



# Fill-In Permitting Packet for Small-Scale PV Systems: Micro-Inverter System

This packet may be used for simple residential PV system installations.  
For projects that are more complex, please refer to the [Solar Photovoltaic Plan Submittal Checklist](#).

## Required Information for Permit:

1. **Site plan** showing location of major components on the property. This drawing need not be exactly to scale, but it should represent relative location of components at site (see example site plan on next page). PV arrays on dwellings with a 3' perimeter space at ridge and sides may not need separate fire service review.
2. **Electrical diagram** showing PV array configuration, wiring system, overcurrent protection, inverter, disconnects, required signs, and AC connection to building (see supplied standard electrical diagram).
3. **Specification sheets and installation manuals** for all manufactured components including, but not limited to, PV modules, inverter(s), combiner box, disconnects, and mounting system.

## Step 1: Structural Review of PV Array Mounting System

Is the array to be mounted on a defined, permitted roof structure?  Yes  No

If No due to non-compliant roof or a ground mount, submit completed worksheet for the structure WKS1.

### Roof Information:

1. Is the roofing type lightweight (Yes = composition, lightweight masonry, metal, etc...)\_\_\_\_\_

If No, submit completed worksheet for roof structure WKS1 (No = heavy masonry, slate, etc...).

2. Does the roof have a single roof covering?  Yes  No

If No, submit completed worksheet for roof structure WKS1.

3. Provide method and type of weatherproofing roof penetrations (e.g. flashing, caulk).\_\_\_\_\_

### Mounting System Information:

1. Is the mounting structure an engineered product designed to mount PV modules with no more than an 18" gap beneath the module frames?  Yes  No

If No, provide details of structural attachment certified by a design professional.

2. For manufactured mounting systems, fill out information on the mounting system below:
  - a. Mounting System Manufacturer \_\_\_\_\_ Product Name and Model# \_\_\_\_\_
  - b. Total Weight of PV Modules and Rails \_\_\_\_\_ lbs
  - c. Total Number of Attachment Points \_\_\_\_\_
  - d. Weight per Attachment Point (b ÷ c) \_\_\_\_\_ lbs (if greater than 45 lbs, see WKS1)
  - e. Maximum Spacing Between Attachment Points on a Rail \_\_\_\_\_ inches (see product manual for maximum spacing allowed based on maximum design wind speed)
  - f. Total Surface Area of PV Modules (square feet) \_\_\_\_\_ ft<sup>2</sup>
  - g. Distributed Weight of PV Module on Roof (b ÷ f) \_\_\_\_\_ lbs/ft<sup>2</sup>

If distributed weight of the PV system is greater than 5 lbs/ft<sup>2</sup>, see WKS1.

## Step 2: Electrical Review of PV System (Calculations for Electrical Diagram)

In order for a PV system to be considered for an expedited permit process, the following must apply:

1. PV modules, utility-interactive inverters, and combiner boxes are identified for use in PV systems.
2. The PV array is composed of 4 series strings or less per inverter.
3. The total inverter capacity has a continuous ac power output 13,440 Watts or less
4. The ac interconnection point is on the load side of service disconnecting means (690.64(B)).
5. One of the standard electrical diagrams (E1.1, E1.1a, E1.1b, or E1.1c) can be used to accurately represent the PV system. Interactive PDF diagrams are available at [www.solarabcs.org/permitting](http://www.solarabcs.org/permitting).

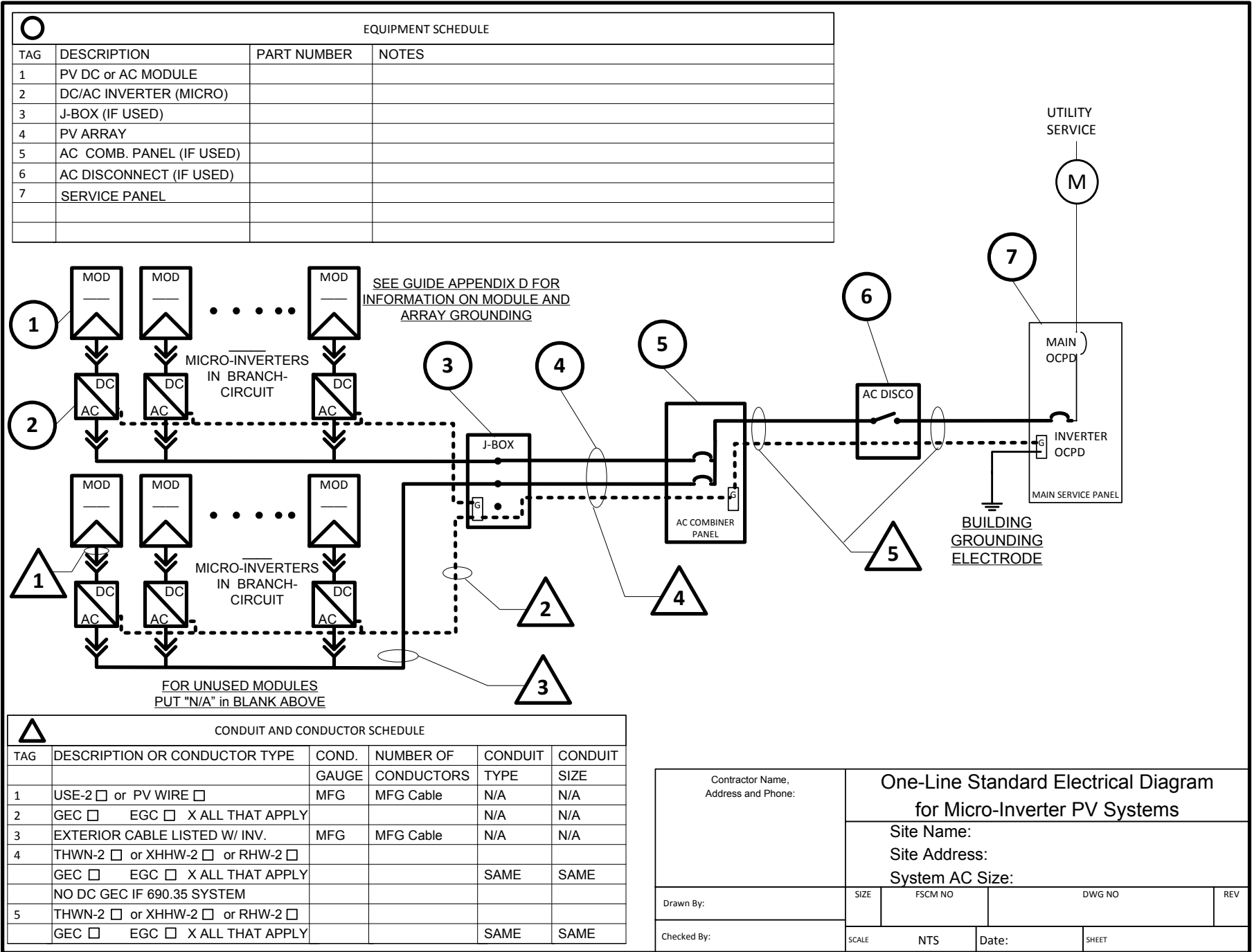
Fill out the standard electrical diagram completely. A guide to the electrical diagram is provided to help the applicant understand each blank to fill in. If the electrical system is more complex than the standard electrical diagram can effectively communicate, provide an alternative diagram with appropriate detail.



# MICRO-INVERTER SITE PLAN

Contractor Name, Address and Phone:	Site Plan for Small-Scale, Single-Phase PV Systems			
	Site Name: Site Address: System AC Size:			
Drawn By:	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE	NTS	Date:	SHEET

# MICRO-INVERTER ELECTRICAL DIAGRAM



# NOTES FOR MICRO-INVERTER ELECTRICAL DIAGRAM

## PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	
MODULE MODEL	
MAX POWER-POINT CURRENT ( $I_{MP}$ )	
MAX POWER-POINT VOLTAGE ( $V_{MP}$ )	
OPEN-CIRCUIT VOLTAGE ( $V_{OC}$ )	
SHORT-CIRCUIT CURRENT ( $I_{SC}$ )	
MAX SERIES FUSE (OCPD)	
MAXIMUM POWER ( $P_{MAX}$ )	
MAX VOLTAGE (TYP $600V_{DC}$ )	
VOC TEMP COEFF ( $mV/^{\circ}C$ <input type="checkbox"/> or $\%/^{\circ}C$ <input type="checkbox"/> )	
IF COEFF SUPPLIED, CIRCLE UNITS	

## NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE  
 NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS (NEC XXX.XX)

## INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	
INVERTER MODEL	
MAX DC VOLT RATING	
MAX POWER @ 40°C	
NOMINAL AC VOLTAGE	
MAX AC CURRENT	
MAX OCPD RATING	

## SIGNS--SEE GUIDE SECTION 7

### SIGN FOR DC DISCONNECT

No sign necessary since 690.51 marking on PV module covers needed information

### SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED) 690.54

<b>SOLAR PV SYSTEM AC POINT OF CONNECTION</b>	
AC OUTPUT CURRENT	
NOMINAL AC VOLTAGE	
<b>THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)</b>	

## NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix E):

- 1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP \_\_\_\_°C
- 2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE \_\_\_\_°C
- 2.) 2009 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),
  - a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH  $I_{sc}$  OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.
  - b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH  $I_{sc}$  OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

## NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

- 1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES  NO  N/A
- 2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES  NO  N/A
- 3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT
- 4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)
- 5) TOTAL OF \_\_\_\_ INVERTER OUTPUT CIRCUIT OCPD(S), ONE FOR EACH MICRO-INVERTER CIRCUIT. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 05.12 B) 2) 3) )? YES  NO

Contractor Name, Address and Phone:	<b>Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems</b>			
	Site Name:			
	Site Address:			
System AC Size:				
Drawn By:	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE	NTS	Date:	SHEET



# STRUCTURAL WORKSHEET

(WKS1)

## *If array is roof mounted*

This section is for evaluating roof structural members that are site-built. This includes rafter systems and site-built trusses. Manufactured truss and roof joist systems, when installed with proper spacing, meet the roof structure requirements covered in item 2 below.

1. Roof construction:     **Rafters**     **Trusses**     **Other:** \_\_\_\_\_
2. Describe site-built rafter or or site-built truss system.
  - a. Rafter Size: \_\_\_ x \_\_\_ inches
  - b. Rafter Spacing: \_\_\_\_\_ inches
  - c. Maximum unsupported span: \_\_\_\_\_ feet, \_\_\_\_\_ inches
  - d. Are the rafters over-spanned per IRC span tables?     **Yes**     **No**

Do any of the following conditions apply?

- The roof system has over-spanned rafters or trusses.     **Yes**     **No**
- The combined weight of the solar PV array exceeds 5 lbs/ft<sup>2</sup> on any roof construction.     **Yes**     **No**
- The attachments have a dead load exceeding 45 lbs per attachment.  
                                  **Yes**     **No**

If you answered "yes" to any of the above, you must provide a **sealed letter from an architect or engineer** stating that trusses have been inspected and can support the new load.

## *If array is ground mounted:*

1. Show array supports, framing members, and foundation posts and footings.
2. Provide information on mounting structure(s) construction. If the mounting structure is unfamiliar to the local jurisdiction and is more than six (6) feet above grade, it may require engineering calculations certified by a design professional.
3. Show detail on module attachment method to mounting structure.