

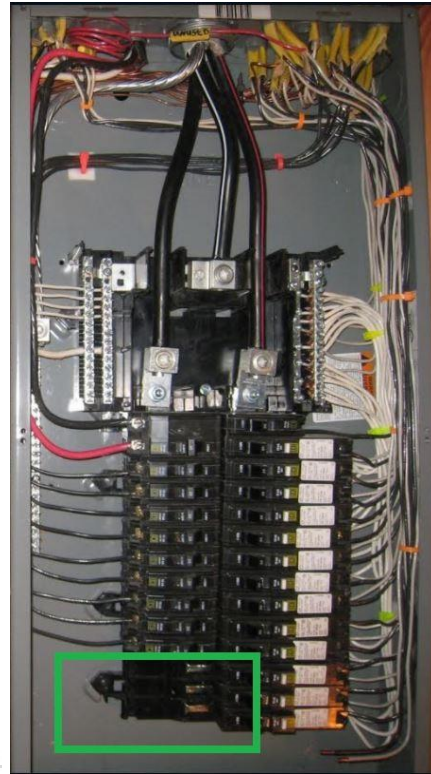
Interconnection Methods (INS-SOP-0090-01)



Overview

[Link to CURRENT version of this SOP](#)

This SOP describes the proper installation of several different interconnection methods.



Legend

General	
	Ensure all Arc Flash PPE is worn during the shown portion of the Installation SOP.
	This symbol indicates a safety-specific call out

	Photo or screenshot required for the Foreperson Installation Checklist (FIC).
	Pro Tip to help the installation procedure.
	Indicates to Tap on a screen or device within an application or website.

Safety Hazards		
 Health Hazard	 Explosive Hazard	 Environmental Hazard
 Acutely Toxic	 Oxidizing Hazard	 Flammable
 Pressurized Gas Hazard	 Corrosive Hazard	 Eye irritant, skin irritant, or both

See the Safety Data Sheet in the Related Documents list for additional information relating to OSHA Hazard Pictograms.

Tools & Materials Required

Estimated Time:	30 minutes
Tools	Load Side Tap • Torque wrench • Insulated tool kit • Linemans pliers • Arc flash PPE Line/Supply Side Tap • Socket wrench with ½” socket • Knife or scissors to cut the tape • Torque wrench • Wire cutters • Complete arc fault gear: suit, face shield, and gloves Side Connection Via Backfeed Breaker • Torque wrench or screwdriver with appropriate bits • Wire strippers • Wire cutters

Materials:	Load Side Tap • IlSCO IPC - 4/0 - 6, 157-04550; or • IlSCO IPC - 4/0 - 2/0, 157-04551 • Main breaker for main panel (If main breaker is needed, determine the make and amperage rating prior to install). Line/Supply Side Tap • ILSCO IPC-4/0-6, PIERCING 6-14 AWG TAP: 157-04550 • ILSCO, IPC-4/0-2/0, PIERCING 2/0-6 AWG TAP: 157-04551 • Roll UL listed electrical tape • 60 Amp fused AC disconnect Side Connection Via Backfeed Breaker • Backfeed breaker of required size and manufacturer.
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Load Side Tap



Step 1: DETERMINE WHETHER A LOAD SIDE TAP IS POSSIBLE

1. Always read the plan set thoroughly and understand the work to be performed.

IMPORTANT: Ensure the clearance inside the main breaker enclosure is large enough to install the IPC taps.

2. Get a visual confirmation that the panel controlled by the main breaker also has a main breaker installed.

IMPORTANT: If there is no main breaker, do not proceed with tap until the main breaker is installed.

IMPORTANT: Confirm that the breaker at the panel is not rated greater than the ampacity of the feeders from the load side of the tap connection.

3. Only proceed with a load side tap if all of the above items are cleared first.



No Main Breaker

Step 2: PREPARE TO WORK IN THE SERVICE PANEL

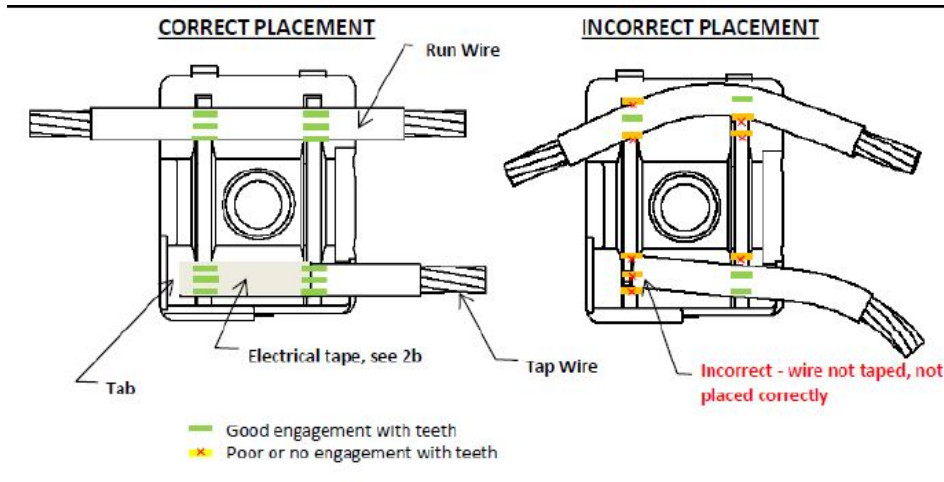
1. Always communicate with the homeowner about shutting down power before doing so.
2. Wear arc flash suit.
3. Power down the home and following all Sunrun ESP safety procedures.
4. Before doing anything else, confirm that power has been shut off, using a voltmeter.
5. Remove arc flash gear and return to minimum PPE.

Step 3: INSTALL THE FIRST TAP ON THE L1 CONDUCTOR

1. Make sure the conductor has a straight section long enough to properly fit the tap.

IMPORTANT: Do not install taps on curved conductors.

2. First, test to confirm there is no continuity between the PV feeders and ground using a multimeter set to continuity and the panel not energized.
3. Install tap terminal on L1 conductor:
 - With the two halves of the tap terminal held loosely by the bolt, slide the main side over the Line conductor.
4. Make sure the conductor lays straight across the teeth in the channel.



5. Finger tighten the bolt, enough to hold on to the conductor.
6. Place the tap conductor against the outside of the tap to determine the full insertion distance.
7. Holding the tap wire at the full insertion point, push it into the tap terminal until it reaches the stop tab.
8. Make sure the tap conductor is fully inserted and straight across the rows of teeth.
9. With both conductors centered over the teeth, finger tighten the bolt.
10. Holding the terminal firmly in hand, tighten the bolt to the required value using a torque wrench.



TAPS INSTALLED

Step 4: INSTALL THE SECOND TAP ON THE L2 CONDUCTOR

1. Repeat all of Step 3 on the L2 conductor.



2. Once the IPCs are installed on L1 and L2, connect the neutral conductor to an available lug in the service panel.
3. Connect the EGC conductor to the GEC via a C-crimp (irreversible crimp).



4. If there are no lugs available for the neutral conductor, install another IPC for the neutral conductor.



Step 5: RESTORE POWER TO THE HOME

1. Wear appropriate Arc Flash PPE.
2. If the utility meter was removed, install the utility meter by pushing the Load side in first, then the Line side. Then, install the meter cover.
3. Switch on the main breaker to restore power to the main panel. Then proceed to turn all branch circuit breakers back on. Test the voltage to each branch breaker to ensure they are all working properly. Finally, close the main panel.
4. Test the voltage on the line side of the fused AC disconnect or breaker disconnect - whichever form of overcurrent protective device (OCPD) is used.
5. Confirm voltages: 120 V per leg, and 240 V between L1 and L2.
6. Be sure to leave the fused AC disconnect in the OFF position and locked out, until you are ready to power ON the PV system.

Line/Supply Side Tap

Step 1: DETERMINE IF A LINE SIDE TAP IS POSSIBLE

1. A line side tap may not be possible in all situations. Before performing a line side tap, review all of the following criteria:
2. Plans showing "Supply Side Tap" as interconnection method must be approved by the AHJ.
3. Ensure that there is room for the taps you will use:
 - IPC-4/0-6 tap terminal requires clearance about the size of a tennis ball for installation.
 - IPC-4/0-2/0 tap terminal requires clearance about the size of a fist.
4. The panel must have an adequate section of straight conductors for tap.

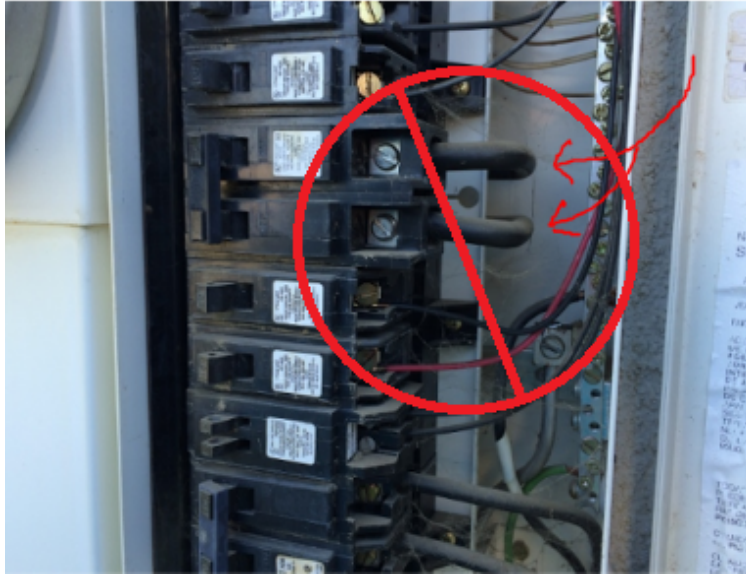


Allow adequate conductor length and clearance for taps.

5. Tap terminals are listed for use only with insulated wire - not bare stranded wire.



6. Taps cannot be installed on conductor bends or on solid bus bars.
7. Tap terminals are rated for 90 deg C, and are rated for use with Aluminum or Copper conductors.



8. Always communicate with the homeowner about shutting down power before doing so.
9. Wear arc flash PPE.
10. Power down the home, following all Sunrun ESP safety procedures.
11. Before doing anything else, confirm that power has been shut off, using a volt meter.
12. Remove arc flash gear and return to minimum PPE.

Step 2: PREPARE FOR TAP TERMINAL INSTALLATION

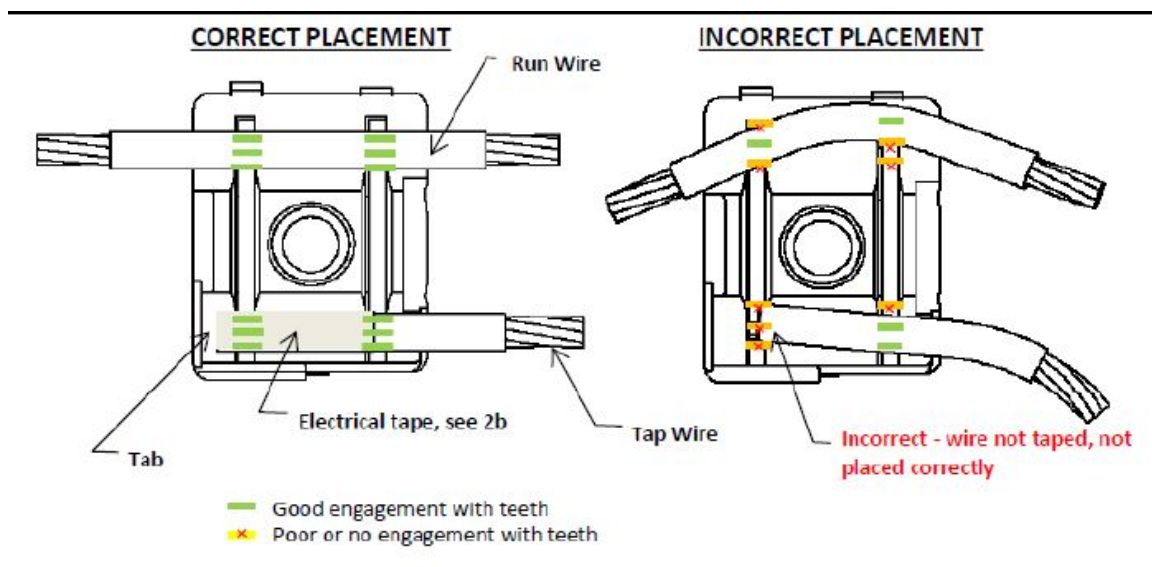
1. Adjust wiring in the panel to provide clearance around tap area.
2. Tap conductor (PV) must not be live during tap - make sure that conductor is not energized.
3. Cut the tap conductor end squarely and apply tape strips across the end.

Step 3: INSTALL THE TAP TERMINAL

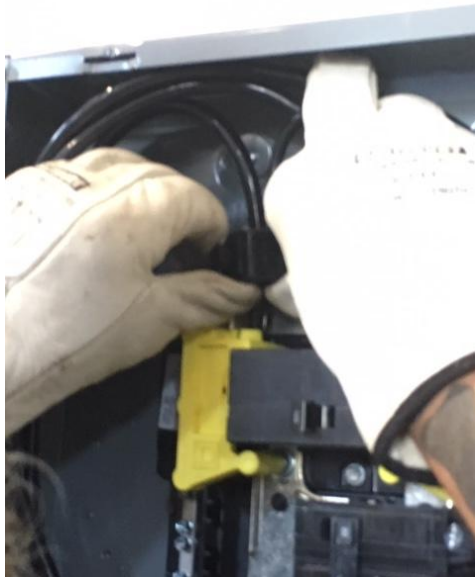
1. Make sure the conductor has a straight section long enough to properly fit the tap.

IMPORTANT: Do not install taps on curved conductors.

2. Observe Sunrun safety policies for working with live conductors! Ensure that all appropriate PPE is worn.
3. With the two halves of the tap terminal held loosely by the bolt, slide the Main side over the Line conductor.
4. Make sure the conductor lays straight across the teeth in the channel.



5. Finger tighten the bolt enough to hold on to the conductor.



6. Place the tap conductor against the outside of the tap to determine the full insertion distance.
7. Holding the tap wire at the full insertion point, push it into the tap terminal until it reaches the stop tab.
8. Make sure the tap conductor is fully inserted and straight across the rows of teeth.
9. With both conductors centered over teeth, finger tighten the bolt.
10. Holding the terminal firmly in hand, tighten the bolt to the required value.

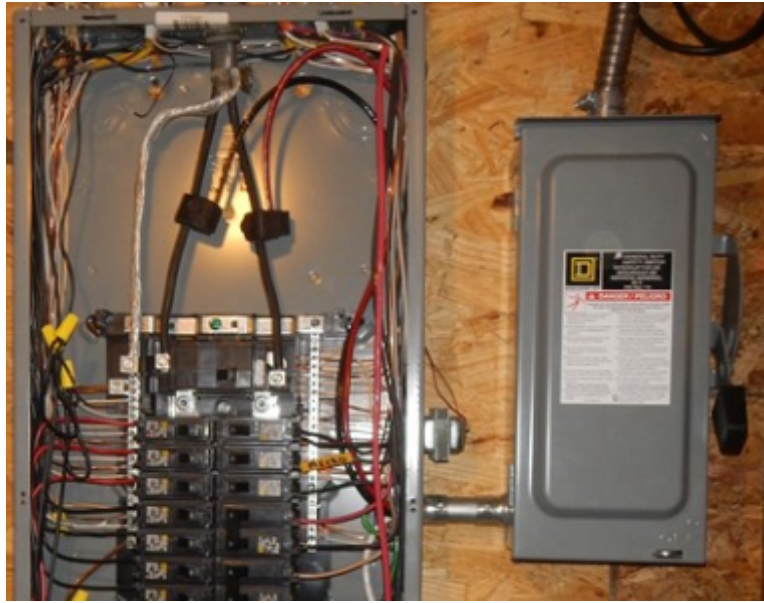


Step 4: COMPLETE THE INTERCONNECTION WIRING

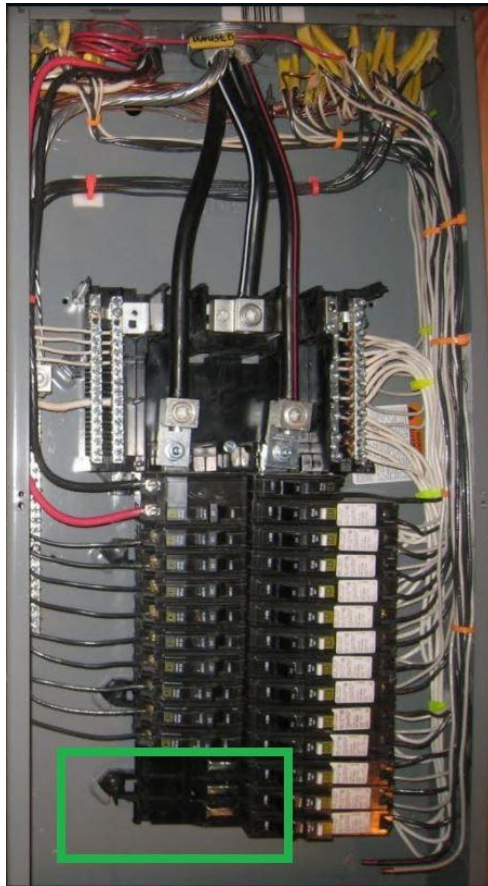
1. Tap conductors must go directly to fused switch or breaker.

IMPORTANT: The maximum conductor length from tap to disconnect is limited to 10 ft. per NEC.

2. Most AHJs require tap conductor ampacity to match the disconnects' maximum rating.
3. It is required that a minimum rating of 60A for the fused disconnect switch.

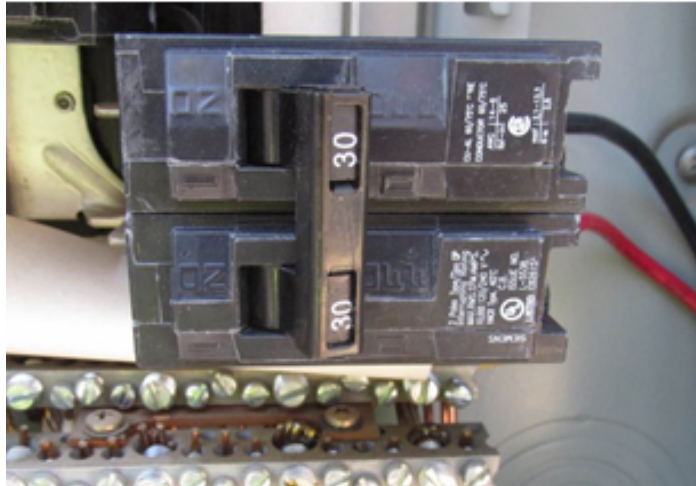


Load Side Connection Via Backfeed Breaker



Step 1: PV BREAKER BASIC REQUIREMENTS

1. Make sure breaker sizes match those shown on the design plan set.



2. Breaker must be of approved type for PV backfeed:
 - Cannot be marked "Line" and "Load."
 - GFI and Arc Fault breakers are not allowed.
3. Breaker must be of the same manufacturer as service panel, or listed for use on panel sticker.
4. Inverters provide 240 VAC, so backfeed breaker must be two-pole.
 - Avoid using quad breakers for PV backfeed. Instead, use quad and tandem breakers on existing loads to make room for single two-pole PV breaker.

Step 2: INSTALL THE PV BREAKER

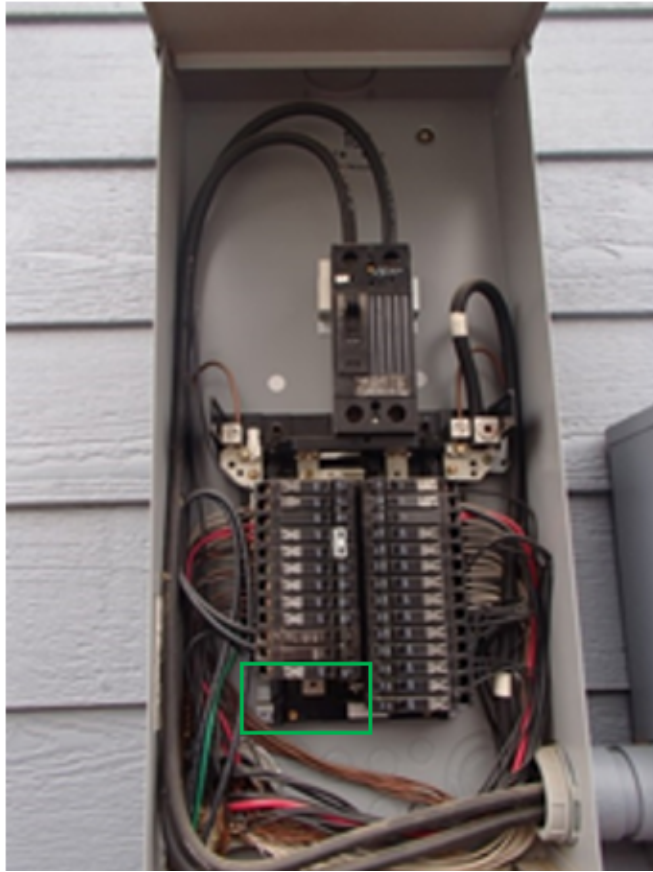
IMPORTANT: Safety Check: Make absolutely certain that the service panel bus bar is NOT energized!

1. Seat the PV breaker in the appropriate place on the bus bar, depending on the service panel configuration. See the following steps 2a-e.

Step 2A: SERVICE PANEL WITH A MAIN BREAKER FEEDING THE BUSBAR AT ONE END

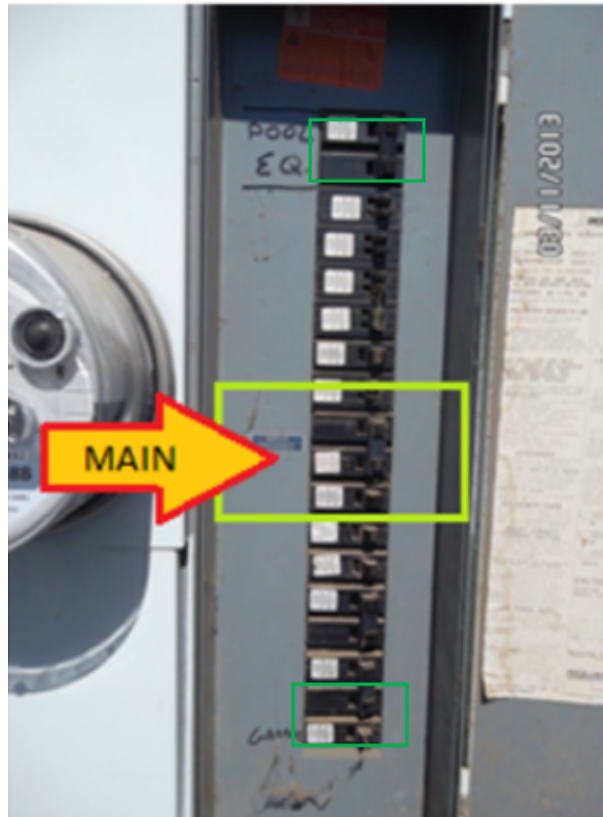
1. Sometimes called an end fed "all-in-one" if utility meter is included in the panel.

2. Install the PV breaker opposite the main breaker on the bus bar.



Step 2B: SERVICE PANEL WITH A MAIN BREAKER FEEDING THE BUSBAR FROM THE MIDDLE

1. Sometimes called a center-fed "all-in-one" if utility meter is included in panel.
2. The PV breaker can be installed at either end of the busbar.



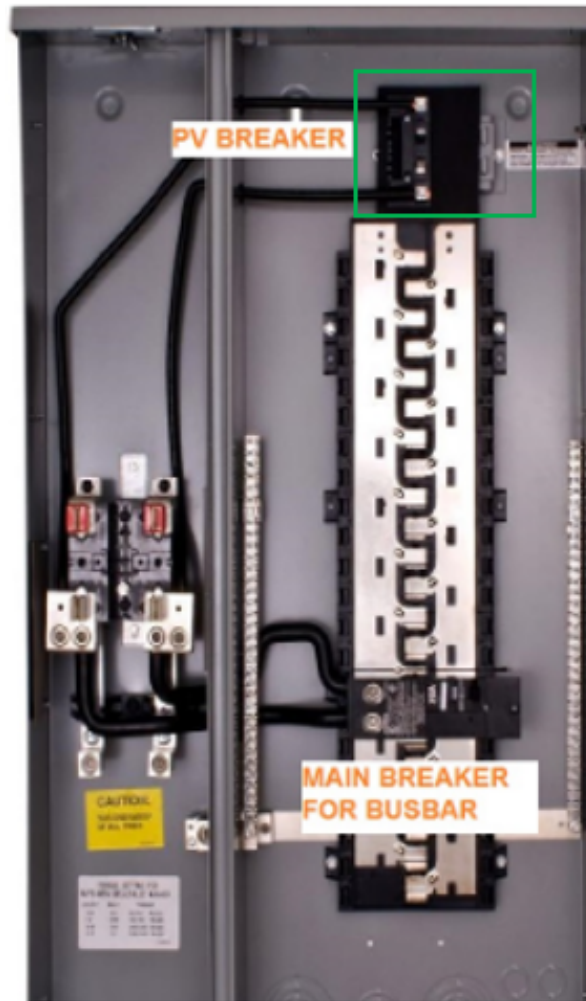
Step 2C: SERVICE PANEL WITH NO MAIN BREAKER AND A SMALL BUS BAR (1-6 DOUBLE POLE BREAKER SLOTS)

1. Sometimes called "hot bus," "main lug," or "disconnect" type service panel.
2. PV backfeed breaker may be installed in any position



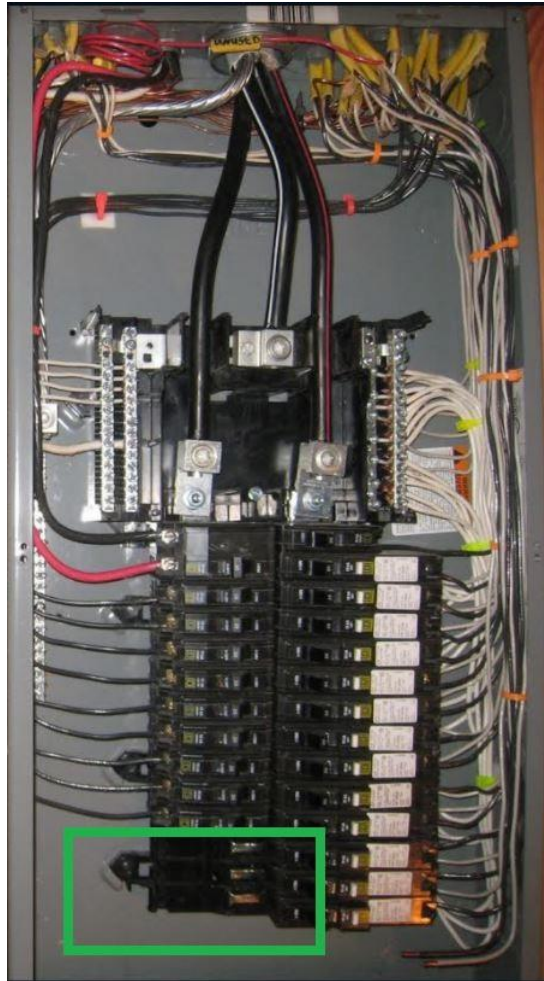
Step 2D: SERVICE PANEL WITH DEDICATED SOLAR BREAKER LOCATION

1. Sometimes called a "solar ready" panel.
2. Install PV backfeed breaker in dedicated breaker location.



Step 2E: LOAD CENTER SUB-PANEL, FED FROM METER OR OTHER PANEL BREAKER

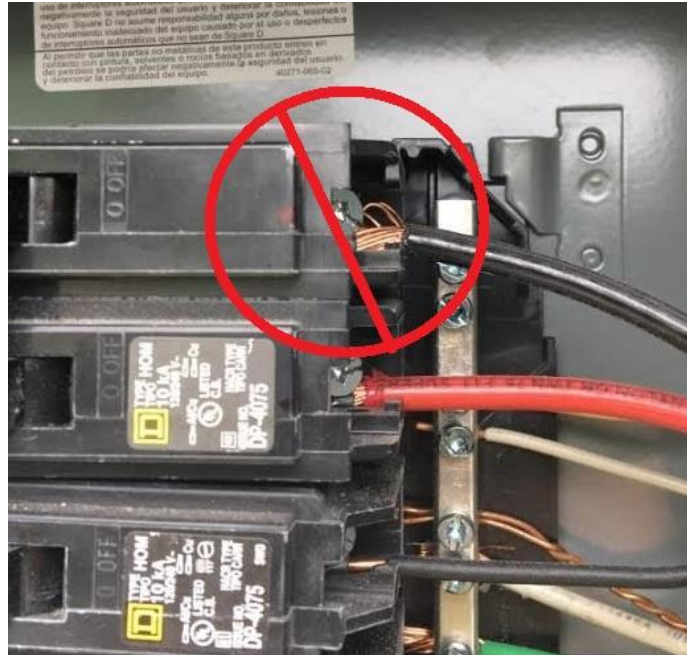
1. Sometimes called a "main lug sub panel" if no main breaker is installed.
2. Install PV breaker at end of busbar, opposite the main breaker or feed lugs.



Step 3: CONNECT THE PV BREAKER

IMPORTANT: Proper breaker installation can avoid inverter arc fault errors!

1. Terminate wires in accordance with [General Wiring Practices - Work Instruction - INS-WRK-0003](#)
2. Strip conductor using strip gauge on side of breaker.
3. Use an appropriate-size stripper, and do not clip strands.
4. Insert wire fully into breaker wire channel.
 - Do not push too far and get insulation under the screw.
 - Do not leave exposed strands.



5. Torque conductor to specification listed on the breaker.
 - Using a torque wrench is critical for larger gauge wires.

Verification

Load Side Tap

- ☐ Verify there was proper clearance inside the main breaker enclosure for the IPC taps.
- ☐ Verify a main breaker is present in the panel with the installed taps.
- ☐ Verify that the breaker in the panel is not rated greater than the ampacity of the feeders from the load side of the tap connection.
- ☐ Verify taps are only attached to straight section of conductor.

Line/Supply Side Tap

- ☐ Verify there was proper clearance inside the main breaker enclosure for the IPC taps.
- ☐ Verify the maximum conductor length from tap to disconnect is limited to 10 ft.
- ☐ Verify taps are only attached to straight section of conductor.

Load Side Connection Via Backfeed Breaker

- ☐ Verify the PV backfeed breaker is located in the proper location on the busbar according to the panel type.
- ☐ Verify conductors are properly terminated on the PV breaker.

Product Feedback

Use the links below to provide feedback on SOPs and/or products:

- [SOP/Work Instruction Feedback](#)
- [Product Feedback](#)

Approvals

Approvals			
Prepared by: Field Ops	09/25/2019	Training:	
Reviewed by:		Safety:	
Electrical:		Structural:	
Design:		CRT:	
Product:		Other:	
Quality:		Other:	

Revision History

Revision	Date	Description	Approval
1	09/25/2019	Initial Release	Field Ops