# PROCEDURE
# FOR THE TESTING AND COMMISSIONING OF GRID-CONNECTED PHOTOVOLTAIC SYSTEMS IN MALAYSIA

## PART 1 - SYSTEMS LESS THAN OR EQUAL TO 12 kWp

**SUSTAINABLE ENERGY DEVELOPMENT AUTHORITY (SEDA)**
**MALAYSIA**

**2014**

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# 1. PRE-COMMISSIONING CHECKLIST AND TEST

Prior to commissioning, the service provider of the GCPV systems must perform the pre-commissioning checks.

This activity shall be conducted by the competent persons as stated at the end of the checklist, whilst adhering to the relevant laws and regulations.

A copy of the completed pre-commissioning checklist and test results must be submitted to SEDA and Distribution Licensee (DL) for application of Testing and Commissioning.

**During the pre-commissioning checks, the GCPV systems shall not be engaged to the grid.**

The pre-commissioning checks consist of the following (**mandatory minimum**):

1. Information about Project
2. Checklist for General Inspection
3. Checklist for PV Module Mounting Structure & Civil foundation
4. Checklist for DC Junction Box or String Monitoring Box
5. Checklist for Earthing & Lightning Arrestor
6. Checklist for PV Module
7. Checklist for Inverter
8. Checklist for AC Distribution Box
9. Checklist of Cable identification and cable routing inspection
10. Cable insulation test
11. String fuse continuity and string open circuit voltage test
12. String DC short circuit current test
13. Isolation device functional test

## 1.1 INFORMATION ABOUT PROJECT

| Table 1.1 Information about project | |
|---|---|
| Project details | |
| FIT application number | |
| Project description | |
| Site GPS coordinates (Latitude, Longitude) | |
| Site address | |
| Date of inspection (dd_mmm_yyyy) | |

| Customer details | |
|---|---|
| Name | |
| Contact address | |
| Contact phone number/email address | |
| Contact details with Email address | |

| Installation details | |
|---|---|
| Date of completion of installation | |
| Date of planned connection to grid | |
| Import meter reading (kWh) at pre-comm session | |
| Export meter reading (kWh) at pre-comm session | |
| Remarks | |

## 1.2 CHECKLIST FOR GENERAL INSPECTION

| *Table 1.2 Checklist for General Inspection* | | | |
|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| Instructions | This form shall be filled-up for each sub-array connected to one inverter | Inverter ID: | Sub-array ID: |
| **A. General** | i. All necessary safety equipment are available at the site ☐ | | |
| | ii. Array frame correctly fixed and stable ☐ | | |
| | iii. All cable entries are weather proof ☐ | | |
| | iv. PV module location, perimeter, gate, control room & switch yard, plant internal road location as per approved layout drawing ☐ | | |
| | v. Components comply with standards and are selected as per design & not damaged ☐ | | |
| | vi. Equipment accessible for inspection, operation & maintenance ☐ | | |
| | vii. Equipment & accessories are connected as per approved drawing ☐ | | |
| | viii. Protective measures for special locations have been addressed (if applicable) ☐ | | |
| | ix. Equipment & protective measures are appropriate to external influence ☐ | | |
| | x. System installed to prevent mutual detrimental influence ☐ | | |
| | xi. All cables are identified and connected as per approved drawing ☐ | | |
| | xii. All cables are selected for current carrying capacity and voltage drop as per approved design ☐ | | |
| | xiii. Conductors routed are in safe zone or protected against mechanical damage ☐ | | |
| | xiv. All tagging are appropriate. ☐ | | |
| | xv. All signages are appropriate. ☐ | | |
| | xvi. All relevant documents are available. ☐ | | |
| | xvii. Emergency procedure displayed at site ☐ | | |
| | xviii. PV system schematic displayed at site ☐ | | |

| | | | |
|---|---|---|---|
| **B. DC Side** | i. | Adequate physical separation of AC, DC & communication cables | ☐ |
| | ii. | All DC components are sized for rated operation at maximum DC system voltage | ☐ |
| | iii. | All DC cables are meant for solar PV applications and as per design document | ☐ |
| | iv. | PV string fuse or DC breaker are available in the combiner boxes | ☐ |
| **C. Protection against over voltage & Electric Shock** | i. | Live parts are insulated and protected by barrier/enclosure, placed out of reach | ☐ |
| | ii. | Surge protection devices are available | ☐ |
| | iii. | External lightning protection system is available | ☐ |
| | iv. | PV frame grounding correctly integrated with existing installation | ☐ |
| **D. AC Side** | i. | Inverter protection setting as per local regulation (labelling & identification mark) | ☐ |
| | ii. | Protection setting by installers displayed at site (maximum current, range of voltage and frequency) | ☐ |
| Comments: | | | |

## 1.3 CHECKLIST FOR PV MODULE MOUNTING STRUCTURE & CIVIL FOUNDATION

| Table 1.3 Checklist for PV Module Mounting Structure & Civil Foundation | | | |
|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| Instructions | This form shall be filled-up for each sub-array connected to one inverter | Inverter ID: | Sub-array ID: |

| | | |
|---|---|---|
| i. | Mounting structure and jointing materials as per approved drawing | ☐ |
| ii. | Foundation dimensions as per approved drawing | ☐ |
| iii. | Switch yard civil foundation as per approved drawing | ☐ |
| iv. | The material for structure has corrosion proof coating (check for availability of factory test certificate) | ☐ |
| v. | Structures are correctly fixed at specific tilt and orientation as per design document | ☐ |
| vi. | No crack found in the foundation and/or mounting structure | ☐ |
| vii. | Structures are designed based on the maximum wind load of the location (check for availability of structure engineer certificate) | ☐ |
| viii. | No rust (for steel) or discoloration (for aluminium) found in the structure materials (e.g. frame, clamp, bolt and nuts, etc.) | ☐ |
| ix. | Water drainage is available | ☐ |

Comments:

## 1.4 CHECKLIST FOR DC JUNCTION BOX OR STRING MONITORING BOX

| Table 1.4 Checklist for DC Junction Box or String Monitoring Box | | | |
|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| Instructions | This form shall be filled-up for each sub-array connected to one inverter | Inverter ID: | Sub-array ID: |

| | | |
|---|---|---|
| i. | DC Junction/String Monitoring Box connection diagram is available at the inside of the cover | ☐ |
| ii. | Wiring is as per approved schematic | ☐ |
| iii. | String fuses or DC circuit breakers are available | ☐ |
| iv. | Metal casings are earthed as per design document | ☐ |
| v. | All boxes are properly fixed at appropriate locations as per design document | ☐ |
| vi. | Surge protections devices are available inside the box as per design document | ☐ |
| vii. | Box and related component & insulation rating based on maximum DC voltage | ☐ |
| viii. | Boxes for outdoor use should be suitably rated based on Malaysia climate | ☐ |

Comments:

## 1.5 CHECKLIST FOR EARTHING & LIGHTNING ARRESTOR

| Table 1.5 Checklist for earthing & lightning arrestor | | | |
|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| Instructions | This form shall be filled-up for each earthing pit and each lightning arrestor | Earth pit ID: | Lightning arrestor ID: |

| | |
|---|---|
| i. Earthing location as per approved drawing | ☐ |
| ii. Earthing conductor properly connected to metal parts of all structures | ☐ |
| iii. All array frames (for framed modules) and structures are earthed and bonded properly | ☐ |
| iv. Earthing & lightning arrestor are installed as per design document | ☐ |

Comments:

## 1.6 CHECKLIST FOR PV MODULE INSPECTION

| Table 1.6 Checklist for PV module | | | |
|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| Instructions | This form shall be filled-up for each sub-array structure | Structure ID: | Sub-array ID: |

| | | |
|---|---|---|
| i. | PV modules are fixed on the structure as per design drawing | ☐ |
| ii. | PV modules are properly levelled on the structure | ☐ |
| iii. | PV modules conform to relevant IEC standards as per design document | ☐ |
| iv. | Inter-module connectors are properly crimped & securely connected | ☐ |
| v. | PV modules are connected with correct polarity | ☐ |
| vi. | Non-metallic isolator is present between each PV module frame & structure (if they are made from different metals) | ☐ |
| vii. | Installation of PV modules are done as per manufacturer's guidelines | ☐ |

Comments:

## 1.7 CHECKLIST FOR INVERTER INSPECTION

| Table 1.7 Checklist for inverter | | | |
|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| Instructions | This form shall be filled-up for each inverter | Inverter ID: | |

| | | |
|---|---|---|
| i. | Inverter is installed as per manufacturer's guideline | ☐ |
| ii. | Sufficient ventilation is available around the inverter (as per manufacturer's guideline) | ☐ |
| iii. | Inverter conforms to relevant IEC standards (or equivalent) as per design document | ☐ |
| iv. | Inverter unit is properly fastened to floor/wall surfaces | ☐ |
| v. | Inverter is properly earthed | ☐ |
| vi. | Inverter incoming/outgoing cables are properly tagged | ☐ |
| vii. | Inverter incoming/outgoing cables are properly connected as per drawing | ☐ |
| viii. | The connections for phase sequence L1, L2 & L3 are in proper order (for three phase inverters) | ☐ |
| ix. | The connections for L and N are in proper order (for single phase inverters) | ☐ |
| x. | Inverter for outdoor use shall be suitable rated based on Malaysia climate. | ☐ |
| xi. | Gap maintained between power cables and signal cables routing as per design document | ☐ |
| xii. | The auxiliary power cables are connected properly | ☐ |
| xiii. | All cable terminations are done properly | ☐ |
| xiv. | Proper labelling of all the cables and components are done | ☐ |
| xv. | Inverter factory settings are as per local utility guidelines | ☐ |

Comments:

## 1.8 CHECKLIST FOR AC DISTRIBUTION BOX

| Table 1.8 Checklist for AC Distribution Box (ACDB) | | | |
|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| Instructions | This form shall be filled-up for each ACDB | ACDB ID: | |

| | | |
|---|---|---|
| i. | ACDB is properly mounted as per design document | ☐ |
| ii. | Sufficient free space available around each ACDB | ☐ |
| iii. | ACDB is properly earthed as per design document (if applicable) | ☐ |
| iv. | The connections for phase sequence L1, L2 & L3 are in proper order (for three phase inverters) | ☐ |
| v. | The connections for L and N are in proper order (for single phase inverters) | ☐ |
| vi. | Incoming/outgoing cables are properly connected as per approved schematic diagram | ☐ |
| vii. | All cable terminations are done properly | ☐ |
| viii. | Proper tagging of all cables and components are done | ☐ |
| ix. | All cable glands are properly secured & tightened | ☐ |
| x. | Boxes for outdoor use shall be suitably rated based on Malaysia climate | ☐ |

Comments:

## 1.9 CHECKLIST OF CABLE IDENTIFICATION AND CABLE ROUTING INSPECTION

**Table 1.9 Checklist for cable identification & route inspection**

| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | Date of inspection: (dd_mmm_yyyy) |
|---|---|---|
| i. | All cable routed areas are properly marked on the ground | ☐ |
| ii. | All power cable route & locations are as per drawing | ☐ |
| iii. | All cables are properly tagged | ☐ |
| iv. | All DC cables are meant for solar PV applications and as per design document | ☐ |
| v. | Cable caution tape is used for all underground cables as per design document | ☐ |
| vi. | All trunking and conduits are installed as per design document | ☐ |

Comments:

## 1.10 CABLE INSULATION TEST

| Table 1.10 Cable insulation test | | | | | |
|---|---|---|---|---|---|
| Cable ID | | | | | Date of inspection: (dd_mmm_yyyy) |
| Description | | | References (Please state) | | |
| Test point | | | All new cables | | |
| Use appropriate tools to measure and record | | | | | |
| Testing is performed on new cable installations to determine if the insulation has been damaged. | | | Instructions:<br>**SWITCH OFF / DISCONNECT** the following:<br>- PV AC Main Switch (Isolator)<br>- All AC switches<br>- All DC switches<br>- All DC fuses<br><br>Isolate all cables except for inter-module connection and earthing cables. | | |
| No. | Cable from (originating) | Cable to (terminating) | Insulation resistance value | Pass | Fail |
| | | | | (Please tick ✓ in the box) | |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Comments: | | | | | |

## 1.11 STRING FUSE CONTINUITY AND STRING OPEN CIRCUIT VOLTAGE TEST

| **Table 1.11 String fuse and String Open Circuit Voltage test** | | | | | | | |
|---|---|---|---|---|---|---|---|
| String cable ID | | | | | | Date of inspection: (dd_mmm_yyyy) | |
| Description | | References (Please state) | | | | | |
| Test point | | Each Array Junction Box/String Monitoring Box | | | | | |
| Use appropriate tools to measure and record | | | | | | | |
| Test the continuity of each string fuse (Please tick ✓) | | | | | OK: ☐ | Not OK: ☐ | |
| Determine the following:<br>1. Measured Open Circuit Voltage (Voc_mea) of each string.<br>2. Expected Open Circuit Voltage (Voc_exp) of each string.<br>3. % Difference between measured and expected Voc.<br><br>**ACCEPT** if<br>• % difference of Voc (between measured Voc and expected Voc) with respect to expected Voc is within ±5%<br>• Voc measured of each string is less than the maximum input voltage of the inverter<br>• Polarity of all DC cables (string and array) is correct | | | | | Solar irradiance should be at least **350 $Wm^{-2}$** when performing this test.<br><br>Instructions:<br>**SWITCH OFF / DISCONNECT** the following:<br>- PV AC Main Switch (isolator)<br>- All AC switches<br>- All DC switches<br>- All DC fuses | | |
| String No. | Voc of string at STC (V) | Voc measured (V) | Voc expected (V) | Measured module temp ($^0$C) | Measured Irradiance ($Wm^{-2}$) | % difference of Voc | Accept (A) or Reject (R) |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| … | | | | | | | |
| … | | | | | | | |
| Comments: | | | | | | | |

## 1.12 STRING DC SHORT CIRCUIT CURRENT TEST

| Table 1.12 String DC Short circuit current test | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| String Cable ID | | | | | | | | | Date of inspection: (dd_mmm_yyyy) | |
| Description | | | References (Please state) | | | | | | | |
| Test point | | | All DC Junction Boxes | | | | | | | |
| Inverter No | | | | | | | | | | |
| Use appropriate tools to measure and record | | | | | | | | | | |
| Using appropriate method, determine the following:<br>1. Measured short circuit current (Isc_mea) of each string<br>2. Expected short circuit current (Isc_exp) of each string<br>3. % Difference between measured and expected Isc.<br><br>**ACCEPT** if<br>• % difference of Isc (between measured Isc_mea and expected Isc_exp) with respect to Isc_exp is within $\pm 5\%$<br><br>AJB: Array Junction Box<br>SMB: String Monitoring Box | | | | | | | Solar irradiance should be at least **350 $Wm^{-2}$** when performing this test.<br><br>Instructions:<br>**SWITCH OFF / DISCONNECT** the following:<br>- PV AC Main Switch (isolator)<br>- All AC switches<br>- All DC switches<br>- All DC fuses | | | |
| No. | AJB/SMB ID No. | No. of strings per AJB/SMB | String no. | Solar irradiance ($Wm^{-2}$) | Measured module temp ($^0C$) | Measured Isc of string (A) | Expected Isc string (A) | % difference of Isc | Accept (A) or Reject (R) | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Comments: | | | | | | | | | | |

## 1.13 ISOLATION DEVICE FUNCTIONAL TEST

| **Table 1.13 Isolation device test** | | | | |
|---|---|---|---|---|
| Description | | Date of inspection: (dd_mmm_yyyy) | | |
| Test point | All isolators, switches and fuses | | | |
| Use appropriate tools to measure and record | | | | |
| Please tick ✓ in the appropriate box | Solar irradiance should be at least **350 Wm$^{-2}$** when performing this test.<br><br>Instructions:<br>**SWITCH OFF / DISCONNECT** the following:<br>- PV AC Main Switch (isolator)<br>- All AC switches<br>- All DC switches<br>- All DC fuses | | | |

| **No.** | **Description** | **Accept** | **Reject** | **Note** |
|---|---|---|---|---|
| 1 | Confirm voltage is NOT present at array cable terminal at AJB before all fuses are engaged | | | |
| 2 | Confirm voltage is present at array cable terminal at AJB after all fuses are engaged | | | |
| 3 | Confirm voltage is NOT present at the outgoing terminal of PV DC Main Switch when the switch is in OFF position | | | |
| 4 | Confirm voltage is present at the outgoing terminal of PV DC Main Switch when the switch is in ON position | | | |
| 5 | Confirm voltage is NOT present at the outgoing terminal of AC Switch when the switch is in OFF position | | | |
| 6 | Confirm voltage is present at the outgoing terminal of AC Switch when the switch is in ON position | | | |
| 7 | Confirm voltage is NOT present at the outgoing terminal of PV AC Main Switch when the switch is in OFF position | | | |
| 8 | Confirm voltage is present at the outgoing terminal of PV AC Main Switch when the switch is in ON position | | | |

Comments:

| | | |
|---|---|---|
| Signature | | |
| Date | | |
| Name | | |
| Designation | Chargeman/Wireman with SEDA PV certification | SEDA Malaysia GCPV System Design certificate holder |

## 2. TESTING AND COMMISSIONING CHECKLIST

This activity shall be conducted by competent persons as stated at the end of the checklist whilst adhering to the provisions of all relevant laws and regulations.

After completion of pre-commissioning checklist and tests, the service provider **must perform commissioning tests** to ensure all inter-connections of the components are satisfactory.

The commissioning test comprises the following:

1. Information about PV module
2. Information about PV array
3. Information about inverter
4. Inverter functional test
5. Acceptance test

Conditions:

1. All tests **must be done in sequence**.
2. If one test in the sequence fails, the next test **shall not be performed**.
3. Failure of any test **nullifies** the entire Testing and Commissioning.

## 2.1 INFORMATION ABOUT PV MODULE

| Table 2.1 Information about PV module | | | | |
|---|---|---|---|---|
| Description | | Visual Inspection<br>If the job has been done satisfactorily, please tick ✓ in the box.<br>If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| No. | Item | Details | | Check (✓) |
| 1 | Module make & model | | | |
| 2 | Power at maximum power point (Pmp_stc) | | Wp | |
| 3 | Open Circuit Voltage (Voc_stc) | | V | |
| 4 | Short Circuit Current (Isc_stc) | | A | |
| 5 | Fill factor at STC | | - | |
| 6 | Module efficiency at STC | | % | |
| 7 | Temperature coefficient for Pmp (at STC) | | % per deg C | |
| 8 | Temperature coefficient for Voc ( at STC) | | % per deg C | |
| 9 | Temperature coefficient for Isc ( at STC) | | % per deg C | |
| 10 | Maximum system voltage | | V | |
| 11 | Maximum reverse current | | A | |
| Comments: | | | | |

## 2.2 INFORMATION ABOUT PV ARRAY

| Table 2.2 Information about PV array | | | |
|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) |
| Instructions | This form shall be filled-up for each connection to one inverter | Inverter ID: | Sub-array ID: |

| No. | Item | Details | | Check (✓) |
|---|---|---|---|---|
| 1 | No. of modules per string | | pcs | |
| 2 | Total no. of strings | | pcs | |
| 3 | Total array power at STC | | Wp | |
| 4 | PV array inclination | | deg | |
| 5 | PV array orientation (azimuth angle from South) | | deg | |
| 6 | No. of strings per Array Junction Box/String Monitoring Box | | pcs | |
| 7 | No. of Array Junction Box/String Monitoring Box | | pcs | |

Comments:

## 2.3 INFORMATION ABOUT INVERTER

| Table 2.3 Information about inverter | | | | |
|---|---|---|---|---|
| Description | If the job has been done satisfactorily, please tick ✓ in the box. If not applicable, write 'NA' in the box. | | Date of inspection: (dd_mmm_yyyy) | |
| Instructions | This form shall be filled-up for each connection to one inverter | Inverter ID | | |

| No. | Item | Details | | Check (✓) |
|---|---|---|---|---|
| 1 | Inverter model | | | |
| 2 | Nominal AC power rating | | W | |
| 3 | Maximum AC power rating | | W | |
| 4 | Maximum DC voltage | | V | |
| 5 | DC voltage range | | V | |
| 6 | MPPT voltage range | | V | |
| 7 | No. of MPPT trackers | | unit | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Comments:

## 2.4 INVERTER FUNCTIONAL TEST

| Table 2.4 Inverter functional test | | | | | |
|---|---|---|---|---|---|
| Format No | | | Date of inspection: (dd_mmm_yyyy) | | |
| Description | References | | | | |
| Test point | All Inverters | | | | |
| Use appropriate tools to measure and record | | | | | |
| | Please tick ✓ in the appropriate box<br><br>Solar irradiance should be at least **350 $Wm^{-2}$** when performing this test.<br><br>Instructions: **SWITCH ON** the system and ensure that the inverter is operating.<br><br>**CAUTION**: Before switching on the inverter, make sure Voc measured at the inverter input terminal must be LESS THAN the maximum allowable input DC voltage of the inverter. | | | | |
| **No.** | **Description** | **Value** | **Accept** | **Reject** | **Reasons** |
| 1 | Check whether the measured DC voltage falls within the allowable MPPT voltage range of the inverter | | | | |
| 2 | Check whether the measured grid voltage and frequency are within the acceptable limit | | | | |
| Comments: | | | | | |

## 2.5 ACCEPTANCE TEST

| | Table 2.5 System acceptance test | | |
|---|---|---|---|
| Inverter ID | | References (please state) | Date of inspection: (dd_mmm_yyyy) |
| | Determine the following:<br>1. Measured AC output power of inverter, Pac_mea<br>2. Expected AC output power of inverter, Pac_exp<br>3. Please declare the following:<br>• Tolerance due to module mismatch : _____<br>• Soiling index : _____<br>• Ageing factor : _____<br>• Cable loss : _____<br>• Maximum inverter efficiency : _____<br>• Shading factor : _____<br>4. Acceptance Ratio (AR) : _____<br><br>Note: AR is the ratio of Pac_mea to Pac_exp<br><br>**ACCEPT** if<br>• AR is greater than or equal to 0.9 | | Solar irradiance should be at least **350 $Wm^{-2}$** when performing this test.<br><br>Instructions:<br>**SWITCH ON** the system and ensure that the inverter is operating. |

| Inv No. | Irradiance ($Wm^{-2}$) | Measured module temp ($^0C$) | Temperature de-rating factor | Pac expected (W) | Pac measured (W) | AR | Accept (A) or Reject (R) |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| … | | | | | | | |
| … | | | | | | | |
| | If AR is not acceptable, please troubleshoot the system, rectify the fault and repeat the test until all parties are satisfied. | | | | | | |
| Comments: | | | | | | | |

| | | |
|---|---|---|
| Signature | | |
| Date | | |
| Name | | |
| Designation | Wireman with SEDA PV certification | SEDA Malaysia GCPV System Design certificate holder |

**End of Document**