Fraunhofer USA

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Plug and Play PV Standards Portfolio

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Version 1.1	8/01/2016	Modified description of SCD standard

1 Plug & Play PV Standards Portfolio, Process and Document Overview

The Plug and Play PV framework serves to promote the use of components, systems and processes which increase the ease of installation, standardize the proof of code compliance, and enable the introduction of electronic permitting, inspection and interconnection (ePI&I) processes for residential PV systems.

The Plug and Play PV Standards Portfolio describes the requirements for PV systems and communication devices to be listed as Plug & Play PV compliant, enabling them to participate in ePI&I processes. The portfolio comprises of the following standards:

- Plug & Play PV System Standard (Section 2)
- Plug & Play ePI&I Communication Standard (Section 3), supported by the
  - *Plug & Play PV API Technical Reference Manual (separate document)*
- Plug & Play Solar Connection Device Standard (Section 4)

The concepts behind the Plug and Play PV framework are further described in a separate White Paper.

2 Plug & Play PV System Standard

2.1 Plug & Play PV System Certification Requirements

2.1.1 A Plug & Play PV System shall satisfy the requirements identified in sections 2.2-2.5.

2.1.2 Plug & Play PV System Manufacturers shall provide documentation as identified in 2.2-2.4.

Informational Note: A summary of documentation requirements is included in Section 2.8. An illustrative example of a fully documented Plug & Play PV System is included in Appendix 2.

2.1.3 A Plug & Play PV System shall be certified by a Certification Provider according to procedures identified in Section 2.6.

2.2 System Plan

2.2.1 System Plan Requirements

The System Manufacturer shall define and document a standardized System Plan for the System to be certified. The System Plan shall consist of:

(1) A System Summary, per Section 2.2.1.1

(2) A System Configuration Diagram, per Section 2.2.1.2

(3) A System Specification, per Section 2.2.1.3

2.2.1.1 System Summary

The System Summary shall provide an overall description of the System to be Certified.

Informational Note: Guidelines for generating a System Summary are included in Appendix 1.2.

2.2.1.2 System Configuration Diagram

The System Configuration Diagram shall define the valid system configuration(s) for the System to be Certified. A system configuration consists of a defined assembly of Sub-Systems with a defined connection topology.

Informational Note: Guidelines for generating a System Configuration Diagram template are included in Appendix 1.3. The "valid system configurations" for a System to be Certified can be represented as a generalized single line diagram of the system that indicates the maximum and minimum number of each Sub-System. An example is provided in Appendix 2.[1]

Informational Note: A Sub-System is a discrete component or block of repeated discrete components that comprise a PV System. Examples of Sub-Systems include PV modules, cable assemblies, and inverters. Additional examples are identified and defined in Appendix 1.1.

2.2.1.3 System Specification

The System Specification shall include information described in (1) and (2):

(1) **System-Level Specification:** The System-Level Specification shall use an applicable System-level data model to define system-level specifications for the System Under Test that are fixed at the time of system certification.

(2) **Sub-System Specifications:** For each Sub-System identified in the System Configuration Diagram, the System Specification shall define all sub-system specifications that are fixed at the time of system certification using an applicable data model.

System-Level and Sub-System specifications shall be documented by utilizing an existing data model within the certification database, or a new data model developed as part of system certification that is associated with the relevant system or constituent sub-system.

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[1] *Examples of configuration parameters include, for example, # of AC Modules in a branch circuit or number of branch circuits (for AC Module Systems); or # of PV modules or number of strings in a string inverter system.*

Informational Note: A reference library of System-Level and Sub-System data models are incorporated in Appendix 1.4.

2.3 Verification of Code Compliance

2.3.1 Code Compliance Plan

The System Manufacturer shall submit a Code Compliance Plan for the System to be Certified that satisfies the requirements of Section 2.3.1.1-2.3.1.4.

Informational Note: The Code Compliance Plan is a system-specific description of how the System to be Certified satisfies the requirements of the Plug & Play PV Standard for verifying compliance with the National Electric Code. It is derived from the Master Inspection Checklist, which is a library of verification requirements for a PV System; it includes requirements that must be satisfied at the system level, and requirements that must be satisfied for each instance of the Sub-Systems that comprise the System to be Certified. The Code Compliance Plan identifies, for the PV System as a whole, and for each instance of a Sub-System identified in the Standard Plan, how the relevant requirements defined in the Master Inspection Checklist are satisfied.

Informational Note: Example Code Compliance Plans are included as part of the example documentation package presented in Appendix 2.

2.3.1.1 Code Compliance Plan Documentation Requirements – General

The Code Compliance Plan shall be comprised of a list of requirements derived from the Master Inspection Checklist in accordance with the requirements of Section 2.3.1.2-2.3.1.4.

Informational Note: The Master Inspection Checklist is found in the Appendix 1.5.

2.3.1.2 Code Compliance Plan Documentation Requirements for Sub-Systems

For each *instance* of a Sub-System in the System Plan, the Code Compliance Plan shall document how each requirement in the Master Inspection Checklist is satisfied.

2.3.1.3 Code Compliance Plan Documentation Requirements for PV System

The Code Compliance Plan shall document how each system-level requirement in the Master Inspection Checklist is satisfied for the System to be Certified as a system. The system-level requirements shall correspond to the system type identified in the System Plan (e.g., AC Module, Microinverter, String Inverter).

2.3.1.4 Methodology for Compiling a Code Compliance Plan

Each requirement in the Code Compliance Plan shall be documented by identifying:

(1) The generally recognized method for proving code compliance (per section 2.3.3), and

(2) A detailed description of the specific approach adopted by the System Manufacturer for proving compliance.

(3) Requirements identified in the Code Compliance Plan that are verified by Electrical Self-Test, per 2.3.3(2), shall cross-reference to the Electronic Self-Test Report Data Model for the System to be Certified.

(4) Requirements identified in the Code Compliance Plan that are verified by Remote Visual Documentation, per 2.3.3(3), shall cross-reference to a list of required photographs.

2.3.2 Code Compliance Plan Implementation

The System to be Certified shall satisfy the requirements identified in the Code Compliance Plan for all valid system configurations using the method identified in the Compliance Plan.

The System Plan, defined per Section 2.2, shall be used to identify valid configurations and Sub-System specifications.

2.3.3 Recognized methods for satisfying Code Compliance Plan requirements

The following methods shall be permitted to satisfy Code Compliance Plan requirements:

(1) Verification by Design: A System to be Certified shall satisfy a Code Compliance Plan requirement by Design if (1) a system characteristic identified in the System Plan satisfies the identified requirement; and (2) the identified system characteristic is enforced at installation time by a clearly identified means.

Informational Note: Verification by design includes, for example, elimination of exposed metal from electrical system components to eliminate the need for equipment grounding conductors (implied by a manufacturer part # detected through a self-test), or use of a keyed connector that identifies a specific type of cable assembly has been used (implied by identification of upstream devices that use the mating connector). In general, Verification by Design is used to verify that the design parameters defined by the System Electrical Plan constitute a Code Compliant PV System.

(2) Verification by Electrical Self-Test. A System to be Certified shall satisfy a Code Compliance Plan requirement by Electrical Self-Test if (1) a commissioning application interrogates components of the as-built system or other external data sources to verify that the as-built system meets the identified requirement; and (2) it complies with the requirements of Section 2.4.1.

Informational Note: Example of Code Compliance Plan Requirements that may be satisfied by Electrical Self-Test include, for example, mapping of an as-built array to determine that the number of PV modules in a DC string or AC Modules in a branch circuit are within specified limits (e.g., max string voltage or max branch circuit current). In general, Verification by Electrical Self Test is expected to verify that the proper system components are detected in the as-built system and that they are connected properly.

(3) Verification by Remote Visual Documentation. A System Under Test shall satisfy a Code Compliance Plan Requirement by Remote Visual Documentation if (1) satisfaction of the identified requirement can be readily verified from a digital photograph or other optical recognition means of an as-built system; and (2) it complies with the requirements of Section 2.4.2.

Informational Note: In general, Remote Visual Documentation is expected primarily to verify factors such as workmanship. Code Compliance Plan Requirements that are met by Remote Visual Documentation are not validated by the System Under Test, but are reserved for requirements that may be remotely inspected with a high degree of confidence. Examples of Code Compliance Plan Requirements that may be satisfied with Remote Visual Documentation include, for example, presence of required plaques, Array layout, and cable management.

Remotely submitted visual documentation requires as part of the Inspection Submittal package, time and location-stamped photographs to provide evidence that the system has been installed correctly from a mechanical perspective.

(4) Verification by Visual Inspection. A Code Compliance Plan Requirement that does not meet the threshold for Verification By Design, Electrical Self-Test, or Remote Visual Documentation shall be identified as satisfying the Code Compliance Plan Requirement by Visual Inspection.

Informational Note: A Code Compliance Plan Requirement that is satisfied by Visual Inspection is not validated by the System Under Test, and is not easily verified through a remote inspection. Examples include connection of conductors to terminals blocks, or wiring into service panels.

2.4 Proof of Compliance Reporting

2.4.1 Electronic Self-Test Report

If the Code Compliance Plan identifies any requirements as satisfied by electronic self-test, the System to be Certified shall execute an electronic self-test that satisfies requirements (1)-(4):

(1) The electronic self-test shall verify that pre-installation regulatory approvals have been granted

(2) The electronic self-test shall address each requirement identified in the Code Compliance Plan as satisfied by electronic self-test.

(3) The System to be certified shall generate an Electronic Self-Test Report that documents the results of the electronic self-test. The Self-Test Report shall include results of the test as well as sufficient information to support calculations and results generated by the electronic self-test. The content and format of the Electronic Self-Test Report shall utilize defined Plug & Play data model guidelines, and shall be submitted by the manufacturer for the certification process for incorporation into the Plug & Play Data Model Library.

(4) The Electronic Self-Test Report shall be communicated to the Plug & Play Server.

Informational Note: The ePI&I Communications Standard defines the communications protocol for exchanging information with the Plug & Play PV Server

Informational Note: Electronic Self-Test Report data models are included in Appendix 1.6.

2.4.2 Narrative Test Report

The System Manufacturer shall provide a Narrative Test Report that can be auto-populated with results from the Electronic Self-Test Report.

Informational Note: The Narrative Test Report is intended to act as a human-readable summary description of the as-built system, including the overall system design concept and important results from the self-test.

2.5 Commissioning Protocol

(1) The System to be Certified shall complete steps (a)-(c) in sequence prior to exporting power on a sustained and continuous basis. "Sustained and continuous" shall be defined as exceeding the limits identified in (3).
   (a) The as-built system has linked to an existing Plug & Play PV project on the Plug & Play PV Server.
   (b) All required regulatory approvals have been granted for the Plug & Play PV Project.
   (c) Following receipt of regulatory approvals, the Installer provides authorization for the system to complete interconnection and begin exporting power.

(2) The System to be Certified shall signal completion of the commissioning process for the Plug & Play PV Project to the Plug & Play Server.

(3) The System to be Certified shall be permitted to export power on a temporary basis for the purposes of testing the system during installation. Power export during test mode shall automatically cease after a period of 30 minutes.

Informational Note: Data is exchanged with the Plug & Play PV Server using communication protocols identified in the Plug & Play ePI&I Communications Standard (Section 3).

2.6 System Certification Procedure

The Certification Provider shall ascertain compliance with the Plug & Play PV System Standard by following procedures outlined in 2.6.1-2.6.5.

2.6.1 Audit of System Design Package

The Certification Provider shall conduct an audit of the system design package to ascertain completeness and consistency. As part of the design audit, the Certification Provider shall: (1) ascertain that all required documentation has been completed and meets the requirements identified in Sections 2.2-2.4; (2) that all components identified within the System Plan are appropriate for the identified purpose; (3) that the valid system configurations defined by the System Plan comprise a code compliant system; and (4) that the proposed system design concept satisfies the requirements for certification of a Plug & Play PV System Sections 2.2-2.5.

2.6.2 Field Assessment

The Certification Provider shall conduct a comprehensive set of experiments on a sample system of a maximal configuration of the System to be Certified to ascertain that an as-built system satisfies the requirements for certification of a Plug & Play PV System Sections 2.2-2.5. Specifically, the field assessment shall verify test criteria (1)-(4)

(1) **Verification of Code Compliance:** Verifies that the System to be Certified meets each line item in described in the Code Compliance Verification Plan (i.e., verify compliance across the system's full design envelope, and, conversely, to verify that the system does not function if this design envelope is violated.)

(2) Proof of Compliance Reporting: Verifies the completeness, accuracy, and reporting of the results of the electronic self-test

(3) Compliance with the Commissioning Protocol: Verifies that the System to be Certified initiates power export in line with the requirements of the Commissioning Protocol.

2.6.3 Audit of Factory Acceptance Test

The Certification Provider shall review and audit the manufacturer's process for ensuring the integrity of the factory acceptance testing procedures.

2.6.4 Ratings Assessment

The Certification Provider shall assign ratings to Sub-Systems per Section 2.7.

2.6.5 Documentation

The Certification Provider shall register applicable system documentation on the Plug & Play Server in a system certification database. System documentation shall include the approved System Plan, the Code Compliance Plan, and a Certificate of Compliance report. As necessary, the Certification Provider shall update the existing data model libraries on the server to incorporate any new data models generated during the certification process.

2.7 Plug & Play System Ratings

Each sub-system identified in the System Plan shall receive a Plug & Play PV System Rating from the Certification Provider. The Plug & Play PV System Rating shall be determined based on the following characteristics of the System to be Certified's Code Compliance Plan:

- **Documenting System Information:** How is the sub-system documentation compiled and communicated for the as-built system?
- **Auditing Code Compliance:** How is the sub-system's compliance with the Code Compliance Plan determined?
- **Qualification Requirements:** What level of electrical training is required of, and what level of electrical hazard is presented to, the installer?

Informational Note: The Ratings framework is intended to provide a formalized, structured method to communicate the degree to which labor qualification and onsite inspection requirements of the PV System may be reduced.

Table 1: Rating framework for PV systems

"A Rating"	**System Information:** Automatically compiles and communicates all relevant information about the sub-system to a software commissioning application **Code Compliance:** Substantively guarantees compliance with applicable code without further review **Qualification Requirements:** Limited or no electrical training required. No exposure to hazardous voltages
"B Rating"	**System Information:** Compiles and communicates all relevant information about the sub-system through a bar code scanning tool that interfaces with a software commissioning application. **Code Compliance:** Full verification of compliance with applicable code requires remote visual documentation and may require onsite inspection **Qualification Requirements:** May require electrical training, no exposure to hazardous voltages
"C Rating"	**System Information**: Requires manual compilation of relevant information about the sub-system **Code Compliance:** Verification requires onsite inspection and/or visual documentation **Qualification Requirements:** Requires electrical training / Potential exposure to hazardous voltages

Informational Note: A Software Commissioning Application could be implemented on a controller embedded within a sub-system in the System to be Certified, or using an external platform such as a mobile app. In either case, the Software Commissioning Application is considered part of the System to be Certified.

Documentation Summary

Table 2-1: Summary of documents required to initiate certification of a Plug & Play PV System

Document	Description	Requirements Definition	Reference Library & Templates	Example Implementation
System Plan	Describes the overall design concept, configuration diagram, and specifications for the System to be Certified	Section 2.2	Appendix 1.2 Appendix 1.3 Appendix 1.4	Appendix 2.1-2.2
Code Compliance Plan	Describes how the System to be Certified meets the requirements for verifying code compliance of an as-built system. defined by the Master Inspection Checklist	Section 2.3	Appendix 1.5	Appendix 2.3
Electronic Self-Test Report Data Model	Structured data model that defines the information that an as-built system is required to compile and communicate to the Plug & Play Server to satisfy Code Compliance Plan requirements that are identified as being met by electronic self-test	Section 2.4	Appendix 1.6	Appendix 2.4
Visual Documentation Plan	List of photographs required to comply with the remote visual documentation requirements identified in the Code Compliance Plan	Section 2.3	Appendix 1.5	Appendix 2.5

3 Plug & Play ePI&I Communication Standard

3.1 Plug & Play PV ePI&I Communication Standard Requirements

3.1.1 A Plug & Play Software Application shall be considered compliant with the Plug & Play ePI&I Communication Standard if it satisfies the requirements of Sections 3.2-3.3.

Informational Note: The ePI&I Communication Standard consists of an Application Programmer's Interface (API), and a set of standardized Plug & Play PV data models. The API defines the protocol and conventions used for stakeholders to exchange data, while the Plug & Play Data Models define the recognized library of data models that constitute the payload of these data exchanges.

Informational Note: Refer to the Plug & Play PV White Paper, "Making Plug & Play PV Systems A Reality", for a description of how the ePI&I Communication Standard is used to define and execute a typical Plug & Play Process and Workflow.

3.2 Plug & Play PV Application Programmer's Interface (API)

Plug & Play-Compliant Software Applications shall follow the communication protocol defined in the Plug & Play PV API to transact ePI&I dataflows.

Informational Note: Refer to the Plug & Play PV API Technical Reference Manual, for complete API documentation. An interactive API user reference may be found online at: https://pnpserver.cse.fraunhofer.org:5000/spec.html

3.3 Plug & Play PV Data Models

3.3.1 Requirements

A Plug & Play-Compliant Software Application shall communicate using data models that satisfy the requirements of (1)-(3):

(1) Data shall utilize existing Plug & Play data models.

(2) Data shall be transacted using the communication protocols identified in the Plug & Play API.

(3) Data shall incorporate meta-data that follow the conventions identified in the Plug & Play API.

Informational Note: A reference list of Plug & Play PV Data Models are documented in Appendix 1.7-Misc. Data Model Library. Example implementations for a typical process flow may be found on the Plug & Play Server reference implementation at https://pnpserver.cse.fraunhofer.org:5000/. Please contact Fraunhofer CSE to obtain credentials.

3.3.2 Process for Adding to the Plug & Play Data Model Library

Additional data models may be incorporated into the Plug & Play Data Model library by registering with the Plug & Play server using the API. New data models shall follow conventions identified in the API.

ePI&I Communications Standard Documentation Summary

Document	Description	Requirements Definition	References
Plug & Play API Technical Reference	Defines the Plug & Play Application Programmer's Interface for electronic dataflows	3.2	https://pnpserver.cse.fraunhofer.org:5000/spec.html
Plug & Play Data Model Library	Defines the complete list of identified Plug & Play PV data models	3.3	Appendix 1.7

4 Plug & Play Solar Connection Device Standard

A Plug & Play Solar Connection Device (SCD) shall consist of a listed Plug & Play Connector Inlet and a readily accessible circuit breaker not to exceed 60A, and associated mating plug. The Plug & Play Connector Inlet consists of 4 power pins (L1,L2,N,G), rated to 60A; and 4 signal pins, reserved for manufacturer-specific implementations. The form factor and detailed specifications for a Plug & Play SCD will be defined under an appropriate umbrella of applicable component-level standards (e.g., NEMA, UL) once the device has achieved a product listing.

Appendix

A1.1 Sub System Definitions

Sub-System Name	Description
Microinverter/ACM System Information	system-level information about a MI/AC Module (ACM) PV System
String Inverter System Information	system-level information about a string-inverter PV System
PV Module Block	Represents a block of one or more PV modules series connected in a DC string. The PV Modules in a PV Module block may incorporate factory integrated electronics on module (such as optimizers, monitoring, or shutdown). All PV Modules in a PV Module block are identical.
AC Module Block	Represents a block of one or more listed AC modules parallel connected to form a branch. All AC Modules in a block are identical.
Microinverter Block	A block of one or more microinverters (not AC Modules) comprising a branch circuit
Converter Block	A block of one or more dc-dc power converters that are not integrated on a PV module. "DC-DC Power Converter" includes multiple types of devices that process power from a PV module or group of PV modules such as DC optimizers or module-level shutdown devices.
Class 2 Power Supply	An listed Class 2 power supply
Combiner	An AC or DC combiner. May include integrated overcurrent protection devices, rapid shutdown, and/or disconnects
Inverter	A central inverter, for use with a DC bus PV system.
Cabling Assembly	A conductor or cable assembly that is field-installed as a discrete component
Production Meter	A PV production meter that is field-installed as a discrete component
Disconnect	A disconnect that is field-installed as a discrete component
Solar Connection Device	A Plug & Play-compatible premises-side solar connection device inlet. May include integrated over current protection. May include Modbus communications interface
Service Panel	A service panel that acts as the connection point for a load-side premises connection.
Supply-Side Premises Interconnection	A premises interconnection on the supply side of the main service panel
Load-Side Premises Interconnection	A premises interconnection on the load side of the main service panel

A1.2 System Plan Summary Template

Manufacturer	*System Manufacturer*
Type of System	*High level description of system – e.g. AC Module, Microinverter, String Inverter*
Maximal configuration	*Maximum constraints on system size and configuration:*
	Max branch circuits / strings
	Max inverters per branch/ PV modules per string
	Max DC voltage
	Max AC Power Rating
	Nominal AC Voltage
Grounding	*For string inverter systems – grounded or ungrounded?*
Grounding System	*Describe how continuity of grounding conductors is insured*
Rapid Shutdown	*Description of rapid shutdown solution*
AFCI description	*Description of AFCI solution, if applicable*
GFCI description	*Description of GFCI solution, if applicable*
AC Disconnecting Means	*Description of AC Disconnect*
DC Disconnecting Means	*Description of DC Disconnect, if applicable*
Software Commissioning Application	*Description of Software Commissioning Application and Electrical Self-Test – how data is compiled, what executes the self-test, and how the HMI is implemented*
Sub-Systems:	*Description of Sub-Systems, including:*
Array Mounting	*Cross-reference ID against System Configuration*
Array	*Approved Mfr & part #s*
Cabling & Conduit	*Connector & termination method*
Inverter	*Protection requirements & method*
Combiner	*Grounding method*
Premises Connection	*Additional Features about the sub-system*

A1.3 System Configuration Diagram

System Configuration Diagram - Guidelines

The System Configuration Diagram is required to indicate:

(1) The (a) type, (b) maximum allowable number, and (c) connection topology of constituent subsystems that comprise a maximal valid system configuration.

Informational Note: A valid configuration of the System is generated by removing sub-systems from the maximal system configuration indicated in the System Configuration Diagram.

(2) The location of overcurrent protection and disconnects (even if integral to a constituent sub-system)

(3) Requirements for connection to the premises wiring

(4) A unique, monotonically increasing reference ID for each sub-system.

Informational Note: This reference ID is used to cross-reference to other portions of the required documentation package, such as the system specification.

(5) Whether the constituent sub-system is required or optional

A1.4 System Specification Data Model Library

Sub-System	Field Label	Description	Type	Units
Microinverter/ACM System information	Vendor	Vendor	txt	n/a
Microinverter/ACM System information	PnP ID	Unique P&P System Reference Identifier - a "model #" for a P&P system	txt	n/a
Microinverter/ACM System information	Version	System Certification Version	Integer	n/a
Microinverter/ACM System information	Type	System Type	Enumerated	1 = ACM 2 = String Inverter with Class 1 (standard) wiring 3 = Stringer Inverter with Class 2 Wiring 4 = Microinverter
Microinverter/ACM System information	max_ac_pwr_rating	Maximum allowable AC Power rating of the PV System	Real	W
Microinverter/ACM System information	max_branch_circuits	Maximum allowable number of branch circuits	Integer	Each
Microinverter/ACM System information	ac_pwr_rating	Actual AC Power rating of the PV System	Real	W
Microinverter/ACM System information	n_branch_circuits	Number of branch circuits in the PV System	Integer	Each
Microinverter/ACM System information	max_ambient_temp	Max expected ambient temperature	Real	deg C
Microinverter/ACM System information	max_rooftop_temp	Rooftop temperature adjustment factor	Real	deg C
Microinverter/ACM System information	n_fcn_blocks	# of subsystems within the PV System	Integer	Each
String Inverter System Information	Vendor	Vendor	txt	n/a
String Inverter System Information	PnP ID	Unique P&P System Reference Identifier - a "model #" for a P&P system	txt	n/a
String Inverter System Information	Version	System Certification Version	Integer	n/a
String Inverter System Information	Type	System Type	Enumerated	1 = ACM 2 = String Inverter with Class 1 (standard) wiring 3 = Stringer Inverter with Class 2 Wiring 4 = Microinverter
String Inverter System Information	max_ac_pwr_rating	Maximum allowable AC Power rating of the PV System	Real	W
String Inverter System Information	max_strings	Maximum allowable number of PV Strings in the PV System	Integer	Each
String Inverter System Information	ac_pwr_rating	Actual AC Power rating of the PV System	Real	W
String Inverter System Information	n_strings	Number of DC strings in the PV System	Integer	Each
String Inverter System Information	max_ambient_temp	Max expected ambient temperature	Real	deg C
String Inverter System Information	max_rooftop_temp	Rooftop temperature adjustment factor	Real	deg C
String Inverter System Information	n_fcn_blocks	# of subsystems within the PV System	Integer	Each
PV Module Block	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
PV Module Block	mfr	PV Module Manufacturer	txt	n/a
PV Module Block	model	PV Module Model #	txt	n/a
PV Module Block	i_sc	PV Module Isc	Real	A
PV Module Block	v_oc	PV Module Voc	Real	V
PV Module Block	i_mp	PV Module Imp	Real	A
PV Module Block	v_mp	PV Module Vmp	Real	V
PV Module Block	p_max	PV Module Pmax	Real	W
PV Module Block	temp_coeff	PV Module Voc Temp. Coefficient	Real	mV/deg K
PV Module Block	max_fuse	PV Module Max Series Fuse	Real	A
PV Module Block	max_sys_v	PV Module Max System Voltage	Real	V
PV Module Block	max_modules_per_string	Max modules per string	Integer	16

Sub-System	Field Label	Description	Type	Units
PV Module Block	module_level_shutdown	PV Module Level Shutdown Present	Enumerated	1 (Yes)
PV Module Block	datasheet	Link to datasheet	txt	n/a
PV Module Block	n_modules	Number of PV Modules in this block	txt	
ACM Block	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
ACM Block	mfr	AC Module Manufacturer	txt	n/a
ACM Block	model	AC Module Model #	txt	n/a
ACM Block	max_ACMs	Max ACMs per Branch Circuit	Integer	Each
ACM Block	ac_pwr_rating	AC Module AC Power Rating	Real	W
ACM Block	ac_i_rating	AC Module AC Output Current	Real	A
ACM Block	ac_v_rating	AC Module Nominal AC Voltage	Real	V
ACM Block	max_ocpd	AC Module Max OCPD Current Rating	Real	A
ACM Block	datasheet	Link to datasheet	txt	n/a
ACM Block	n_ACMs	Number of AC Modules in this block	Integer	Each
Microinverter Block	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
Microinverter Block	mfr	Inverter Mfr	txt	n/a
Microinverter Block	model	Inverter Model #	txt	n/a
Microinverter Block	max_microinverters	Max number of microinverters per branch circuit	Integer	Each
Microinverter Block	dc_i_rating	Inverter DC Current Rating	Real	A
Microinverter Block	dc_v_rating	Inverter DC Voltage Rating	Real	V
Microinverter Block	ac_pwr_rating	Inverter AC Power Rating	Real	W
Microinverter Block	ac_i_rating	Inverter Max AC Current	Real	A
Microinverter Block	ac_v_rating	Inverter Nominal AC Voltage	Real	V
Microinverter Block	max_ocpd	Inverter Max OCPD Current Rating	Real	A
Microinverter Block	n_microinverters	Number of inverters in this block	Integer	Each
Microinverter Block	datasheet	Link to datasheet	txt	n/a
Inverter	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
Inverter	type	Inverter type	Enumerated	1=AC Module/Microinverter; 2=Inverter;
Inverter	mfr	Inverter Mfr	txt	n/a
Inverter	model	Inverter Model #	txt	n/a
Inverter	dc_i_rating	Inverter DC Current Rating	Real	A
Inverter	dc_v_rating	Inverter DC Voltage Rating	Real	V
Inverter	ac_pwr_rating	Inverter AC Power Rating	Real	W
Inverter	ac_i_rating	Inverter AC Current Rating	Real	A
Inverter	ac_v_rating	Inverter AC Voltage Rating	Real	V
Inverter	max_ocpd	Inverter Max OCPD Current Rating	Real	A
Inverter	class2	Class 2 Input?	Enum	Y/N
Inverter	afci_integrated	AFCI integrated?	Enum	Y/N
Inverter	dc_disconnect_integrated	AC disconnect integrated?	Enum	Y/N
Inverter	ac_disconnect_integrated	DC disconnect integrated?	Enum	Y/N
Inverter	rapid_shutdown	Rapid Shutdown equipped?	Enum	Y/N
Inverter	grounding	Grounded / Ungrounded	Enum	Grounded / Ungrounded

Sub-System	Field Label	Description	Type	Units
Inverter	datasheet	Link to datasheet	txt	n/a
DC-DC Converter Block	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
DC-DC Converter Block	type	Converter type	Enumerated	1=DC Optimizer 2=Smart Shutdown 3=Class 2 Supply
DC-DC Converter Block	mfr	Converter Mfr	txt	n/a
DC-DC Converter Block	model	Converter Model #	txt	n/a
DC-DC Converter Block	input_i_rating	Converter Input DC Current Rating	Real	A
DC-DC Converter Block	input_v_rating	Converter Input DC Voltage Rating	Real	V
DC-DC Converter Block	input_pwr_rating	Converter Input Power Rating	Real	W
DC-DC Converter Block	max_output_current	Converter Max Output Current	Real	A
DC-DC Converter Block	max_output_voltage	Converter Max Output Voltage Rating	Real	W
DC-DC Converter Block	output_pwr rating	Converter Output Power Rating	Real	A
DC-DC Converter Block	max_ocpd	Converter Max OCPD Current Rating	Real	A
DC-DC Converter Block	n_converters	Number of converters in this block	Integer	Each
DC-DC Converter Block	datasheet	Link to datasheet	txt	n/a
Class 2 Power Supply	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
Class 2 Power Supply	mfr	Converter Mfr	txt	n/a
Class 2 Power Supply	model	Converter Model #	txt	n/a
Class 2 Power Supply	n_class2supplies	Number of Class 2 supplies in this block	Integer	Each
Class 2 Power Supply	input_i_rating	Class 2 Supply Input DC Current Rating	Real	A
Class 2 Power Supply	input_v_rating	Class 2 Supply Input DC Voltage Rating	Real	V
Class 2 Power Supply	max_output_current	Class 2 Supply Max Output Current	Real	A
Class 2 Power Supply	max_output_voltage	Class 2 Supply Max Output Voltage Rating	Real	V
Class 2 Power Supply	max_ocpd	Class 2 Supply Max OCPD Current Rating	Real	A
Class 2 Power Supply	datasheet	Link to datasheet	txt	n/a
Cable Assembly	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
Cable Assembly	type	Cable/Wire Type	txt	(PV Wire, TC-ER, etc)
Cable Assembly	connector_flag	Connectorized (Y/N)	Enum	0=No; 1=Yes
Cable Assembly	mfr	Manufacturer	txt	n/a
Cable Assembly	part_no	Part #	txt	n/a
Cable Assembly	n_connections	Number of connection terminals	Integer	Each
Cable Assembly	v_rating	AC Voltage Rating	Real	V
Cable Assembly	n_conductors	Total # of Conductors	Integer	Each
Cable Assembly	n_current_carrying_pwr_conductors	# of Current Carrying **Power** Conductors (as distinguished from signal cond	Integer	Each
Cable Assembly	pwr_conductor_awg	Power Conductor Size	txt	AWG
Cable Assembly	n_egc	# of Equipment Grounding Conductors	Integer	Each
Cable Assembly	egc_awg	EGC Size	Txt	AWG
Cable Assembly	n_sig_conductors	# of Control/Signal Conductors	Integer	Each
Cable Assembly	sig_conductor_awg	Control/Signal Conductor size	Txt	AWG
Cable Assembly	length	Cable Length	Real	ft

Sub-System	Field Label	Description	Type	Units
Cable Assembly	datasheet	Link to datasheet	txt	n/a
Combiner	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
Combiner	mfr	Manufacturer	txt	n/a
Combiner	model	Model #	txt	n/a
Combiner	type	AC or DC combiner?	Enumerated	1=AC; 2=DC
Combiner	n_inputs	# of Input Circuits	Integer	Each
Combiner	i_rating_per_input	Input current rating per circuit	Real	A
Combiner	output_i_rating	Output current rating / Busbar rating	Real	A
Combiner	v_rating	Voltage rating	Real	V
Combiner	input_ocpd_type	Input Circuit OCPD Type	Enumerated	1 = Breaker; 2 = Fuse
Combiner	input_ocpd_rating	Input Circuit OCPD Rating	Real	A
Combiner	disconnecting_means	Disconnect type (None, Switch, Blade)	Enumerated	0 = No Disconnect; 1 = Circuit Breaker; 2 = Dedicated Disconnect
Combiner	max_mount_angle	Maximum Mounting Angle	Real	deg
Combiner	min_mount_angle	Minimum Mounting Angle	Real	deg
Combiner	datasheet	Link to datasheet	txt	n/a
Production Meter	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
Production Meter	part_no	Part #	txt	n/a
Production Meter	datasheet	Link to datasheet	txt	n/a
Disconnect	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
Disconnect	type	Disconnect Type	Enumerated	1 = AC 2 = DC
Disconnect	part_no	Part #	txt	n/a
Disconnect	i_rating	Current Rating	Real	A
Disconnect	v_rating	Voltage Rating	Real	V
Disconnect	n_poles	# of Poles	Integer	Each
Disconnect	datasheet	Link to datasheet	txt	n/a
Solar Connection Device Requirements	ref_id	Standard Electrical Plan Functional Block reference	Integer	n/a
Solar Connection Device Requirements	connector_flag	Connectorized (Y/N)	Enum	Y/N
Solar Connection Device Requirements	ocpd_min	Min OCPD size	Real	A
Solar Connection Device Requirements	ocpd_max	Max OCPD size	Real	A
Conduit Schedule	tag	lettered annotation	txt	n/a
Conduit Schedule	description	text description of which cables it handles (ref to a ref_id), and other relevant information about the conduit	txt	n/a
Conduit Schedule	type	PVC, EMT, etc	txt	n/a
Conduit Schedule	size	inner diameter	Real	in
Conduit Schedule	n_conduit_conductors	# of conductors running in the conduit	Integer	Each

A1.5 Master Inspection Checklist

Sub-System	Description	Reference(s)
String Inverter System	Total number of PV modules match the approved plans	P&P Standard
String Inverter System	Total number of power converters match the approved plans	P&P Standard
String Inverter System	Total system power rating matches the approved plans	P&P Standard
String Inverter System	Site layout drawings match the approved plans	P&P Standard
String Inverter System	# of DC Strings matches plans	P&P Standard
String Inverter System	# of AC branch circuits matches plans	P&P Standard
String Inverter System	# of paralleled AC sources per branch circuit matches plans	P&P Standard
String Inverter System	Total system power rating is less than applicable P&P limits	P&P Standard
String Inverter System	Systems with DC voltage > 80V, shall incorporate listed Arc Fault detection	690.11
String Inverter System	Systems with DC voltage > 80V shall incorporate an annunciator to identify if an arc fault has occurred	690.11
String Inverter System	With the exception of AC module systems, ungrounded conductors shall be protected by a listed ground fault detector	690.5, 690.6, 690.35
String Inverter System	GFCI, if required, properly isolates the faulted circuit	690.5, 690.6, 690.35
String Inverter System	System is equipped with an approved rapid shutdown device	690.12
String Inverter System	PV System has an approved AC disconnecting means located in a readily accessible location outside the building	690.15
String Inverter System	PV System includes a means to disconnect all ungrounded DC conductors from all other conductors in a readily accessible location, outside the building	690.15, 690.17, 690.54, 690.13
String Inverter System	Grounded two-wire DC systems have one conductor grounded or impedance grounded; Grounded bipolar systems have the reference (center tap) conductor grounded	690.41
String Inverter System	DC circuit grounding conductor connects at a single point to grounding electrode conductor through accepted means of bonding	690.42
String Inverter System	Equipment ground conductor connects at a single point to grounding electrode conductor through accepted means of bonding	690.43(B)
String Inverter System	Grounded conductor in grounded DC systems has continuous connection to grounding electrode conductor	690.49, 690.31(J)
String Inverter System	Equipment grounding conductor maintains continuity throughout PV system to grounding electrode conductor connection	690.48
String Inverter System	There is a disconnecting means to disconnect OCPD from all sources of supply. For source circuits, it shall be capable of being disconnected independently of other source circuits	690.16
ACM/MI System	Total number of PV modules match the approved plans	P&P Standard
ACM/MI System	Total number of power converters match the approved plans	P&P Standard

Sub-System	Description	Reference(s)
ACM/MI System	Total system power rating matches the approved plans	P&P Standard
ACM/MI System	Site layout drawings match the approved plans	P&P Standard
ACM/MI System	# of AC branch circuits matches plans	P&P Standard
ACM/MI System	# of series connected DC sources per circuit matches plans	P&P Standard
ACM/MI System	Total system power rating is less than applicable P&P limits	P&P Standard
ACM/MI System	Systems with DC voltage > 80V, shall incorporate listed Arc Fault detection	690.11
ACM/MI System	Systems with DC voltage > 80V shall incorporate an annunciator to identify if an arc fault has occurred	690.11
ACM/MI System	With the exception of AC module systems, ungrounded conductors shall be protected by a listed ground fault detector	690.5, 690.6, 690.35
ACM/MI System	GFCI, if required, properly isolates the faulted circuit	690.5, 690.6, 690.35
ACM/MI System	System is equipped with an approved rapid shutdown device	690.12
ACM/MI System	PV System has an approved AC disconnecting means located in a readily accessible location outside the building	690.15
ACM/MI System	Equipment ground conductor connects at a single point to grounding electrode conductor through accepted means of bonding	690.43(B)
ACM/MI System	Equipment grounding conductor maintains continuity throughout PV system to grounding electrode conductor connection	690.48
ACM/MI System	There is a disconnecting means to disconnect OCPD from all sources of supply. For source circuits, it shall be capable of being disconnected independently of other source circuits	690.16
PV Module Block	PV Modules are Listed to UL1703	690.4(B)
PV Module Block	PV Modules are labeled in accordance with NEC 690.51	690.51
PV Module Block	Module manufacturer and model # match the approved plans	P&P Standard
PV Module Block	Panel OCV is within specification (tbd - does this belong here?, >2V, < 1.25 x OCV)	P&P Standard
PV Module Block	Modules are mounted in compliance with manufacturer specifications	Oregon, Wisc, IREC, EERE
PV Module Block	Roof penetrations are secure and weather tight	EERE, Santa Clara, IREC
PV Module Block	PV Modules are protected by over current protection device per 690.9, located in an accessible location	690.9
PV Module Block	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 112
PV Module Block	Elecrical connections are fully and properly engaged	110.3(B), 110.12(A)
PV Module Block	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50

Sub-System	Description	Reference(s)
PV Module Block	Connectors listed to UL6703. Connectors are guarded (690.33(C)), polarized (690.33(B)), Have FMLB Grounding member 690.33(D))	690.33
PV Module Block	If not rated for interrupting current, module connectors are labeled with ""Do Not Disconnect Under Load" or "Not for Current Interrupting."	690.33(E)
PV Module Block	# of series connected DC sources per circuit matches plans	P&P Standard
AC Module Block	AC Modules are Listed to UL1703	690.4(B)
AC Module Block	AC Module manufacturer and model # is in accordance with plans	690.4, 690.13
AC Module Block	AC Module is Listed to UL1741	690.4, 690.13
AC Module Block	AC Module is labeled in accordance with 690.13, 690.53, 690.56	690.13, 690.53, 690.56
AC Module Block	AC Module has an approved means to disconnect from ungrounded conductors of all sources, within or in sight of inverter.	690.13, 690.15
AC Module Block	AC output voltage matches the premises connection	P&P Standard
AC Module Block	AC Module output is protected by over current protection device per 690.9	690.9
AC Module Block	AC Module is labeled in accordance with NEC 690.51	690.51
AC Module Block	AC Modules are mounted in compliance with manufacturer specifications	Oregon, Wisc, IREC, EERE
AC Module Block	Roof penetrations are secure and weather tight	EERE, Santa Clara, IREC
AC Module Block	Electrical connections are properly terminated and weather tight	110.3(B), 112
AC Module Block	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
AC Module Block	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50
AC Module Block	Connectors listed to UL6703. Connectors are guarded (690.33(C)), polarized (690.33(B)), Have FMLB Grounding member 690.33(D))	690.33
AC Module Block	If not rated for interrupting current, module connectors are labeled with ""Do Not Disconnect Under Load" or "Not for Current Interrupting."	690.33(E)
AC Module Block	# of paralleled AC sources per branch circuit matches plans	P&P Standard
Inverter	Inverter manufacturer and model # is in accordance with plans	690.4, 690.13
Inverter	Inverter is Listed to UL1741	690.4, 690.13
Inverter	Inverter is labeled in accordance with 690.13, 690.53, 690.56	690.13, 690.53, 690.56
Inverter	Max current per input circuit is less than <1.25 max input rating	690.8
Inverter	Max combined current of paralleled sources is <1.25X max input rating of converter	690.8
Inverter	Input Voltage rating is sufficient for the maximum DC voltage per 690.7	690.7

Sub-System	Description	Reference(s)
Inverter	Inverters have an approved means to disconnect from ungrounded conductors of all sources, within or in sight of inverter.	690.13, 690.15
Inverter	AC output voltage matches the premises connection	P&P Standard
Inverter	Inverter output is protected by over current protection device per 690.9	690.9
Inverter	Inverter input circuit is protected by over current protection device per 690.9	690.9
Inverter	Connectors are listed for the application	690.33
Inverter	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
Inverter	Elecrical connections are fully and properly engaged	110.3(B), 112
Inverter	Enclosures are firmly secured to the mounting surface, and mounted in compliance with manufacturer specifications	110.3(B), 110.13
Inverter	For any user-serviceable compartments: verify that the cover is closed and secured correctly	110.12(A)
Inverter	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50
Microinverter	Microinverter manufacturer and model # is in accordance with plans	690.4, 690.13
Microinverter	Microinverter is Listed to UL1741	690.4, 690.13
Microinverter	Microinverter is labeled in accordance with 690.13, 690.53, 690.56	690.13, 690.53, 690.56
Microinverter	Max current per input circuit is less than <1.25 max input rating	690.8
Microinverter	Max combined current of paralleled sources is <1.25X max input rating of converter	690.8
Microinverter	Input Voltage rating is sufficient for the maximum DC voltage per 690.7	690.7
Microinverter	Microinverters have an approved means to disconnect from ungrounded conductors of all sources, within or in sight of Microinverter.	690.13, 690.15
Microinverter	AC output voltage matches the premises connection	P&P Standard
Microinverter	Microinverter output is protected by over current protection device per 690.9	690.9
Microinverter	Microinverter input circuit is protected by over current protection device per 690.9	690.9
Microinverter	Connectors are appropriately listed for the application	690.33
Microinverter	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
Microinverter	Elecrical connections are fully and properly engaged	110.3(B), 112
Microinverter	Enclosure is firmly secured to the mounting surface, and mounted in compliance with manufacturer specifications	110.3(B), 110.13
Microinverter	For any user-serviceable compartments: verify that the cover is closed and secured correctly	110.12(A)

Sub-System	Description	Reference(s)
Microinverter	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50
Microinverter	# of paralleled AC sources per branch circuit matches plans	P&P Standard
DC-DC Converter	Converter manufacturer and model # is in accordance with plans	690.4, 690.13
DC-DC Converter	Converter is Listed to UL1741	690.4, 690.13
DC-DC Converter	Converter is labeled in accordance with 690.13, 690.53, 690.56	690.13, 690.53, 690.56
DC-DC Converter	Max current per input circuit is less than <1.25 max input rating per string input	690.8
DC-DC Converter	Max combined current of paralleled sources is <1.25X max input rating of converter	690.8
DC-DC Converter	Input Voltage rating is sufficient for the maximum DC voltage per 690.7	690.7
DC-DC Converter	Converter output is protected by over current protection device per 690.9	690.9
DC-DC Converter	Connectors are appropriately listed for the application	690.33
DC-DC Converter	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
DC-DC Converter	Elecrical connections are fully and properly engaged	110.3(B), 112
DC-DC Converter	Enclosure is firmly secured to the mounting surface, and mounted in compliance with manufacturer specifications	110.3(B), 110.13
DC-DC Converter	For any user-serviceable compartments: verify that the cover is closed and secured correctly	110.12(A)
DC-DC Converter	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50
DC-DC Converter	# of series connected converter per string matches plans	P&P Standard
Class 2 Power Supply	Manufacturer and model # is in accordance with plans	690.4, 690.13
Class 2 Power Supply	Max current per input circuit is less than <1.25 max input rating per string input	690.8
Class 2 Power Supply	Input Voltage rating is sufficient for the maximum DC voltage per 690.7	690.7
Class 2 Power Supply	Output is protected by over current protection device per 690.9	690.9
Class 2 Power Supply	Connectors are appropriately listed for the application	690.33
Class 2 Power Supply	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
Class 2 Power Supply	Elecrical connections are fully and properly engaged	110.3(B), 112
Class 2 Power Supply	Enclosure is firmly secured to the mounting surface, and mounted in compliance with manufacturer specifications	110.3(B), 110.13
Class 2 Power Supply	For any user-serviceable compartments: verify that the cover is closed and secured correctly	110.12(A)
Class 2 Power Supply	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50
Cable Assembly	Conductor ampacity is sufficient for the max current of the connected source(s) per 690.8	690.8

Sub-System	Description	Reference(s)
Cable Assembly	Conductor voltage rating is sufficient for the connected source(s) per 690.7	690.7
Cable Assembly	Conductors are protected by over current protection device per 690.9	690.9
Cable Assembly	Cable assembly is an NEC-approved wiring method (e.g., 690.33, Chapter 3 / Article 300) for the application	690.33, 300, 110.8
Cable Assembly	Conductors are appropriately color coded, Conductors of various PV source & output circuits grouped, identified	690.31(B)
Cable Assembly	Conductors are listed and specified for the application	690.31
Cable Assembly	Conductors are undamaged	110.12(B)
Cable Assembly	Conductor bend radius is within specification, sufficient clearance around connectors	336.24, IREC
Cable Assembly	Wiring is installed in a neat & workmanlike manner; Conductor follows the surface of the building	110.12, IREC
Cable Assembly	Cable or Raceway is adequately supported at 6' intervals	334.3
Cable Assembly	Raceways terminated by adequate fittings or other means	300.12
Cable Assembly	Raceways are mechanically continiuous	300.12
Cable Assembly	Raceway is properly sized for conductors	300.17
Cable Assembly	PV Source & Output circuits in readily accessible location are suitably guarded 150+VDC in an accessible location	690.31(A), 690.7(D)
Cable Assembly	Cable protected from physical damage by approved means: protected from touching roof or other abrasive surfaces exposing them to physical damage.	334.12, IREC
Cable Assembly	PV Source & Output circuit conductors routed in a raceway that does not include conductors from other systems	690.31(B)
Cable Assembly	Equip ground conductor routed in the same raceway as other conductors	690.43, IREC
Cable Assembly	Equipment Ground is suitably sized and specified	690.45, 690.46, 250.120(c), EERE, 250.120, 250.122
Cable Assembly	Max DC bus voltage of series connected sources <600V	690.7C
Cable Assembly	Raceways, conduit, etc inside building shall be marked in accordance with 690.31(G)(3)	690.31(G)(3)
Cable Assembly	Connectors listed for the purpose.	690.33
Cable Assembly	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
Cable Assembly	Elecrical connections are fully and properly engaged	110.3(B), 112
Disconnect	Interrupting current rating is sized for max circuit current rating per 690.8	690.15, 690.17
Disconnect	Voltage rating is sized for max voltage per 690.7	690.15, 690.17

Sub-System	Description	Reference(s)
Disconnect	Disconnect is identified and listed for the specified purpose	690.15, 690.17
Disconnect	Connectors are appropriately listed for the application	690.33
Disconnect	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
Disconnect	Elecrical connections are fully and properly engaged	110.3(B), 112
Disconnect	Enclosure is firmly secured to the mounting surface, and mounted in compliance with manufacturer specifications	110.3(B), 110.13
Disconnect	For any user-serviceable compartments: verify that the cover is closed and secured correctly	110.12(A)
Disconnect	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50
Disconnect	<6 disconnects in a single enclosure; Disconnects from more than one source shall be grouped and identified	690.31
Combiner	DC Combiners have a disconnect in the combiner, or within 1.8m of the combiner	690.15(C)
Combiner	Combiner model # is in accordance with plans	P&P Standard
Combiner	Combiner is listed to UL1741	690.4
Combiner	Voltage rating is sized for max voltage per 690.7	690.7
Combiner	Max current per input circuit is less than <1.25 max input rating per input	690.8
Combiner	Max combined current of paralleled sources is <1.25X max output rating of combiner	690.8
Combiner	Properly sized OCPD protects output	690.9
Combiner	Connectors are appropriately listed for the application	690.33
Combiner	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
Combiner	Elecrical connections are fully and properly engaged	110.3(B), 112
Combiner	Enclosure is firmly secured to the mounting surface, and mounted in compliance with manufacturer specifications	110.3(B), 110.13
Combiner	For any user-serviceable compartments: verify that the cover is closed and secured correctly	110.12(A)
Combiner	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50
Supply-Side Premises Interconnection	Premises voltage matches nominal voltage of PV system	P&P Standard
Supply-Side Premises Interconnection	Backfeed overcurrent protection sized appropriately for generation source	690.9
Supply-Side Premises Interconnection	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)

Sub-System	Description	Reference(s)
Load-Side Premises Interconnection	Sum of PV breaker and panel main breaker less than 120% of panel rating	NEC
Load-Side Premises Interconnection	Premises voltage matches nominal voltage of PV system	P&P Standard
Load-Side Premises Interconnection	Backfeed overcurrent protection sized appropriately for generation source	690.9
Load-Side Premises Interconnection	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
Production Meter	Connectors are appropriately listed for the application	690.33
Production Meter	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)
Production Meter	Elecrical connections are fully and properly engaged	110.3(B), 112
Production Meter	Enclosure is firmly secured to the mounting surface, and mounted in compliance with manufacturer specifications	110.3(B), 110.13
Production Meter	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50

A1.6 Self Test Data Model Library

Sub-System	Test Item	Units	key name	actual value (d)	Passing condition for Code Compliance Test			passing condition for permit compliance test		
					LB	Spec	UB	LB	Spec	UB
AC Module PV System Self Test Report	Total # of ACMs	Each	n_acm	Total # of ACMs detected in the system	n/a	n/a	n/a		# of ACMs specified on the permit	n/a
AC Module PV System Self Test Report	Total # of branch circuits	Each	n_branchcircuit	Total # of branch circuits detected in the system	1 (Set by P&P std)	n/a	3 (set by P&P std)	n/a	# of branch circuits specified on the permit	n/a
AC Module PV System Self Test Report	Total pwr rating	W	ac_rating	Detected AC power rating of the system	0	n/a	10000 (set by P&P std)	Permitted AC rating x 0.99	n/a	Permitted AC rating x 1.01
AC Module PV System Self Test Report	P&P Part Model #	n/a	pnp_model_no	Detected model number of the overall PV System	n/a	n/a	n/a	n/a	P&P System Model # specified on permit	n/a
AC Module PV System Self Test Report	Max Ambient temp	deg C	max_ambient_temp	Max ambient temp for this location.	n/a	n/a	n/a	Max ambient temp specified on the permit	n/a	n/a
AC Module PV System Self Test Report	Ambient temp on rooftop	deg C	rooftop_temp_adj	Rooftop temperature adjustment for this location.	n/a	n/a	n/a	Rooftop temp adjustment specified on permit	n/a	n/a
AC Module PV System Self Test Report	# of Functional Blocks	Each	n_fcn_blocks	Total number of functional blocks detected	n/a	n/a	n/a	n/a	# of constituent subsystems specified by the permit	n/a
String Inverter PV System Self Test Report	Total # of PV Modules	Each	n_pvmodules	Total # of PV Modules detected in the system	n/a	n/a	n/a	n/a	# of PV Modules specified on permit	n/a
String Inverter PV System Self Test Report	Total # of PV strings	Each	n_strings	Total # of strings detected in the system	1 (Set by P&P std)	n/a	3 (set by P&P std)	n/a	# of strings specified on permit	n/a
String Inverter PV System Self Test Report	Total pwr rating	W	ac_rating	Detected AC power rating of the system	0	n/a	10000 (set by P&P std)	Permitted AC rating x 0.99	n/a	Permitted AC rating x 1.01
String Inverter PV System Self Test Report	P&P Part Model #	n/a	pnp_model_no	Detected model number of the overall PV System	n/a	n/a	n/a	n/a	P&P System Model # specified on permit	n/a
String Inverter PV System Self Test Report	Max Ambient temp	deg C	max_ambient_temp	Max ambient temp for this location.	n/a	n/a	n/a	Max ambient temp specified on the permit	n/a	n/a
String Inverter PV System Self Test Report	Ambient temp on rooftop	deg C	rooftop_temp_adj	Rooftop temperature adjustment for this location.	n/a	n/a	n/a	Rooftop temp adjustment specified on permit	n/a	n/a
String Inverter PV System Self Test Report	# of Functional Blocks	Each	n_fcn_blocks	Total number of functional blocks detected	n/a	n/a	n/a	n/a	# of constituent subsystems specified by the permit	n/a
AC Module Block Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
AC Module Block Self Test Report	# of ACMs per branch	Each	n_acm_bc	# of ACMs in the branch circuit	0	n/a	max number of ACMs allowed, per mfr spec	n/a	Permitted # of ACMs in the branch circuit	n/a
AC Module Block Self Test Report	ACM Model #	n/a	model_no_acm	Model # of the ACMs in the branch circuit	n/a	n/a	n/a	n/a	Permitted ACM Model #	n/a
AC Module Block Self Test Report	ACM power rating	W	ac_rating_acm	Power rating of the ACMs	n/a	n/a	n/a	n/a	n/a	n/a
AC Module Block Self Test Report	ACM Voltage	V	v_acm	Voltage rating of the ACM	n/a	n/a	n/a	n/a	Permitted premises AC Voltage	n/a
AC Module Block Self Test Report	ACM Max Continuous Current	A	i_max_acm	Max Continuous Current of the ACM	n/a	n/a	n/a	n/a	n/a	n/a
AC Module Block Self Test Report	branch circuit current	A	i_branch_circuit	Max branch circuit current	n/a	n/a	n/a	n/a	n/a	n/a
AC Module Block Self Test Report	Overcurrent protection	A	ocpd_branch_circuit	Ampere rating of the circuit breaker or fuse protecting this branch circuit	Required OCPD size, 1.25 x Max branch circuit current _actual	n/a	n/a	n/a	n/a	n/a
AC Module Block Self Test Report	Terminations	Each	terminations_branch_circuit	Total number of mated connections detected in the branch circuit	n/a	Total number of mated connections expected in the branch circuit	n/a	n/a	n/a	n/a
Cable Assembly Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
Cable Assembly Self Test Report	Cable assembly voltage rating	V	v_cable	Voltage rating of the cable assembly	Max Allowable AC Voltage	n/a	Max voltage, based on permit	n/a	n/a	n/a
Cable Assembly Self Test Report	Cable assembly ampacity	A	ampacity_cable	Max ampacity rating, accounting for cable gauge x temp adj x fill factor adj	1.25 x max current of the supply circuits	n/a	n/a	n/a	n/a	n/a
Cable Assembly Self Test Report	Max current from parallel sources	A	max_parallel_current	Maximum backfeed current on to the circuit of all paralllel connected sources	n/a	n/a	n/a	n/a	n/a	n/a
Cable Assembly Self Test Report	Cable assembly OCPD	A	ocpd_cable	Ampere rating of the circuit breaker or fuse protecting this cable assembly	IF max current from other sources = 0, then LB = 0 IF max current from other sources < ampacity_cable_actual, then LB = 0 IF max current from other sources > ampacity_cable_actual, then LB = isc x 1.56	n/a	Actual ampacity of the cable	n/a	n/a	n/a
Cable Assembly Self Test Report	Cable assembly terminations	Each	terminations_cable	Total number of mated connections detected on the cable assembly	n/a	Expected number of mated connections	n/a	n/a	n/a	n/a
Cable Assembly Self Test Report	Cable assembly type	n/a	type_cable	Cable type (e.g., TC-ER, THHN, etc)	n/a	n/a	n/a	n/a	Cable type specified by the permit	n/a
Cable Assembly Self Test Report	Cable Assembly AWG	AWG	awg_cable	Cable AWG	n/a	n/a	n/a	n/a	AWG of conductors specified by the permit	n/a
Cable Assembly Self Test Report	Cable Assembly Max Current @ 30C	A	i_max_30c_cable	Current @ 30C, based on the AWG	n/a	n/a	n/a	n/a	n/a	n/a
Cable Assembly Self Test Report	Cable Assembly # of Conductors	Each	n_conductors_cable	# of conductors in the cable assembly	n/a	n/a	n/a	n/a	Permitted # of conductors in the cable assembly	n/a
Cable Assembly Self Test Report	Cable Assembly temp adjustment	n/a	temp_adj_cable	NEC temperature adjustment factor	n/a	n/a	n/a	n/a	n/a	n/a
Cable Assembly Self Test Report	Cable Assembly Fill Factor Adj.	n/a	ff_adj_cable	NEC fill factor adjustment factor	n/a	n/a	n/a	n/a	n/a	n/a
Combiner Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component						
Combiner Self Test Report	Combiner Model #	n/a	model_no_combiner	Model # of the Combiner	n/a	n/a	n/a	n/a	Permitted Combiner Model #	n/a
Combiner Self Test Report	Combiner Voltage rating	V	v_combiner	Voltage rating of the combiner	n/a	n/a	n/a	n/a	Permitted premises AC Voltage	n/a
Combiner Self Test Report	Combiner input current rating	A	i_input_combiner	Current rating of combiner input(s)	maximum of (1.25 x Max branch circuit current _actual)	n/a	n/a	n/a	n/a	n/a
Combiner Self Test Report	Combiner output current rating	A	i_output_combiner	Current rating of combiner output	sum of bc currents (1.25 x Max branch circuit current _actual)	n/a	n/a	n/a	n/a	n/a
Combiner Self Test Report	Combiner terminations	Each	terminations_combiner	Total number of mated connections detected on the combiner	n/a	Expected number of mated connections	n/a	n/a	n/a	n/a
Combiner Self Test Report	Combiner Output OCPD	A	ocpd_combiner_output	Ampere rating of the circuit breaker or fuse protecting the combiner output	sum of bc currents (1.25 x Max branch circuit current _actual)	n/a	n/a	n/a	n/a	n/a
Combiner Self Test Report	Measured voltage	V	v_meas_combiner	Actual voltage measured at the combiner	ANSI voltage lower limit = 211VAC	n/a	ANSI voltage upper limit = 264VAC	n/a	n/a	n/a
Solar Connection Device Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component						
Solar Connection Device Self Test Report	SCD Type	n/a	type_scd	SCD Type	n/a	n/a	n/a	n/a	n/a	n/a
Solar Connection Device Self Test Report	SCD Model #	n/a	model_no_scd	SCD Model #	n/a	n/a	n/a	n/a	SCD model # specified by the permit	n/a
Solar Connection Device Self Test Report	SCD Voltage	V	v_scd	SCD nominal voltage rating	n/a	n/a	n/a	n/a	Permitted premises AC Voltage	n/a
PV Module Block Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
PV Module Block Self Test Report	# of PV Modules in this string	Each	n_pvmodules_blk	# of PV modules detected in this PV string	n/a	n/a	n/a	n/a	# of PV Modules in the string specified by the permit	n/a
PV Module Block Self Test Report	PV Module Model #	n/a	model_no_pvmodule	Model # of the PV Module	n/a	n/a	n/a	n/a	PV Module model # in the block specified by the permit	n/a
PV Module Block Self Test Report	Measured Panel OCV	V dc	v_oc_pvmodule	Measured voltage on the panel in open-circuit state	Datasheet OCV x 0.5	n/a	Datasheet OCV x 1.2	n/a	n/a	n/a
PV Module Block Self Test Report	Max Series Fuse	A	max_series_fuse_pvmodule	Max series fuse rating for the PV module, per the datasheet	n/a	n/a	n/a	n/a	n/a	n/a

Sub-System	Test Item	Units	key name	actual value (d)	Passing condition for Code Compliance Test			passing condition for permit compliance test		
					LB	Spec	UB	LB	Spec	UB
PV Module Block Self Test Report	Max current from parallel sources	A	max_parallel_current_pvstring	Maximum backfeed current on to the PV string of all parallel connected sources	n/a	n/a	n/a	n/a	n/a	n/a
PV Module Block Self Test Report	PV Modules are protected by over current protection device per 690.9	A	ocpd_pvmodule	Size of OCPD protecting the PV Module Block	IF max current from other sources = 0, then LB = 0 IF max current from other sources < max series fuse, then LB = 0 IF max current from other sources > max series fuse, then LB = isc x 1.56	n/a	max_series_fuse_pvmodule	n/a	n/a	n/a
PV Module Block Self-Test Report	PV Module Power Rating	W	dc_pwrrsting_pvmodule	Power rsting of the PV Modules in this block	n/a	n/a	n/a	n/a	n/a	n/a
PV Module Block Self-Test Report	String Voltage	V dc	v_oc_pvstring	calculated theoretical max voltage of the string, accounting for module OCV and temperature effects	n/a	n/a	600V	n/a	n/a	n/a
PV Module Block Self-Test Report	Voltage temperature adjustment factor	n/a	temp_adj_pvmodule	Voltage adjustment factor for pv module based on temperature	n/a	n/a	n/a	n/a	n/a	n/a
PV Module Block Self-Test Report	PV Module Open-Circuit Voltage, per specification	V dc	v_oc_pvmodule	Module open circuit voltage, per specification/datasheet	n/a	n/a	n/a	n/a	n/a	n/a
PV Module Block Self-Test Report	PV Module Short-Circuit Current, per specification	A	i_sc_pvmodule	Module short circuit current, per specification/datasheet	n/a	n/a	n/a	n/a	n/a	n/a
PV Module Block Self-Test Report	PV string voltage while system is in safe mode	V DC	v_safemode_pvmodule	max voltage measured on the DC string prior to energizing dc bus	n/a	n/a	80V	n/a	n/a	n/a
PV Module Block Self-Test Report	Terminations	Esch	terminations_pvstring	Total number of mated connections detected in the PV string	n/a	Total number of mated connections expected in the PV String	n/a	n/a	n/a	n/a
Class 2 Power Supply Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
Class 2 Power Supply Test Report	Model #	n/a	model_no_class2supply	Model # of the Class 2 supply	n/a	n/a	n/a	n/a	Class2 Supply Model # specified by permit	n/a
Class 2 Power Supply Test Report	Voltage rating of the class 2 power supply	V dc	v_rtg_class2supply	Input voltage rating of the Class 2 power supply	1.1 x Total number of mated connections detected on the cable assembly_actual	n/a	n/a	n/a	n/a	n/a
Class 2 Power Supply Test Report	Class 2 supply input current rating	A	i_input_class2supply	Input current rating of Class 2 supply	1.25 x Current @ 30C, based on the AWG_actual	n/a	n/a	n/a	n/a	n/a
Class 2 Power Supply Test Report	Class 2 supply output current rating	A	i_output_class2supply	Current rating of Class 2 supply output	n/a	n/a	n/a	n/a	n/a	n/a
Class 2 Power Supply Test Report	Class 2 supply terminations	Esch	terminations_class2supply	Total number of mated connections detected on the Class 2 supply	n/a	Expected number of mated connections	n/a	n/a	n/a	n/a
Class 2 Power Supply Test Report	Class 2 Supply Output OCPD	A	ocpd_output_class2supply	Ampere rating of the circuit breaker or fuse protecting the Class 2 Supply output	IF max current from other sources = 0, then LB = 0 IF max current from other sources < i_output_class2supply, then LB = 0 IF max current from other sources > i_output_class2supply, then LB = isc x 1.56	n/a	i_output_class2supply	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Cable assembly voltage rating	V	v_cable	Voltage rating of the cable assembly	600VDC	n/a	n/a	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Cable assembly ampacity	A	ampacity_cable	Max ampacity rating, accounting for cable gauge x temp adj x fill factor adj	1.25 x max current of the supply circuit. E.g., for STR output = 1.25 x Current rating of combiner input(s)_actual	n/a	n/a	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Max current from parallel sources	A	max_parallel_current_pvstring	Maximum backfeed current on to the PV string of all parallel connected sources	n/a	n/a	n/a	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Cable assembly OCPD	A	ocpd_cable	Ampere rating of the circuit breaker or fuse protecting this cable assembly	IF max current from other sources = 0, then LB = 0 IF max current from other sources < ampacity_cable_actual, then LB = 0 IF max current from other sources > ampacity_cable_actual, then LB = isc x 1.56	n/a	ampacity_cable_actual	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Cable assembly terminations	Esch	terminations_cable	Total number of mated connections detected on the cable assembly	n/a	Expected number of mated connections	n/a	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Cable assembly type	n/a	type_cable	Cable type (e.g., TC-ER, THHN, etc)	n/a	n/a	n/a	n/a	Cable type specified by the permit	n/a
DC Cable Assembly Self Test Report	Cable Assembly AWG	AWG	awg_cable	Cable AWG	n/a	n/a	n/a	n/a	AWG of conductors specified by the permit	n/a
DC Cable Assembly Self Test Report	Cable Assembly Max Current @ 30C	A	i_max_30c_cable	Current @ 30C, based on the AWG	n/a	n/a	n/a	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Cable Assembly # of Conductors	Esch	n_conductors_cable	# of conductors in the cable assembly	n/a	n/a	n/a	n/a	Permitted # of conductors in the cable assembly	n/a
DC Cable Assembly Self Test Report	Cable Assembly temp adjustment	n/a	temp_adj_cable	NEC temperature adjustment factor	n/a	n/a	n/a	n/a	n/a	n/a
DC Cable Assembly Self Test Report	Cable Assembly Fill Factor Adj	n/a	ff_adj_cable	NEC fill factor adjustment factor	n/a	n/a	n/a	n/a	n/a	n/a
String Inverter Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	n/a	n/a	n/a	n/a	n/a	n/a	n/a
String Inverter Self Test Report	Inverter Model Number	n/a	model_no_inverter	Model # of the Inverter	n/a	n/a	n/a	n/a	Inverter model # specified by the permit	n/a
String Inverter Self Test Report	Output Power Rating	W AC	ac_rsting_inverter	Inverter AC output power rsting	n/a	n/a	n/a	n/a	AC rsting of the inverter specified by the perit	n/a
String Inverter Self Test Report	Inverter Input Voltage	V dc	v_inverter_dc_input	Calculated max string voltage	Inverter min input operating voltage	n/a	Inverter input voltage rating - max	n/a	n/a	n/a
String Inverter Self Test Report	Inverter Output Voltage	V ac	v_inverter_ac_output	Nominal voltage rating of the inverter	n/a	n/a	n/a	n/a	Permitted premises AC Voltage	n/a
String Inverter Self Test Report	Inverter input current rating per string	A	i_input_perstring_inverter	Max current rating of inverter string input	1.25 x max of all inputs Current rating of combiner input(s)_actual)	n/a	n/a	n/a	n/a	n/a
String Inverter Self Test Report	Inverter total input current rating	A	i_input_total_inverter	Current rating of combined inverter input	(1.25 x sum of all inputs (Current rating of combiner input(s)_actual)	n/a	n/a	n/a	n/a	n/a
String Inverter Self Test Report	Inverter max continuous output current rating	A	i_output_inverter	Current rating of inverter output	n/a	n/a	n/a	n/a	n/a	n/a
String Inverter Self Test Report	Inverter terminations	Esch	terminations_inverter	Total number of mated connections detected on the inverter	n/a	Expected number of mated connections	n/a	n/a	n/a	n/a
String Inverter Self Test Report	Inverter Output OCPD	A	ocpd_inverter_output	Ampere rating of the circuit breaker or fuse protecting the inverter output	1.25 x max output. (1.25 x i_output_inverter_actual)	n/a	Inverter max output fuse	n/a	n/a	n/a
String Inverter Self Test Report	Measured voltage	V	v_meas_inverter	Actual voltage measured at the inverter ouput	ANSI voltage lower limit - 211VAC	n/a	ANSI voltage upper limit - 264VAC	n/a	n/a	n/a
Microinverter Block Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
Microinverter Block Self Test Report	# of MIs per branch	Esch	n_mi_bc	# of MIs in the branch circuit	0	n/a	max number of MIs allowed, per mfr spec	n/a	Permitted # of MIs in the branch circuit	n/a
Microinverter Block Self Test Report	MI Model #	n/a	model_no_mi	Model # of the MIs in the branch circuit	n/a	n/a	n/a	n/a	Permitted MI Model #	n/a
Microinverter Block Self Test Report	MI power rating	W	ac_rsting_mi	Power rating of the MIs	n/a	n/a	n/a	n/a	n/a	n/a
Microinverter Block Self Test Report	MI Nominal AC Voltage	V	ac_v_mi	Nominal AC Voltage of the MI	n/a	n/a	n/a	n/a	Permitted premises AC Voltage	n/a

Sub-System	Test Item	Units	key name	actual value (d)	Passing condition for Code Compliance Test			passing condition for permit compliance test		
					LB	Spec	UB	LB	Spec	UB
Microinverter Block Self Test Report	MI Input Current	A	dc_i_mi	Current rating of MI DC input	1.25 x Max Isc of connected source circuit	n/a	n/a	n/a	n/a	n/a
Microinverter Block Self Test Report	MI Input Voltage	V	dc_v_mi	Voltage rating of MI DC input	Max OCV of connected source circuit	n/a	n/a	n/a	n/a	n/a
Microinverter Block Self Test Report	MI Max Continuous Current	A	i_ac_max_mi	Max Continuous Current of the MI	n/a	n/a	n/a	n/a	n/a	n/a
Microinverter Block Self Test Report	branch circuit current	A	i_branch_circuit	Max branch circuit current	n/a	n/a	n/a	n/a	n/a	n/a
Microinverter Block Self Test Report	Overcurrent protection	A	ocpd_branch_circuit	Ampere rating of the circuit breaker or fuse protecting this branch circuit	Required OCPD size, 1.25 x Max branch circuit current _actual	n/a	n/a	n/a	n/a	n/a
Microinverter Block Self Test Report	Terminations	Each	terminations_branch_circuit	Total number of mated connections detected in the branch circuit	n/a	Total number of mated connections expected in the branch circuit	n/a	n/a	n/a	n/a
DC-DC Converter Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
DC-DC Converter Test Report	Model #	n/a	model_no_converter	Model # of the Converter	n/a	n/a	n/a	n/a	Converter Model # specified by permit	n/a
DC-DC Converter Test Report	# of Converters	Each	n_converters	# of converters in the branch circuit	n/a	n/a	n/a	n/a	Permitted # of converters in the branch circuit	n/a
DC-DC Converter Test Report	Converter Input Current	A	input_i_converter	Current rating of Converter DC input	1.25 x Max Isc of connected source circuit	n/a	n/a	n/a	n/a	n/a
DC-DC Converter Test Report	Converter Input Voltage	V	input_v_converter	Voltage rating of Converter DC input	Max OCV of connected source circuit	n/a	n/a	n/a	n/a	n/a
DC-DC Converter Test Report	Converter max output current	A	i_output_converter	Calculated max current from the converter	n/a	n/a	n/a	n/a	n/a	n/a
DC-DC Converter Test Report	Converter terminations	Each	terminations_converter	Total number of mated connections detected on the Converter	n/a	Expected number of mated connections	n/a	n/a	n/a	n/a
DC-DC Converter Test Report	Converter Max Voltage	V dc	v_ac_converter	calculated theoretical max voltage of the converter block, accounting for module OCV and temperature effects	n/a	n/a	600V	n/a	n/a	n/a
DC-DC Converter Test Report	Class 2 Supply Output OCPD	A	ocpd_output_class2supply	Ampere rating of the circuit breaker or fuse protecting the converter output	IF max current from other sources = 0, then LB = 0 IF max current from other sources < i_output_converter, then LB = 0 IF max current from other sources > i_output_converter, then LB = Isc x 1.56	n/a	i_output_converter	n/a	n/a	n/a
Disconnect Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
Disconnect Test Report	Model #	n/a	model_no_disconnect	Model # of the Disconnect	n/a	n/a	n/a	n/a	Disconnect Model # specified by permit	n/a
Disconnect Test Report	Listing	n/a	disconnect_type	Type of Disconnect		Req'd disco type				
Disconnect Test Report	Disconnect Voltage Rating	A	i_rtg_disconnect	Current rating of Disconnect	Max current of source circuit	n/a	n/a	n/a	n/a	n/a
Disconnect Test Report	Disconnect Current Rating	V	v_rtg_disconnect	Voltage rating of Disconnect	Max voltage of connected source circuit	n/a	n/a	n/a	n/a	n/a
Main Service Panel Self Test Report	Functional Block Reference #	n/a	fcn_block_ref_no	Reference to the functional block in the reference Single Line Diagram represented by this component	n/a	n/a	n/a	n/a	n/a	n/a
Main Service Panel Self Test Report	PV System OCPD	A	max_pv_ocpd	Ampere rating of PV system OCPD			n/a			
Main Service Panel Self Test Report	Main OCPD	A	max_main_ocpd	Ampere rating of Main OCPD			n/a			
Main Service Panel Self Test Report	Max Combined OCPD	A	max_combined_ocpd	(PV System OCPD + Main OCPD)	n/a	n/a	Busbar rating x 1.2	n/a	n/a	n/a

A1.7 Miscellaneous Data Models

Listed below are example data models for the Plug and Play ePI&I communication. Additional data model definitions, for any MIME file type, or written using JSON Schema Version 4, may be submitted by any stakeholder using the Plug and Play API. Some datasets collected by the server are in PDF format. The others are in JSON format, as defined for each by a JSON schema as shown below.

Example PDF dataset labels:

- Schedule Z (MA) : Schedule Z (MA) Net Metering Form
- Site Plan
- Contract: Contract between installer and property owner

Example JSON datasets:

Premises Electric Details

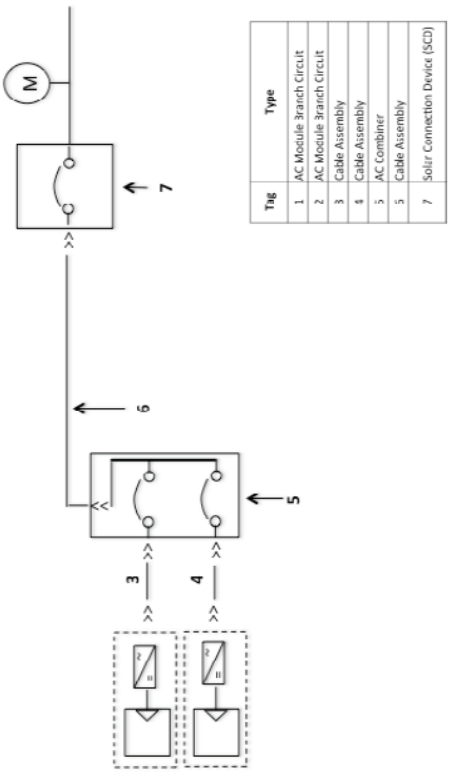
Information on the electrical connections on a set of premises

Attributes

Name	Type	Description	Example
Connection Location	*string*	Is the connection on the Supply Side or Load Side of the Main Service panel? **one of:**`"Supply Side"` or `"Load Side"`	`"Supply Side"`
Connection Type	*string*	Wiring type for the premises. **one of:**`"Hard Wired"` or `"Solar Connection Device"`	`"Hard Wired"`
Service Panel:Service Panel OCPD rating	*number*	Amps (Only needed if connection is on the load side)	`42.0`
Service Panel:Service Panel current rating	*number*	Amps (Only needed if connection is on the load side)	`42.0`
Service Panel:Service Panel rating	*number*	Current rating for the main panel (amps)	`42.0`
Service Panel:circuits/current	*number*	current in amperes	`42.0`
Service Panel:circuits/voltage	*number*	AC Voltage	`42.0`
Solar Connection Device:SCD Type	*string*	**one of:**`"Meter Collar"` or `"Meter Socket"` or `"Enclosure / Subpanel"` or `"Main Panel"`	`"Meter Collar"`
Solar Connection Device:ac_current_rating	*number*	Input Current Rating	`42.0`
Solar Connection Device:ac_voltage_rating	*number*	Input Voltage Rating	`42.0`
Solar Connection Device:disconnect_included	*boolean*	Integrated Disconnect?	`true`
Solar Connection Device:install_date	*string*	Installation Date	`"example"`
Solar Connection Device:mfr	*string*	Manufacturer	`"example"`

Solar Connection Device:model	*string*	Model	`"example"`
Solar Connection Device:ocpd_type	*string*	OCPD Type (1 = Breaker; 2 = Fuse) **one of:**`"Breaker"` or `"Fuse"`	`"Breaker"`
Solar Connection Device:pv_ocpd	*string*	PV System OCPD Current Rating	`"example"`
ac_voltage	*number*		`42.0`
ac_voltage_description	*string*		`"1Ph 2Wi 120V L-N – 1-Phase, 2-Wire 120 V Line to Neutral."`
notes	*string*	Any other notes	`"example"`

A2.1 System Plan - Summary



Tag	Type
1	AC Module Branch Circuit
2	AC Module Branch Circuit
3	Cable Assembly
4	Cable Assembly
5	AC Combiner
6	Cable Assembly
7	Solar Connection Device (SCD)

Manufacturer	PV Systems, Inc
Type of System	AC Module
Maximal Configuration	Maximum constraints on system size and configuration: Max 2 branch circuits 12 AC Modules per branch 7,858 kW- max AC Power rating 240V AC nominal voltage
Grounding System	Rack bonded to ACM frame w/UL2703 hardware. Grounding conductors path is continuous from frame to a 4-wire premises-side Solar Connection Device
Rapid Shutdown	AC Modules provide rapid shutdown, activated from an AC Combiner outside premises
AFCI description	N/A
GFCI description	N/A
AC Disconnecting Means	Integral disconnect in SCD
DC Disconnecting Means	N/A
Software Commissioning Application	Embedded platform housed in an AC Combiner executes self-test: (1) maps array, (2) detects end-caps, and (3) detects connection to SCD. Mobile app provides an HMI to interface with the embedded platform.

Sub-Systems

Sub-System	Description	Sys Config Diagram Reference	Connectorized? (Y/N)
Array Mounting	Racking system to be identified by installer; UL2703 bonding screws secure rack to frame	N/A	N/A
PV Array - Branch Circuit #1-2	Part #SPR-E20-327-AC Branch circuit terminated with smart end cap protected by 20A OCPD in AC Combiner	1-2	Y
PV Array to AC Combiner Wiring	Each branch uses a pre-fabricated 10AWG TC-ER 3 conductor cable (L1, L2, PE), length specified by installer. Excess cable secured under rooftop array Conduit schedule defined by installer Conductors protected by 20A OCPD in AC Combiner	3-4	Y
AC Combiner	Part # PV-ACC-V12 Houses embedded controller Input: 20A smart breaker per branch circuit input, pin & sleeve connector sys Output: Rated to 60A, terminated SCD receptacle. Protected by OCPD in SCD	5	Y
AC combiner to Premises Connection wiring	Pre-fabricated 2 meter, 4 conductor 6AWG USE wire connects SCD to AC Combiner Housed in flex conduit Conductors protected by OCPD in SCD	5	Y
Premises Connection	Premises connection through Solar Connection Device on load side or supply side SCD incorporates AC disconnect SCD requires 40A breaker	7	Y

A2.2 System Specification

Sub-System	Field Label	Description	Type	value
Microinverter/ACM System information	Vendor	Vendor	txt	SunPower
Microinverter/ACM System information	PnP ID	Unique P&P System Reference Identifier - a "model #" for a P&P system	txt	SPWR-EQX-123
Microinverter/ACM System information	Version	System Certification Version	Integer	1
Microinverter/ACM System information	Type	System Type	Enumerated	1 (AC Module)
Microinverter/ACM System information	max_ac_pwr_rating	Maximum allowable AC Power rating of the PV System	Real	7848
Microinverter/ACM System information	max_branch_circuits	Maximum allowable number of branch circuits	Integer	2
Microinverter/ACM System information	n_branch_circuits	Number of branch circuits in the PV System	Integer	<configurable>
Microinverter/ACM System information	ac_pwr_rating	Actual AC Power rating of the PV System	Real	<configurable>
Microinverter/ACM System information	max_ambient_temp	Max expected ambient temperature	Real	<configurable>
Microinverter/ACM System information	max_rooftop_temp	Rooftop temperature adjustment factor	Real	<configurable>
Microinverter/ACM System information	n_fcn_blocks	# of subsystems within the PV System	Integer	7
ACM Block	ref_id	Standard Electrical Plan Functional Block reference		1
ACM Block	mfr	AC Module Manufacturer		SunPower
ACM Block	model	AC Module Model #		SPR-E20-327-AC
ACM Block	max_ACMs	Max ACMs per Branch Circuit		12
ACM Block	n_ACMs	Number of AC Modules in this block		<configurable>
ACM Block	ac_pwr_rating	AC Module AC Power Rating		320
ACM Block	ac_i_rating	AC Module AC Output Current		1.33
ACM Block	ac_v_rating	AC Module Nominal AC Voltage		240
ACM Block	max_ocpd	AC Module Max OCPD Current Rating		20
ACM Block	datasheet	Link to datasheet		http://us.sunpower.com/sites/sunpower/files/media-library/data-sheets/ds-e20-series-327-320-residential-ac-modules.pdf
ACM Block	ref_id	Standard Electrical Plan Functional Block reference		2
ACM Block	mfr	AC Module Manufacturer		SunPower
ACM Block	model	AC Module Model #		SPR-E20-327-AC
ACM Block	max_ACMs	Max ACMs per Branch Circuit		12
ACM Block	n_ACMs	Number of AC Modules in this block		<configurable>
ACM Block	ac_pwr_rating	AC Module AC Power Rating		320
ACM Block	ac_i_rating	AC Module AC Output Current		1.33
ACM Block	ac_v_rating	AC Module Nominal AC Voltage		240
ACM Block	max_ocpd	AC Module Max OCPD Current Rating		20
ACM Block	datasheet	Link to datasheet		http://us.sunpower.com/sites/sunpower/files/media-library/data-sheets/ds-e20-series-327-320-residential-ac-modules.pdf
Cable Assembly	ref_id	Standard Electrical Plan Functional Block reference		3
Cable Assembly	type	Cable/Wire Type	txt	SOOW
Cable Assembly	connector_flag	Connectorized (Y/N)	Enum	1 (Connectorized)
Cable Assembly	mfr	Manufacturer	txt	Cerrowire
Cable Assembly	part_no	Part #	txt	283-3603A
Cable Assembly	n_connections	Number of connection terminals		2
Cable Assembly	v_rating	AC Voltage Rating	Real	600
Cable Assembly	n_conductors	Total # of Conductors	Integer	3

Sub-System	Field Label	Description	Type	value
Cable Assembly	n_current_carrying_pwr_conductors	# of Current Carrying **Power** Conductors (as distinguished from signal conductors)	Integer	2
Cable Assembly	pwr_conductor_awg	Power Conductor Size	Integer	12
Cable Assembly	n_egc	# of Equipment Grounding Conductors	Integer	1
Cable Assembly	egc_awg	EGC Size	Txt	12
Cable Assembly	n_sig_conductors	# of Control/Signal Conductors	Integer	0
Cable Assembly	sig_conductor_awg	Control/Signal Conductor size	Txt	n/a
Cable Assembly	length	Cable Length	Real	<configurable>
Cable Assembly	conduit_tag	cross reference to conduit schedule	txt	<configurable>
Cable Assembly	datasheet	Link to datasheet	txt	http://www.homedepot.com/p/Cerrowire-25-ft-12-3-600-Volt-Black-SOOW-Cord-283-3603A/202564775
Cable Assembly	ref_id	Standard Electrical Plan Functional Block reference		4
Cable Assembly	type	Cable/Wire Type	txt	SOOW
Cable Assembly	connector_flag	Connectorized (Y/N)	Enum	1 (Connectorized)
Cable Assembly	mfr	Manufacturer	txt	Cerrowire
Cable Assembly	part_no	Part #	txt	283-3603A
Cable Assembly	n_connections	Number of connection terminals		2
Cable Assembly	v_rating	AC Voltage Rating	Real	600
Cable Assembly	n_conductors	Total # of Conductors	Integer	3
Cable Assembly	n_current_carrying_pwr_conductors	# of Current Carrying **Power** Conductors (as distinguished from signal conductors)	Integer	2
Cable Assembly	pwr_conductor_awg	Power Conductor Size	Integer	12
Cable Assembly	n_egc	# of Equipment Grounding Conductors	Integer	1
Cable Assembly	egc_awg	EGC Size	Txt	12
Cable Assembly	n_sig_conductors	# of Control/Signal Conductors	Integer	0
Cable Assembly	sig_conductor_awg	Control/Signal Conductor size	Txt	n/a
Cable Assembly	length	Cable Length	Real	<configurable>
Cable Assembly	conduit_tag	cross reference to conduit schedule	txt	<configurable>
Cable Assembly	datasheet	Link to datasheet	txt	http://www.homedepot.com/p/Cerrowire-25-ft-12-3-600-Volt-Black-SOOW-Cord-283-3603A/202564775
Combiner	ref_id	Standard Electrical Plan Functional Block reference	Integer	5
Combiner	mfr	Manufacturer	txt	SunPower
Combiner	model	Model #	txt	PnP-PVS5-001
Combiner	type	AC or DC combiner?	Enumerated	1 (AC Combiner)
Combiner	n_inputs	# of Input Circuits	Integer	2
Combiner	i_rating_per_input	Input current rating per circuit	Real	20
Combiner	output_i_rating	Output current rating / Busbar rating	Real	60
Combiner	v_rating	Voltage rating	Real	1000
Combiner	input_ocpd_type	Input Circuit OCPD Type	Enumerated	Breaker
Combiner	input_ocpd_rating	Input Circuit OCPD Rating	Real	20
Combiner	disconnecting_means	Disconnect type (None, Switch, Blade)	Enumerated	0 (none)
Combiner	max_mount_angle	Maximum Mounting Angle		0
Combiner	min_mount_angle	Minimum Mounting Angle		180

Sub-System	Field Label	Description	Type	value
Combiner	nrtl_ref	NRTL File #	txt	n/a
Combiner	datasheet	Link to datasheet	txt	n/a
Cable Assembly	ref_id	Standard Electrical Plan Functional Block reference		6
Cable Assembly	type	Cable/Wire Type	txt	THHN
Cable Assembly	connector_flag	Connectorized (Y/N)	Enum	1 (Connectorized)
Cable Assembly	mfr	Manufacturer	txt	Phoenix
Cable Assembly	part_no	Part #	txt	PnP-123
Cable Assembly	n_connections	Number of connection terminals		2
Cable Assembly	v_rating	AC Voltage Rating	Real	600V
Cable Assembly	n_conductors	Total # of Conductors	Integer	7
Cable Assembly	n_current_carrying_pwr_conductors	# of Current Carrying **Power** Conductors (as distinguished from signal conductors)	Integer	3
Cable Assembly	pwr_conductor_awg	Power Conductor Size	Integer	6
Cable Assembly	n_egc	# of Equipment Grounding Conductors	Integer	1
Cable Assembly	egc_awg	EGC Size	Txt	6
Cable Assembly	n_sig_conductors	# of Control/Signal Conductors	Integer	4
Cable Assembly	sig_conductor_awg	Control/Signal Conductor size	Txt	18
Cable Assembly	length	Cable Length	Real	<configurable>
Cable Assembly	conduit_tag	cross reference to conduit schedule	txt	<configurable>
Cable Assembly	datasheet	Link to datasheet	txt	n/a
Solar Connection Device	ref_id	Standard Electrical Plan Functional Block reference		7
Solar Connection Device	connector_flag	Connectorized (Y/N)	Enum	1 (Connectorized)
Solar Connection Device	ocpd_min	Min OCPD size		40
Solar Connection Device	ocpd_max	Max OCPD size		60
Conduit Schedule	tag	lettered annotation	txt	A
Conduit Schedule	description	text description of which cables it handles (ref to a ref_id), and other relevant information about the conduit	txt	<configurable>
Conduit Schedule	type	PVC, EMT, etc	txt	<configurable>
Conduit Schedule	size	inner diameter	Real	<configurable>
Conduit Schedule	n_conduit_conductors	# of conductors running in the conduit	Integer	<configurable>
Conduit Schedule	tag	lettered annotation	txt	B
Conduit Schedule	description	text description of which cables it handles (ref to a ref_id), and other relevant information about the conduit	txt	<configurable>
Conduit Schedule	type	PVC, EMT, etc	txt	<configurable>
Conduit Schedule	size	inner diameter	Real	<configurable>
Conduit Schedule	n_conduit_conductors	# of conductors running in the conduit	Integer	<configurable>

A2.3 Code Compliance Plan

Sub-System	Description	Reference(s)	Verification Method	Expanded Description of Verification Method	Self test reference	Vis doc reference
ACM/MI System	Total number of PV modules match the approved plans	P&P Standard	Design	AC Modules, pv module count is implied through interrogation of electronics	n/a	n/a
ACM/MI System	Total number of power converters match the approved plans	P&P Standard	Self-Test	Interrogation of AC Modules	1	n/a
ACM/MI System	Total system power rating matches the approved plans	P&P Standard	Self-Test	Calculated: based on AC Modules count x power output referenced from AC Module part #	3	n/a
ACM/MI System	Site layout drawings match the approved plans	P&P Standard	Visual	Digital photograph of PV Array	n/a	1
ACM/MI System	# of AC branch circuits matches plans	P&P Standard	Self-Test	Implied by detected presence of AC Modules on each branch circuit	2	n/a
ACM/MI System	# of series connected DC sources per circuit matches plans	P&P Standard	Design	Not required - System uses listed AC Modules	n/a	n/a
ACM/MI System	Total system power rating is less than applicable P&P limits	P&P Standard	Self-Test	Calculated: based on AC Modules count x power output referenced from AC Module part #	3	n/a
ACM/MI System	Systems with DC voltage > 80V, shall incorporate listed Arc Fault detection	690.11	Design	Not required - System uses listed AC Modules	n/a	n/a
ACM/MI System	Systems with DC voltage > 80V shall incorporate an annunciator to identify if an arc fault has occurred	690.11	Design	Not required - System uses listed AC Modules	n/a	n/a
ACM/MI System	With the exception of AC module systems, ungrounded conductors shall be protected by a listed ground fault detector	690.5, 690.6, 690.35	Design	Not required - System uses listed AC Modules	n/a	n/a
ACM/MI System	GFCI, if required, properly isolates the faulted circuit	690.5, 690.6, 690.35	Design	Not required - System uses listed AC Modules	n/a	n/a
ACM/MI System	System is equipped with an approved rapid shutdown device	690.12	Design	Combiner incorporates rapid shutdown	n/a	n/a
ACM/MI System	PV System has an approved AC disconnecting means located in a readily accessible location outside the building	690.15	Visual	Digital photograph of SCD. Connects to premises through SCD with an integrated breaker located in a readily accessible location.	n/a	2
ACM/MI System	Equipment ground conductor connects at a single point to grounding electrode conductor through accepted means of bonding	690.43(B)	Design	Grounding to premises GEC through SCD install	n/a	n/a
ACM/MI System	Equipment grounding conductor maintains continuity throughout PV system to grounding electrode conductor connection	690.48	Self-Test	Continuous cable assembly w/integrated EGC from rooftop array through SCD. Continuity implied by detection of AC Modules on branch circuits, and by detection of line voltage from SCD	1	n/a
ACM/MI System	Disconnecting means to disconnect fuse from all sources of supply if energized from both directions. For source circuits, it shall be capable of being disconnected independently of other source circuits	690.16	Design	Not applicable, no fuses	n/a	n/a
AC Module Block	Ref ID 1				n/a	n/a
AC Module Block	AC Modules are Listed to UL1703	690.4(B)	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC Module manufacturer and model # is in accordance with plans	690.4, 690.13	Self-Test	Interrogation of AC modules to ascertain that model # is valid	12	n/a
AC Module Block	AC Module is Listed to UL1741	690.4, 690.13	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC Module is labeled in accordance with 690.13, 690.53, 690.56	690.13, 690.53, 690.56	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC Module has an approved means to disconnect from ungrounded conductors of all sources, within or in sight of inverter.	690.13, 690.15	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC output voltage matches the premises connection	P&P Standard	Self-Test	Comparison of AC Module nominal voltage spec to voltage specified in permit	16	n/a
AC Module Block	AC Module output is protected by over current protection device per 690.9	690.9	Self-Test	Implied by branch circuit connection - combiner includes 20A breaker on each branch circuit input	14	n/a
AC Module Block	AC Module is labeled in accordance with NEC 690.51	690.51	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC Modules are mounted in compliance with manufacturer specifications	Oregon, Wisc, IREC, EERE	Visual	Digital photograph of PV Array	n/a	1
AC Module Block	Roof penetrations are secure and weather tight		Visual	Digital photograph of racking system	n/a	3
AC Module Block	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 112	Self-Test	Detection of modules within branch circuit ensures terminations of all connections within the branch except for the terminal connection in the branch. Terminal connection in branch is detected using electronic end-cap detection. Fully connectorized.	15	n/a
AC Module Block	Elecrical connections are fully and properly engaged	110.3(B), 110.12(A)	Design	Connectors have audible click to become fully engaged	n/a	n/a
AC Module Block	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	Connectors listed to UL6703. Connectors are guarded (690.33(C)), polarized (690.33(B)), Have FMLB Grounding member 690.33(D))	690.33	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	If not rated for interrupting current, module connectors are labeled with ""Do Not Disconnect Under Load" or "Not for Current Interrupting."	690.33(E)	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	# of paralleled AC sources per branch circuit matches plans	P&P Standard	Self-Test	Branch circuit mapping using controllable relays	11	n/a
AC Module Block	Ref ID 2				n/a	n/a
AC Module Block	AC Modules are Listed to UL1703	690.4(B)	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC Module manufacturer and model # is in accordance with plans	690.4, 690.13	Self-Test	Interrogation of AC modules to ascertain that model # is valid	33	n/a
AC Module Block	AC Module is Listed to UL1741	690.4, 690.13	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC Module is labeled in accordance with 690.13, 690.53, 690.56	690.13, 690.53, 690.56	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC Module has an approved means to disconnect from ungrounded conductors of all sources, within or in sight of inverter.	690.13, 690.15	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC output voltage matches the premises connection	P&P Standard	Self-Test	Comparison of AC Module nominal voltage spec to voltage specified in permit	37	n/a

Sub-System	Description	Reference(s)	Verification Method	Expanded Description of Verification Method	Self test reference	Vis doc reference
AC Module Block	AC Module output is protected by over current protection device per 690.9	690.9	Self-Test	Implied by branch circuit connection - combiner includes 20A breaker on each branch circuit input	35	n/a
AC Module Block	AC Module is labeled in accordance with NEC 690.51	690.51	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	AC Modules are mounted in compliance with manufacturer specifications	Oregon, Wisc, IREC, EERE	Visual	Digital photograph of PV Array	n/a	1
AC Module Block	Roof penetrations are secure and weather tight		Visual	Digital photograph of racking system	n/a	3
AC Module Block	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 112	Self-Test	Detection of modules within branch circuit ensures terminations of all connections within the branch except for the terminal connection in the branch. Terminal connection in branch is detected using electronic end-cap detection. Fully connectorized.	36	n/a
AC Module Block	Electrical connections are fully and properly engaged	110.3(B), 110.12(A)	Design	Connectors have audible click to become fully engaged	n/a	n/a
AC Module Block	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	Connectors listed to UL6703. Connectors are guarded (690.33(C)), polarized (690.33(B)), Have FMLB Grounding member 690.33(D))	690.33	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	If not rated for interrupting current, module connectors are labeled with ""Do Not Disconnect Under Load" or "Not for Current Interrupting."	690.33(E)	Design	Implied by interrogation of AC Modules cross-referencing to a valid model #	n/a	n/a
AC Module Block	# of paralleled AC sources per branch circuit matches plans	P&P Standard	Self-Test	Branch circuit mapping using controllable relays	32	n/a
Cable Assembly	Ref ID 3				n/a	n/a
Cable Assembly	Conductor ampacity is sufficient for the max current of the connected source(s) per 690.8	690.8	Self-Test	Ampacity calculated basd on (1) Cable AWG (implied by use of specialized connector); (2) ambient and rooftop temperature correction factors; and (3) adjustments for conduit conductor count; compared against branch circuit current output calculated from sum of AC Module current	20	n/a
Cable Assembly	Conductor voltage rating is sufficient for the connected source(s) per 690.7	690.7	Self-Test	voltage rating based on referenced cable specification; compared against permitted premises voltage	19	n/a
Cable Assembly	Conductors are protected by over current protection device per 690.9	690.9	Self-Test	calculated ampacity compared against implied connection to 20A breaker in combiner;	22	n/a
Cable Assembly	Cable Assembly is installed using an NEC-approved wiring method (e.g., 690.33, Chapter 3 / Article 300) for the application	690.33, 300, 110.8	Visual, Self-Test	Implied by referenced cable and conductor specification in conjunction with digital photograph of wiring method, showing guarding, etc. Compared against permit submittal	24	4
Cable Assembly	Conductors are appropriately color coded, Conductors of various PV source & output circuits grouped, identified	690.31(B)	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Conductors are listed and specified for the application	690.31	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Conductors are undamaged	110.12(B)	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Conductor bend radius is within specification, sufficient clearance around connectors	336.24, IREC	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Wiring is installed in a neat & workmanlike manner; Conductor follows the surface of the building	110.12, IREC	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Cable or Raceway is adequately supported at 6' intervals	334.30	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Raceways terminated by adequate fittings or other means	300.12	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Raceways are mechanically continiuous	300.12	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Raceway is properly sized for conductors	300.17	Visual, Self-Test	Digital photograph of branch circuit cabling used to show proper conduit sizing, can be compared with permit	27	4
Cable Assembly	PV Source & Output circuits in readily accessible location are suitably guarded 150+VDC in an accessible location	690.31(A), 690.7(D)	Design	No DC circuits	n/a	n/a
Cable Assembly	Cable protected from physical damage by approved means: protected from touching roof or other abrasive surfaces exposing them to physical damage.	334.12, IREC	Visual	Digital photograph of conduit	n/a	n/a
Cable Assembly	PV Source & Output circuit conductors routed in a raceway that does not include conductors from other systems	690.31(B)	Design	No DC circuits	n/a	n/a
Cable Assembly	Equip ground conductor routed in the same raceway as other conductors	690.43, IREC	Design	EGC integrated into branch circuit cable assembly	n/a	n/a
Cable Assembly	Equipment Ground is suitably sized and specified	690.45, 690.46, 250.120(c), EERE, 250.120, 250.122	Design	EGC integrated into branch circuit cable assembly	n/a	n/a
Cable Assembly	Max DC bus voltage of series connected sources <600V	690.7C	Design	No DC circuits	n/a	n/a
Cable Assembly	Raceways, conduit, etc inside building shall be marked in accordance with 690.31(G)(3)	690.31(G)(3)	Visual	Designed for routing outside premises	n/a	4
Cable Assembly	Connectors listed for the purpose.	690.33	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)	Self-Test	Implied by detection of branch circuit. Fully connectorized.	23	n/a
Cable Assembly	Elecrical connections are fully and properly engaged	110.3(B), 112	Design	Audible click	n/a	n/a
Cable Assembly	Ref ID 4				n/a	n/a

Sub-System	Description	Reference(s)	Verification Method	Expanded Description of Verification Method	Self test reference	Vis doc reference
Cable Assembly	Conductor ampacity is sufficient for the max current of the connected source(s) per 690.8	690.8	Self-Test	Ampacity calculated basd on (1) Cable AWG (implied by use of specialized connector); (2) ambient and rooftop temperature correction factors; and (3) adjustments for conduit conductor count; compared against branch circuit current output calculated from sum of AC Module current	41	n/a
Cable Assembly	Conductor voltage rating is sufficient for the connected source(s) per 690.7	690.7	Self-Test	voltage rating based on referenced cable specification; compared against permitted premises voltage	40	n/a
Cable Assembly	Conductors are protected by over current protection device per 690.9	690.9	Self-Test	calculated ampacity compared against implied connection to 20A breaker in combiner;	43	n/a
Cable Assembly	Cable Assembly is installed using an NEC-approved wiring method (e.g., 690.33, Chapter 3 / Article 300) for the application	690.33, 300, 110.8	Visual, Self-Test	Implied by referenced cable and conductor specification in conjunction with digital photograph of wiring method, showing guarding, etc.	45	4
Cable Assembly	Conductors are appropriately color coded, Conductors of various PV source & output circuits grouped, identified	690.31(B)	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Conductors are listed and specified for the application	690.31	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Conductors are undamaged	110.12(B)	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Conductor bend radius is within specification, sufficient clearance around connectors	336.24, IREC	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Wiring is installed in a neat & workmanlike manner; Conductor follows the surface of the building	110.12, IREC	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Cable or Raceway is adequately supported at 6' intervals	334.30	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Raceways terminated by adequate fittings or other means	300.12	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Raceways are mechanically continiuous	300.12	Visual	Digital photograph of branch circuit cabling	n/a	4
Cable Assembly	Raceway is properly sized for conductors	300.17	Visual, Self-Test	Digital photograph of branch circuit cabling used to show proper conduit sizing, can be compared with permit	48	4
Cable Assembly	PV Source & Output circuits in readily accessible location are suitably guarded 150+VDC in an accessible location	690.31(A), 690.7(D)	Design	No DC circuits	n/a	n/a
Cable Assembly	Cable protected from physical damage by approved means: protected from touching roof or other abrasive surfaces exposing them to physical damage.	334.12, IREC	Visual	Digital photograph of conduit	n/a	n/a
Cable Assembly	PV Source & Output circuit conductors routed in a raceway that does not include conductors from other systems	690.31(B)	Design	No DC circuits	n/a	n/a
Cable Assembly	Equip ground conductor routed in the same raceway as other conductors	690.43, IREC	Design	EGC integrated into branch circuit cable assembly	n/a	n/a
Cable Assembly	Equipment Ground is suitably sized and specified	690.45, 690.46, 250.120(c), EERE, 250.120, 250.122	Design	EGC integrated into branch circuit cable assembly	n/a	n/a
Cable Assembly	Max DC bus voltage of series connected sources <600V	690.7C	Design	No DC circuits	n/a	n/a
Cable Assembly	Raceways, conduit, etc inside building shall be marked in accordance with 690.31(G)(3)	690.31(G)(3)	Visual	Designed for routing outside premises	n/a	4
Cable Assembly	Connectors listed for the purpose.	690.33	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)	Self-Test	Implied by detection of branch circuit. Fully connectorized.	44	n/a
Cable Assembly	Elecrical connections are fully and properly engaged	110.3(B), 112	Design	Audible click	n/a	n/a
Combiner	Ref ID 5				n/a	n/a
Combiner	DC Combiners have a disconnect in the combiner, or within 1.8m of the combiner	690.15(C)	n/a		n/a	n/a
Combiner	Combiner model # is in accordance with plans	P&P Standard	Self-Test	Comparison of interogated model # to permit	n/a	n/a
Combiner	Combiner is listed to UL1741	690.4	Design	Implied by model #	n/a	n/a
Combiner	Voltage rating is sized for max voltage per 690.7	690.7	Self-Test	Comparison of permitted nominal voltage to voltage rating	53	n/a
Combiner	Max current per input circuit is less than <1.25 max input rating per input	690.8	Self-Test	Comparison of current rating, per spec, to actual max branch circuit current inputs	54	n/a
Combiner	Max combined current of paralleled sources is <1.25X max output rating of combiner	690.8	Self-Test	Comparison of current rating, per spec, to sum of max branch circuit current inputs	55	n/a
Combiner	Properly sized OCPD protects output	690.9	Self-Test	Comparison of OCPD in the SCD, per permit, to output current rating	57	n/a
Combiner	Connectors are appropriately listed for the application	690.33	Design	Based on device specification	n/a	n/a
Combiner	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)	Self-Test	Input connections implied based on detection of branch circuits, or suitable terminator on branch circuit input; Output connection implied based on detection of line voltage. Fully connectorized.	56	n/a
Combiner	Elecrical connections are fully and properly engaged	110.3(B), 112	Design	Locking connector	n/a	n/a
Combiner	Enclosure is firmly secured to the mounting surface, and mounted in compliance with manufacturer specifications	110.3(B), 110.13	Visual	Digital photograph	n/a	5
Combiner	For any user-serviceable compartments: verify that the cover is closed and secured correctly	110.12(A)	Visual	Digital photograph	n/a	5
Combiner	Exposed metal is bonded to equipment ground conductor though approved means	690.43, 250.110, 690.50	Design	Non-metal enclosure	n/a	n/a
Cable Assembly	Ref ID 6				n/a	n/a

Sub-System	Description	Reference(s)	Verification Method	Expanded Description of Verification Method	Self test reference	Vis doc reference
Cable Assembly	Conductor ampacity is sufficient for the max current of the connected source(s) per 690.8	690.8	Self-Test	Ampacity calculated basd on (1) Cable AWG (implied by use of specialized connector); (2) ambient and rooftop temperature correction factors; and (3) adjustments for conduit conductor count; compared against branch circuit current output calculated from sum of AC Module current	61	n/a
Cable Assembly	Conductor voltage rating is sufficient for the connected source(s) per 690.7	690.7	Self-Test	voltage rating based on referenced cable specification; compared against permitted premises voltage	60	n/a
Cable Assembly	Conductors are protected by over current protection device per 690.9	690.9	Self-Test	calculated ampacity compared against connection to OCPD in SCD	63	n/a
Cable Assembly	Cable assembly is an NEC-approved wiring method (e.g., 690.33, Chapter 3 / Article 300) for the application	690.33, 300, 110.8	Design	Cable routed in flexible conduit	n/a	n/a
Cable Assembly	Conductors are appropriately color coded, Conductors of various PV source & output circuits grouped, identified	690.31(B)	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Conductors are listed and specified for the application	690.31	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Conductors are undamaged	110.12(B)	Visual	Digital photograph of SCD connector cable	n/a	2
Cable Assembly	Conductor bend radius is within specification, sufficient clearance around connectors	336.24, IREC	Visual	Digital photograph of SCD connector cable	n/a	2
Cable Assembly	Wiring is installed in a neat & workmanlike manner; Conductor follows the surface of the building	110.12, IREC	Visual	Digital photograph of SCD connector cable	n/a	2
Cable Assembly	Cable or Raceway is adequately supported at 6' intervals	334.30	Visual	Digital photograph of SCD connector cable	n/a	2
Cable Assembly	Raceways terminated by adequate fittings or other means	300.12	Visual	Digital photograph of SCD connector cable	n/a	2
Cable Assembly	Raceways are mechanically continiuous	300.12	Visual	Digital photograph of SCD connector cable	n/a	2
Cable Assembly	Raceway is properly sized for conductors	300.17	Design	Integral flex conduit	n/a	2
Cable Assembly	PV Source & Output circuits in readily accessible location are suitably guarded 150+VDC in an accessible location	690.31(A), 690.7(D)	Design	No DC circuits	n/a	n/a
Cable Assembly	Cable protected from physical damage by approved means: protected from touching roof or other abrasive surfaces exposing them to physical damage.	334.12, IREC	Visual	Digital photograph of SCD connector cable	n/a	2
Cable Assembly	PV Source & Output circuit conductors routed in a raceway that does not include conductors from other systems	690.31(B)	Design	No DC circuits	n/a	n/a
Cable Assembly	Equip ground conductor routed in the same raceway as other conductors	690.43, IREC	Design	EGC integrated into SCD cable assembly	n/a	n/a
Cable Assembly	Equipment Ground is suitably sized and specified	690.45, 690.46, 250.120(c), EERE, 250.120, 250.122	Design	EGC integrated into SCD cable assembly	n/a	n/a
Cable Assembly	Max DC bus voltage of series connected sources <600V	690.7C	Design	No DC circuits	n/a	n/a
Cable Assembly	Raceways, conduit, etc inside building shall be marked in accordance with 690.31(G)(3)	690.31(G)(3)	Visual	Designed for routing outside premises	n/a	2
Cable Assembly	Connectors listed for the purpose.	690.33	Design	Part of cable assembly specification	n/a	n/a
Cable Assembly	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)	Self-Test	Connection implied by detection of line voltage in the Combiner. Fully connectorized.	64	n/a
Cable Assembly	Elecrical connections are fully and properly engaged	110.3(B), 112	Design	Audible click	n/a	n/a
Supply-Side Premises Interconnection	Ref ID 7				n/a	n/a
Supply-Side Premises Interconnection	Premises voltage matches nominal voltage of PV system	P&P Standard	Self-test	detected voltage within ANSI spec of nominal permitted voltage	74	n/a
Supply-Side Premises Interconnection	Backfeed overcurrent protection sized appropriately for generation source	690.9	Visual	Digital photograph of OCPD integrated into SCD	n/a	2
Supply-Side Premises Interconnection	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)	Design	Premises connection through a Solar Connection Device	n/a	n/a
Load-Side Premises Interconnection	Ref ID 7				n/a	n/a
Load-Side Premises Interconnection	Sum of PV breaker and panel main breaker less than 120% of panel rating	NEC	Visual	Digital photograph of service panel, indicating ratings.	n/a	6
Load-Side Premises Interconnection	Premises voltage matches nominal voltage of PV system	P&P Standard	Self-test	detected voltage within ANSI spec of nominal permitted voltage	74	n/a
Load-Side Premises Interconnection	Backfeed overcurrent protection sized appropriately for generation source	690.9	Visual	Digital photograph of OCPD integrated into SCD	n/a	n/a
Load-Side Premises Interconnection	Electrical connections are properly terminated, have proper polarity, and are weather tight. Hard-wired connections maintain appropriate torque, clearance, creepage, etc.	110.3(B), 110.12(A)	Design	Premises connection through a Solar Connection Device	n/a	n/a

A2.4 Electronic Self-Test Report

Item	Sub-System	Description	key name	actual value (d)	Passing Condition for Code Compliance Test			Passing condition for permit compliance test		
					LB	Spec	UB	LB	Spec	UB
1	PV System	Total # of ACMs	n_acm	Detected - interrogate ACMs in the system	n/a	n/a	n/a		n_acm_permit	n/a
2	PV System	Total # of branch circuits	n_branchcircuit	Use branch circuit detection to identify if ACMs are present on each branch circuit	1	n/a	2	n/a	n_branchcircuit_permit	n/a
3	PV System	Total pwr rating	ac_rating	Calculated = ACMs x pwr rating of each ACM	0	n/a	10000	ac_rating_permit x 0.99	n/a	ac_rating_permit x 1.01
4	PV System	P&P Part Model #	pnp_model_no	Detected - Hard-coded value in the PVSS	n/a	n/a	n/a	n/a	pnp_model_no_permit	n/a
5	PV System	Max Ambient temp	max_ambient_temp	Detected - hard code value for now. Future rev would cross-reference against NWS data based on location	n/a	n/a	n/a	max_ambient_temp_permit	n/a	n/a
6	PV System	Ambient temp on rooftop	rooftop_temp_adj	Detected - hard code value for now. Future rev would cross-reference against NWS data based on location	n/a	n/a	n/a	rooftop_temp_adj_permit	n/a	n/a
7	PV System	# of Functional Blocks	n_fcn_blocks	Detected - hard code - total number of blocks, including ACM branches, cables, SCD, etc	n/a	n/a	n/a	n/a	n_fcn_blocks_permit	n/a
8	AC Module Block	Functional Block Reference #	fcn_block_ref_no	1	n/a	n/a	n/a	n/a	n/a	n/a
9	AC Module Block	Subsystem Tag	tag	AC Module Block	n/a	n/a	n/a	n/a	n/a	n/a
10	AC Module Block	ACM power rating	ac_rating_acm	Reference - look up, based on ACM model #	n/a	n/a	n/a	n/a	n/a	n/a
11	AC Module Block	# of ACMs per branch	n_acm_bc	detected	0	n/a	12	n/a	n_acm_bc1_permit	n/a
12	AC Module Block	ACM Model #	model_no_acm	detected	n/a	n/a	n/a	n/a	model_no_acm1_permit	n/a
13	AC Module Block	branch circuit current	i_branch_circuit	calculated = # of ACMs x max current of ACM (per datasheet)	n/a	n/a	n/a	n/a	n/a	n/a
14	AC Module Block	Overcurrent protection	ocpd_branch_circuit	Circuit breaker size, referenced based on the CCU specification	1.25 x i_branch_circuit_actual	n/a	n/a	n/a	n/a	n/a
15	AC Module Block	Terminations	terminations_branch_circuit	detected - find the end cap. All other terminations are implied by connection of MIs to each other or to the drop cable assembly	n/a	2 x n_acm_bc1_actual	n/a	n/a	n/a	n/a
16	AC Module Block	ACM Voltage	v_acm	referenced (look up, based on ACM model #)	n/a	n/a	n/a	n/a	check the ac_voltage field in the premises electrical dataset	n/a
17	AC Module Block	ACM Max Continuous Current	i_max_acm	Reference, based on ACM model #	n/a	n/a	n/a	n/a	n/a	n/a
18	Cable Assembly	Functional Block Reference #	fcn_block_ref_no	2	n/a	n/a	n/a	n/a	n/a	n/a
19	Cable Assembly	Cable assembly voltage	v_cable	referenced (look up, based on hard-coded cable spec)	n/a	n/a	n/a	n/a	check the ac_voltage field in the premises electrical dataset	n/a
20	Cable Assembly	Cable assembly ampacity	ampacity_cable	calculated - max current based on the cable gauge x temp adj x fill factor adj	1.25 x i_branch_circuit_actual	n/a	n/a	n/a	n/a	n/a
21	Cable Assembly	Max current from parallel source	max_parallel_current	Maximum backfeed current on to the circuit of all parallel connected sources - max should be the SCD overcurrent protection size + BC#2 OCPD size	n/a	n/a	n/a	n/a	n/a	n/a
22	Cable Assembly	Cable assembly OCPD	ocpd_cable	Circuit Breaker size - referenced based on the Combiner specification	1.25 x i_branch_circuit_actual Determined by - IF max current from other parallel sources = 0, then LB = 0 IF max current from other parallel sources < ampacity_cable_actual, then LB = 0 IF max current from other parallel sources > ampacity_cable_actual, then LB = 1.25 x imax --> this is the applicable case	n/a	ampacity_cable_actual	n/a	n/a	n/a
23	Cable Assembly	Cable assembly terminations	terminations_cable	detected / implied by electrical connection between ACMs and the CCU	n/a	2	n/a	n/a	n/a	n/a
24	Cable Assembly	Cable assembly type	type_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	type_cable1_permit	n/a
25	Cable Assembly	Cable Assembly AWG	awg_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	awg_cable1_permit	n/a
26	Cable Assembly	Cable Assembly Max Current @ 3	i_max_30c_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	n/a	n/a
27	Cable Assembly	Cable Assembly # of Conductors	n_conductors_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	n_conductors_cable1_permit	n/a
28	Cable Assembly	Cable Assembly temp adjustment	temp_adj_cable	Reference - look up, based on temp factors	n/a	n/a	n/a	n/a	n/a	n/a
29	Cable Assembly	Cable Assembly Fill Factor Adj.	ff_adj_cable	reference look up, based on # of conductors	n/a	n/a	n/a	n/a	n/a	n/a
30	AC Module Block	Functional Block Reference #	fcn_block_ref_no	3	n/a	n/a	n/a	n/a	n/a	n/a
31	AC Module Block	ACM power rating	ac_rating_acm	reference - based on ACM model #	n/a	n/a	n/a	n/a	n/a	n/a
32	AC Module Block	# of ACMs per branch	n_acm	detected	0	n/a	12	n/a	n_acm_bc2_permit	n/a
33	AC Module Block	ACM Model #	model_no_acm	detected	n/a	n/a	n/a	n/a	model_no_acm_bc2_permit	n/a
34	AC Module Block	branch circuit current	i_branch_circuit	calculated = # of ACMs x max current of ACM (per datasheet)	n/a	n/a	n/a	n/a	n/a	n/a
35	AC Module Block	Overcurrent protection	ocpd_branch_circuit	Circuit breaker size, referenced based on the CCU specification	1.25 x i_branch_circuit_actual	n/a	n/a	n/a	n/a	n/a
36	AC Module Block	Terminations	terminations_branch_circuit	detected - find the end cap. All other terminations are implied by connection of MIs to each other or to the drop cable assembly	n/a	2 x n_acm2_actual	n/a	n/a	n/a	n/a
37	AC Module Block	ACM Voltage	v_acm	referenced (look up, based on ACM model #)	n/a	n/a	n/a	n/a	check the ac_voltage field in the premises electrical dataset	n/a
38	AC Module Block	ACM Max Continuous Current	i_max_acm	referenced, based on ACM model #	n/a	n/a	n/a	n/a	n/a	n/a
39	Cable Assembly	Functional Block Reference #	fcn_block_ref_no	4	n/a	n/a	n/a	n/a	n/a	n/a
40	Cable Assembly	Cable assembly voltage	v_cable	referenced (look up, based on hard-coded cable spec)	n/a	n/a	n/a	n/a	check the ac_voltage field in the premises electrical dataset	n/a
41	Cable Assembly	Cable assembly ampacity	ampacity_cable	calculated - max current based on the cable gauge x temp adj x fill factor adj	1.25 x i_branch_circuit_actual	n/a	n/a	n/a	n/a	n/a

Item	Sub-System	Description	key name	actual value (d)	Passing Condition for Code Compliance Test			Passing condition for permit compliance test		
					LB	Spec	UB	LB	Spec	UB
42	Cable Assembly	Max current from parallel sources	max_parallel_current	Maximum backfeed current on to the circuit of all parallel connected sources - max should be the SCD overcurrent protection size + BC #1 OCPD size	n/a	n/a	n/a	n/a	n/a	n/a
43	Cable Assembly	Cable assembly OCPD	ocpd_cable	Circuit Breaker size - referenced based on the Combiner specification	1.25 x i_branch_circuit_actual Determined by - IF max current from other parallel sources = 0, then LB = 0 IF max current from other parallel sources < ampacity_cable_actual, then LB = 0 IF max current from other parallel sources > ampacity_cable_actual, then LB = 1.25 x imax -> this is the applicable case	n/a	ampacity_cable_actual	n/a	n/a	n/a
44	Cable Assembly	Cable assembly terminations	terminations_cable	detected / implied by electrical connection between ACMs and the CCU	n/a	2	n/a	n/a	n/a	n/a
45	Cable Assembly	Cable assembly type	type_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	type_cable2_permit	n/a
46	Cable Assembly	Cable Assembly AWG	awg_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	awg_cable2_permit	n/a
47	Cable Assembly	Cable Assembly Max Current @ 3	i_max_30c_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	n/a	n/a
48	Cable Assembly	Cable Assembly # of Conductors	n_conductors_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	n_conductors_cable2_permit	n/a
49	Cable Assembly	Cable Assembly temp adjustment	temp_adj_cable	Reference - look up, based on temp factors	n/a	n/a	n/a	n/a	n/a	n/a
50	Cable Assembly	Cable Assembly Fill Factor Adj.	ff_adj_cable	reference look up, based on # of conductors	n/a	n/a	n/a	n/a	n/a	n/a
51	Combiner	Functional Block Reference #	fcn_block_ref_no	5	n/a	n/a	n/a	n/a	n/a	n/a
52	Combiner	Combiner Model #	model_no_combiner	detected - Combiner spec	n/a	n/a	n/a	n/a	model_no_combiner_permit	n/a
53	Combiner	Combiner (CCU) Voltage rating	v_combiner	referenced (look up, based on Combiner spec)	n/a	n/a	n/a	n/a	check the ac_voltage field in the premises electrical dataset	n/a
54	Combiner	Combiner input current rating	i_input_combiner	referenced (look up, based on Combiner spec)	maximum of (1.25 x i_branch_circuit_actual)	n/a	n/a	n/a	n/a	n/a
55	Combiner	Combiner output current rating	i_output_combiner	referenced (look up, based on Combiner spec)	sum of bc currents (1.25 x i_branch_circuit_actual)	n/a	n/a	n/a	n/a	n/a
56	Combiner	Combiner terminations	terminations_combiner	detected - # of input connections + output connections	n/a	# of branch circuits + output connection	n/a	n/a	n/a	n/a
57	Combiner	Combiner Output OCPD	ocpd_combiner_output	Retrieve from the permit submittal - what is the size of the OCPD on the SCD	sum of bc currents (1.25 x i_branch_circuit_actual)	n/a	n/a	n/a	n/a	n/a
58	Combiner	Combiner voltage above lower bo	v_lb_meas_combiner	detected - actual voltage at CCU	211VAC	n/a	264VAC	n/a	n/a	n/a
59	Cable Assembly	Functional Block Reference #	fcn_block_ref_no	6	n/a	n/a	n/a	n/a	n/a	n/a
60	Cable Assembly	Cable assembly voltage	v_cable	referenced (look up, based on hard-coded cable spec)	n/a	n/a	n/a	n/a	check the ac_voltage field in the premises electrical dataset	n/a
61	Cable Assembly	Cable assembly ampacity	ampacity_cable	calculated - max current based on the cable gauge x temp adj x fill factor adj	n/a	n/a	sum of bc currents (1.25 x i_branch_circuit_actual)	n/a	n/a	n/a
62	Cable Assembly	Max current from parallel sources	max_parallel_current	Maximum backfeed current on to the circuit of all parallel connected sources - max should be the size of the SCD overcurrent protection	n/a	n/a	n/a	n/a	n/a	n/a
63	Cable Assembly	Cable assembly OCPD	ocpd_cable	Circuit Breaker size - referenced based on the Combiner specification	1.25 x sum of max branch circuit current out Determined by - IF max current from other parallel sources = 0, then LB = 0 IF max current from other parallel sources < ampacity_cable_actual, then LB = 0 IF max current from other parallel sources > ampacity_cable_actual, then LB = 1.25 x imax -> this is the applicable case	n/a	ampacity_cable_actual	n/a	n/a	n/a
64	Cable Assembly	Cable assembly terminations	terminations_cable	detected / implied by electrical connection between ACMs and the CCU	n/a	2	n/a	n/a	n/a	n/a
65	Cable Assembly	Cable assembly type	type_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a		type_cableoutput_permit	n/a
66	Cable Assembly	Cable Assembly AWG	awg_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	awg_cableoutput_permit	n/a
67	Cable Assembly	Cable Assembly Max Current @ 3	i_max_30c_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	n/a	n/a
68	Cable Assembly	Cable Assembly # of Conductors	n_conductors_cable	Referenced based on combiner connector inlet	n/a	n/a	n/a	n/a	n_conductors_cableoutput_permit	n/a
69	Cable Assembly	Cable Assembly temp adjustment	temp_adj_cable	Reference - look up, based on temp factors	n/a	n/a	n/a	n/a	n/a	n/a
70	Cable Assembly	Cable Assembly Fill Factor Adj.	ff_adj_cable	reference look up, based on # of conductors	n/a	n/a	n/a	n/a	n/a	n/a
71	Solar Connection Device	Functional Block Reference #	fcn_block_ref_no	7	n/a	n/a	n/a	n/a	n/a	n/a
72	Solar Connection Device	SCD Type	type_scd	detected - modbus polling of the SCD	n/a	n/a	n/a	n/a	n/a	n/a
73	Solar Connection Device	SCD Model #	model_no_scd	detected - modbus polling of the SCD	n/a	n/a	n/a	n/a	model_no_scd_permit	n/a
74	Solar Connection Device	Specified Voltage	v_scd	detected - modbus polling of the SCD	n/a	n/a	n/a	n/a	check the ac_voltage field in the premises electrical dataset	n/a

A2.5 Visual Documentation Plan

Description of Photograph
PV Array
SCD
Racking
Drop cables
Combiner
Service Panel