TECHNICAL BRIEF:

INSTALLING ENPHASE CURRENT TRANSFORMERS (CT's)

Introduction

A Current Transformer (CT) is a current measurement device used in conjunction with the Enphase Envoy-S Metered to determine power flowing through a cable. Enphase provides a proprietary CT solution.

This document will provide information on:

- Identifying the correct CT
- Identifying the correct CT terminals on the Envoy
- Extending CT wiring
- Confirming CT's are installed correctly
- Tips for installing CT's

Identifying the correct CT

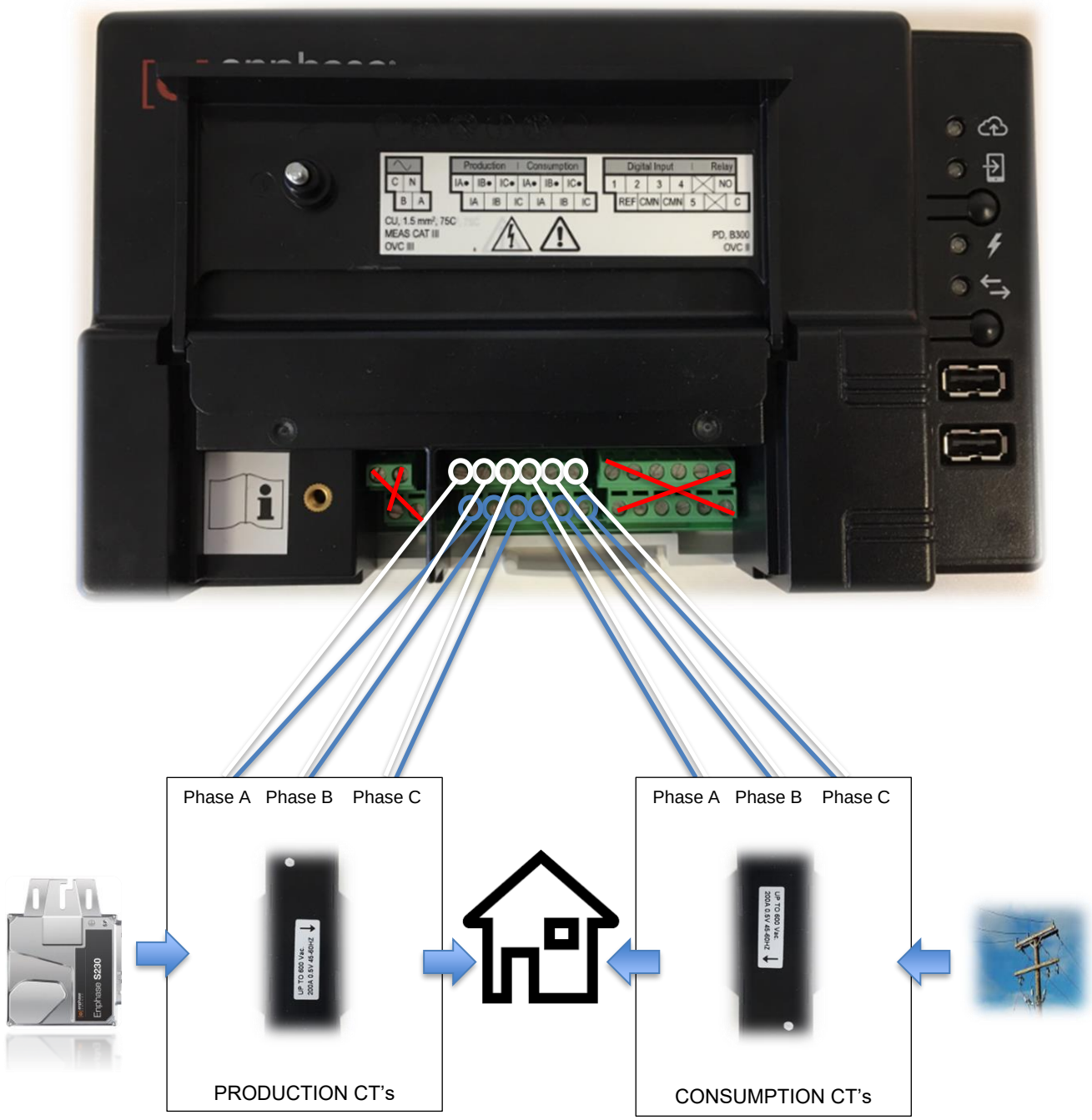
Envoy-S Metered Envoys are supplied with (2) CT's. One for the solar generation current and one for consumption current. Extra CT's are available when more than one phase of current is to be monitored.

Confirm the Envoy model required before ordering a CT. The 100A CT will provide more measurement accuracy than the 200A CT so should be used where possible.

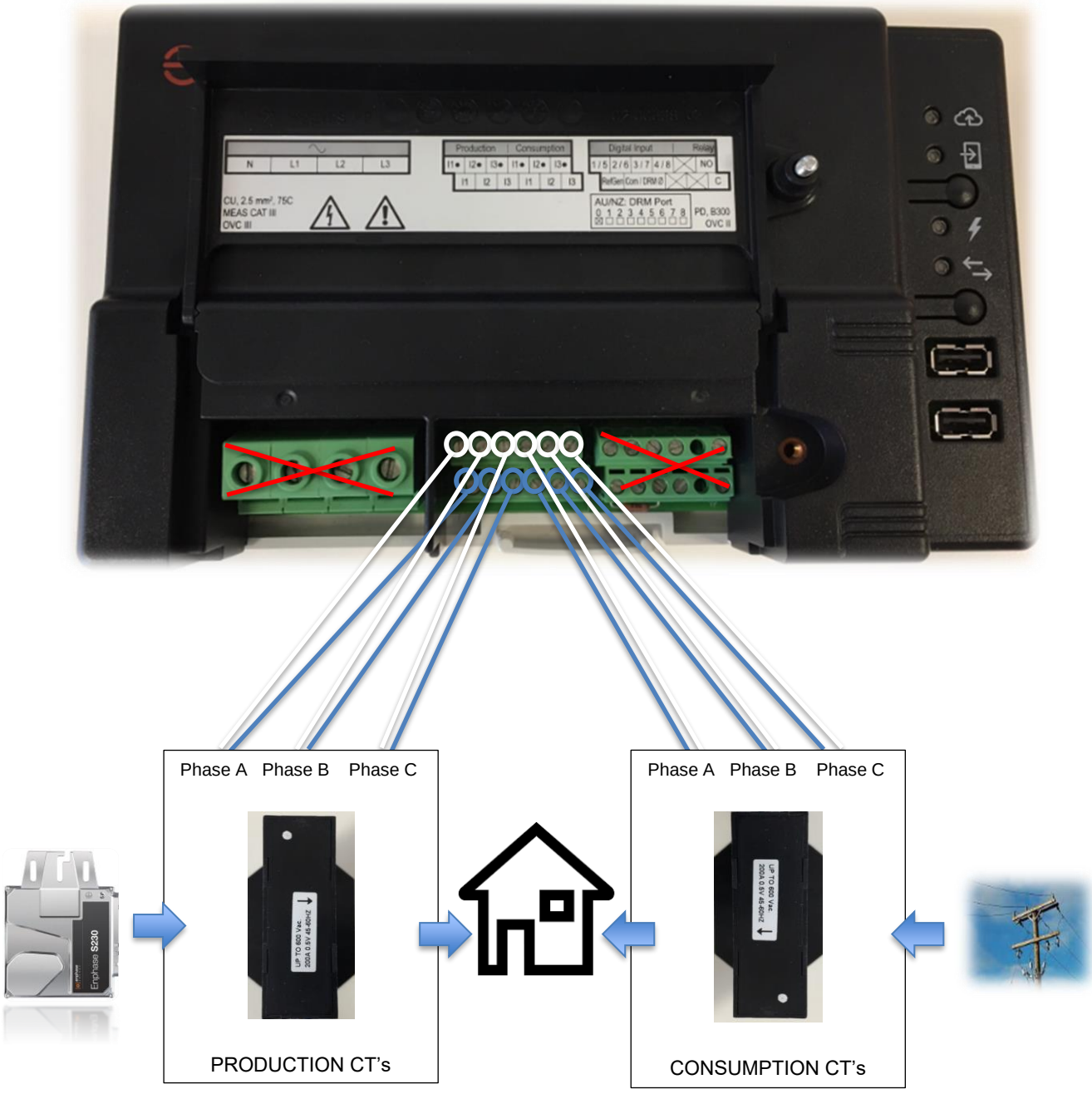
Envoy Type	**Supplied CT**
Envoy-S Metered SKU: **ENV-S-WM1-230-M** *Note:* *Multiphase units have part number 880-00209.* *Single Phase units have part number 880-00121.*	200A CT SKU: **CT-200-SPLIT** **2.5% Accuracy**  
Envoy-S Metered + DRM SKU: **ENV-S-WM-230-M** *Note: All units are multiphase*	100A CT SKU: **CT-100-SPLIT** **1% Accuracy**  

Identifying the correct CT terminals on the Envoy-S Metered

Envoy-S Metered (SKU ENV-S-WM1-230-M, Part Number:880-00209)



Envoy-S Metered + DRM (SKU ENV-S-230-WM-M)



Extending CT wiring

Each CT includes a 2m flying leads for wiring the CT directly into the Envoy-S metered terminals.

These wires may be extended to a maximum 1.5 Ohms per wire, 3 Ohms for both wires end to end. Appropriately rated, 0.75mm2 to 1.5mm2, twisted pair wire cable is recommended. Install in accordance with all applicable electrical codes and standards.

Some suggested options:

Manufacturer	**Cable Description**	**Recommended Max CT Extension (m)**
Elcon Cables	Elcon/LAPP Instrumentation cable 1.5 mm^2 (1 or 3 core). 500 VAC, test voltage 2,00 Vac (PCV/Foil/PVC V90 -30^{0}C to 105^{0}C)	100
Clipsal CBus	Cat. 5e rated 4 pair Unshielded Twisted Pair (UTP) cable but with a unique pink coloured main rated outer sheath that unlike standard Cat5E, can legally cohabitate in electrical enclosures with 240-volt wiring.	50
Belden	Belden 8471NH Unshielded Twisted pair cable (1.33mm^2)	75
Olex, General Cable, Electra Cables	Twin Active 1.5mm^2 TPS (AS/NZS 5000.2) (must be twisted gently by hand 20 twists per metre, V-90, PVC, 90^{0}C)	90
Olex, General Cable, Electra Cables	Twin Active 2.5mm^2 TPS (AS/NZS 5000.2) (must be twisted gently by hand 20 twists per metre, V-90, PVC, 90^{0}C)	200

Confirming CT's are installed correctly

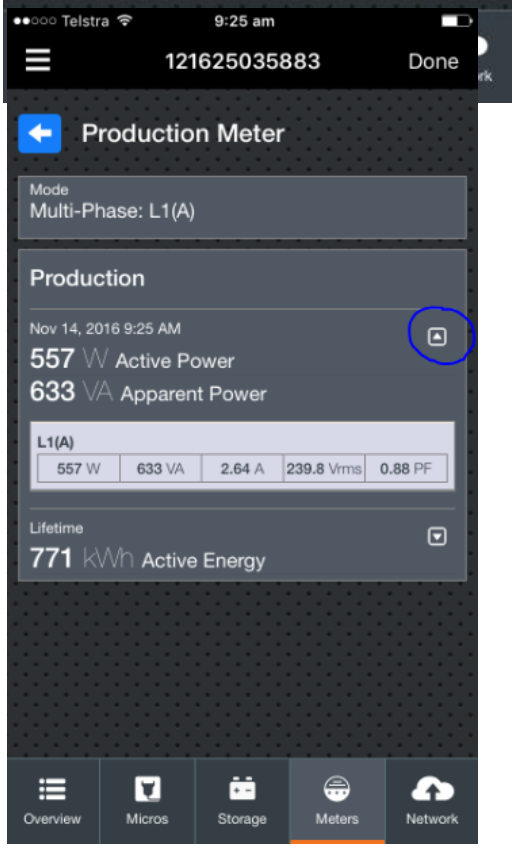
The Enphase Installer Toolkit should be used to verify CT's are installed and measuring correctly.

Check Meters are enabled

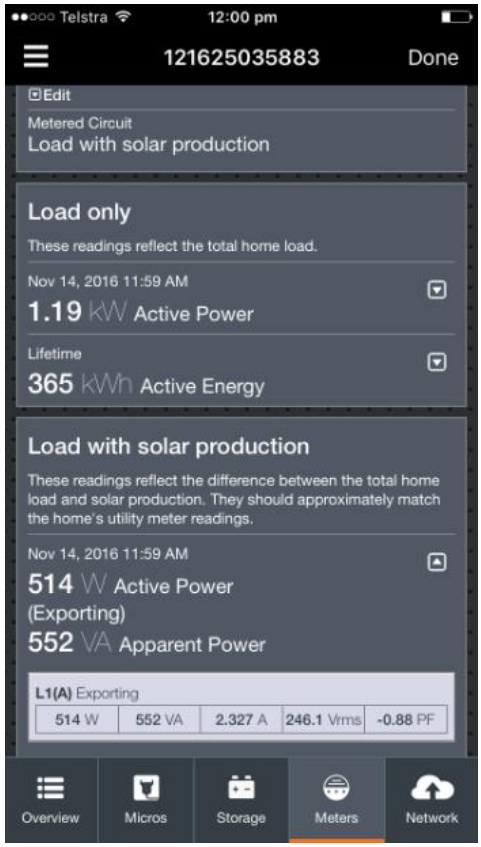
1. Connect the Enphase Installer Toolkit app to the Envoy via a network or AP mode.
2. Select 'Meters' from the menu.
3. Verify required meters have green ticks next to them indicating they are enabled. If not select the meter, and proceed to enable them.

Verify Production & Consumption Meter Readings

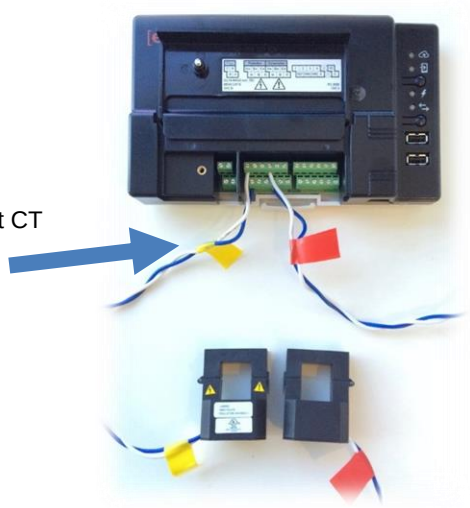
1. Select the **Production Meter**.
2. Verify the number of phases is correct.
   Single Phase (L1A)
   Two Phase (L1A+L2B)
   Three Phase (L1A+L2B+L3C)
   In the example shown the site is single phase so the number of phases selected is correct.
3. Expand the active power measurements by selecting the drop down arrow on the right hand side.
4. Confirm Power measurement is positive. 557W is shown in the example. If a negative power level is shown check CT polarity is correct. The CT arrow should point from the Solar inverters to the switchboard.
5. Confirm the CT is reading current correctly. In the example 2.64A is shown as the current from the solar inverters to the switchboard. With an AC clamp meter confirm this reading. If this reading is not correct check the CT is closed correctly and connected to the correct CT input on the Envoy.
6. Confirm the AC voltage measured by the Envoy is correct with an AC Voltmeter. In the example 239.8V is measured by the Envoy.
7. Confirm the power factor (PF) is correct. In the example 0.88 PF has been measured. Generally, the power factor will be in the range 0.7 to 1 when the production is at least 230W.



8. Select the **Consumption Meter**.
9. Verify the number of phases is correct.
   In the example shown the site is single phase so the number of phases selected is correct.
10. Verify the Metered Circuit is correct. If the CT is on the grid supply, then 'Load with solar production' should be selected. If the CT is installed on the loads only, then 'Load only' mode should be operating.
11. Scroll down to Load with solar production.
12. Expand the active power measurements by selecting the drop down arrow on the right hand side on.
13. Confirm Power measurement is positive. 1.14kW is shown in the example. If a negative power level is shown check the consumption CT polarity is correct. The CT arrow should point from the grid supply on the street to the switchboard.
14. Using an AC current clamp confirm the consumption CT is reading current correctly. In the example 2.327A is shown. If this reading is not correct check the CT is closed correctly and connected to the correct CT input on the Envoy.
15. Confirm the AC voltage measured by the Envoy is correct with an AC Voltmeter. In the example 246.8V is measured by the Envoy.
16. Confirm the power factor (PF) is correct. In the example 0.88 PF has been measured. Generally, the power factor for load will be in the range 0.5 to 0.99 when the load is at least 230W. A very low power factor is possible but it is generally an indication of voltage being out of phase to current measurement so on multiphase sites please check CT's and Envoy voltage supplies match.



TIPS FOR INSTALLING CT's



Mark each end of the CT wires

Colour code each end of the CT wiring so you can quickly identify the correct CT Envoy terminal. This can be especially helpful in a multiphase installation.

Terminate the CT wiring before closing the CT

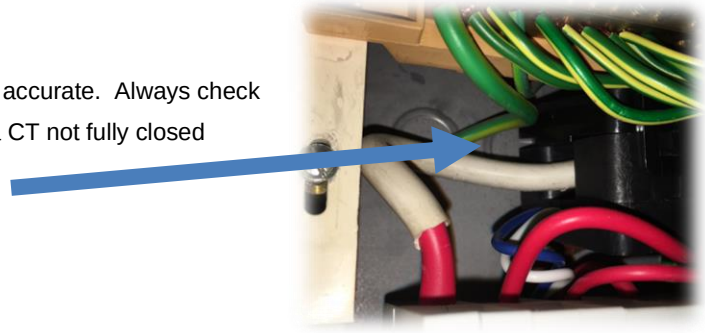
CT's can produce dangerous voltage and current if unterminated while closed around a wire with current flowing through it. Always terminate the CT in the Envoy terminals before closing the CT around a wire.

CT Noise

If the CT is making a buzzing noise it has not been terminated to the Envoy correctly or there is a break in the wiring. Open the CT and check the wiring.

Close the CT Fully

If a CT is not closed tightly measurements will not be accurate. Always check the CT is fully closed once fitted. This photo shows a CT not fully closed which caused some inaccurate readings.



Enable CT's

The CT's must be enabled via the Enphase Installer Toolkit before they will operate.

CT Polarity

CT's are polarity sensitive. The arrows on the clamp meters indicate the direction of typical energy flow. For example, solar energy should flow from the solar modules to the switchboard. Consumption should flow from the electricity supply to the switchboard.

Enphase Customer Service 1800 006 374

Enphase customer support technicians can make some adjustments remotely to the Envoy-S Metered if an internet connection is in place. Adjustments that may be made remotely on request:

Enabling CT's, Number of Phases, Metered Circuit