

Scope requests on devices

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The Scope data tab allows requesting scoped variables. Scoped variables or device scopes are device variable waveforms to be saved during the time-domain or frequency-scan simulations. The selected waveforms are saved into a plot file and can be visualized from the plot processor by selecting the appropriate scope variable group (type). The plot processor can be started using the menu "EMTP>View Scopes".

1 Scope variable groups (Scope types)

Scope variable groups (also called Scope types) are used to collect and locate similar records. The selection "v" of a device, for example, will appear under the group "vb" or Branch Voltages. For the time-domain simulation, "v" is a function of time: $v(t)$. For the frequency-scan option, "v" is a function of frequency: $v(f)$ and appears as a phasor within the "vbmag" group for magnitude and the "vbang" group for angle.

The voltage polarity and current direction of a passive device are defined as in Figure 1-1. The current direction for an active (source) device is opposite. The Scope tab of each device provides tooltips with related information.

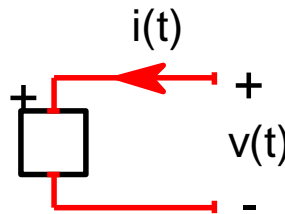


Figure 1-1 Voltage and current computation for passive devices

Some scopes are only available for time-domain computations.

The standard list of device scope requests is given in the following table.

Scope	Description	Time-domain group	Frequency-scan groups
v	Branch voltage scope $v(t)$ or $v(f)$.	vb, branch voltage	vbmag, vbang
	Node voltage scope $v(t)$ or $v(f)$.	vn, node voltage	vnmag, vngang
i	Branch current scope $i(t)$ or $i(f)$,	ib, branch current	ibmag, ibang
	Switch type device current scope $i(t)$ or $i(f)$.	is, switch current	ismag, isang
	Voltage source type device current scope $i(t)$ or $i(f)$.	ivs, voltage source current	ivsmag, ivsang
p	Branch power, $p(t) = v(t) i(t)$	p, power	Not available

ϕ	Flux, tagged as phi, phi(t)	phi, flux	Not available
s	Control device output signal, s(t)	control, control signal	Not available

2 Scope names

A given device waveform is identified in its Scope variable group by its name. There is also an optional method based on k-side (left) and m-side (right) signal names, but it is not recommended due to lack of precision in several conditions, such as devices connected in parallel.

When a device is 1-phase, then its scopes are given its name. In the example of Figure 2-1, the current scope of “SW1” appears under the group “is” with the name “SW1”.

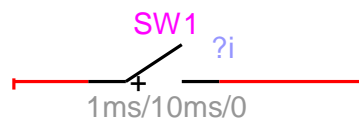


Figure 2-1 Scope request on a 1-phase device named “SW1”

When a device is 3-phase, then its scopes are identified by its name followed by the phase identifier. In the example of Figure 2-2, the switch carries two different types of scope requests. The voltage scope is only for phase a, while the current scope is set for all phases. The voltage scope appears under the group “vb” with the name “SW1a”. The current scopes are appearing under the group “is” with the names “SW1a”, “SW1b” and “SW1c” respectively.

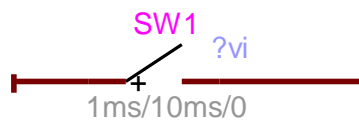


Figure 2-2 Scope request on a 3-phase device named “SW1”

3 Visual indicator

When a scope variable is checked in a device scope tab, EMTWorks turns on a visual indicator. The visual indicator format is an interrogation mark “?” followed by the generic scope name. Current, for example, is indicated by “?i” as in the example of Figure 2-1. When more than one scopes are selected then a common string starting with “?” is created. Figure 2-2 shows an example with voltage and current scopes. In the 3-phase condition, the visual indicator will appear when at least one phase is turned on.

The visual indicator is saved into the device attribute “Description”.