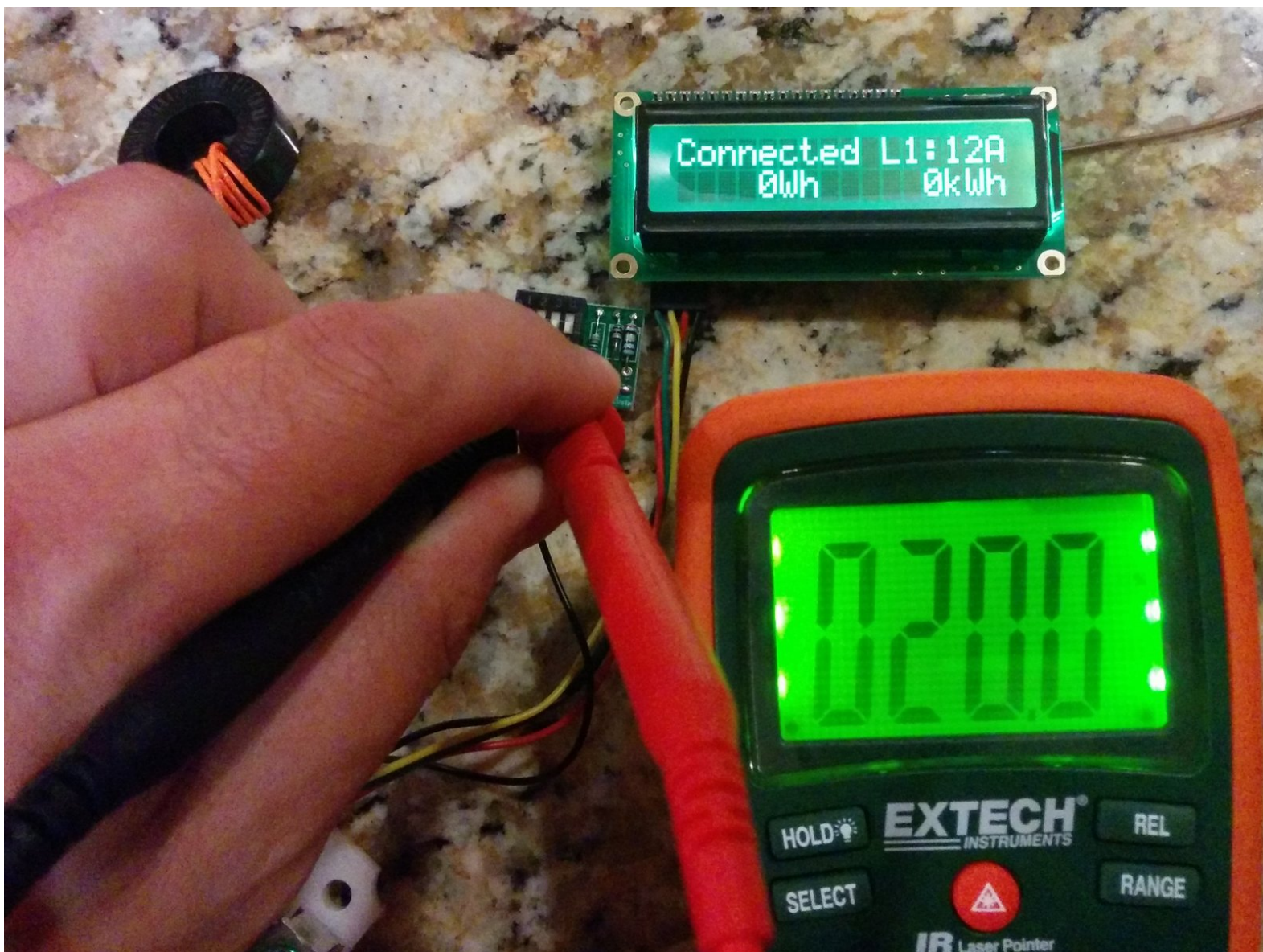


OpenEVSE

Testing Basic and Advanced

This guide provides both basic testing to ensure you OpenEVSE Charging Station is working correctly and an Advanced guide for Hardware and Software Developers to validate safety features are working correctly.

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Step 1 — Introduction



- ⚠ Testing is an important part of the OpenEVSE build process. This guide provides testing recommendation both for the user and those developing hardware and software.
- i OpenEVSE performs extensive self test during boot, before closing relays/contactors and while operating.
- ★ Basic Testing is recommended for all builders after building your charging station and whenever maintenance is performed.
- ★ Advanced testing shall be performed by hardware and software developers before releasing "Stable" firmware or a new hardware revision.
- i For builders wishing to better understand how a charging stations work, Advanced Testing may be performed.
- ⚠ Advanced Tests require live AC Power. Use extreme caution when working near energized high voltage components.

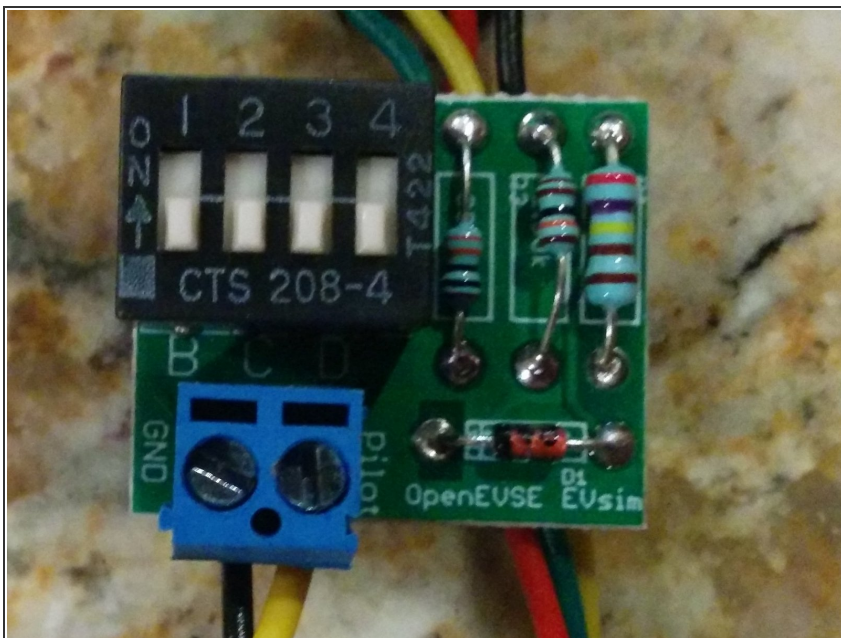
Step 2 — Basic Testing - Power on Self Test (POST)



❗ During the boot process OpenEVSE will run a Power on Self Test (POST).

⚠ If the POST fails by indicating any Error condition or a RED LED/LCD please refer to the Troubleshooting guide before proceeding.

Step 3 — Basic Testing - Testing EVSE States



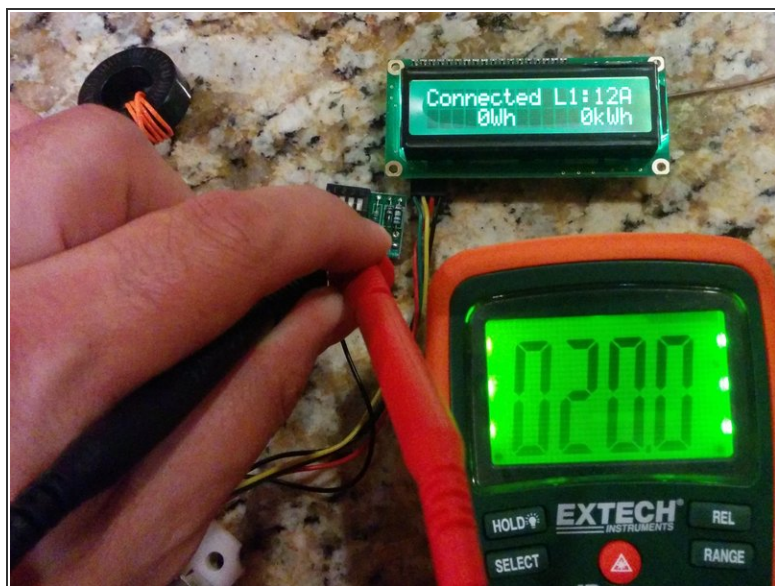
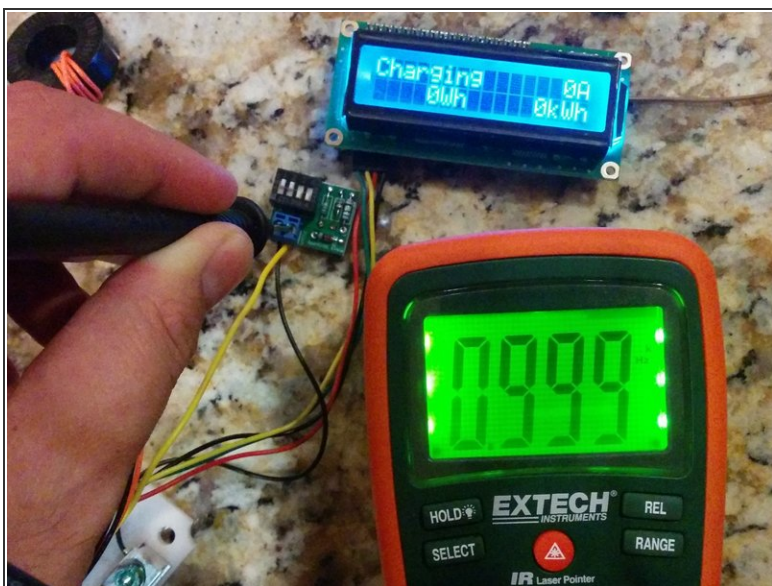
- EVSE states can be tested with a few resistors and a diode, and EV Simulator or an EVSE Tester. After a successful Power on Self Test OpenEVSE should enter State A - Ready and the LED/LCD should be Green.

- State B - EV Connected. Connect 2.74k resistance plus a diode from Pilot to ground. OpenEVSE display

should display "EV Connected" and LED/LCD should turn Yellow.
(OpenEVSE Sim - 1 on)

- State C - Charging. Connect 882 ohm resistance plus a diode from Pilot to ground. OpenEVSE display should display "Charging" and LED/LCD should turn Blue.
(OpenEVSE Sim - 1 on + 2 on)
- State D - Ventilation Required. Connect 246 ohms resistance plus a diode from Pilot to ground. OpenEVSE display should display "EVSE ERROR - VENT REQUIRED" and LED/LCD should turn Red. (OpenEVSE Sim - 1 on + 2 on + 3 on)

Step 4 — Basic Testing (Optional) Pilot Signal Frequency and Duty Cycle



- i** OpenEVSE outputs a 1000hz pilot signal when connected to an EV and Ready.

 - Using a Multimeter with frequency measurement, a oscilloscope or an EV Sim II from nslayer. Enter State B and measure frequency from pilot to ground.
- i** Frequency should measure between 980 to 1020Hz.

 - Using a Multimeter with duty cycle measurement, a oscilloscope or an EV Sim II from nslayer. Enter State B and measure duty cycle from pilot to ground. Duty Cycle should match formulas below.
- i** 6 to 51A -- Amps = Duty cycle x 0.6 -- Duty cycle = Amps / 0.6
- i** 51 - 80A -- Amps = (Duty Cycle - 64) 2.5

Step 5 — Basic Testing - GFCI Test



- Power on OpenEVSE Charging Station with the GFCI coil with self test loop disconnected.
- The OpenEVSE Charging Station should fail the boot process with "Error GFCI Self Test Failed" and indicate red on the LED/LCD.
- If the Power on Self Test does not fail with the coils disconnected, check that GFCI Self Test is enabled in the Service Menu.

⚠ If GFCI self check is enabled and the test does not fail please refer to the Troubleshooting guide.

Step 6 — Advanced Testing



- The following tests are intended for Hardware and Software developers to validate hardware revisions and validate production software.
- ① Builders who wish to better understand the safety features of OpenEVSE Charging Stations may proceed if desired.

⚠ Advanced Tests require live AC Power. Use extreme caution when working near energized high voltage components.

Step 7 — Advanced Testing - GFCI Fault trip point



- ★ GFCI must trip between 15ma and 20ma.
- Using Ohms Law select to correct 5 watt resistors to draw 15ma and 20ma. Alternatively, a 5 watt resistor selected for 12ma plus a 5k 5 watt pot can be used to determine the exact trip point.
- i US - 120v line to ground $8k = 15ma$ and $6k = 20ma$
- i Europe 230v line to ground $15.3k = 15ma$ and $11.5k = 20ma$
- While the EVSE is in State C "Charging" connect a wire with the 15ma resistor in parallel through the GFCI coil from one hot to ground. The Charging Station should not trip.
- While the EVSE is in State C "Charging" connect a wire with the 20ma resistor in parallel through the GFCI coil from one hot to ground. The Charging Station should trip this time.

Step 8 — Advanced Testing - GFCI Auto Retry



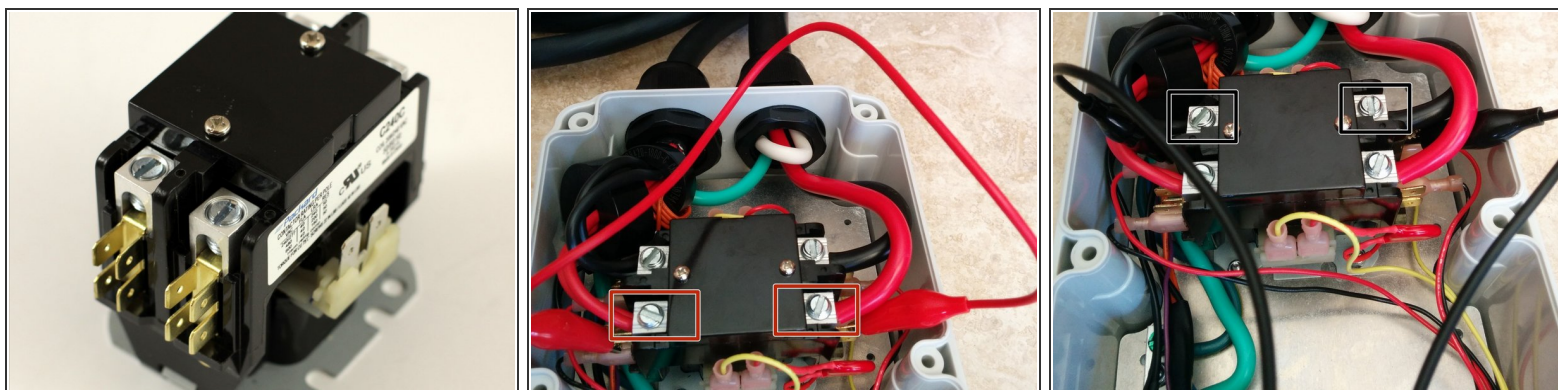
- ❗ OpenEVSE will recover and retry after a GFCI fault. The time to retrys is configurable in the OpenEVSE firmware.
- Induce a GFCI Fault.
 - EVSE should display EVSE ERROR - GFCI FAULT.
- Remove GFCI Fault. EVSE should recover after the time to retry has elapsed.

Step 9 — Advanced Testing - GFCI Lockout



- ❗ OpenEVSE will lockout if a GFCI fault occurs within 2 seconds of contact closure.
- Enter State C (Charging).
- Within 2 seconds of contact closure induce GFCI Fault. OpenEVSE should display SERVICE REQUIRED - GFCI Fault.
- ⚠ OpenEVSE will remain in this state until power is removed.

Step 10 — Advanced Testing - Welded Contactor



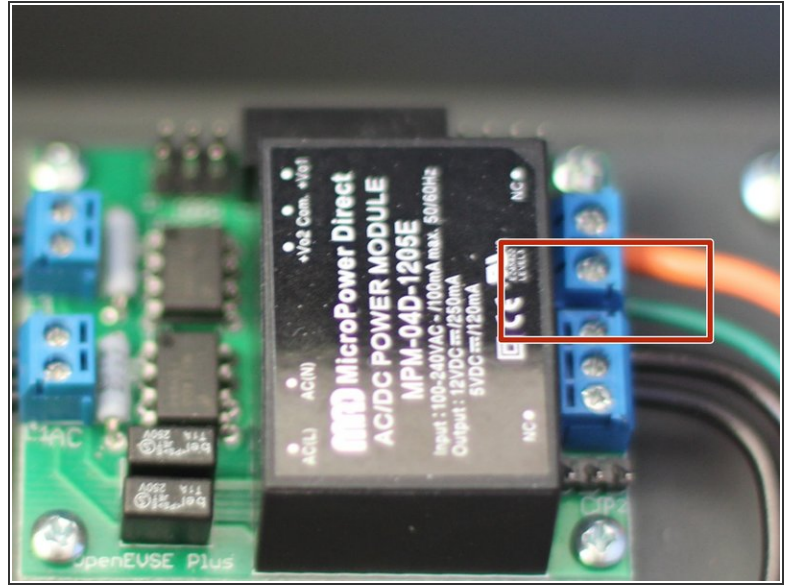
i OpenEVSE tests the Contactor at each boot and every time before closing the contacts.

⚠ All OpenEVSE versions except v3 have 2 AC Detect chips. For v3 test just the hot connected to AC_TEST.

⚠ For testing on single phase 208 (US) and 230 (Europe) test just the Hot line. Neutral will not produce any results and Neutral to ground should measure 0v.

- Testing Hot - Using a alligator clip connect across the relay from the line side of Hot 1 to the EV load side. Power on the Charging Station - The Charging should display "Error Stuck Relay".
- Testing Hot 2 (US Split Phase) (Versions except v3) - Using a alligator clip connect across the relay from the line side of Hot 2 to the EV load side. Power on the Charging Station - The Charging should display "Error Stuck Relay".

Step 11 — Advanced Testing - Earth Ground



- i** OpenEVSE checks for Earth Ground Continuously while Charging (State C).
- Testing - Connect EV Simulator. Enter State C Charging. Disconnect Earth Ground from the OpenEVSE board. OpenEVSE should enter and Error state and Display "EVSE ERROR - NO GROUND".
 - Restore Ground Connection. EVSE should resume charging within 1 minute.