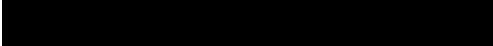
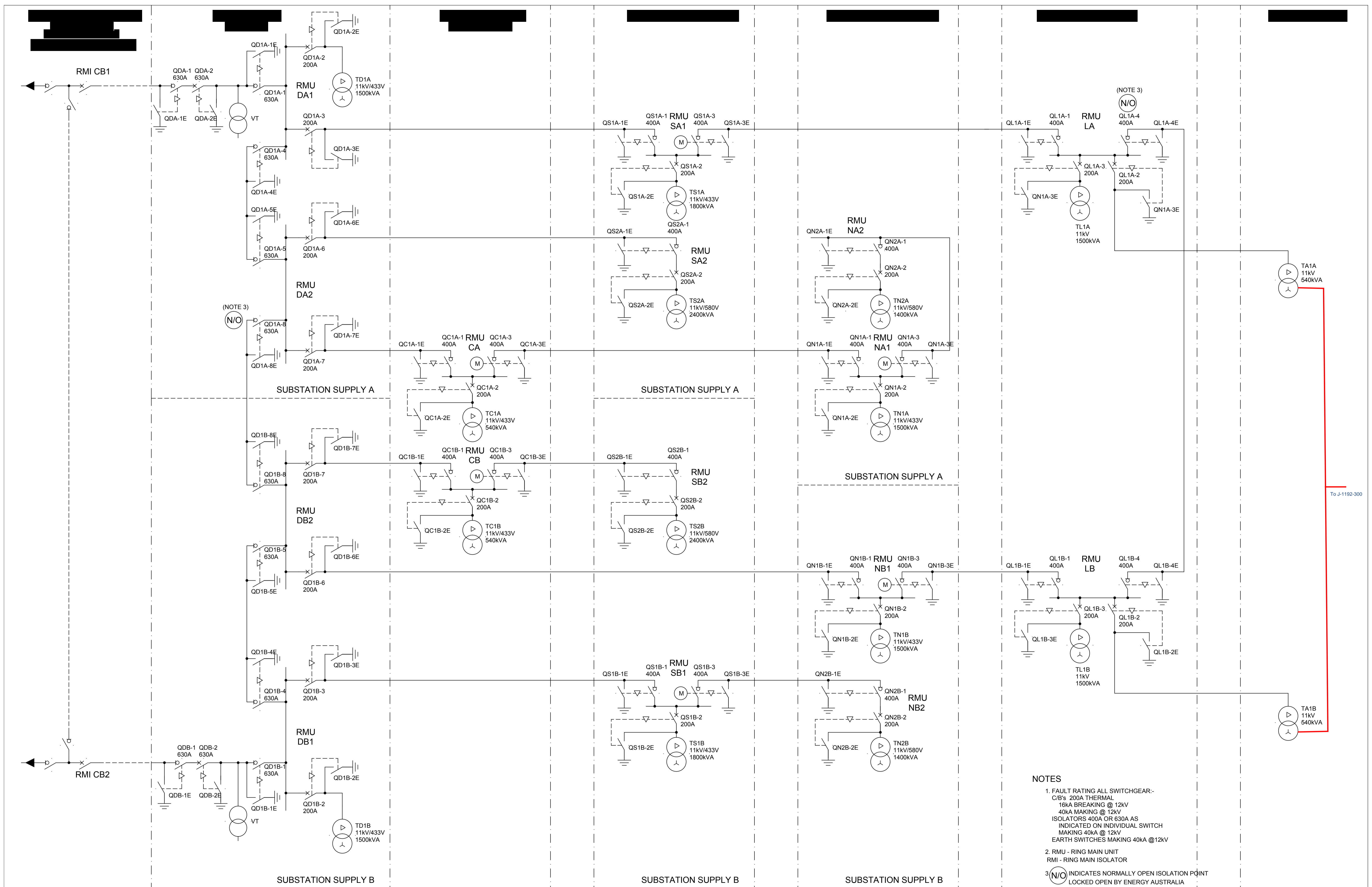


- 
1. Technology: Solar PV
 2. Maximum Power: 38kW
 3. Contribution to fault levels: N/A
 4. Size & rating of the relevant Transformer: N/A
 5. Single line diagram: refer to following page
 6. Protection Systems & Communication Systems: refer to following page
 7. Voltage Control and reactive power capability: N/A
 8. Details specific to the location of facility: N/A



- NOTES**
1. FAULT RATING ALL SWITCHGEAR:-
C/B's 200A THERMAL
16kA BREAKING @ 12kV
40kA MAKING @ 12kV
ISOLATORS 400A OR 630A AS
INDICATED ON INDIVIDUAL SWITCH
MAKING 40kA @ 12kV
EARTH SWITCHES MAKING 40kA @ 12kV
 2. RMU - RING MAIN UNIT
RMI - RING MAIN ISOLATOR
 3. (N/O) INDICATES NORMALLY OPEN ISOLATION POINT
LOCKED OPEN BY ENERGY AUSTRALIA

AB X	04/4/00	AS BUILT
CD 4	15/12/99	FOR CONSTRUCTION - ECN 586
CD 3	02/12/99	FOR CONSTRUCTION - ECN 577
CD 2	04/11/99	FOR CONSTRUCTION - ECN 459
CD 1	14/4/99	CHANGE AS INDICATED & RMU IDENTIFICATION ADDED
CD 0	24/2/99	FOR CONSTRUCTION - ECN 233
PD B	8/2/99	LANDBRIDGE RING-MAINED - ECN 207
PD A	17/8/98	PRELIMINARY ISSUE
REV	DATE	DESCRIPTION

DRAWN	DATE
STATUS	SCALE
AS BUILT	N.T.S.
DRAWING No.	M138/DG2/11147 REV H

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LEIGHTON Leighton Contractors Pty Limited



DRG. TITLE
11kV SUBSTATIONS RETICULATION SINGLE LINE DIAGRAM

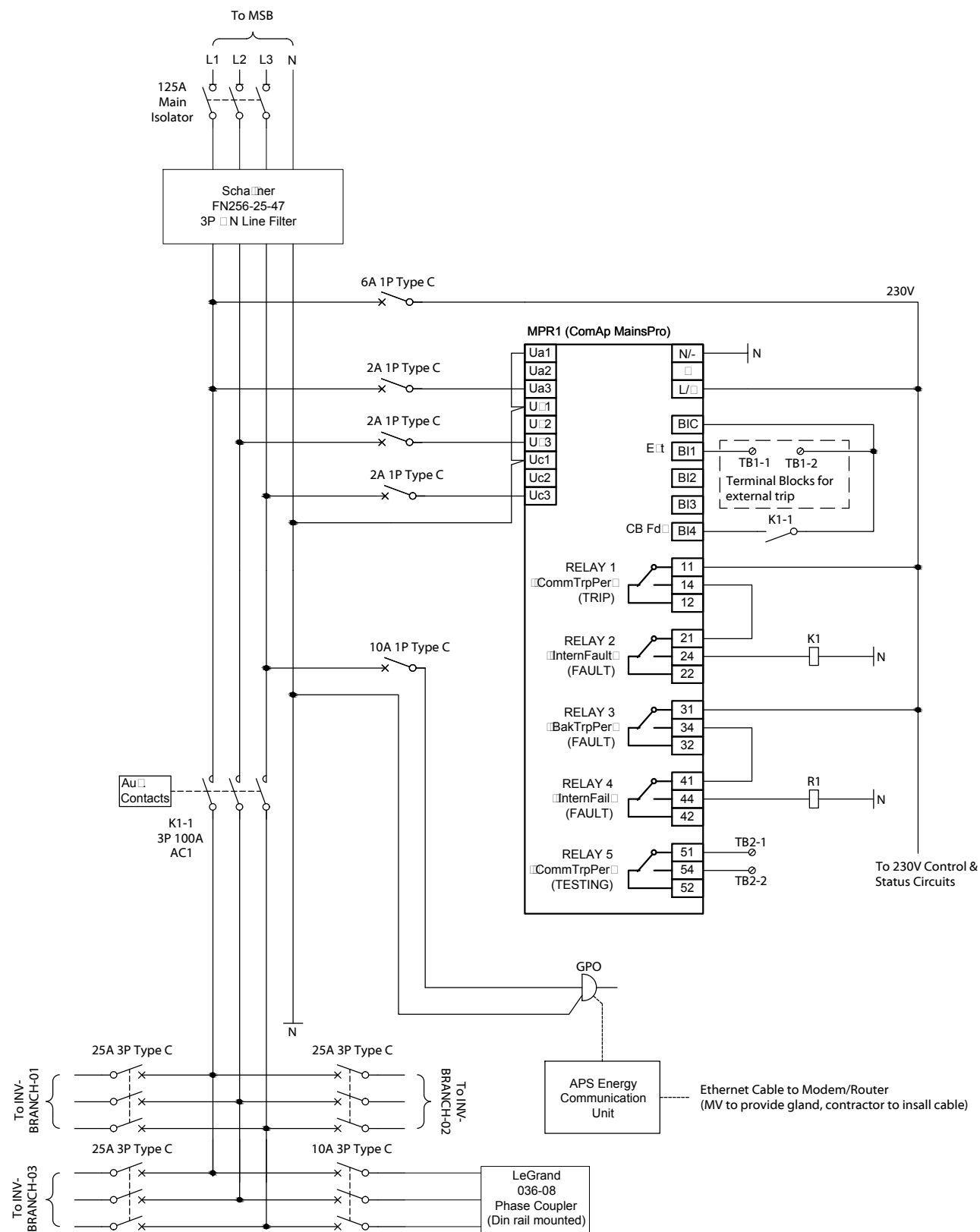
DRG. No. **N641/G/EL/11147/AB** REV **X**

To J-1192-300



CEC Designer: [Redacted]
CEC Accreditation No: [Redacted]

The accredited designer confirms that all settings and component specifications shown on this drawing are accurate and conform to Clean Energy Council (C.E.C) guidelines and relevant Australian Standards. Unless previously agreed between Clean Technology Partners & the installation contractor it is the responsibility of the contractor using this drawing to establish all relevant site factors via a site visit and ensure all required information is provided to the client as required by C.E.C design & installation guidelines including an estimate of yearly energy output for the site. In the event of any responsibility issues, please contact the listed accredited designer on this drawing or refer to the C.E.C website: www.solaraccreditation.com.au/acceci/installerresources/compliance/guidelines.html



Grid Protection Strategy

Protection System Operation

During normal operation with grid parameters within the set limits, the MainsPro relay will hold the main contactor closed. In the event of grid instability (over / under voltage or frequency, excess ROCOF / Vector shift or voltage unbalance) the relay will trip and open the main contactor.

The status of the main contactor (open / closed) is monitored and if it remains closed after a trip occurs for any reason an alarm lamp is illuminated on the switchboard and the remote monitoring contact closes to notify the system owner. Note the external protection relay is backed up by the AS4777 inverter protection.

In addition, the MainsPro has an internal watchdog (RELAY 2) that will trip the system in the instance of an internal fault in the relay and activate the alarm lamp. RELAY 5 is for testing.

Protection Settings

	Inverter Settings	Proposed MFR Settings	Trip Time (s)
Over-voltage (59)	260.0V	265.0V	1.80s
Under-voltage (27)	200.0V	200.0V	1.80s
Over-frequency (81O)	51.0Hz	51.0Hz	1.80s
Under-frequency (81U)	48.0Hz	49.0Hz	1.80s
RoCoF (81R)	N/A	1.0Hz/s	0.5s
Vector Shift (78)	N/A	8°	0.045s
Re-connection Delay Time (s)	60s		

* RoCoF filter (number of cycles) before trip set to 25, giving a response time of 0.5s.

** Vector Shift reaction time, according to ComAp documentation, is 1.5 period of measured signal + 15ms (0.045s).



Do not scale from this drawing. Always check dimensions on site before using any information contained within this drawing. All dimensions shown are indicative only and need to be verified on-site. Clean Technology Partners accepts no liability from errors or omissions shown on this drawing. Check this drawing is the latest version. Do not reproduce all or part of this drawing without prior consent.

Client:



Notes:

- All installation works shall comply with; AS3000, AS3008, AS5033, AS4777, CEC Guidelines, Supply Authority Service & Installation Rules and local authority guidelines.
- All AC isolators shall be load break type. AC isolators installed externally shall be min IP65. An AC isolator is not required if the inverter is in line of sight of the Solar DB, where the inverter CB can be used for isolation.
- Utilise WEEB washers and bond all array frames with earth cabling ensuring a continuous earth connection even with the removal of a PV module.
- Ensure system is labelled to AS5033, AS4777.1, CEC guidelines and relevant state requirements.
- Phase coupler not to have neutral terminal connected. To use Legrand 036-08 Phase Coupler

FOR APPROVAL

Project: [Redacted]

Title: PV Protection Schematic

Dwg No: J1192-301

Rev: A1

Rev	Date	Comments	Dwn	Chkd

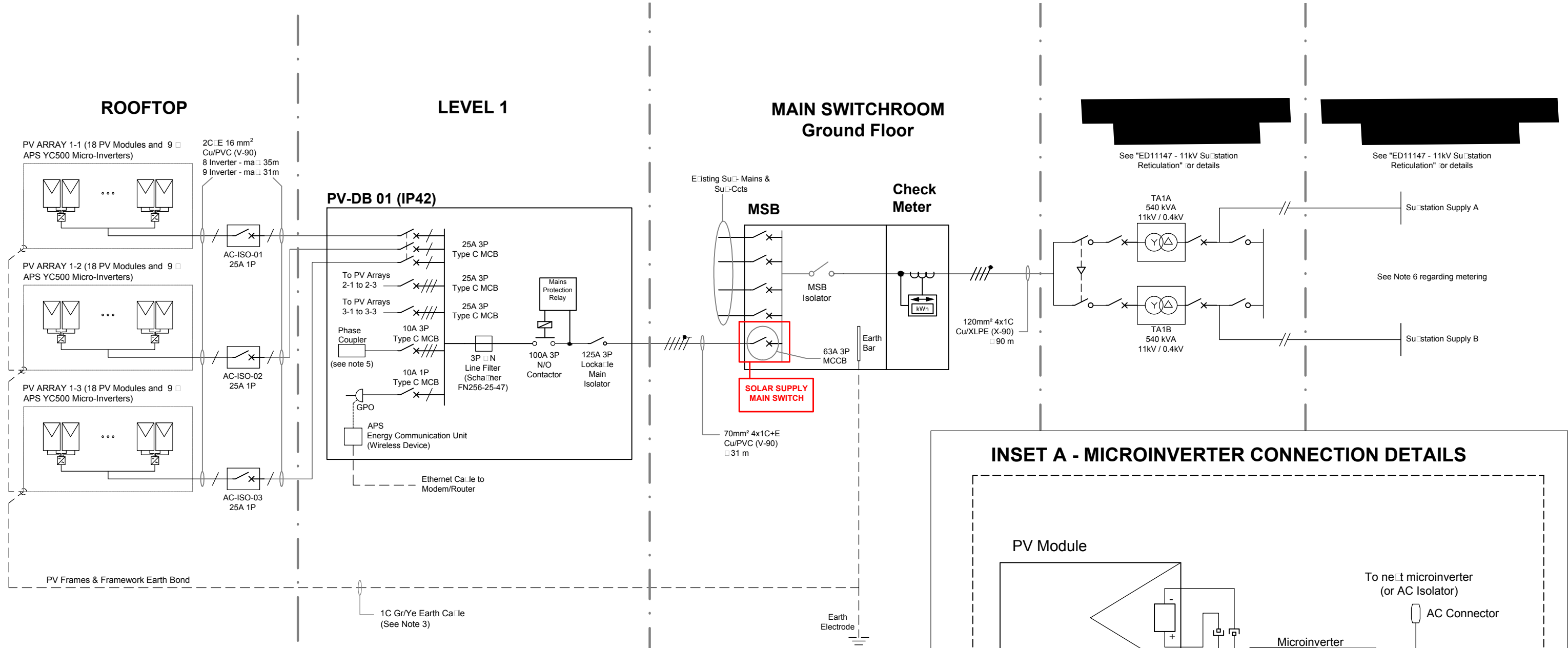
Dwn: [Redacted] Chkd: [Redacted] Date: 07/01/15
Job No: J1193 Scale: NTS



CEC Designer: [Redacted]

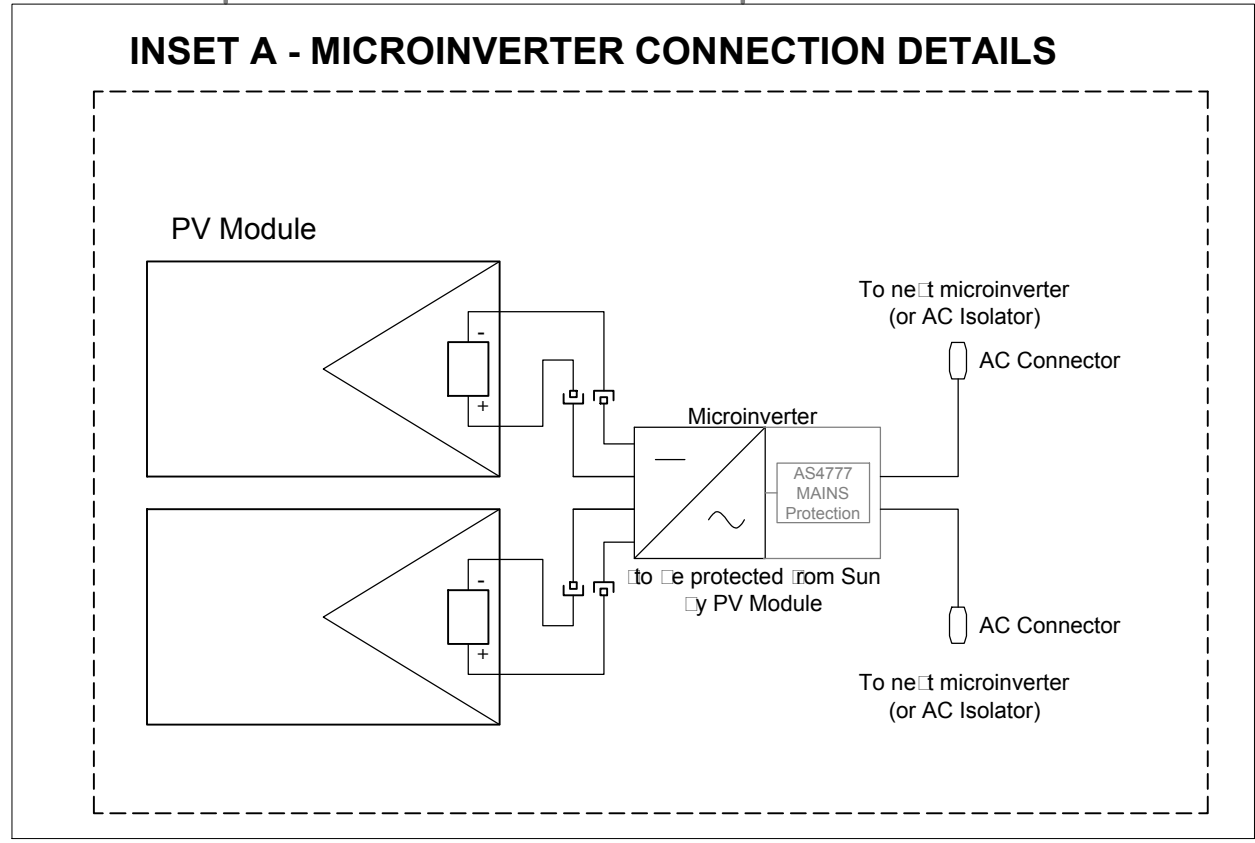
CEC Accreditation No: [Redacted]

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PV Arrays 1-1 to 2-2: 18 PV Modules and 9 APS YC500 Micro-Inverters
 PV Arrays 2-3 to 3-3: 16 PV modules and 8 APS YC500 Micro-Inverters

PV SYSTEM DETAILS	
PV TYPE:	Renesola JC250M-24/Bb
MODULE SIZE:	1640x992x40mm
No. MODULES:	154
TOTAL kWp:	38.5 kWp
ARRAY PITCH:	10°
ORIENTATION:	16° East of North



- Notes:
- All installation works shall comply with; AS3000, AS3008, AS5033, AS4777, CEC Guidelines, Supply Authority Service & Installation Rules and local authority guidelines.
 - All AC isolators shall be load break type. AC isolators installed externally shall be min IP65. An AC isolator is not required if the inverter is in line of sight of the Solar DB, where the inverter CB can be used for isolation.
 - Utilise WEEB washers and bond all array frames with earth cabling ensuring a continuous earth connection even with the removal of a PV module.
 - Ensure system is labelled to AS5033, AS4777.1, CEC guidelines and relevant state requirements.
 - Phase coupler not to have neutral terminal connected. Recommended to use Legrand 036-08 Phase Coupler.
 - [Redacted]

FOR APPROVAL

Project: [Redacted]
 Title: PV AC Schematic
 Dwg No: J1192-300 Rev: A2

Rev	Date	Comments	Dwn	Chkd
A2	15/01/15	Updated AC ISO size		
A1	12/01/15	CB, Cable Spec and HV details		
P4	16/12/14	Inverter iso and cable spec		
P3	15/12/14	Cable labels updated		
P2	12/12/14	CB rating added		

Dwn: [Redacted] Chkd: [Redacted] Date: 12/12/14
 Job No: J1192 Scale: NTS