

Key features & functionality

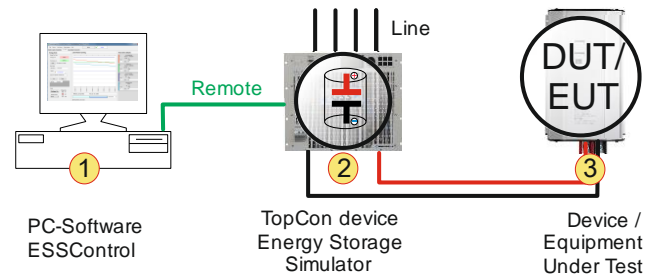
- The optional simulation model of capacitors is an additional software component option of the application Energy Storage Simulation ESSControl.
- Full integration with Regatron TopCon device series: TC.GSS, TC.GXS, TC.GSX, TC.DSS and TC.P hardware (power supplies).
- Implementation of a RC-equivalent circuit model.
- Simulation of the most common capacitors. E.g. Electric Double Layer Capacitors EDLC
- The CapSim model parameters are changeable in the GUI or in simulation scripts:
 - Charge/ discharge current value
 - State of Charge (SOC)
 - Number of capacitor cells in series and parallel.
- Adaptation and controlling of the individual configured capacitor simulation model possible with simple and powerful scripting language.
- Multi-channel data-logger with EventMarker as time stamps and file export in file type: csv
- Reporting / output-to-file capabilities within the scripting language during process.
- Data analysis (e.g. comparison) of different measurements in the time line via a data analyser component.

Contact information

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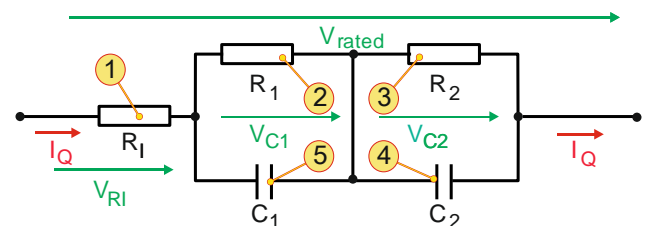
Simulation with the hardware



ESSControl/ CapSim in combination with a TopCon device simulate the behaviour and the properties of a real capacitor.

- The ESSControl contains CapSim, while CapSim includes the simplified equivalent circuit model of capacitor characteristics.
- The preset values of the TopCon device -2- will be set by the charging/ discharging curve of CapSim.
- The CapSim has the same behaviour and its output to the DUT -3- is similar of real capacitor.

CapSim – The simplified equivalent circuit model



The Basic capacitor cell model with its parasitic and frequency behaviour is built as a realistic RC-circuit model for the charging and discharging.

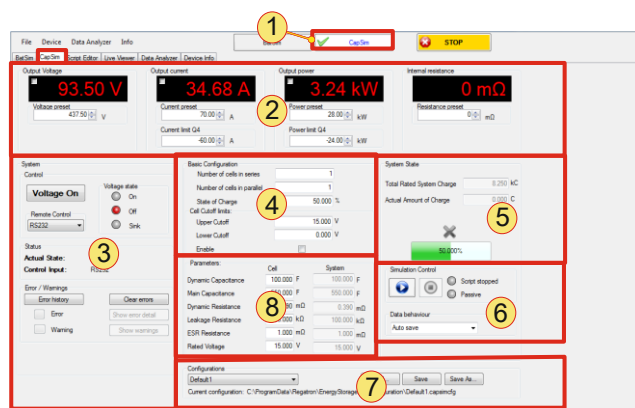
The rated voltage and the charging/ discharging current are determined by these circuit components.

- ESR resistance -1-
All resistive components, like contacts, electrode etc.
- Dynamic resistance -2-
real part of the complex impedance. The parameter represents the inertia of the charge carriers.
- Leakage resistance -3-
is calculated by a leakage current and the rated voltage.
- Main capacity -4-
Depends on the kind of capacitor and the geometry of the capacitor cells.
- Dynamic capacity -5-
imaginary part of the complex impedance. The parameter represents the inertia of the charge carriers
- The combination of several cells in series or in parallel makes possible to simulate array of capacitors or simulate the real geometric design of a capacitor.

Tabs of the user interface software ESSControl

- **<CapSim> tab**
Display and setting of the actual and preset values. Configure the capacitor model parameter. Control the model simulation.
- **<Live Viewer> tab**
Real-time display of collected simulation data. Multi-channel logger and setting of EventMarker as time stamps. The data channels are configurable.
- **<Data Analyzer> tab**
Load and display of the recorded values. Data analysis of different measurements in the time line via a data analyser component. The data channels are selectable to get a better overview.
- **<Script Editor> tab**
Programming, debugging and modifying scripts.
- **<Device info> tab**
Information about the connected system.

<CapSim> tab



<CapSim> tab

The <CapSim> tab serves:

- Indication of the installed option CapSim -1-
- System settings and display -2-
 - Setting reference and display of actual values like voltage, current power and internal resistor.
 - Indication of controller mode (CV,CC,CP)
- System control -3-
 - Switching the energy flow on/ off to the load via button.
 - Indication of warnings and errors details and access to the logged error history.
 - Remote interface selection.
- CapSim parameters -4-
 - Cut-off thresholds, State Of Charge (SOC)
 - Number of capacitor cells in parallel/ serial.
- Simulation control -6- and state display -5-
 - Start, stop, break the simulation
 - Display of SOC and the model output parameters.
- Handling of different CapSim configurations -7-:
 - Selection of defined CapSim configurations.
 - Load, store of new CapSim configuration files.

- Model parameters -8-
 - Resistance and capacitance of the parasitic, dynamic and real capacitor components of a cell.
 - Parameter value display of the total system with all number of cells in parallel and serial.

Enabling of the CapSim option

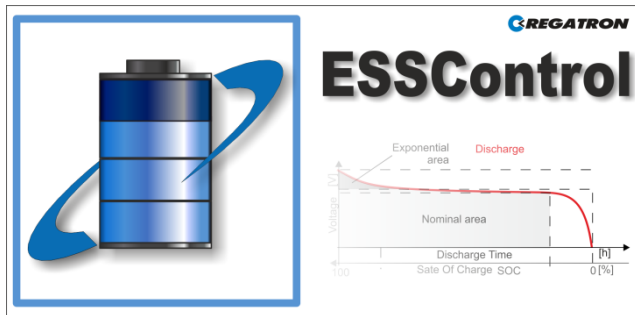
- Required conditions:
 - Newest Software TopControl V4.02.24 or higher for the enabling procedure.
 - Newest Version of device firmware V4.20.99 or higher includes all functionality that is needed by CapSim.
- Please note that you need to purchase CapSim option before you can enable it.
- The option has to be enabled with an option code via the Software TopControl.
- CapSim option is stored on the device.
- A trial time period is available for the option.
- Contact your sales partner or Regatron to get support for the CapSim activation.

General information

- Swiss made developed, implemented and tested in Switzerland by Regatron AG, manufacturer of TopCon product family.

Scope of delivery

- Newest version of TopCon firmware includes all functionality that is needed by CapSim.
- Installer package for PC including:
 - The ESSControl.exe (ESSControl user interface)
 - TCIO.DLL (communications functions), TCIOWrapper DLL (enhanced communications + .NET support)
 - ESSControl.DLL (CapSim related functions)
- Program operation manual
- ESSScript function reference is coming in the future.
- Installed standard CapSim-ESSScript (It can be modified)
- Installation support from your sales partner or Regatron customer support.



Key features & functionality

- ESSControl is the user interface software and script environment for the additional software options BatSim or CapSim.
- Full integration with Regatron TopCon device series: TC.GSS, TC.GXS, TC.GSX, TC.DSS and TC.P hardware (power supplies).
- Remote connection via PC interfaces E.g. RS-232 or USB interface.
- Adaptation and controlling of the individual configured simulation models possible with simple and powerful scripting language.
- Multi-channel data-logger with EventMarkers as time stamps and file export in file type: csv
- Reporting / output-to-file capabilities from within the scripting language during process.
- Data analysis (e.g. comparison) of different measurements in the time line via a data analyser component.

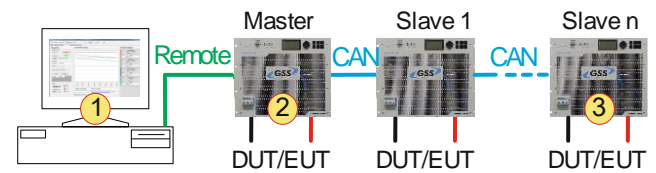
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Simulation with the hardware



ESSControl with a simulation model options CapSim or BatSim in combination with a TopCon device simulate the behaviour and the properties like a real component.

- Scripts in the ESSControl environment control the simulation model, while the simulation model runs in the characteristic simulation curve.
- The preset values of the TopCon device **-2-** will be set by the charging/ discharging curve of the simulation.
- The simulation has the same behaviour and its output to the DUT is similar of a real component.
- Using ESSControl in combination of several devices to simulate high power applications. The software ESSControl **-1-** remotes the master **-2-** device and the master device controls the slave **-3-** devices. Only for the master device the options has been enabled.

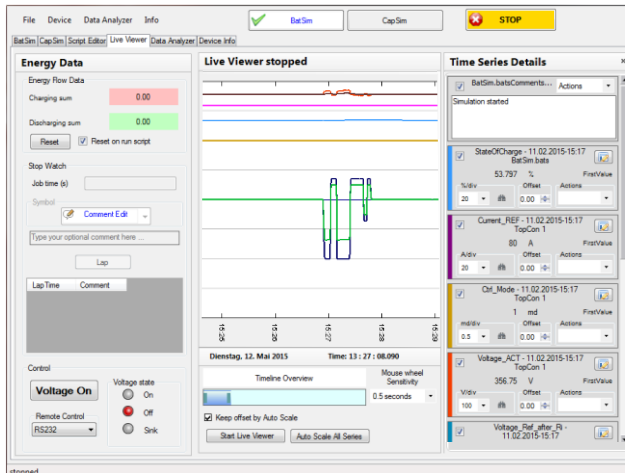
Tabs of the User interface software ESSControl

- **<BatSim> tab**
Display and setting of the actual and preset values.
Configure of the battery model parameter.
Control the model simulation
- **<CapSim> tab**
Display and setting of the actual and preset values.
Configure of the capacitor model parameter.
Control of the model simulation.
- **<Live Viewer> tab**
Real-time display of collected simulation data. Multi-channel logger and setting of EventMarker as time stamps. The data channels are selectable.
- **<Data Analyzer> tab**
Load and display of the recorded values. Data analysis of different measurements in the time line via a data analyser component.
The data channels are configurable to get a better overview.
- **<Script Editor> tab**
Programming, debugging and modifying scripts as well.
- **<Device info> tab**
Collected information about the connected system.

<CapSim>/ <BatSim> tab

For further Information, refer to the CapSim and BatSim SOFTWARE INFORMATION

<Live Viewer>/ <Data Analyzer> tab



<Live Viewer> tab example – Screenshot

The <Live Viewer> tab contains:

- Real-time display of recording simulation data. Multi-channel data-logger. The Channels are selectable in the “Time Series” group.
- EventMarker setting as time stamps for the <Data Analyzer> tab.
- The data channels are configurable in the “Time Series” group.
- Scope over the total time line with zoom-Window functionality.

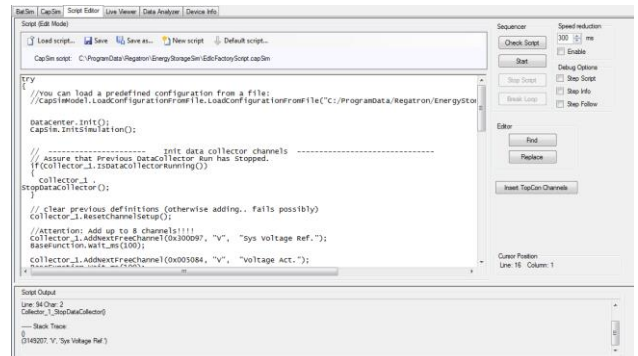
The <Data Analyser> tab additional contains:

- TimeMarker
 - Set a TimeMarker in the time line.
 - Comparing of two sessions that have been recorded at different time. The signals can be shifted to the TimeMarker position.
- Display of EventMarker that are set in the <Live Viewer> tab.
- Load data sessions from files and store session in new files.

<Device Info>

The tab contains information of the TopCon device; the information is combined into various groups, e.g. the device data, the device identification and Software version.

<Script Editor> tab



<Script Editor> tab – Screenshot

The tabs contains:

- Customize the factory model script.
 - Add data channels to the DataCollector for the live scoping and the DataAnalyzer.
 - Initialize the controlling of the simulation model
 - Define the outputs
- Script handling
Load, store, reset to factory script.
- Running script
Run, stop and break of a script.
- Edit script
 - Script debugging via “Step mode”.
 - Grain syntax script checking.
 - Highlighting of search strings.

General information

- Swiss made developed, implemented and tested in Switzerland by Regatron AG, manufacturer of TopCon product family.
- For further Information about the available simulation models CapSim and BatSim, refer to the according SOFTWARE INFORMATION.

Scope of delivery

- Newest version of device firmware including all functionality that is needed by simulation options.
- Installer package for PC including:
 - The ESSControl.exe (ESSControl user interface)
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