



Powerwall 2 AC Installation Manual

with Backup Gateway 2

For the latest Powerwall installation documents in all supported languages, visit:

www.tesla.com/support/powerwall.

To secure the full 10-year product warranty, Powerwall must be registered by completing the commissioning process and sending system information to Tesla.

Product Specifications

All specifications and descriptions contained in this document are verified to be accurate at the time of printing. However, because continuous improvement is a goal at Tesla, we reserve the right to make product modifications at any time.

The images provided in this document are for demonstration purposes only. Depending on product version and market region, details may appear slightly different.

Errors or Omissions

To communicate any inaccuracies or omissions in this manual, send an email to: energy-pubs@tesla.com.

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Electronic Device: Do Not Throw Away

Proper disposal of batteries is required. Refer to local codes for disposal requirements.

For Private Households: Information on Disposal for Users of WEEE

This symbol on the product(s) and / or accompanying documents means that used electrical and electronic equipment (WEEE) should not be mixed with general household waste. For proper treatment, recovery and recycling, please take this product(s) to designated collection points where it will be accepted free of charge. Alternatively, in some countries, you may be able to return your products to your local retailer upon purchase of an equivalent new product.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

Please contact your local authority for further details of your nearest designated collection point.

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For Disposal in Countries Outside of the European Union

This symbol is only valid in the European Union (EU). If you wish to discard this product please contact your local authorities or dealer and ask for the correct method of disposal.



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ATTENTION: Read this entire document before installing or using Powerwall. Failure to do so or to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, or death, or can damage Powerwall, potentially rendering it inoperable.








Important Safety Instructions

This manual contains important instructions for the Tesla Powerwall 2 AC and Backup Gateway that must be followed during installation and maintenance of the system.




















Symbols Used

	<p>CAUTION: indicates a hazardous situation which, if not avoided, could result in minor injury or damage to the equipment.</p>		<p>RISK OF ELECTRIC SHOCK: indicates components that present risk of electrical shock.</p>
	<p>WARNING: indicates a hazardous situation which, if not avoided, could result in injury or death.</p>		<p>CAUTION, RISK OF ELECTRIC SHOCK, ENERGY STORAGE TIMED DISCHARGE. Discharge time is 5 minutes from de-energization.</p>
	<p>NOTE: indicates an important step or tip that leads to best results, but is not safety or damage related.</p>		<p>BIDIRECTIONAL TERMINAL: Indicates location of combined input/output connector on the equipment.</p>
	<p>REFER TO OPERATING INSTRUCTIONS: indicates that user should refer to operating or installation instructions before proceeding.</p>		<p>PROTECTIVE CONDUCTOR TERMINAL: Indicates location of grounding connection on the equipment.</p>

General Information

-  **WARNING:** Read this entire document before installing or using Powerwall. Failure to do so or to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, or death, or may damage Powerwall, potentially rendering it inoperable.
-  **WARNING:** A battery can present a risk of electrical shock, fire, or explosion from vented gases. Observe proper precautions.
-  **WARNING:** Powerwall installation must be carried out only by a competent electrician who is certified by Tesla and who has been trained in dealing with low voltage electricity.
-  **WARNING:** Powerwall is heavy. Use of lift equipment is recommended.
-  **WARNING:** Use Powerwall only as directed.
-  **WARNING:** Do not use Powerwall if it is defective, appears cracked, broken, or otherwise damaged, or fails to operate.
-  **WARNING:** Before beginning the wiring portion of the installation, ensure that Powerwall is switched off, and lock out any associated circuit breakers and disconnect switches (if applicable for the installation).



-  **WARNING:** Do not attempt to open, disassemble, repair, tamper with, or modify Powerwall. Powerwall and its components are not user serviceable. Batteries in Powerwall are not replaceable. Contact Tesla Support for guidance on repairs.
-  **WARNING:** To protect Powerwall and its components from damage when transporting, handle with care. Do not impact, pull, drag, or step on Powerwall. Do not subject Powerwall to any strong force. To help prevent damage, leave Powerwall in its shipping packaging until it is ready to be installed.
-  **WARNING:** Do not insert foreign objects into any part of Powerwall.
-  **WARNING:** Do not expose Powerwall or its components to direct flame.
-  **WARNING:** Do not install Powerwall near heating equipment.
-  **WARNING:** Do not immerse Powerwall or its components in water or other fluids.
-  **WARNING:** Install Powerwall and Backup Gateway in a location that prevents damage from flooding.
-  **WARNING:** Operating or storing Powerwall in temperatures outside its specified range might cause damage to Powerwall.
-  **WARNING:** Do not expose Powerwall to ambient temperatures above 60°C (140°F) or below -30°C (-22°F).
-  **CAUTION:** Do not use solvents to clean Powerwall, or expose Powerwall to flammable or harsh chemicals or vapors.
-  **CAUTION:** Do not use fluids, parts, or accessories other than those specified in this manual, including use of non-genuine Tesla parts or accessories, or parts or accessories not purchased directly from Tesla or a Tesla-certified party.
-  **CAUTION:** Do not place Powerwall in a storage condition for more than one (1) month, or permit the electrical feed on the Powerwall to be severed for more than one (1) month, without placing Powerwall into a storage condition in accordance with Tesla's storage specifications.
-  **CAUTION:** Do not paint any part of Powerwall, including any internal or external components such as the exterior shell or casing.
-  **CAUTION:** Do not connect Powerwall directly to photovoltaic (PV) solar wiring.
-  **CAUTION:** When installing Powerwall in a garage or near vehicles, keep it out of the driving path. If possible, install Powerwall on a side wall and/or above the height of vehicle bumpers.
-  **CAUTION:** Avoid installing Powerwall and Backup Gateway in direct sunlight.
-  **CAUTION:** Ensure that no water sources are above or near Powerwall or Backup Gateway, including downspouts, sprinklers, or faucets.
-  **CAUTION:** Ensure that snow does not accumulate around Powerwall or Backup Gateway.
-  **CAUTION:** Avoid installing the Powerwall and Backup Gateway where it will be exposed to direct sunlight or ambient temperatures greater than 35°C.



Powerwall Specifications

Performance Specifications

AC Voltage (Nominal)	120/240 V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Total Energy ¹	14 kWh
Usable Energy ¹	13.5 kWh
Real Power, max continuous	5 kW (charge and discharge)
Real Power, peak (10 s, off-grid/backup)	7 kW (charge and discharge)
Apparent Power, max continuous	5.8 kVA (charge and discharge)
Apparent Power, peak (10 s, off-grid/backup)	7.2 kVA (charge and discharge)
Maximum Supply Fault Current	10 kA
Maximum Output Fault Current	32 A
Overcurrent Protection Device	30 A
Imbalance for Split-Phase Loads	100%
Power Factor Output Range	+/- 1.0 adjustable
Power Factor Range (full-rated power)	+/- 0.85
Internal Battery DC Voltage	50 V
Round Trip Efficiency ^{1,2}	90%
¹ Values provided for 25°C (77°F), 3.3 kW charge/discharge power.	
² AC to battery to AC, at beginning of life.	

Mechanical Specifications

Dimensions ³	1150 mm x 753 mm x 147 mm (45.3 in x 29.6 in x 5.75 in)
Weight ³	114 kg (251.3 lbs)
Mounting	Floor or wall mount
³ Dimensions and weight differ slightly if manufactured before March 2019. Contact Tesla for additional information.	



Environmental Specifications

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Recommended Temperature	0°C to 30°C (32°F to 86°F)
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions	-20°C to 30°C (-4°F to 86°F)
	Up to 95% RH, non-condensing
	State of Energy (SoE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R
Ingress Rating	IP67 (Battery & Power Electronics)
	IP56 (Wiring Compartment)
Wet Location Rating	Yes
Noise Level @ 1m	< 40 dBA at 30°C (86°F)



Backup Gateway 2 Specifications

Performance Specifications

AC Voltage (Nominal)	120/240 V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Current Rating	200 A
Maximum Input Short Circuit Current	10 kA ¹
Overcurrent Protection Device	100-200A; Service Entrance Rated ¹
Overvoltage Category	Category IV
AC Meter	Revenue accurate (+/- 0.2 %)

¹When protected by Class J fuses, Backup Gateway 2 is suitable for use in circuits capable of delivering not more than 22kA symmetrical amperes.

Mechanical Specifications

Dimensions	660 mm x 411 mm x 149 mm (26 in x 16 in x 6 in)
Weight	20.4 kg (45 lb)
Mounting	Wall mount, Semi-flush mount

Environmental Specifications

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R



Tesla Powerwall comes with a warranty whose term depends on the connection of Powerwall to the Internet. To secure the full 10-year warranty for Powerwall, it must be reliably connected to the Internet to allow remote firmware upgrades from Tesla. If an Internet connection is not established or is interrupted for an extended period, and Tesla is unable to contact the owner, the warranty may be limited to 4 years. To ensure that the owner can receive the full 10-year warranty, be sure to complete the commissioning process so that registration information is sent to Tesla.








For more information, refer to the Powerwall Warranty for your region at www.tesla.com.



Powerwall and Backup Gateway 2 Installation Requirements

Powerwall comes with a separate Backup Gateway to enable integration with the electrical grid and generation like solar systems (refer to [Compatibility Matrix](#) for information on what can be connected with Powerwall). The Backup Gateway communicates with the system by means of wireless and wired connections. Wiring and conduit (where required) must be provided by the installer and installed to comply with local codes.

AC isolation and interconnection requirements between the Powerwall system and the electrical panel are subject to local codes. Ensure that the installation meets local isolation and interconnection requirements. All U.S. and Canada electrical installations must be done in accordance with local codes and the National Electric Code (NEC) ANSI/NFPA 70 or the Canadian Electrical Code CSA C22.1.

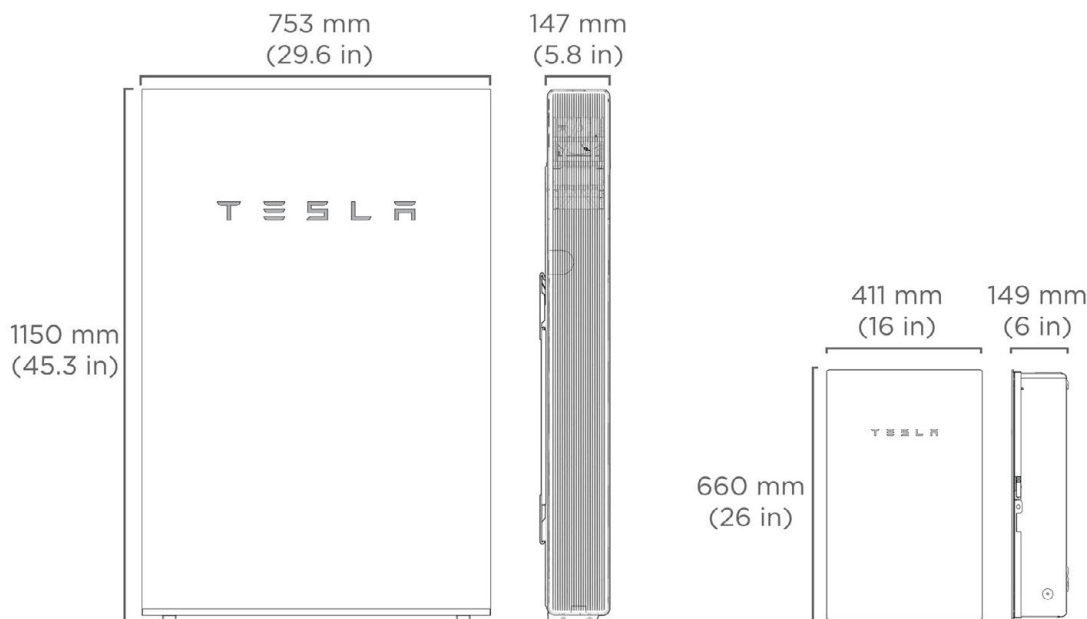
-  **WARNING:** All Powerwalls in the system must be installed on the 'Backup' side of the Backup Gateway's relay.
-  **WARNING:** When Powerwall is installed in a dwelling unit, fire detection and protection equipment should be installed in accordance with local building and fire codes.
-  **WARNING:** Do not connect the Backup Gateway in any way that bypasses or short-circuits its relay.
-  **WARNING:** Do not connect the Backup Gateway to the source side only or to the load side only. The Backup Gateway must have both source and load connections, and must be wired in compliance with local codes.
-  **CAUTION:** The Backup Gateway 2 is rated for 10 kA maximum supply fault current. Where local regulation requires a 10 kA rating, all breakers employed in circuit with the Backup Gateway 2 should also be rated to 10 kA.
-  **CAUTION:** The Manual Override switch inside of the product must not be used to simulate a grid outage or take home off-grid. A main isolation switch should be installed upstream of the Backup Gateway for testing the system and for service purposes.
-  **CAUTION:** Before installing, disconnecting, and/or adjusting current transformers for metering, ensure the circuits being measured are not energized and the system is completely powered down. Failure to de-energize the system may compromise operator and equipment safety.

NOTE: All installations must conform to the laws, regulations, codes, and standards applicable in the jurisdiction of installation.

The Backup Gateway must be wall-mounted and can be configured for cable entry at the top, bottom, rear, or sides of the enclosure. It requires adequate clearance for installation and cabling or conduit. Wiring and conduit (where required) must be provided by the installer and the installation must comply with local codes and UL514B requirements.



Figure 1. Powerwall 2 AC and Backup Gateway 2 Dimensions



Powerwall Physical Requirements

Powerwall can be mounted on a floor or wall, and includes a mounting bracket to support either configuration. Mounting Powerwall must follow the guidance outlined in this document. Mounting requirements based on wall type are provided in [Appendix A: Powerwall Mounting Details on page 41](#).

Powerwall requires adequate clearance for installation, cabling, and airflow. Do not install anything above Powerwall that limits access to the unit or that might fall and damage the unit. Do not mount Powerwall horizontally or upside down.

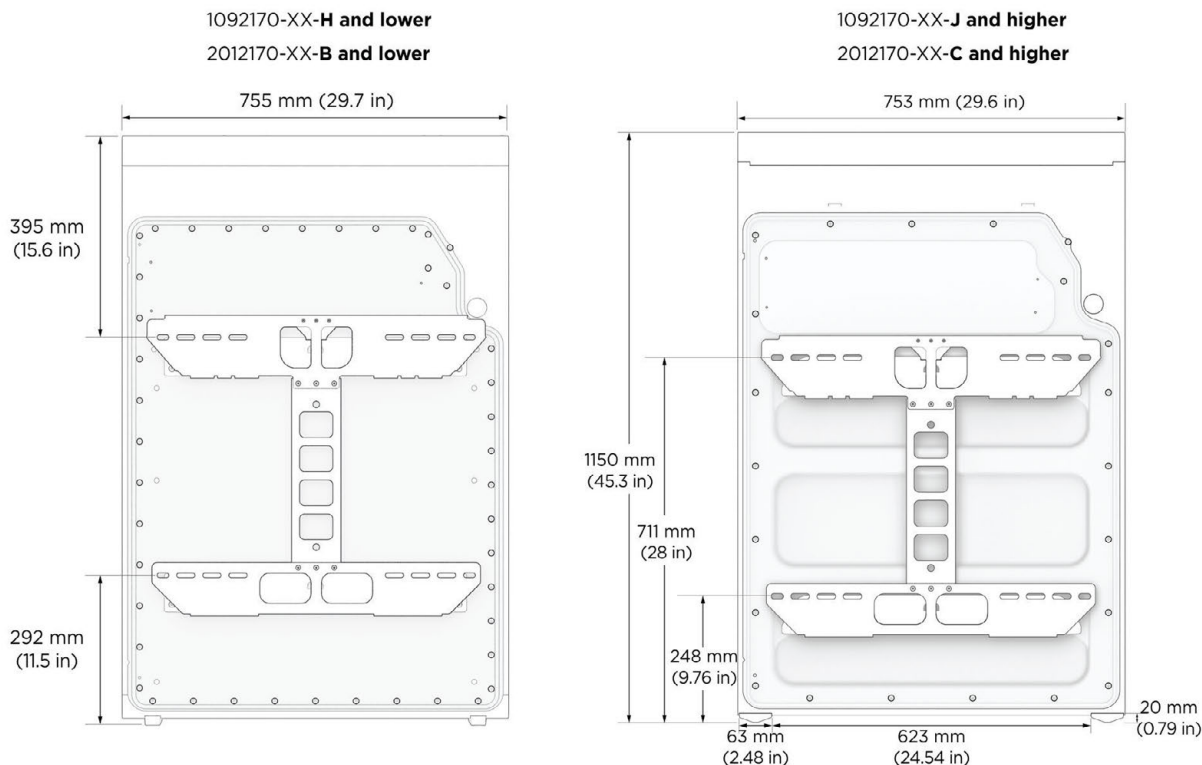
NOTE: Powerwall has a pump and fan that produce a gentle hum during operation, comparable to a typical refrigerator. The noise level depends on the ambient temperature and the power level of operation. Consider these noise levels when choosing where to install Powerwall.



Powerwall Identification

Newer Powerwalls have slightly different dimensions for mounting-bracket height. Powerwalls may be easily identified by part number and by comparing the back of the Powerwall.

Figure 2. Powerwall 2 Identification by Mounting Bracket Height



Powerwall Optimum Temperature Range

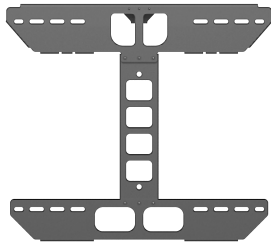
Powerwall is rated to operate in temperatures from -4°F to 122°F (-20°C to 50°C). However, for best performance Tesla recommends installing Powerwall in locations with ambient temperature between 32°F to 86°F (0°C to 30°C) year round. When outside this optimum temperature range, charge/discharge power may be reduced and Powerwall will utilize its thermal control system more frequently to maintain battery cell temperature which will reduce the energy efficiency of the system. Systems operating off-grid for long periods (>4 hours) in cold weather may need to curtail PV, and reduce energy used for pre-conditioning.

- For cold climates Tesla strongly recommends installing Powerwall indoors when possible (particularly when long outages are expected).
- For hot climates Tesla recommends keeping Powerwall out of direct sunlight. Installation in full sun raises the temperature inside the enclosure above ambient temperature. This temperature rise is not a safety risk, but may impact battery performance.

Additionally, if stored in a cold environment (e.g. below 0°C) before installation, it may take several hours for Powerwall to raise its internal temperature using pre-conditioning. Tesla recommends storing Powerwalls in a warm location prior to installation to help efficiently commission and test the system.



In the Powerwall Box



In the Powerwall Accessory Bag

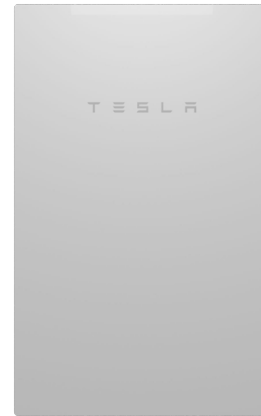
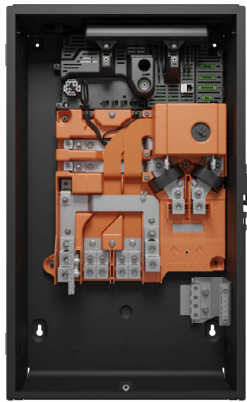
Powerwall Accessory Bag: Tesla P/N 1104517-00-x



1	2	3	4	5
Wiring compartment cover with (4) screws	(1) AC power harness	(3) Wago 2-position lever nuts	(1) 4-pin terminal block connector	(1) 4-pin terminal block connector with 120-Ohm terminating resistor
6	7	8	9	
(1) 32-mm reducing washer	(2) 25-mm reducing washers	(1) 35-mm rubber grommet	(1) drillable threaded cable gland	



In the Backup Gateway 2 Box



In the Backup Gateway 2 Accessory Bag



1	2	3
(1) Main circuit breaker adhesive label	(1) Tesla 100 A CT	(4) Sealing washers
4	5	
(1) Tesla CT extension cable harness [10 ft/3 m]	(1) Owner's Guide	



Required Tools

- Personal protective equipment (safety glasses, gloves, protective footwear)
- Drill and drill bit for drilling pilot holes in mounting surface
- Torque screwdriver with 1/4-inch bit holder and Torx T20 bit
- Large (5 mm) flathead driver bit (for Powerwall Earth terminal)
- Small (2 mm) flathead screwdriver (for wiring connector spring terminals)
- Torque wrench with 1/4-, 3/8-, and 5/16-inch Allen bit (for Backup Gateway power connections)
- Socket wrench with 8 mm hex socket
- Wire strippers/cutters for 24 AWG to 250 kcmil (0.2 mm² to 120 mm²) wires
- Installation tools (level, stud sensor, tape measure, pencil, painter’s tape, flashlight)
- Multimeter and Loop Impedance Tester
- Lift equipment capable of lifting and supporting 125 kg up to 1.5 m
- Ratcheting strap to secure Powerwall to lift equipment
- Digital camera or smartphone for documenting the installation

⚠ WARNING: Powerwall is heavy. Wear appropriate personal protective equipment (such as gloves and protective footwear) when handling the unit. Only a sufficient number of trained movers should lift Powerwall. Use of lift equipment is recommended.

Required Supplies

- Powerwall mounting bracket hardware (see [Appendix A: Powerwall Mounting Details on page 41](#))
- Backup Gateway mounting hardware
- Conduit or raceway (depending on local electrical requirements)
- Conduit adapters (necessary for cable entry into Powerwall wiring compartment and Backup Gateway)
- Minimum 600 V rated 4-conductor (twisted pair optional) or double-insulated (with one twisted pair) shielded copper (Cu) cable (for communication connection between Powerwall and the Backup Gateway)
- Minimum 600 V rated copper (Cu) cable (for power connections to Powerwall and the Backup Gateway)

Optional Accessory Kits and Orderable Parts

Part Number	Name	Description
1467316-00-x	Tesla 100 A CT	Additional Tesla 100 A CT (1 count)
1467274-00-x	Tesla 100 A CT Extension	Tesla 100 A CT Extension (10 ft / 3 m)
1529623-00-x	Internal Panelboard Kit	Optional internal panelboard kit with wire jumpers and breaker hold-down bar
1549184-00-x	2" Conduit Hub Kit	2" conduit hub and bolts
1549184-01-x	1.25" Conduit Hub Kit	1.25" conduit hub and bolts
1112484-02-x	Neurio Meter Kit with 200 A CTs	Neurio Meter Kit with (2) Neuroio 200 A CTs
1112477-00-x	Neurio Additional 200 A CTs	Additional Neuroio 200 A CTs (2 count)
1125547-03-x	Neurio CT Extension Wires	Neurio CT Extension Wires



Part Number	Name	Description
1447689-00-x	Neurio 800 A CTs	Neurio 800 A CTs (2 count)
1129625-00-x	Neurio CT Y Splitter	Neurio CT Y-Splitter to allow for paralleling CT connections
1133339-00-x	Neurio RS-485 meter communication harness	Neurio RS-485 cables that connect from meter to Gateway to ensure a hardwired connection
EP-PW-BUNDLE-1	Bundle 1	Two Neuroio 200 A CTs, two Neuroio CT Extension Wires, one Neuroio CT Y-Splitter
EP-PW-BUNDLE-2	Bundle 2	One Neuroio Meter Kit with two Neuroio 200 A CTs, two additional Neuroio 200 A CTs, four Neuroio CT Extension Wires, two Neuroio CT Y-Splitters, one Neuroio RS 485 cable
1107999-00-x	Powerwall 2 Mounting Bracket	Additional Powerwall Wall Mounting Bracket (1 bracket is included with every Powerwall)
1104517-00-x	Powerwall 2 Accessory Bag (North America)	Additional Powerwall 2 accessory bag for North American market (1 accessory bag is included with every Powerwall)
1112154-00-x	Powerwall 2 Stack Kit	Powerwall 2 Stack Kit for stacked Powerwall installs

Figure 3. Optional Internal Panelboard Kit



Figure 4. Conduit Hub Kit





Choose a Location

Choose a wall capable of supporting the full weight of Powerwall, with one of the following characteristics:

- Wood studs at regular intervals
- Plywood sheathing of sufficient thickness
- Solid concrete or masonry
- Metal studs of sufficient gauge

If floor-mounting Powerwall, choose a level surface adjacent to a wall space that meets the above requirements. Make sure the area is isolated from hazards that could damage Powerwall, such as vehicle traffic or flooding. Consider the spacing requirements for Powerwall (see [Appendix A: Powerwall Mounting Details on page 41](#)).

Choose Powerwall Cable Entry

Determine whether cables will be routed into Powerwall from the side or the back of the unit.

- For side cable entry, a conduit fitting or cable gland must be used to seal the entry into the wiring compartment.
- For back cable entry, a rubber grommet or cable gland is used to seal the entry into the wiring compartment.

NOTE: If Powerwall is mounted on a wall with studs spaced 24 inches apart, cable entry from the back of Powerwall may be blocked.

Choose Backup Gateway Cable Entry

Determine whether cables will be routed into the Backup Gateway from the top, bottom, sides, or rear of the enclosure.

NOTE: For cable entry at the top of the Backup Gateway enclosure, a Tesla Top Hub must be used in order to maintain enclosure ingress protection.

Plan the Electrical Service Connection to Backup Gateway

The Backup Gateway is service entrance rated. When installed at the service entrance, appropriate overcurrent protection must be installed in the Backup Gateway. The Backup Gateway can accommodate a main circuit breaker between 100 and 200 A. Breaker sizing and installation must comply with the National Electric Code.

Plan Amount and Size of Conduit or Raceway

Calculate the amount and size of conduit or raceway needed for the installation, based on fill limits and local code requirements. An adapter may be required between the entry into the Powerwall wiring compartment and the conduit.



Plan Distance Between Components

Follow the table below for maximum distances between system components. Wire gauge must meet local codes and in some circumstances wire gauge requirements change based on distance. Refer to [Appendix B on page 45](#) for wire gauge requirements.

	Maximum Cable Length
Backup Gateway to Powerwall(s)*	150 ft (45 m)
Neurio Energy Meter to Backup Gateway (RS485 wired connection)	164 ft (50 m)
Backup Gateway to Internet router (wired Ethernet connection)	328 ft (100 m)

*Total length of communications cable, including daisy-chained connections, through last Powerwall in chain

⚠ CAUTION: Failure to follow minimum cable size and length requirements may result in intermittent or unreliable operation of the Powerwall system. In systems that do not meet these minimum requirements, performance issues may arise even after successful commissioning.

Maximum CT Extension

Tesla 100 A CTs	Maximum Extension Length
Using 20 AWG (0.5 mm ²) or larger twisted pair conductors	Up to 330 ft (100 m)
Using Tesla 100 A CT Extension (10 ft/3 m) (Tesla P/N 1467274-00-x)	Up to 330 ft (100 m)

Neurio 200 A CTs (Remote Metering)	Maximum Extension Length
Using Neuroio CT extension harness (Tesla P/N 1125547-03-x)	Up to 15 ft (4.5 m)
Using 24-18 AWG (0.2-1.5 mm ²) shielded twisted pair with drain wire	Up to 50 ft (15 m)

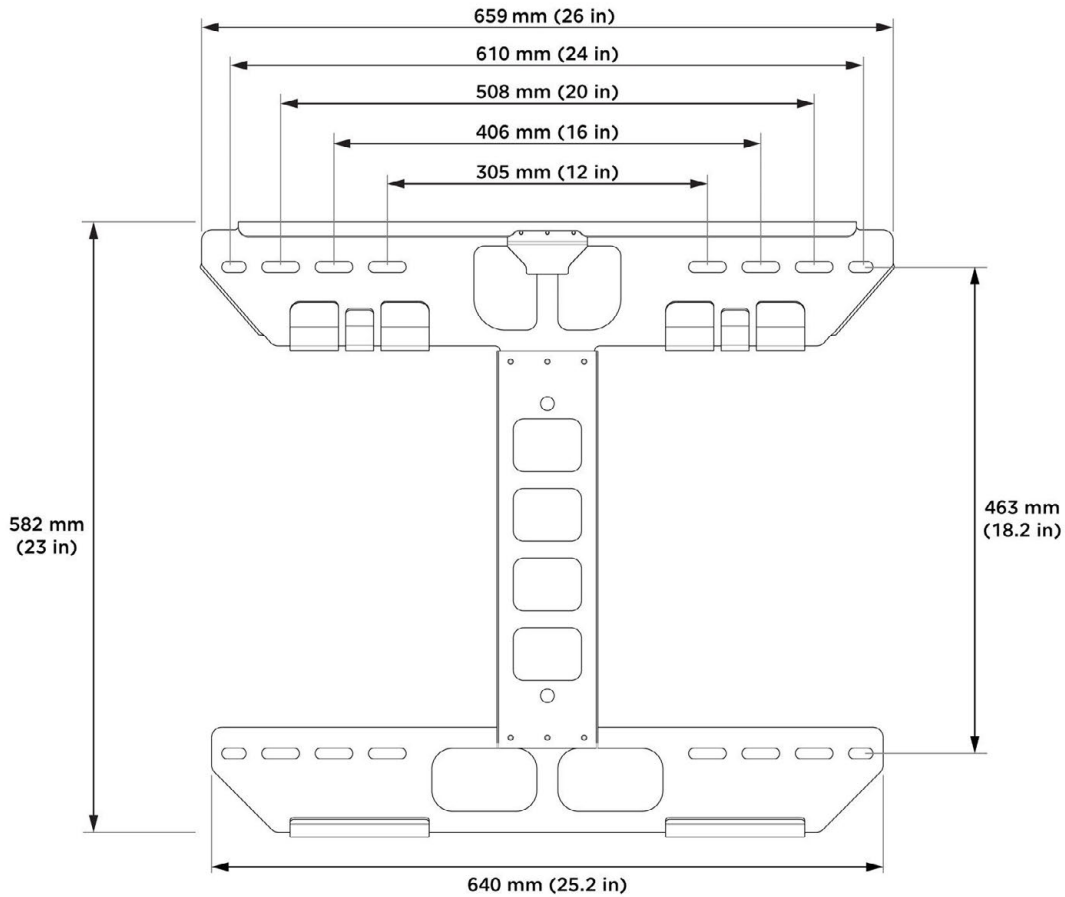


Anchor the Powerwall Mounting Bracket

NOTE: For detailed instructions on mounting Powerwall, including minimum spacing requirements, refer to [Appendix A: Powerwall Mounting Details on page 41](#).

- Using a drill and level, mount the bracket to the selected wall. See [Mounting Bracket Anchoring Details on page 42](#) for additional details on the type and number of fasteners to use.

Figure 5. Mounting Bracket Dimensions





2. For back cable entry installations, drill a hole in the wall corresponding to the back cable entry port.

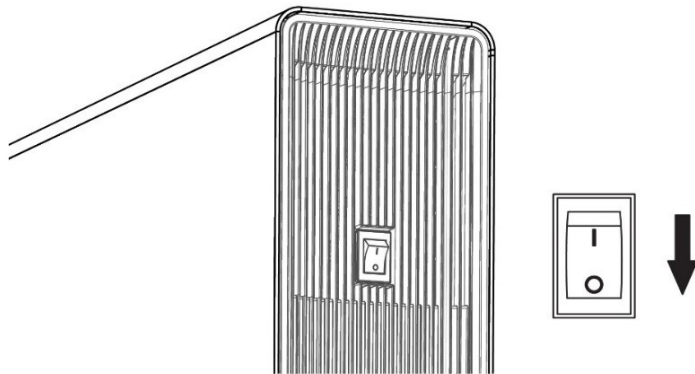
Table 1. Location of Back Cable Entry Port in Relation to Bracket

<p>14 mm (0.55 in)</p> <p>Ø 35 mm (1.375 in)</p> <p>24 mm (0.95 in)</p>	<p>14 mm (0.55 in)</p> <p>Ø 35 mm (1.375 in)</p> <p>68 mm (2.7 in)</p>
<p>1092170-XX-H and lower</p>	<p>1092170-XX-J and higher</p>
<p>2012070-XX-B and lower</p>	<p>2012070-XX-C and higher</p>

Mount Powerwall on the Bracket

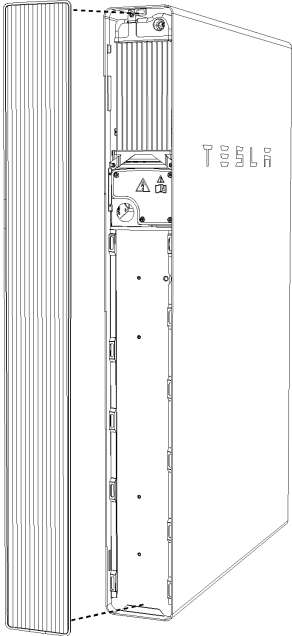
1. Switch off Powerwall.

⚠ WARNING: Switching off will ensure Powerwall does not grid form. However, AC voltage may still be present from the grid. Ensure all equipment is safely de-energized before working.



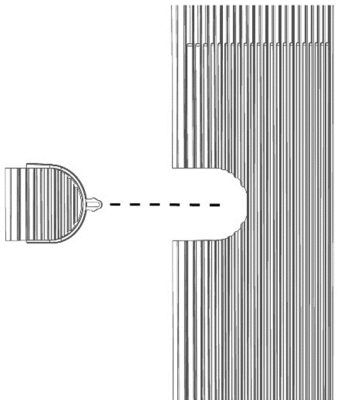


2. Remove the left side cover from Powerwall.



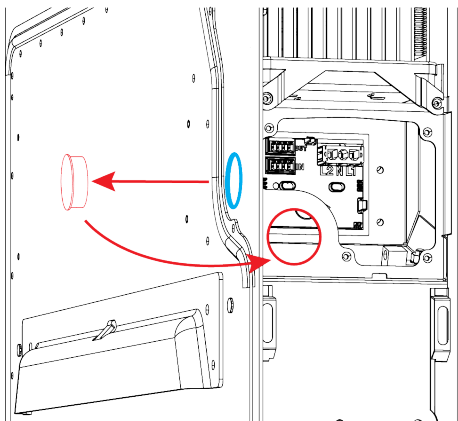
3. Prepare Powerwall for side or back cable entry:

a. For side cable entry installations, remove the side cable entry door from the left side cover.



b. For back cable entry installations, remove the plug from the back cable entry port and place it in the side cable entry port.

NOTE: The plug must always be placed in either the back or side cable entry port.



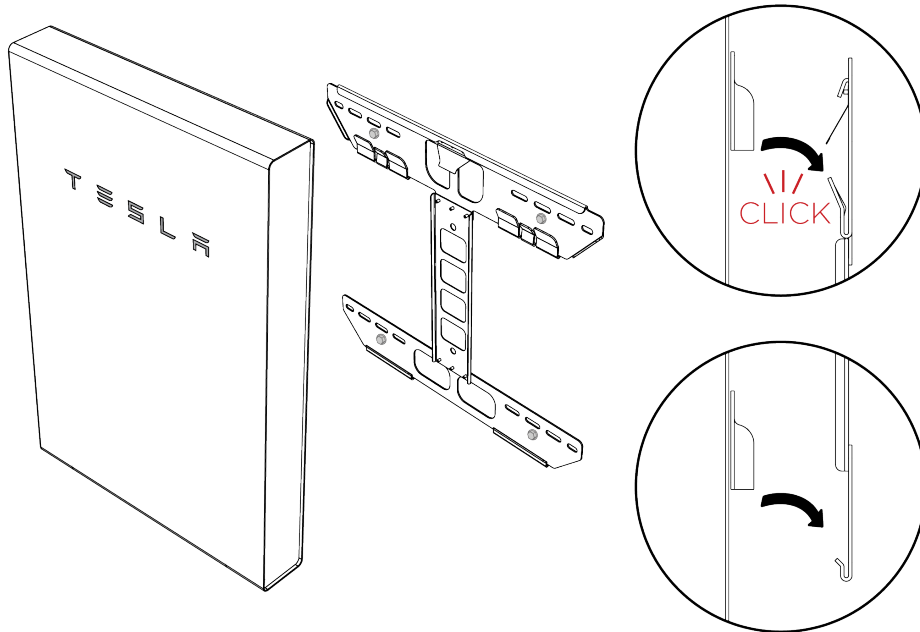
STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY



- Using lift equipment, position Powerwall close to the wall and adjust the height of Powerwall until its mounting cleats are just above the flanges on the bracket.
- Lower Powerwall until the top cleat engages the top flange on the bracket and the bottom cleat aligns with the bottom flange.
- With both cleats engaged, lower Powerwall onto the bracket. An audible click will be heard when the cleats are seated in the bracket and the locking mechanism at the center of the top flange clicks into place.

NOTE: To remove Powerwall from the mounting bracket, place a thin piece of sheet metal between the Powerwall unit and the bracket to compress the locking mechanism, and lift the Powerwall straight up.

Figure 6. Mounting Powerwall on the Bracket



- If floor-mounting Powerwall, use shims to ensure that Powerwall is level. The unit should be level within +/- 2 degrees side-to-side and within +/- 5 degrees front-to-back.
- If wall-mounting Powerwall, remove the feet from the unit.

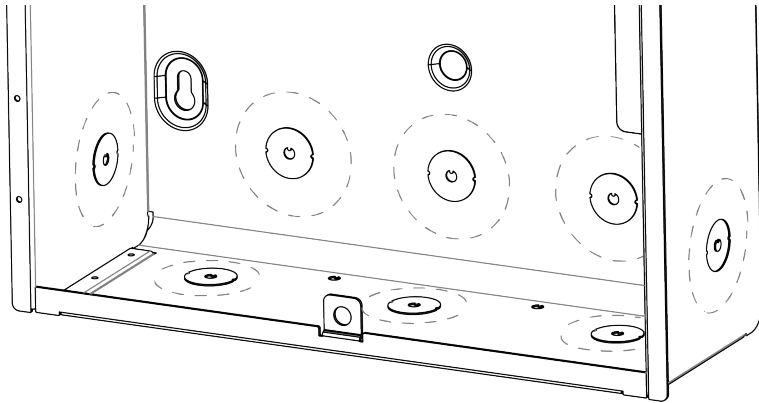
NOTE: Step 8 applies only to updated versions of Powerwall, see [Powerwall 2 Identification by Mounting Bracket Height](#) on page 11.



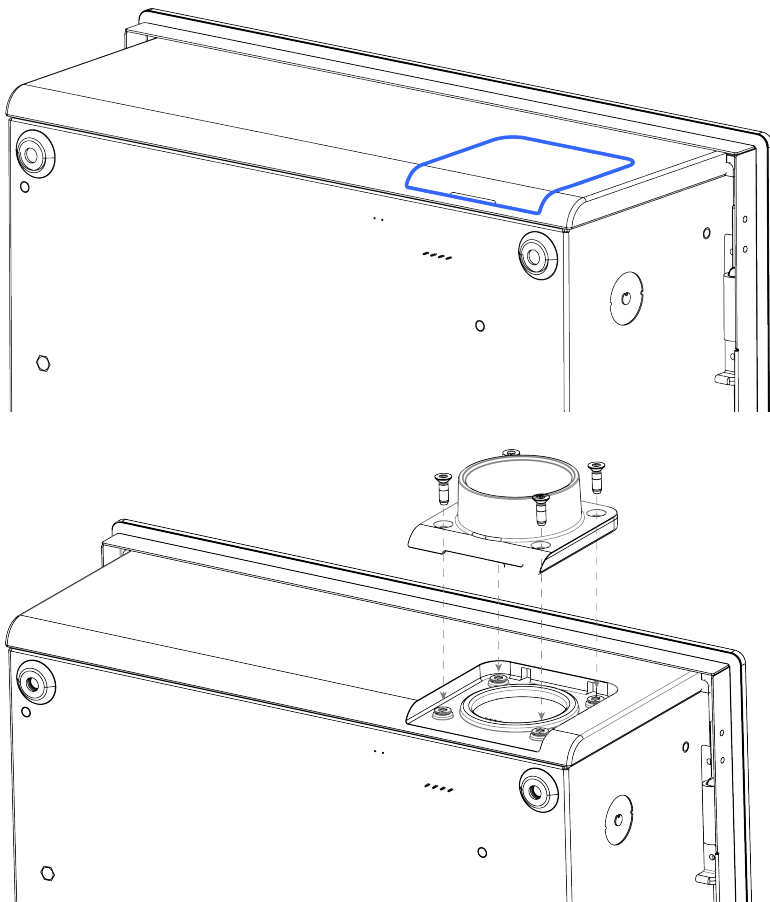
Mount the Backup Gateway

1. Using a hole saw, drill out the necessary cable access holes from the Backup Gateway. All cable knockouts are $\frac{3}{4}$ " in diameter but can be expanded to 2".

Figure 7. Cable Access Drill Guides



2. If using top cable entry, remove the Top Hub Cap from the enclosure and install the Tesla Top Hub (Tesla P/N 1549184-00-A (2-inch kit) or Tesla P/N 1549184-01-A (1.25-inch kit)).



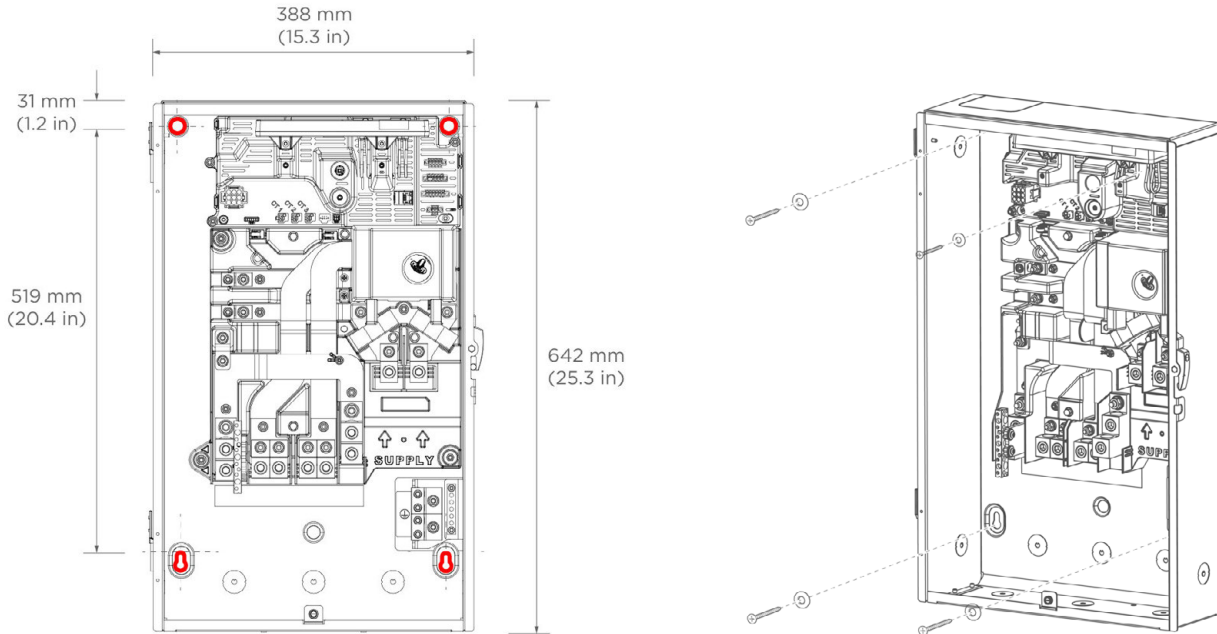
STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY



- Using a drill and level and ¼" screws, mount the Backup Gateway enclosure. The provided sealing washers must be used when mounting the Backup Gateway.

NOTE: Mount the Backup Gateway vertically, in the orientation shown in [Backup Gateway Enclosure Mounting Holes on page 23](#). Do not mount the Backup Gateway enclosure horizontally or upside down.

Figure 8. Backup Gateway Enclosure Mounting Holes



- Locate the Backup Gateway serial number on the label on the dead front cover. Record the serial number for reference.



Remove Neutral-Ground Bonding Strap from Backup Gateway if Not Installed as Service Equipment

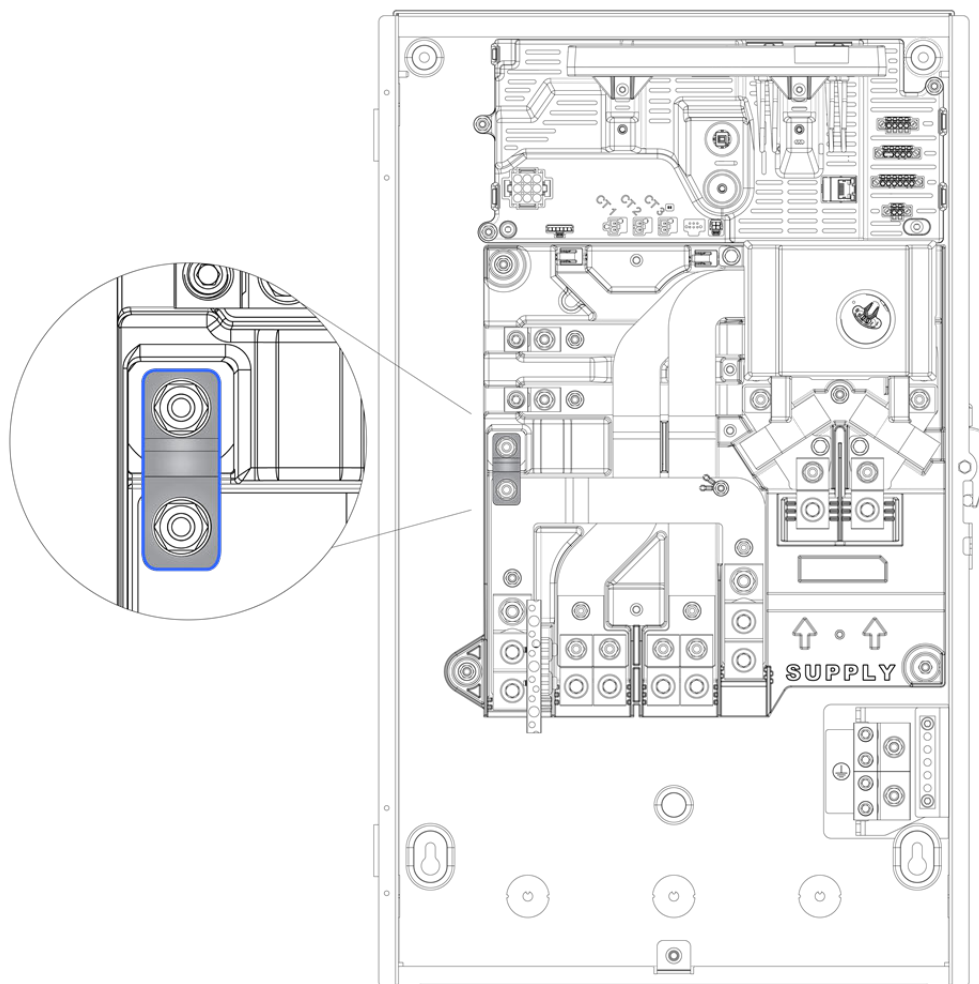
Proper earth connection and Neutral-to-Ground bonding is required for safe operation of the Powerwall system and for compliance with local code requirements.

When installed as Service Equipment, the factory-installed Neutral-Ground Bonding Strap bonds neutral to ground, as shown in Figure 8. The Neutral-Ground Bonding Strap must only be removed if not installed as Service Equipment, or for test purposes.

Use a 7/16-inch socket to remove the two nuts attaching the Neutral-Ground Bonding Strap.

If replacing the Neutral-Ground Bonding Strap, torque nuts to 65 in-lbs (7.4 N-m).

Figure 9. Neutral-Ground Bonding Strap Location



⚠ WARNING: To ensure safe operation in Backup Mode, a local earth connection must be present on the site such as by earth rod or ground electrode. Connection of earth rod must comply with local codes.



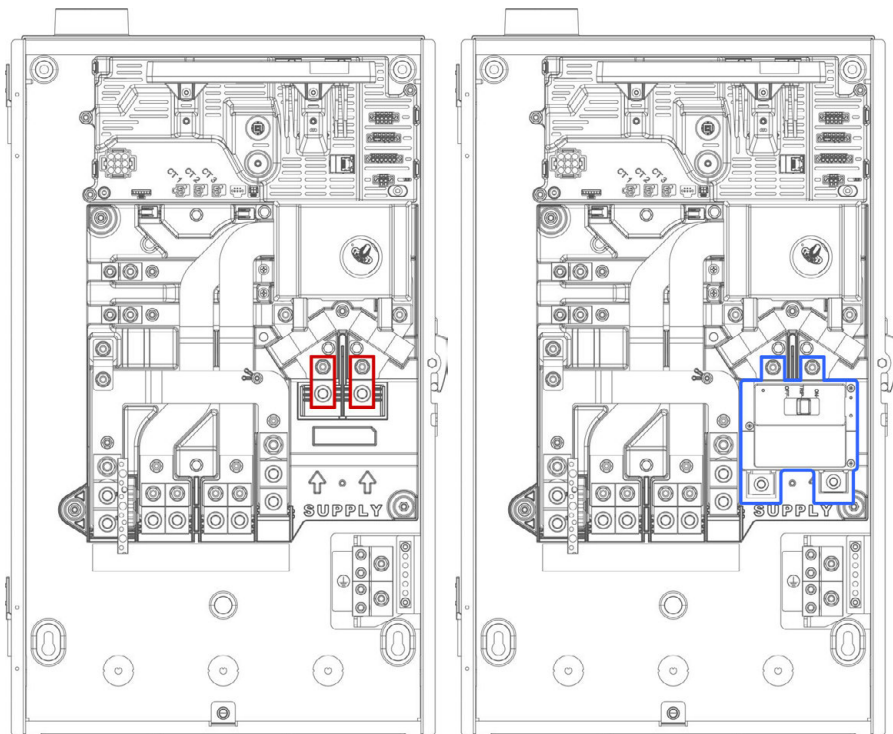
Install Main Breaker in Backup Gateway

When installed as Service Equipment, a main breaker must be installed. Eaton CSR or BW type breakers may be used; see [Eaton Breakers on page 48](#) for compatible breakers.

1. Remove the S1 and S2 supply lugs using a 7/16-inch hex socket.
2. Install the main breaker, torquing the two S1 and S2 nuts to 65 in-lbs (7.4 N-m) using a 7/16-inch hex socket.

NOTE: Main breaker wire lug cover caps are recommended any time a main breaker is installed in the Backup Gateway

Figure 10. Removing the S1 and S2 Supply Lugs to Install a Main Breaker



Make AC Power Connections to Supply and Load Panels

In each of the following steps:

- Strip the ends of the wires and insert into the corresponding Backup Gateway terminal lugs.
 - Using an appropriate torque tool, tighten the lugs according to the table on the following page.
 - Use copper or aluminum wire only.
1. Connect the supply conductors to the Backup Gateway Supply terminals according to [Conductor Connections on page 26](#) and the accompanying table.
 2. Connect the home load panel conductors to the Backup Gateway Backup terminals according to [Conductor Connections on page 26](#) and the accompanying table.
 3. For partial home backup with Non-Backup loads under 100 A, a Non-Backup panel can be connected. Connect the conductors (L1, L2, Neutral, and Ground) from the Non-Backup panel to the Backup Gateway's Non-Backup terminals according to [Conductor Connections on page 26](#) and the accompanying table.

STEP 4: MAKE AC POWER CONNECTIONS



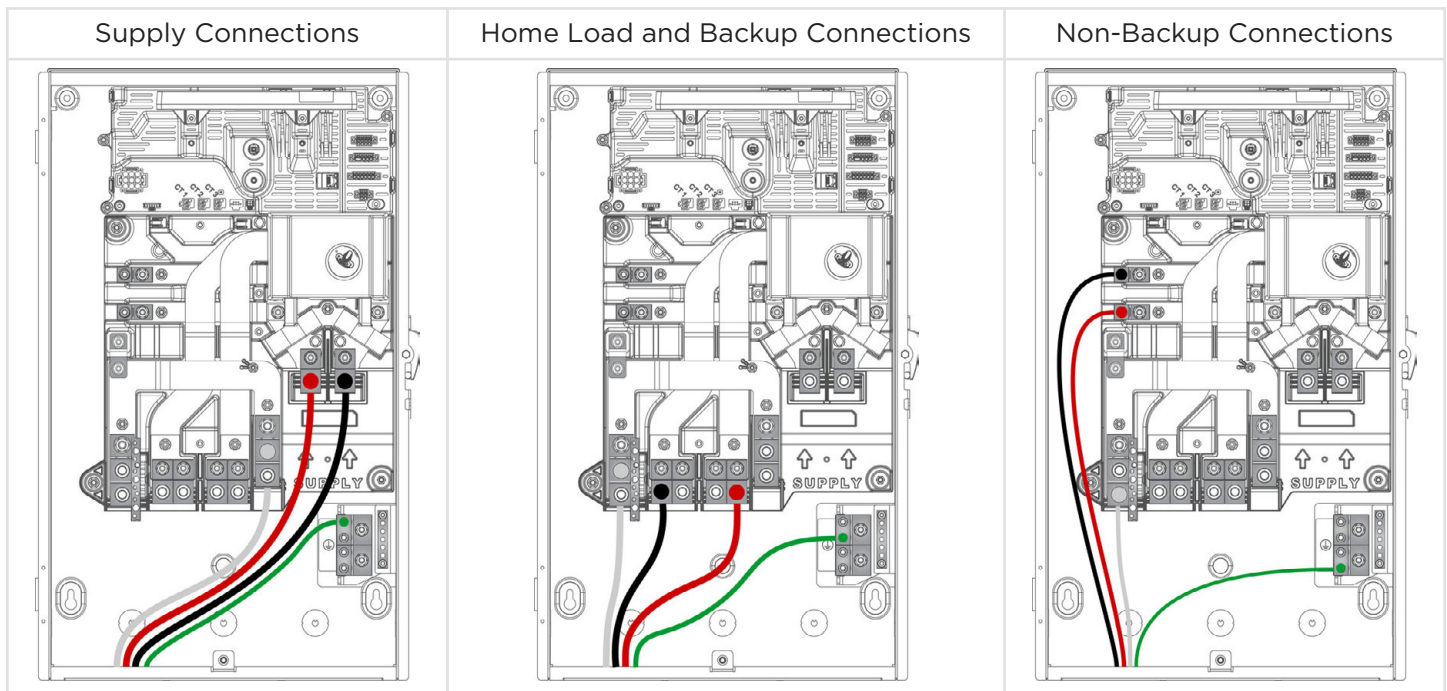
Any circuits connected here will not be powered when disconnected from the grid. During on-grid operation, these circuits are still metered by the internal site metering with no additional metering hardware required.

- ⚠ WARNING:** Always ensure all equipment is safely de-energized and locked out prior to working, to prevent risk of electric shock. To avoid shock hazard, never power on the system without a connection to Earth at the Gateway.
- ⚠ WARNING:** Incorrect wiring of AC conductors presents a risk of electrical shock or damage to equipment. Before energizing the system, ensure all connections are made correctly according to the instructions in this document and in accordance with local wiring codes and regulations.

Refer to [Appendix B: Wiring Reference on page 45](#) for all wiring requirements and recommendations, including wire colors and gauges.

Refer to [Appendix C: System Wiring Diagrams on page 49](#) for example system wiring diagrams.

Table 2. Conductor Connections



Terminal	Wire Gauge	Tool Size	Strip Length	Torque
Supply Lugs (S1, S2)	6 AWG - 250 kcmil	5/16-in hex	1.25 in (32 mm)	275 in-lbs (31 N-m)
Non-Backup Lugs (L1, L2)	14 - 2 AWG	3/16-in hex	3/4 in (20 mm)	120 in-lbs (14 N-m)
Backup Lugs (L1, L2)	6 AWG - 250 kcmil	5/16-in hex	1.25 in (32 mm)	275 in-lbs (31 N-m)
Large Neutral Lugs	6 AWG - 250 kcmil	5/16-in hex	1.25 in (32 mm)	275 in-lbs (31 N-m)
Large Earth Lugs	14 AWG - 2/0	3/16-in hex	3/4 in (20 mm)	120 in-lbs (14 N-m)

Design Considerations

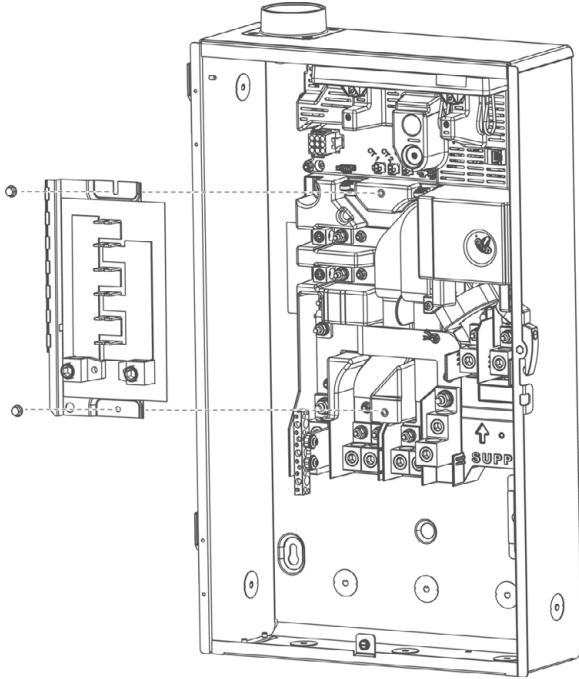
Refer to [Appendix F: Feature Notes on page 63](#) for information on the Backup Gateway load shedding feature, which can be used to interrupt any 60 V circuit when operating off-grid.



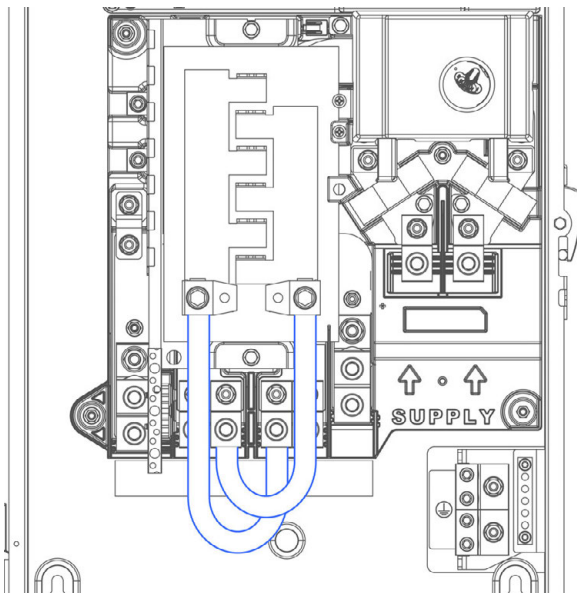
Install Optional Internal Panelboard in the Backup Gateway

The Internal Panelboard kit (Tesla P/N 1529623-00-x) may be installed in the Backup Gateway 2 and connected to either the Backup or the Non-Backup terminals by feeding a two pole breaker on the bussing.

1. Mount the Internal Panelboard into the Backup Gateway using the provided mounting screws (M5x12 hex bolts).

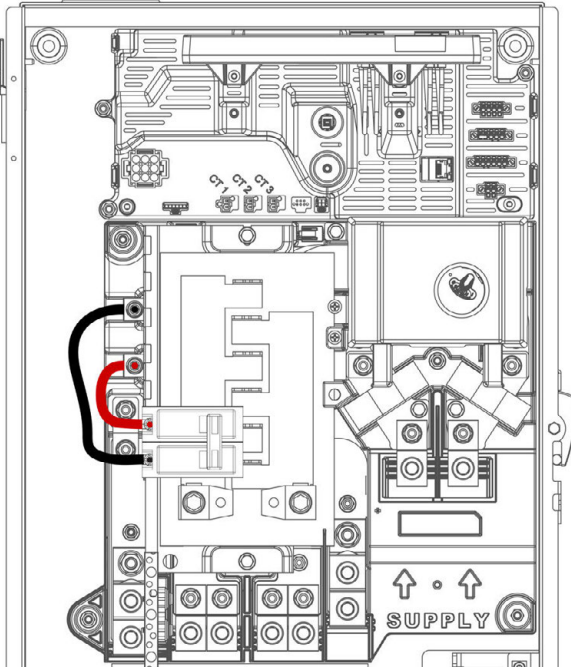


2. Connect the internal panelboard to either the backup (2a) or non-backup (2b) lugs:
 - a. Connect the L1 and L2 lugs on the bottom of the Internal Panelboard to the Backup lugs via the provided 105°C-rated CU wire jumpers.



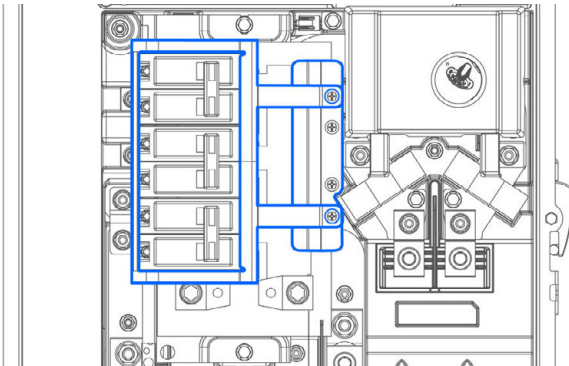


- b. Connect the Non-Backup Lugs to an Eaton BR breaker on the bussing (up to 100 A).



NOTE: The Eaton BR breakers are **required** when connecting the internal panelboard to the Non-Backup lugs to accommodate for wire gauge difference (see [Backup Gateway 2 Wiring on page 46](#) for wire gauge ranges).

3. Once all breakers have been installed, install the breaker hold-down if installing any back-fed or generation breakers on the bussing. Mount the hold-down bracket using the provided (2) M5-0.8x12 Philips head screws.



4. Place the adhesive circuit label on the deadfront to label circuits.

Design Considerations

The Internal Panelboard is 200 A-rated and supports 6x 1" breaker spaces (12 circuits) using Eaton BR branch circuit breakers up to 125 A maximum.

The Powerwall connection to the Backup Gateway always requires a 30 A circuit breaker. This breaker serves as circuit protection for the Powerwall. Breaker sizing and installation must comply with the National Electric Code.



Connect Powerwall to the Backup Gateway

NOTE: Refer to [Appendix B: Wiring Reference on page 45](#) for wiring specifications.

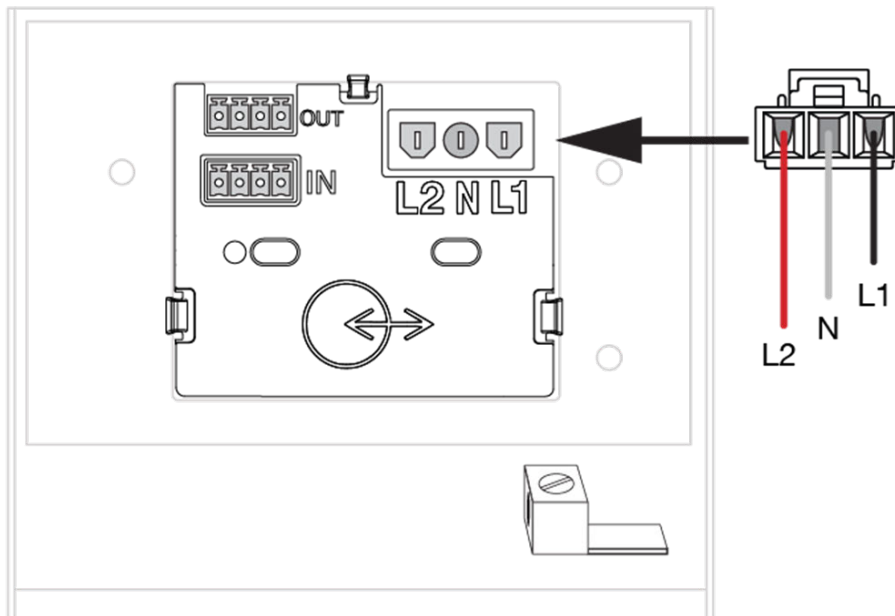
Depending on local requirements, Powerwall wiring can be installed through conduit or through a cable gland. Refer to local codes to determine wiring requirements.

1. (Conduit installations only) Run conduit as needed and attach the conduit fitting to the inlet of the wiring compartment. The wiring compartment inlet accepts a standard 1-inch conduit fitting.
2. (Conduit installations only) If the conduit connector does not have an integrated bushing, affix the provided insulation bushing to the conduit opening on the inside of the wiring compartment.

NOTE: Ensure that all conduit joints and outlets have smooth edges so that wiring is not damaged as it is run through the conduit.

3. Run the 4-conductor communication cable, the AC power conductors, and equipment grounding conductor from the Backup Gateway through the conduit or cable gland and pull them into the Powerwall wiring compartment.
4. At the Powerwall, strip the ends of the AC conductors and attach them to the corresponding leads on the AC power harness.
5. Plug the AC power harness into the AC connector in the Powerwall wiring compartment. Ensure that the connector clicks into place.

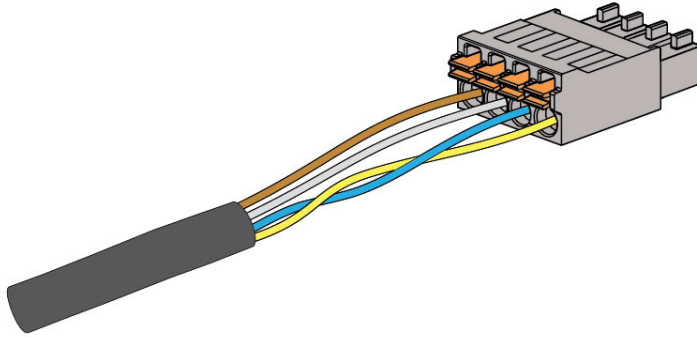
Figure 11. Powerwall 2 AC Power Harness Connection





6. On each end of the 4-conductor communication cable, strip and insert the wires into the provided 4-pin connectors. On the Powerwall side, use the black connector provided in the accessory bag. On the Backup Gateway side, use the connector that came plugged into the corresponding connector socket in the Backup Gateway.


Figure 12. Communication Connector Wiring

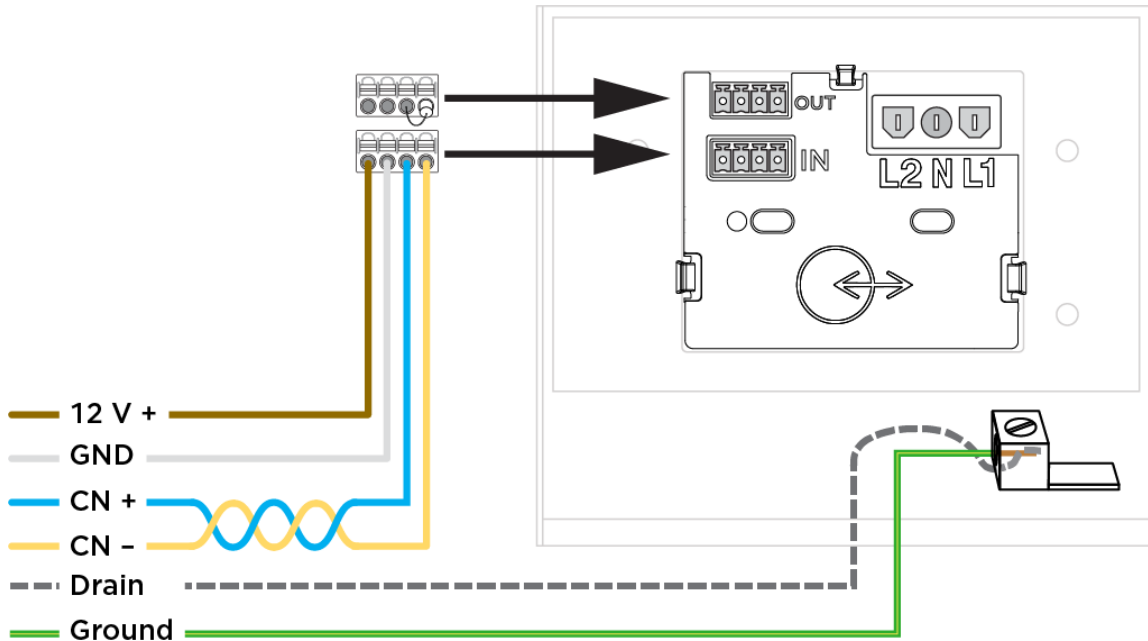


7. On the Backup Gateway side of the 4-conductor communication cable, cut back the drain wire. ***The drain wire should be terminated at the Powerwall chassis Earth terminal only.***
8. On the Backup Gateway side, plug the 4-pin connector into the 4-pin socket labelled “Powerwall”. Tighten screws on the connector.
NOTE: See [Backup Gateway 2 Communication Wiring on page 47](#) for diagrams and wiring specifications.
9. On the Powerwall side, plug the 4-pin connector into the bottom 4-pin socket (labeled “IN”) in the Powerwall wiring compartment.
10. Plug the provided 4-pin connector with the terminating 120-Ohm resistor into the top 4-pin socket (labeled “OUT”) in the Powerwall wiring compartment. (In multi-Powerwall installations, use this connector only in the last Powerwall in the chain.)
11. On the Powerwall side, strip the end of the equipment grounding conductor and wrap the communication cable drain wire around the grounding conductor lead.

STEP 5: MAKE COMMUNICATIONS CONNECTIONS



12. Insert the grounding conductor and drain wire in the Powerwall chassis Earth terminal. The Earth terminal is identified with the following symbol: . Tighten the screw in the Earth terminal to 4.5 Nm. Figure 13. Powerwall Earth / Ground and Communication Connections with a Terminating Resistor

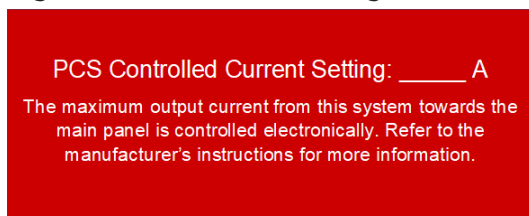




NOTE: The Tesla Powerwall system supports ESS Operating Mode of Import Only, where it will not export active power from the battery to the Area EPS. The installer and the customer can select three standard modes of operation for the Powerwall: Backup, Solar Self-Powered, and Time of Use. All three of the modes of operations operate within the constraint of the Import Only ESS Operating Mode.

NOTE: This system is equipped with a power control system (PCS) which is suitably rated to provide branch circuit overcurrent protection. The controlled current setting shall not exceed the rating of any controlled busbars or conductor ampacity.

NOTE: The PCS controlled current setting for each PCS controlled conductor or bus bar shall be indicated with a field applied marking label on the conductor or in close proximity to the busbar.

Figure 14. PCS Field Marking Label



-  **WARNING:** 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.
-  **WARNING:** Configuration of power control settings system or changes to settings shall be made by qualified personnel only. Incorrect configuration or setting of the power control settings may result in unsafe conditions.

NOTE: The maximum operating currents in controlled busbars or conductors are limited by the settings of the power control system (PCS) and may be lower than the sum of the currents of the connected controlled power sources. The settings of the PCS controlled currents may be used for calculation of the design currents used in the relevant sections of NEC Article 690 and 705.

NOTE: Maximum PCS Controlled Current setting: 200 A.



Install Optional Remote Disable Switch

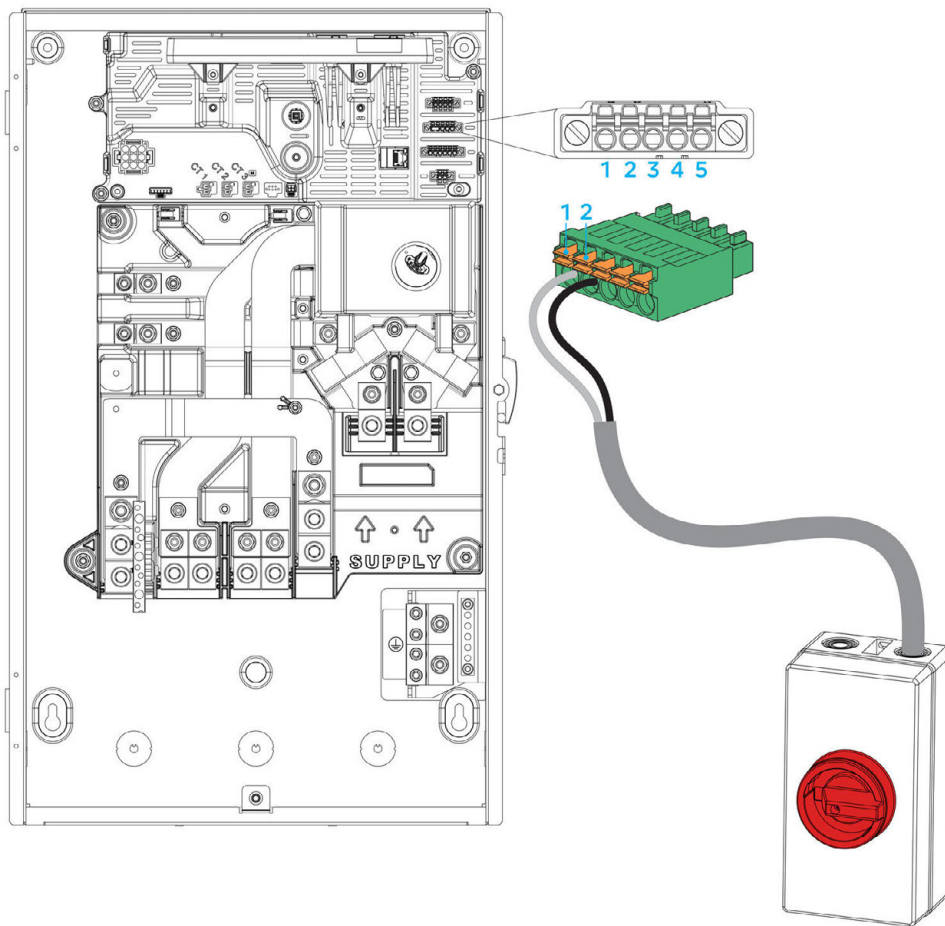
NOTE: This section provides guidelines on a system functionality. Please consult your local AHJ or Utility before use.

The Backup Gateway 2 can be wired to include an external Remote Disable switch that simultaneously commands all Powerwalls to become idle and enter a safe mode.

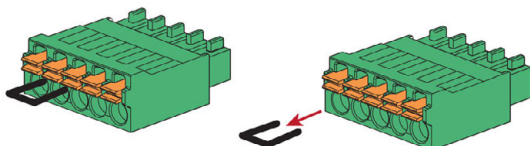
Installation Instructions

The Remote Disable switch is wired through a low voltage, 12 V DC, control circuit connected to the Gateway AUX port.

Figure 15. Wiring a Remote Disable Switch to the Backup Gateway AUX Port



1. Remove the factory-installed jumper from pins 1 and 2 of the 5-position “AUX” connector inside the Gateway 2. See [Appendix B: Wiring Reference on page 45](#) for a diagram of the connector location.





- Using minimum 24 AWG conductors (maximum 16 AWG), with wiring methods according to code, connect pins 1 and 2 (labelled "SDO" and "SDI") to a suitable disconnect switch.



- Confirm that all Powerwalls cease operation when the switch is open.

Operation

Initiate Remote Disable	Turn the switch to the OFF (open) position	
	All Powerwalls will go to idle. This behavior is the same wither the AC utility grid is present or not.	
Resume Powerwall Operation	Turn the Switch to the ON (closed) position	
	AC Grid Present	AC grid not present (Off-grid or AC grid is down)
	Normal system operation will resume shortly	Powerwall operation will only resume when the grid is back or a 12V jump start is provided to the Gateway

Guidelines for Remote Disable Switch Selection and Installation

- Must be Listed or Recognized as "Emergency Stop Button", "Emergency Stop Device", "Emergency Stop Unit"
- Must be Lockable on ON/OFF position
- Must have a clear indication of ON/OFF position
- Must be outdoor rated (NEMA 3R or higher)
- Should be Installed externally in a readily accessible location preferably by utility meter
- The maximum low voltage wire run from switch to Gateway should not exceed 150 feet (45 m)
- Should observe 12V, 0.1 A ratings



About Energy Metering

Visibility on power and energy data is needed for the Powerwall system to operate properly. An energy meter accomplishes this by measuring voltage (by voltage tap) and current (by Current Transformer, CT) at certain points in the system.

There are many possible configurations for installing metering depending on system design. However, there are two goals:

- **Metering the Site** – Site meters show the overall power flow to/from a site from the Grid's perspective. Thus, Site meter(s) must be installed upstream of all solar production, Powerwalls, and loads. Multiple physical Site meters can be installed together where needed, but their sum should capture all of the power flows from load, solar, and Powerwall(s).
- **Metering all Solar** – Solar meters capture production from PV inverter(s). There must not be any loads or Powerwalls behind the Solar CTs. This would result in under- or over-estimation of solar production.

Site and Solar Metering for Backup Gateway 2

Backup Gateway 2 makes metering simple with built-in options for Site and Solar metering:

- **Internal Primary Meter (Meter X)** – This Site meter may be used when the Grid connection is at the *Supply* terminals. No additional steps are needed during install. If there are any loads or solar upstream of the *Supply* terminals, a Remote Meter must be used to meter the Grid connection point.
- **Internal Auxiliary Meter (Meter Y)** – Metering solar circuits inside the Gateway or in adjacent switchboards is simple with the three (3) internal CT connections for use with Tesla 100 A CTs (one included in the Accessory Kit). Additional Tesla 100 A CTs (Tesla P/N 1467316-00-x) may be ordered individually.

The Tesla 100 A CTs may be extended a max distance of 330 ft (100 m) by splicing twisted pair or using the Tesla 100A CT Extension (10 ft/3 m) (Tesla P/N 1467274-00-x). Use 20 AWG (0.5 mm²) conductors or larger to extend CTs up to 330 ft (100 m). Voltage rating of the extension wire must be equal to or greater than all other adjacent circuits.

Depending on site layout it may not be possible to use internal Gateway 2 meters, and Remote Energy Meters will be required.

- See [Appendix D: Configure Energy Metering on page 56](#) for further guidance on metering.
- See [Appendix E: Installing a Neurio Energy Meter on page 57](#) for Remote Neurio Meter installation instructions.

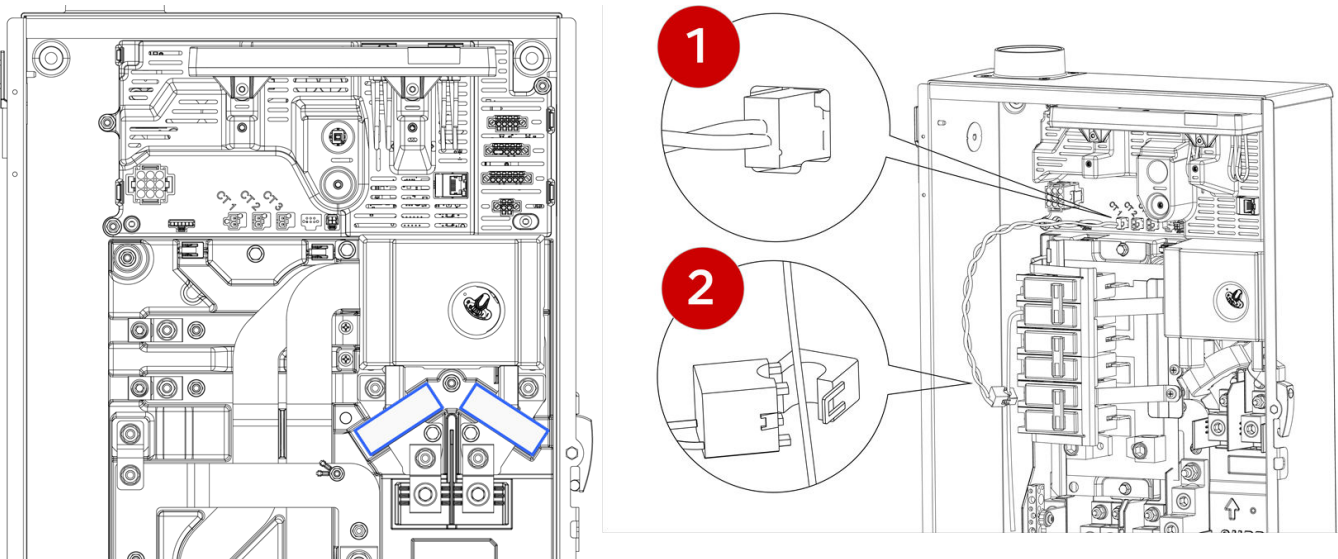


Install Tesla 100 A CTs

⚠ WARNING: Before installing, disconnecting, and/or adjusting CTs, ensure the circuits being measured are not energized and the system is completely powered down. Failure to de-energize the system may compromise operator and equipment safety.

1. Plug the Tesla 100 A CT into the terminal in the Backup Gateway. Ensure the connector is fully seated in the terminal.
2. Clamp the CT around the conductor to be measured.

Figure 16. Embedded Site CTs and Solar CT Connectors



Tips

- See [Appendix D: Configure Energy Metering on page 56](#) for additional diagrams on configuring energy metering.
- When metering split-phase 240 V solar inverters, a single CT on L1 or L2 can be used to meter production.
- The CT1 and CT2 terminals have voltage references to L1 and L2 respectively and cannot be reconfigured. The CT3 terminal has a default voltage reference to L1 but can be configured as L2 in the Commissioning Wizard.
- Ensure CTs are facing the proper direction as indicated on the label. A CT will show negative current if installed backwards.
- When upgrading a Gateway 1 system, the existing Remote (Neurio) Energy Meter(s) may be left in place and re-paired with the new Gateway. The Remote Meter must be power cycled within one minute prior to re-pairing. If metering Site power with the Remote Meter, ensure the Backup Gateway 2 internal site meter is de-selected in Commissioning.
- See [Appendix G: Installation Troubleshooting on page 65](#) for CT configuration troubleshooting tips.
- The Powerwall installer has the option to set a Conductor Export Limit, or a Site Charge Limit. When used, the Powerwall will dynamically curtail to meet these site-specific programmed thresholds. See [Appendix F: Feature Notes on page 63](#) for more information.



Plan Internet Connection for the Backup Gateway 2

Internet connectivity is required to receive the full 10-year Powerwall warranty, and for the customer to see their system in the Tesla App.

For best performance, ensure Ethernet and Wi-Fi connections are both configured during commissioning. The Gateway will automatically select the network option with best connection.

Cellular is available only as a backup connection when Wi-Fi and Ethernet connections are lost. Cellular should not be relied on as the default connection method.

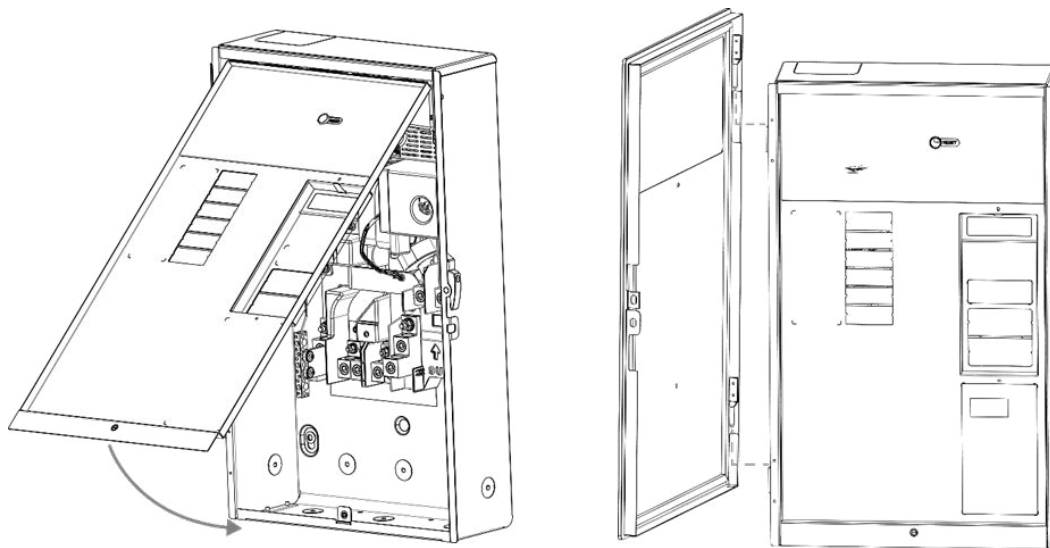
Install Ethernet Connection

- Ethernet cable must be CAT5 (24 AWG) cable at minimum.
- If not possible to run an Ethernet cable directly to the customer's network router, Powerline Ethernet socket adapters may be used.
- See [Appendix B: Wiring Reference on page 45](#) for the position of the Ethernet port.

Close the Wiring Compartments and Turn the System On

1. **Before closing any installed hardware**, take photos of the completed wiring in the Powerwall, Backup Gateway, and main distribution board.
2. Ensure that all conduit junctions and cable entry points are secure and properly sealed.
3. Arrange the communication and AC power wires neatly inside the Powerwall wiring compartment.
4. Replace the cover on the Powerwall wiring compartment. Ensure that the cover seats properly on the gasket so that the compartment is sealed. Using a Torx T20 bit, tighten the fasteners to 1.5 Nm.
5. Replace the left side cover on Powerwall by pushing the top into place and working toward the bottom to reattach it to the clips along the length of the unit.
6. Install the Backup Gateway dead front panel and secure it firmly with the original screw. Mount the Backup Gateway door, and latch it shut.

Figure 17. Install the Dead Front Cover and Glass Door





7. Use the provided breaker label sheet to clearly label the circuit breakers.

NOTE: If the Backup Gateway is installed outdoors or in a high-traffic area, the latch can be locked shut.

8. Switch on the AC circuit breakers for the Backup Gateway and Powerwall.

9. Switch on Powerwall by moving the switch on the right side of the unit to the ON position. When Powerwall establishes communication with the Backup Gateway, the LED on the right side of Powerwall illuminates.

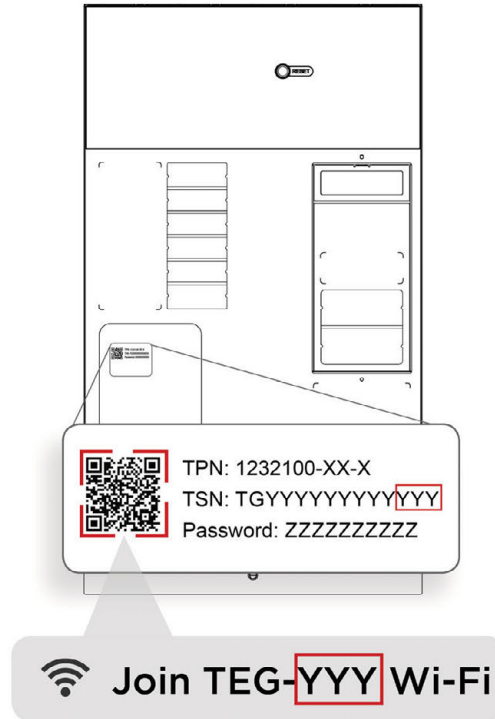


CAUTION: Always leave site with Powerwall breaker closed for battery to maintain a base level of charge. Leaving the Powerwall disconnected from AC for extended periods increases risk of damage.



Commission the System

1. Locate the label on the Backup Gateway deadfront. Using a smartphone, scan the QR code on the label to establish Wi-Fi connection with the Backup Gateway.



NOTE: To connect to the Backup Gateway via Ethernet, connect a computer to the Ethernet port of the Backup Gateway with a standard CAT5 Ethernet cable.

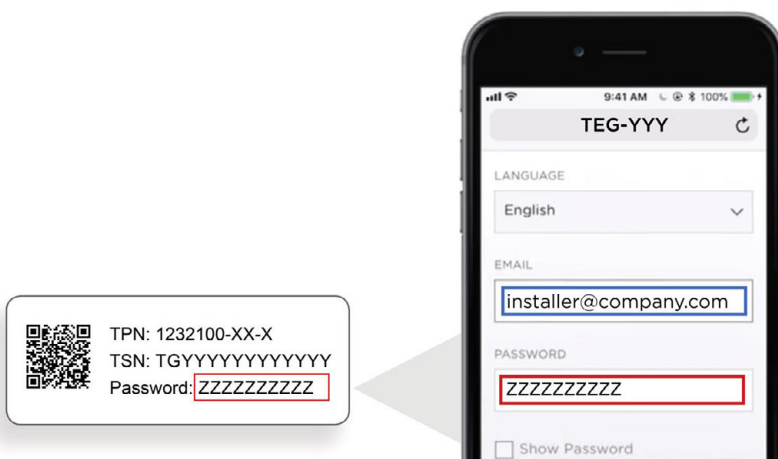
2. Open a browser and navigate to <http://TEG-YYY> where YYY are the last 3 digits of the Backup Gateway serial number.



NOTE: If the Backup Gateway Wi-Fi network doesn't appear or the connection to the Backup Gateway fails, power cycle the Backup Gateway using the Reset button, wait 2 minutes, and try connecting again.



3. Once communication is established, the browser may show a Security Warning page. This is normal. To enter the Commissioning Wizard, click **Advanced** and then **Proceed**. The browser should then show the login page to the Commissioning Wizard.
4. Log into the Commissioning Wizard:
 - Username: Enter the e-mail address of the installer who is carrying out the work
 - Password: Enter the password on the deadfront label
 - Click **Continue**



NOTE: For systems with firmware version 1.48+, the password will only be required the first time the installer logs in to commission the system. Once the system has been commissioned, the Commissioning Wizard will prompt the installer to log in by toggling the On/Off switch on one connected Powerwall. If the Powerwall(s) are unable to communicate with the gateway, the password will be available as an alternative login.

5. Connect the Backup Gateway to the Internet by the following means:

NOTE: Either an Ethernet or a Wi-Fi connection must be connected. For best reliability, ensure Wi-Fi and Ethernet options are both configured.

Wi-Fi (2.4 or 5 GHz)	Ethernet
<ul style="list-style-type: none"> ◦ In the Commissioning Wizard, click the arrow for Wi-Fi ◦ Scan and locate the home Wi-Fi network name (SSID) ◦ Enter the homeowner’s network password ◦ Click the blue arrow 	<ul style="list-style-type: none"> ◦ In the Commissioning Wizard, click the arrow for Ethernet ◦ Choose DHCP (most common) or Static (only if necessary and you know the Network settings) ◦ Click Connect


NOTE: Cellular connection must only be relied on as fallback connection if Wi-Fi and/or Ethernet is lost.

6. Click **Check Connection** to verify that the Internet connection is working. Click **Continue**.

NOTE: See [Appendix G: Installation Troubleshooting on page 65](#) for troubleshooting steps on accessing the Commissioning Wizard.



7. Click **Check for Update** to apply any firmware updates to the Backup Gateway and Powerwall. After the update is staged, click **Update**. After the update is complete, re-establish connection to the Backup Gateway and the Internet, starting with procedure #1 above.

 **WARNING:** Software updates may take several minutes, especially for installations with multiple Powerwalls. Never power down during an update, as it may result in damage to the system.

8. Follow the Commissioning Wizard steps to complete the commissioning process.

Finish and Demonstrate the Installation

1. After installation is complete, remove the protective film from Powerwall.
2. Remove the plastic straps from the left and right side covers by cutting them and carefully pulling them through the slots in the covers.
3. Ask the homeowner to download and install the Tesla mobile app and connect to the system.
4. Demonstrate the capabilities of the Tesla mobile app, such as how to change the operation mode.
5. Simulate an outage by opening the main breaker and show that Powerwall is powering backup loads.
6. Leave the *Powerwall Owner's Manual* with the owner of the newly installed system.
7. Archive the photos from the installation.

Troubleshooting

See [Appendix G: Installation Troubleshooting on page 65](#) for common installation troubleshooting steps.

Technical Support

Resources for Certified Installers, including service request forms and the latest versions of installation manuals, are available within the Tesla Partner Portal:

<https://partners.tesla.com>

Maintenance

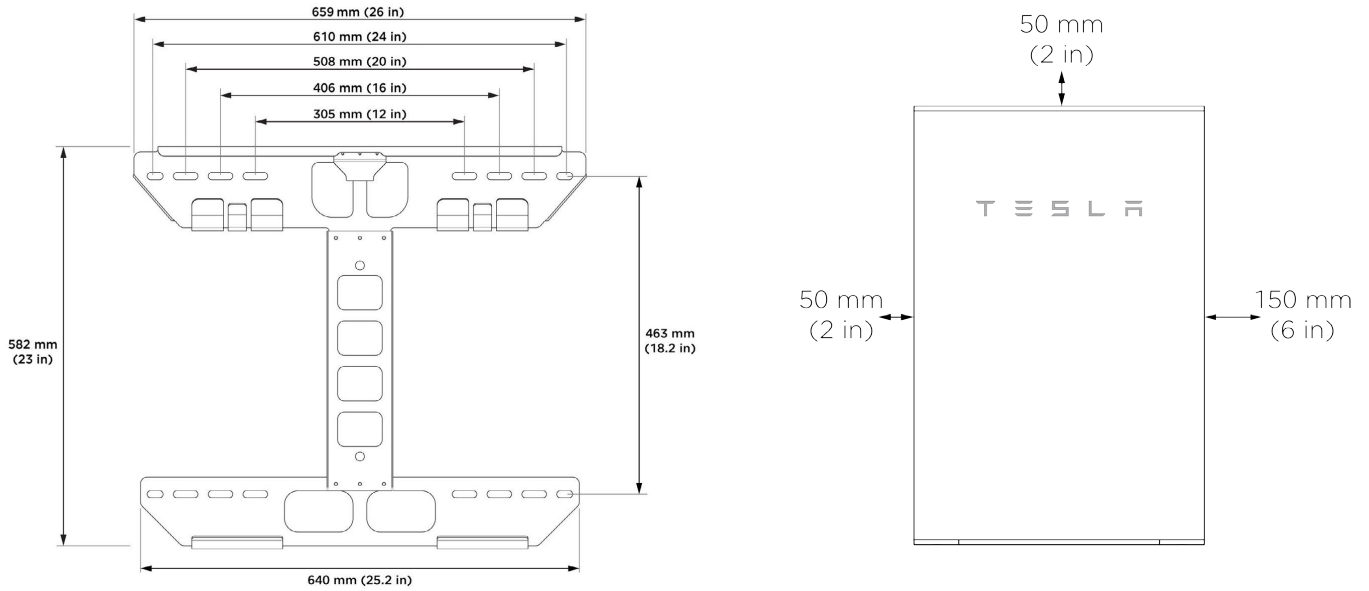
Powerwall does not require pre-scheduled preventative maintenance. The only maintenance required by an owner is to keep the unit connected to the internet and free and clear of debris, especially around the air intake and exhaust.

To clean Powerwall, use a soft, lint-free cloth. If needed, the cloth can be dampened with mild soap and water only. Do not use cleaning solvents to clean Powerwall, or expose Powerwall to flammable or harsh chemicals or vapors.



Powerwall Space Requirements

Figure 18. Powerwall 2 Mounting Bracket Dimensions and Space Requirements



Minimum lateral wall space	38 in (960 mm)
Minimum clearance from left side (air intake)	2 in (50 mm)
Minimum clearance from right side (air exhaust)	6 in (150 mm)
Minimum clearance above single Powerwall	2 in (50 mm)
Minimum clearance above side-by-side Powerwalls	12 in (300 mm)
Minimum clearance between side-by-side Powerwalls	10 in (250 mm)
Maximum height above ground	39.5 in (1 m) to bottom of unit
Maximum slope	+/- 2° side-to-side +/- 5° front-to-back

NOTE: Powerwall has a pump and fan that produce a gentle hum during operation, comparable to a typical refrigerator. The noise level depends on the ambient temperature and the power level of operation. Consider these noise levels when choosing where to install Powerwall.

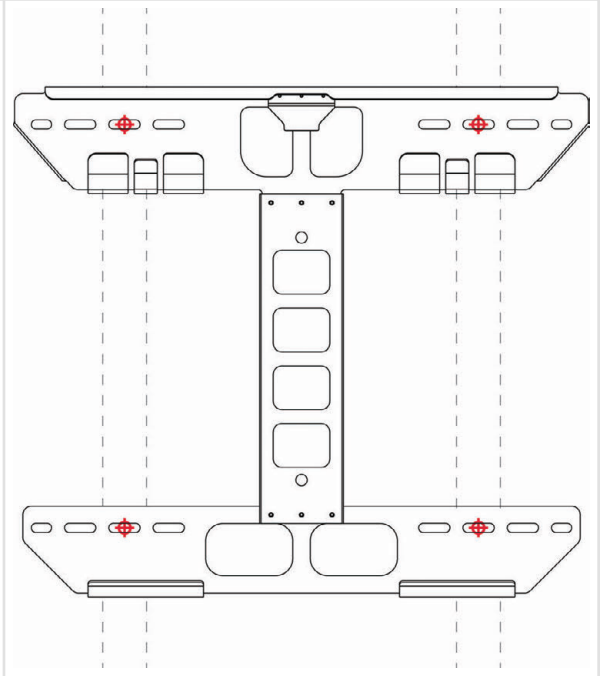


Mounting Bracket Anchoring Details

NOTE: The details below are minimum guidelines and are not guaranteed to be applicable. Refer to local building codes to ensure the use of appropriate fasteners. Refer to Powerwall 2 Anchorage Details for complete mounting information.

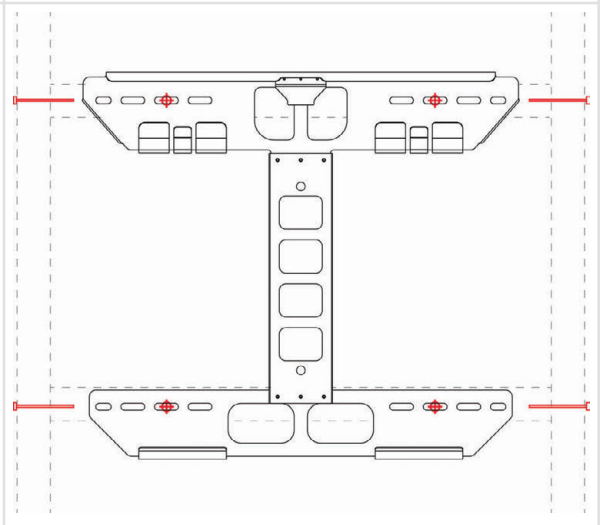
Wood Studs (spaced at 12, 16, 20 or 24 inches)

If anchoring directly into wood studs, use at least four (one in each corner) 1/4-inch wood screws with washers, of sufficient length for at least 2.5 in embedment into the studs.



Wood Studs (spaced at 12, 16, 20 or 24 inches)

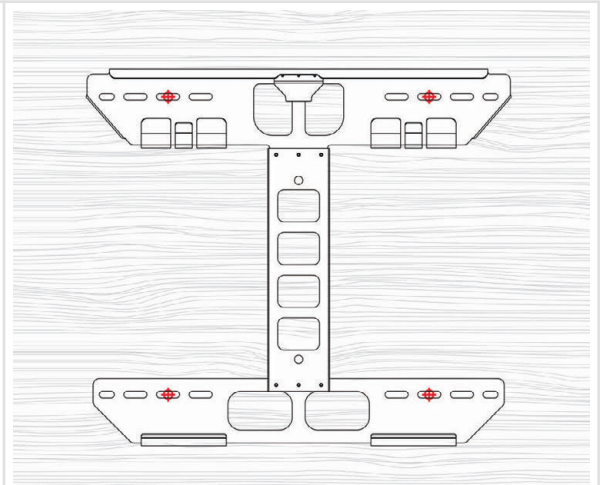
If anchoring to blocking between wood studs, use minimum 2 x 4 in blocks, end-nailed into studs with two 16d nails or toenailed into studs with four 8d nails. Use at least four (one in each corner) 1/4-inch wood screws with washers, of sufficient length for at least 2.5 in embedment into the blocking.





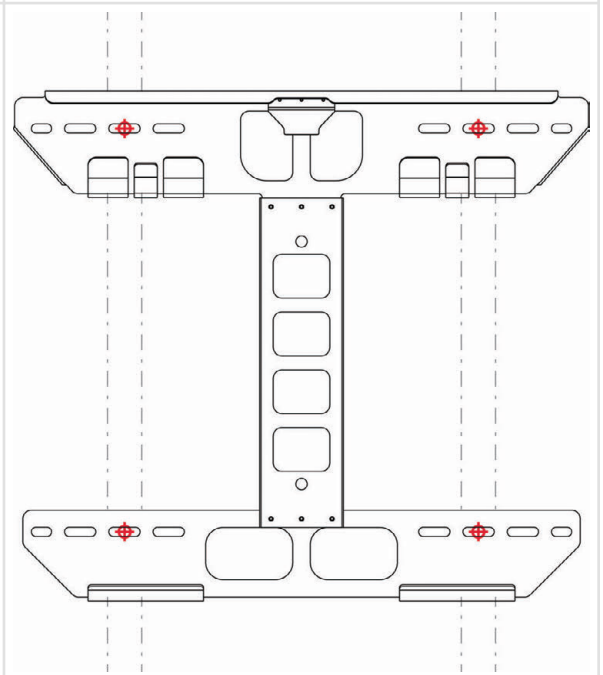
Plywood

If anchoring to plywood wall material, the plywood must be minimum 1/2-inch thick. Use at least four (one in each corner) 1/4-inch wood screws with washers, of sufficient length to penetrate at least 1/4 inch beyond the backside of the plywood.



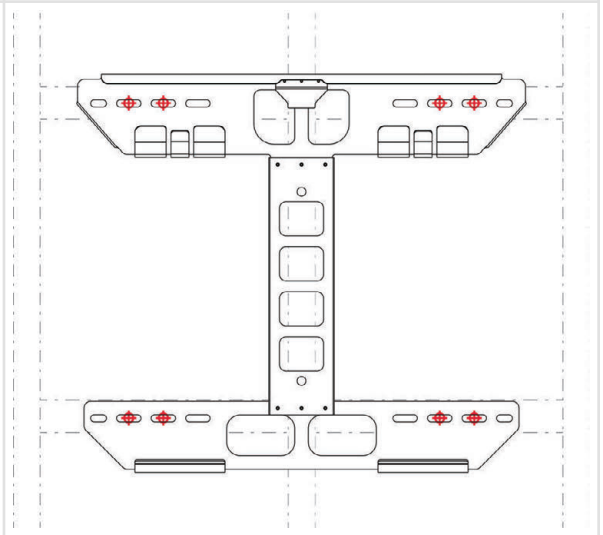
Metal Studs (spaced at 12, 16, 20 or 24 inches)

If anchoring directly to metal studs, studs must be minimum 18 gauge. Use at least four (one in each corner) #14 sheet metal screws with washers, of sufficient length to penetrate at least 3 threads beyond the stud.



Metal Studs (spaced at 12, 16, 20 or 24 inches)

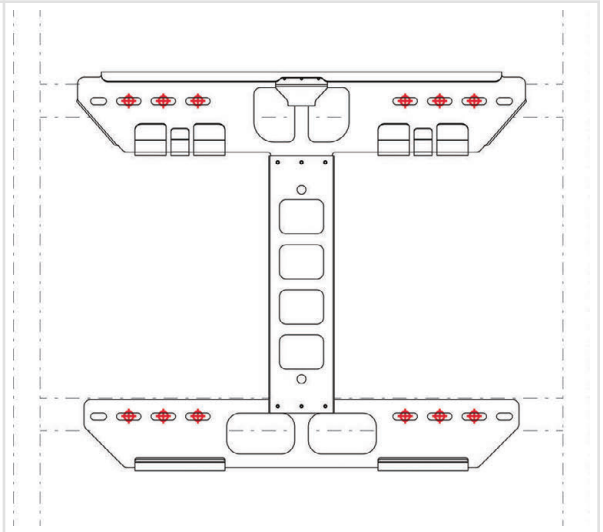
If anchoring to backing between metal studs, studs must be minimum 25 gauge, and backing must be minimum 22 gauge. Use at least eight (two in each corner) #14 sheet metal screws with washers, of sufficient length to penetrate at least 3 threads beyond the backing.





Metal Studs (spaced at 12, 16, 20 or 24 inches)

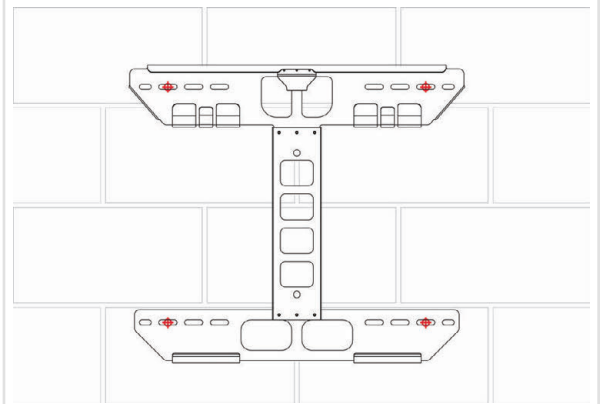
If anchoring to backing between metal studs in an outdoor high wind area, studs must be minimum 25 gauge, and backing must be minimum 22 gauge. Use at least twelve (three in each corner) #14 sheet metal screws with washers, of sufficient length to penetrate at least 3 threads beyond the backing.



Concrete or Masonry

Minimum strength must be 2500 PSI (concrete) or 1500 PSI (masonry).

Use at least four (one in each corner, in any available anchor slot) 1/4-inch fasteners with washers, of sufficient length for at least 1.5 in (38 mm) embedment into the material. Ensure that all fasteners are at least 1.5 in (38 mm) away from the edges of masonry blocks or bricks.



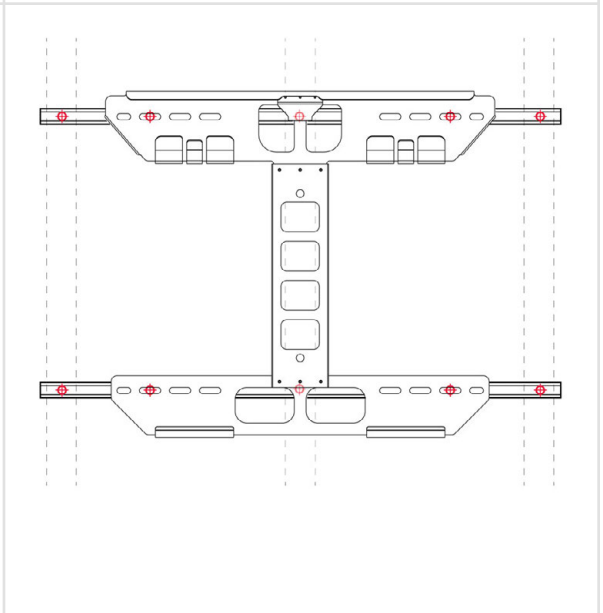
Channel Strut (Unistrut)

Struts must be minimum 1-5/8 in x 1-5/8 in, 12 gauge.

If mounting on wood studs, attach the strut to at least three studs, using at least one 1/4-inch wood screw with washer per stud, of sufficient length for at least 2.5 in embedment into the studs.

If mounting on metal studs, attach the strut to at least three studs, using at least two #14 sheet metal screws with washers per stud, of sufficient length to penetrate at least 3 threads beyond the studs.

To attach the bracket to the struts, use at least four (one in each corner) 1/4-inch hex head screws with washers and strut nuts.





Powerwall Wiring

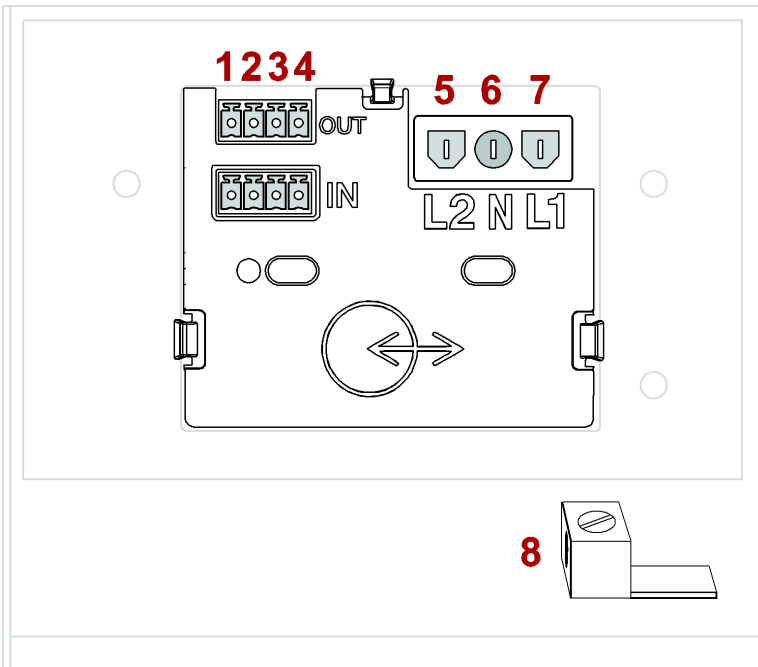


Table 3. Powerwall Wiring: Communication

Powerwall Terminal	Recommended Wire Color	Wire Gauge
1 12V + (Logic +)	Brown	18 - 16 AWG (0.8 - 1.5 mm ²)
2 GND (Earth)	White	18 - 16 AWG (0.8 - 1.5 mm ²)
3 CN + (CAN HI)	Blue	24 - 16 AWG (0.2 - 1.5 mm ²)
4 CN - (CAN LO)	Yellow	24 - 16 AWG (0.2 - 1.5 mm ²)
Cable Shield/Drain Wire	(Terminate at Powerwall chassis ground lug only)	

Table 4. Powerwall Wiring: Power

Powerwall Terminal	Recommended Wire Color	Wire Gauge
5 L2 (Line 2) - to Neutral	Red	10- 8 AWG (6 - 10 mm ²)
6 N (Neutral)	White	10 - 8 AWG (6 - 10 mm ²)
7 L1 (Line 1)	Black	10 - 8 AWG (6 - 10 mm ²)
8 Chassis Ground Lug	Green / Yellow	10 - 8 AWG (6 - 10 mm ²)

* Depending on local code for installation methods and cable sizing calculations.

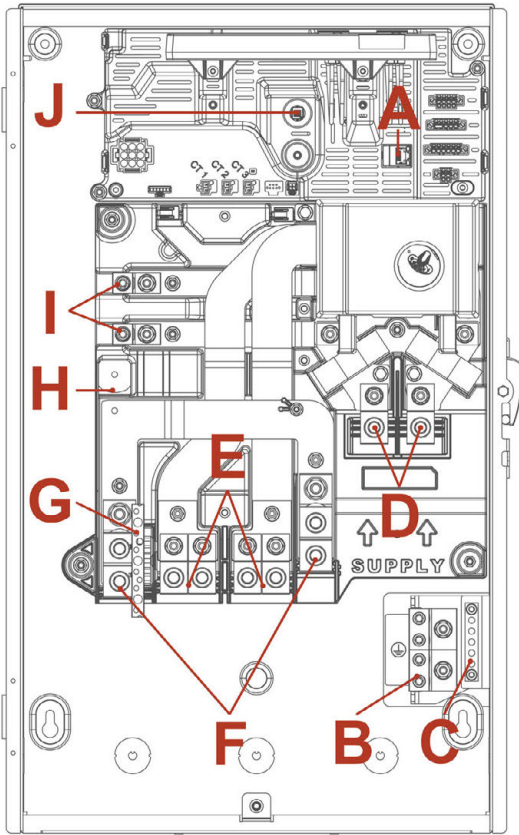
NOTE: Refer to local codes and standards for correct wiring practices and wire colors.

(3) Wago lever nuts are provided for use with up to 10 AWG (6 mm²) cable. If 8 AWG (10 mm²) cables are required per wiring methods, other appropriate connectors may be used, or a junction box near the Powerwall can be used to convert from 10 to 8 AWG (10 to 6 mm²) cables. **Follow all code wiring requirements.**

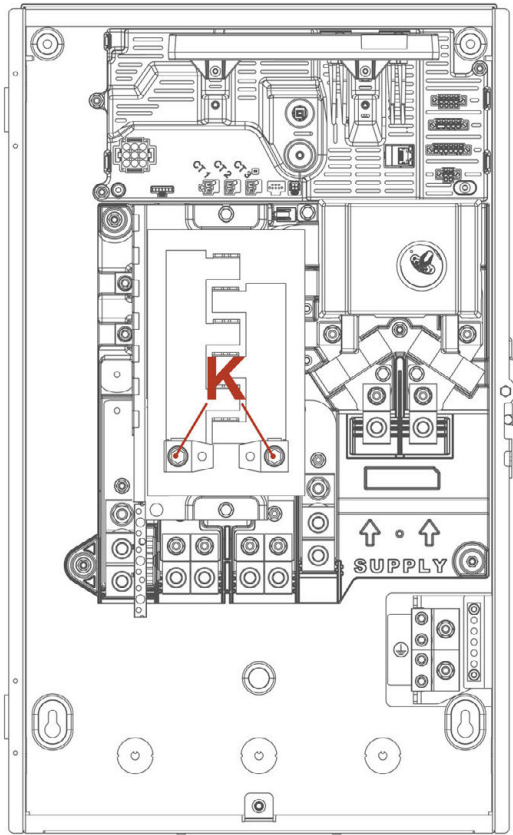
NOTE: Suitable wire ferrules may be used with Wago connectors, but are not required.



Backup Gateway 2 Wiring



Without Internal Panelboard



With Internal Panelboard

Table 5. Backup Gateway 2 Wiring: Power

Component	Recommended Wire Color	Wire Gauge *
A Ethernet Terminal	-	24 AWG CAT5 or better
B Main Ground Terminals	Green or Bare	6 AWG - 2/0
C Load/Generation Ground Terminals	Green or Bare	14-4 AWG
D Supply Terminals (L1, L2)	Black, Red	6 AWG - 250 kcmil
E Backup Loads and Generation (L1, L2)	Black, Red	6 AWG - 250 kcmil
F Main Neutral Terminals	White	6 AWG - 250 kcmil
G Load / Generation Neutral Terminals	White	14 - 6 AWG, 14 AWG - 1/0
H Neutral-Ground Bonding Strap	-	-
I Non-Backup Loads (L1, L2)	Black, Red	14 - 2 AWG
J RESET button	-	-
K Optional Internal Panelboard Terminals	Black, Red	300 kcmil - 1 AWG

* Use copper or aluminum conductors.



Backup Gateway 2 Communication Wiring

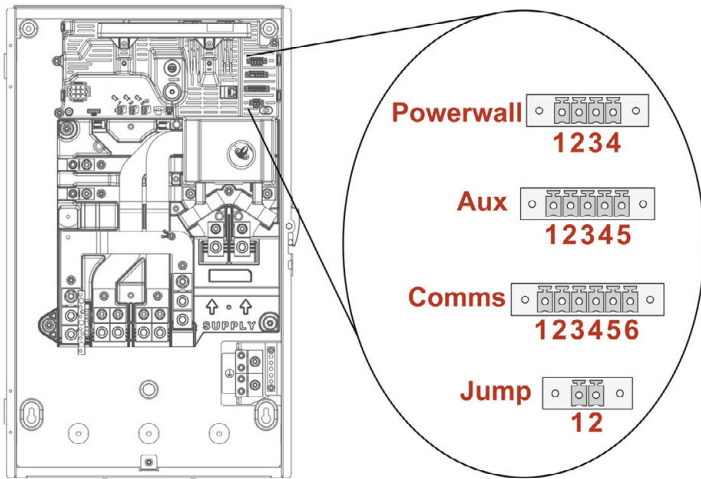


Table 6. Backup Gateway Communication Wiring

Terminal Name	Recommended Wire Color	Wire Gauge
1 12V + (Logic +)	Brown	18 - 16 AWG (0.8 - 1.5 mm ²)
2 GND (Earth)	White	18 - 16 AWG (0.8 - 1.5 mm ²)
3 CN + (CAN HI)	Blue	24 - 16 AWG (0.2 - 1.5 mm ²)
4 CN - (CAN LO)	Yellow	24 - 16 AWG (0.2 - 1.5 mm ²)

Table 7. Aux Wiring

Terminal Name	Recommended Wire Color	Wire Gauge
1 Remote Disable (OUT)	-	24 - 16 AWG (0.2 - 1.5 mm ²)
2 Remote Disable (IN)	-	24 - 16 AWG (0.2 - 1.5 mm ²)
3 Generator / Load Control (+)	Red	18 - 16 AWG (0.8 - 1.5 mm ²)
4 Generator / Load Control (-)	Black	18 - 16 AWG (0.8 - 1.5 mm ²)
5 Interlock pin	-	24 - 16 AWG (0.2 - 1.5 mm ²)

Table 8. External Meter Communication Wiring

Terminal Name	Recommended Wire Color	Wire Gauge
1 GND (Earth)/Shield	-	24 - 16 AWG (0.2 - 1.5 mm ²)
2 RS485 HI #1	Red	24 - 16 AWG (0.2 - 1.5 mm ²)
3 RS485 LO #1	Black	24 - 16 AWG (0.2 - 1.5 mm ²)
4 GND (Earth)/Shield	-	24 - 16 AWG (0.2 - 1.5 mm ²)
5 RS485 HI #2	Red	24 - 16 AWG (0.2 - 1.5 mm ²)
6 RS485 LO #2	Black	24 - 16 AWG (0.2 - 1.5 mm ²)



Eaton Breakers

Eaton CSR 25 kAIC Breakers

Amps	Part Number	Description
100	CSR2100	Eaton # CSR2100N: 100A MB; 2-Pole, 240V, 25kAIC, For Convertible Load Centers
125	CSR2125N	Eaton # CSR2125N: 125A MB; 2-Pole, 240V, 25kAIC, For Convertible Load Centers
150	CSR2150N	Eaton # CSR2150N: Breaker, 150A, 2P, 120/240V, 25 kAIC, Type CSR
175	CSR2175N	Eaton # CSR2175N: 175A MB; 2-Pole, 240V, 25kAIC, For Convertible Load Centers
200	CSR2200N	Eaton # CSR2200N: 200A MB ONLY; 2-Pole, 120V/240V, 25kAIC, Bolt On

Eaton BW 10 kAIC Breakers

Amps	Part Number	Description
100	BW2100	Eaton # BW2100: 100A Main Circuit Breaker; 2-Pole, 240V, 10kAIC
150	BW2150	Eaton # BW2150: Circuit Breaker; 150A/240V/2P
175	BW2175	Eaton # BW2175: Circuit Breaker; 175A/240V/2P
200	BW2200	Eaton # BW2200: 200A Main Circuit Breaker; 2-Pole, 240V, 10kAIC

Eaton BWH 25 kAIC Breakers

Amps	Part Number	Description
100	BWH2100	Eaton # BWH2100: 100A Circuit Breaker; 2-Pole, 120V/240V, 25kAIC, Bolt On
125	BWH2125	Eaton # BWH2125: 125A Circuit Breaker; 2-Pole, 120V/240V, 25kAIC, Bolt On
150	BWH2150	Eaton # BWH2150: 150A MB; 2-Pole, 120V/240V, 25kAIC, Bolt On
175	BWH2175	Eaton # BWH2175: 175A MB; 2-Pole, 120V/240V, 25kAIC, Bolt On
200	BWH2200	Eaton # BWH2200: 200A MB; 2-Pole, 120V/240V, 25kAIC, Bolt On



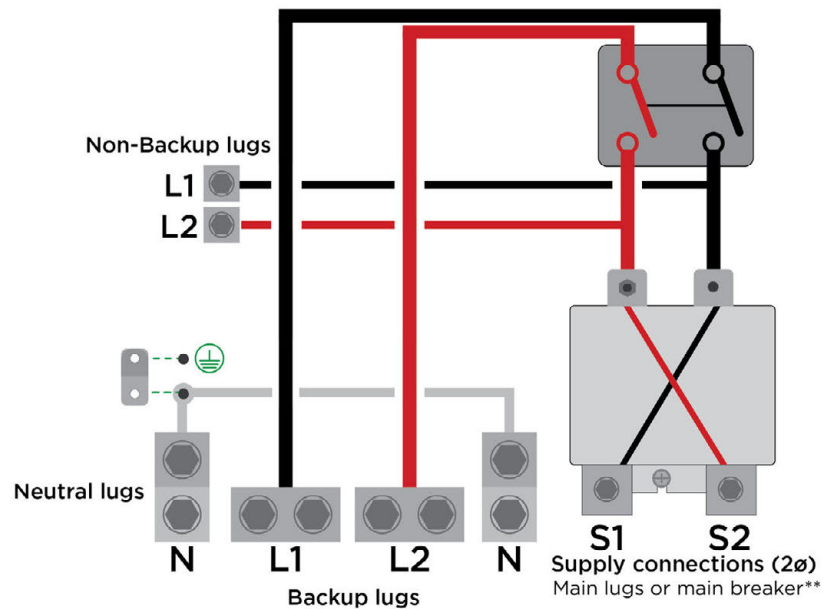
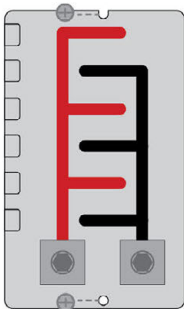
Overview

The following diagrams are intended for illustration purposes only. Drawings represent sample site layouts to show example system layout and metering. These diagrams should not be considered complete plan sets.

The Wiring Key below illustrates how the lugs in the Backup Gateway are connected.

Figure 19. Backup Gateway 2 Wiring Key

Optional Internal Panelboard



Whole-Home Backup

- All loads and generation are downstream of the Backup Gateway contactor.
- Site-level metering by integrated Site CTs.
- Internal panelboard kit may be used for Generation breakers.
- Neutral-Ground Bonding Strap installed only if Gateway is main service equipment.



Figure 20. Whole Home Backup with Standalone Meter

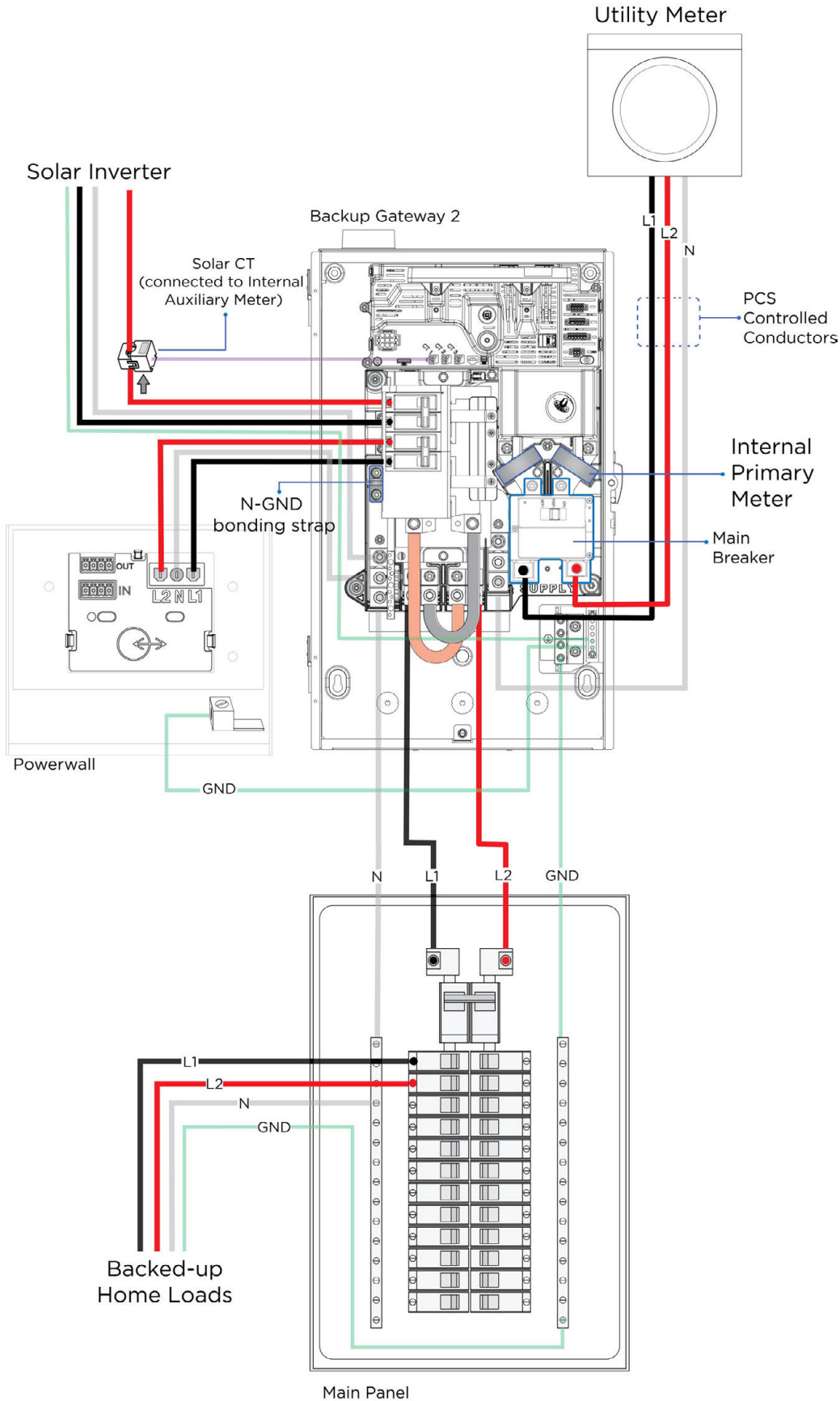
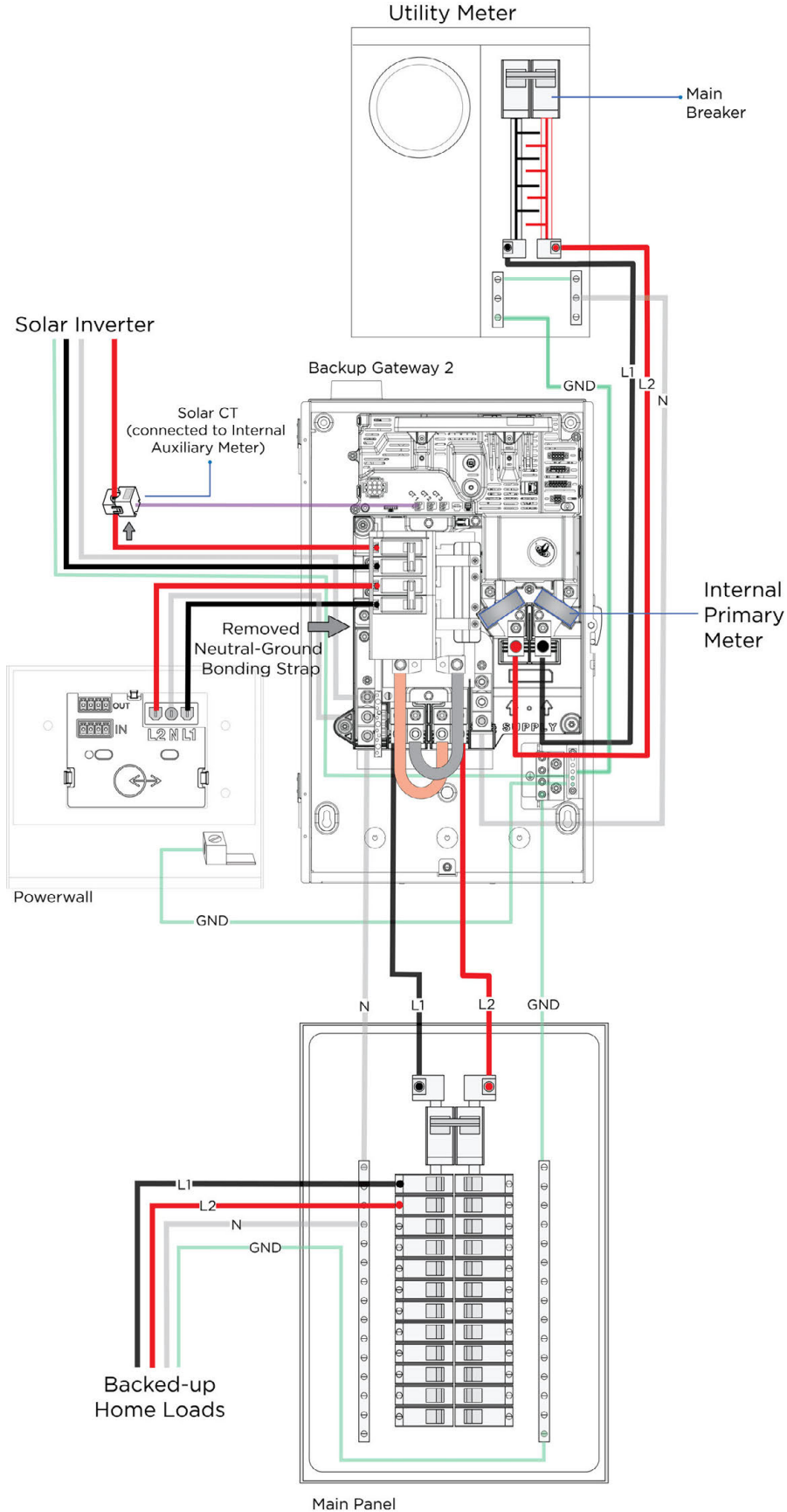




Figure 21. Whole Home Backup with Meter Load Center





Partial-Home Backup

- Non-Backup loads (refer to [design guidance](#) for information on selecting circuits to back up)
- If Non-backup loads connected to Non-Backup Lugs, site-level metering by integrated Site CTs.
- If Non-backup loads are upstream of Gateway, site-level metering by integrated Site CTs plus additional 100 A CTs on L1/L2 of non-backup circuit, or by remote meters at point of interconnection.
- Internal panelboard kit may be used for Generation breakers or Non-Backup loads.
- Neutral-Ground Bonding Strap installed only if Gateway is main service equipment.



Figure 22. Partial Home Backup with Standalone Meter

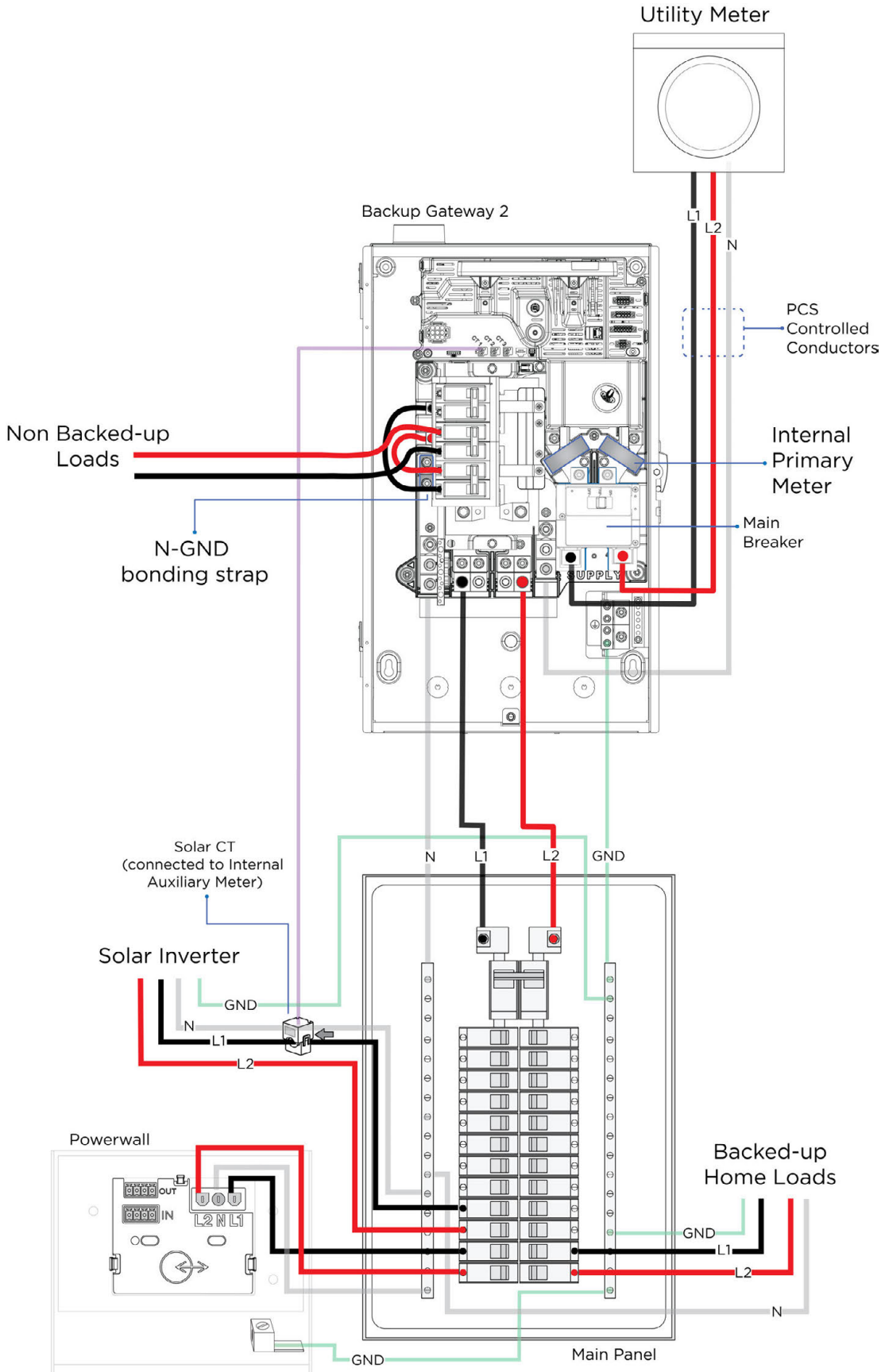




Figure 23. Partial Home Backup with Standalone Meter - Option Using Secondary Load Lugs

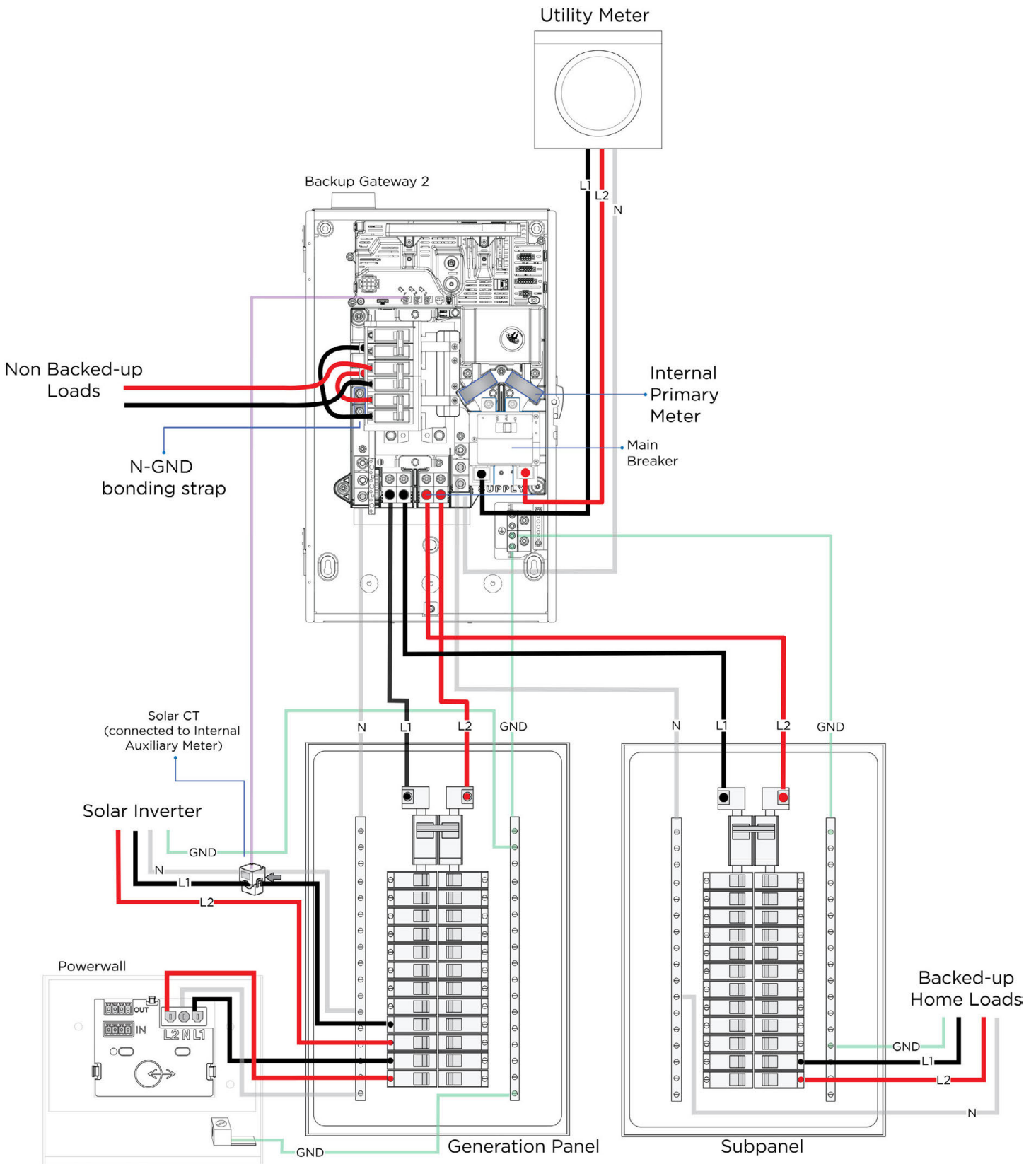
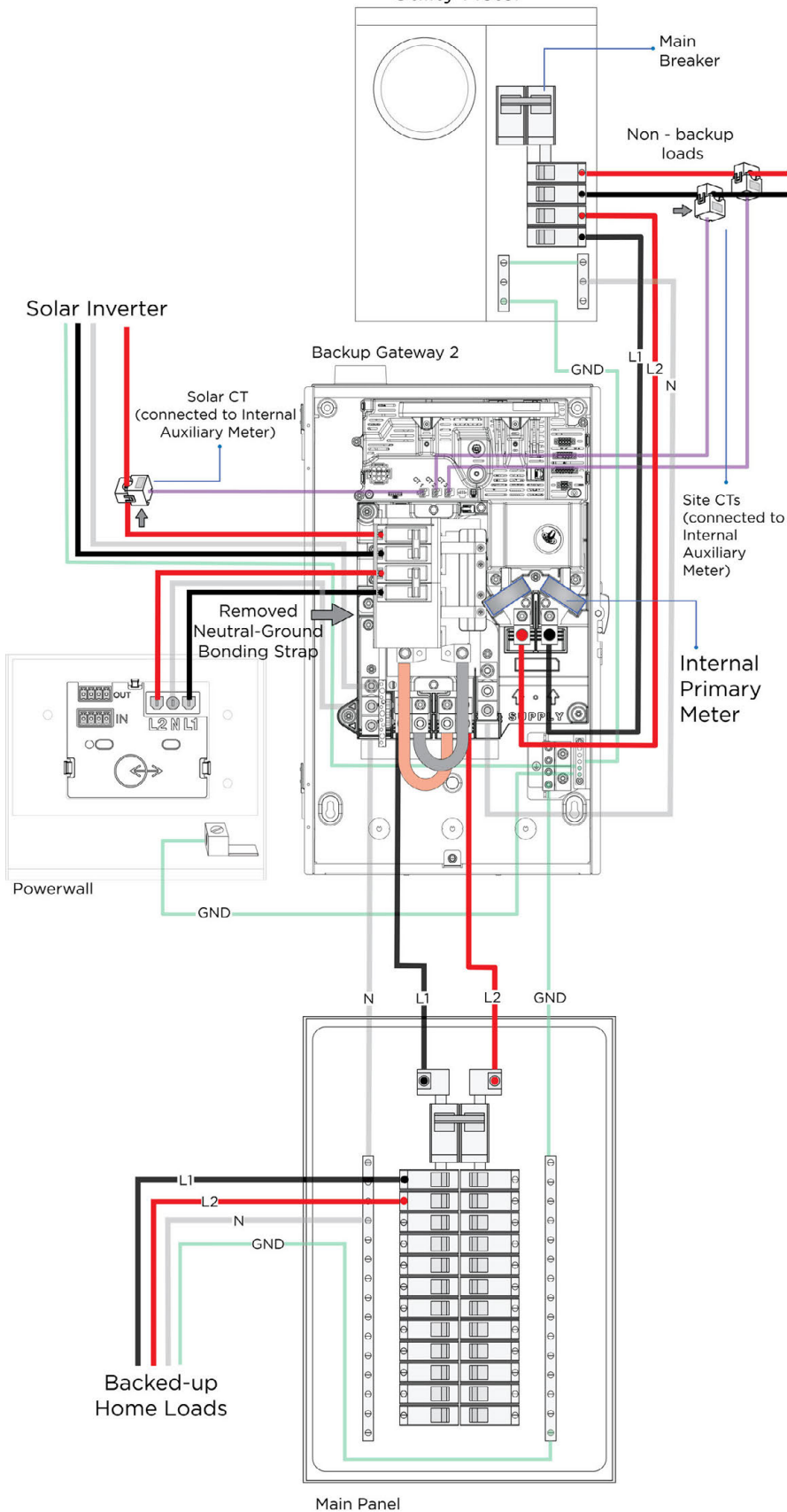


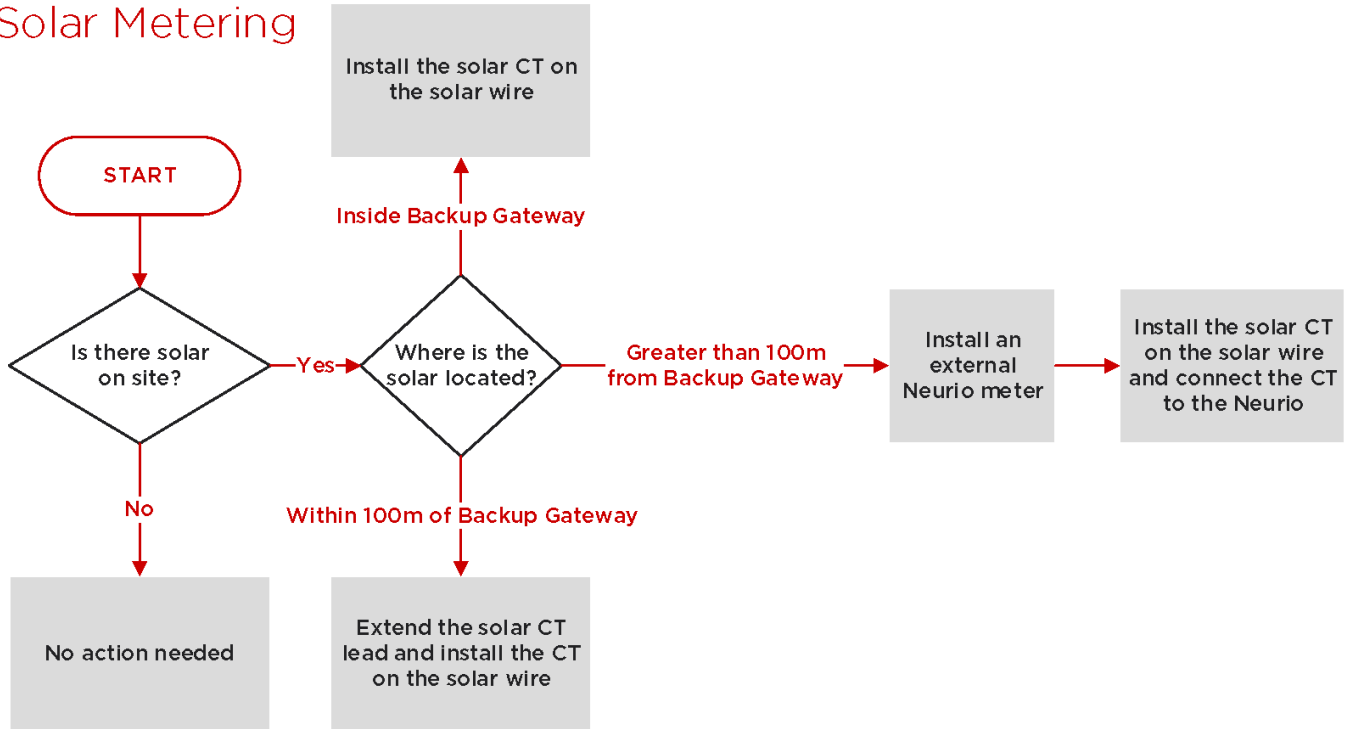


Figure 24. Partial Home Backup with Meter Load Center
Utility Meter

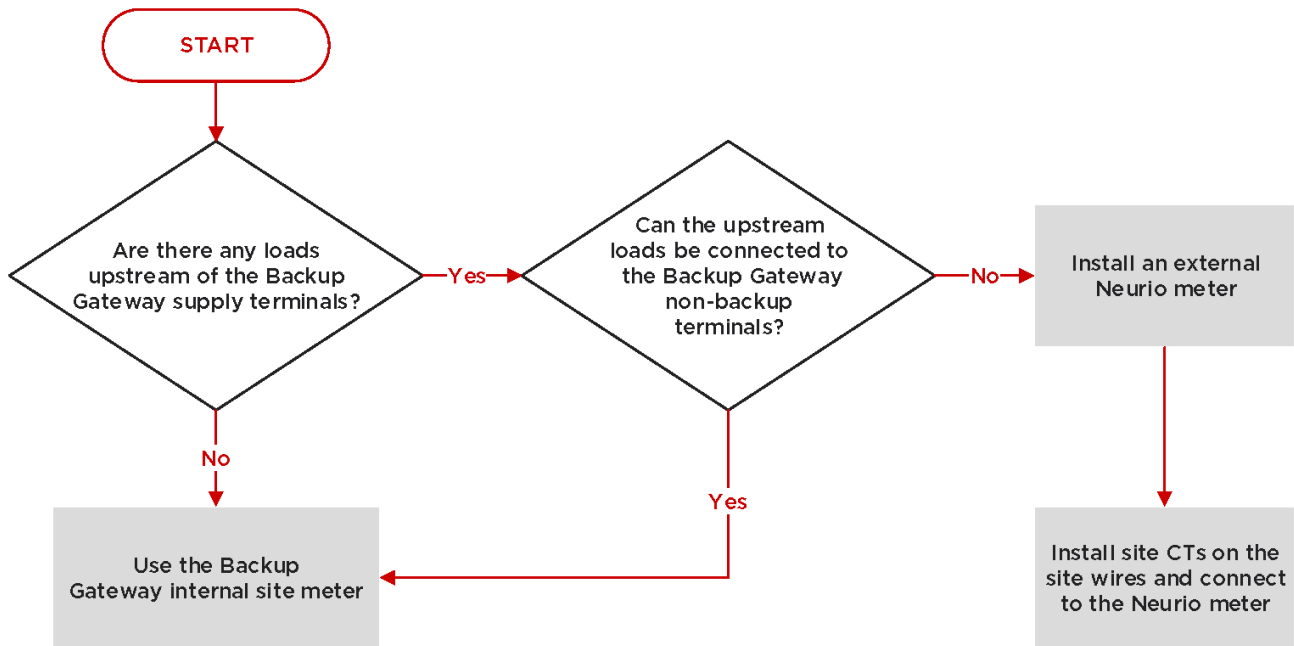




Solar Metering



Site Metering





Neurio Energy Meter Overview

If energy metering in addition to the built-in Site and Solar metering is required, remote Neurio Energy Meter(s) may be paired with Backup Gateway.

The Neurio Energy Meter(s) connect to Backup Gateway 2 by wireless connection, or wired communication between the meter and the Backup Gateway using an optional 2-conductor RS485 meter communication harness (Tesla P/N 1133339-00-x). The Backup Gateway can support wired communication for up to two meters.

NOTE: When upgrading a Gateway 1 system with Gateway 2, the existing Neurio Energy Meter(s) may be left in place in the main distribution board and re-paired. The Neurio Meter must be power cycled within one minute prior to re-pairing. If metering Site power with the Neurio Meter, ensure the Gateway 2's internal site meter is deselected in Commissioning.

Wireless Communication to the Backup Gateway

The Neurio Energy Meter (Tesla P/N 1112484-00-x) may be wirelessly paired with Backup Gateway as part of the normal Powerwall commissioning process within the Commissioning Wizard.

Wired Communication to the Backup Gateway

As an alternative to wireless communication, it is possible to establish wired communication between the meter and the Gateway using an optional 2-conductor meter communication harness (Tesla P/N 1133339-00-x). Up to two meters can be wired directly to the Gateway.

If the meter is located outside the Gateway, the harness leads can be extended by splicing additional wire to the harness. See [Maximum CT Extension on page 17](#).

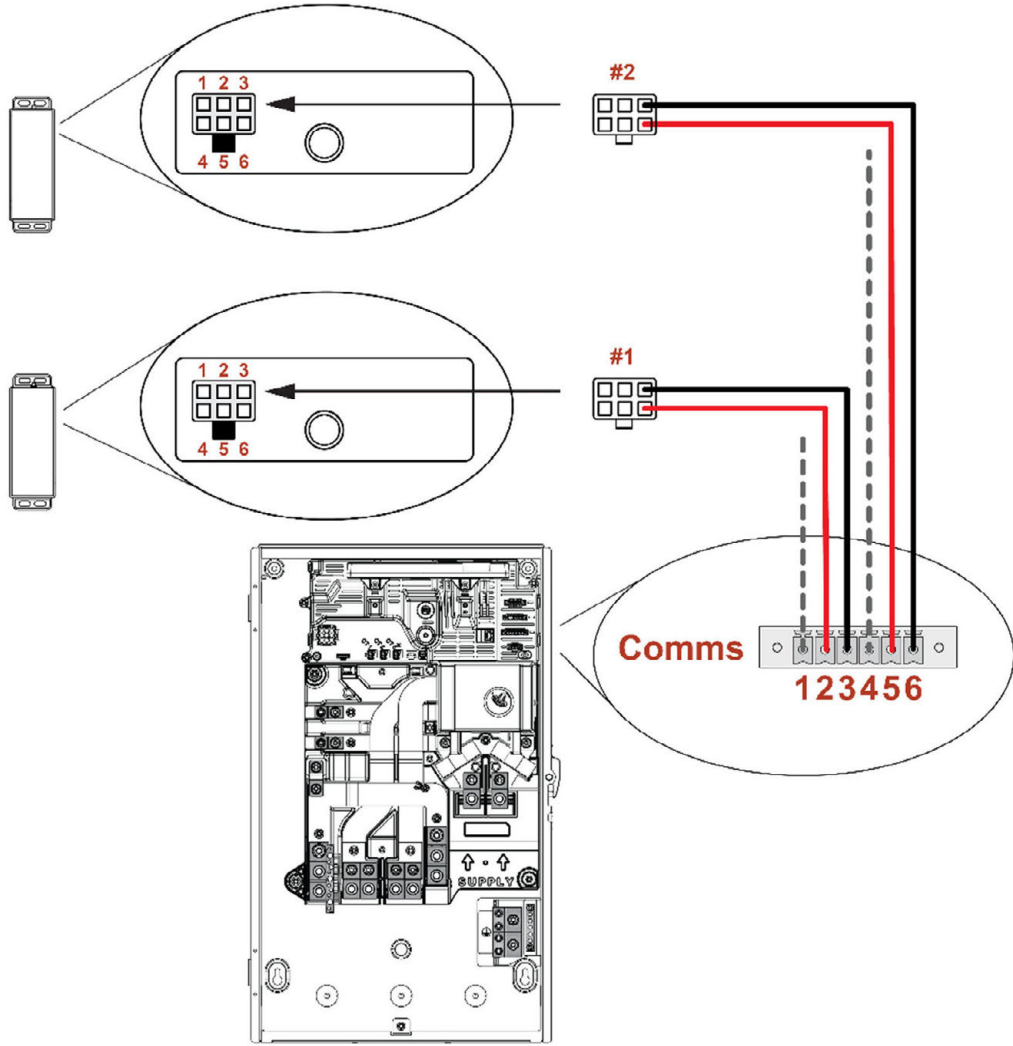
The meter antenna is always required, even if the meter is located inside the Backup Gateway enclosure or connected to the Gateway using the optional wired communication harness.

NOTE: Tesla recommends connecting the meter via wireless Wi-Fi rather than using a wired connection. This is because the meter receives firmware updates with new features and improvements, but only if the meter is communicating to the Gateway via Wi-Fi. Firmware updates are not possible when the meter is using wired communication. If you must use wired communication, connect the meter to the gateway wirelessly first to update the meter firmware, then transition to wired communication.

1. Plug the 2-conductor harness into the port on the top of the meter.
2. Connect the harness leads to the Backup Gateway Meter Communication ports by inserting them into the corresponding connector, according to the following table and diagram.



Figure 25. Meter Communication Wiring



Meter #1 Communication Port Pin	Meter Terminal	Backup Gateway Meter Communication Pin	Wire Gauge
3	RS485 LO	3	24-16 AWG (0.2-1.5 mm ²) or CAT5 (24 AWG)
6	RS485 HI	2	24-16 AWG (0.2-1.5 mm ²) or CAT5 (24 AWG)
(Harness shield)	(Earth/Shield)	1	24-16 AWG (0.2-1.5 mm ²) or CAT5 (24 AWG)

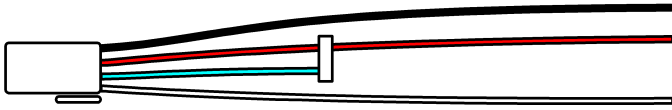
Meter #2 Communication Port Pin	Meter Terminal	Backup Gateway Meter Communication Pin	Wire Gauge
3	RS485 LO	6	24-16 AWG (0.2-1.5 mm ²) or CAT5 (24 AWG)
6	RS485 HI	5	24-16 AWG (0.2-1.5 mm ²) or CAT5 (24 AWG)
(Harness shield)	(Earth/Shield)	4	24-16 AWG (0.2-1.5 mm ²) or CAT5 (24 AWG)



Meter Voltage Taps

If the site has single-phase electrical service, before relocating the meter, modify the provided voltage line harness by combining the blue and red leads.

Figure 26. Voltage Line Harness with Combined Leads



Current Transformer Placement

CT placement locations include the following:

Site (Grid): A CT is placed between the utility meter and main switch to measure both load and generation. See Appendix F for information on implementing a Site Limit to curtail Powerwall charging from the grid.

Solar: If the site includes solar equipment, a CT is placed after the solar inverter to measure the solar output.

Load: Site and solar metering are preferred. However, in configurations where it is not possible to locate CTs between the utility meter and the main switch, load metering can substitute for site metering.

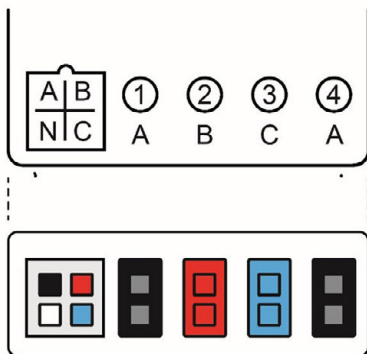
Conductor: Where desired to curtail Powerwall discharge on a conductor, a dedicated Conductor Limit CT can be installed. This feature is optional for installations. See [Appendix F: Feature Notes on page 63](#) for more information.

See [Appendix C on page 49](#) for system wiring diagrams depicting CT placement for various wiring configurations.

Voltage Tap and Current Transformer Connections

Voltage taps and current transformers must be connected so they are measuring the same phase. They must correspond according to the following table and diagram:

Figure 27. Voltage Tap Port (left) and Four CT Ports (right) on Bottom of Meter



Phase	Meter Voltage Tap Port	Meter CT Port
Site L1	A	1/A
Site L2	B/C*	2/B
Solar L1		4/A
Solar L2		3/C



Meter Placement and CT Wire Lengths

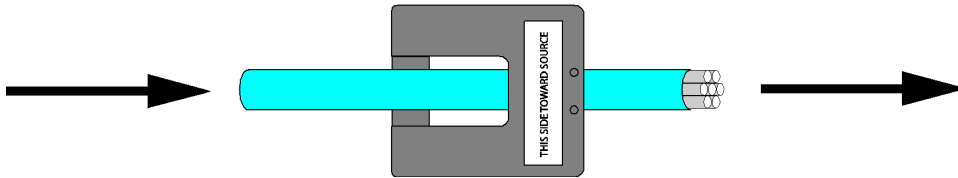
CT leads are 1.5 m long and can be extended to a maximum length of 50 ft (15 m), as follows:

- For a total extended length of **up to 15 ft (4.5 m)**: CT wiring can be extended with up to one Neuroio CT Extension (10 ft/3 m) (Tesla P/N 1125547-03-x)
- For a total extended length of **up to 50 ft (15 m)**: CT wiring can be extended by using wire with the following properties:
 - Shielded, twisted pair with drain wire
 - Wire gauge of 24-18 AWG (0.2-1.5 mm²)
 - Voltage rating equal to or greater than all other circuits in shared enclosures or raceways
- If the distance between the meter and the CT is **greater than 50 ft (15 m)**, the meter can be relocated, or a second meter can be used. When the meter is relocated into the main distribution board, use the antenna extension to place the antenna on the outside of the distribution board.

Current Transformer Orientation

CTs must be installed with the label on the CT housing pointing toward the power source, according to the following table and diagram. Always verify CTs are in the correct orientation by observing power flow in the Commissioning Wizard.

Figure 28. CT Orientation in Relation to Power Flow



CT Usage	CT Orientation
Site CTs	CT label facing <i>toward</i> the service entrance/grid
Solar CTs	CT label facing <i>toward</i> the solar inverter
Load CTs	CT label facing <i>away</i> from the loads

Current Transformer Capacity

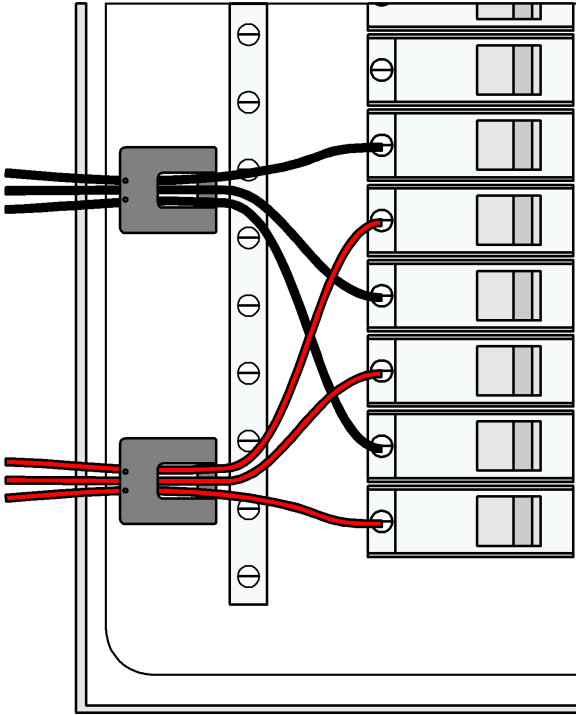
Standard Neuroio CTs have a capacity of 200 A.

If the wiring configuration allows, it is possible to pass multiple conductors of the same type through a single CT, provided the sum of the conductor’s current ratings does not exceed the CT current handling capacity. This is especially useful for systems with multiple solar inverters.

NOTE: Multiple conductors through a single CT is only possible if all conductors are on the same phase.

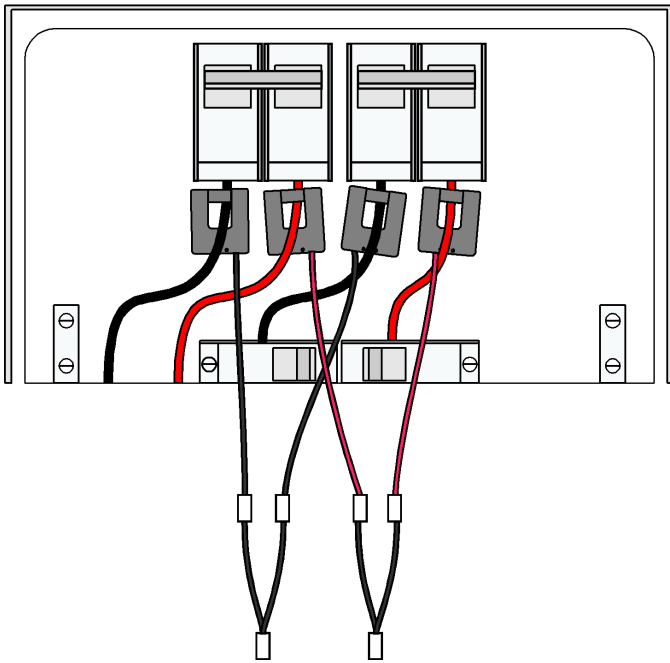


Figure 29. Multiple Conductors Passing Through Single CTs



If a site has multiple solar inverters spaced far apart, or if a main panel has two main breakers (for example, 400 A service with two 200 A breakers), a Y-splitter cable (Tesla P/N 1129625-00-x) can be used to connect two CTs on the same phase to a single meter port.

Figure 30. Y-Cables Connecting CTs on the Same Phase



800 A CTs are also available for larger service sizes (Tesla P/N 1447689-00-x). The 800 A CTs can be used with the standard Neurio Energy meter, but the 800 A CT option must be selected in the Commissioning Wizard drop down menu on the CT page. If using a Y-splitter with 800 A CTs, total current should not exceed 800 A.



Metering Split-phase Solar with a Single CT

Metering a split-phase solar inverter with one Current Transformer (CT) is supported with firmware version 1.37 and later. In this configuration, connecting a single CT to one of the two PV inverter output phases allows total power output to be calculated by software.

The single CT must be installed on the phase that corresponds to the same CT port on the meter (phase A or B).

It is possible to meter multiple split-phase solar inverters with one CT, if the solar inverter circuits are physically near each other:

1. Install both solar inverters with the same phasing
2. Group all conductors of the same phase together to pass through a single CT
3. As with a single inverter, it is important that the phase of this CT matches the phase of the voltage reference on the meter

Installing the Meter

Using the self-drilling screws provided in the meter kit, attach the meter to the inside of the main distribution board or to another surface. Choose a location that takes into account the voltage line harness and CT cable lengths.

To wire the voltage taps:

1. Plug the voltage line harness into the meter in its new location.
2. Connect the voltage line harness leads to a dedicated circuit breaker (not exceeding 16 A) of corresponding phase inside the distribution board:

Voltage Harness Port/Wire Color	Distribution Board Connection
A / Black	L1 breaker terminal
B / Red	L2 breaker terminal
C / Blue	L3 breaker terminal or spliced with the Red B wire
N / White	Neutral bus bar

To locate the CTs:

- Place a CT on the corresponding power wire in the main distribution board, after the utility meter and ahead of any loads.
- If the site includes solar equipment, place an additional CT on the solar wire in the main distribution board.



Configuring Site Limits

The Backup Gateway can be configured to limit Powerwall charge power from the grid. When Site Limits are programmed by the installer during commissioning, the Powerwall charge power is dynamically adjusted based on the net measured site power and the programmed site limit threshold.

Site Limits are configured in the Commissioning Wizard; select **Site Import Limit** from the *Settings* page. At the conclusion of the commissioning process, a summary of the settings will be displayed.

The net site power measurement can be a virtual aggregated meter; therefore, abide by all prior guidance on meters and CTs.

Configuring Conductor Export Limits

Overview

The Powerwall system can be configured to limit Powerwall discharge power. When Conductor Export Limits are programmed, the Powerwall discharge power is dynamically adjusted based on the amperage measured by designated current transformers (CTs) and the programmed Conductor Limit amperage threshold.

Set Conductor Export Limits

Install CTs

- Conductor CTs must be installed on conductors that are:
 - Between the grid connection and the Powerwalls.
 - At a location where the Powerwalls have control over current.
- CTs should be oriented such that the label faces toward the grid.

Complete Commissioning

1. In the Commissioning Wizard, assign the correct CTs to **Conductor**.

NOTE: CTs can only be assigned one designation, meaning a CT cannot be both a Site and a Conductor CT.

2. Enter the amperage for the Conductor Limit on the *Settings* page.

At the conclusion of the commissioning process, a summary of the settings will be displayed.

Load Shedding

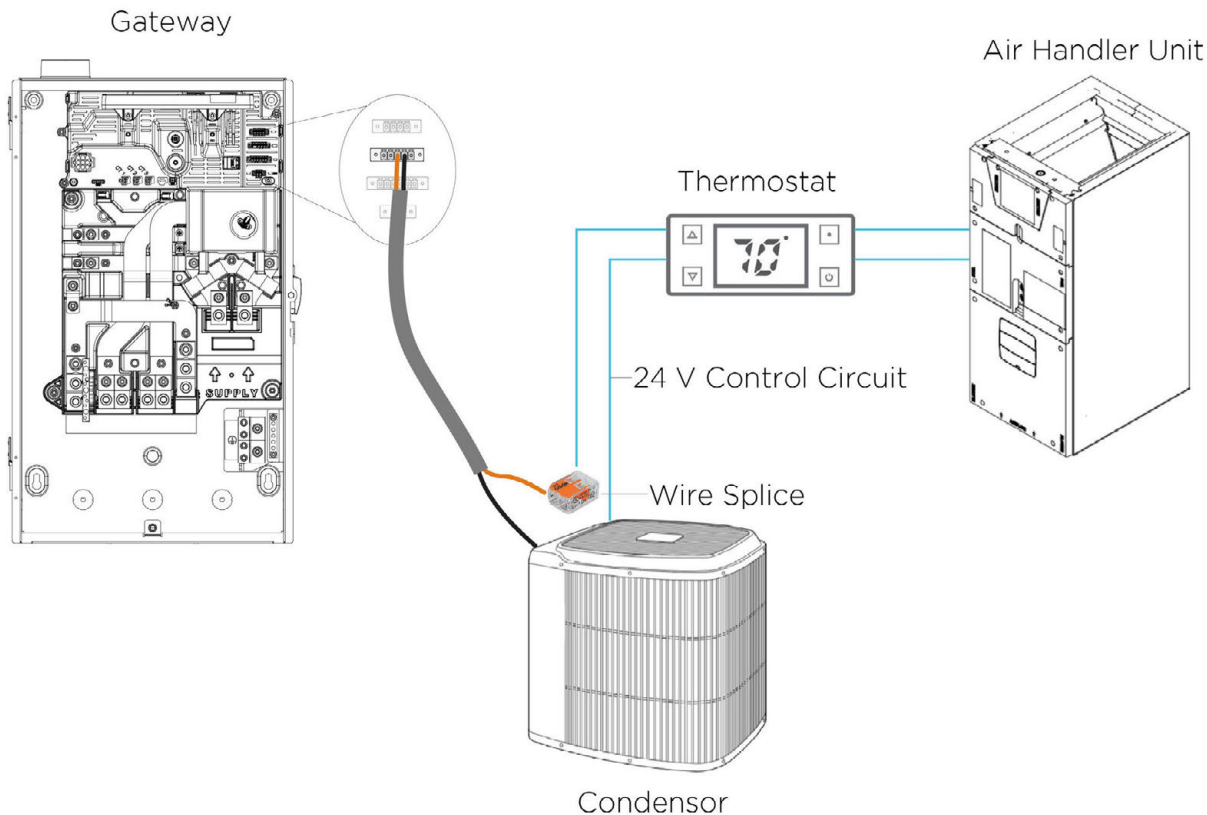
Overview

The Backup Gateway allows for load shedding, meaning a low voltage control circuit can be wired to control a specific load. For instance, an air conditioning load controlled by a thermostat can be wired to the low voltage control circuit in the Backup Gateway so that the load can be shed when Powerwall is off-grid.

When commissioned for load shedding and the Powerwall system is on-grid, the low voltage control circuit is closed and the load is powered. When commissioned for load shedding and the system is operating off-grid, the low voltage control circuit is open and the load is OFF.



When the system is wired for load shedding, the controlled load breaker can remain on the backup loads panel.



NOTE: The load shedding feature is not applicable to permanently off-grid Powerwall systems. Permanently off-grid systems use the Backup Gateway Aux terminals for generator control rather than for load shedding.

NOTE: To activate this feature in the Commissioning Wizard, check the **Open Relay when Off-Grid** box under "Gateway Low Voltage Relay" on the *Installation* page. This feature can be activated in firmware version 1.47 or later.

NOTE: See the [Load Shedding with the Backup Gateway application note](#) for an example installation which uses the load shedding feature to control a condenser for a central air conditioning system.

NOTE: The low voltage control circuit will be opened briefly during firmware updates and under abnormal fault conditions.

NOTE: The load shed relay is rated up to 60 V (DC or AC) and 2 A.



Accessing the Powerwall User Interface

Use Chrome: Incognito mode or Safari: Private Browsing mode .
Work in one browser tab only.
For security message <i>Your connection is not private</i> , select Advanced and Proceed to 192.168.xx.x (unsafe) .
For <i>Error: Bad Credentials</i> , select FORGOT PASSWORD to reset password.
For <i>Error: Login Error (Cannot Start Wizard)</i> , select Click for More and tick the Force Launch Wizard option. Try again.
If experiencing other issues in the Commissioning Wizard, refresh the web page.
If issues persist, reboot Gateway using RESET button.

Updating Firmware

CHECK INTERNET CONNECTION to verify Gateway network connection.
Check for Update to verify you are on the latest firmware. Factory firmware ending in GF must be updated.
Never power down or modify wiring during an update.
During the update, the Gateway will reboot which will cause the “TEG-xxx” Wi-Fi to disconnect. When reconnected, refresh the web page.

Configuring Energy Meters

Conduct all CT tests with at least 1 kW of power flowing.
Ensure all solar inverters are monitored with CTs.
When using only 1 CT for solar, select Solar (1CT x2) on the Current Transformers screen in the Commissioning Wizard.
For each CT, select the applicable function on the Current Transformers screen and perform the following steps to ensure it is in the correct location and orientation: <ul style="list-style-type: none"> • Adjust the Amps/kW slider to see what the CTs are reading. • Verify the on-screen values for the CT against the applicable meter (such as the solar inverter meter or utility meter). • Ensure that: <ul style="list-style-type: none"> ◦ Site CTs are positive for import, negative for export. ◦ Solar CTs are positive when the PV array is producing power (Solar is NEVER negative during daytime).
Negative power flow may indicate CT is installed on the wrong phase! <ul style="list-style-type: none"> • If the “toward source” CT label is correctly facing the solar inverter but power flow is negative, a voltage-current mismatch is likely. • Physically move the CT to the correct phase with the label facing the correct direction. Do not use the Flip checkbox in this case.



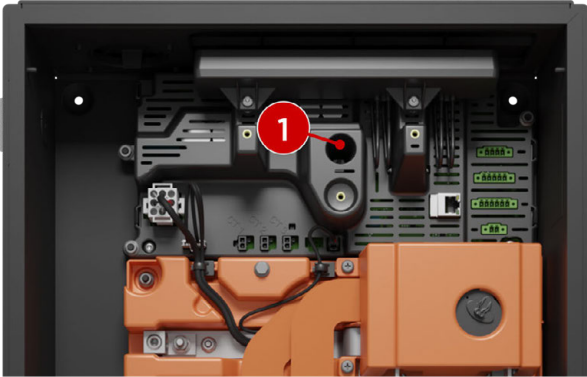
Solar CTs should only meter generation sources. It is never recommended to meter both generation and loads using the Solar (1 CT x2) option. If it is absolutely necessary to install solar and a small amount of loads together without independent metering, you must install the solar CT on the phase without any downstream loads.

Use a handheld clamp or fork meter to verify CT readings.



Reset the Backup Gateway

If experiencing issues with the Backup Gateway, reboot the Gateway using the RESET button (1 below).



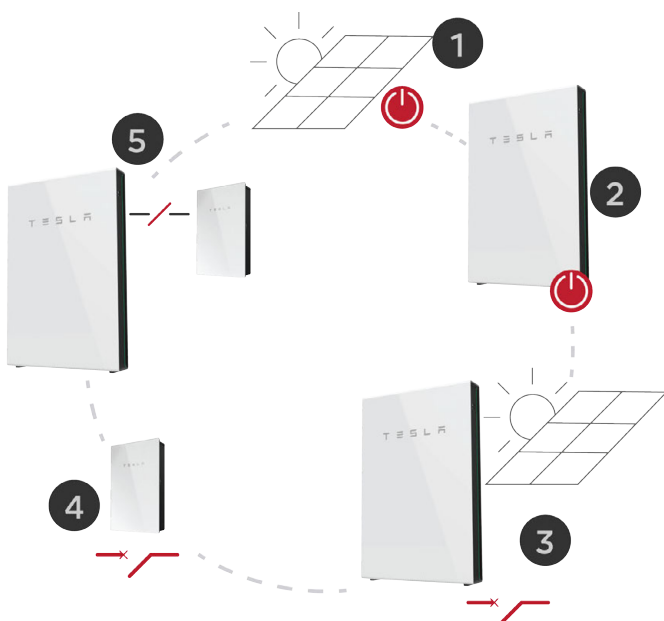
Power Cycle the System

If resetting the Backup Gateway does not resolve issues, power cycle the system as follows.

To power the system off :

1. Turn off solar equipment.
2. Turn off all Powerwalls.
3. Open breakers feeding Powerwall and solar.
4. Open breaker feeding Gateway.
5. Disconnect communication wiring.

Reverse steps to power the system on.





Electrical Equipment Sizing and Overcurrent Protection

Overview

This section describes the requirements for installation of multiple Powerwall units with a Backup Gateway in North America.

Pre-Requisites for Design

Before designing a Powerwall system with more than four Powerwall units:

- AC line impedance must be measured at the installation site to ensure the utility grid connection is able to support the desired quantity of Powerwalls. If the required grid impedance is too high, the Powerwalls may not connect to the grid, resulting in undesirable operation. See Table 1 in this app note for required minimum impedance values.
- Minimize Impedance:
 - Install the Powerwalls as close as possible to the point of interconnection with the grid. The recommended maximum wire length is 33 ft (10 m).
 - Install wires larger than required by code between the Powerwall generation panel and the point of interconnection with the grid. Example, if the design requires 3/0 AWG wire, use 4/0 AWG wire.
- Tesla Certified Installers should submit their multiple Powerwall system designs and measured impedance values to Tesla for review by sending design documents to powerwalldesignreview@tesla.com. Copy your Tesla account manager on all submissions.
- Designers must properly size overcurrent protection and loads to account for the full power potential of multiple Powerwalls. For example, a 10-Powerwall system is capable of discharging up to 50 kW of power. See design examples in Panel Configuration and Breaker Sizing.
- Multi-Powerwall installations may require larger Powerwall communication wire between the Backup Gateway and the Powerwall units. Please refer to the Powerwall 2 AC / Gateway Communication Wiring application note on communication cable requirements, as your install may require up to #16 AWG or 1.3 mm² wire.
- For systems between 11 to 20 Powerwalls, multiple Backup Gateways are required, as each Gateway can only control up to 10 Powerwall units. Please refer to the Multiple Gateways on a Single Site application note on the Partner Portal.
- Grid impedance does not need to be measured for off-grid systems as there is no grid impedance to measure.

Pre-Requisites for Installation

Before installing and commissioning a multi-Powerwall system:

- Plan for the commissioning process to take longer than a typical installation. It can take up to 3 minutes to complete the commissioning scan and verify process for each Powerwall, so a 10-Powerwall system can take up to 45 minutes during this stage of commissioning.

NOTE: Do not interrupt a commissioning step, turn off the system, or unplug the communication wiring at any time during the commissioning process.



Service Type and Capacity Requirements

The Backup Gateway supports systems of up to 10 Powerwall units, but the maximum number of Powerwalls may be limited by the site electrical service, utility grid infrastructure, or local requirements; therefore an impedance test is required to confirm.

Line Impedance Requirements

The sensitivity of the system to line impedance increases with the number of Powerwalls in the system. (See [Impedance Requirements for Multi-Powerwall Systems on page 70](#) for the maximum allowable impedance as it relates to number of Powerwalls.)

If grid impedance at a site exceeds the maximum allowable value, do either of the following:

- Decrease the impedance of the site grid connection. This may require coordinating with the local electrical utility. See “Minimize Impedance” in the Pre-Requisites for Design for suggestions.
- Reduce the quantity of Powerwalls installed at the site to meet the maximum allowable impedance value.

If impedance values exceed the requirement for the installed number of Powerwalls, the system may not function properly.

Measuring Line Impedance

To determine the line impedance at a site, measure between Line and Neutral where the Powerwalls will be interconnected to the site electrical system with testing equipment such as the following:

- Fluke 1660 Series Installation Tester (1662, 1663, or 1664)
- Metrel-MI3000 Multifunction Tester
- Megger LTW315 Loop Impedance Tester

Example Line Impedance Test Instructions

For details on line impedance testing, refer to the test equipment manufacturer’s instructions. The steps below are general guidelines only.

⚠ WARNING: Impedance tests must be performed on an energized electrical system. Impedance tests should be carried out only by trained electricians using appropriate safety equipment and safety practices.

1. Follow manufacturer instructions to calibrate and zero the impedance tester before taking measurements.
2. Complete the test on L1 first, then move to L2.
3. Connect all three voltage test leads – Line, Neutral, and Ground
4. Follow manufacturer instructions to verify that the correct voltage is present. Switch the tester to a voltage measurement mode and check Line-to-Neutral and Line-to-Ground voltages.
5. Follow manufacturer instructions and take an impedance measurement where the Powerwalls will be interconnected to the site electrical system. Switch the tester to the appropriate impedance measurement mode and take the following readings:
 - Line-Neutral
 - Line-Ground

NOTE: The Line-Neutral impedance measurement is the value referenced in [Impedance Requirements for Multi-Powerwall Systems on page 70](#).



6. Record the impedance measurements.
7. Repeat steps 3-6 for L2.

Recommended Interconnection Point for Large Multiple Powerwall Systems



NOTE: Impedance should always be measured at the point of Powerwall interconnection.

Table 9. Impedance Requirements for Multi-Powerwall Systems

# of Powerwalls per site	Maximum Grid Impedance, Line - Neutral
1	0.80 Ohms
2	0.40 Ohms
3	0.27 Ohms
4	0.20 Ohms
5	0.16 Ohms
6	0.13 Ohms
7	0.11 Ohms
8	0.10 Ohms
9	0.09 Ohms
10 *	0.08 Ohms
11 to 12 **	0.07 Ohms
13 to 14 **	0.06 Ohms
15 to 17 **	0.05 Ohms
18 to 20 **	0.04 Ohms

*Maximum number of Powerwalls supported for a single Gateway

**11 to 20 Powerwalls require multiple Gateways

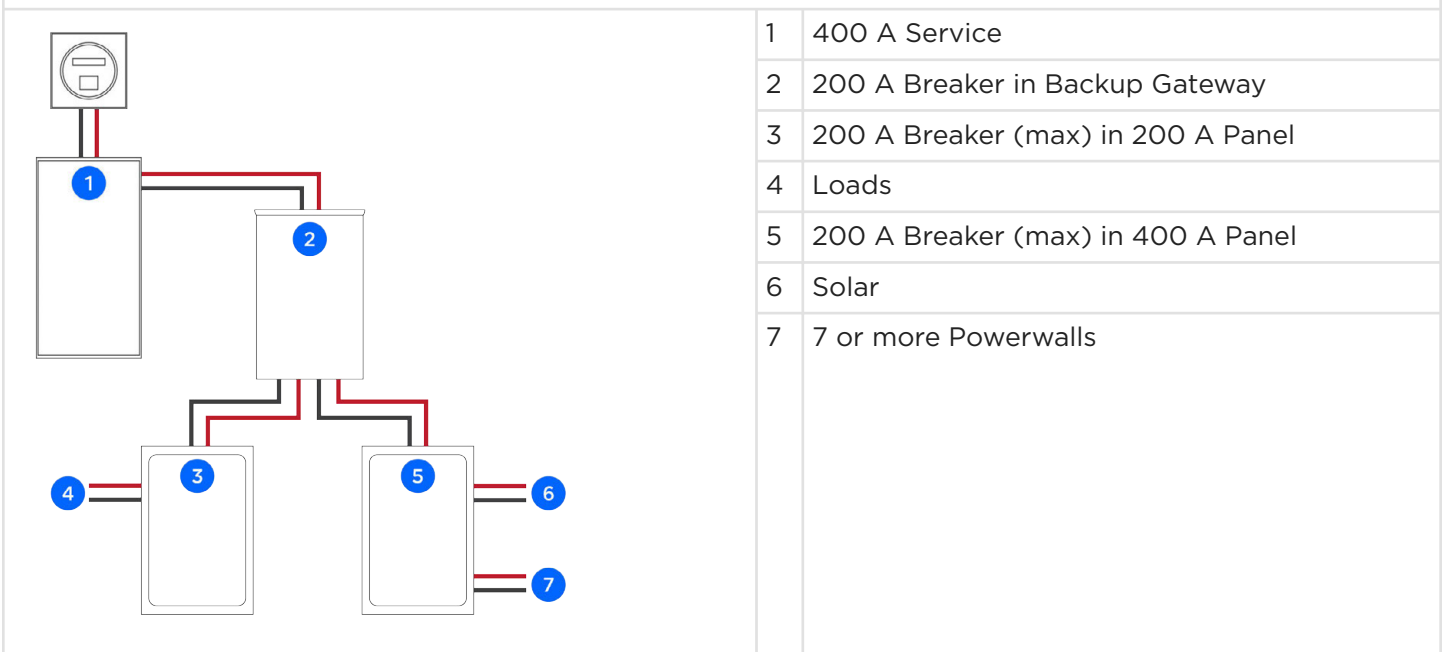


Panel Configuration and Breaker Sizing

The Backup Gateway has a maximum continuous current rating of 200 A. In systems with 7 or more Powerwall units, to ensure sufficient ampacity while keeping total charge/discharge current within the 200 A capacity of the Backup Gateway, a separate generation panel (400 A minimum) with a 200 A main breaker is recommended. The example below shows the following:

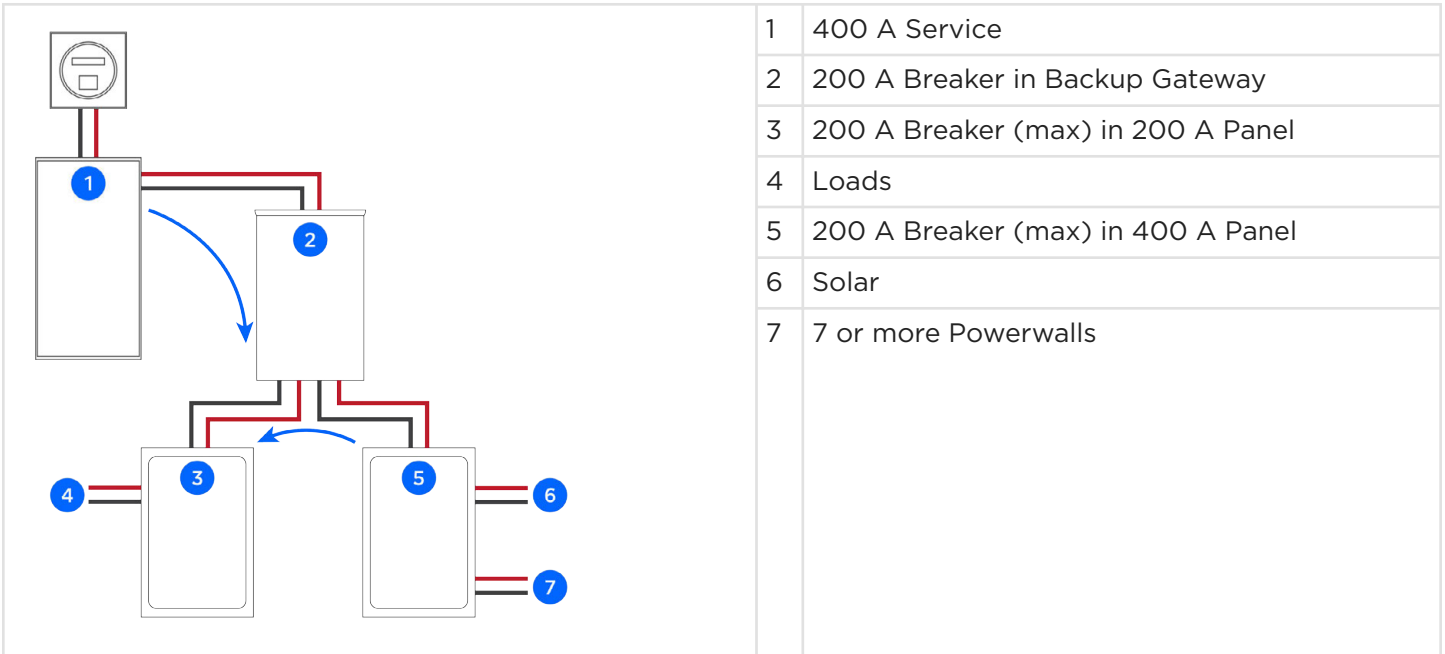
- 400 A main panel with a 200 A main breaker in the panel or in the Backup Gateway
- 400 A generation panel with 200 A main breaker
- Load panel w/ 200 A main breaker

Example 400 A Service with Separate Generation and Load Panels

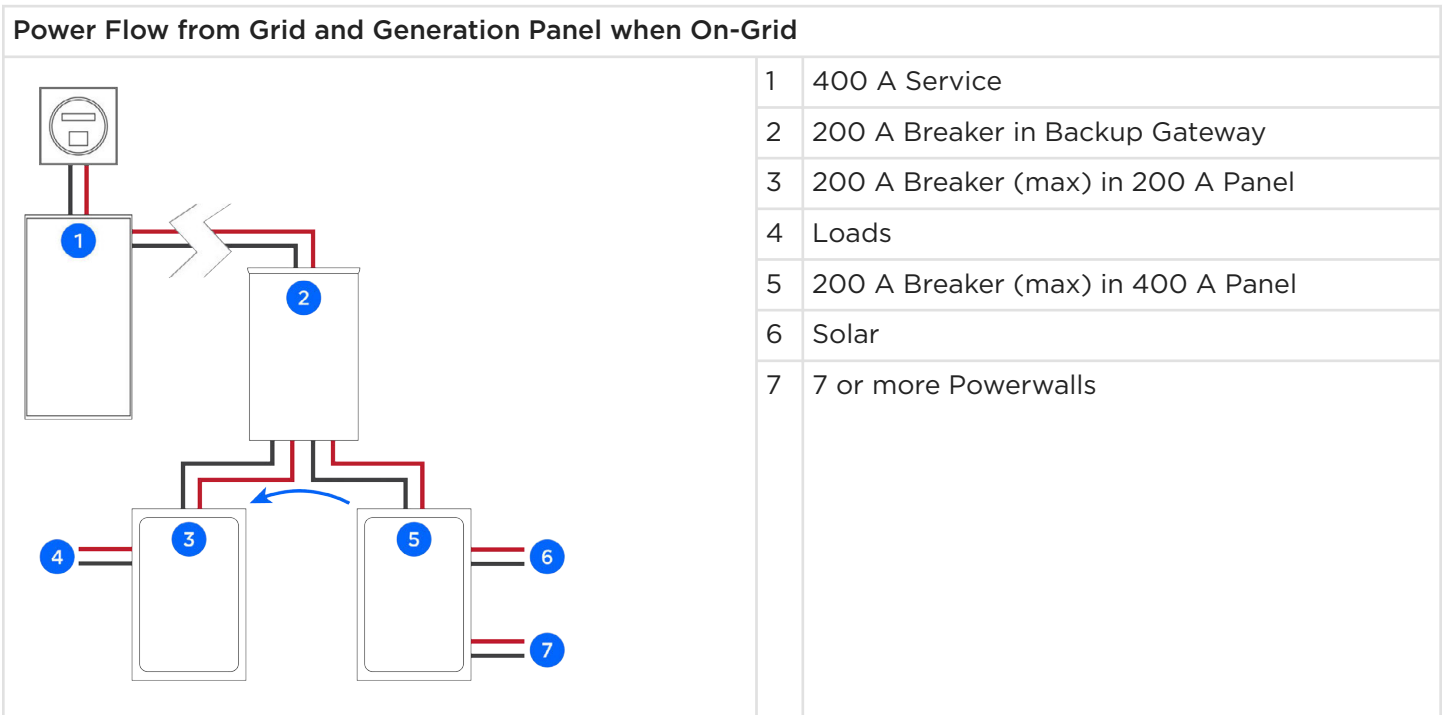


When wiring the load panel, ensure that combined loads do not exceed main breaker continuous or peak current ratings, whether the system is on-grid or off-grid. When the grid is operational, power can flow from both the grid and the generation panel to the load panel.

Power Flow from Grid and Generation Panel when On-Grid



When there is a grid outage, power can flow from the generation panel to the load panel.

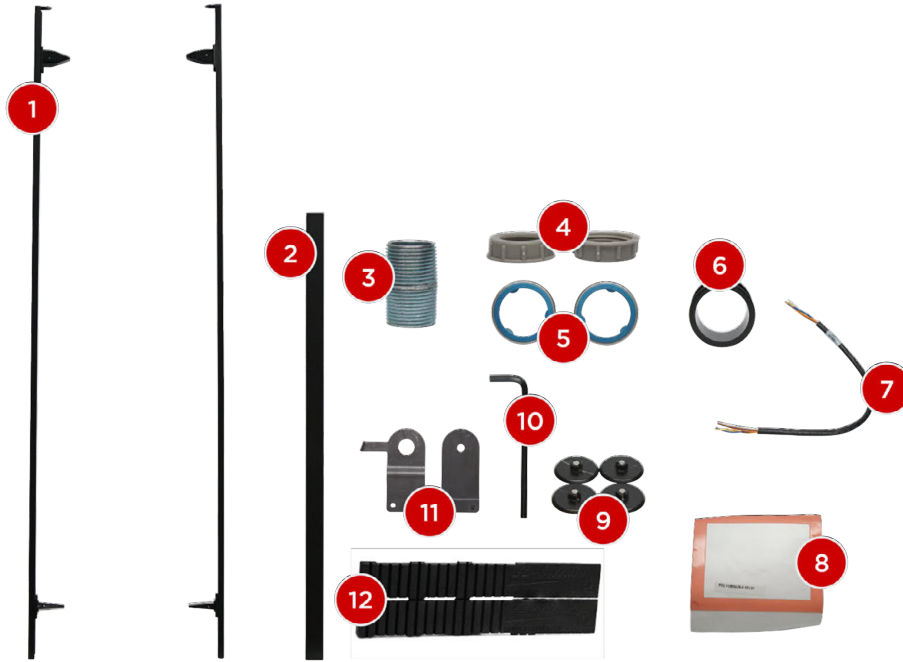




Multi-Powerwall Installations with the Stack Kit

In the Powerwall Stack Kit

Powerwall Stack Kit: Tesla P/N 1112154-00-x



1	2	3	4
(2) Side clips	(1) Top cover	(1) Conduit nipple	(2) Conduit insulation bushings
5	6	7	8
(2) Conduit sealing O-rings	(1) Bridge piece	(1) 5-conductor communication cable	(1) Wiring interface cover
9	10	11	12
(4) Magnetic camshaft caps	(1) 6 mm Allen wrench	(1) Drill guide (two pieces)	(2) Shims

Required Tools

- Personal protective equipment (safety glasses, gloves, protective footwear)
- Drill and 6 mm (1/4-inch) drill bit (for drilling pilot hole in Powerwall chassis)
- 35 mm (1-3/8 inch) hole saw (for drilling conduit hole in Powerwall chassis)
- Small metal file (for removing burrs from Powerwall chassis sheet metal)
- Rubber mallet or small hammer and wood block (for seating side clips in Powerwall)
- Wire strippers/cutters for 24 to 8 AWG (1.5 to 8 mm²) wires
- Small grease applicator (wooden craft stick or cotton swab)



- Water-resistant heavy-duty grease (Dow Corning Molykote BR-2 Plus High Performance Grease or equivalent, for preventing corrosion on side clips)
- Installation tools (level, tape measure, pencil, flashlight)

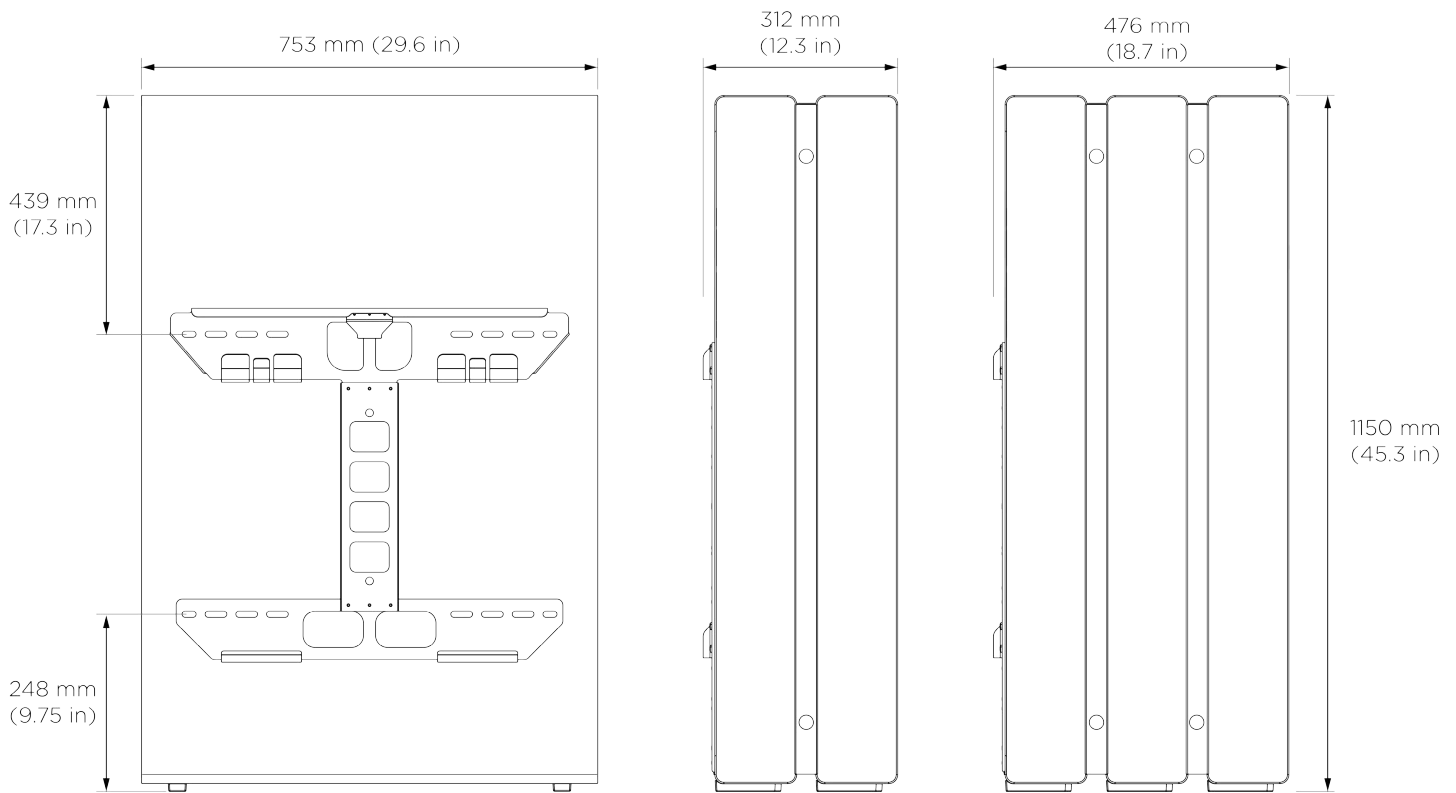
Site Requirements

Stacked multi-Powerwall systems must be floor-mounted and must be anchored to an adjacent wall. The wall must be capable of supporting the lateral load of the Powerwall stack.

A maximum number of 3 floor-mounted Powerwall units may be joined together with two Powerwall Stack Kits. For systems with more than 3 Powerwalls, separate groups of 3 units should be assembled, with each group of 3 attached to a wall.

For complete Powerwall Mechanical Specifications and Site Requirements, see [Site Requirements and Pre-Installation Guidance on page 9](#).

Figure 31. Dimensions for 2-unit and 3-unit Powerwall Stacks



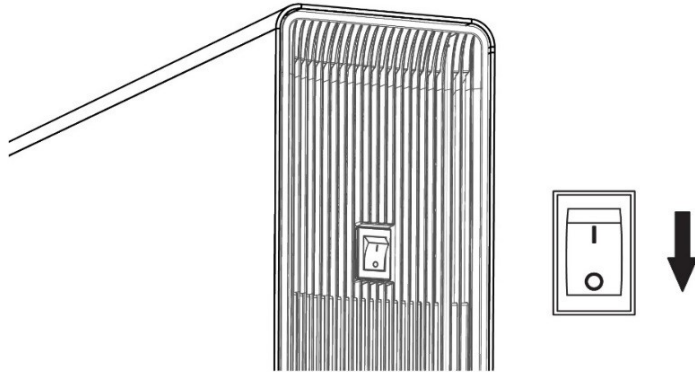
Installation Instructions

These instructions assume that at least one Powerwall has been installed and additional Powerwall units are being installed using the Powerwall 2 Stack Kit (Tesla P/N 112154-00-x). See [STEP 1: Plan the Installation Site on page 16](#) for complete installation instructions.

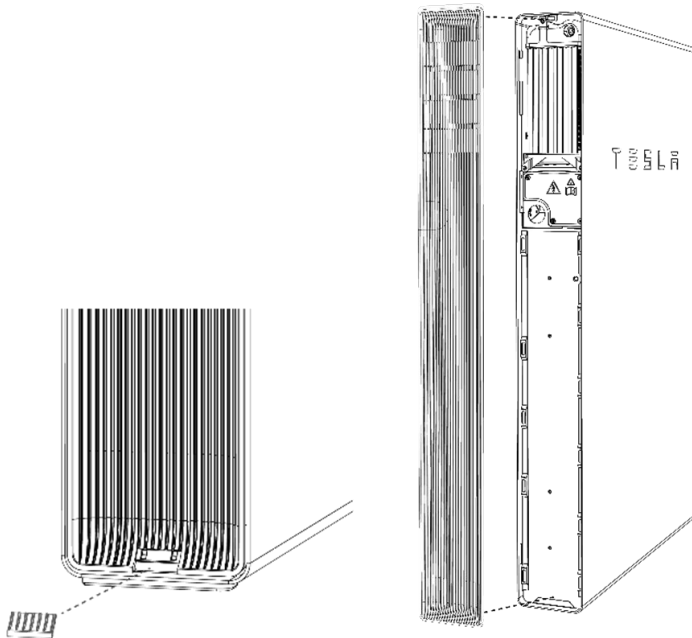


Step 1: Prepare for Installation

1. Turn off the first (previously installed) Powerwall by setting its On/Off switch to the OFF position.

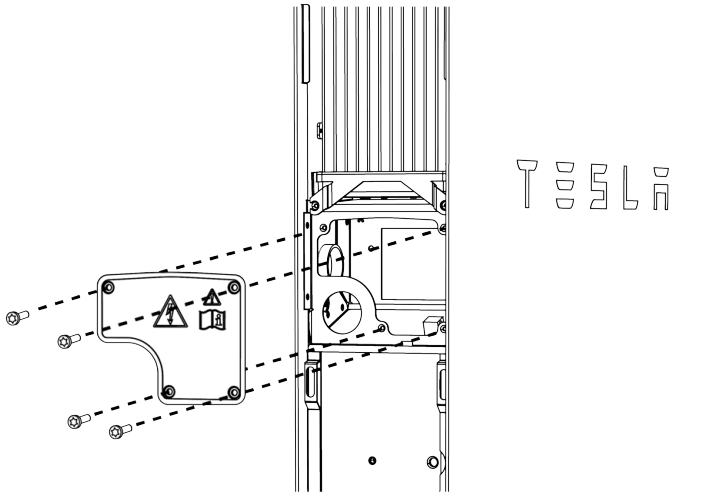


2. Turn off the AC circuit breaker for the Powerwall.
3. Ensure that the second Powerwall is turned off by verifying that its On/Off switch is set to the OFF position.
4. Remove both side covers from each Powerwall to be joined. NOTE: On the first (previously installed) Powerwall, it may be necessary to remove the small plastic insert at the bottom of the covers to help with removal. For the right (LED) side covers, do not disconnect the switch and LED leads. Turn the cover to one side and rest it against the Powerwall chassis.





- Using a T20 Torx bit, remove the wiring compartment covers from the previously installed Powerwall.



Step 2: Choose a Wiring Option

In multi-Powerwall systems, communication wiring is daisy-chained between Powerwall units. Power wiring is direct (home run) from each Powerwall to a dedicated circuit breaker in the electrical panel. Wiring between Powerwalls can be concealed, or run externally.

Concealed Wiring

For concealed wiring, a hole is drilled from the front of the first Powerwall into its wiring compartment and wires are run directly into it from the back port of the second Powerwall. To use this wiring method, proceed to Step 3, “Prepare for Concealed Wiring.”

External Wiring

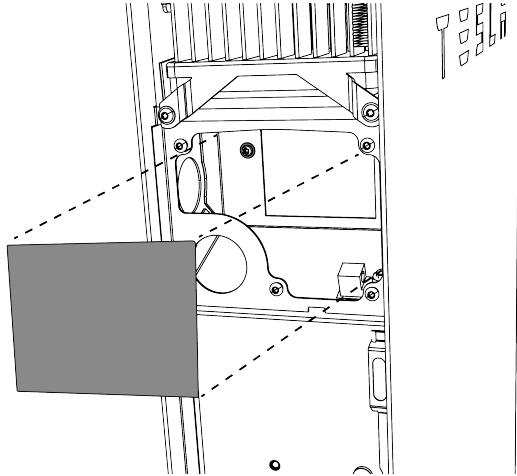
For external wiring, wires are run through conduit or raceway that spans the wiring compartment ports on the side of each Powerwall. To use this wiring method, skip to Step 4, “Join the Powerwall Units.”

Step 3: Prepare for Concealed Wiring

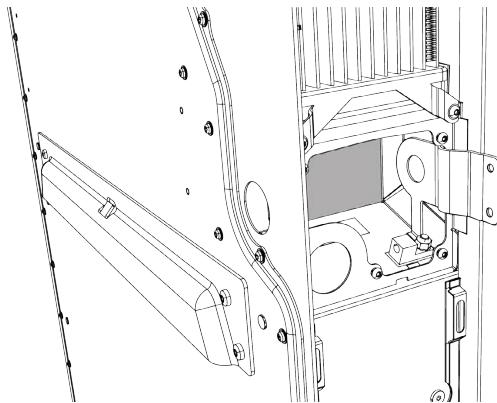
- Disconnect all wiring from the wiring compartment of the first Powerwall.



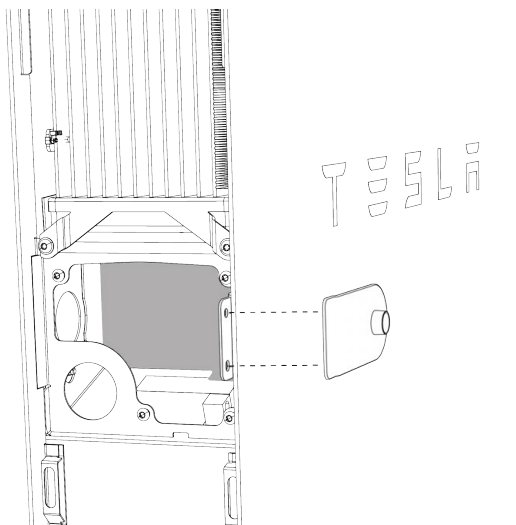
2. Locate the wiring interface cover and peel back the film to expose the adhesive on the cover gasket. With the gasket facing inward, place the cover over the interface board at the back of the wiring compartment. The cover is intended to protect the circuit board and its components from metal shavings while drilling into the wiring compartment.



3. Attach the included drill guide to the front of the first Powerwall by bracing the inside half of the guide against the bottom of its wiring compartment.

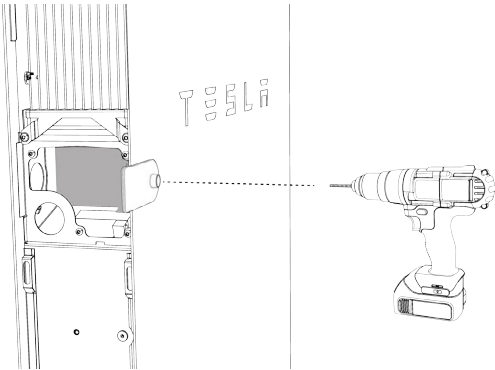


4. Clip the outside half of the drill guide to the inside half so that the guide engages the hem of the Powerwall enclosure.



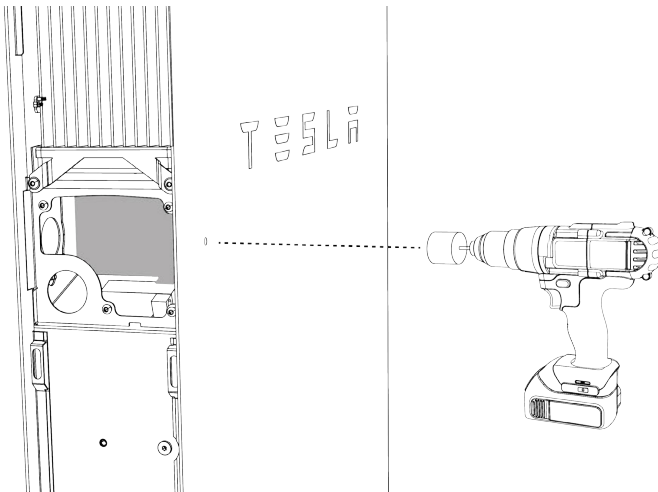


5. While holding the drill guide to make sure it conforms to the edge of the Powerwall chassis, drill a 1/4-inch (6 mm) pilot hole using the small hole in the drill guide.



6. Remove the drill guide.

7. Drill the full-size 1-3/8 in (35 mm) hole with a hole saw, using the pilot hole as a guide.



8. File the edges of the hole to remove any burrs.

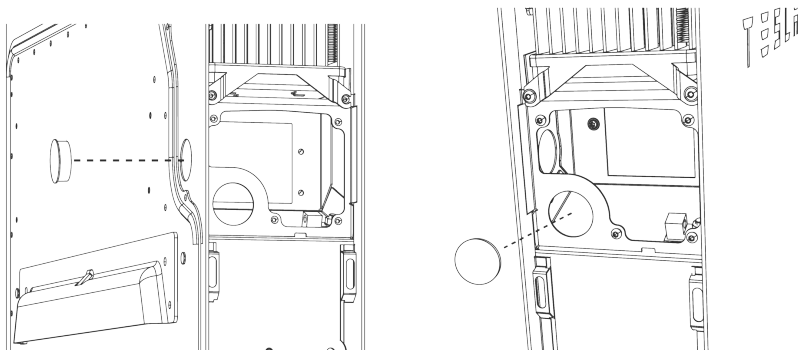
9. Clear the wiring compartment of all metal shavings and debris.

10. Remove the protective cover from the wiring compartment.

11. If the first Powerwall still has its protective film, remove the film.

12. Peel back the protective film from the feet of the second Powerwall before moving it into place.

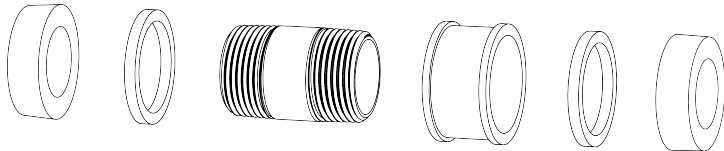
13. Remove the plug from the back cable entry port of the second Powerwall and place it in the side cable entry port of the same Powerwall.





Step 4: Join the Powerwall Units

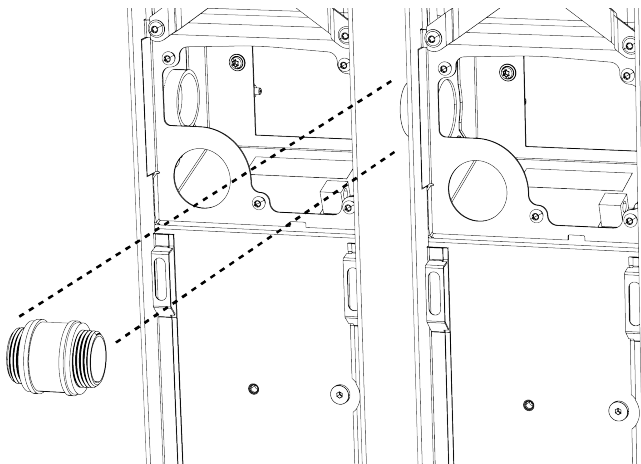
1. Orient the second Powerwall about 1 in (2 cm) in front of the first, with its back cable entry port facing the hole you drilled in the front of the first Powerwall.
2. (Concealed wiring installations only) Do the following to bridge the gap between the Powerwall wiring compartments:
 - Locate the bridge piece, conduit nipple, two O-rings, and two insulation bushings.



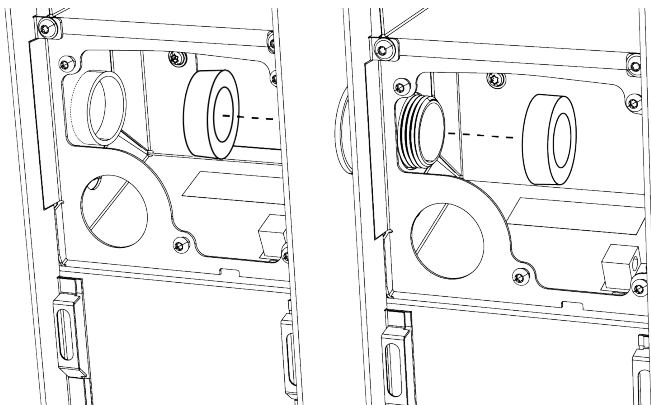
- Assemble the conduit nipple, bridge piece and O-rings. Center the bridge and O-rings on the nipple.

NOTE: Orient the O-rings so that the sides with greater surface area (marked “Box Side”) point to the outside, toward the Powerwall chassis.

- Install the assembly between the two Powerwalls so it spans the two wiring compartments.

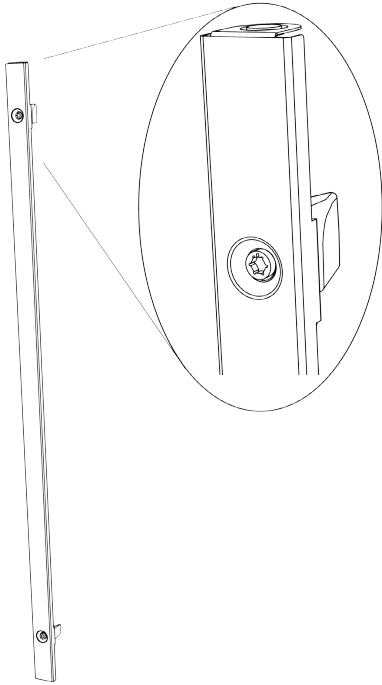


- Thread an insulation bushing onto each end of the conduit nipple, but do not fully tighten the bushings.

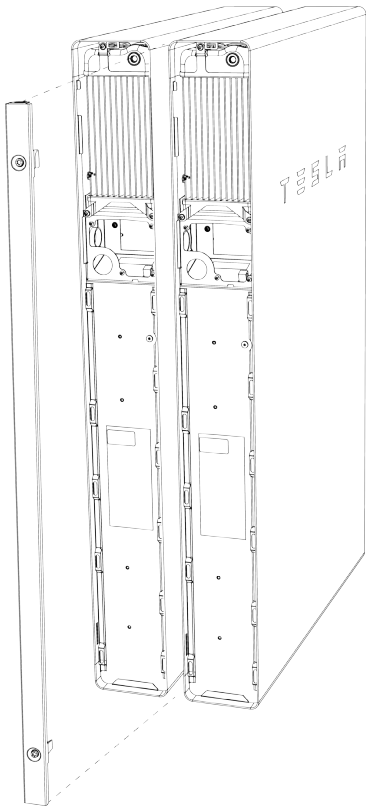




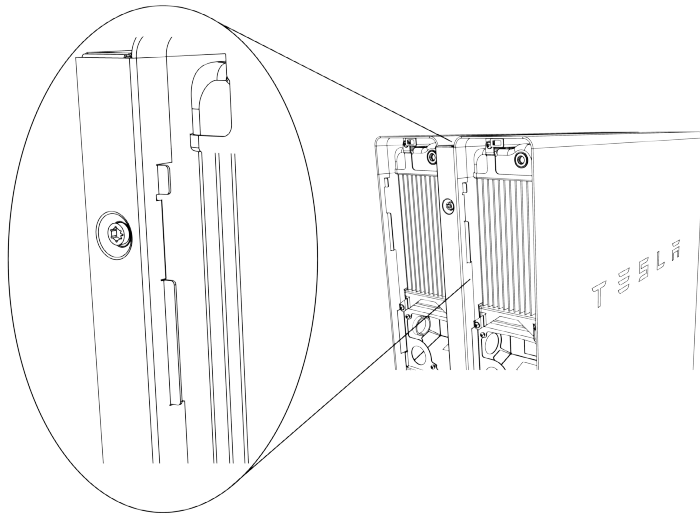
3. (All installations) Locate a side clip, making sure the flange (with magnet) is positioned at the top and that the cams are rotated vertically in relation to the clip.



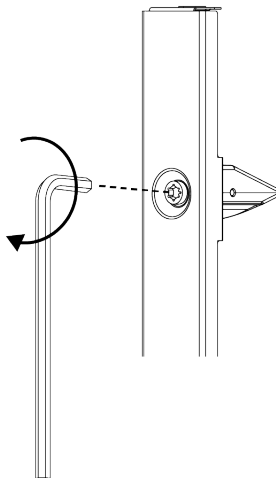
4. Slide the side clip into the gap between the two Powerwalls so that its flanges engage the side hem of each enclosure.



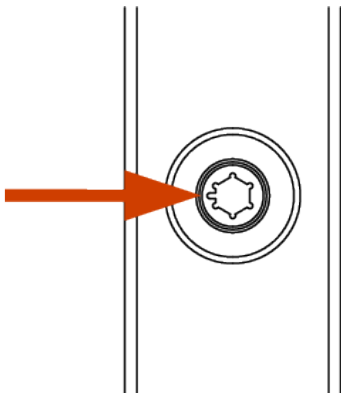
NOTE: The Powerwall enclosure hems have cutouts that mate with tabs in the clip.



5. Press the clip until it is flush with the sides of the Powerwalls.
6. Using the provided 6 mm Allen hex wrench, do the following:
 - Turn the top cam 90 degrees clockwise until it clicks into place and stops rotating.



- Turn the bottom cam toward the wall (toward the first Powerwall) so that the cam indicator notch on the hex camshaft head points toward the wall, until the cam clicks into place.



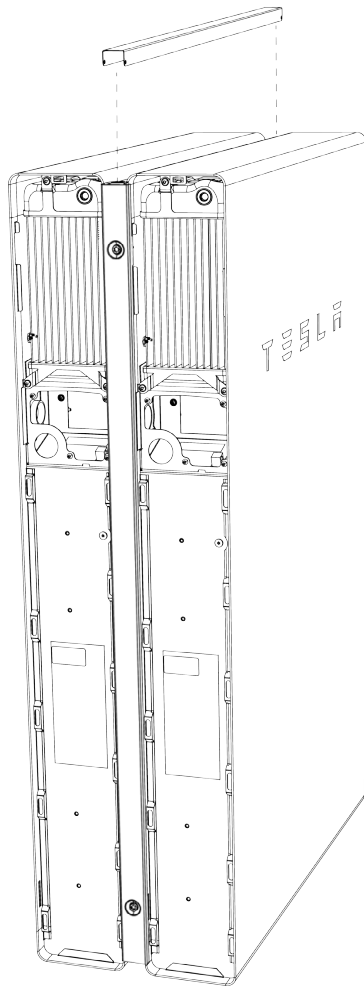


NOTE: The top cam is symmetrical and can be rotated in either direction to secure the side clip. The bottom cam must be rotated toward the first Powerwall so that its stepped side (indicated by the notch on the hex camshaft head) engages the housing of one of the Powerwalls.

7. Repeat steps 3-6 to install a side clip on the other side of the Powerwalls.

NOTE: If necessary, use a small rubber mallet or a hammer and wood block to gently tap the side clips so that they are fully seated in the hem of the Powerwall.

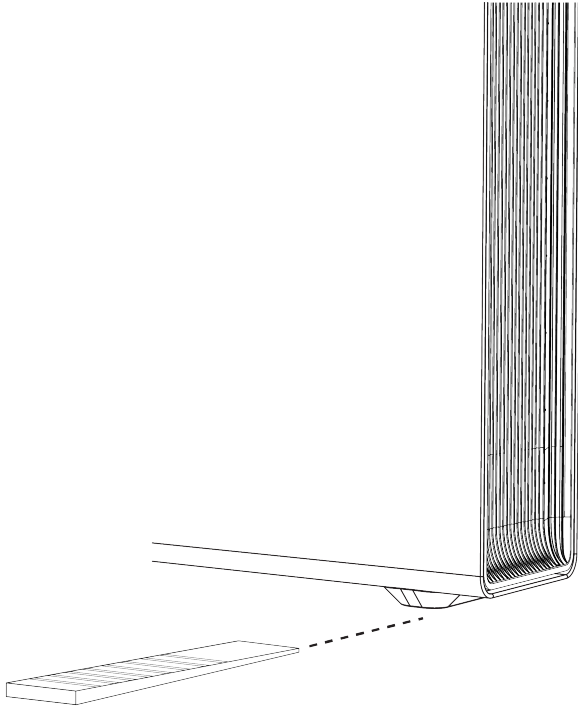
8. Position the top cover across the gap between the Powerwalls so that its flanges engage the tops of each side clip. The cover is held in place by the magnets on the tops of the side clips.



9. (Concealed wiring installations only) Tighten the insulation bushing on each side of the conduit nipple to secure the bridge between the two Powerwall wiring compartments.



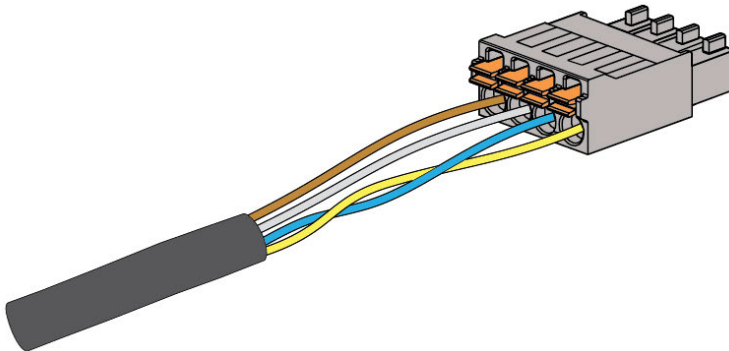
10. Use the provided shims to ensure that the Powerwalls are level.



NOTE: When joined, the units should be level within +/- 2 degrees side-to-side and within +/- 5 degrees front-to-back.


Step 5: Wire the Powerwall Units

1. Connect the communication ports of the two Powerwalls by doing the following:
 - Run the 4-conductor communication cable between the Powerwall wiring compartments. At the first Powerwall, cut back the drain wire; the drain wire should be terminated only at the second Powerwall.
 - Attach the provided Phoenix connector to one end of the cable, and attach the extra Phoenix connector that came with the Powerwall to the other end of the cable. See [Appendix B: Wiring Reference on page 45](#) for additional wiring information.





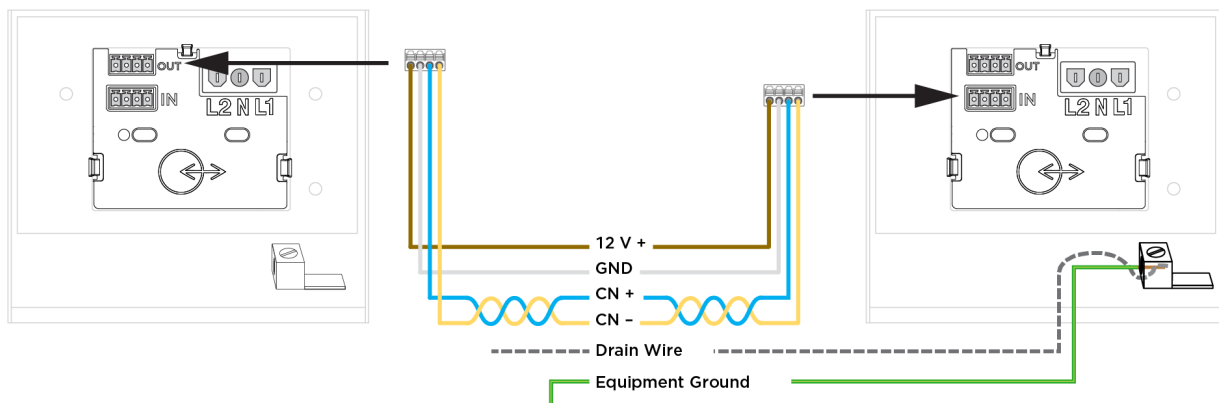
- Connect the communication OUT connector of the first Powerwall to the communication IN connector of the second Powerwall.
- To ground the drain wire:
 - Strip the end of the equipment grounding conductor and wrap the communication drain wire around the grounding conductor lead.
 - Insert the drain wire and grounding conductor lead into the second Powerwall chassis ground lug.

The ground lug is identified with the following symbol: 

- Tighten the screw in the ground lug to 4.5 Nm (40 lb-in).

NOTE: There will be a drain wire grounded in each Powerwall in the chain. For each pair of components (Gateway and first Powerwall, first Powerwall and second Powerwall, etc.), the drain wire is cut at the first component and grounded at the second.

Figure 32. Connecting Powerwall Communication Ports



- In the last Powerwall in the communication chain, plug the 4-pin Phoenix connector with the terminating 120-Ohm resistor into the top 4-pin socket (labeled “OUT”).
2. Connect each AC Powerwall to the main or sub electrical panel of the installation (depending on the system configuration) according to the electrical service type.
 3. On the Powerwall side, strip the ends of the wires and attach them to the corresponding leads on the 3-pin AC power harness.
 4. Plug the AC power harness into the AC connector in the Powerwall wiring compartment. Ensure that the connector clicks into place.

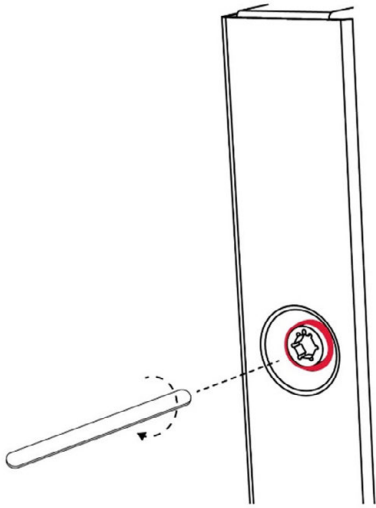
NOTE: Each Powerwall connection to the main electrical panel requires an independent 30 A circuit breaker. This breaker serves as the disconnect for the Powerwall, and must be wired in accordance with local wiring codes and regulations.
 5. Reconnect the power and communications leads that were disconnected from the first Powerwall at the beginning of the installation.

Step 6: Close the Wiring Compartments and Replace the Covers

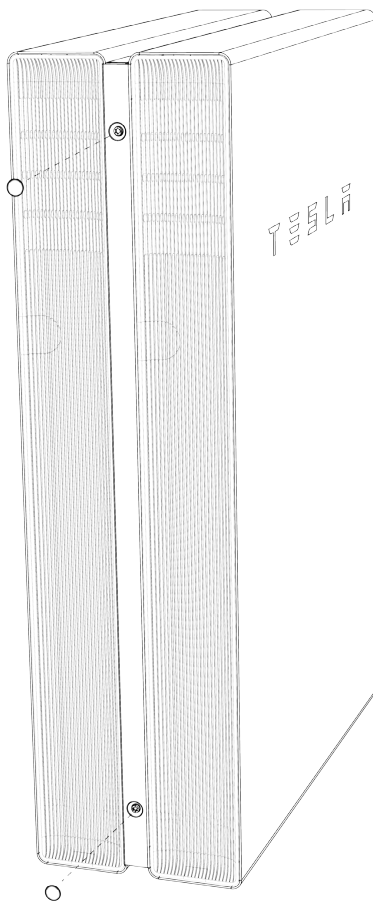
1. Arrange the communication and AC power wires inside the Powerwall wiring compartments.
2. Ensure that all conduit junctions and cable entry points are secure and properly sealed.
3. Replace the wiring compartment cover on each Powerwall. Ensure that the cover seats properly on the gasket so that the compartment is sealed. Tighten the fasteners using a Torx T20 bit. Torque to 1.5 Nm.
4. Replace each of the side covers on the Powerwalls by pushing the top into place and working toward the bottom to reattach it to the clips along the length of the unit.



- (Optional) In humid or rainy climates, or in locations where the installation may be exposed to salt, fog, or other corrosive elements use a small applicator (such as a wooden craft stick or cotton swab) to apply a generous bead of heavy duty water-resistant grease around the outside edge of each camshaft head where it contacts the side clip.



- Place a magnetic camshaft cap on each of the four hex camshaft heads





Step 7: Turn On and Commission the System

1. Switch on the AC circuit breakers for the Gateway and each Powerwall.
2. Switch on each Powerwall by moving the switch on the right (LED) side of the unit to the ON position. When each Powerwall establishes communication with the Gateway, the LED on the right side of Powerwall illuminates.
3. See [Commission the System on page 38](#) for instructions on updating system firmware and commissioning the system.

NOTE: During commissioning, ensure that when scanning for Powerwalls, the Commissioning Wizard shows all Powerwalls in the system.

4. After installation is complete, remove the protective film from the second Powerwall.



Revision	Date	Description
1.0	2020-05-23	Initial release
1.1	2020-06-26	<ul style="list-style-type: none">• Added Powerwall and Backup Gateway 2 specifications• Updated multi-Powerwall communication wiring instructions for clarity
1.2	2020-08-10	<ul style="list-style-type: none">• Noted breaker requirement when wiring Optional Internal Panelboard to Non-Backup lugs (see Install Optional Internal Panelboard in the Backup Gateway on page 27)• Added Optional Internal Panelboard terminal wire gauges to Wire Reference
1.3	2020-09-30	<ul style="list-style-type: none">• Corrected stack kit dimensions



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Revision 1.3