



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.

Penalties may be applicable for incorrect disposal of this waste, in accordance with your national legislation.

For Professional Users in the European Union

If you wish to discard electrical and electronic equipment (EEE), please contact your dealer or supplier for further information.

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.

General Warnings and Information.....	3	Install Powerwall and Generation Breakers in the Backup Gateway.....	32
Specifications.....	6	Configuring Powerwall(s) on Three-Phase Installations.....	33
Powerwall Specifications.....	6	Inverter Configuration.....	33
Backup Gateway 2 Specifications.....	8		
Registering Powerwall.....	9	STEP 6: Connect Powerwall to the Backup Gateway.....	34
Site Requirements and Pre-Installation Guidance.....	10	Connect Powerwall to the Backup Gateway.....	34
Powerwall and Backup Gateway 2 Installation Requirements.....	10	STEP 7: Install Energy Metering for the System.....	37
Powerwall Physical Requirements.....	11	About Energy Metering.....	37
Powerwall Identification.....	12	Site and Solar Metering for Backup Gateway 2.....	37
Powerwall Optimum Temperature Range.....	12	Install Tesla 100 A CTs.....	38
Preparing for Installation.....	13	STEP 8: Complete the Installation.....	39
In the Powerwall Box.....	13	Plan Internet Connection for the Backup Gateway 2.....	39
In the Powerwall Accessory Bag.....	13	Close the Wiring Compartments and Turn the System On.....	39
In the Backup Gateway 2 Box.....	15	STEP 9: Commission the System.....	41
In the Backup Gateway 2 Accessory Bag.....	15	Commission the System.....	41
Required Tools.....	16	Finish and Demonstrate the Installation.....	44
Required Supplies.....	16	Troubleshooting.....	44
Installation Materials not Provided by Tesla.....	17	Technical Support.....	44
STEP 1: Plan the Installation Site.....	18	Maintenance.....	44
Choose a Location.....	18	Appendix A: Powerwall Mounting Details.....	45
Choose Side or Rear Cable Entry for Powerwall.....	18	Powerwall Space Requirements.....	45
Choose Top, Bottom, or Rear Cable Entry for Backup Gateway.....	18	Mounting Bracket Anchoring Details.....	46
Plan the Electrical Service Connection to Backup Gateway.....	18	Appendix B: Wiring Reference.....	49
Plan Distance Between Components.....	19	Powerwall Wiring.....	49
STEP 2: Mount Powerwall and the Backup Gateway.....	20	Backup Gateway 2 Wiring.....	51
Anchor the Powerwall Mounting Bracket.....	20	Backup Gateway 2 Communication Wiring.....	52
Mount Powerwall on the Bracket.....	21	Appendix C: System Wiring Diagrams.....	54
Mount the Backup Gateway.....	25	Overview.....	54
STEP 3: Verify Neutral-Earth Bonding Scheme and Install Earthing Rod.....	28	Single-Phase Service (TN Network).....	55
STEP 4: Make AC Power Connections to Supply and Load Panels.....	29	Three-Phase Service (TN Network).....	56
Make AC Power Connections to Supply and Load Panels.....	29	Appendix D: Grid Supply Fuse and Fuse Holder.....	57
STEP 5: Install Powerwall and Generation Breakers in the Backup Gateway.....	32	Grid Supply Fuse and Fuse Holder.....	57
		Appendix E: Configure Energy Metering... ..	58

Appendix F: Installing a Neurio Energy Meter.....	60	Step 4: Join the Powerwall Units.....	86
Neurio Energy Meter Overview.....	60	Step 5: Wire the Powerwall Units.....	91
Wireless Communication to the Backup Gateway.....	62	Step 6: Close the Wiring Compartments and Replace the Covers.....	92
Wired Communication to the Backup Gateway.....	62	Step 7: Turn On and Commission the System.....	94
Meter Voltage Taps.....	64	Appendix J: Revision Log.....	95
Voltage Tap and Current Transformer Connections....	64		
Meter Placement and CT Wire Lengths.....	65		
Current Transformer Placement.....	65		
Current Transformer Orientation.....	65		
Current Transformer Capacity.....	66		
Installing the Meter.....	67		
Neurio Meter Installation Troubleshooting.....	69		
Appendix G: Feature Notes.....	70		
Configuring Site Limits.....	70		
Load Shedding.....	71		
Appendix H: Installation Troubleshooting.....	73		
Accessing the Powerwall User Interface.....	73		
Updating Firmware.....	73		
Configuring Energy Meters.....	73		
Power Cycle the System.....	74		
Appendix I: Multi-Powerwall Installations.....	75		
Multi-Powerwall Installations with Backup Gateway...	75		
Pre-Requisites for Design.....	75		
Service Type and Capacity Requirements.....	75		
Line Impedance Requirements.....	75		
Example of Line-to-Neutral Impedance Test Instructions.....	76		
System Installation.....	77		
System Commissioning.....	78		
System Operation on Three-Phase Systems.....	78		
Note for the UK Market.....	79		
Multi-Powerwall Installation Notes.....	79		
Multi-Powerwall Installations with the Stack Kit.....	80		
In the Powerwall Stack Kit.....	80		
Required Tools.....	80		
Site Requirements.....	81		
Installation Instructions.....	82		
Step 1: Prepare for Installation.....	82		
Step 2: Choose a Wiring Option.....	83		
Step 3: Prepare for Concealed Wiring.....	84		










GENERAL WARNINGS AND INFORMATION

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

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

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.



GENERAL WARNINGS AND INFORMATION

-  **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:** Powerwall is not intended for installation in habitable spaces or living spaces in dwelling units.
-  **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.



GENERAL WARNINGS AND INFORMATION



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.



CAUTION: The Backup Gateway may not be flush mounted in a wall or cavity.



SPECIFICATIONS

Powerwall Specifications

Performance Specifications

Usable Energy ¹	13.5 kWh
AC Voltage (Nominal)	230 V
Maximum Continuous Current	16 A (UK - G98)
	25 A (UK - G99; EU)
Frequency (Nominal)	50 Hz
Real Power, max continuous (charge and discharge)	3.68 kVA (UK - G98)
	5 kW (UK - G99)
Apparent Power, max continuous (charge and discharge)	3.68 kVA (UK - G98)
	5 kW (UK - G99)
Power Factor Output Range	+/- 1.0 adjustable
Overvoltage Category	Category III
Maximum Supply Fault Current	10 kA
Maximum Output Fault Current	32 A
Maximum Inrush Current	0.4 A
Round Trip Efficiency ¹	90%
¹ Values provided for 25°C, 3.3 kW charge/discharge power.	

Mechanical Specifications²

Height	1150 mm
Width	753 mm
Depth	147 mm
Weight	114 kg
² Powerwalls with part numbers 1092170-XX-H and lower and 2012170-XX-B and lower have the following mechanical specifications: 1150 x 755 x 155 mm, 125 kg.	



Environmental Specifications

Operating Temperature³	-20°C to 50°C
Optimum Temperature	0°C to 30°C
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions (up to 12 months)	-20°C to 30°C
	Up to 95% RH, non-condensing
	State of Energy (SoE): 25% initial
Maximum Altitude	3000 m
Noise Level @ 1m	< 40 dBA at 30°C
Ingress Rating	IP67 (battery and power electronics)
	IP56 (wiring)
Wet Location Rating	Yes
Seismic Rating	AC156, IEEE 693-2005 (high)
³ Performance may be de-rated at operating temperatures below 10°C.	



Backup Gateway 2 Specifications

Backup Gateway 2 Electrical Specifications

Maximum Overcurrent Protection Device	100 A (single-phase service)
	80 A (2- and 3-phase service)
Rated Frequency	50-60 Hz
Overvoltage Category	Category III
AC Meter	Revenue accurate (+/- 0.2 %)
Maximum Input Short Circuit Current ¹	16 kA
Compatible Earthing Systems ²	TN or TT networks
Distribution boards intended to be operated by ordinary persons (DBO) Type	Type B
Safety	IEC 61439-1, IEC 61439-3
¹ 16 kA rating when installed with current limiting fuse compliant to BS 88.3; 10 kA rating without fuse.	
² TT earthing networks supported for Gateways with part number 1152100-13-H and higher.	

Environmental Specifications

Operating Temperature ³	-20°C to 50°C
Operating Humidity (RH)	Up to 100%, condensing
Maximum Altitude	3000 m
Ingress Rating	IP55
Environmental Category	Outdoor rated
Wet Location Rating	Yes
Pollution Degree	PD2
³ Performance may be de-rated in extreme ambient temperatures	

Mechanical Specifications

Height	584 mm
Width	380 mm
Depth	127 mm
Weight	11.4 kg



REGISTERING POWERWALL

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.




SITE REQUIREMENTS AND PRE-INSTALLATION GUIDANCE


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. 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. Where conduit is required, the installation must comply with local codes


 **NOTE:** Refer to [Compatibility Matrix](#) for information on what can be connected with the Powerwall.


AC disconnect and interconnection requirements between the Powerwall system and the main distribution board are subject to local codes. Ensure that the installation meets local disconnect and interconnection requirements.


 **WARNING:** All Powerwalls in the system must be installed on the 'Backup' ('Home') 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 may not be recessed into a wall or cavity.

 **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.

 **CAUTION:** The Manual Override switch inside the product may 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.


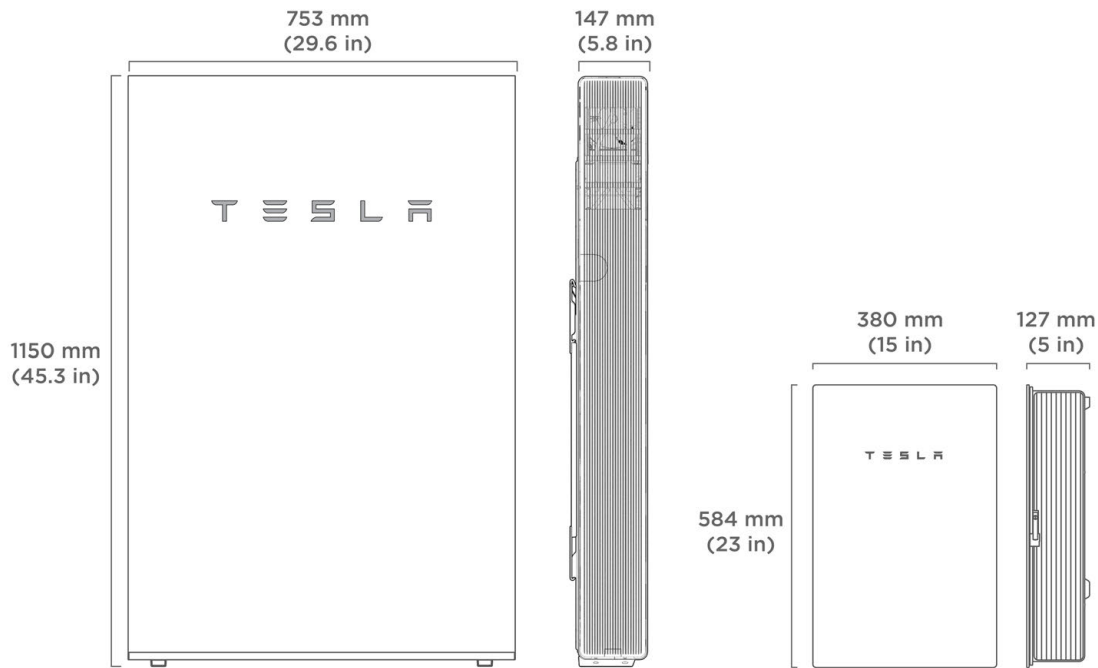
 **NOTE:** All installations must conform to the laws, regulations, codes, and standards applicable in the jurisdiction of installation.


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 45](#).

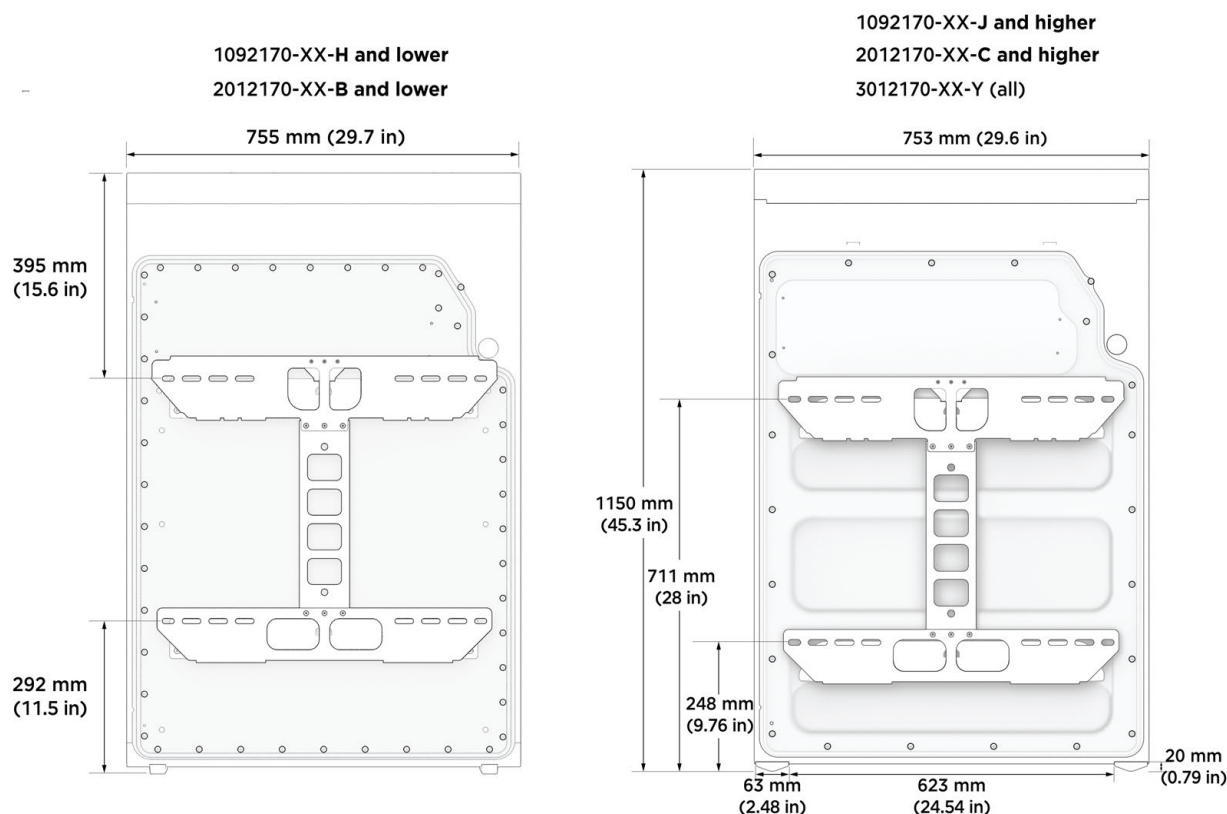
Powerwall requires adequate clearance for installation, cabling, and airflow. Do not install anything above Powerwall that limits access to the unit or that might fall and damage the unit. Do not mount Powerwall horizontally or upside down.

 **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 (see figure below).

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.

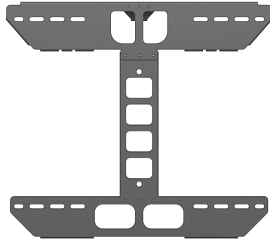
- For cold climates Tesla strongly recommends installing Powerwall indoors when possible (particularly when long outages are expected).
- For hot climates Tesla recommends keeping Powerwall out of direct sunlight. Installation in full sun raises the temperature inside the enclosure above ambient temperature. 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 Powerwall in a warm location prior to installation to help efficiently commission and test the system.



PREPARING FOR INSTALLATION

In the Powerwall Box



In the Powerwall Accessory Bag

Powerwall Accessory Bag: Tesla P/N 1586086-00-x



1. Wiring compartment cover with (4) screws
2. (1) 4-pin terminal block connector
3. (1) 4-pin terminal block connector with 120-Ohm terminating resistor
4. (1) AC power harness
5. (2) Wago 2-position lever nuts
6. (1) 32-mm reducing washers
7. (2) 25-mm reducing washers



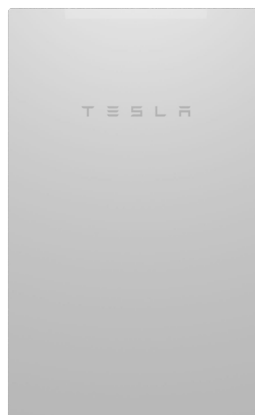
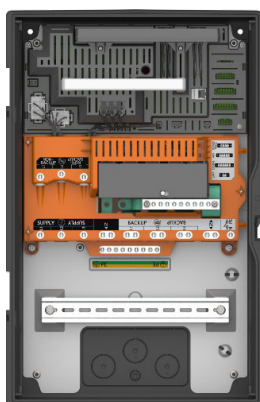
PREPARING FOR INSTALLATION

8. (1) 35-mm rubber grommet
9. (1) drillable threaded cable gland



PREPARING FOR INSTALLATION

In the Backup Gateway 2 Box



In the Backup Gateway 2 Accessory Bag



1. (1) Adhesive circuit label
2. (1) CT extension cable harness (3 m)
3. (3) 1/4-inch rubber boned stainless steel washers
4. (5) 8 mm backplate nuts
5. (1) M25 communication gland and insert
6. (1) Solar CT (100 A, split-core)
7. (1) Circuit breaker blanking hole filler set
8. (1) Owner's Manual (not pictured)




Required Tools

General Installation Tools

- Personal protective equipment (safety glasses, gloves, protective footwear)
- Drill with applicable drill bits
- Torque screwdriver with 1/4-inch bit holder and T20 Torx bit
- Small (2 mm) flathead screwdriver (for wiring connector spring terminals)
- Socket wrench with 8mm hex socket
- Wire strippers/cutters for 0.2 mm² to 35 mm² wires
- Installation tools (level, stud sensor, tape measure, pencil, painter's tape, flashlight)
- Multimeter and Loop Impedance Tester
- Digital camera or smartphone for documenting the installation

Powerwall Installation Tools

- Large (5 mm) flathead driver bit (for Powerwall Earth terminal)
- Lift equipment capable of lifting and supporting 125 kg up to 1.5 m
- Ratcheting strap to secure Powerwall to lift equipment

 **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.

Backup Gateway Installation Tools

- Small bit for drilling pilot holes in Backup Gateway mounting surface
- Hole saws for drilling cable access holes in Backup Gateway (M12, M20, M25, M32, M40, M50)
- Torque wrench with 3 mm Allen bit (for Backup Gateway power connections)

Required Supplies

- Powerwall mounting bracket hardware (see [Appendix A: Powerwall Mounting Details on page 45](#))
- Backup Gateway mounting hardware
- Conduit fitting or cable gland (depending on local electrical requirements)
- Conduit or raceway (depending on local electrical requirements)
- Earthing rod (if local earthing is not present on site)
- Minimum 300 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)



Installation Materials not Provided by Tesla

The material listed below is required to complete a Tesla Powerwall installation with Backup Gateway 2.



NOTE: This is not an exhaustive list. Any device installed or procedure carried out must be in compliance with local code.

- Tesla Powerwall overcurrent and indirect contact protections:
 - Residential Current Device Differential Residential Current = 30mA, Type A or AC
 - MCB (Miniature Circuit Breaker) In = 32 A⁽¹⁾ Icc = 6/10 kA
 - Residual current circuit breaker with overcurrent protection set to same settings as above
- Gateway overcurrent and indirect contact protections:
 - Non-Backup Gateway: MCB (Miniature Circuit Breaker) In max = 16 A Icc as per local code
 - Backup Gateway: In max = 100 A single phase or 80 A three-phase
 - Supplied fuse and fuse holder must be installed inside Gateway. (Needed only if no consumer protective device installed upstream) Icc = 6/10 kA
- Neurio Meter overcurrent and indirect contact protections:
 - MCB (Miniature Circuit Breaker) or RCBO depending by the installation in max = 16 A⁽²⁾ Icc as per local code
- Tesla Powerwall AC cable:
 - AC cable to be designed to carry 32A
- Tesla Powerwall-Gateway communication cable:
 - 4-wire cable or 2 * 2-wire shielded
 - GND / 12 V: 1 mm² up to 35 m / 1.5 mm² up to 45 m
 - CH + / CH-: 0.22 - 1.5 mm² (must be shielded)
- CT extension cable
 - Neurio - shielded twisted pair cable (max 15 m)
 - Backup Gateway - 0.5 mm²min (max 100 m)
- Gateway-Neurio Meter RS485 extension cable: twisted and shielded twisted pair (max 50 m)
- Earth spike:
 - Copper coated rod
 - Earth pit and warning labels
 - Connection and crimp, denso tapped for water protection
 - Correctly sized earth cable recommended 16 mm green and yellow
- Material for a general electrical installation: Conduit, Trunking
- All appropriate warnings labels and a single line diagram



STEP 1: PLAN THE INSTALLATION SITE

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 sheeting 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 45](#)).

Choose Side or Rear Cable Entry for Powerwall


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 610 mm apart, cable entry from the back of Powerwall may be blocked.

Choose Top, Bottom, or Rear Cable Entry for Backup Gateway

Determine whether cables will be routed into the Backup Gateway from the top or bottom of the enclosure. The internal Backplate Assembly can be installed in either orientation to accommodate cable runs.

 **NOTE:** The Backup Gateway does not support cable entry from both the top and bottom of the enclosure. A given backplate orientation supports entry from only one direction.

Plan the Electrical Service Connection to Backup Gateway

The Backup Gateway is service entrance rated, and can be located between the main switch and the distribution board. A main isolation switch should be installed upstream of the Backup Gateway for testing the system and for service purposes.




STEP 1: PLAN THE INSTALLATION SITE

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: Wiring Reference on page 49](#) for wire gauge requirements.

Distance to Measure	Maximum Cable Length
Backup Gateway to Powerwall(s)*	45 m
Neurio Energy Meter to Backup Gateway (RS485 wired connection)	50 m
Backup Gateway to Internet router (wired Ethernet connection)	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 Neurio CT Extension

Neurio W1 200 A CTs (Remote Metering)	Maximum Extension Length
Using Neurio CT extension harness (Tesla P/N 1125547-03-x)	Up to 15 ft (4.5 m)
Using 0.2-1.5 mm ² shielded twisted pair with drain wire	Up to 50 ft (15 m)
Neurio W2 200 A CTs (Remote Metering)	Maximum Extension Length
Using Neurio CT extension harness (Tesla P/N 1622289-00-x)	Up to 15 ft (4.5 m)



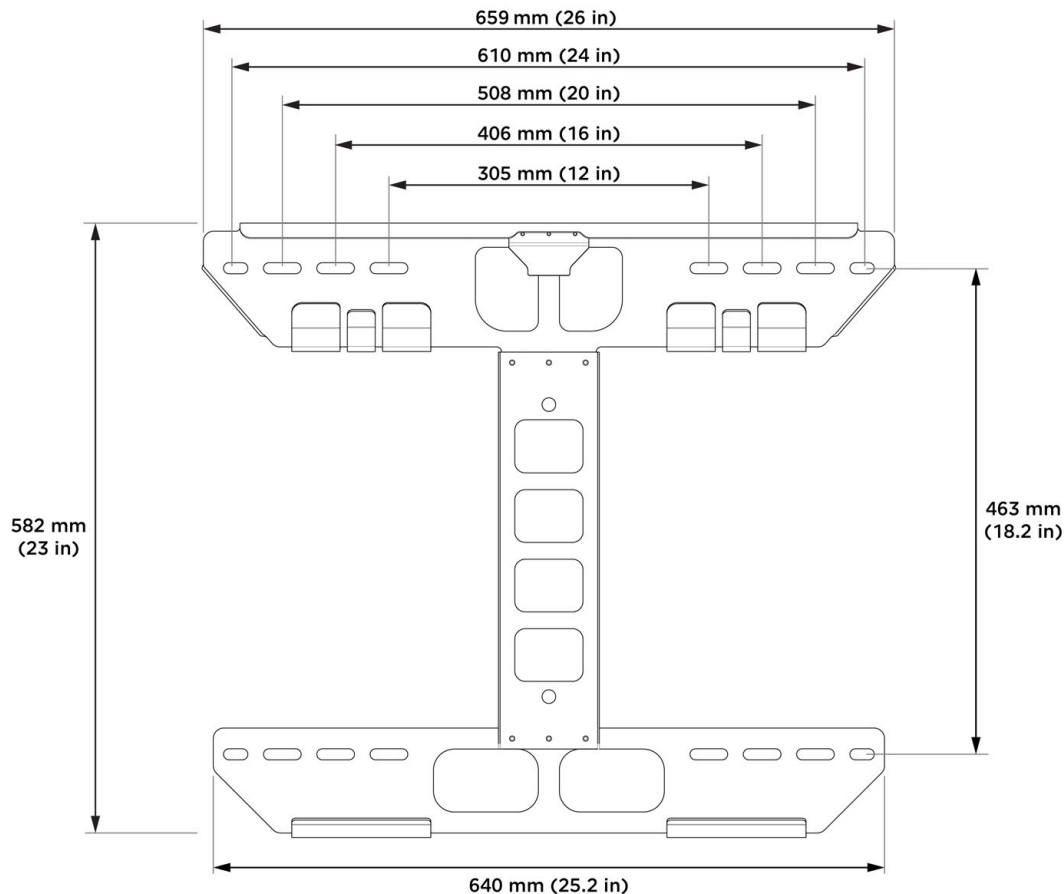
STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY

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 45](#).

1. Using a drill and level, mount the bracket to the selected wall. See [Appendix A: Powerwall Mounting Details on page 45](#) for additional details on the type and number of fasteners to use.

Figure 3. Mounting Bracket Dimensions





STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY

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

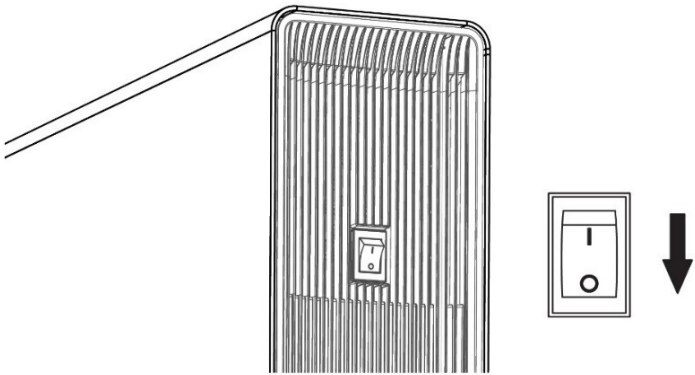
<p>14 mm (0.55 in)</p> <p>Ø 35 mm (1.375 in)</p> <p>24 mm (0.95 in)</p>	<p>14 mm (0.55 in)</p> <p>Ø 35 mm (1.375 in)</p> <p>68 mm (2.7 in)</p>
1092170-XX-H and lower	1092170-XX-J and higher
2012070-XX-B and lower	2012070-XX-C and higher
	3012170-XX-Y (all)

Mount Powerwall on the Bracket

1. Switch off Powerwall.



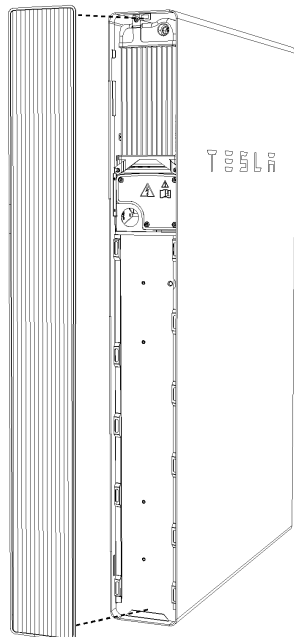
WARNING: Switching off will ensure Powerwall does not grid form. However, AC voltage may still be present from the grid. Ensure all equipment is safely de-energized before working.





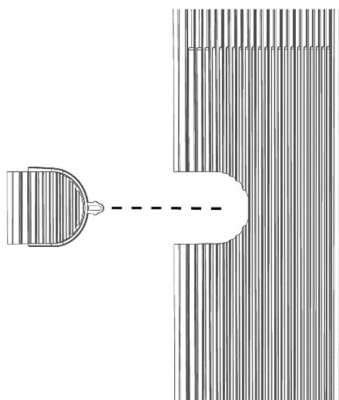
STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY

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.



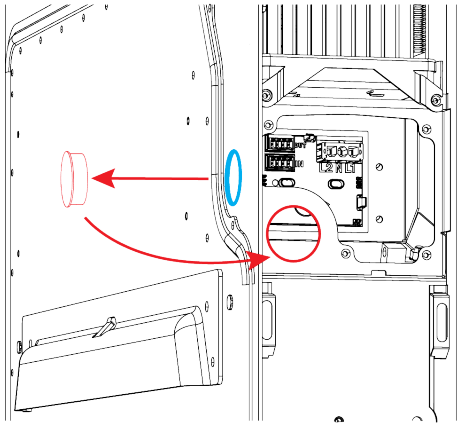


STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY

- 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.



4. 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.
5. Lower Powerwall until the top cleat engages the top flange on the bracket and the bottom cleat aligns with the bottom flange.
6. 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.

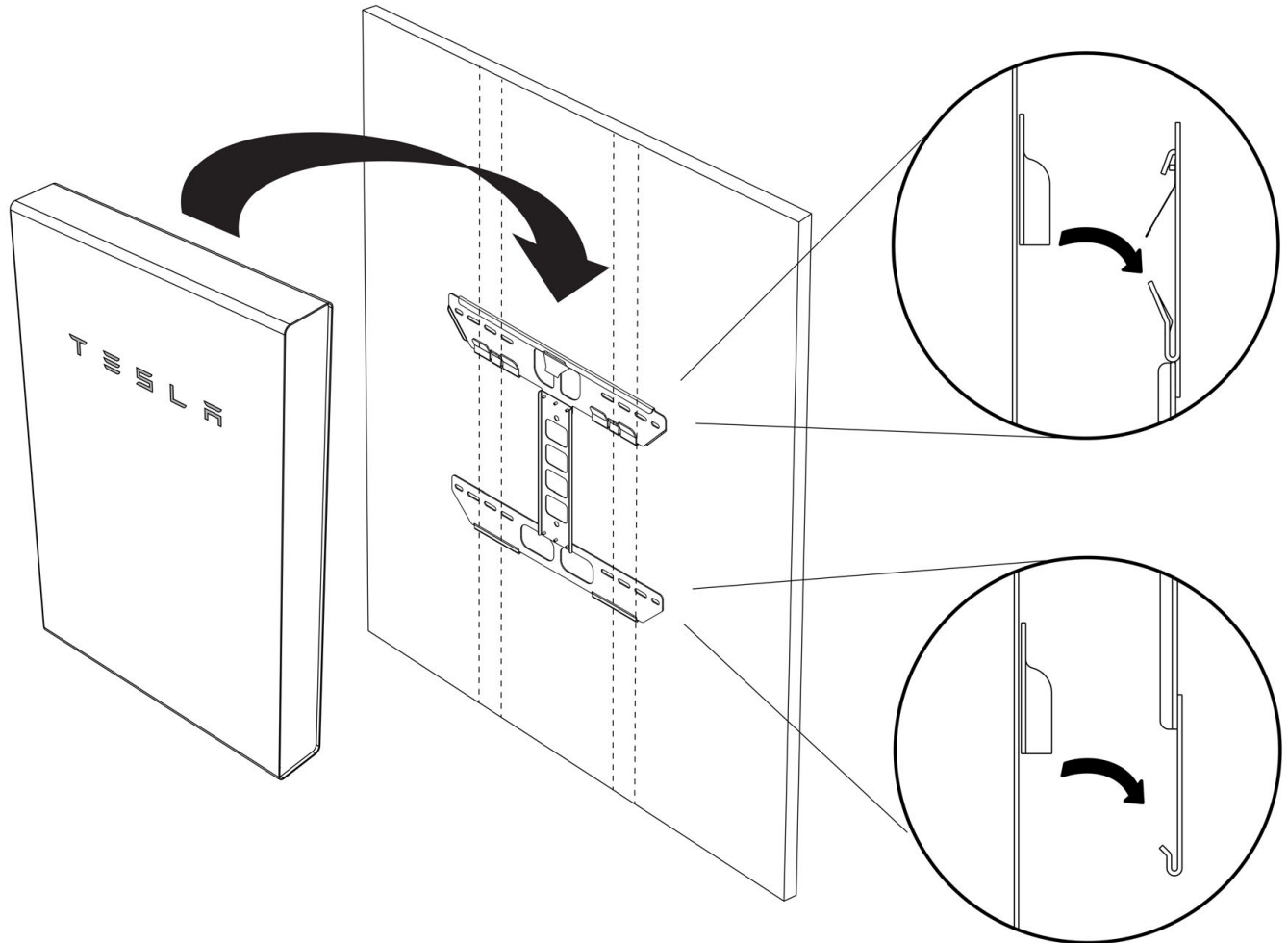


NOTE: To remove Powerwall from the mounting bracket, place a thin piece of sheet metal between the Powerwall unit and the bracket to compress the locking mechanism, and lift the Powerwall straight up.



STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY

Figure 4. Mounting Powerwall on the Bracket



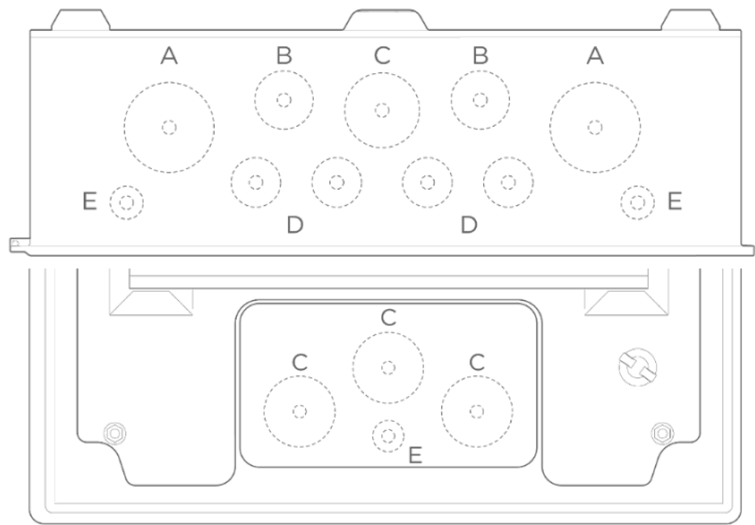
7. If floor-mounting Powerwall, use shims to ensure that Powerwall is level. The unit should be level within +/- 2 degrees side-to-side and within +/- 5 degrees front-to-back.
8. If wall-mounting Powerwall, remove the feet from the unit (applicable only to the updated versions of Powerwall, see [Powerwall 2 Identification by Mounting Bracket Height on page 12](#))



Mount the Backup Gateway

- 1. Using a hole saw, drill out the necessary cable access holes from the Backup Gateway.

Figure 5. Top / Bottom (above) and Back (below) Cable Access Drill Guides



Drill Guide Diameters	
A	M40, expandable to M50
B	M25
C	M32
D	M20
E	M12

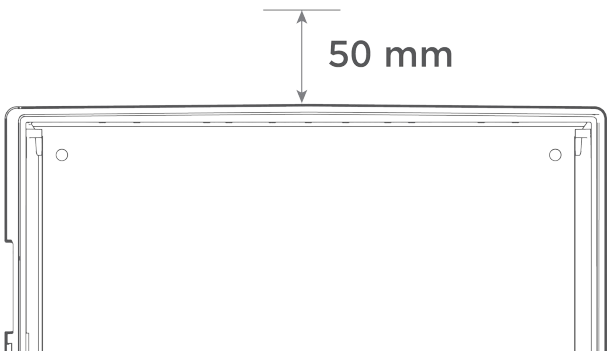


STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY

2. Using a drill and level, mount the Backup Gateway enclosure.



NOTE: Leave a minimum clearance of 50 mm above the Backup Gateway.

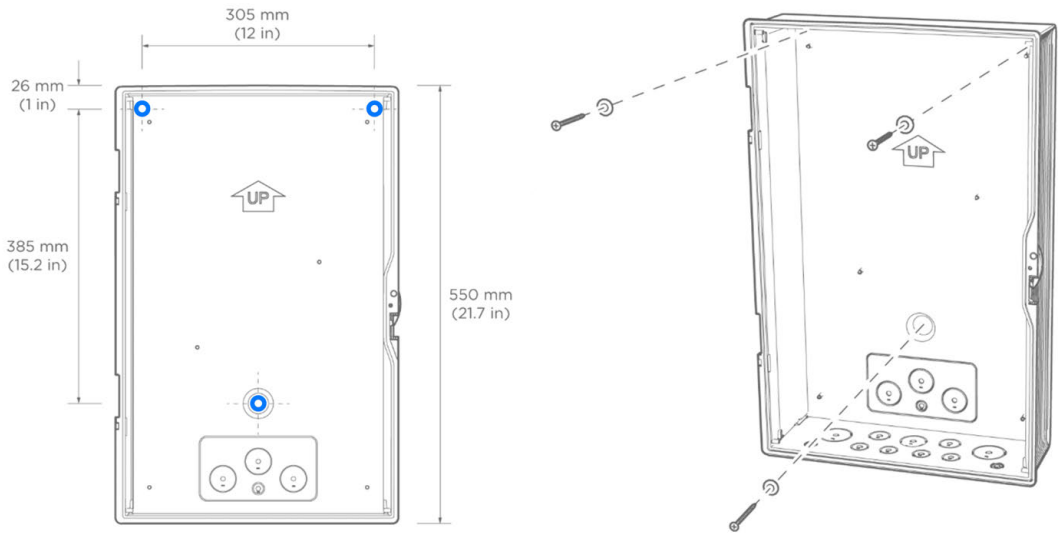


NOTE: The enclosure must be installed in the orientation shown below. Do not mount the Backup Gateway enclosure horizontally or upside down.



CAUTION: To ensure IP55 ingress rating is maintained, the enclosure must only be mounted at these three points.

Figure 6. Backup Gateway Enclosure Mounting Holes



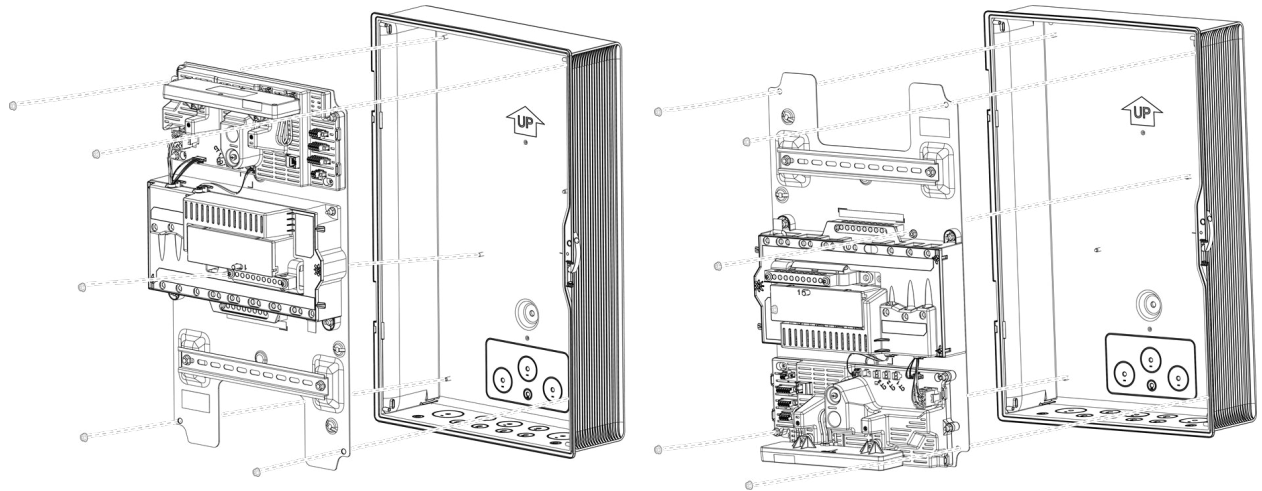
CAUTION: The sealing washers must be installed to guarantee IP55 ingress rating.



STEP 2: MOUNT POWERWALL AND THE BACKUP GATEWAY

3. Install the Backplate Assembly in the enclosure, orienting it for bottom or top cable entry. Attach it to the five (5) studs using the five (5) supplied 8 mm nuts. Use a torque wrench with 8 mm socket to tighten the nuts to 6 Nm.

Figure 7. Backplate Orientation for Bottom Cable Entry (left) or Top Cable Entry (right)



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

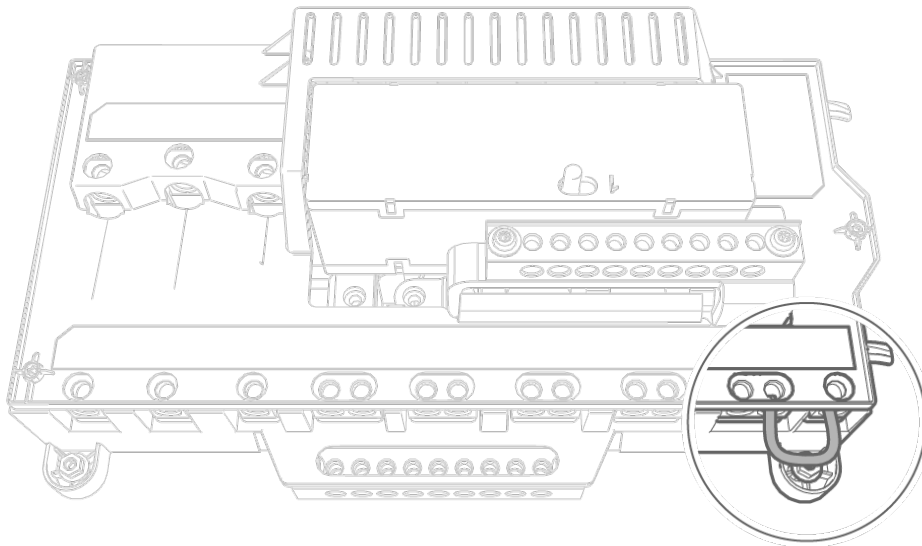


STEP 3: VERIFY NEUTRAL-EARTH BONDING SCHEME AND INSTALL EARTHING ROD

Proper earth connection and Neutral-to-Physical Earth (N-PE) bonding is required for safe operation of the Powerwall system and for compliance with local code requirements. The correct Neutral-to-Earth bonding scheme must be maintained even when the system is disconnected from the grid.

To meet UK regulations, the Neutral must be disconnected in off-grid operation. For typical UK supply arrangements, disconnecting the Neutral means that the N-PE bond will be lost when off-grid. With the **Switched Earth (N-PE) Jumper** installed, the Backup Gateway's internal contractor will re-bond Neutral to Earth locally when the Line and Neutral contacts are open.

Figure 8. Neutral Re-bonded to Earth During Off-Grid Operation with Switched Earth (N-PE) Jumper



WARNING: To ensure safe operation, a **local earth connection must be present** on the site such as by earth rod or ground electrode. During a grid fault it cannot be assumed that the DNO's Earth or PEN conductors are intact. Installation of earth rod must comply with local codes.

WARNING: Incorrect earthing or Neutral-to-Protective Earth (N-PE) bonding presents a risk of electrical shock or damage to equipment. Verify that the system is properly earthed and that the correct Neutral-to-Earth bonding scheme meets regional and local requirements.

See [Powerwall 2 AC RCD And Fault Protection Application Note](#) for additional information on earthing and fault protection.



STEP 4: MAKE AC POWER CONNECTIONS TO SUPPLY AND LOAD PANELS

Make AC Power Connections to Supply and Load Panels

In each of the following steps:

- Strip the ends of the wires, install ferrules, and insert into the corresponding Backup Gateway terminal lugs.
 - Using an M3 Allen bit, tighten the lugs to 4 Nm.
1. Install 22x55mm DIN-mounted fuse holder and 22x58mm **type aM** cartridge fuse on the Backup Gateway's internal DIN rail. The fuse must be replaced in the cable between the Backup Gateway and the grid. See [Appendix D: Grid Supply Fuse and Fuse Holder on page 57](#) for additional information about fuse requirements.
 2. Connect the main service conductors to the Backup Gateway Supply terminals according to the table on the following page.



CAUTION: Where site-level RCDs are required, one of the following methods must be used to avoid risk of upstream RCD nuisance tripping:

- Relocate the site-level RCD into the Backup Gateway enclosure after Gateway's contractor
- Use a Type-S time-delayed RCD upstream of Backup Gateway

See [Powerwall 2 AC RCD and Fault Protection Application Note](#) for additional information.

3. Connect the home load panel conductors to the Backup Gateway terminals according to the table on the following page.
4. Depending on the quantity of Non-Backup circuits, a Non-Backup panel will be required. Connect the conductors (Line(s), Neutral, and Protective Earth) from the Non-Backup panel to the Backup Gateway's Non-Backup terminals.

Non-Backup circuits include: 3-phase PV inverters, 3-phase loads, large single-phase loads.

5. Connect the non-backup panel conductors to the Backup Gateway Non-Backup terminals according to the table on the following page. 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: Installing 3-phase equipment on the backup circuit may result in equipment damage. The only exceptions to this rule are the Tesla Wall Connector or sockets feeding Tesla Mobile Connectors (please see the [Vehicle Charging During Power Outage](#) page for more information). The Powerwall system's backup phase should be connected to L1 of the Wall Connector or Mobile Connector socket.



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. The Earth bar and backplate voltage may float when ungrounded. If conducting earth loop impedance testing, ensure the Gateway always has a suitable Earth connection.



STEP 4: MAKE AC POWER CONNECTIONS TO SUPPLY AND LOAD PANELS

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.

CAUTION: To ensure IP55 ingress protection, appropriate fittings and/or cable glands must be used to secure all cables passing into the enclosure.

Refer to [Appendix B: Wiring Reference on page 49](#) for all wiring requirements and recommendations, including wire colors and gauges.

Refer to [Appendix C: System Wiring Diagrams on page 54](#) for example system wiring diagrams.

Table 2. Conductor Connections for Single Phase (left) and Three-Phase (right)

	Single Phase	Three-Phase
Supply Connections		
Home Load and Backup Connections		
Non-Backup Connections		



STEP 4: MAKE AC POWER CONNECTIONS TO SUPPLY AND LOAD PANELS

Terminal	Maximum Wire Gauge	Strip Length	Torque
Supply	35 mm ²	12.5 mm	4 Nm
Non-Backup	35 mm ²	12.5 mm	4 Nm
Home (Backup)	35 mm ²	12.5 mm	4 Nm
Neutral terminal bar	25 mm ²	12.5 mm	4 Nm
PE terminal bar	25 mm ²	12.5 mm	4 Nm

Design Considerations

Refer to [Appendix G: Feature Notes on page 70](#) for information on the Backup Gateway load shedding feature, which can be used to interrupt any 60 V circuit when operating off-grid.



STEP 5: INSTALL POWERWALL AND GENERATION BREAKERS IN THE BACKUP GATEWAY

Install Powerwall and Generation Breakers in the Backup Gateway

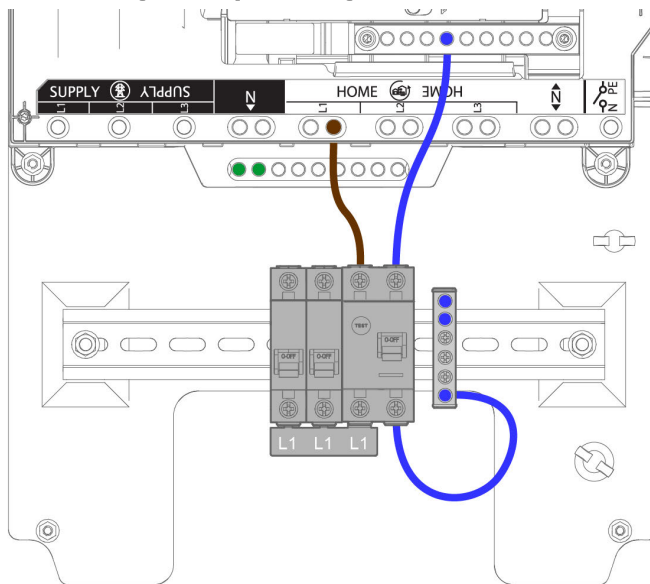
1. Install the Powerwall and generation circuit breakers on the DIN rail, and connect using an appropriately rated DIN rail circuit breaker busbar.



WARNING: All Powerwalls in the system must be installed on the 'Backup' ('Home') side of the Backup Gateway's relay.

2. Connect the line conductors from the bussed generation circuit breakers to the Backup Gateway's Backup terminals (see figure below). These conductors must be appropriately rated to carry the current of the main supply fuse.
3. Connect Neutral and PE conductors from Powerwall and generation circuits to the Neutral and PE wiring bars, respectively.

Figure 9. Single Phase Wiring Example Using RCD Main Switch



Design Considerations



CAUTION: If installing greater than 100 A of generation, a separate overcurrent protection (such as a generation sub-board) is required to maintain maximum current rating of the Backup Gateway.

The Backup Gateway 2 can accommodate up to nine (9) 1-pole MCB slots on the DIN rail for generation circuits and fuse carrier(s).

The Powerwall connection to the Backup Gateway requires a 32 A circuit breaker. This breaker serves as circuit protection for the Powerwall, and must be wired in accordance with local wiring codes and regulations.




STEP 5: INSTALL POWERWALL AND GENERATION BREAKERS IN THE BACKUP GATEWAY

Some regions may require use of an external Residual Current Device (RCD) on the solar PV inverter and/or Powerwall circuits.

Configuring Powerwall(s) on Three-Phase Installations

- When installing multiple Powerwalls, they must be distributed evenly across the three phases. Installation must meet local generation imbalance rules.
- During the commissioning process, the **Backup Phase** will be selected (L1, L2, or L3). During an outage, the system will provide backup power only to loads on this phase, and Powerwalls on other phases will not operate. Ensure that all critical loads in the Home Load Panel are connected on the desired Backup Phase.
- **To ensure Powerwall charges from solar production, the single-phase PV circuit(s) must be installed on the same phase as Powerwall(s).**

 **WARNING:** Installing 3-phase PV inverters or 3-phase equipment on the Backup side may result in equipment damage during off-grid operation. 3-phase PV inverters and 3-phase equipment should always be installed on the Non-Backup side of the Backup Gateway. The only exceptions to this rule are the Tesla Wall Connector or sockets feeding Tesla Mobile Connectors (please see the [Vehicle Charging During Power Outage](#) page for more information). The Powerwall system's backup phase should be connected to L1 of the Wall Connector or Mobile Connector socket.

Inverter Configuration

During backup operation, the Gateway will shift the system frequency to control the power output of solar inverters. Therefore, all solar inverters connected to the Backup terminals should be configured for the local grid code, G98/G99. This ensures that the inverter will respond correctly to frequency curtailment efforts. If the inverter is not compliant with the grid code requirements, it might not perform as expected during Backup operation. This could lead to hardware damage due to over-voltage. Please see more information regarding backup operation on our [website](#).



STEP 6: CONNECT POWERWALL TO THE BACKUP GATEWAY

Connect Powerwall to the Backup Gateway



NOTE: Refer to [Appendix B: Wiring Reference on page 49](#) 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. If necessary, use the included 1 in-to-32 mm or 1 in-to-25 mm reducing washers to adapt the cable gland to the wiring compartment inlet.

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.

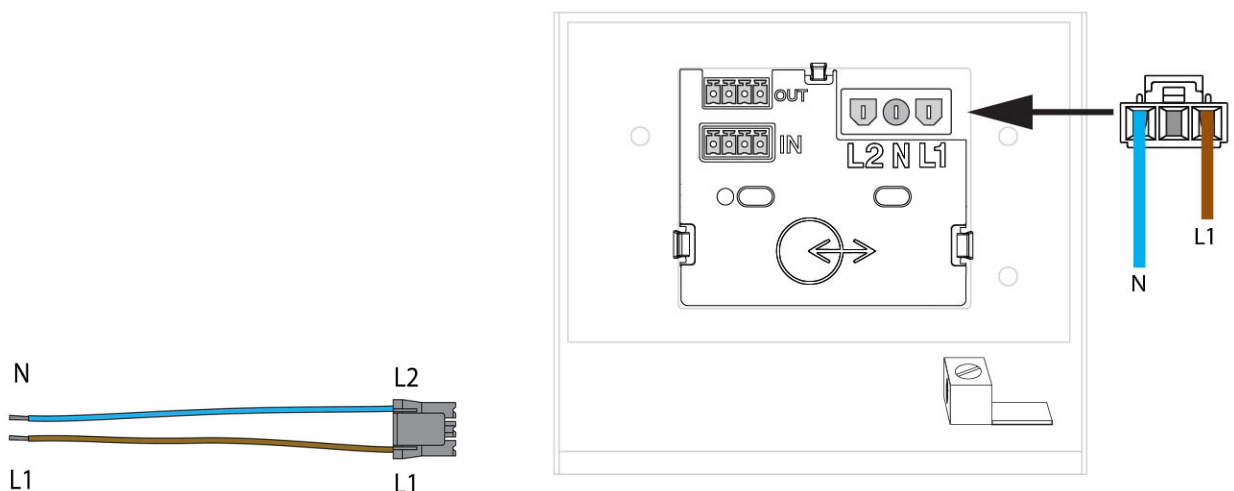
3. Run the 4-conductor communication cable, the AC power conductors, and equipment grounding conductor from the Backup Gateway through the conduit or cable gland and pull them into the Powerwall wiring compartment.



NOTE: 4-conductor communication cable must be 300 V rated or double insulated with one twisted pair shielded copper cable.

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 10. Powerwall 2 AC Power Harness Connection

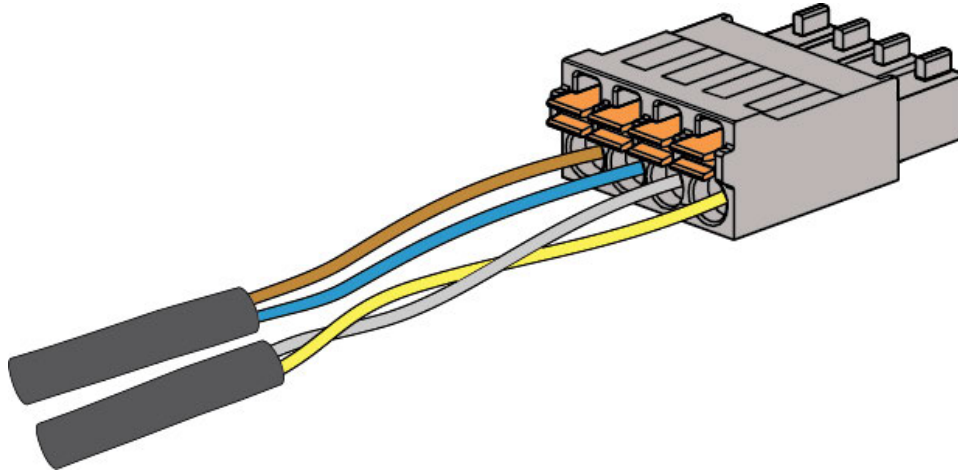




STEP 6: CONNECT POWERWALL TO THE BACKUP GATEWAY

- On each end of the 4-conductor communication cable, strip and insert the wires into the provided 4-pin connectors (see figure below). 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 11. Communication Connector Wiring



- 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.**
- 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 52](#) in [Appendix B: Wiring Reference on page 49](#)

- On the Powerwall side, plug the 4-pin connector into the bottom 4-pin socket (labeled “IN”) in the Powerwall wiring compartment.
- 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.)
- On the Powerwall side, strip the end of the equipment grounding conductor and wrap the communication cable drain wire around the grounding conductor lead.



- ### Figure 12. Powerwall Earth / Ground and Communication Connections with a Terminating Resistor





STEP 7: INSTALL ENERGY METERING FOR THE SYSTEM

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 Site Meter** – This internal 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, an External Energy Meter must be used to meter the Grid connection point.
- **Internal Auxiliary Meter** – Metering solar circuits inside the Gateway or in adjacent switchboards is simple with the three (3) internal CT connections for use with Tesla 100-amp-rated split-core solar CTs (one included in the Accessory Kit). Additional Tesla 100 Amp CTs (1112477-00-x) may be ordered individually.

The Tesla 100A split-core CTs may be extended a max distance of 100 m by splicing twisted pair or using 3 m CT extension harnesses (1125547-03-x). Use 0.5mm² (20 AWG) conductors or larger to extend CTs up to 100 m. Voltage rating of the extension wire must be equal to or greater than all other adjacent circuits.



NOTE: Neurio meter CTs **cannot** be extended beyond 15 m without significant accuracy loss.

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

- See [Appendix E: Configure Energy Metering on page 58](#) for further guidance on metering.
- See the section titled "System Operation on Three-Phase Systems" in Appendix I for detailed information on the requirements for three-phase metering.
- See [Appendix E: Configure Energy Metering on page 58](#) for external Energy Meter installation instructions.



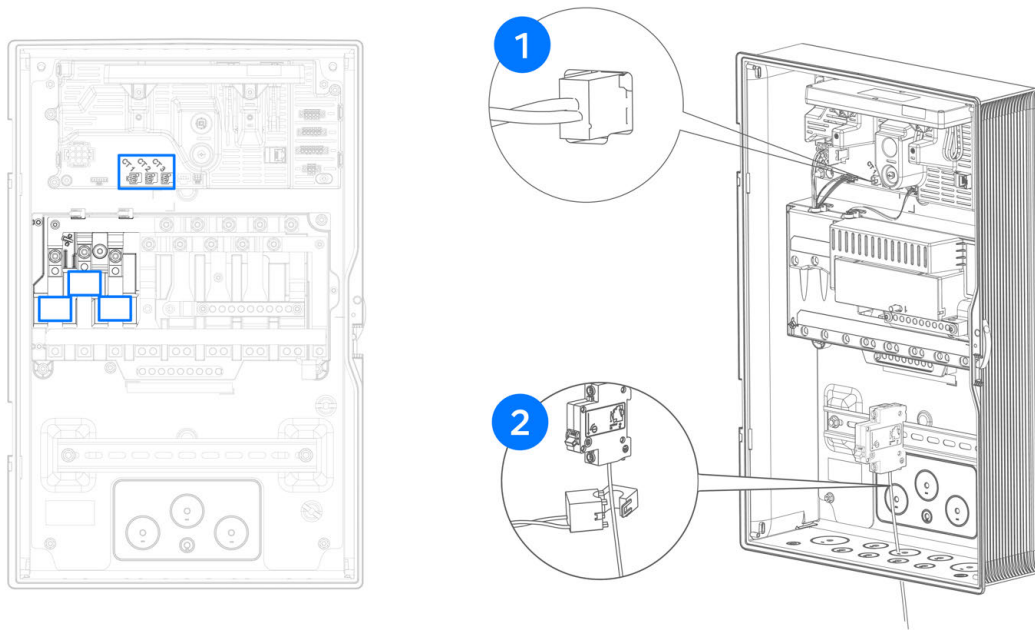
STEP 7: INSTALL ENERGY METERING FOR THE SYSTEM

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 13. Embedded Site CTs and Solar CT Connectors



Tips

- See [Appendix E: Configure Energy Metering on page 58](#) for additional diagrams on configuring energy metering.
- When metering 3-phase solar inverters, install CTs on L1, L2, and L3 output of the solar inverter AC circuit.
- 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 Energy Meter(s) may be left in place and re-paired with the new Gateway. The Neurio Meter must be power cycled within one minute prior to re-pairing. If metering Site power with the Neurio Meter, ensure the Backup Gateway 2 internal site meter is de-selected in Commissioning.
- See [Appendix H: Installation Troubleshooting on page 73](#) for CT configuration troubleshooting tips.
- The Powerwall installer has the option to set a Site Charge Limit. When used, the Powerwall will dynamically curtail the meet this programmed threshold. See [Appendix G: Feature Notes on page 70](#) for more information.



STEP 8: COMPLETE THE INSTALLATION

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.
- An M25 cable gland for communications cables is provided in the Accessory Kit.
- See [Appendix B: Wiring Reference on page 49](#) for the position of the Ethernet port.

Close the Wiring Compartments and Turn the System On

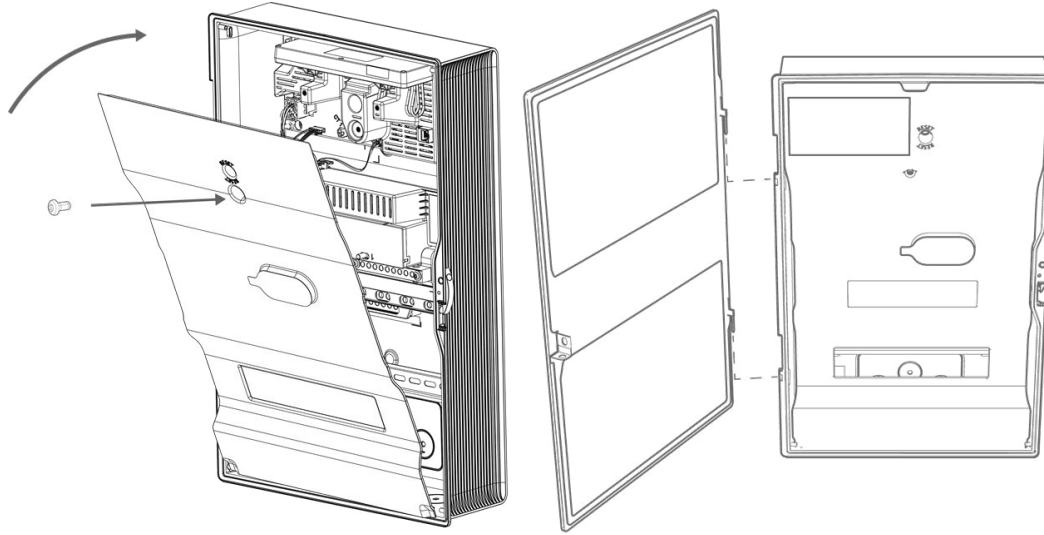
1. **Before closing any installed hardware**, take photos of the completed wiring in the Powerwall, Backup Gateway, and main distribution board.
2. Ensure that all conduit junctions and cable entry points are secure and properly sealed.
3. Arrange the communication and AC power wires neatly inside the 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.



STEP 8: COMPLETE THE INSTALLATION

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 14. Install the Dead Front Cover and Glass Door



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



NOTE: The provided snap-in breaker pole-fillers must be installed to ensure touch safety.



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.



WARNING: Upon powering on the Backup Gateway and Powerwall system, allow it to boot up undisturbed for at least one minute. Do not power cycle or reset the Backup Gateway during this time, as the boot sequence must be completed for the software to operate properly.

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.



STEP 9: COMMISSION THE SYSTEM

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.



STEP 9: COMMISSION THE SYSTEM

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

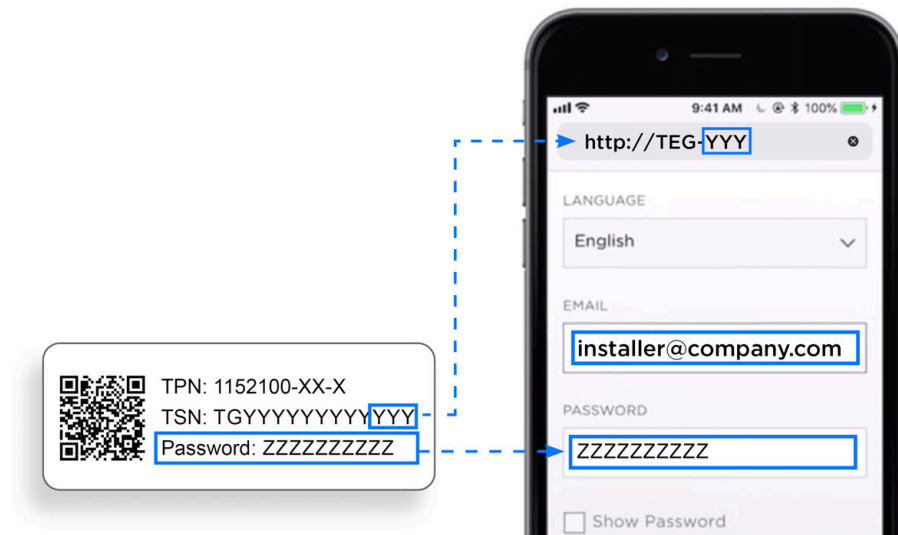


NOTE: If the Backup Gateway Wi-Fi network doesn't appear or the connection to the Backup Gateway fails, power cycle the Backup Gateway using the Reset button, wait 2 minutes, and try connecting again.

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**



STEP 9: COMMISSION THE SYSTEM



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 H: Installation Troubleshooting on page 73](#) 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.



STEP 9: COMMISSION 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. If necessary, 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 H: Installation Troubleshooting on page 73](#) 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.

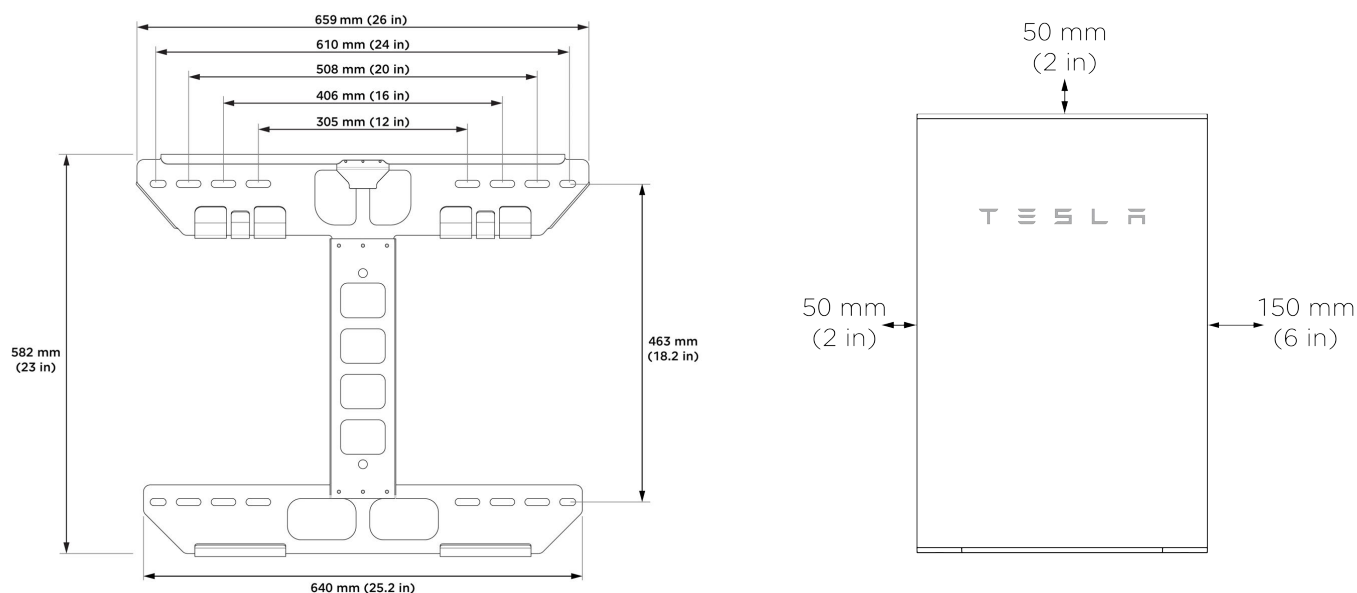
To clean Powerwall, use a soft, lint-free cloth. If needed, the cloth can be dampened with mild soap and water only. Do not use cleaning solvents to clean Powerwall, or expose Powerwall to flammable or harsh chemicals or vapors.



APPENDIX A: POWERWALL MOUNTING DETAILS


Powerwall Space Requirements

Figure 15. Powerwall 2 Mounting Bracket Dimensions and Space Requirements



Minimum lateral wall space	960 mm
Minimum clearance from left side (air intake)	50 mm ¹
Minimum clearance from right side (air exhaust)	150 mm
Minimum clearance above single Powerwall	50 mm
Minimum clearance above side-by-side Powerwalls	300 mm
Minimum clearance between side-by-side Powerwalls	250 mm
Maximum height above ground	1.5 m to bottom of unit
Maximum slope	+/- 2° side-to-side +/- 5° front-to-back


¹Ensure there is sufficient working space to connect Powerwall wiring. Tesla recommends at least 200 mm of working space to the left of the unit.

 **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.



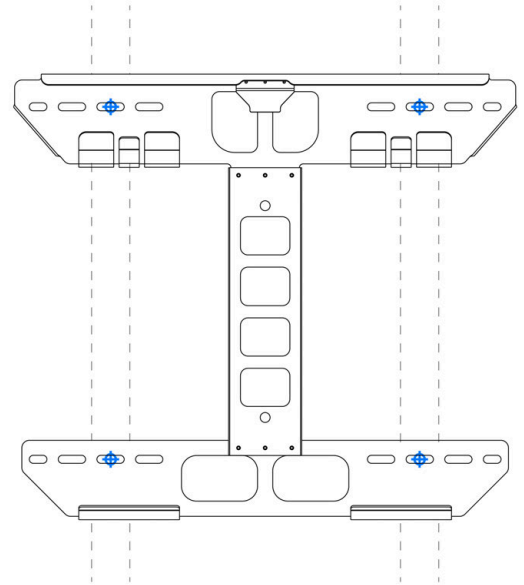
APPENDIX A: POWERWALL MOUNTING DETAILS

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.

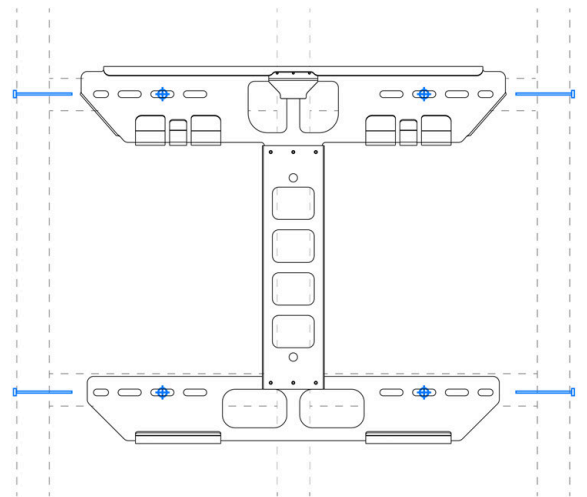
Wood Studs (spaced from 300 mm to 600 mm)

If anchoring directly into wood studs, use at least **four (one in each corner)** 10 mm wood screws with washers, of sufficient length for at least 64 mm embedment into the studs.



Wood Studs (spaced from 300 mm to 600 mm)

If anchoring to blocking between wood studs, use minimum 50 mm x 100 mm blocks, end-nailed into studs with two 16d (100 mm) nails or toe-nailed into studs with four 8d (75 mm) nails. Use at least four (one in each corner) 10 mm wood screws with washers, of sufficient length for at least 64 mm embedment into the blocking.

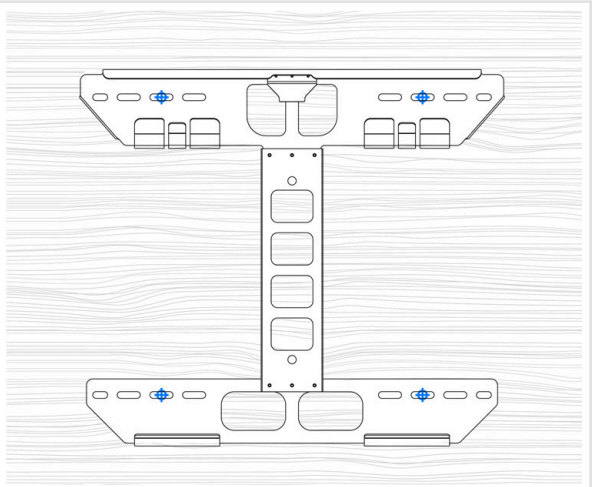




APPENDIX A: POWERWALL MOUNTING DETAILS

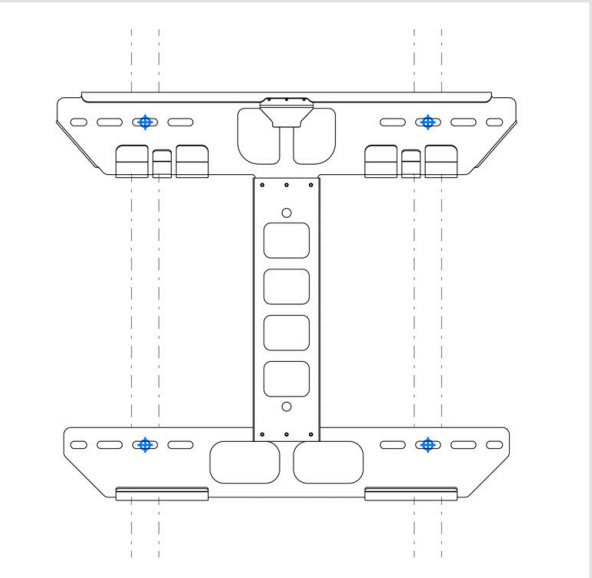
Plywood

If anchoring to plywood wall material, the plywood must be minimum 38 mm thick. Use at least **four (one in each corner)** 10 mm wood screws with washers, of sufficient length to penetrate at least 7 mm beyond the backside of the plywood.



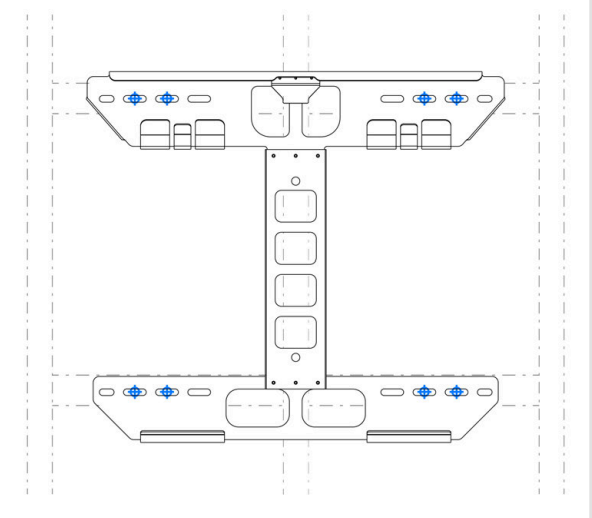
Metal Studs (spaced from 300 mm to 600 mm)

If anchoring directly to metal studs, studs must be minimum 1.2 mm thick. Use at least **four (one in each corner)** 10 mm sheet metal screws with washers, of sufficient length to penetrate at least 3 threads beyond the stud.



Metal Studs (spaced from 300 mm to 600 mm)

If anchoring to backing between metal studs, studs must be minimum 0.5 mm thick, and backing must be minimum 0.7 mm thick. Use at least **eight (two in each corner)** 10 mm sheet metal screws with washers, of sufficient length to penetrate at least 3 threads beyond the backing.

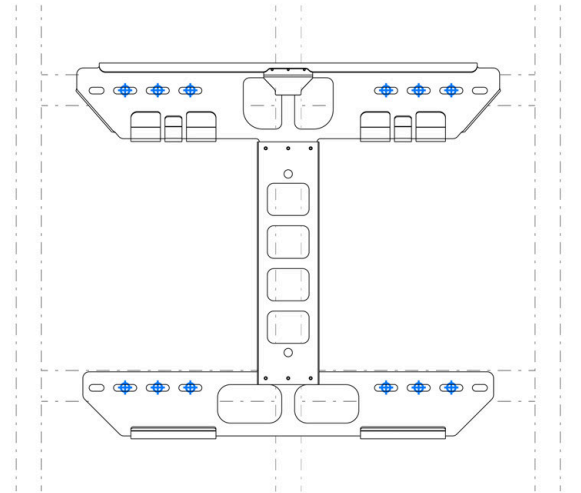




APPENDIX A: POWERWALL MOUNTING DETAILS

Metal Studs (spaced from 300 mm to 600 mm)

If anchoring to backing between metal studs in an outdoor high wind area, studs must be minimum 0.5 mm thick, and backing must be minimum 0.7 mm thick. Use at least **twelve (three in each corner)** 10 mm hexhead sheet metal screws with washers, of sufficient length to penetrate at least 3 threads beyond the backing.



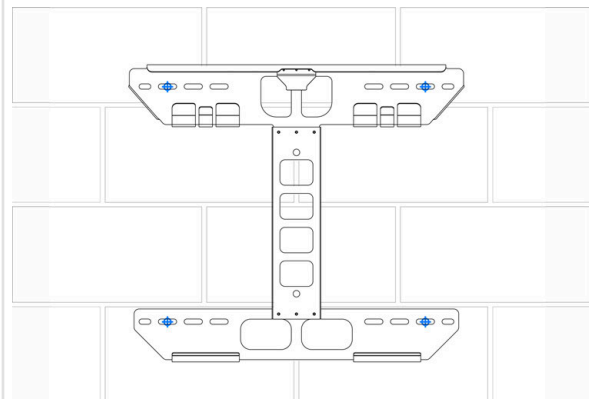
Concrete or Masonry

Minimum strength must be 18 MPa (concrete), 12 MPa (clay brick), or 11 MPa (masonry).

Use at least **four (one in each corner, in any available anchor slot)** 10 mm fasteners with washers, of sufficient length for at least 50 mm embedment into the material.



NOTE: Avoid weak compositions and always inspect the surface prior to mounting.



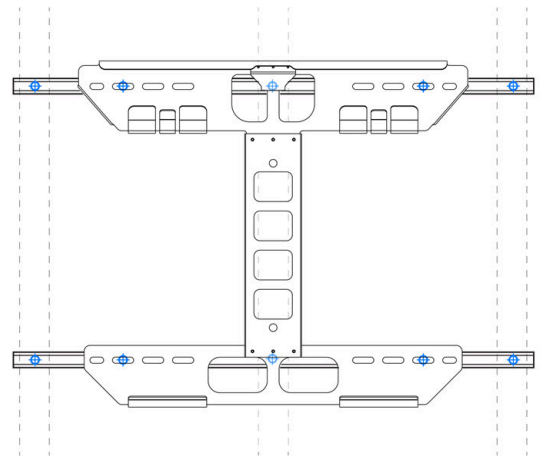
Channel Strut (Unistrut)

Struts must be minimum 42 mm x 42 mm x 2.5 mm thick.

If mounting on wood studs, attach the strut to at least three studs, using at least one 10 mm wood screw with washer per stud, of sufficient length for at least 64 mm embedment into the studs.

If mounting on metal studs, attach the strut to at least three studs, using at least two 10 mm 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)** 10 mm hexhead screws with washers and strut nuts.





APPENDIX B: WIRING REFERENCE

Powerwall Wiring

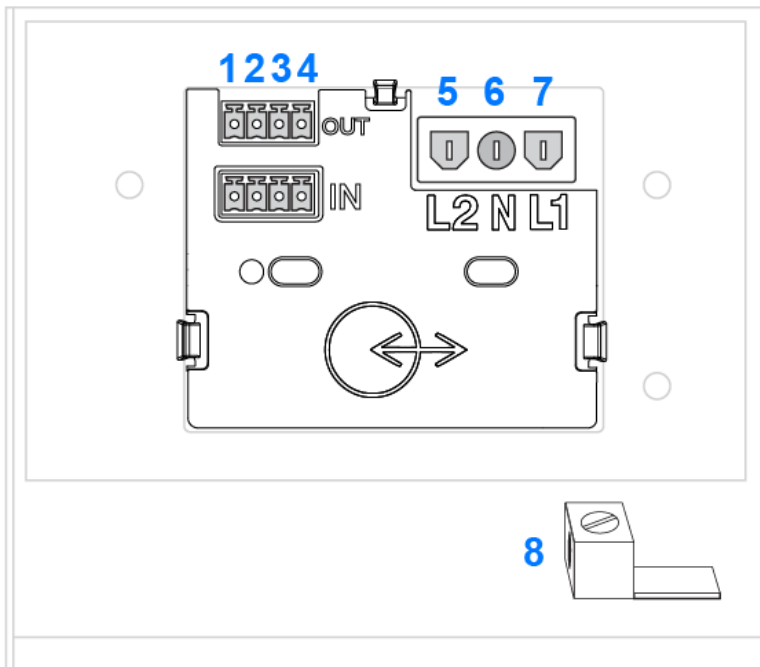


Table 3. Powerwall Wiring: Communication

	Powerwall Terminal	Recommended Wire Color	Wire Gauge
1	12V + (Logic +)	Brown	1.0 mm ² (max 35 m) 1.5 mm ² (max 45 m)
2	GND (Earth)	Blue	
3	CN + (CAN HI)	White	0.2 - 1.5 mm ²
4	CN - (CAN LO)	Yellow	


 **NOTE:** 4-conductor communication cable must be 300 V rated or double insulated with one twisted pair shielded copper cable.

Table 4. Powerwall Wiring: Power¹

	Powerwall Terminal	Recommended Wire Color	Wire Gauge
5	L2 (Line 2) - to Neutral	Blue	4 - 10 mm ²
6	N (Neutral)		
7	L1 (Line 1)	Brown	4 - 10 mm ²
8	Chassis Ground Lug	Green / Yellow	2.5 - 10 mm ²

¹ Depending on local code for installation methods and cable sizing calculations.



APPENDIX B: WIRING REFERENCE



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

(2) Wago lever nuts are provided for use with up to 6 mm² AWG cable. If 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 6 mm² cables. **Follow all code wiring requirements.**



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



CAUTION: For single-phase service, Neutral is **not** connected to the Powerwall N terminal. It is instead connected to the Powerwall L2 terminal.



Backup Gateway 2 Wiring

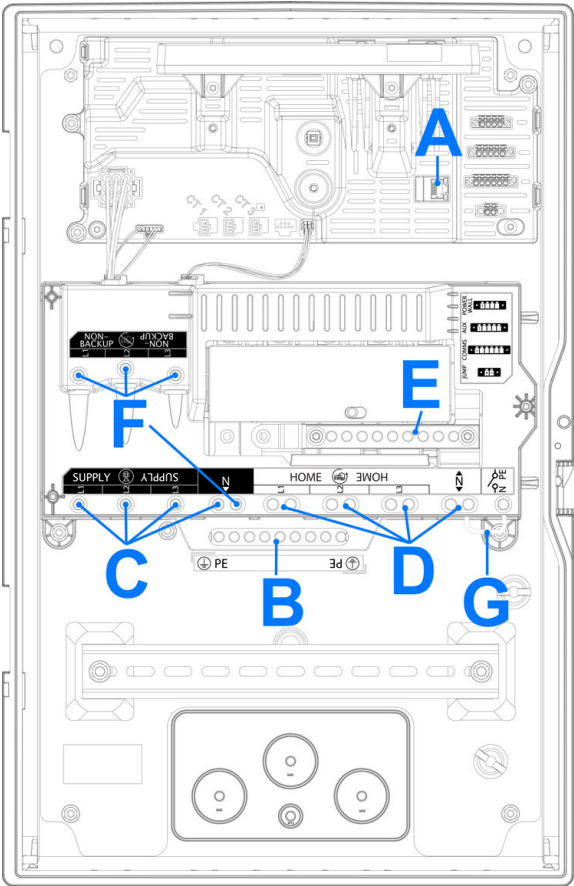


Table 5. Backup Gateway 2 Wiring: Power

	Terminal Name	Recommended Wire Color	Wire Gauge
A	Ethernet	-	24 AWG CAT5 or better
B	Earth Bar	Green or Green/Yellow	2.5 – 25 mm ²
C	Grid Supply (L1, L2, L3, N)	Brown, Black, Grey, Blue	2.5 – 35 mm ²
D	Backup Loads and Generation (L1, L2, L3, N)	Brown, Black, Grey	2.5 – 35 mm ²
E	Generation Neutral Bar (N)	Blue	2.5 – 25 mm ²
F	Non-Backup Loads and Generation Backup Loads and Generation (L1, L2, L3, N)	Brown, Black, Grey, Blue	2.5 – 35 mm ²
G	Switched Neutral-Earth link	-	16 mm ²



APPENDIX B: WIRING REFERENCE

Backup Gateway 2 Communication Wiring

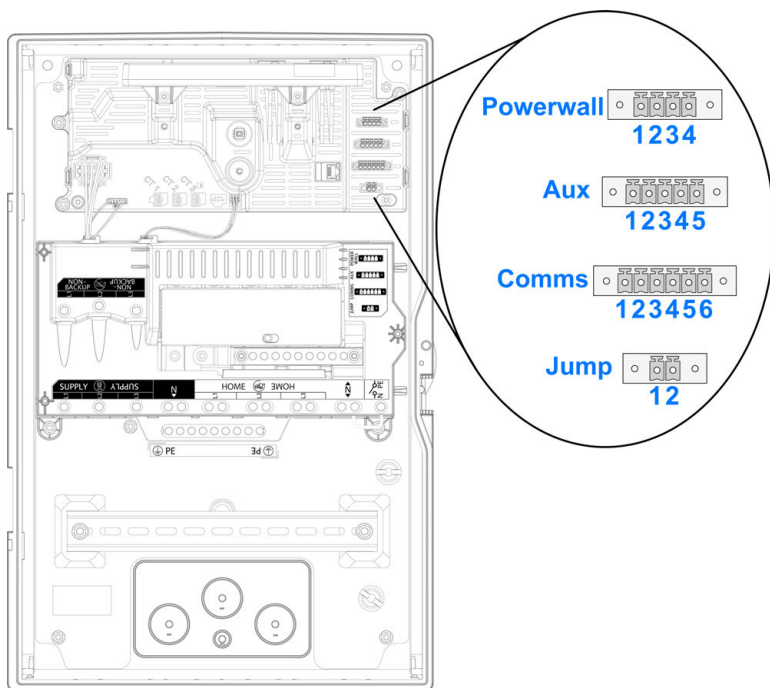


Table 6. Powerwall Communication Wiring

	Terminal Name	Recommended Wire Color	Wire Gauge
1	12V + (Logic +)	Brown	1.0 mm ² (max 35 m) 1.5 mm ² (max 45 m)
2	GND (Earth)	Blue	
3	CN + (CAN HI)	White	0.2 - 1.5 mm ²
4	CN - (CAN LO)	Yellow	


 **NOTE:** 4-conductor communication cable must be 300 V rated or double insulated with one twisted pair shielded copper cable.

Table 7. Aux Wiring

	Terminal Name	Recommended Wire Color	Wire Gauge
1	Site Shutdown (OUT)	-	0.2 - 1.5 mm ²
2	Site Shutdown (IN)	-	0.2 - 1.5 mm ²
3	Generator / Load Control (+)	Red	0.2 - 1.5 mm ²
4	Generator / Load Control (-)	Black	0.2 - 1.5 mm ²
5	Interlock pin	-	0.2 - 1.5 mm ²

Table 8. External Meter Communication Wiring

	Terminal Name	Recommended Wire Color	Wire Gauge
1	GND (Earth)/Shield	-	0.2 - 1.5 mm ²
2	RS485 HI #1	Red	0.2 - 1.5 mm ²



APPENDIX B: WIRING REFERENCE

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

Table 9. Jump Start

	Terminal Name	Recommended Wire Color	Wire Gauge
1	12V	Red	0.2 - 1.5 mm ²
2	GND	Black	0.2 - 1.5 mm ²



APPENDIX C: SYSTEM WIRING DIAGRAMS

Overview

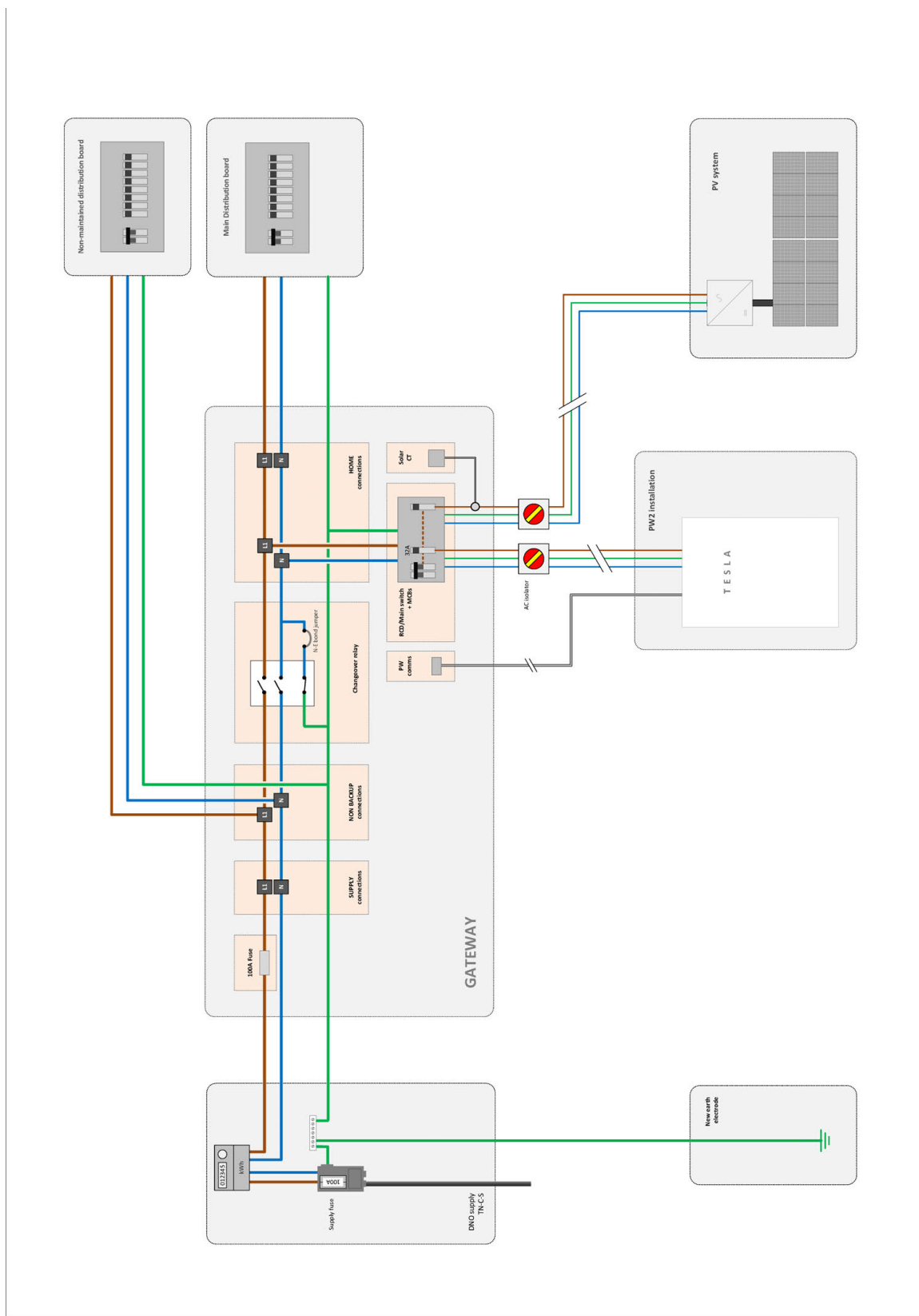
The following diagrams are intended for illustration purposes only. Drawings represent sample site layouts to show example system layout and metering. These diagrams should not be considered complete plan sets.

1. Single-phase supply, single-phase solar, partial backup
2. Three-phase supply, three-phase solar, single-phase partial backup



APPENDIX C: SYSTEM WIRING DIAGRAMS

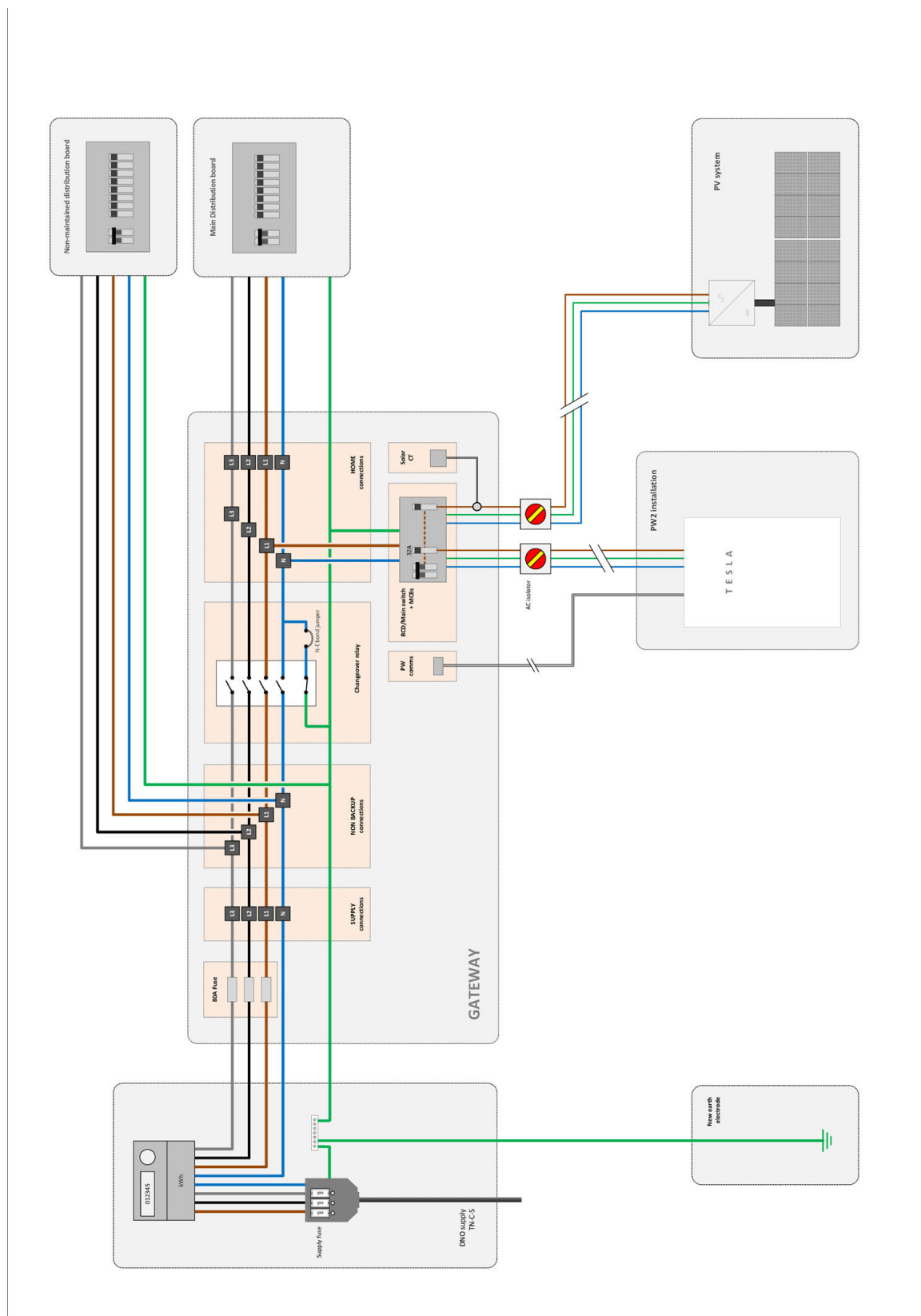
Single-Phase Service (TN Network)





APPENDIX C: SYSTEM WIRING DIAGRAMS

Three-Phase Service (TN Network)



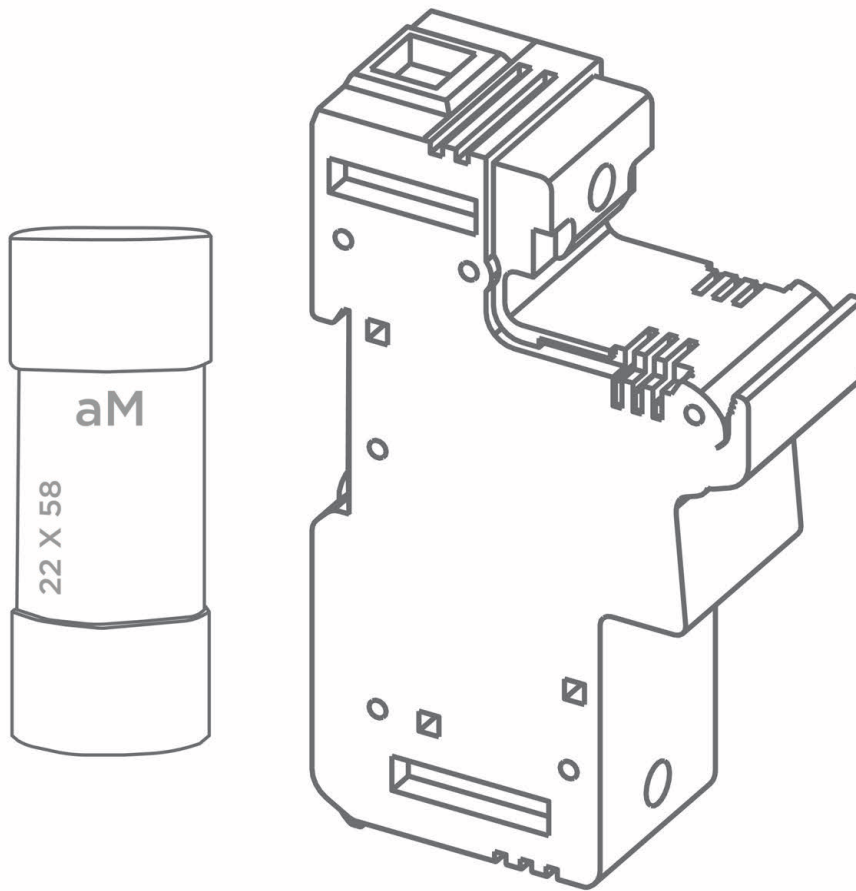



APPENDIX D: GRID SUPPLY FUSE AND FUSE HOLDER


Grid Supply Fuse and Fuse Holder

The grid supply fuse and sue holder are installed during [Make AC Power Connections to Supply and Load Panels on page 29](#).

Figure 16. Grid Supply Fuse and Fuse Holder for 16kA protection



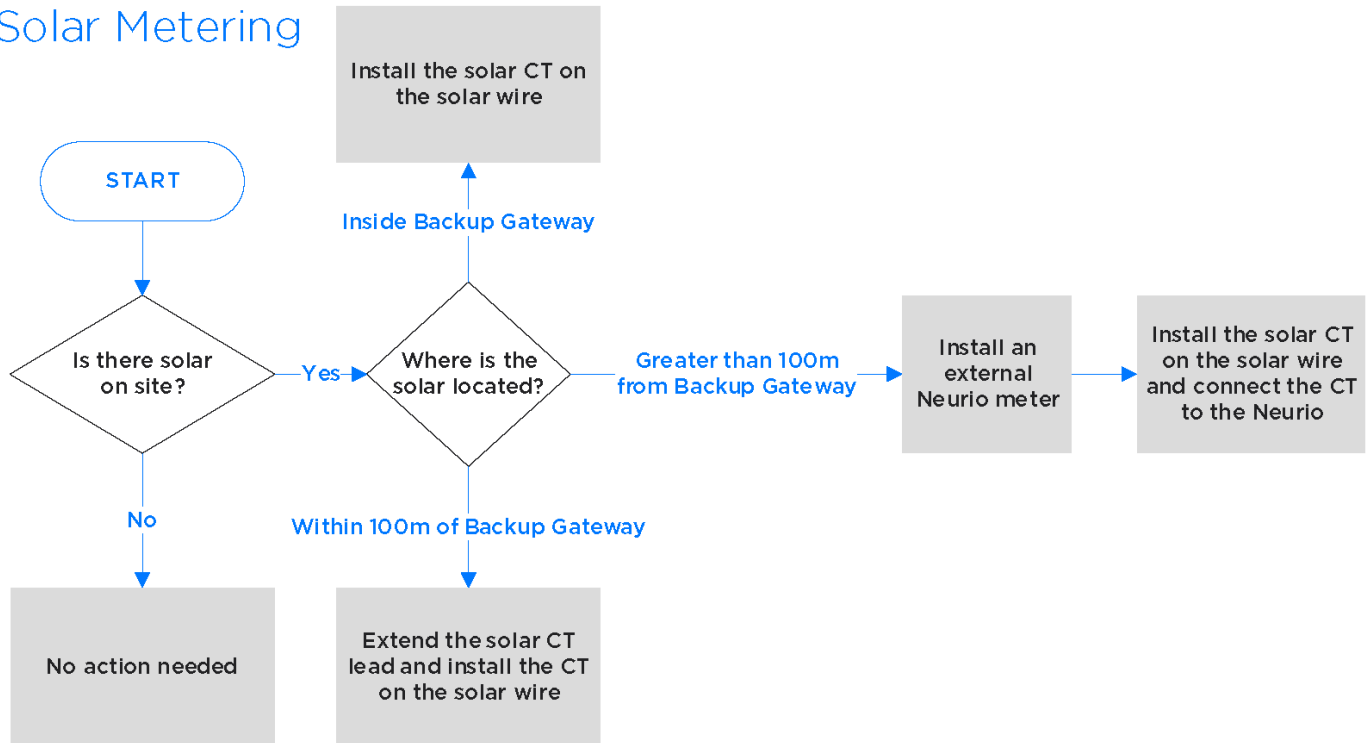
 **NOTE:** The 'type aM' fuse ensure 16 kA short circuit current protection per DNO requirements. Without this fuse, the topic is rated to a 10 kA short circuit current. If replacing fuses or breakers, they must be of equivalent trip/open and short circuit ratings and CE marked.

 **NOTE:** For single-phase sites, a single 100 A fuse is required and for 3-phase sites three (3) 80 A fuses are required. Fuse type fuses should simply comply to BS 88.3, type aM, 22x58mm cartridge fuse.

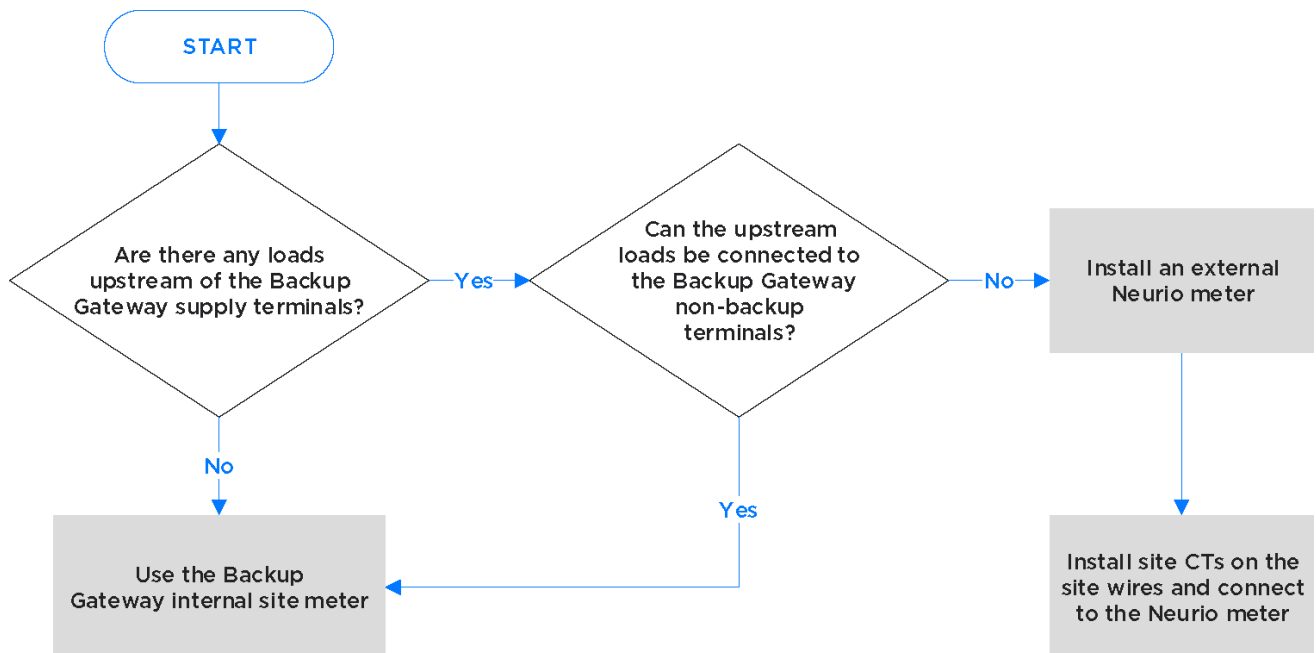


APPENDIX E: CONFIGURE ENERGY METERING

Solar Metering



Site Metering





APPENDIX E: CONFIGURE ENERGY METERING

Figure 17. CT Installation Using Built-in CTs

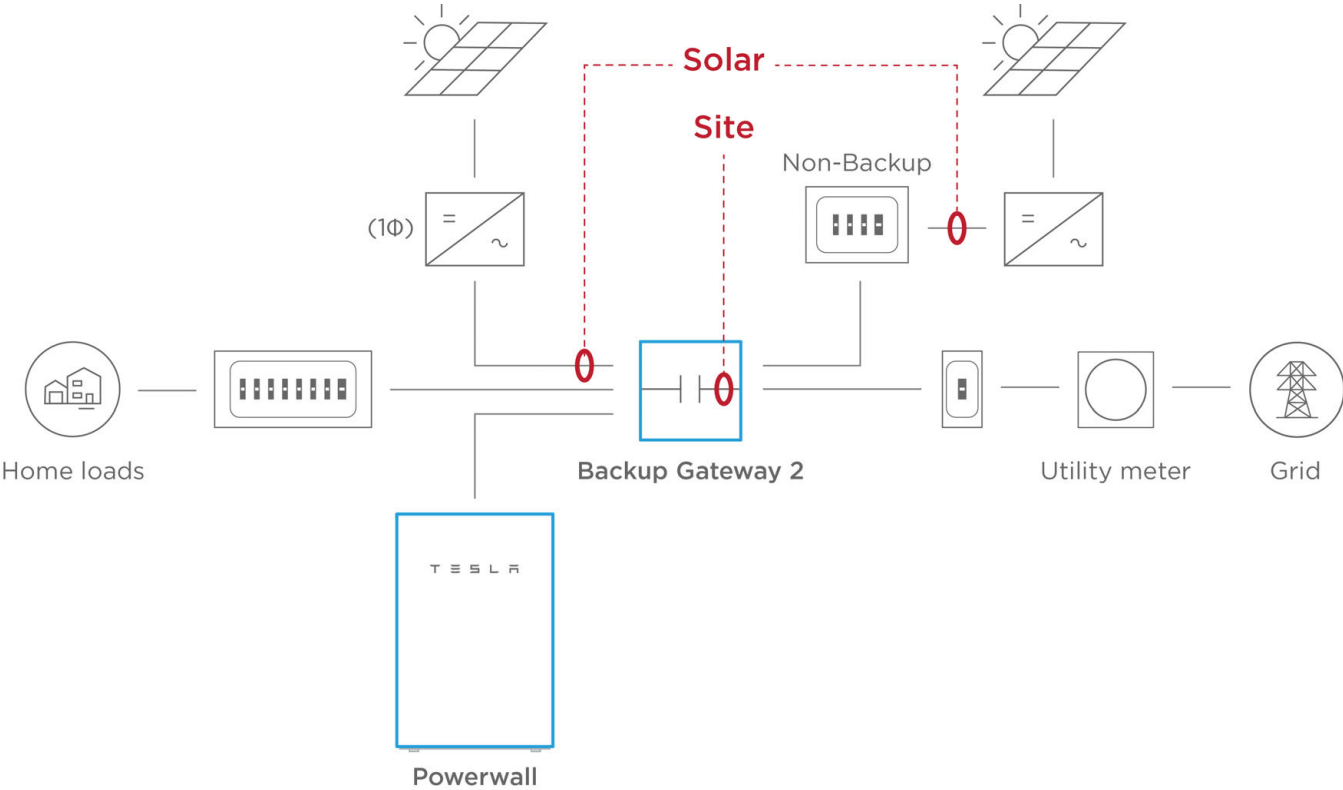
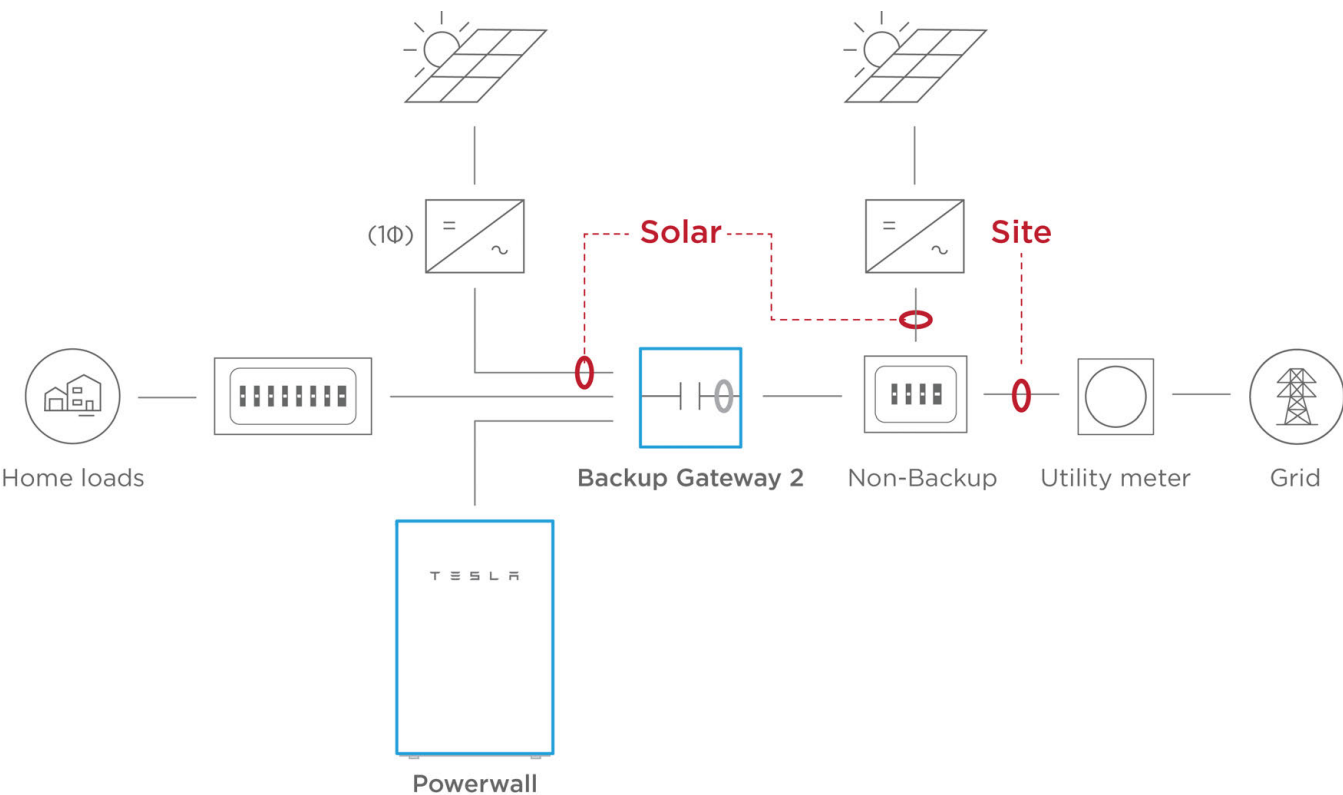


Figure 18. CT Installation with Upstream Loads or Generation





APPENDIX F: INSTALLING A NEURIO ENERGY METER

Neurio Energy Meter Overview

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

Beginning with Powerwall firmware 21.13, Tesla supports both the Neurio W1 (Tesla P/N 1112484-02-x) and Neurio W2 (Tesla P/N 1112484-04-x) meters and their accessories. While the meters serve the same applications, there are some differences between them which will be called out in the following sections. It is very important to note that Neurio W1 accessories are not compatible with the Neurio W2 meter, and Neurio W2 accessories are not compatible with the Neurio W1 meter.

Important Notes






	Powerwall Software Version Neurio W2 is supported in Powerwall version 21.13 and later. When commissioning systems with the Neurio W2 meter, ensure the software has been updated to at least this version to allow pairing and reading from the meter.
	Neurio W2 Currently Only Supports Wi-Fi Connections Neurio W2 currently only supports Wi-Fi connections; no wired (RS-485) connections are supported at this time.
	No 800 A CTs Currently there are no 800 A CTs available for the Neurio W2 meter. For sites requiring 800 A CTs, a Neurio W1 meter with Neurio W1 800 A CTs is available for purchase.
	CTs are not Backwards Compatible The Neurio W2 meter uses a new 4-wire CT which is not compatible with Neurio W1 meters (nor are Neurio W1 CTs compatible with Neurio W2 meters).

Figure 19. Neurio W1 Meter Kit with 200 A CTs



Figure 20. Neurio W2 Meter Kit with 200 A CTs



 **NOTE:** When replacing a Gateway, 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's internal site meter is deselected in Commissioning.

Wireless Communication to the Backup Gateway

The Neurio Energy Meter (Tesla P/N 1112484-00-x) is 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 with the Neurio W1 meter, 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:

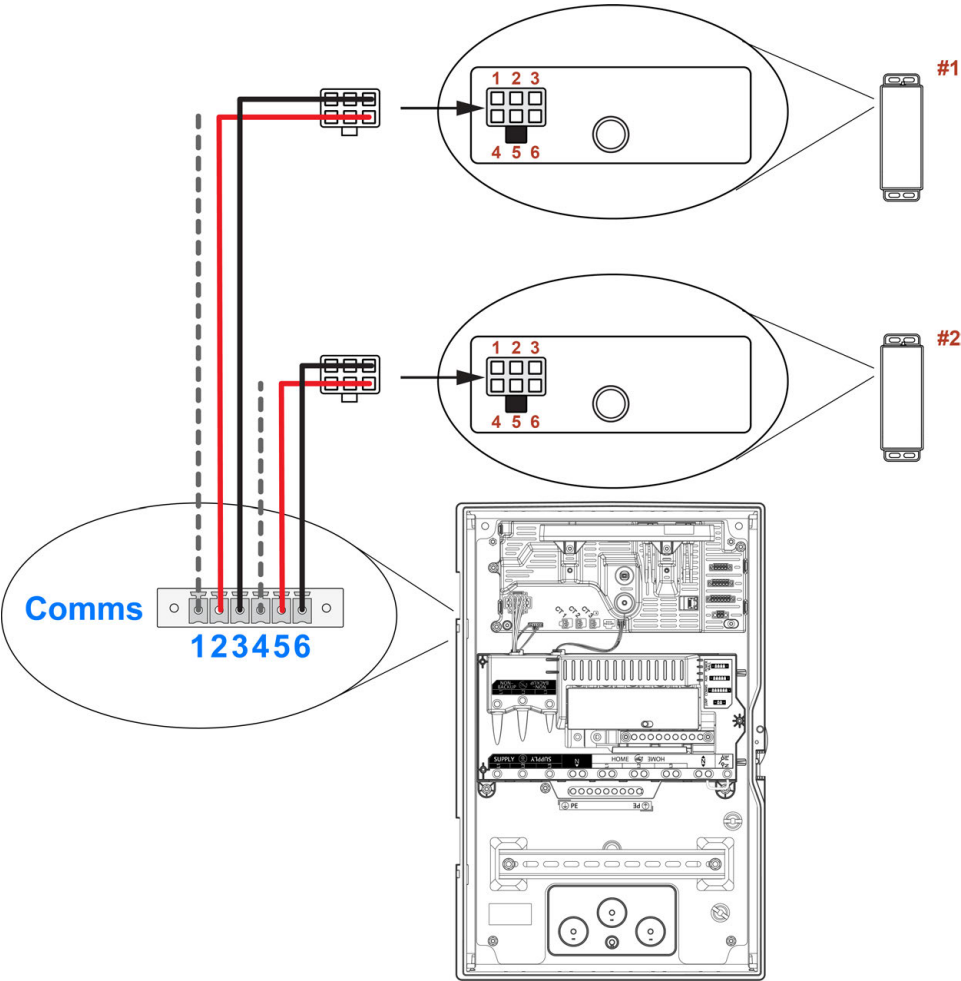
- Shielded twisted pair with drain wire (such as CAT5)
- Terminate the harness shield/drain wire in the corresponding Gateway earth terminal
- Total extended length of up to **50 m**

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 Neurio Energy Meter via wireless Wi-Fi rather than using a wired connection. This will enable firmware updating the Energy Meter. If using a wired connection, first connect the meter to the gateway wirelessly to update the meter firmware, then re-pair via a wired connection.

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 21. Meter Communication Wiring

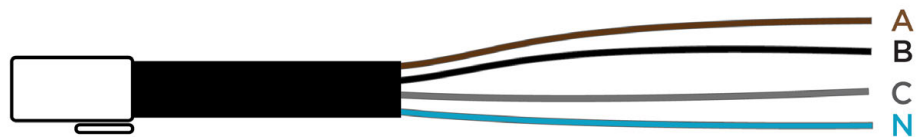


Meter #1 Communication Port Pin	Meter Terminal	Backup Gateway Meter Communication Pin	Wire Gauge
3	RS485 LO	3	0.2-1.5 mm ²
6	RS485 HI	2	0.2-1.5 mm ²
(Harness shield)	(Earth/Shield)	1	0.2-1.5 mm ²
Meter #2 Communication Port Pin	Meter Terminal	Backup Gateway Meter Communication Pin	Wire Gauge
3	RS485 LO	6	0.2-1.5 mm ²
6	RS485 HI	5	0.2-1.5 mm ²
(Harness shield)	(Earth/Shield)	4	0.2-1.5 mm ²

Meter Voltage Taps

The voltage line harness provided in the meter kit is used to install the corresponding voltage taps in the electrical panel. If the site has a three-phase electrical service, all leads on the voltage line harness are used.

Figure 22. Voltage Line Harness for Three-Phase Service



For sites with a single-phase electrical service, the voltage line harness is modified by combining the black, gray, and brown leads using a Wago splicing connector (see **annotation 1** in [Neurio W2 Meter Installed in Panel, Measuring Two Conductors Using CT Y-Splitter on page 68](#) for an illustration). Only the brown and blue leads are needed in single-phase electrical systems.

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 23. Neurio W1 Meter Voltage Tap Port (left) and Four CT Ports (right) on Bottom of Meter

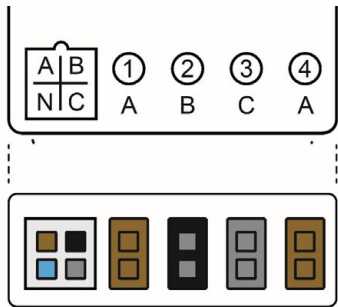
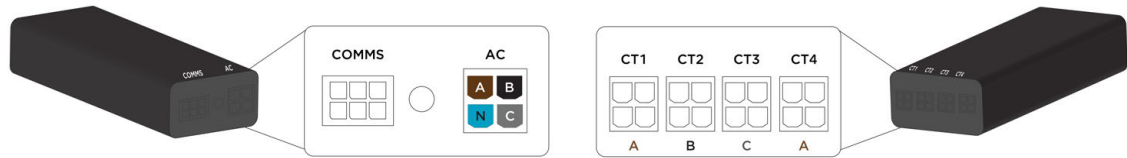


Figure 24. Neurio W2 Meter Voltage Tap Port (left) and CT Ports (right)



Phase (Example)	Meter Voltage Tap Port	Meter CT Port
Site L1	A	CT 1 (Phase A)
Site L2	B	CT 2 (Phase B)
Site L3	C	CT 3 (Phase C)
Solar L2	(A)	CT 4 (Phase A)

Meter Placement and CT Wire Lengths

	CT Lead Length	CT Extension Kit Length	Maximum Wire Extension
Neurio W1 CT	1.5 m	3 m Tesla P/N: 1125547-03-x Total Length: 4.5 m	15 m using wire with the following properties: <ul style="list-style-type: none"> • Shielded, twisted pair with drain wire • Wire gauge of 0.2-1.5 mm² • Voltage rating equal to or greater than all other circuits in shared enclosures or raceways
Neurio W2 CT	1.2 m	3.3 m Tesla P/N: 1622289-xx-y Total Length: 4.5 m	N/A

If the distance between the meter and the CT is greater than the maximum extension length, 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 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 Feature Notes 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.

See System Diagrams for system wiring diagrams depicting CT placement for various wiring configurations.

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 25. Neurio W1 CT Orientation in Relation to Power Flow

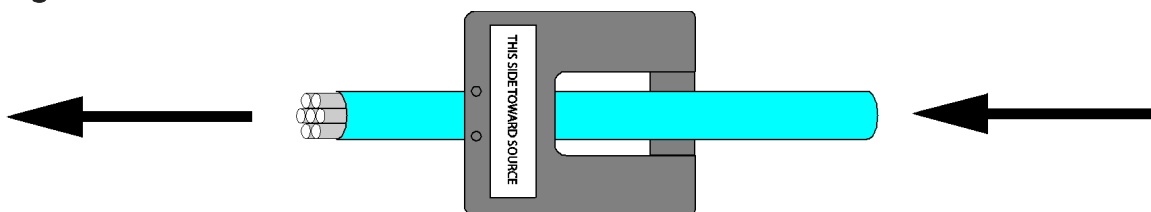
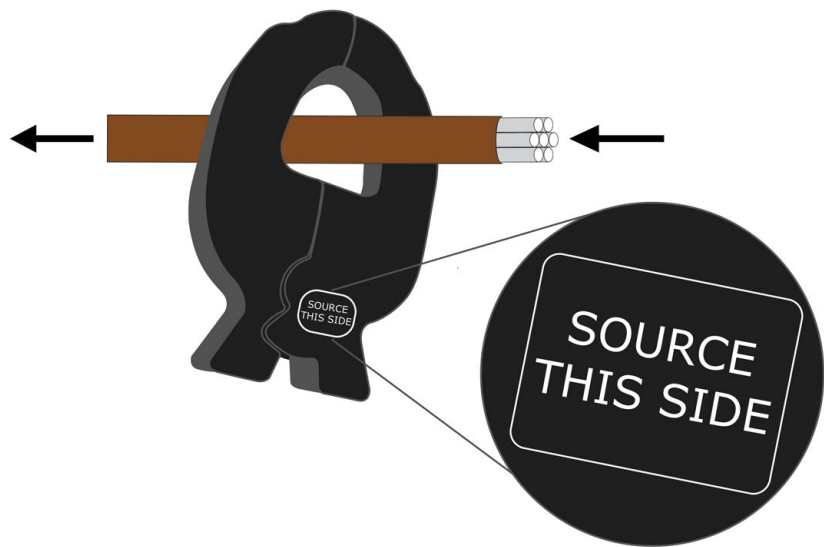


Figure 26. Neurio W2 CT Orientation in Relation to Power Flow



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 Neurio 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.


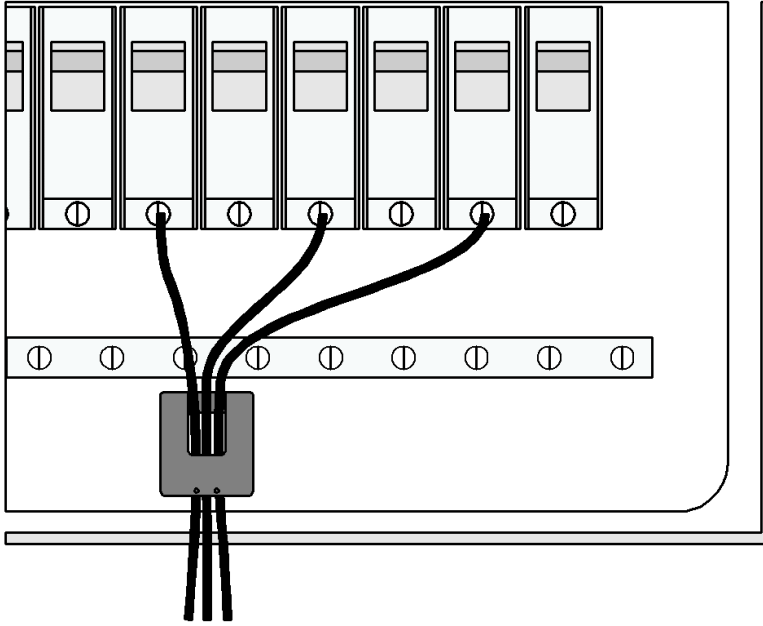


NOTE: Multiple conductors through a single CT is only possible if all conductors are on the same phase.

Figure 27. Multiple Conductors Passing Through Single CTs



If a site has multiple solar inverters spaced far apart, or if a distribution board has two main breakers, a Y-splitter cable (for Neurio W1 meters: Tesla P/N 1129625-00-x, for Neurio W2 meters: Tesla P/N 1622286-xx-y) can be used to connect two CTs on the same phase to a single meter port. See **annotation 3** in [Neurio W2 Meter Installed in Panel, Measuring Two Conductors Using CT Y-Splitter on page 68](#) for an illustration of a CT Y-splitter cable being used to measure two breakers using one CT port.

For the Neurio W1 meter, 800 A CTs are also available for larger service sizes (Tesla P/N 1447689-00-x). The 800 A CTs must be selected in the Commissioning Wizard. There is no 800 A CT for the Neurio W2 meter.

 **NOTE:** When 200 A CTs are used in parallel, each input channel can measure up to 400 A. When 800 A CTs are used in parallel, each input channel can measure up to 1100 A.

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
2. Connect the voltage line harness leads to a dedicated circuit breaker (not exceeding 16 A) of corresponding phase inside the distribution board (see **annotation 2** in figure 32).

Voltage Harness Port/Wire Color	Distribution Board Connection
A / Brown	L1 breaker terminal
B / Black	L2 breaker terminal
C / Gray	L3 breaker terminal
N / Blue	Neutral bus bar








NOTE: If a dedicated circuit breaker is not available, the voltage line harness can be spliced to existing breakers.

[illegible]

- 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.

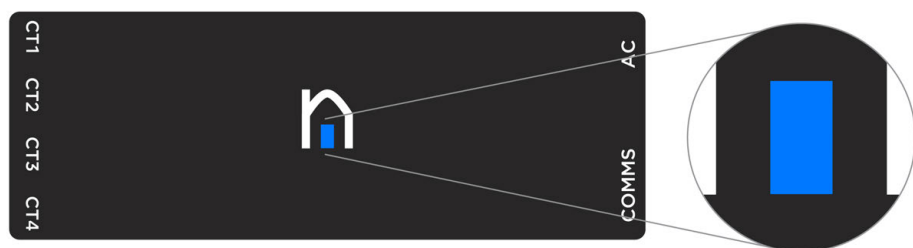
Neurio Meter Installation Troubleshooting

When powered on, the Neurio W2 will play the following tones to indicate its status in sequential order.

Tone	Indication	Description
Short Beeps 	Voltage check	One beep for each voltage wire that is connected. For a 3-phase installation there should be three beeps to indicate that the brown, black, and gray wires are connected.
Short Chime 	Neurio Wi-Fi network started	Neurio has started housing its own Wi-Fi network. You can join this network to configure Neurio and connect it to your own Wi-Fi network.
Long beep 	Voltage warning (conditional)	Indicates that two wires are connected to the same phase.
Long Chimes 	Neurio joined network successfully	Neurio successfully joined your Wi-Fi network.
Failing tone 	Neurio failed to join network	Neurio was unable to join your Wi-Fi network. Neurio will now start hosting its own Wi-Fi network again to allow you to re-connect to Neurio and re-enter the Wi-Fi credentials.

The LED on the meter housing will also indicate the current state of the meter.

Figure 29. Neurio W2 Meter LED Location



State	LED Behavior
Powered	Solid Red
Wi-Fi Connected	Solid Blue
Normal Operation	"Breathing" Blue
Wi-Fi Network Lost	Slow Flashing Blue (2s/2s)
Attempting to join Wi-Fi Network	Fast Flashing Blue (0.5s/0.5s)
Configuration Network Up (Ready to Pair)	Solid Green
Configuration Data Transfer (Pairing in Process)	Blinking Purple
Firmware Update in Progress	Solid Yellow



APPENDIX G: FEATURE NOTES

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.



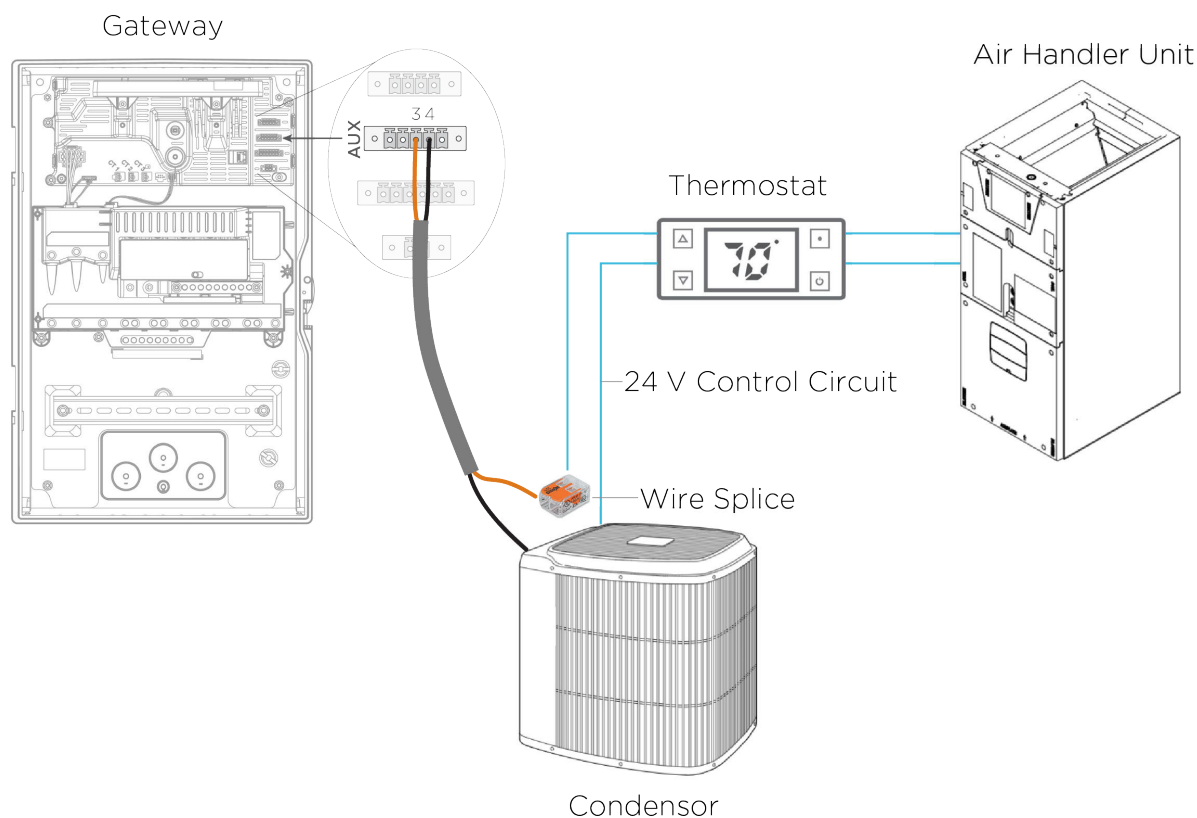
Load Shedding

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: Refer to [Appendix B: Wiring Reference on page 49](#) for wiring specifications




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, make the appropriate selection to the "Gateway Low Voltage Relay" within the *Installation* page. This feature can be activated in firmware version 1.47 or later.



APPENDIX G: FEATURE NOTES

 **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.



APPENDIX H: INSTALLATION TROUBLESHOOTING

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.
If issues still persist after rebooting the Gateway, reset the Backup Switch using the 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).



APPENDIX H: INSTALLATION TROUBLESHOOTING

Negative power flow may indicate CT is installed on the wrong phase!

- 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.

Power Cycle the System

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.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

Multi-Powerwall Installations with Backup Gateway

This section describes the requirements for installation of two or more Powerwall units with a Backup Gateway.

Pre-Requisites for Design

Before designing a Powerwall system with 2 or more Powerwalls per phase:

- Measure AC Line-to-Neutral impedance at the service head to ensure the utility grid connection is able to support the desired quantity of Powerwalls. Refer to the Line Impedance Requirements section below for more information.
- Minimize Impedance:
 - Install the Powerwalls as close as possible to the point of interconnection with the grid.
 - Install wires larger than required by code between the Powerwall generation panel and the point of interconnection with the grid. For example, while 4 or 6mm² may be sufficient to meet regulations (provide sufficient current carrying capacity), increasing the cable to 10mm² or even 16mm² for longer runs should be considered, especially on sites with high grid impedance. Maximum recommended AC voltage drop between the Powerwall and the point of interconnection is 2%.

Service Type and Capacity Requirements

The Backup Gateway supports systems of up to 10 Powerwall units, but the actual maximum number of Powerwalls may be limited by the electrical service size or local requirements.

Powerwall is a single-phase device. Large multi-Powerwall systems can be installed at single-phase or three-phase sites, according to the local standard. For three-phase sites, many local codes require phase balancing, so it may be necessary to have an equal number of Powerwalls on each phase. Typical Multi-Powerwall systems have three, six or nine Powerwalls. Other configurations are also possible if in compliance with the local standard.

Line Impedance Requirements

Measure the impedance between Line and Neutral at the service head, as shown in the following figure and compare it to the values in the table on the following page. The sensitivity of the system to line impedance increases with the number of Powerwalls in the system, therefore the maximum allowable impedance relates to the number of Powerwalls. If the measurement exceeds the maximum allowable value, do one of the following:

- Decrease the impedance of the site grid connection. This may require coordinating with the local electrical utility.
- Decrease the number of Powerwalls to meet the maximum allowable impedance value.
- Contact Tesla Technical Support



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

Figure 30. Impedance Measurement Location Before Designing the System

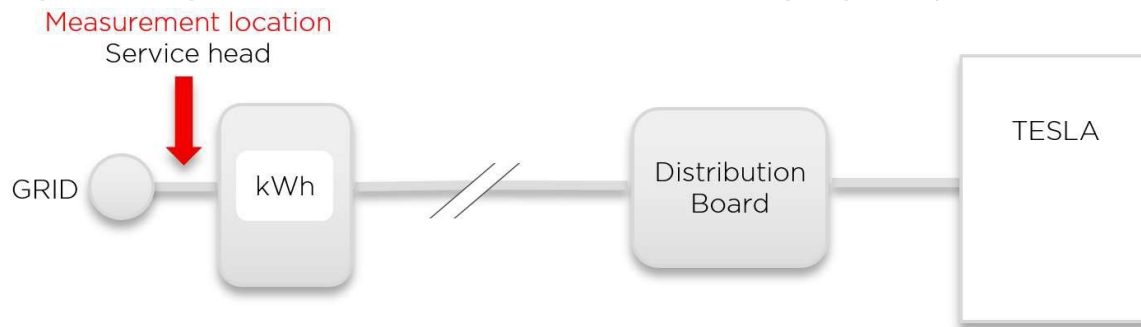


Table 10. Impedance Requirements for Multi-Powerwall Systems*

Number of Powerwalls per Phase	Maximum Line-Neutral Impedance at the Service Head (Point A)
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

*Values to be measured before designing the Powerwall system.

Example of Line-to-Neutral Impedance Test Instructions

Take the measurement test equipment such as the following:

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

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. If the site has a 3-phase electrical system, complete the test on L1 first, then move to L2 and L3 in sequence.
3. 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.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

4. Follow manufacturer instructions to take an impedance measurements at the service head (see [Measurement Locations After Installing the System on page 77](#)). Switch the tester to the appropriate impedance measurement mode and take the readings between Line and Neutral.
5. Record the impedance measurements.


System Installation

Multiple Powerwall units can be installed side-by-side, or stacked up to three units deep with the Powerwall Stack Kit. Stacked multi-Powerwall systems must be floor-mounted and must be anchored to an adjacent wall. In a 9 Powerwall installation, there will be 3 groups of 3 Powerwalls each, stacked with 3 different kits. Refer to [Multi-Powerwall Installations with the Stack Kit on page 80](#) for more information.

After the installation, measure the impedance between Line and Neutral at terminals of Powerwall (C), at the distribution board (B) and service head (A) as shown in the figure below. In a standard installation, the difference is within 0.1 ohm. Where a difference of greater than 0.1 ohm is measured, do either of the following:

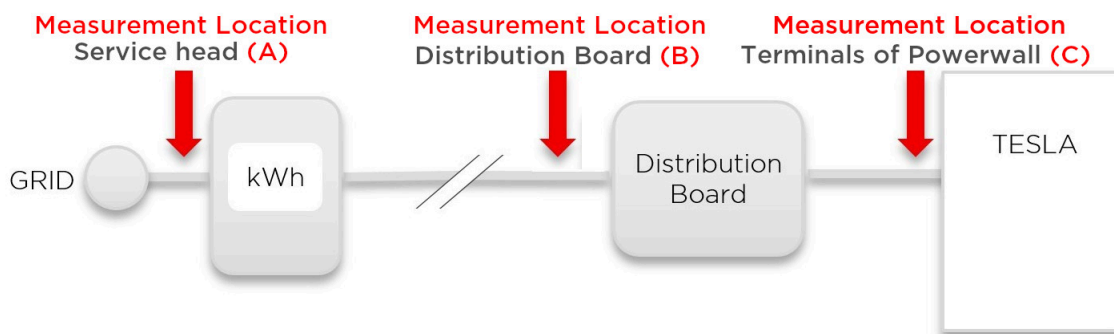
- **Increase wire size on the circuits supplying the Powerwalls.** This simple and effective means reduces the impedance seen at the terminals of the Powerwall.
- **Reduce and improve electrical connections.** Every connection contributes to the overall impedance seen by the Powerwall. Keep in mind that resistance directly results in heat; if the heat is concentrated it can end in a thermal event.


Enter all impedance measurements and size and length of the Powerwall circuits between points A and B and B and C in the *EMEA - High Impedance* Tesla BOLT form. The system will automatically choose the best possible impedance configuration for your installation and will notify you via email.

 **NOTE:** If the impedance measured at the service head exceeds the maximum allowable value, the system may not work as expected even after that the high impedance configuration has been loaded. Tesla strongly recommends contacting the local electrical utility to decrease the impedance of the site grid connection.

On a mobile device, navigate to <https://mobile.tesla.com/> to download the Tesla BOLT application. Additional information and training can be found in the Document section on Partner Portal.

Figure 31. Measurement Locations After Installing the System



 **NOTE:** The difference between the impedance point C and point A is within 0.1 ohm in a standard electrical installation.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

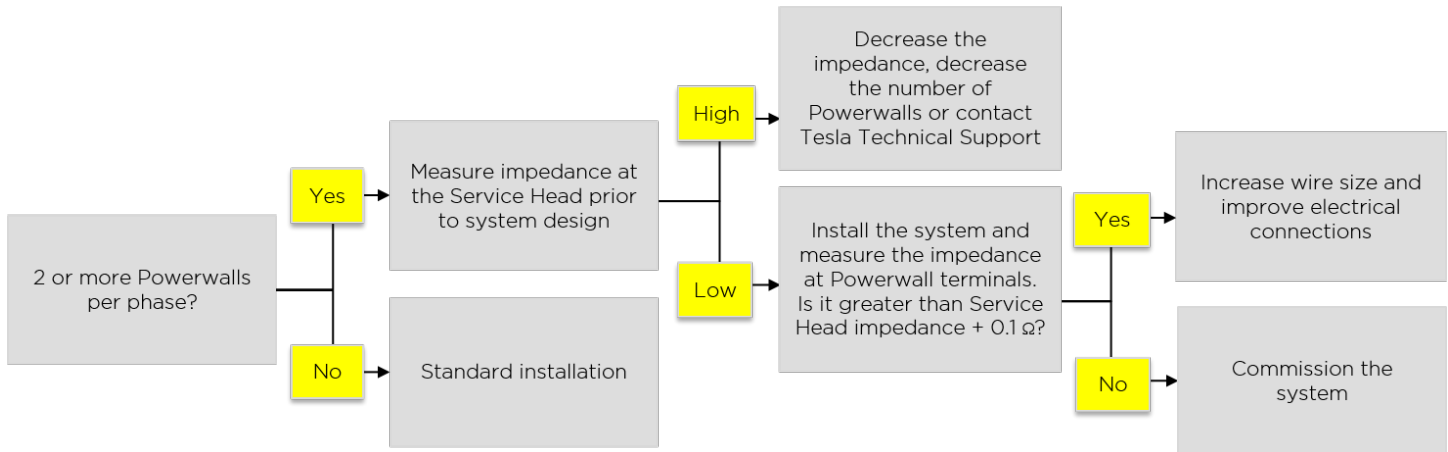
System Commissioning

Plan for the commissioning process to take longer with multi-Powerwall installation. Each Powerwall can take up to 3 minutes to complete the commissioning scan and verify process, so a 10-powerwall system can take up to 30 minutes during the stage of commissioning.

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

The figure below shows the Multi-Powerwall installations flowchart, from design to commissioning.

Figure 32. Multi-Powrewall Installations Flowchart



System Operation on Three-Phase Systems

NOTE: This paragraph is applicable to all Powerwall systems installed on three-phase systems, regardless of the number of Powerwalls installed.

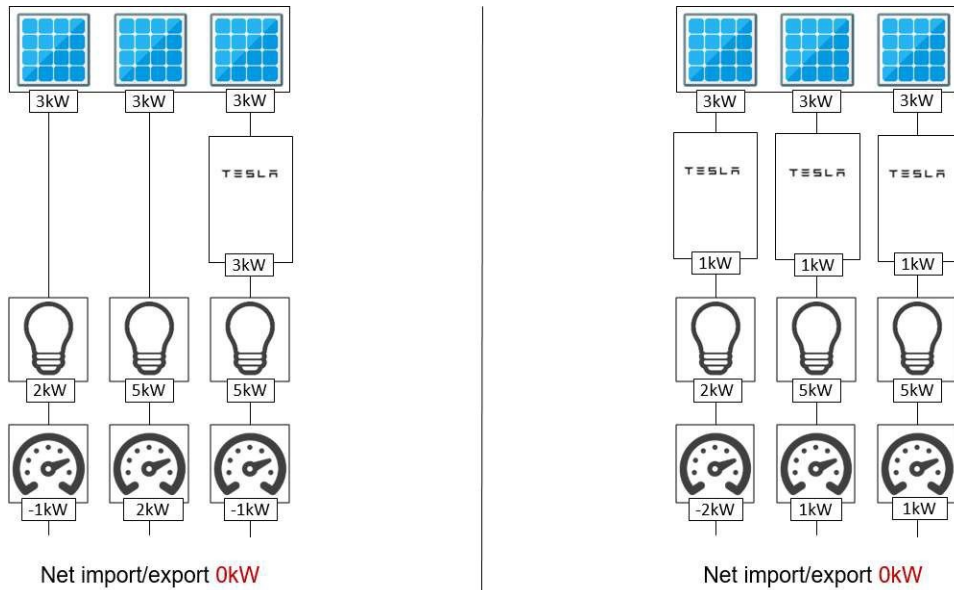
Powerwall systems installed to maximize solar self-consumptions operate according to Three Phase Vector Sum Compensation: the system targets an aggregate import from the grid of 0 kW (calculated as difference between imports and exports across 3 phases) using all available Powerwalls. To achieve this, the site may import on some of the phases while exporting on the other phases as shown in the figure below; the systems have 1 and 3 Powerwall units installed but the same principle is applicable to systems with a larger number of Powerwall units installed.

- Example on the left: Solar produces 9 kW, total loads are 12 kW. Powerwall unit discharges 3 kW to keep the aggregate import from the grid at 0 kW.
- Example on the right: Solar produced at 9 kW, total loads are 12 kW. Powerwall units discharge 3 kW in total to keep the aggregate import at 0 kW. Since there are 3 units installed, each unit discharges 1 kW.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

Figure 33. Examples of Multi-Powerwall System Operation



Note for the UK Market

Before designing the system, please ensure that the installed utility three-phase meter records the sum of the imports less any exports (vector-sum meter type). Not all multi-phase meters are vector-sum type, for example some measure only the imports without detracting the exports. Vector-sum meter is required to make the application work correctly. If a multi-phase non-vector sum meter is installed, please coordinate with the customer and the customer's energy supplier to replace it with a vector-sum one. If that is not possible, do not proceed with the Powerwall installation.

Multi-Powerwall Installation Notes

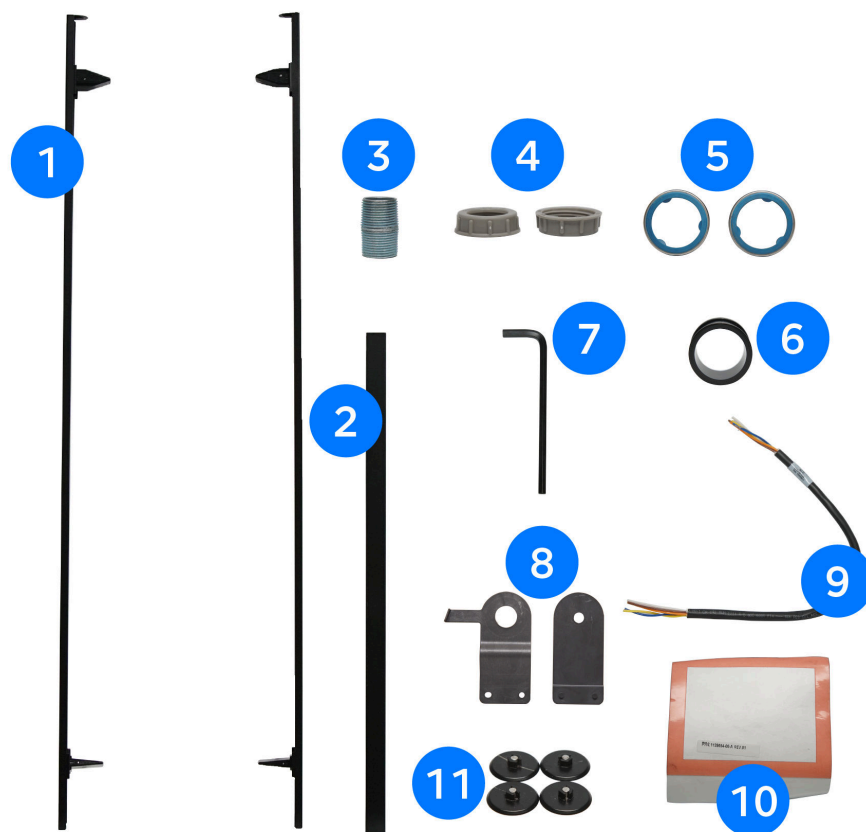
- For single-phase solar, Powerwall(s) must be installed on the same phase(s) as the solar inverter(s).
- Ensure that loads are balanced across the three phases.
- Meter voltage taps must be matched phase-by-phase to their respective current transformers (CTs).
- In Backup installations, the Backup phase is selected during the commissioning process. During an outage, the system provides backup power only to the loads on this phase. Ensure that all critical loads in the Home Load Panel are connected on the desired Backup phase.



Multi-Powerwall Installations with the Stack Kit

In the Powerwall Stack Kit

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



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

Required Tools

- Personal protective equipment (safety glasses, gloves, protective footwear)



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

- 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 1.5 to 8 mm² (24 to 8 AWG) wires
- Large (5 mm) flathead driver bit (for Powerwall Earth terminal)
- 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)

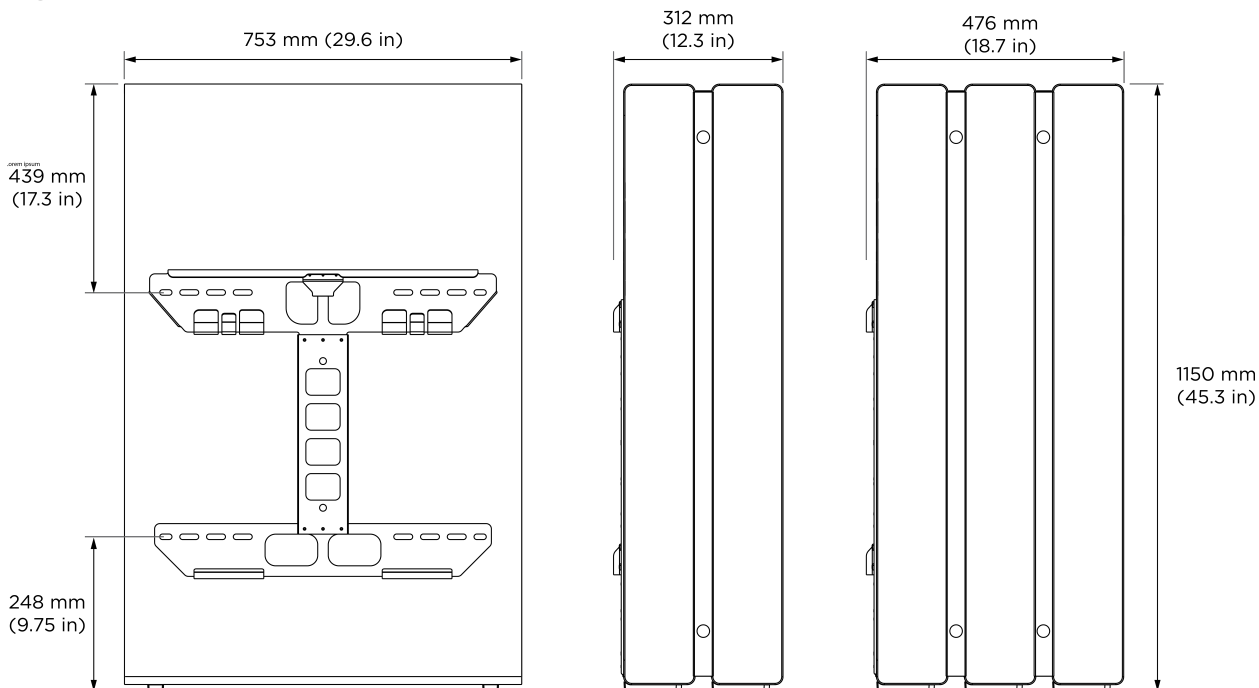
Site Requirements

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 10](#).

Figure 34. Dimensions for 2-unit and 3-unit Powerwall Stacks





APPENDIX I: MULTI-POWERWALL INSTALLATIONS

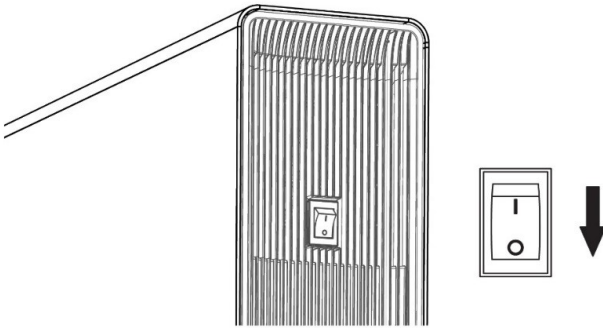
Installation Instructions

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 1112154-00-x).

See [Plan the Installation Site on page 18](#) 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.



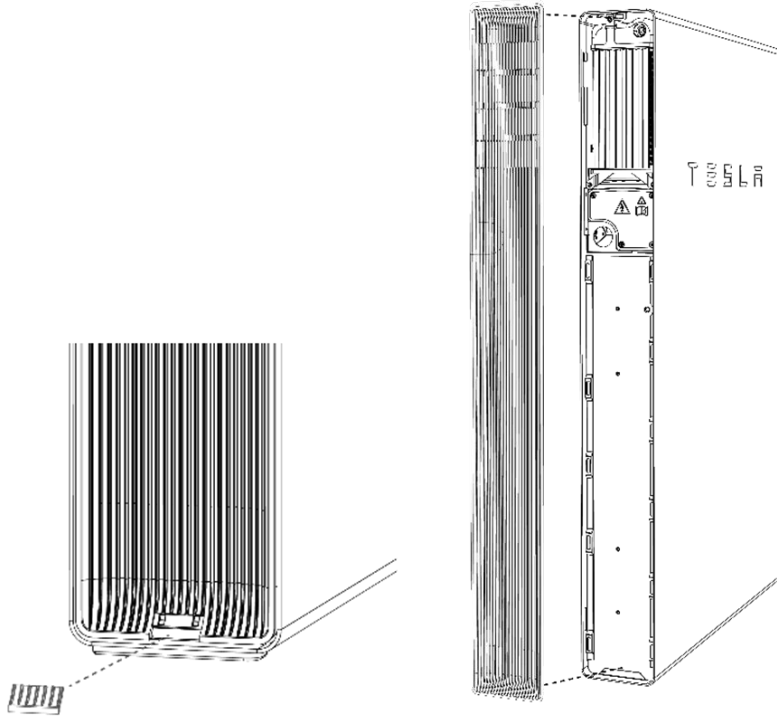
2. Turn off the AC circuit breaker for the Powerwall.
3. Ensure that the second Powerwall is turned off by verifying that its On/Off switch is set to the OFF position.
4. Remove both side covers from each Powerwall to be joined.



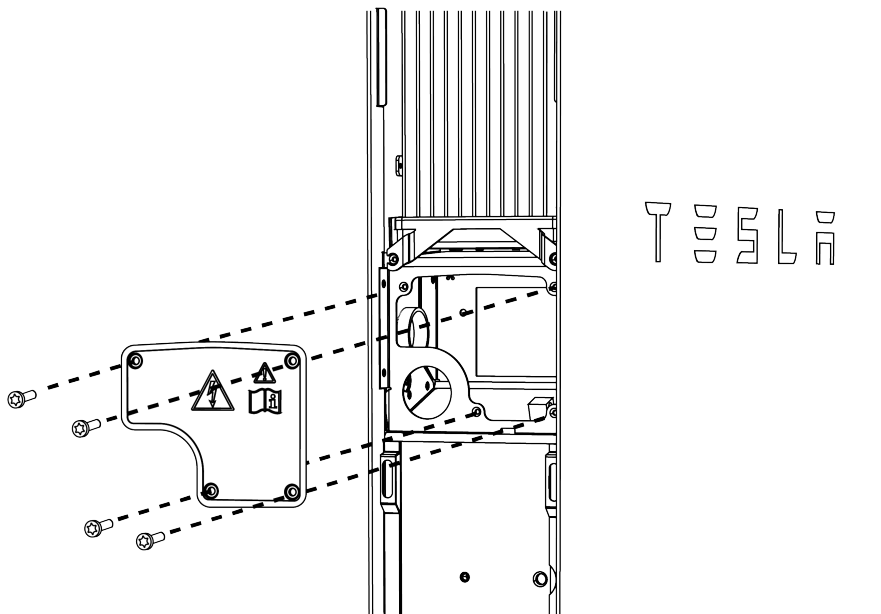
NOTE: On the first (previously installed) Powerwall, it may be necessary to remove the small plastic insert at the bottom of the covers to help with removal. For the right (LED) side covers, do not disconnect the switch and LED leads. Turn the cover to one side and rest it against the Powerwall chassis.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS



5. 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.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

Concealed Wiring

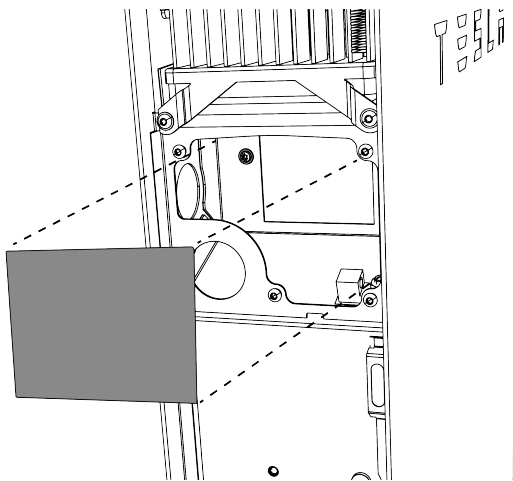
For concealed wiring, a hole is drilled from the front of the first Powerwall into its wiring compartment and wires are run directly into it from the back port of the second Powerwall. To use this wiring method, proceed to Step 3, “Prepare for Concealed Wiring.”

External Wiring

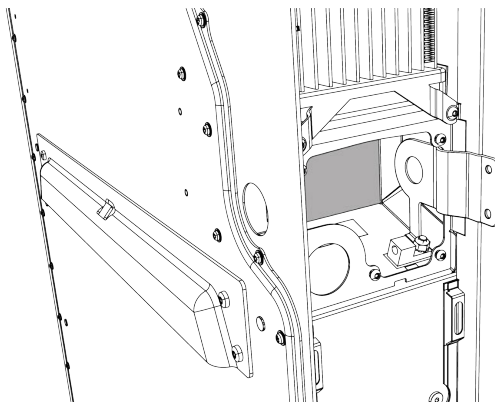
For external wiring, wires are run through conduit or raceway that spans the wiring compartment ports on the side of each Powerwall. To use this wiring method, skip to Step 4, “Join the Powerwall Units.”

Step 3: Prepare for Concealed Wiring

1. 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.



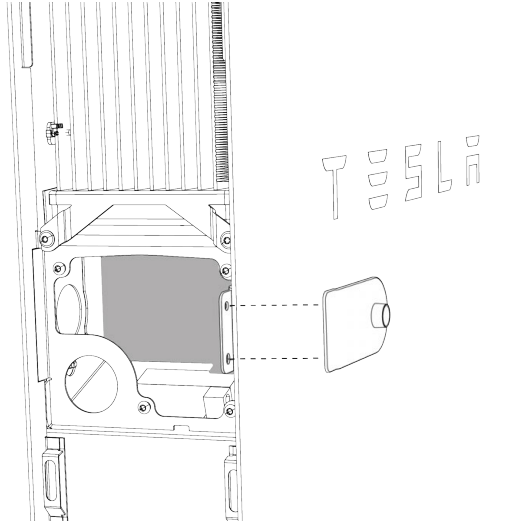
3. Attach the included drill guide to the front of the first Powerwall by bracing the inside half of the guide against the bottom of its wiring compartment.



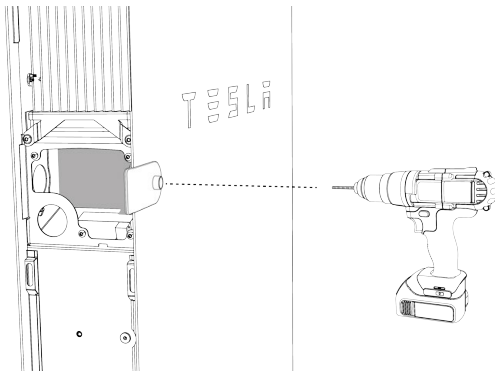


APPENDIX I: MULTI-POWERWALL INSTALLATIONS

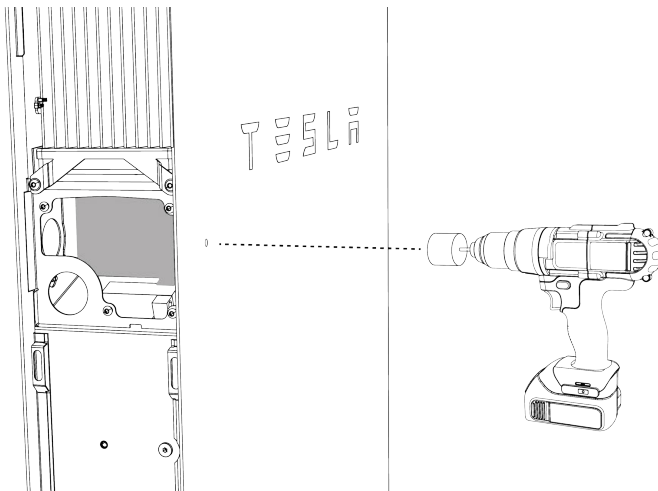
4. Clip the outside half of the drill guide to the inside half so that the guide engages the hem of the Powerwall enclosure.



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



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

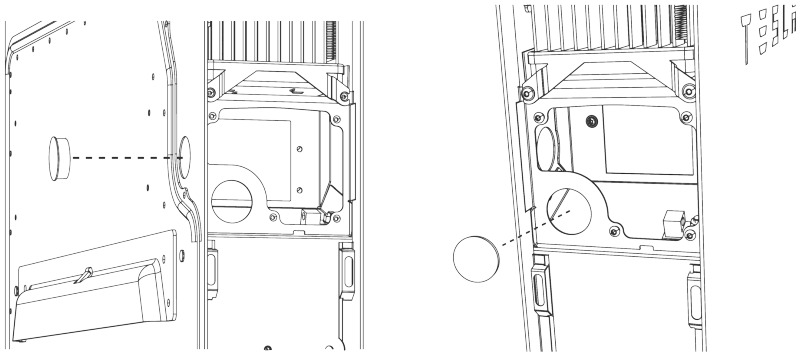


8. File the edges of the hole to remove any burrs.
9. Clear the wiring compartment of all metal shavings and debris.
10. Remove the protective cover from the wiring compartment.



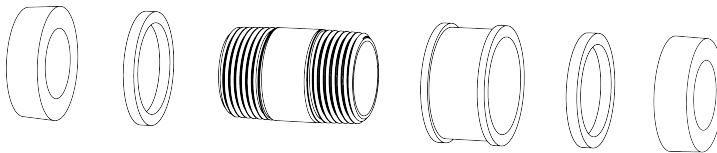
APPENDIX I: MULTI-POWERWALL INSTALLATIONS

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 2 cm (1 in) 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.

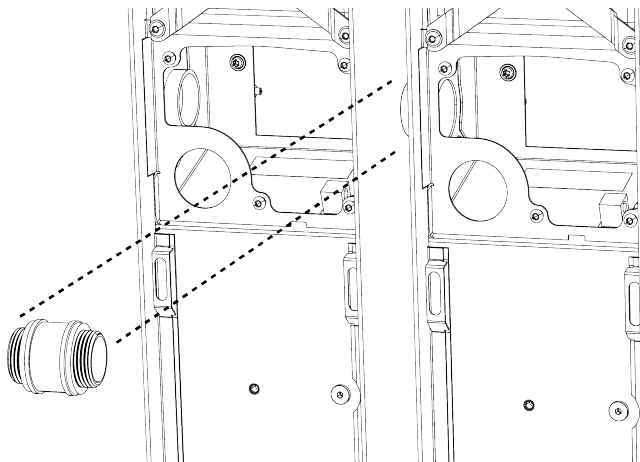


- Assemble the conduit nipple, bridge piece and O-rings. Center the bridge and O-rings on the nipple.



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

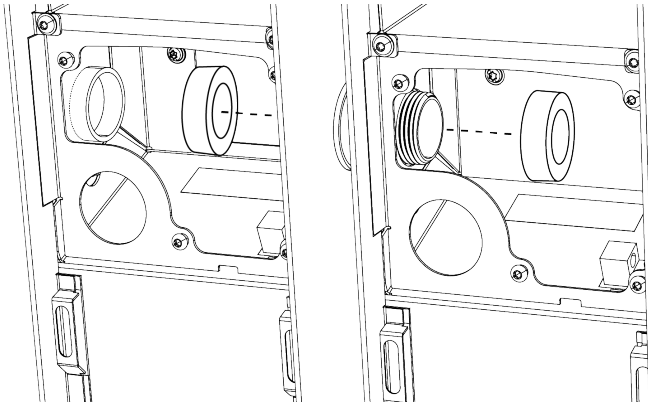
- Install the assembly between the two Powerwalls so it spans the two wiring compartments.



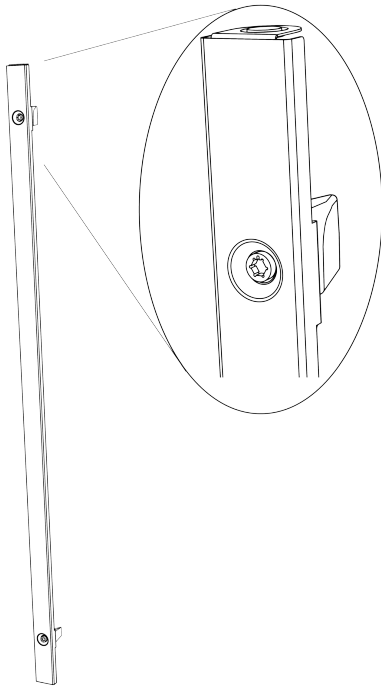


APPENDIX I: MULTI-POWERWALL INSTALLATIONS

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



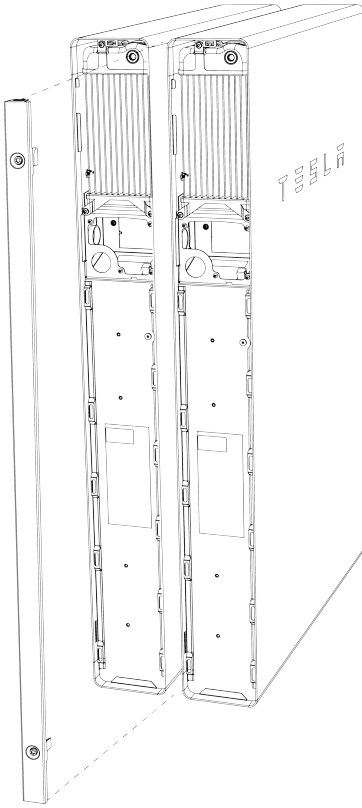
3. (All installations) Locate a side clip, making sure the flange (with magnet) is positioned at the top and that the cams are rotated vertically in relation to the clip.



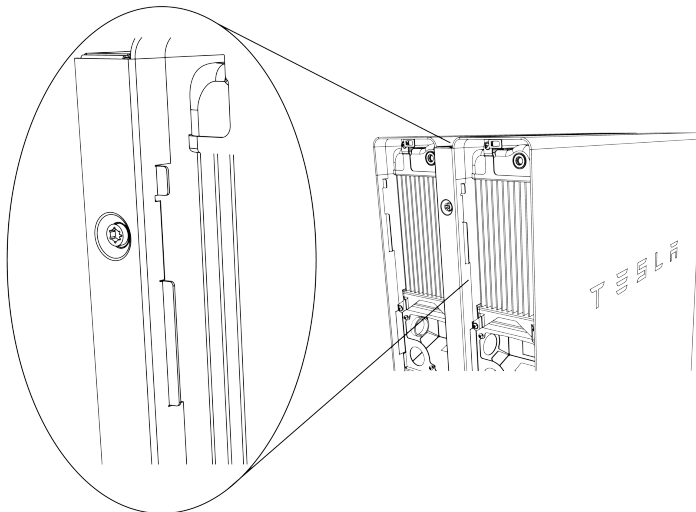


APPENDIX I: MULTI-POWERWALL INSTALLATIONS

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



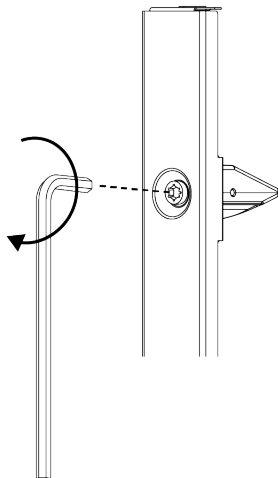
NOTE: The Powerwall enclosure hems have cutouts that mate with tabs in the clip.



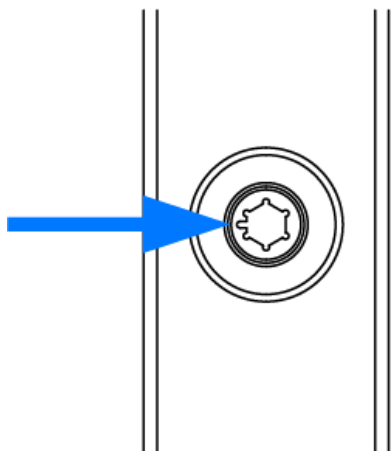
5. Press the clip until it is flush with the sides of the Powerwalls.
6. Using the provided 6 mm Allen hex wrench, do the following:
 - Turn the top cam 90 degrees clockwise until it clicks into place and stops rotating.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS



- 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.

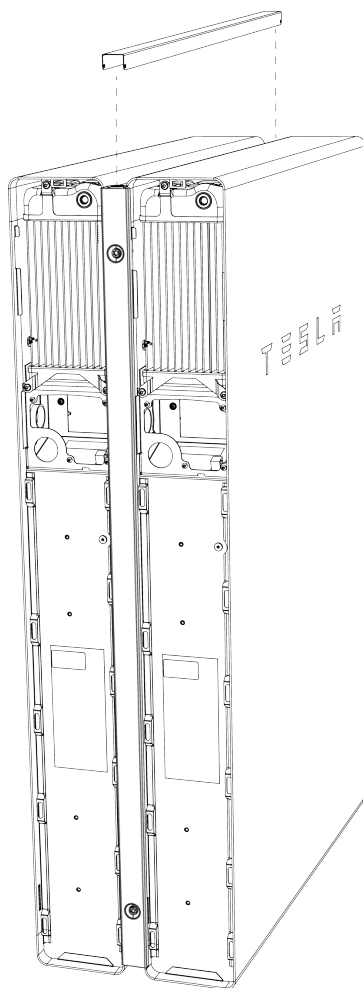


NOTE: If necessary, use a small rubber mallet or a hammer and wood block to gently tap the side clips so that they are fully seated in the hem of the Powerwall.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

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.

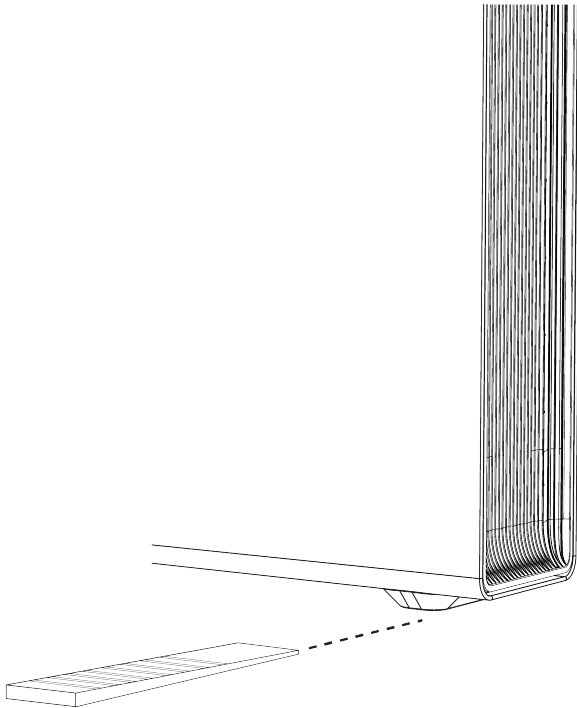


9. (Concealed wiring installations only) Tighten the insulation bushing on each side of the conduit nipple to secure the bridge between the two Powerwall wiring compartments.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

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.

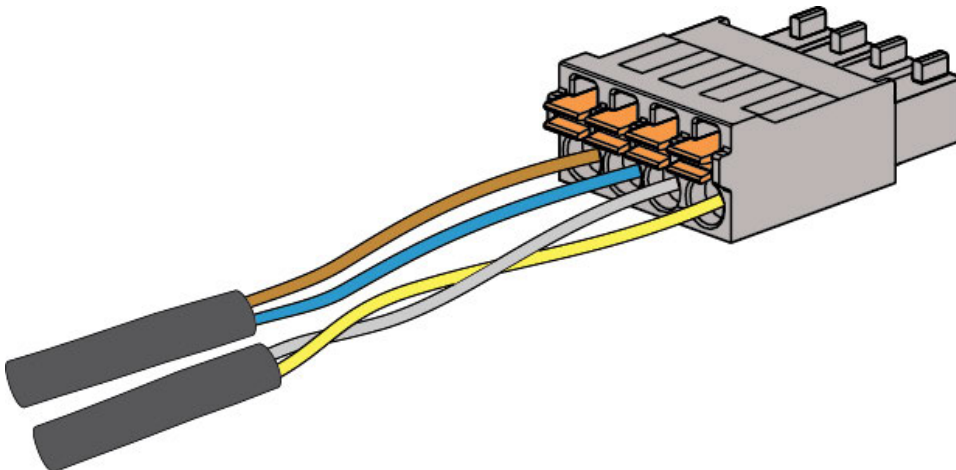
Step 5: Wire the Powerwall Units

1. Connect the communication ports of the two Powerwalls by doing the following:
 - Run the provided 5-conductor communication harness 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.




NOTE: The orange conductor is unused in Powerwall 2 AC installations.

- Attach the provided Phoenix connector to one end of the harness, and attach the extra Phoenix connector that came with the Powerwall to the other end of the harness. See [Appendix B: Wiring Reference on page 49](#) for additional wiring information.





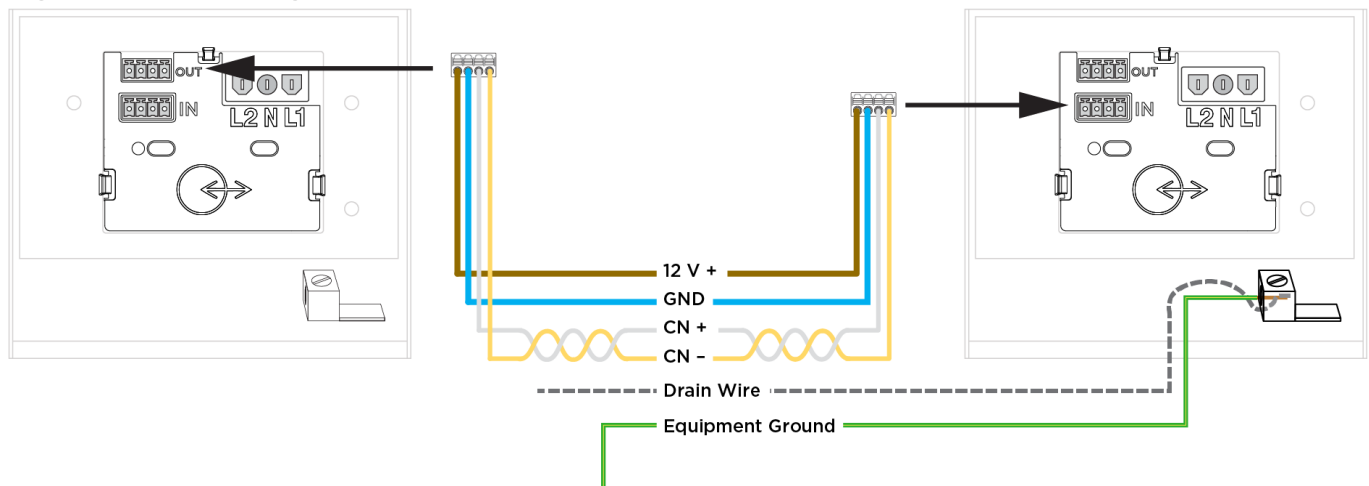
APPENDIX I: MULTI-POWERWALL INSTALLATIONS

- 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 lead 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 35. 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.

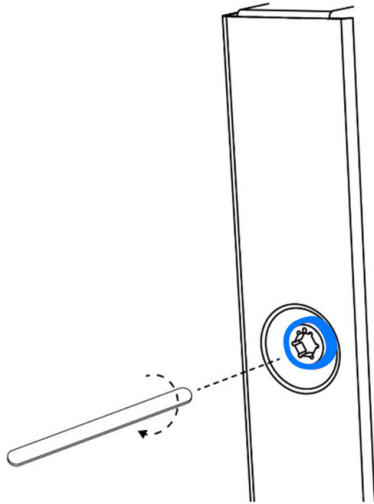
Step 6: Close the Wiring Compartments and Replace the Covers

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.



APPENDIX I: MULTI-POWERWALL INSTALLATIONS

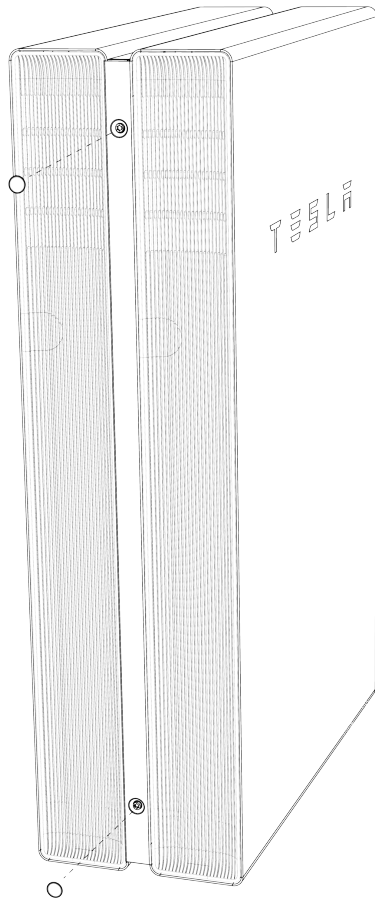
3. Replace the wiring compartment cover on each Powerwall. Ensure that the cover seats properly on the gasket so that the compartment is sealed. Tighten the fasteners using a Torx T20 bit. Torque to 1.5 Nm.
4. Replace each of the side covers on the Powerwalls by pushing the top into place and working toward the bottom to reattach it to the clips along the length of the unit.
5. (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.





APPENDIX I: MULTI-POWERWALL INSTALLATIONS

6. 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 41](#) 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.



APPENDIX J: REVISION LOG

Revision	Date	Description
1.0	2019-02-20	Initial release
1.1	2019-03-06	<ul style="list-style-type: none">• Updated fuse requirements• Updated product dimensions• Updated grid codes (G98, G99)
1.2	2019-03-11	<ul style="list-style-type: none">• Updated wiring figures for clarity
1.3	2019-04-18	<ul style="list-style-type: none">• Included warning statement regarding electrical shock safety and earthing at Gateway• Included section on multi-Powerwall installation• Included example system diagrams• Included note on leaving Powerwall breaker closed for maintenance charging• Updated Powerwall mechanical specifications• Included instructions for 800 A CTs with the Neurio Energy Meter• Included Gateway Reset Button in troubleshooting steps
1.4	2019-06-06	<ul style="list-style-type: none">• Included additional graphics for clarity in Energy Metering section• Updated Neurio meter Wi-Fi pairing details for firmware updates• Added location of back and side cable entry ports in updated mounting layout
1.5	2019-06-07	<ul style="list-style-type: none">• Included note on earthing network type when off-grid• Included note on using existing Energy Meters from Gateway 1 when upgrading to Gateway 2• Updated AC wiring requirements with note on following local code• Updated recommended temperature range for Powerwall installation
1.6	2019-11-07	<ul style="list-style-type: none">• Updated and simplified installation Manual format• Updated guidance for installation on TT Networks
1.7	2020-01-08	<ul style="list-style-type: none">• Updated maximum Tesla CT distance• Added Multi-Powerwall Installation content as an appendix
1.8	2020-04-20	<ul style="list-style-type: none">• Added Feature Notes appendix with Site Limit feature overview• Updated Powerwall accessory bag list
1.9	2020-06-17	<ul style="list-style-type: none">• Added Load Shedding to Feature Notes appendix



APPENDIX J: REVISION LOG

Revision	Date	Description
1.10	2020-10-20	<ul style="list-style-type: none">• Corrected stack kit dimensions
1.11	2020-12-10	<ul style="list-style-type: none">• Added warning to allow the Backup Gateway a full minute to complete its boot sequence before power cycling or resetting it• Added Inverter Configuration to explain how to configure a solar inverter during installation• Added minimum clearance above Backup Gateway• Updated to include new Powerwall part number 3012170-xx-y• Added note on maximum input channel current that can be measured by each CT when two CTs are used in parallel (see Current Transformer Capacity on page 66)
1.12	2021-01-20	<ul style="list-style-type: none">• Added "Installation materials not provided by Tesla" list
1.13	2021-06-04	<ul style="list-style-type: none">• Updated installing a Neurio Energy Meter appendix to include the Neurio W2 meter and accessories
1.14	2021-07-27	<ul style="list-style-type: none">• Added note to specify that all Powerwall communication cable must be 300 V rated or double insulated with one twisted pair shielded copper cable• Updated multi-Powerwall installation high impedance testing instructions to include entering results in Tesla BOLT app• Updated document formatting
1.15	2021-10-15	<ul style="list-style-type: none">• Updated Make AC Power Connections to Supply and Load Panels on page 29 and Configuring Powerwall(s) on Three-Phase Installations on page 33 to note that Tesla Wall Connector and sockets feeding the Tesla Mobile Connector are three-phase equipment that can be included in backup.• Added warning in Install Powerwall and Generation Breakers in the Backup Gateway on page 32 to always install Powerwalls on the Backup side of the Backup Gateway relay



Revision 1.15 - Published October 2021