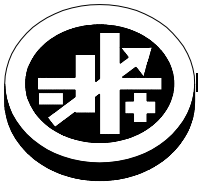


# APPLICATION NOTE



**KEPCO** An ISO 9001 Company.

**EL**  
**001**

## EL Electronic Load Fast Timing Adjustments

### I — INTRODUCTION

Kepeco's EL Series Electronic Loads are able to produce fast current transients down to about 500uS. When rapid transitions are required, adjustments need to be made to the EL Series damping settings so that the best response for your particular application is obtained.

External factors such as long or non-twisted load wires, excessive inductance or capacitance from the source, etc. can cause the response of the EL to change. The purpose of adjusting the damping is to find the best balance between speed with minimum to no oscillation during transitions. Damping is adjusted by means of **sys:damp** and **sys:pfm:damp** SCPI commands. The default settings are **sys:damp 5** and **sys:pfm:damp 4**. When optimizing high speed response in current mode, it is recommended to start with settings of **sys:damp 3** and **sys:pfm:damp 2**

**Critically Damped.** A critically damped step response is a perfect response and this is our goal when setting the damping settings for fast speed switching. As shown in Figure 1. There is no overshoot and no oscillation and the settling time is at optimal conditions.

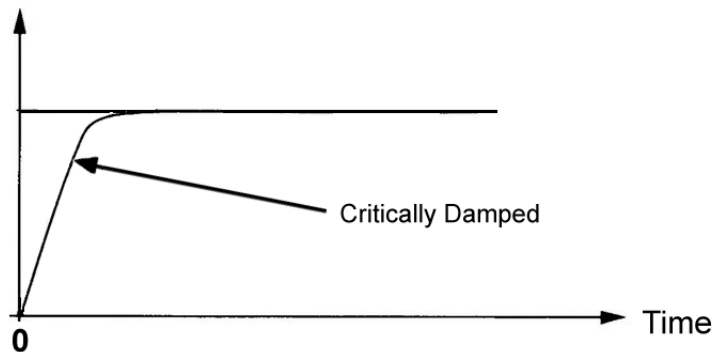


FIGURE 1. CRITICALLY DAMPED WAVEFORM SHOWING PROPER ADJUSTMENT FOR A FAST CURRENT STEP

**Underdamped.** An underdamped step response is one that is too fast for the impedance of the external wiring and components, and therefore, needs to be damped to prevent overshoot and oscillation.

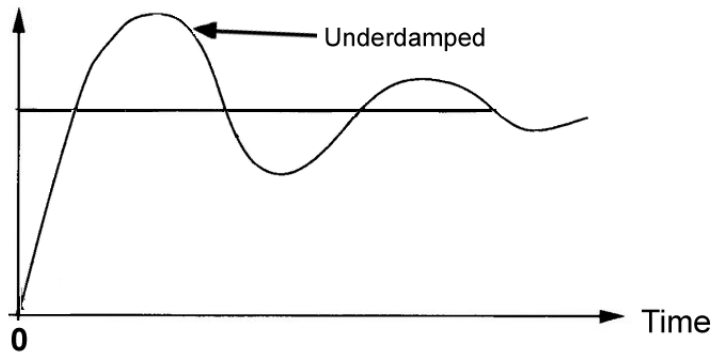


FIGURE 2. UNDERDAMPED WAVEFORM

**Overdamped.** An overdamped step response is one that is too slow, causing no oscillation or overshoot, but making the settling time very long. In this case, we want to make the damping factors faster in order to obtain a critically damped response.

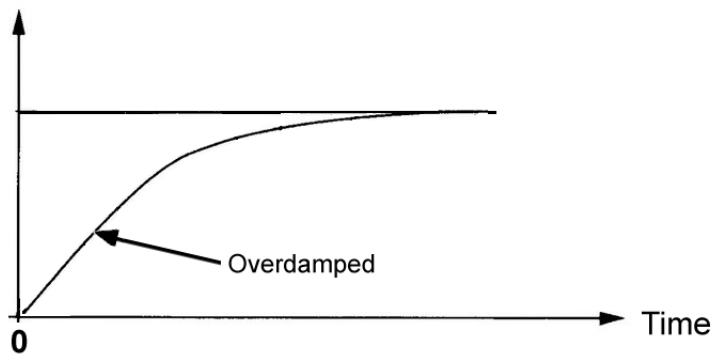


FIGURE 3. OVERDAMPED WAVEFORM

## II — USING A BATCH FILE SCRIPT

As mentioned previously, the damping can be changed for a particular application's needs. Changing the damping can be done via the front panel controls as shown in the manual, as well as via SCPI commands. For your convenience a batch script that simplifies the process of picking the best damping settings is provided below as an example. The batch script shown in Table 1 is an example which sets **syst:damp** to 3 and **syst:pfm:damp** to 2.

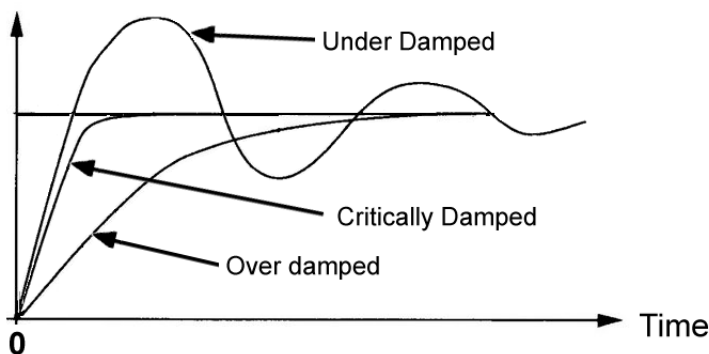
**TABLE 1. BATCH FILE SCRIPT TO ADJUST DAMPING**

Command	Function
@echo off	STARTS THE SCRIPT
echo mode curr >COM3	SETS CURRENT MODE VIA COM 3 RS 232 PORT
echo <b>syst:damp 3</b> >COM3	SETS SYSTEM DAMPING TO 3 VIA COM 3
echo <b>syst:pfm:damp 2</b> >COM3	SETS SYSTEM POWER FET MODULE TO 2 VIA COM 3
echo curr 0 >COM3	SETS CURRENT TO 0 VIA COM 3
echo outp 1 >COM3	SET THE OUTPUT TO ON VIA COM 3
:loop	STARTS A LOOP
echo curr 50 >COM3	SETS CURRENT TO 50A VIA COM 3
timeout 1 >null	DELAY
echo curr 10 >COM3	SETS CURRENT TO 10A
timeout 1 >null	DELAY
goto loop	LOOPS BACK TO START OF LOOP

If the waveform that results from the looping script looks underdamped or overdamped, then the systdamp and systpfm-damp values need to be changed. For most applications, the following values are suggested:

<b>syst:damp value</b>	<b>syst:pfm:damp value</b>
3	2
2	3
4	3
5	4

It is recommended to try the sets above and chose one that produces the most desirable response. If none are satisfactory, other values not in the list may be experimented with by extrapolating the results obtained from previously tested values.



**FIGURE 4. DAMPING WAVEFORMS COMPARISON.**

