

User Manual

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1 Circuits by options

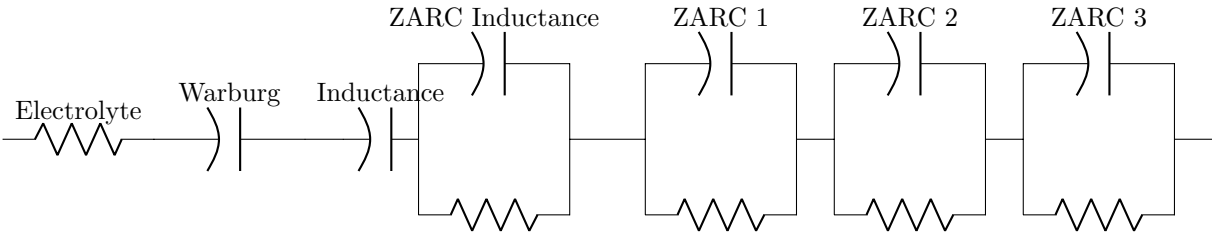
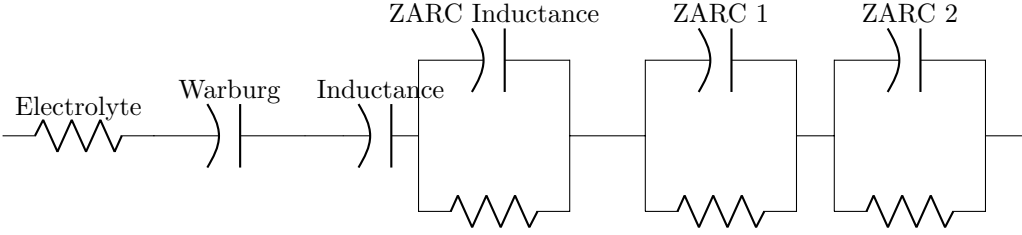
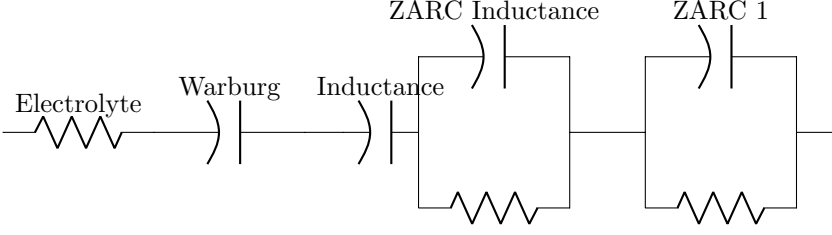
There are some basic options that always must be present, such as `mode`, `logdir`, `input_dir`, `dataset`, `output_dir`, so a typical fitting command will start with something like:

```
python manage.py eis_main ^  
--mode=import_process_output ^  
--logdir=OnePercentTraining ^  
--input_dir=RealData\EIS ^  
--dataset=USER7 ^  
--output_dir=OutputData10
```

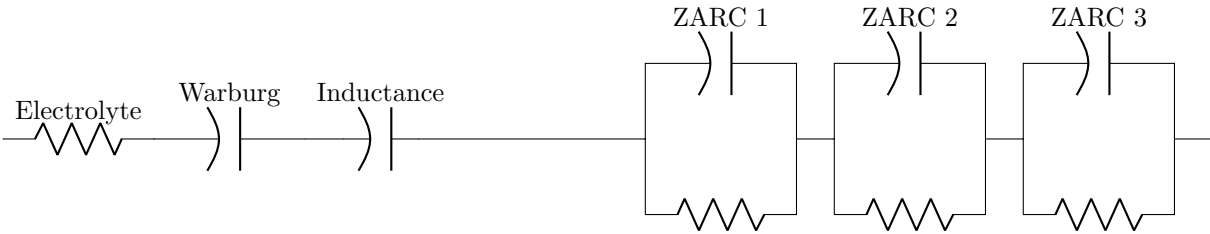

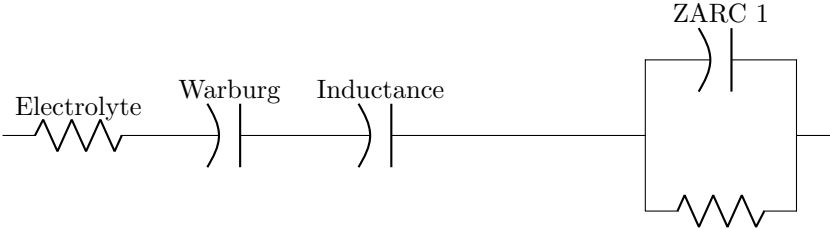
or alternatively, in a single line:

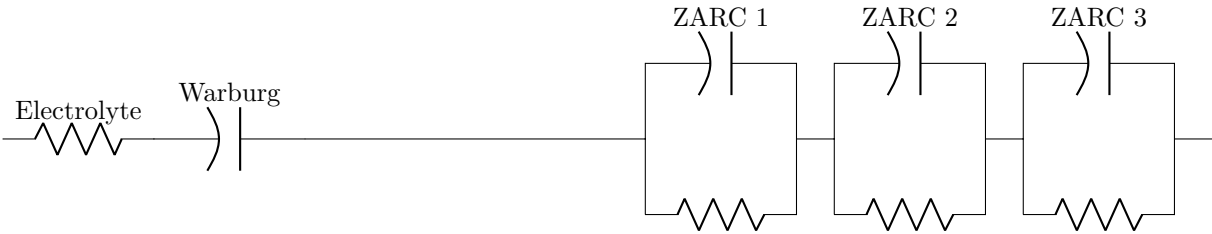


```
python manage.py eis_main --mode=import_process_output --logdir=OnePercentTraining --input_dir=RealData\EIS --dataset=USER7 ...
```

Therefore, we shall only list the additional options for obtaining a specific circuit.

Minimal Options	Full Options	Circuit
<pre> —inductance —zarc_inductance </pre>	<pre> —inductance —zarc_inductance —num_zarcs=3 —no_warburg_inception </pre>	 <p>The circuit diagram shows a series connection of four components: an Electrolyte (resistor), a Warburg element (inductor), an Inductance element (inductor), and three ZARC elements (each a parallel combination of a capacitor and a resistor). The ZARC elements are labeled ZARC Inductance, ZARC 1, ZARC 2, and ZARC 3.</p>
<pre> —inductance —zarc_inductance —num_zarcs=2 </pre>	<pre> —inductance —zarc_inductance —num_zarcs=2 —no_warburg_inception </pre>	 <p>The circuit diagram shows a series connection of three components: an Electrolyte (resistor), a Warburg element (inductor), and two ZARC elements (each a parallel combination of a capacitor and a resistor). The ZARC elements are labeled ZARC Inductance, ZARC 1, and ZARC 2.</p>
<pre> —inductance —zarc_inductance —num_zarcs=1 </pre>	<pre> —inductance —zarc_inductance —num_zarcs=1 —no_warburg_inception </pre>	 <p>The circuit diagram shows a series connection of three components: an Electrolyte (resistor), a Warburg element (inductor), and one ZARC element (a parallel combination of a capacitor and a resistor). The ZARC element is labeled ZARC Inductance and ZARC 1.</p>

Minimal Options	Full Options	Circuit
<pre> --zarc_inductance </pre>	<pre> --no_inductance --zarc_inductance --num_zarcs=3 --no_warburg_inception </pre>	
<pre> --zarc_inductance --num_zarcs=2 </pre>	<pre> --no_inductance --zarc_inductance --num_zarcs=2 --no_warburg_inception </pre>	
<pre> --zarc_inductance --num_zarcs=1 </pre>	<pre> --no_inductance --zarc_inductance --num_zarcs=1 --no_warburg_inception </pre>	

Minimal Options	Full Options	Circuit
<code>--inductance</code>	<code>--inductance</code> <code>--no_zarc_inductance</code> <code>--num_zarcs=3</code> <code>--no_warburg_inception</code>	 <p>The circuit diagram shows a series connection of four components: an Electrolyte (resistor), a Warburg element (inductor and capacitor in parallel), an Inductance element (inductor and capacitor in parallel), and three ZARC elements in series. Each ZARC element consists of a parallel combination of a capacitor and a resistor. The ZARC elements are labeled ZARC 1, ZARC 2, and ZARC 3 from left to right.</p>
<code>--inductance</code> <code>--num_zarcs=2</code>	<code>--inductance</code> <code>--no_zarc_inductance</code> <code>--num_zarcs=2</code> <code>--no_warburg_inception</code>	 <p>The circuit diagram shows a series connection of four components: an Electrolyte (resistor), a Warburg element (inductor and capacitor in parallel), an Inductance element (inductor and capacitor in parallel), and two ZARC elements in series. Each ZARC element consists of a parallel combination of a capacitor and a resistor. The ZARC elements are labeled ZARC 1 and ZARC 2 from left to right.</p>
<code>--inductance</code> <code>--num_zarcs=1</code>	<code>--inductance</code> <code>--no_zarc_inductance</code> <code>--num_zarcs=1</code> <code>--no_warburg_inception</code>	 <p>The circuit diagram shows a series connection of four components: an Electrolyte (resistor), a Warburg element (inductor and capacitor in parallel), an Inductance element (inductor and capacitor in parallel), and one ZARC element. The ZARC element consists of a parallel combination of a capacitor and a resistor and is labeled ZARC 1.</p>

Minimal Options	Full Options	Circuit
	<div><div>—no_inductance</div><div>—no_zarc_inductance</div><div>—num_zarcs=3</div><div>—no_warburg_inception</div></div>	 <p>The circuit diagram for 3 ZARCs consists of an 'Electrolyte' resistor in series with a 'Warburg' element (represented by a vertical line and a curved line). This is followed by three parallel branches, each labeled 'ZARC 1', 'ZARC 2', and 'ZARC 3' respectively. Each ZARC branch contains a capacitor (represented by two parallel vertical lines) in series with a resistor (represented by a zigzag line). The branches are connected in parallel to the main circuit line.</p>
<div>—num_zarcs=2</div>	<div><div>—no_inductance</div><div>—no_zarc_inductance</div><div>—num_zarcs=2</div><div>—no_warburg_inception</div></div>	 <p>The circuit diagram for 2 ZARCs is similar to the 3 ZARC case, but it only contains two parallel branches labeled 'ZARC 1' and 'ZARC 2'. Each branch contains a capacitor in series with a resistor.</p>
<div>—num_zarcs=1</div>	<div><div>—no_inductance</div><div>—no_zarc_inductance</div><div>—num_zarcs=1</div><div>—no_warburg_inception</div></div>	 <p>The circuit diagram for 1 ZARC is the simplest, containing only one parallel branch labeled 'ZARC 1'. This branch contains a capacitor in series with a resistor.</p>

Minimal Options	Full Options	Circuit
—inductance —zarc_inductance —warburg_inception	—inductance —zarc_inductance —num_zarcs=3 —warburg_inception	
—inductance —zarc_inductance —num_zarcs=2 —warburg_inception	—inductance —zarc_inductance —num_zarcs=2 —warburg_inception	
—inductance —zarc_inductance —num_zarcs=1 —warburg_inception	—inductance —zarc_inductance —num_zarcs=1 —warburg_inception	

Minimal Options	Full Options	Circuit
—zarc_inductance —warburg_inception	—no_inductance —zarc_inductance —num_zarcs=3 —warburg_inception	<p>The circuit diagram shows an 'Electrolyte' resistor in series with three parallel branches. Each branch contains a ZARC element (inductor and capacitor in parallel) in series with a resistor. The branches are labeled 'ZARC Inductance', 'ZARC 1', 'ZARC 2', and 'ZARC 3'. A 'Warburg' element (resistor and Warburg impedance in parallel) is connected in series with the second ZARC branch.</p>
—zarc_inductance —num_zarcs=2 —warburg_inception	—no_inductance —zarc_inductance —num_zarcs=2 —warburg_inception	<p>The circuit diagram shows an 'Electrolyte' resistor in series with two parallel branches. Each branch contains a ZARC element (inductor and capacitor in parallel) in series with a resistor. The branches are labeled 'ZARC Inductance', 'ZARC 1', and 'ZARC 2'. A 'Warburg' element (resistor and Warburg impedance in parallel) is connected in series with the second ZARC branch.</p>
—zarc_inductance —num_zarcs=1 —warburg_inception	—no_inductance —zarc_inductance —num_zarcs=1 —warburg_inception	<p>The circuit diagram shows an 'Electrolyte' resistor in series with one parallel branch. The branch contains a ZARC element (inductor and capacitor in parallel) in series with a resistor. The branch is labeled 'ZARC Inductance' and 'ZARC 1'. A 'Warburg' element (resistor and Warburg impedance in parallel) is connected in series with the ZARC branch.</p>

Minimal Options	Full Options	Circuit
—inductance —warburg_inception	—inductance —no_zarc_inductance —num_zarcs=3 —warburg_inception	<p>The circuit diagram shows an Electrolyte (resistor) in series with an Inductance (inductor). This is followed by three parallel ZARC branches labeled ZARC 1, ZARC 2, and ZARC 3. Each ZARC branch consists of a capacitor in parallel with a Warburg element (resistor in series with a Warburg inductor). The Warburg element is represented by a resistor and a vertical line with a horizontal step.</p>
—inductance —num_zarcs=2 —warburg_inception	—inductance —no_zarc_inductance —num_zarcs=2 —warburg_inception	<p>The circuit diagram shows an Electrolyte (resistor) in series with an Inductance (inductor). This is followed by two parallel ZARC branches labeled ZARC 1 and ZARC 2. Each ZARC branch consists of a capacitor in parallel with a Warburg element (resistor in series with a Warburg inductor). The Warburg element is represented by a resistor and a vertical line with a horizontal step.</p>
—inductance —num_zarcs=1 —warburg_inception	—inductance —no_zarc_inductance —num_zarcs=1 —warburg_inception	<p>The circuit diagram shows an Electrolyte (resistor) in series with an Inductance (inductor). This is followed by a single parallel ZARC branch labeled ZARC 1. The ZARC branch consists of a capacitor in parallel with a Warburg element (resistor in series with a Warburg inductor). The Warburg element is represented by a resistor and a vertical line with a horizontal step.</p>

Minimal Options	Full Options	Circuit
—warburg_inception	—no_inductance —no_zarc_inductance —num_zarcs=3 —warburg_inception	<p>The circuit diagram shows an 'Electrolyte' resistor in series with three parallel branches. Each branch contains a ZARC element (inductor and capacitor in parallel) in series with a Warburg element (resistor and constant phase element in parallel). The branches are labeled 'ZARC 1', 'ZARC 2', and 'ZARC 3' at the top.</p>
—num_zarcs=2 —warburg_inception	—no_inductance —no_zarc_inductance —num_zarcs=2 —warburg_inception	<p>The circuit diagram shows an 'Electrolyte' resistor in series with two parallel branches. Each branch contains a ZARC element (inductor and capacitor in parallel) in series with a Warburg element (resistor and constant phase element in parallel). The branches are labeled 'ZARC 1' and 'ZARC 2' at the top.</p>
—num_zarcs=1 —warburg_inception	—no_inductance —no_zarc_inductance —num_zarcs=1 —warburg_inception	<p>The circuit diagram shows an 'Electrolyte' resistor in series with a single parallel branch. This branch contains a ZARC element (inductor and capacitor in parallel) in series with a Warburg element (resistor and constant phase element in parallel). The ZARC element is labeled 'ZARC 1' at the top.</p>

1.1 Reference on components and parameters

Element	Parameters
Electrolyte	R (ohm), the series resistor
Warburg	<ul style="list-style-type: none">• Q_warburg (the units depend on Phi), the magnitude of a Constant Phase Element• Phi_warburg (unitless), the exponent of a Constant Phase Element
Inductance	<ul style="list-style-type: none">• Q_inductance (the units depend on Phi), the magnitude of a Constant Phase Element• Phi_inductance (unitless), the exponent of a Constant Phase Element
ZARC Inductance	<ul style="list-style-type: none">• R_zarc.impedance (ohm), the resistance• W_c.inductance (rad/s), the characteristic frequency (angular)• Phi_zarc.inductance (unitless), the exponent
ZARC 1	<ul style="list-style-type: none">• R_zarc.1 (ohm), the resistance• W_c.zarc.1 (rad/s), the characteristic frequency (angular)• Phi_zarc.1 (unitless), the exponent
ZARC 2	<ul style="list-style-type: none">• R_zarc.2 (ohm), the resistance• W_c.zarc.2 (rad/s), the characteristic frequency (angular)• Phi_zarc.2 (unitless), the exponent
ZARC 3	<ul style="list-style-type: none">• R_zarc.3 (ohm), the resistance• W_c.zarc.3 (rad/s), the characteristic frequency (angular)• Phi_zarc.3 (unitless), the exponent