

# Line side connections

## Installation Guidelines

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## Line Side Connection Overview

An installation of Alternate Energy (AE) systems for residential applications covers a wide geography and a number of jurisdictions, both for electrical inspectors as well as serving utilities. To maximize the benefit of the installation, the connection to the grid power is being planned on the line side of the main service disconnect (typically a circuit breaker) between the electric utility meter and the service main breaker onto the service entrance conductors as permitted by National Electrical Code (NEC) 230.82(6). The existing meter and main panelboard enclosure is presently certified (UL Listed) and this line side connection has been deemed by some serving utilities and local electrical inspectors to be a modification to the certified equipment as provided from the main panelboard manufacturer. This document covers only line side connections that are made on the customer side of the service. The meter enclosure will only have the service conductors going from the customer's meter socket terminals to the customer's equipment. The following are three typical installation concepts that might be used.

### Line Side 1 (LS1) – Line Side connection is made directly to the existing Service Entrance Conductors inside the customer side of the service panelboard enclosure.

- Utilize certified connector such as an Insulation Piercing connectors or equivalent certified splicing connector rated for the appropriate conductor sizes and voltage.
- The main conductor is the existing or replaced unspliced service entrance conductor between the meter and the service main breaker.
- The power source output circuit conductor is from the (AE) AC disconnecting means.
- The power source output circuit connection would be inside the existing certified panelboard enclosure where sufficient space per the NEC permits the installation.
- See layout in the **(LS1) drawing** on last page as an example.

### Line Side 2 (LS2) – Line Side connection installed inside an external certified Type 3R rated junction box.

- Utilize certified Insulation Piercing connectors or equivalent certified splicing connector rated for the appropriate conductor size and voltage.
- New certified properly rated unspliced main Service Conductors will be installed between the Utility Meter load side terminals and the Main Service Breaker through the junction box.

- The insulation piercing connectors or equivalent splicing connector will be used to connect into the (AE) power source output circuit conductors to the service entrance conductors in a new certified Type 3R junction box.
- The power source output circuit conductor is installed from the (AE) AC disconnecting means.
- See layout in the **(LS2) drawing** on last page as an example.

The LS2 diagram on the last page provides a partial detail of the supply side connection. The position of the junction box will vary depending on the panel configuration and if the service is from overhead or underground to the meter.

### Line Side 3 (LS3) – Line Side connection installed to the bus between the meter and service main breaker.

- Install connections to manufacture supplied and identified termination point. Existing holes in the bus may or may not be used for connection of a terminal.
- New connectors shall not be attached to existing bolted bus connection point without a review.
- A review and approval must be conducted if a hole is to be drilled into the bus to add a terminal.

## UL Field Evaluation Process

### Client Submittal Requirements:

1. Provide the design drawings detailing the installation from the Alternate Energy (AE) AC disconnect to the main service panelboard. Include the power source output circuit connection into the existing service entrance conductors. The drawing shall include the following:
  - a. Main service entrance conductor size
  - b. (AE) AC disconnect shall be listed as suitable for use as service equipment.
  - c. Power source output circuit conductor size (minimum 6 AWG copper or 4 AWG aluminum)
  - d. Conductor routing in raceway and inside panelboard including the grounded circuit conductor (neutral) per NEC 300.3.
  - e. Power source output circuit conductor length limitation of 10 feet.
  - f. Grounding and bonding connections from the (AE) AC disconnect connection to the service panelboard, and grounding electrode conductor as applicable.



2. Provide the method proposed to complete the power source output circuit installation and specify the connector product to be used.
3. Provide the bill of materials for the connector system to be used and all specifications including applicable torque values.

**UL Inspection Process:**

The overall UL Field Evaluation process and documentation is outlined below:

1. LS Design:

- a. Inspection will be made of the assembly including all connections, such as (AE) power source output circuit conductors, and the torquing of the insulation piercing connector or equivalent connector with a calibrated torque wrench / screwdriver.

2. LS 2 Design:

- a. Inspection will be made of the assembly including the additional junction box, (AE) power source output circuit conductors, and the torquing of the insulation piercing connector or equivalent connector, and the replacement service entrance conductor termination points with a calibrated torque wrench / screwdriver.
- b. Inspect junction box for correct sizing per NEC 314.28 and suitable environmental rating per NEC 110.28.

**General Field Evaluation Requirements for all Line Side connections:**

- 3 The main conductor shall be verified as having a thermoplastic (i.e. THWN, etc.) or thermoset (i.e. XHHW) insulation. AWM conductors will be investigated for suitability.
4. If the service entrance (main) conductor is replaced, the conductor shall have the proper ampacity.
5. The power source output circuit conductor will be confirmed as being a certified building wire identified in Chapter 3 of the NEC with a thermoplastic or thermoset insulation.
6. Any exposed end of the power source output circuit conductor shall be covered with a certified electrical insulating tape or equivalent means to provide suitable electrical insulation over exposed conductors as per the connector manufacturer’s installation instructions.
7. Verify correct use of the certified connector device
8. Verify wiring space is provided in accordance with applicable NEC 312.8 Section and that wire bending space is provided per 312.6.

9. Document the inspection points for the report.
10. A serialized UL Field Evaluated label will be applied to the service panel enclosure inside the cover near the panelboard nameplate by UL Field Engineer if the Line Side connection installation is found to be in compliance.
11. Complete a letter report documentation including:
  - a. Name of residence owner
  - b. Address of residence including street, city, state
  - c. Client job number
  - d. Client installation electrical permit number
  - e. Type of equipment used for making the connection
  - f. Manufacturer’s nameplate (mfg., model no.) of service panel where available
  - g. Inspection results
  - h. UL Evaluated label serial number
  - i. Photograph of overall installation and detail photograph of connector installation
  - j. Name of UL Field Engineer
  - k. Date of UL inspection

Unless requested and included in the scope of work, the UL inspection will not include any (AE) panel(s) or other (AE) source, DC conductor, DC disconnect, inverter, raceways (AC or DC), AC disconnect, overcurrent protection of (AE) system, grounding or bonding of (AE) components, (AE) system, or raceways. These items are typically the responsibility of the local inspection authority (AHJ) to review.

For more information or questions to UL on this procedure please contact the following:

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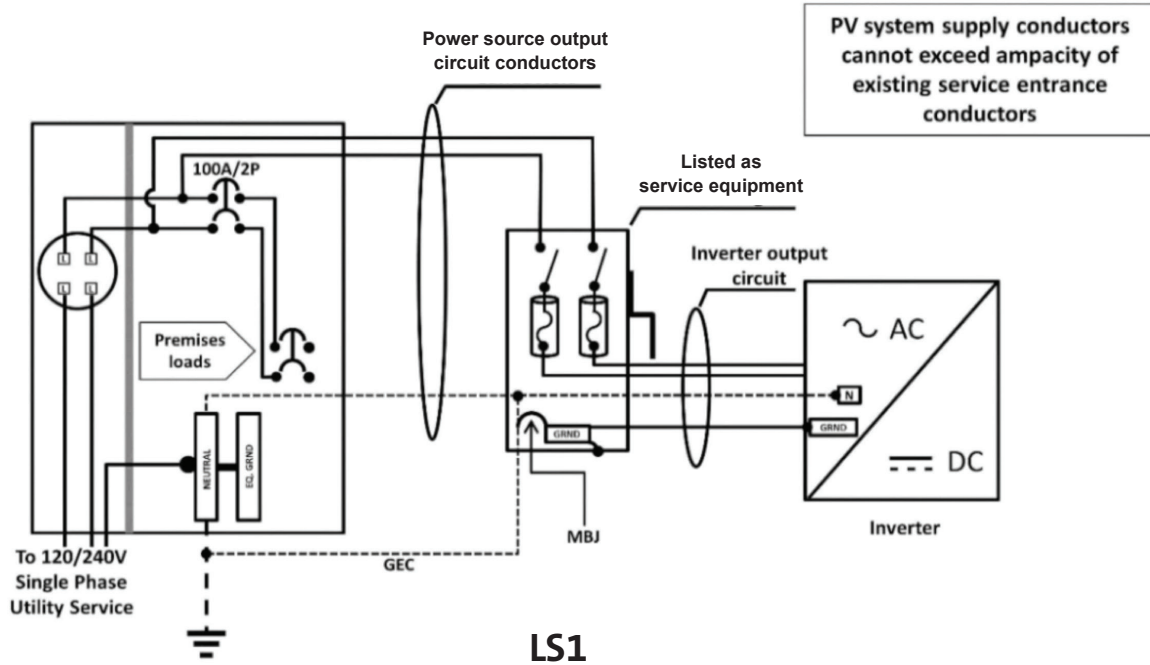
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### Example Drawing Showing Option 1



### Example Drawing Showing Option 2

