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| A picture of a winding road and trees  [Document title]  [Document subtitle] | Abstract  [Draw your reader in with an engaging abstract. It is typically a short summary of the document. When you’re ready to add your content, just click here and start typing.]  Oliver  [Course title] |

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# About the Valve Workbench

# The Analyser

## Analysing triodes

## Analysing pentodes

# The Modeller

## Modelling triodes

Modelling triodes is quite simple but does require one specific step – triode modelling is dependent on there being at least one Measurement of Anode Characteristics in the Project. This can be done very easily from the Analyser tab by performing the necessary Measurement and then clicking on the “Add to Project…” button. The reason for this requirement is that the Modeller uses this Measurement to estimate the Model fitting parameters before performing a fit of all the Measurements to the triode Model.

As long as there is at least one Measurement of Anode Characteristics, any number of other Measurements can be added to the Project (either Anode Characteristics or Transfer Characteristics) and they will be used in the fitting process. Note that adding more measurements is not guaranteed to improve the accuracy of the fit and the fitting process may take longer. To start the modelling process, simply click on the “Fit Model” button.

The modelling process has just two stages: the estimation stage and the fitting stage. The estimation is always done with the **first** Anode Characteristics Measurement in the project and is dependent on there being **more than one Sweep** in this Measurement. If this requirement is not met, a message dialog will be shown to indicate that the requirements for modelling have not been met.

Once the Estimate has been generated, the Model is then created by fitting all the Measurements to the Model using a least squares approach, and beginning with the Model parameters from the Estimate. Once complete, the Model will be added to the Project and can be plotted in conjunction with any measurement from the Project.

## Modelling pentodes

Modelling pentodes is more complex than modelling triodes because multiple types of Measurement are needed. This is because a pentode is essentially a triode but with a couple of extra grids (the Suppressor Grid, which must be connected to the Cathode, and the Screen) and so the modelling process for pentodes starts with a determination of the triode characteristics of the pentode. This is done by “triode strapping” the device and creating a triode Anode Characteristics Measurement using the Analyser.

To complete the pentode modelling, once it has been modelled as a triode, the process is then similar to modelling a simple triode: an Estimate is created using a **pentode** Anode Characteristics Measurement which is then used to create a least squares fit of all pentode Measurements in the Project to the Model.

Pentode modelling does require more careful consideration than triode modelling as there are two types of pentode Model that can be used, and there is also an option to include the effects of secondary emission in the Model. Furthermore, there are choices that can be made with regards to how the Measurements are fitted to the Model. For this reason, with a pentode Project, clicking the “Fit Model…” button will pop up a dialog that allows the modelling process to be configured before it is executed.

Pentode modelling steps:

* Model as triode
* Estimate pentode (kg2, A, alpha and beta)
* Fit pentode

Fitting approach:

* Fit Ik to determine x, A, kg2, alpha and beta
* Fit Ia to determine x, A, kg2, alpha and beta
* Fit Ig2 to determine kg2, alpha and beta, then fit Ia to determine x, A

# The Designer