

RTC PV System Verification Process

I. PV System Verification Process

A. Purpose

The purpose of the PV System Verification Process is to verify that a PV installation meets the local codes for a grid-connected PV System at the Regional Test Centers (RTCs). In addition, this process is tailored to meet the requirements of IEC 60364-6 for initial and periodic verification of an electrical installation.

B. Requirements of a PV System Verification

The PV System Verification consists of Visual Inspection. The Visual Inspection should be conducted by either a licensed electrician or someone who has been certified in electrical installations and electrical safety.

1. PV System Installation Acceptance Visual Inspection (Template A)

The PV System Installation Acceptance Visual Inspection shall be conducted prior to energizing the system. Its purpose is to (1) verify that the system is installed in a manner consistent with the system design and (2) ensure the electrical safety of the system and grid interconnect.

The Checklist Items section outlines what needs to be inspected in the following areas:

- a) AC System
- b) Protection against Overvoltage/Electrical Shock
- c) Labeling and Identification

A column is provided to either certify if the checklist item has been completed satisfactorily (✓) or enter a Note (“Note #”) if it needs attention. All Notes shall include detailed comments, which are to be catalogued in the Notes & Comments section below the checklist

Template A:

PV System Installation Acceptance Visual Inspection Form

Project Details							
Project Title							
RTC Site							
RTC Address							
RTC Site: GPS Coordinates							
RTC Site Contact							
Site Contact							
Site Contact Phone							
Site Contact Email							
Site Visit Date for Visual							
Designed By							
Company Name							
Address							
City, State, ZIP							
Contact							
Contact Phone							
Contact Email							
Installed By							
Company Name							
Address							
City, State, ZIP							
Contact							
Contact Phone							
Contact Email							
Inspected By							
Company Name							
Address							
City, State, ZIP							
Contact							
Contact Phone							
Contact Email							
Installation Details							
Date of Installation Completion							
Installed by Licensed Electrician				Yes <input type="checkbox"/>	No <input type="checkbox"/>		
System Design Drawings				Yes <input type="checkbox"/>	No <input type="checkbox"/>		
Item	Manufacturer	Model #	Serial #	Fuse Rating	Fuse Type	Rated Voltage	Rated Current
AC Disconnect							

Checklist Items:

Review each item and place a check mark (✓) in the left-hand column if the item is complete/correct. If the item needs attention, however, write "Note" in the left-hand column. Please provide details for all Notes in the **Notes & Comments** section, located below the checklist.

Item #	Description	“✓” or “Note”
PV Array		
1.	Array tilt angle is _____ degrees (+/- 1 degree)	
2.	Module wattage is as shown on drawings and nameplate.	
3.	Layout of modules is as depicted on the Array Plan.	
4.	Racking components are attached per racking manufacturer's drawings.	
5.	Racking components are tight and secure.	
6.	Modules are securely attached to the racking system.	
7.	Module and string homerun wiring is secured to racking.	
8.	All modules and racking system are grounded.	
AC System		
9.	A means to isolate AC from system and grid via AC Disconnect.	
10.	All isolation and switching devices have been connected such that PV installation is wired to the "load" side and the AC Utility supply to the "Inverter" side.	
Protection Against Overvoltage/Electrical Shock		
11.	To minimize voltages induced by lightning, the area of all wiring loops has been kept as small as possible.	
12.	(Where required by local codes) Array frame and/or module frame protective grounding conductors have been correctly installed and are connected to ground. Where protective grounding and /or equipotential bonding conductors are installed.	
Labeling and Identification		
13.	All circuits, protective devices, switches, and terminals are suitably labeled.	
14.	The main AC isolating switch is clearly labeled.	
15.	A single line wiring diagram is displayed on-site.	
16.	Emergency shutdown procedures are displayed on-site.	
17.	All signs and labels are suitably affixed and durable.	
Notes & Comments		
Detail all Notes below.		
Preface each Note its corresponding Item #; list them in numerical order. See the provided example.		
38. Inverter protection settings and installer details are not displayed on-site; they are instead listed in a binder in an off-site office.		
43. The label for one cable is weather-worn and difficult to read.		

NOTE: All identified issues were corrected by [redacted] while on-site.

Inspector Name	
Inspector Signature	
Date	

Inspector Name	
Inspector Signature	
Date	

Template B:

PV System Performance and Functional Testing Form

Project Details			
RTC Project			
RTC Project Engineer			
RTC Site			
RTC Address			
RTC Site: GPS Coordinates			
Site Address			
RTC Site Contact			
Site Contact			
Site Contact Phone			
Site Contact Email			
Site Visit Date for Visual			
Designed By			
Company Name			
Address			
City, State, ZIP			
Contact			
Contact Phone			
Contact Email			
Installed By			
Company Name			
Address			
City, State, ZIP			
Contact			
Contact Phone			
Contact Email			
Performance Testing By			
Company Name			
Address			
City, State, ZIP			
Contact			
Contact Phone			
Contact Email			
Installation Details			
Date of Installation Completion			
Site Solar Noon (date of testing)			
PV Acceptance and Visual Inspection Completion Date			
Item	Design Specified	Installed	Verification Initials
Total System Size [STC DC] kW			
PV Module Make / Model(s)			
PV Module Power [STC DC] kW			
PV Modules per String			

Strings per System							
Number of Systems							
Inverter(s) Make / Model							
Total Number of Inverters							
Racking Manufacturer							
Combiner Box Make / Model							
Total Number of Combiners							
Item	Manufacturer	Model #	Serial #	Fuse Rating	Fuse Type	Rated Voltage	Rated Current
Combiner Box							
Junction Box							
DC Disconnect							
DC Disconnect							
AC Disconnect							
Inverter							

Notes:

AC Circuit(s) Testing

Test	Pass/Fail		Comments
Continuity of the protective conductors and of the main and supplementary equipotential bonding conductors	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
Insulation resistance of the electrical installation.	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
Protection by SELV and PELV or by electrical separation	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
Verification of conditions for protection by automatic disconnection of the supply (Fault Loop impedance, Earth resistance, RCD test)	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
Polarity and phase sequence tests	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
Functional and operational tests	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	
Voltage drop	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	

PV System String Testing Form

Project:		Install Date:			Calibration Date:			Tester:			Company:				
Location:		Latitude:		Longitude:		Altitude:									
Module(s)		STC Voc =		STC Isc =		Voc Avg =		Isc Avg =		String Derate =					
		STC Voc =		STC Isc =		Voc Avg =		Isc Avg =							
Date Tested	Modules per String		System STC Voc =		Isc Temp Co (%/C) =		Equipment: PV150, 200R, AC/DC Clamp, RTC DAS - EETS RC01 & Type "T" TC's.								
Conditions	Strings per System		System STC DC Pmp =		Voc Temp Co (%/C) =										
Solar Noon	* # of Inverters														
Air Mass		# of Combiners				± 5%		± 2%		± 5%		± 2%		Notes:	
Module	String	Time (UTC)	Voc (V)	Isc (A)	*Irr (W/m ²)	*Module Temp (DegC)	Resis Iso (Mohm)	Volt Iso (V)	Expected Voc (V)	Voc % Diff (Meas-to-Expected)	Voc % Diff (Meas-to-Average)	Expected Isc (A)	Isc % Diff (Meas-to-Expected)	Isc % Diff (Meas-to-Average)	*Replaced 200R Irr & Temp values
Test Result Notes:										Results:	All Strings Passed	All Strings Passed	All Strings Passed	All Strings Passed	All Strings Passed

Excel version of form is available on RTC Website

PV System Performance and Functionality Test Form

Project:		Installed:		Calibrated:		Oper:		Company:					
Location:		Latitude:		Longitude:		Altitude:							
Module(s):		Inverter:		***AC Xfrmr:		Yes							
		Racking:											
Orientation:		Modules per String		Module STC DC Pmp (W) =									
Configuration:		Strings per System		System STC DC Pmp (W) =									
Date Tested		Number of Systems		Pmpp Temp Co (%/C) =									
Conditions		Number of Inverters		Inverter Eff (CEC,%) =									
Solar Noon		Number of MPP's											
Air Mass		Range		> 0.968		Range		> 0.965					
5 Minute Time Period (UTC)	Module **Temp (degC)	Irradiance (W/m^2)	Measured DC Pwr (W)	*Expected DC Pwr (W)	Calculated DC Loss Factor	Measured AC Pwr (W)	Expected AC Pwr (W)	Calculated System Loss Factor	Ref Only: SMA AC Pwr(W)	Measured Power % Diff (Meas-to-Inv)			
									N/A	N/A			
Average													
Equipment:				Results:	Pass			Pass					
Test Result Notes:													

Excel version of form is available on RTC Website