

Electric network frequency sensing device instructions

There are two derivatives of the device. One for use in countries where the power grid's AC voltage is 230V and the other one for 120V mains voltage.



Figure 1 Europe 230V derivative device.

The device provides two methods for extracting the ENF. The first method captures the voltage amplitude from the power cord through a transformer. The second method uses a photodiode to capture the light intensity fluctuations caused by an incandescent or halogen light bulb. Both signals are fed to a stereo jack cable as seen in Fig. 2.

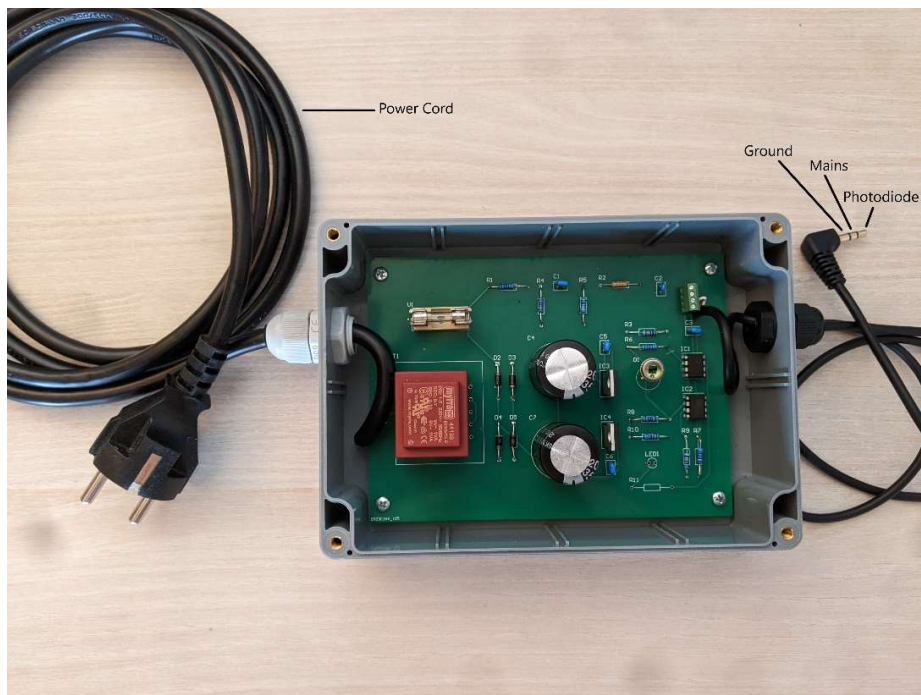


Figure 2 The ENF sensing device.

Device configuration

There are two methods for collecting both signals simultaneously through a PC or a laptop. The easiest and more robust way is to connect the stereo jack coming out of the device directly to a desktop computer's line-in socket or a laptop's jack input, and configure it to behave as a line-in input. This enables you to collect both signals as if it was a stereo recording.

While most motherboards' integrated audio card support a line-in input (light blue colored plug) as seen in Fig. 3, not all laptops support this feature.



Figure 3 Typical motherboard line-in plug inside the black circle.

To check if your laptop supports a line-in connection:

- Connect the stereo jack cable of the device into your laptop's audio socket.
- If there is a pop-up window like the one in Fig. 4 with an option for 'Line-in', then the laptop supports it.
- If there is not a pop-up window. Open the sound settings as in Fig. 5. In the recording tab, hit right click and check 'Show Disabled Devices'.
- If there is a Line In option in the list, right click on it and select 'Enable'.

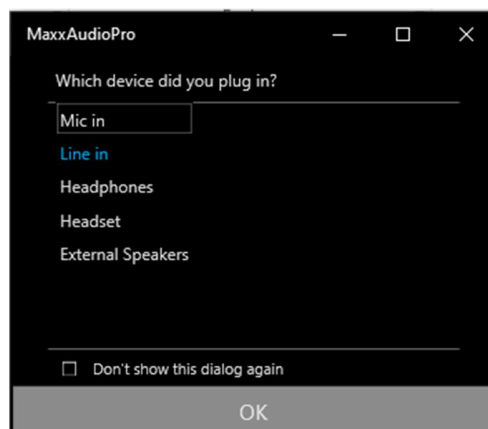


Figure 4 Audio driver pop-up window

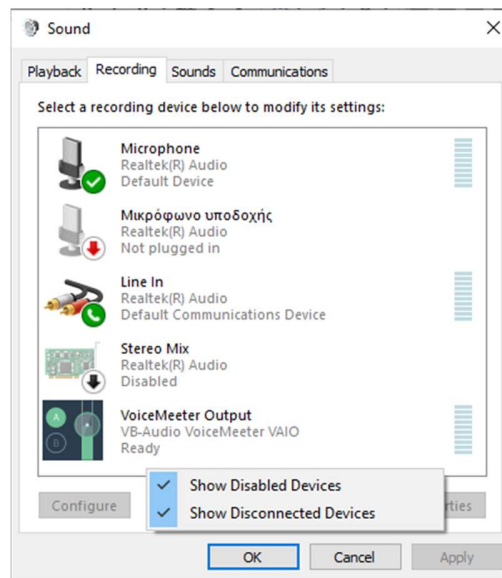


Figure 5 Sound recording settings in Windows.

If the laptop does not support a line-in connection, the instruction below describe a workaround in order to split the stereo signal into left and right signals, and feed them separately into the laptop. One signal is fed through the laptop's audio socket and the other one through an USB sound card.

- Connect the Stereo Jack of the device to the Stereo to Mono Splitter Cable (Fig. 6). The two Mono Jacks are labeled according to the signal they carry, i.e. Mains and Photodiode.
- Connect the Splitter's Photodiode Jack to the Mono to TRRS Cable (Fig. 7) and into the laptop's audio socket.
- Connect the Splitter's Mains Jack to the Mono to TRS Cable. Then connect the TRS side of the cable to the Microphone input of the USB sound card and plug it into a USB socket.

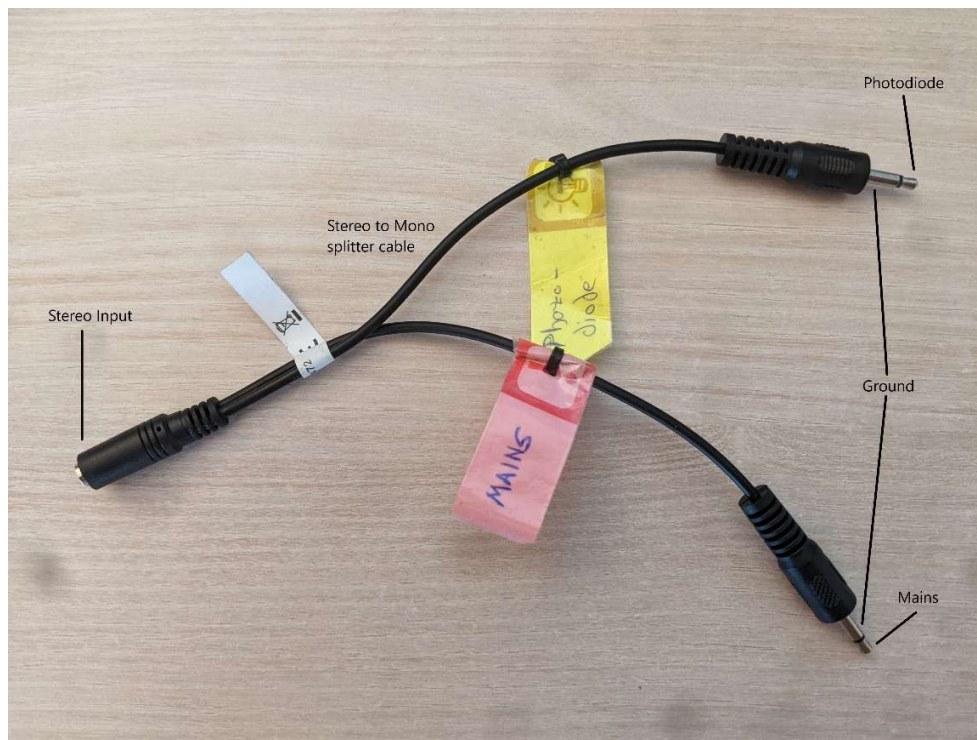


Figure 6 Stereo to Mono splitter cable for mains and photodiode signal separation.

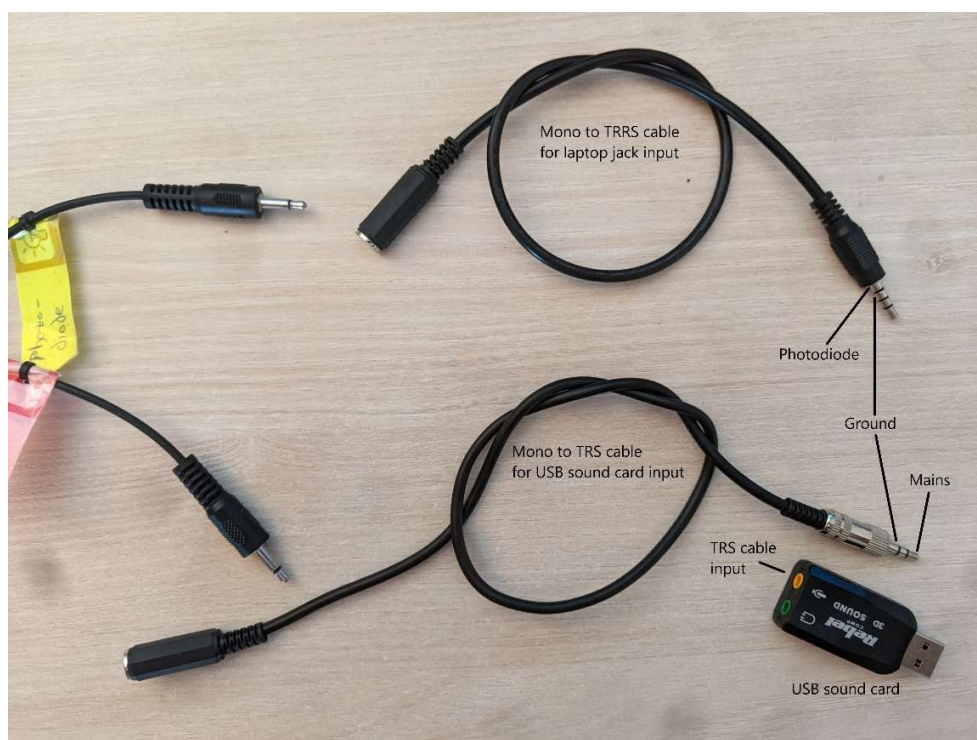


Figure 7 Top: Mono to TRRS cable for feeding the photodiode signal into the laptop's audio plug. Bottom: Mono to TRS cable for feeding the mains power signal through a USB sound card into the laptop.

Data acquisition

Depending on the configuration you followed there are two matlab scripts available to proceed with the recording of the signals.

If a line-in connection is supported, run 'stereo_recording.m'.

If you are using the laptop's audio jack for one signal and the USB sound card for the other, run 'separate_recording.m'.