provided as a component of the Q.HOME COMBINER.



Q.HOME COMBINER also provides PCS labels for current transformers. Apply these labels to the current transformers that enable the PCS modes. Align the white line on the label with the wires near the conductor of the current transformer, then fold the left side and attach it.



14 Commissioning the System

If you do not yet have an account, you will need to register as an installer and generate an account prior to commissioning the system via Q.OMMAND PRO.

14.1 Q.OMMAND PRO App

To commission the product via mobile device (phone/tablet), search and install the Q.OMMAND PRO app in the Apple App Store or Google Play Store. Scan the QR code below to access to Q.OMMAND PRO manual.

Android iOS

14.2 Q.OMMAND PRO Web

To commission the product via computer web browser, visit: qommand.qcells.com

14.3 Q.OMMAND PRO Manual

Scan the QR code below the access to Q.OMMAND PRO manual.

15 Troubleshooting

WARNING Only qualified personnel may service this equipment.

This section contains information and procedures for troubleshooting Q.HOME COMBINER, and provides tips to identify and solve most problems that could occur with the system.

This section will help narrow down the source of any problem you may encounter. Please read the following troubleshooting steps.

Be aware that the error codes described in the table below will be shown in both the FND display indicator and Q.OMMAND PRO, and other error codes not included in the table below will only be shown in Q.OMMAND PRO. On the FND display, an indication starting with 'E' is the error code. In the normal operation state, no error code is displayed and the number of paired AC modules and generated power are alternately displayed. If there is a fault in the operation, the number of paired AC modules, generated power and error code are all alternately displayed.

* Qcells Microinverter (Q.MI.349B-G1 (Model Name))

Q.OMMAND PRO App	Description	Recommended Actions
M001	Microinverter not powered (Link voltage error)	1. Check the connection status. 2. Disconnect the DC (PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace microinverter.
M002	Microinverter not powered (Temp error)	1. Check the connection status. 2. Disconnect the DC (PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace microinverter.
M003	Grid frequency out of range of operation	1. Check the Grid profile setting. 2. Check Grid voltage and Frequency in monitoring. 3. If the system frequency is 0Hz, Check the circuit breaker and AC connector wiring. (Check microinverter to distribution box connection) 4. Check the utility meter grid voltage and frequency. 5. If there is no problem with the system, replace microinverter.
M004	Grid voltage out of range of operation	1. Check the Grid profile setting. 2. Check Grid voltage and Frequency in monitoring. 3. If the system voltage is 0V, Check the circuit breaker and AC connector wiring (check the microinverter to distribution box connection). 4. Check the utility meter grid voltage and frequency. 5. If there is no problem with the system, replace microinverter.
M005	Microinverter not powered (Memory error)	1. Check the connection status. 2. Disconnect the DC (PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace the microinverter.
M006	Microinverter not powered (Ouput current over)	1. Check the connection status. 2. Disconnect the DC (PV) connector (wait for 10 seconds) and reconnect it. 3. If the error persists, replace the microinverter.

Q.OMMAND PRO App	Description	Recommended Actions
M007	Microinverter not powered (Internal diagnosis error)	1. Check the connection status. 2. Disconnect the DC (PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace the microinverter.
M008	PV voltage out of range of operation	1. Check PV Module status and PV connector connection. 2. Check PV voltage. 3. If there is a problem with PV status, replace the AC module. 4. If PV is working as expected, replace the microinverter.
M009	Microinverter not powered (Input current over)	1. Check the connection status. 2. Disconnect the DC(PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace the microinverter.
M010	Microinverter not powered (Temp sensor error)	1. Check the connection status. 2. Disconnect the DC(PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace the microinverter.
M011	Microinverter not powered (Unintentional islanding)	1. If error persists, Check Grid status. 2. Check the circuit breaker and AC connector wiring. 3. Disconnect the DC(PV) connector (wait for 10 seconds) and reconnect it. 4. If there is no problem with the system, replace the microinverter.
M012	Microinverter not powered (ADC error)	1. Check the connection status. 2. Disconnect the DC(PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace the microinverter.
M013	Microinverter not powered (Over surge detection)	1. Check the connection status. 2. Disconnect the DC(PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace the microinverter.
M014	Microinverter not powered (Fucntion check error)	1. Check the connection status. 2. Disconnect the DC(PV) connector (wait for 10 seconds) and reconnect it. 3. If error persists, replace the microinverter.
M015	Microinverter not reporting	1. Check AC/DC connector wiring. 2. Disconnect the DC(PV) connector (wait for 10 seconds) and reconnect it. 3. If there is no problem with AC/DC connector wiring, replace the microinverter.

Display Indication/ Q.OMMAND PRO App	Description	Recommended Actions
E01/A001	AC Modules Count Mismatch: The number of AC Modules scanned by the Q.OMMAND PRO App does not match the intended total number of AC Modules set in the app during commissioning.	1. Check that the number of AC modules entered in the Q.OMMAND PRO app PLC Scan menu is same as the number of installed AC modules. 2. Check that all PV string breakers in Q.HOME COMBINER are closed. 3. Check the serial number of scanned AC modules in the Q.OMMAND PRO app, find the module that is not scanned and check the cable connection status. After checking the cable connection status, try PLC scan again. 4. Check all the AC/DC cabling and try scanning again. 5. Check if time out has not occurred with PLC scan with the Q.OMMAND PRO app, and scan for a longer time by increasing the PLC scanning time in the app. 6. If the fault still occurs, contact Qcells Customer Support for further guidance.
E21/E22 /A002	Negative Production Power Value: Production/External Production metering value is negative	1. Check L1/L2/N connection in Q.HOME COMBINER main busbar or MSP/Hub. 2. Check the cable direction of Production CT. L1 cables should pass through the Production CT in the same direction as the arrow on the side of the CT. 3. Check all L1 cables are installed to pass Production CT. 4. Check the L2 cables are not installed to pass through the Production CT.
E03/A003	Internal PLC Chipset Error: Unable to communicate with the AC modules over the power line.	1. Turn the circuit breaker off and on. 2. If the error persists, replace the GEM Board (Gateway).
E04/A004	Internal Meter Chipset Error: Unable to perform metering.	1. Turn the circuit breaker off and on. 2. If the error persists, replace the GEM Board (Gateway).
E05/A005	Internal Memory Error: Access failed to EEPROM or Flash memory.	1. Turn the circuit breaker off and on. 2. If the error persists, replace the GEM Board (Gateway).
E06/A006	RGM Meter Error: Production metering AC voltage or current value is either too low or too high.	1. Check L1/L2/N connection in Q.HOME COMBINER main busbar or MSP/Hub. 2. Check all L1 cables are installed to pass through the Production CT. 3. Check the L2 cables are not installed to pass through the Production CT. 4. Turn the circuit breaker off and on. 5. If the error persists, replace the GEM Board (Gateway).
E07/A007	AC module firmware Update Error: Download failed to AC module for software upgrade.	1. Firmware update will be retried automatically, and the error will clear once the AC module firmware upgrade is complete. 2. If the error code persists for more than 3 days, contact customer service for further support.
U08	Q.HOME COMBINER Firmware GEM Board (Gateway) Updating	1. Firmware update will be completed automatically, and the error will clear once the Q.HOME COMBINER firmware upgrade is complete. 2. If the error code persists for more than 3 days, contact customer service for further support.

Q.OMMAND PRO App	Description	Recommended Actions
E003	GEM Board (Gateway) Connection Error	1. Check the gateway product setting value for communication. 2. Check gateway connection setting throught installer app or web. 3. Check the RS485 cable or Ethernet cable between EMS and gateway product. If there is any damage to the cable, replace the cable. 4. Update the product with stable software through the installer app. 5. If the gateway product is broken, replace it. 6. If the problem persists, replace the EMS board.
E004	Internet Connection Error	1. Check the network environment of the installation location. 2. Check whether the network type (Ethernet, Wi-Fi, LTE) is set appropriately through the installer app or web. 3. Replace Ethernet, Wi-Fi dongle, or LTE modem. 4. If the problem persists, replace the EMS board.
E014	Board Temperature High	1. This code will be automatically removed. 2. If the error persist, update the product with software through the installer app. 3. Check and adjust whether there are any problems in the actual installation environment.
E017	Cloud Disconnection	1. Check the network environment of the installation location. 2. Check whether the network type (Ethernet, Wi-Fi, LTE) is set appropriately through the installer app or web. 3. Replace Ethernet, Wi-Fi dongle, or LTE modem. 4. If the problem persists, replace the EMS board.

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