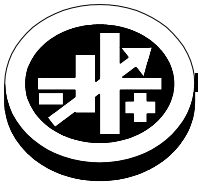


# QUICK START GUIDE



**KEPCO** An ISO 9001 Company.

## Series EL



### SINGLE- AND DUAL-CHANNEL ELECTRONIC LOAD

#### I — INTRODUCTION

**SCOPE OF MANUAL.** This Quick Start Guide covers the installation and operation of the Kepco Series EL Electronic Loads. Full specifications are listed in the applicable Operator's Manual that can be downloaded from the Kepco web site:

[www.kepcopower.com/support/opmanis.htm#el](http://www.kepcopower.com/support/opmanis.htm#el)

**OPTIONS.** D option (suffix D added to model number) models are dual-channel units comprised of two completely independent electronic loads in a single chassis. The controls, indicators and connections are identical to the single unit described herein, except they are labeled channel A or B; the single POWER switch applies to both channels.

The G option (suffix G added to model number) includes the GPIB interface. For single units the GPIB interface is in addition to the standard RS 232 and USB interfaces. For dual units the GPIB interface replaces the standard RS 232 and USB interfaces.

The E Option (suffix E added to model number) includes the Ethernet (LAN) interface in addition to the standard RS 232 and USB interfaces.

**DESCRIPTION.** The Kepco Series EL are modular, air-cooled, electronic loads. Typically these loads are used to test DC power sources, such as batteries, power supplies, generators, chargers, fuel cells, etc.

The Series EL dissipates power from the Unit Under Test (UUT). The UUT is the source of the electrical energy tested by the Series EL.

#### II — SAFETY.

Exercise care in making all connections between the Series EL and the UUT.



#### WARNINGS

1. Very high voltages may be present when using this electronic load. EXERCISE PROPER PRECAUTIONS!
2. High currents may be present when using an electronic load. EXERCISE PROPER PRECAUTIONS!

3. Loose connections or insufficiently sized conductors can become very hot and cause burns. Loose test connections between the UUT and the Series EL can also lead to load instability, erratic operation and equipment damage.

4. The negative load terminal of this electronic load is electrically isolated (d-c) from the control interfaces, however, capacitance between these connections can lead to coupling of fast transients. Therefore, when operating this load with external control connections, the user should ensure there is no transient coupling between these points to avoid serious damage to the connected instruments and/or this load.

#### III — INSTALLATION

**UNPACKING.** Upon receipt, the Series EL and its accompanying components should be carefully unpacked and removed from the shipping container. Separate all parts from the packing material and inspect for any external damage. Record packing methods for future re-shipment.

If any dented, broken or loose parts are seen, do not use the equipment. Notify the shipping company immediately and follow their instructions for remedial action.

**MAINS POWER.** The EI operates with a-c input from 110V to 260V a-c, 50/60Hz, without user modification. A power cord is not supplied with the unit. The a-c input power cord should be a molded and unshielded; it should be terminated with the appropriate power plug depending upon country of usage. The power cord requires an IEC 320-C13 connector to mate with the EL source power connector. The power cord should have three 18AWG conductors and have approvals for mains power from a rating agency such as UL, CSA, VDE, BSI, or TÜV.

**MOUNTING.** Mount the Series EL in a standard 19-inch wide rack or use on a bench. Allow sufficient room for ventilation at front and rear.

**WARNING: The unit is very heavy (80 to 90 pounds). Exercise care when lifting, mounting or otherwise handling this product. It is recommended that two or more persons handle the unit.**

**CAUTION: Refer to the Operator’s manual for optional slide installation. Failure to use slide and screws specified will damage the unit and void the warranty.**

CONNECTIONS. See Figure 3 for typical test connections. The Series EL is capable of drawing very high currents. Connections between the UUT and the Series EL must be properly sized to carry the maximum current. Additionally, it is extremely important to ensure all connections are tight and corrosion free. **See Section II, Safety Warnings.** Use low resistance hardware supplied with the unit for connections to ± LOAD terminals. Regular inspection of ±LOAD connection tightness is important.

Connect the Series EL to the UUT using cabling appropriate for the current expected during testing. **CAUTION: Ensure polarity is correct - reversed polarity will cause immediate and significant damage to the Series EL and/or the UUT.** Contact Kepco if assistance is needed in selecting the appropriate wire size, length and physical configuration. Ensure all connectors are suitable for the current and voltage expected and that connections are tight. Connections should be re-checked to ensure continued low-resistance connections on a regular basis. **CAUTION: When connecting the Series EL to the UUT be very careful not to accidentally short the UUT output while connecting the wiring. Best practice is to make the connection to the UUT Positive (+) output connector the last connection.**

Refer to the EL Operator manual for connections required for remote control.

#### IV — OPERATION

Operation is either from the front panel (local) or via computer control (remote). For remote operation, refer to the EL Operator manual.

CONTROLS AND INDICATORS. Figure 2 shows the location of front panel components described in Table 1.

#### STARTUP.

1. After all connections are completed, turn on system by setting ON/OFF switch to ON.
2. After warming up for about 15 seconds, the unit begins the power-up self-test.
3. Set the desired Mode (see steps 1 and 2 of “Changing Settings.” on page 4).
4. When ready, the LOAD switch-indicator lights green. The VOLTS display shows the voltage of the source under test. AMPS and KW displays indicate zero.

**TABLE 1. FRONT PANEL FUNCTIONS**

SEE FIG. 1	COMPONENT	FUNCTION
1	AMPS display	Displays the load test current in Amps
2	CR indicator	On (solid) indicates Constant Resistance Mode; factory default set to 1000 Ohms. On (blinking) indicates Constant Conductance Mode; factory default set to 1mS (0.001 siemens, I/E).
3	CI indicator	On to indicate Constant Current Mode (factory default setpoint: 0A. After use, the last used setpoint is retained).
4	CV indicator	On to indicate Constant Voltage Mode (factory default setpoint: maximum load voltage).
5	CP indicator	On to indicate Constant Power Mode (factory default setpoint: 0 kilowatts).
6	Power ON/OFF switch	Rocker switch: press top half to turn power on, bottom half to turn power off.
7	LAN indicator	On indicates optional LAN connection is active.
8	LOCAL indicator	On indicates Local mode is active.
9	CONTROL rotary control/ pushbutton switch	When LOCAL is active, three functions are available as follows: a. <b>Select Mode:</b> Press, hold (at least 3 seconds) and rotate knob to select mode indicated by the CI, CR, CV and CP indicators (see Table 2). b. <b>Set Value:</b> Rotate knob to adjust the level of the controlled parameter: current, voltage, resistance, conductance or power (see Table 3). Rotate clockwise to increase, counterclockwise to decrease. Settings are stored and will be available at next power-up. c. <b>Select Digit:</b> Momentarily press knob to select one digit (blinks). Convenience function allows adjustment of one digit at a time.
10	LOAD pushbutton switch/indicator	Indicator lights to show load status: green (ready to operate), amber (load is engaged) or blinking red (fault condition exists). Press switch to engage/disengage load or clear fault indication.
11	KW display	Displays the power (Amps x Volts) being dissipated by the load in kilowatts. Also momentarily indicates resistance (in Ohms) or conductance (in Siemens) setting.
12	VOLTS display	Displays test voltage from UUT applied to the load in Volts.

#### SET SETPOINT ADJUSTMENT RESOLUTION.

1. Momentarily press the CONTROL knob a number of times to select the digit representing the resolution needed for adjustment during test (selected digit blinks).
2. For example, if 1A per click of adjustment is desired, select the most significant digit (MSD), which yields 1 Amp per click. If finer resolution is desired, select a less significant digit such as 100mA or 10mA per click (see Figure 1). NOTE: Leading zeroes are sup-

pressed. Therefore from 0A to 9A, the MSD shows units of Amps. From 10A to 99A the MSD shows 10A per digit. Clicks can be set to a maximum of 10A/click. The adjustment is continuously variable up to the maximum value for the selected mode. Choosing a less significant digit increases the number of turns x 10 per digit.

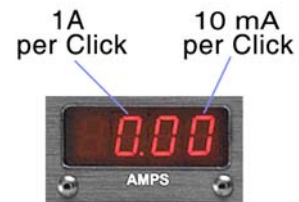
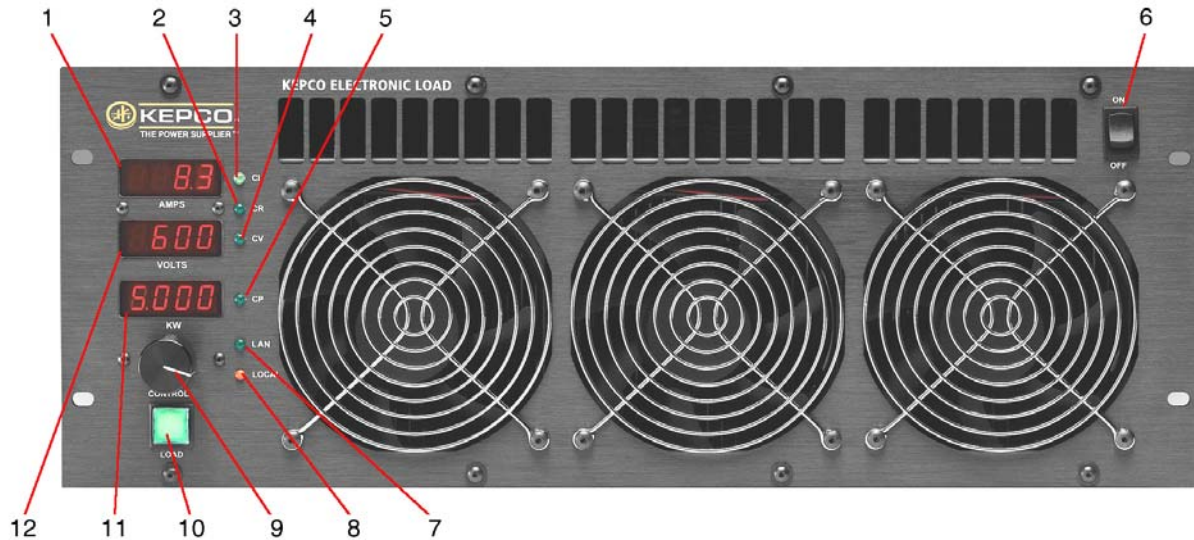


FIGURE 1. ADJUSTING RESOLUTION



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FIGURE 2. FRONT PANEL CONTROLS AND INDICATORS

TABLE 2. MODE SELECTION

MODE INDICATOR	MODE SELECTED
Only CI on (solid)	CI (Constant Current) mode.
Only CR on (solid)	CR (Resistance) mode.
Only CR on (blinking)	CS (Conductance) mode.
Only CV on (solid)	CV (Voltage) mode.
Only CP on (solid)	CP (Constant Power) mode.
CI, CR, CV and CP all blinking	Short mode (lowest resistance possible), maximum current. USE CAUTION prior to setting,
CI, CR, CV and CP all off	Modes off: Load will not engage, no setpoints are active and load will not conduct current.

TABLE 3. LOCAL ADJUSTMENTS

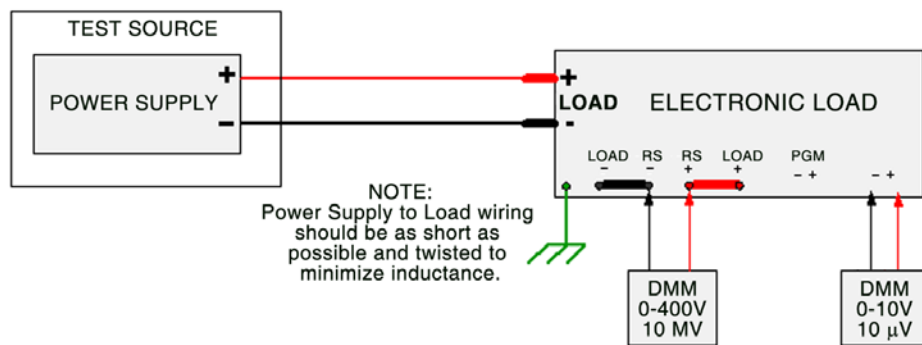
MODE INDICATOR	SETPOINT ADJUSTMENT when LOAD switch shows green
Only CI on (solid)	CONTROL sets constant current level in Amperes as viewed on AMPS display.
Only CR on (solid)	CONTROL sets resistance in Ohms as viewed on KW display.
Only CR on (blinking)	CONTROL sets conductance in Siemens (I/E, I in Amps, E in Volts) as viewed on KW display.
Only CV on (solid)	CONTROL sets voltage in Volts as viewed on VOLTS display.
Only CP on (solid)	CONTROL sets constant power level in kilowatts as viewed on KW display.
CI, CR, CV and CP all blinking	Short mode; no adjustment. USE CAUTION prior to setting.
CI, CR, CV and CP all off	Modes off; no adjustment. Pressing LOAD switch causes indicator to blink green, then CONTROL used to view model, serial number, IP information, etc.

RUN TEST. To run a test proceed as follows: If the test is run immediately after unpacking and installing the unit without changing the factory default settings, the mode will be CI mode and setpoint at 0 Amperes). To change the settings before running the test, see CHANGING SETTINGS below. Once the settings are changed, the new settings will be saved when the unit is turned off, and will be restored when the unit is powered up.

1. Set desired mode (see steps 1 and 2 of "Changing Settings." on page 4) and resolution (see "Set Setpoint Adjustment Resolution." on page 2).
2. Press the green LOAD button to engage the load. The LOAD indicator changes from green to amber, indicating the load is engaged with the source under test.
3. The load will respond according to the default settings or to your prior memorized settings
4. If the load has not been previously set up, then it will be in the CI mode and will engage at 0 Amperes
5. Turn the multi-turn CONTROL knob to the desired current.
6. At the completion of the test, press LOAD switch to disengage the load; LOAD indicator changes from amber to green.

CHANGING SETTINGS. Prior to engaging the load you may preset the load to a given set of conditions. After presetting conditions, you may need to fine tune the actual values depending on your test conditions. (see EL Operator manual for details.)

1. Depress and hold the CONTROL knob until the Green LOAD button turns off (~ 3 seconds), indicating you may rotate the knob and select the desired mode.
2. While holding the knob in, rotate it until the desired mode is selected as indicated in Table 2, then release the knob. The mode indicators will illuminate in the order shown in Table 1.
3. To adjust the value (setpoint) for the selected mode, rotate the CONTROL knob (without depressing); see Table 3. To make the adjustment easier adjust resolution as desired (see "Set Setpoint Adjustment Resolution." on page 2).
4. When satisfied with the setting, press the green LOAD button to begin (engage) the test. The LOAD indicator changes from green to amber to show the load is engaged.
5. The selected mode setpoint value may be changed during the test by rotating the CONTROL knob (see Table 3).
6. At the completion of the test, press LOAD switch to disengage the load; LOAD indicator changes from amber to green.



CAUTION: Never open the connection between the Series EL load and UUT while the load is enabled and current is flowing. Always disable Series EL load and/or UUT power source output first. Arcing may damage either the UUT or the EL Series load.

CAUTION: Never power down the Series EL load while the load is enabled and current is flowing. Always disable Series EL load and/or UUT power source first. Otherwise damage to the EL Series load is likely to occur.

CAUTION: Do not close a switch (mechanical, relay contact or electronic) between the UUT power source and the enabled Series EL load. Always connect the UUT to EL and enable them when needed. Closing the circuit between an enabled voltage source UUT and an enabled EL will discharge the voltage source output capacitors into the saturated EL power MOSFETS before EL control can limit the current. This may damage both the EL and the UUT.

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FIGURE 3. TEST SETUP, TYPICAL