



BUILDING & SAFETY
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**Solar PV Standard Plan – Simplified
 Central/String Inverter Systems for
 One- and Two-Family Dwellings
 (10 KW or Less)**

FORM PV 3S

Supplemental Calculation Sheets for Inverter #2

DC Information:

Module Manufacturer: _____		Model: _____	
S2) Module V_{oc} (from module nameplate): _____ Volts		S3) Module I_{sc} (from module nameplate): _____ Amps	
S4) Module DC output power under standard test conditions (STC) = _____ Watts (STC)			
S5) DC Module Layout			
Identify each source circuit (string) for inverter 1 shown on the roof plan with a Tag (e.g., A, B, C ...)	Number of modules per source circuit for inverter 1	Identify, by tag, which source circuits on the roof are to be paralleled (if none, put N/A)	
		Combiner 1:	
		Combiner 2:	
Total number of source circuits for inverter 1: _____			
S6) <u>Are DC/DC Converters used (i.e. optimizers)?</u> <input type="checkbox"/> Yes <input type="checkbox"/> No If No, skip to STEP#S7. If Yes, enter info below.			
DC/DC Converter Model #: _____		DC/DC Converter Max DC Input Voltage: _____ Volts	
Max DC Output Current: _____ Amps		Max DC Output Voltage: _____ Volts	
Max # of DC/DC Converters in a source circuit: _____		DC/DC Converter Max DC Input Power: _____ Watts	

S7) Max. System DC Voltage – Use A for systems without DC/DC converters, and B with DC/DC converters (i.e. optimizers).

A Module V_{OC} (STEP S2) = _____ x # in series (STEP S5) _____ x 1.12 = _____ V

Table 1. Maximum Number of PV Modules in Series Based on Module Rated VOC for 600 Vdc Rated Equipment (CEC 690.7)													
Max. Rated Module Voc (*1.12) (Volts)	29.76	31.51	33.48	35.71	38.27	41.21	44.64	48.70	53.57	59.52	66.96	76.53	89.29
Max # of Modules for 600 Vdc	18	17	16	15	14	13	12	11	10	9	8	7	6

Use for DC/DC converters. The value calculated below must be less than DC/DC converter max DC input voltage (STEP #S6).

B. Module V_{OC} (STEP#S2) _____ x # of modules per converter (STEP S6) _____ x 1.12 = _____ V

Table 2. Largest Module VOC for Single-Module DC/DC Converter Configurations (With 80V AFCI Cap) (CEC 690.7 and 690.11)																
Max. Rated Module Voc (*1.12) (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
DC/DC Converter Max DC Input (STEP #6) (Volts)	34	37	40	43	46	49	52	55	58	61	64	67	70	73	76	79

S8) Maximum System DC Voltage from DC/DC Converters to Inverter – Only required if Yes in STEP S6

Maximum System DC Voltage = _____ Volts

S9) Maximum Source Circuit Current

Is Module ISC below 9.6 Amps (STEP S3)? Yes No (if No, provide comprehensive plan)

S10) Sizing Source Circuit Conductors

Source Circuit Conductor Size = Min. #10 AWG copper conductor, 90°C wet (USE-2, PV Wire, XHHW-2, THWN-2, RHW-2).
Maximum 8 conductors in roof-mounted conduit exposed to sunlight located minimum 1/2" from the roof covering (CEC 310)

S11) Are PV source circuits combined prior to the inverter? Yes No

If No, use Single Line Diagram 1 with Single Line Diagram 3 and proceed to STEP S13.

If Yes, use Single Line Diagram 2 with Single Line Diagram 4 and proceed to STEP S12.

Is source circuit OCPD required? Yes No

Source circuit OCPD size (if needed): 15 Amps

S12) Sizing PV Output Circuit Conductors – If a Combiner box will NOT be used from [STEP#S11],

Output Circuit Conductor Size = Min. #6 AWG copper conductor

S13) Inverter DC Disconnect

Does the inverter have an integrated DC disconnect? Yes No If yes, proceed to STEP S14.

If No, the external DC disconnect to be installed is rated for _____ Amps (DC) and _____ Volts (DC)

S14) Inverter information:

Manufacturer: _____ Model: _____

Max. Continuous AC Output Current Rating: _____ Amps

Integrated DC Arc-Fault Circuit Protection? Yes No (If No is selected, provide comprehensive plan)

Grounded or Ungrounded System: GROUNDED UNGROUNDED

S15) Sizing Inverter Output Circuit Conductors and OCPD:

Inverter Output OCPD rating = _____ Amps (Table 3)

Inverter Output Circuit Conductor Size = _____ AWG (Table 3)

Table 3. Minimum Inverter Output OCPD and Circuit Conductor Size

Inverter Continuous Output Current Rating (Amps) (STEP 14)	12	16	20	24	28	32	36	40	48
Minimum OCPD Size (Amps)	15	20	25	30	35	40	45	50	60
Minimum Conductor Size (AWG, 75°C, Copper)	14	12	10	10	8	8	6	6	6

Solar PV Standard Plan — Simplified Central/String Inverter Systems for One- and Two-Family Dwellings

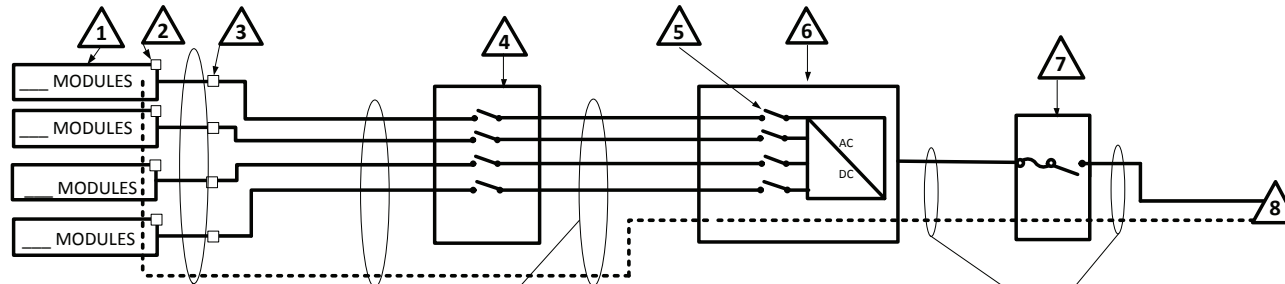
△ TAG	EQUIPMENT SCHEDULE	
1	SOLAR PV MODULE / STRING	
2	DC/DC CONVERTERS INSTALLED?	YES NO (STEP S6)
3	SOURCE CIRCUIT JUNCTION BOX INSTALLED?:	YES NO (STEP S11 & 12)
4	SEPARATE DC DISCONNECT INSTALLED?:	YES NO (STEP S13)
5	INTERNAL INVERTER DC DISCONNECT:	YES NO (STEP S14)
6	CENTRAL INVERTER	
7	SEPARATE AC DISCONNECT INSTALLED?:	YES NO
8	TO LOAD CENTER ON LINE DIAGRAM 1	

SINGLE-LINE DIAGRAM #3 – ADDITIONAL INVERTER FOR DIAGRAM #1

INVERTER # 2

CHECK A BOX FOR WHETHER SYSTEM IS GROUNDED OR UNGROUNDED: GROUNDED (INCLUDE GEC) UNGROUNDED

FOR UNGROUNDED SYSTEMS:
 - DC OCPD MUST DISCONNECT BOTH CONDUCTORS OF EACH SOURCE CIRCUIT
 - UNGROUNDED CONDUCTORS MUST BE IDENTIFIED PER 210.5(C). WHITE-FINISHED CONDUCTORS ARE NOT PERMITTED.

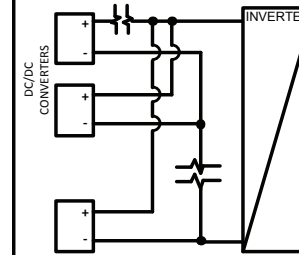


USE-2 OR PV-WIRE
EGC/GEC SIZE: _____

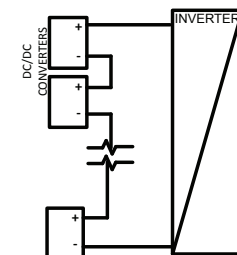
CONDUCTOR TYPE: _____
 SIZE: _____
 QUANTITY: _____
 CONDUIT TYPE: _____
 CONDUIT SIZE: _____
 EGC/GEC SIZE: _____

CONDUCTOR TYPE: _____
 SIZE: _____
 QUANTITY: _____
 CONDUIT TYPE: _____
 CONDUIT SIZE: _____
 EGC/GEC SIZE: _____

IF DC/DC CONVERTERS ARE USED, CHECK THE BOX BELOW THE CORRESPONDING CONFIGURATION



PARALLEL DC/DC CONVERTERS ON ONE SOURCE CIRCUIT (FIXED UNIT VOLTAGE DC/DC CONVERTERS)



DC/DC CONVERTERS ARE ALL RUN IN SERIES (FIXED SOURCE CIRCUIT VOLTAGE DC/DC CONVERTERS)

ENTER "N/A" WHERE SUITABLE FOR WHEN NOT USING CONDUIT OR CABLE AS PERMITTED BY CODE

Solar PV Standard Plan — Simplified Central/String Inverter Systems for One- and Two-Family Dwellings

△ TAG	EQUIPMENT SCHEDULE		
1	SOLAR PV MODULE / STRING		
2	DC/DC CONVERTERS INSTALLED?	YES	NO (STEPS S6)
3	SOURCE CIRCUIT JUNCTION BOX INSTALLED?:	YES	NO (STEP S11 & S12)
4	COMBINER BOX (STEPS 11 & 12 REQUIRED)		
5	SEPARATE DC DISCONNECT INSTALLED?:	YES	NO (STEP S13)
6	INTERNAL INVERTER DC DISCONNECT:	YES	NO (STEP S14)
7	CENTRAL INVERTER		
8	SEPARATE AC DISCONNECT INSTALLED?:	YES	NO
9	TO LOAD CENTER ON LINE DIAGRAM 3		

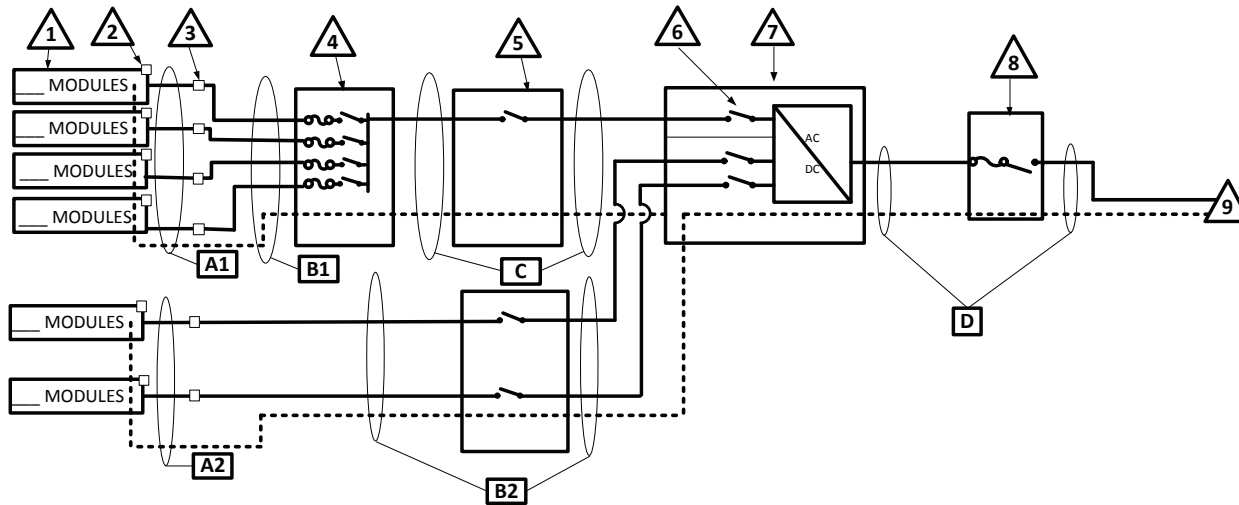
SINGLE-LINE DIAGRAM #4 – ADDITIONAL INVERTER FOR DIAGRAM #2

INVERTER # 2

CHECK A BOX FOR WHETHER SYSTEM IS GROUNDED OR UNGROUNDED: GROUNDED (INCLUDE GEC) UNGROUNDED

FOR UNGROUNDED SYSTEMS:

- DC OCPD MUST DISCONNECT BOTH CONDUCTORS OF EACH SOURCE CIRCUIT
- UNGROUNDED CONDUCTORS MUST BE IDENTIFIED PER 210.5(C). WHITE-FINISHED CONDUCTORS ARE NOT PERMITTED.



□ TAG	COMBINER/CONDUCTOR CONDUIT SCHEDULE				
TAG	CONDUCTOR TYPE	SIZE	QUANTITY	CONDUIT TYPE	CONDUIT SIZE
A1	USE-2 OR PV-WIRE				
	EGC/GEC				
B1					
	EGC/GEC				
C					
	EGC/GEC				
D					
	EGC/GEC				

□ TAG	NON-COMBINED STRINGS CONDUCTOR/CONDUIT SCHEDULE (IF APPLICABLE)				
TAG	CONDUCTOR TYPE	SIZE	QUANTITY	CONDUIT TYPE	CONDUIT SIZE
A2	USE-2 OR PV-WIRE				
	EGC/GEC				
B2					
	EGC/GEC				

ENTER "N/A" WHERE SUITABLE FOR WHEN NOT USING CONDUIT OR CABLE AS PERMITTED BY CODE

