



Building Department

# SOLAR PV STANDARD PLAN

SIMPLIFIED MICROINVERTER & ACM SYSTEMS

390 Towne Centre Dr, Lathrop, CA 95330  
Phone: (209) 941-7270

## SOLAR PV STANDARD PLAN SIMPLIFIED MICROINVERTER & ACM SYSTEMS FOR ONE- / TWO- FAMILY DWELLINGS

Use this plan **ONLY** for utility-interactive central/string inverter systems not exceeding a system AC inverter output rating of 10kW on the roof of a one- or two- family dwelling, or accessory structure. The photovoltaic system must interconnect to the load side of a single-phase AC service panel of nominal 120/240Vac with a bus bar rating of 225A or less. This plan is not intended for bipolar systems, hybrid systems, or systems that utilize storage batteries, charge controllers, trackers, more than two inverters, or more than one DC combiner (non-inverter integrated) per inverter. Systems must comply with current California Building Standards Codes (CBC) and local amendments of the authority having jurisdiction (AHJ). Other Articles of the California Electrical Code (CEC) shall apply as specified in 690.3.

**Manufacturer's Specification Sheets** must be provided for proposed inverter, modules, combiner/junction boxes, and racking systems. Installation instructions for bonding and grounding equipment shall be provided, and local AHJs may require additional details. Listed and labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling (CEC 110.3). Equipment intended for use with PV system shall be identified and listed for the application. (CEC 690.4d).

### Applicant and Site Information

Project Address: \_\_\_\_\_ Permit #: \_\_\_\_\_

Contractor/Engineer Name: \_\_\_\_\_ License #: \_\_\_\_\_ Class: \_\_\_\_\_

Phone #: \_\_\_\_\_ Email: \_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

### 1. General Requirements and System Information

Microinverter

Number of PV modules installed: \_\_\_\_\_

Number of Microinverters installed: \_\_\_\_\_

AC Modules (ACM)

Number of ACMs installed: \_\_\_\_\_

Note: Listed Alternating-Current Module (ACM) is defined in CEC 690.2 and installed per CEC 690.6

1.1 Number of Branch Circuits (1,2, or 3): \_\_\_\_\_

1.2 Actual number of Microinverters or ACMs per branch circuit: 1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_

1.3 Total AC System power rating = (Total Number of Microinverters or ACMs) x (AC inverter power output)  
= \_\_\_\_\_ Watts

1.4 Lowest expected ambient temperature for this plan in Table 1: For -1 to -5°C use 1.12 or for -6 to -10°C use 1.14 correction factors.

1.5 Average ambient temperature for this plan = +47°C

Note: For Lower expected ambient or higher average ambient high temperatures, use Comprehensive Standard Plan



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## 2. Microinverter or ACM Information and Ratings

Microinverters with underground DC inputs shall be installed in accordance with CEC 690.35.

Microinverter or ACM Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

2.1 Rated (continuous) AC output power: \_\_\_\_\_ Watts

2.2 Normal AC voltage rating: \_\_\_\_\_ Volts

2.3 Rated (continuous) AC output current: \_\_\_\_\_ Amps

***If installing ACMS, skip [Step 2.4 & 2.5]***

2.4 Maximum DC input voltage rating: \_\_\_\_\_ Volts (limited to 79 V, otherwise use the Comprehensive Standard Plan)

2.5 Maximum AC output overcurrent protection device (OCPD) \_\_\_\_\_ Amps

2.6 Maximum number of Microinverters or ACMs per branch circuit: \_\_\_\_\_

## 3. PV Module Information

***If installing ACMS, skip to Step 4***

PV Module Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Module DC output power under standard test conditions (STC) = \_\_\_\_\_ Watts

3.1 Module  $V_{OC}$  at STC (from module nameplate): \_\_\_\_\_ Volts

3.2 Module  $I_{SC}$  at STC (from module nameplate): \_\_\_\_\_ Amps

3.3 Adjusted PV Module DC voltage at minimum temperature – [Table 1] \_\_\_\_\_ [cannot exceed Step 2.4]

Table 1. Module  $V_{OC}$  at STC Based on Inverter Maximum DC input Voltage Derived from CEC 690.7

Microinverter Max. DC Input [Step 2.4] (Volts)	34	37	40	43	46	49	52	55	58	61	64	67	70	73	76	79
Max. Module $V_{OC}$ @ STC, 1.12 (-1 to -5°C) Correction Factor (Volts)	30.4	33.0	35.7	38.4	41.1	43.8	46.4	49.1	51.8	54.5	57.1	59.8	62.5	65.2	67.9	70.5
Max. Module $V_{OC}$ @ STC, 1.14 (-6 to -10°C) Correction Factor (Volts)	29.8	32.5	35.1	37.7	40.4	43.0	45.6	48.2	50.9	53.5	56.1	58.8	61.4	64.0	66.7	69.3

## 4. Branch Circuit Output Information

Fill in [Table 3] to describe the branch circuit inverter output conductor and OCPD size. Use [Table 2] for determining the OCPD and Minimum Conductor size.



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Table 2. Branch Circuit OCPD and Minimum Conductor Size\*

Circuit Current (Amps)	Circuit Power (Watts)	OCPD (Amps)	Minimum Conductor Size (AWG)	Minimum Metal Conduit Size for 6 Current Carrying Conductors
12	2880	15	12	¾"
16	3840	20	10	¾"
20	4800	25	8	1"
24	5760	30	8	1"

\*CEC 690.8 and 210.19 (A)(1) Factored in Table 2, Conductors are copper, insulation be 90°C wet-rated. Table 2 values are based on maximum ambient temperature of 69°C, which includes 22°C adder, exposed to direct sunlight, mounted > 0.5 inches above rooftop, ≤ 6 current carrying conductors (3 circuits) in a circular raceway. Otherwise, use Comprehensive Standard Plan.

Table 3. PV Array Configuration Summary

	Branch 1	Branch 2	Branch 3
Number of Micro Inverters or ACMs [Step 1]			
Selected Conductor Size (AWG)			
Selected Branch and Inverter Output OCPD			

## 5. Solar Load Center (if used)

5.1 Solar Load Center is to have a bus bar rating not less than 100 Amps. Otherwise, use Comprehensive Standard Plan.

5.2 Circuit Power see [Step 1] = \_\_\_\_\_ Watts

5.3 Circuit Current = (Circuit Power / (AC Voltage)) = \_\_\_\_\_ Amps

Table 4. Solar Load Center and Total Inverter Output OCPD and Conductor Size\*\*

Circuit Current (Amps)	Circuit Power (Watts)	OCPD (Amps)	Minimum Conductor Size (AWG)	Minimum Metal Conduit Size
24	5760	30	10	½"
28	6720	35	8	¾"
32	7680	40	8	¾"
36	8640	45	8	¾"
40	9600	50	8	¾"
41.6	≤ 10000	60	6	¾"

\*\*CEC 690.8 and 210.19 (A) (1) Factored in Table 4, Conductors are copper, insulation must be 90°C wet-rated. Table 4 values are based on maximum ambient temperature of 47°C (no rooftop temperature adder in this calculation), ≤ 3 current carrying conductors in a circular raceway. Otherwise, use Comprehensive Standard Plan.

\*\*\*Exception: Listed combiners are permitted to be used when they're installed in accordance with their listing and the manufacturer's instructions.

## 6. Point of Connection to Utility

6.1 Load Side Connection **ONLY!** Otherwise, use the Comprehensive Standard Plan.

6.2 Is the PV OCPD positioned at the opposite end from input feeder location or main OCPD location?

Yes  No (If No, then use 100% row in Table 5)

6.3 Per 705.12 (D) (2): (Combined inverter output OCPD size + Main OCPD size) ≤ [bus bar size x (100% or 120%)]

Table 5. Maximum Combined Inverter Output Circuit OCPD

Bus Bar Size (Amps)	100	125	125	200	200	200	225	225	225
Main OCPD (Amps)	100	100	125	150	175	200	175	200	225
Maximum Combined Inverter OCPD with 120% of bus bar rating (Amps)	20	50	25	60†	60†	40	60†	60†	45
Maximum Combined Inverter OCPD with 100% of bus bar rating (Amps)	0	25	0	50	25	0	50	25	0

†This plan limits the maximum system size to < 10kW, therefore the OCPD size is limited to 60A. Reduction of Main Breaker is not permitted with this plan.



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## 7. Grounding and Bonding

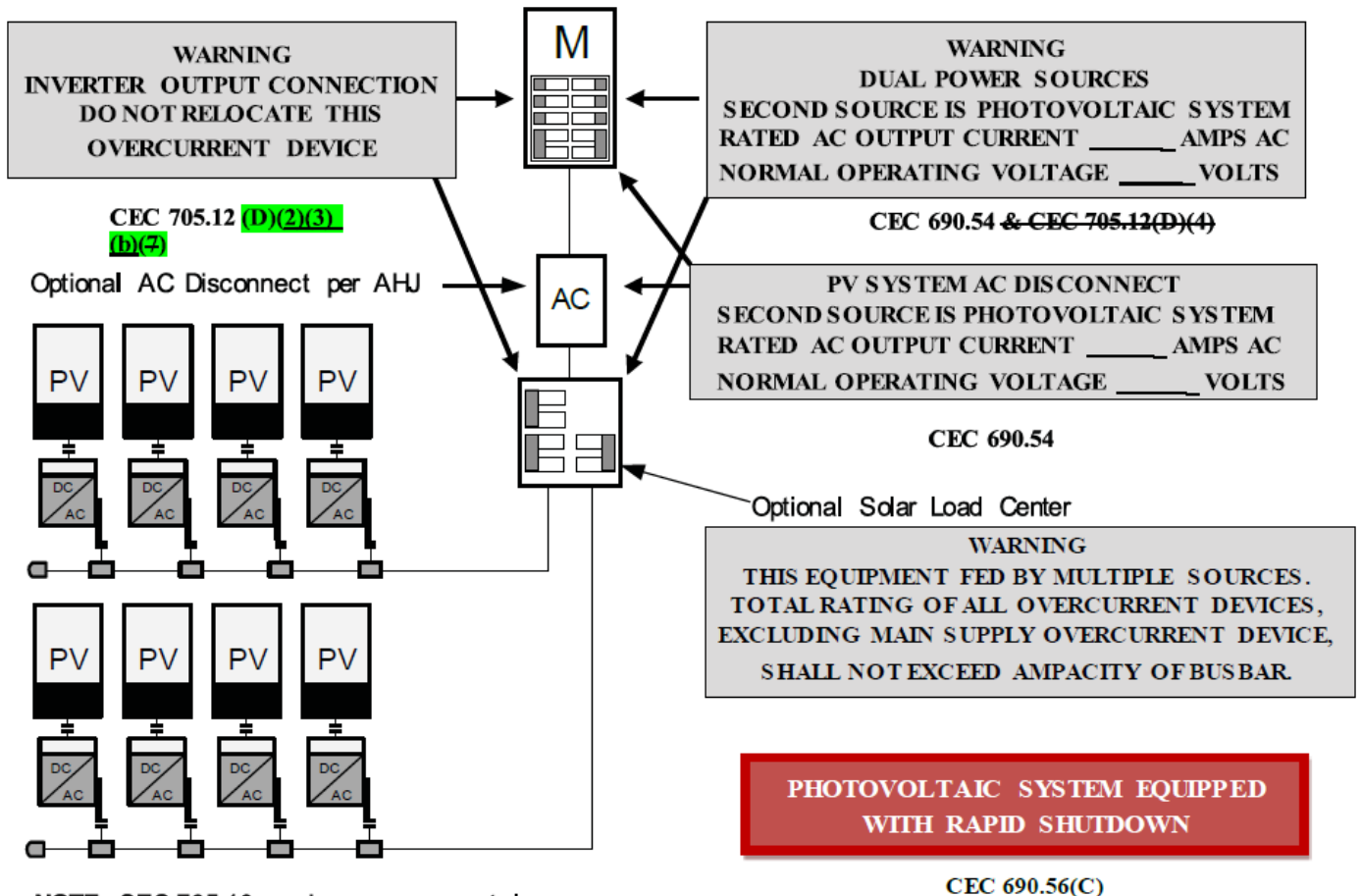
Check one of the boxes for whether system is grounded or ungrounded:  Grounded     Ungrounded

For Microinverters with a grounded DC input, systems must follow the requirements of GEC (CEC 690.47) and EGC (CEC 690.43).

For ACM systems and Microinverters with an ungrounded DC input follow the EGC requirements of (CEC 690.43).

## 8. Markings

Informational Note: ANSI Z535.4 provides guidelines for the design of safety signs and labels for application to products. A phenolic plaque with contrasting colors between the text and background would meet the intent of the code for permanency. No type size is specified, but 20 point (3/8") should be considered the minimum.





# SOLAR PV STANDARD PLAN

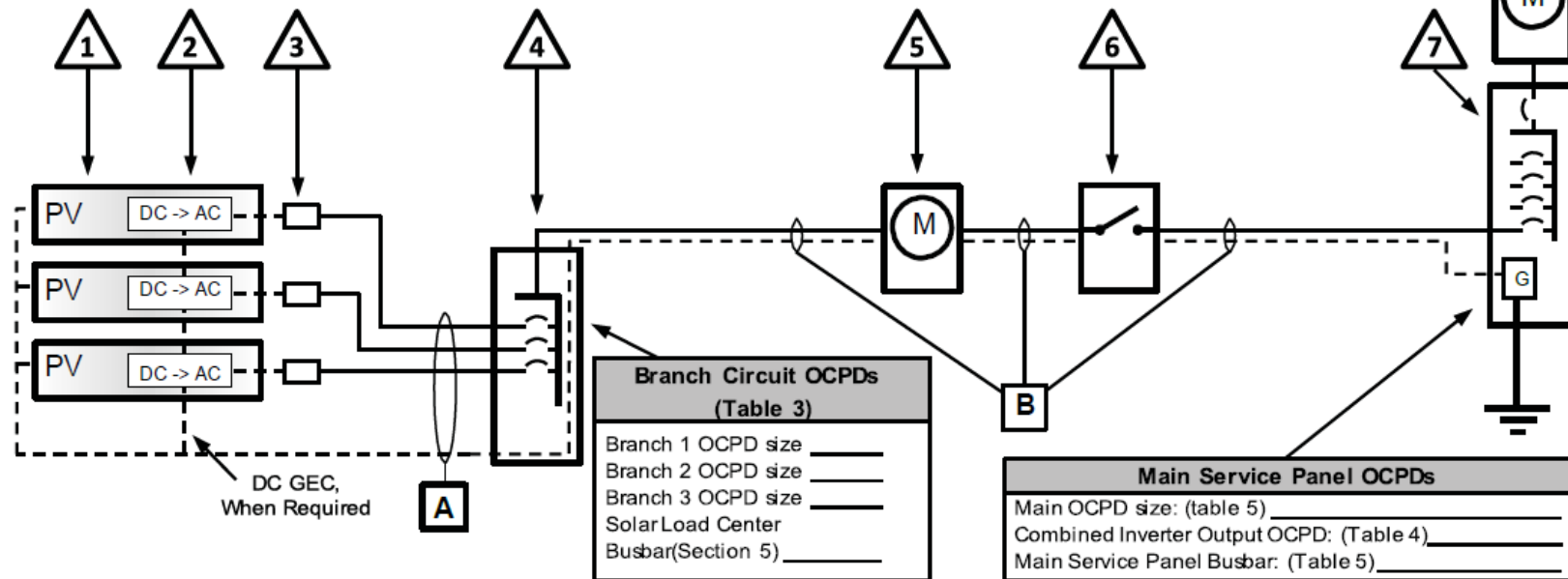
## Equipment Schedule

△ TAG	DESCRIPTION: (Provide model # if provided)
1	Solar PV Module or ACM:
2	Microinverter (if not ACM):
3	Junction Box:
4	Solar Load Center, Yes / No:
5	Performance Meter Yes / No:
6	*Utility External Disconnect Switch Yes / No:
7	Main Electrical Service Panel

## Single-Line Diagram #1 for Microinverters or ACMs (Load Side Connection)

Check a box for dc system grounding:  Grounded,  Ungrounded  
 For ungrounded dc power systems, EGC is required  
 For grounded dc power systems, GEC & EGC are required  
 Refer to CEC 250.120 for EGC installation & Table 250.122 for sizing

\* Consult with your local AHJ and /or Utility



## Conductor, Cable and Conduit Schedule

TAG	Description and Conductor Type: (Table 3)	Conductor Size	Number of Conductors	Conduit/ Conductor/ Cable Type	Conduit Size
A	Current-Carrying Conductors: (for each branch circuit)				
	EGC:				
	GEC (when required):				
B	Current-Carrying Conductors:				
	EGC:				
	GEC (when required):				



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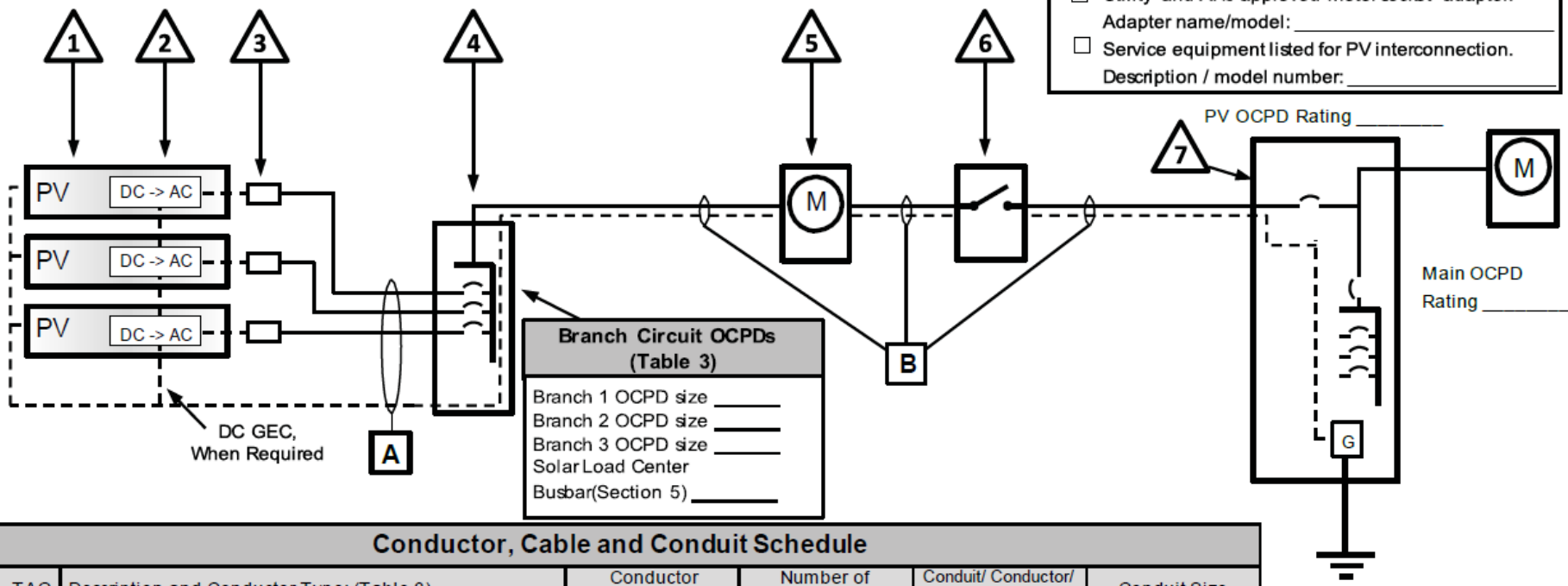
Equipment Schedule	
△ TAG	DESCRIPTION: (Provide model # if provided)
1	Solar PV Module or ACM:
2	Microinverter (if not ACM):
3	Junction Box:
4	Solar Load Center, Yes / No:
5	Performance Meter Yes / No:
6	*Utility External Disconnect Switch Yes / No:
7	Main Electrical Service Panel

## Single-Line Diagram #2 for Microinverters or ACMs (Supply Side Connection)

Check a box for dc system grounding:  Grounded,  Ungrounded  
 For ungrounded dc power systems, EGC is required  
 For grounded dc power systems, GEC & EGC are required  
 Refer to CEC 250.120 for EGC installation & Table 250.122 for sizing

\* Consult with your local AHJ and/or Utility

Supply Side Connection (Select One)	
<input type="checkbox"/>	Utility- and AHJ-approved metersocket adapter. Adapter name/model: _____
<input type="checkbox"/>	Service equipment listed for PV interconnection. Description / model number: _____



Branch Circuit OCPDs (Table 3)	
Branch 1 OCPD size	_____
Branch 2 OCPD size	_____
Branch 3 OCPD size	_____
Solar Load Center	_____
Busbar(Section 5)	_____

## Conductor, Cable and Conduit Schedule

TAG	Description and Conductor Type: (Table 3)	Conductor Size	Number of Conductors	Conduit/ Conductor/ Cable Type	Conduit Size
A	Current-Carrying Conductors: (for each branch circuit)				
	EGC:				
	GEC (when required):				
B	Current-Carrying Conductors:				
	EGC:				
	GEC (when required):				

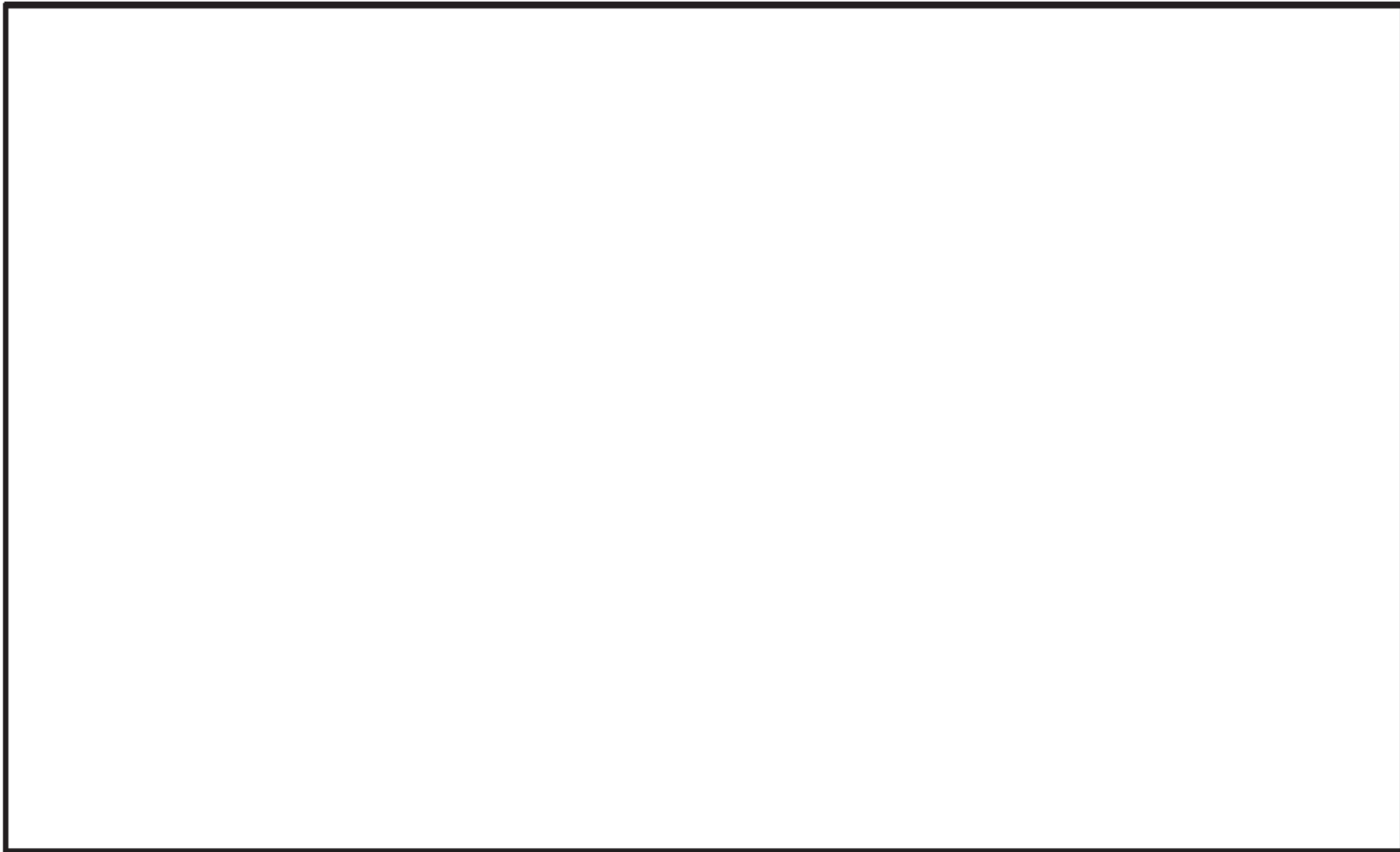


# SOLAR PV STANDARD PLAN

## SOLAR PV STANDARD PLAN — SIMPLIFIED

Microinverter and ACM Systems for One- and Two-Family Dwellings

ROOF LAYOUT PLAN



Items required: roof layout of all panels, modules, clear access pathways and approximate locations of electrical disconnecting means and roof access points.