

This quick reference guide briefly outlines a simple approach to accomplishing common tasks covered in the KLP Operator's Manual, and includes references to appropriate paragraphs, Tables and Figures and Kepco website pages for more details.

## INITIAL SETUP INSTRUCTIONS

1. **Location:** Do not obstruct front and rear panel vents; additional clearance at side, top and bottom vents is recommended.
2. **Connect power supply output to load:**
  - Voltage drop must be less than 0.25V per conductor (see Nomograph1 at <http://www.kepcopower.com/nomomax.htm>)
  - Local error sense operation is factory default; for remote error sense operation see PAR 2.7.5.1.
  - For parallel operation of two or more power supplies see PAR 2.7.7.
  - For series operation of two or more power supplies see to PAR 2.7.6.
3. **Connect remote programming cables (if applicable):** Only one remote programming input may be active at a time.
  - **Remote analog programming:** connect programming cable between programming source and J2 on rear panel of power supply; see Table 2-6 and PAR 3.7.
  - **Digital programming using GPIB:** connect programming cable between host computer and J4; see Table 2-3 and PAR 3.5.
  - **Digital programming using RS 232:** Connect programming cable between host computer and J3; see Table 2-4 and PAR 3.4.
4. **Connect power supply to power source using one of the following:** See PAR 2.7.2 for additional information.
  - Standard NEMA line cord set from Kepco, see Table 1-4.
  - Customized line cord using user-wireable mating connector (supplied) in conjunction with user-selected line cord or discrete wiring as applicable.
  - Source power branch current rating and overload protection recommendations:
    - For 90 - 136V a-c source power, use 20 amp rated service.
    - For 180 - 264V a-c source power, use 15 amp rated service.
5. **Apply source power:** Set Power ON/OFF circuit breaker/switch on front panel to ON. Apply firm, continuous pressure to rocker actuator until fully engaged (right side of rocker actuator locked parallel to front panel). If actuator does not lock when released, allow actuator to return to starting position, then wait a few seconds before repeating turn-on sequence. DO NOT attempt to "tease" the switch contacts closed by repetitive press-and-release action. The circuit breaker is "trip-free" design; if overload exists, contacts cannot be held closed by actuator.

## LOCAL OPERATING MODE INSTRUCTIONS

**How do I enable/disable the output?** Press DC OUTPUT to toggle output on and off. *The output cannot be enabled while SET appears in the status display; tap either knob to exit setpoint mode.* The output can be disabled at any time. VOLTS and AMPS displays show actual output parameters as determined by the load (see PAR. 3.2.3).

**How do I establish the operating mode?** CV and CC indicators light to show operating mode as determined automatically by the programmed settings and the load. If voltage across the load produces a current that is less than the programmed Current setpoint, unit operates in CV mode (voltage programmed to voltage setpoint, current limited by current setpoint). If load changes so that current through the load reaches the current setpoint, the unit automatically enters CC mode (current programmed to current setpoint, voltage limited by voltage setpoint) (see PAR. 3.2.6).

**How do I adjust output voltage or current (real-time)?** Enable the output. If in CV mode (indicator lit) rotate Voltage knob until VOLTS display shows desired output voltage. If in CC mode (indicator lit) rotate Current knob until AMPS display shows desired output current. Rotating the knob controlling limit (Voltage in CC mode, Current in CV mode), changes the limit but it is not visible because actual outputs are displayed on VOLTS and AMPS displays (see PAR. 3.2.6.1).

**How can I see what the voltage and current setpoints are?** Tap (press and release) either Voltage or Current knob once to enter setpoint mode (status reads SET). VOLTS and AMPS displays show the setpoints. Tap either knob once to exit setpoint mode (SET disappears) (see PAR. 3.2.6.2).

**How do I change voltage and current setpoints (enter and exit setpoint mode)?** *Setpoint mode can be entered with output enabled or disabled, but output CAN NOT be enabled while setpoint mode is active* Tap (press and release) either Voltage or Current knob once to enter setpoint mode (status reads SET). Rotate Voltage and Current knobs until desired values appear in VOLTS and AMPS displays; pressing and holding control knob in while turning provides fine adjustment. Tap either knob once to exit setpoint mode (SET disappears) (see PAR. 3.2.6.2).

**What happens when setpoint mode is exited?** If the output is enabled, exiting setpoint causes output to jump to new setpoints, VOLTS and AMPS show actual output determined by load (e.g., in CV the current setpoint is a limit, and the load will draw less than this value while in CV mode). If the output was disabled prior to or while in setpoint, exiting setpoint stores the new settings in memory and causes VOLTS and AMPS to show actual output; then when output is enabled, output jumps to programmed setpoints and VOLTS and AMPS show output values as determined by the load (see PAR. 3.2.6.2).

**How do I enter a Password?** Password required to set Virtual Model or calibrate the unit. Status shows PASS (password) and Current Display shows 0000. Rotate Current knob to select a number from 0-9. Tap Current knob to advance to next digit. Repeat until all four digits have been selected. Tap DC OUTPUT to accept the number. See Table 4-1 for default passwords.

**How do I enter/exit Function mode?** To enter a function, repeatedly press FUNCTION using a thin tool until status reads VIRT (virtual model, see below), ADDR (set GPIB address, PAR. 3.2.8), BAUD (set RS 232 baud rate, PAR. 3.2.9), M/S (Master/Slave, PAR. 3.2.10) or UTIL (utility, PAR. 3.2.11). To exit a function, continue to press FUNCTION until status display is blank.

**How do I view/change the virtual model settings?** The virtual model limits the maximum programmable settings that can be accepted. The default Virtual Model is: V = rated voltage, A = 1200/rated voltage, e.g., for KLP 75-33-1200: 75V/16A (1200/75=16A). If status shows SET, exit setpoint mode (tap either knob once). Use thin tool to press FUNCTION repeatedly until status reads VIRT. VOLTS and AMPS displays show the maximum voltage and current of the present virtual model. If no change exit function mode (see above). Press DC OUTPUT once. Status shows PASS (password). Enter password (see above) and tap DC OUTPUT to accept. When password is accepted, status reads VIRT. To change setting rotate Voltage and Current knobs until VOLTS and AMPS displays show desired virtual model settings. (Press and hold knob in while turning for fine adjustment.) Press DC OUTPUT to accept virtual model settings. Unit displays DONE, then resets and repeats power on sequence while status flashes VIRT. Default protection limits (based on new virtual model settings) are displayed while status reads PROT. When complete, unit is placed in setpoint mode with VOLTS and AMPS displays reset to 0 volts, minimum amps (see PAR. 3.2.5).

**How do I view/change overvoltage and undervoltage protection limits?** Overvoltage (OVP) and overcurrent (OCP) protection limits default to 120% of programmed virtual model limits. If status reads SET, tap either knob to exit setpoint mode. To view protection limits, use a thin tool to press and hold PROTECT until status reads PROT, VOLTS and AMPS displays show the protection limits; To change limits, while continuing to hold PROTECT in, adjust OVP and OCP limits as desired using the Voltage and Current knobs. When PROTECT released, values showing in VOLTS and AMPS displays are the new protection limits (see PAR. 3.2.7).

## REMOTE ANALOG OPERATING MODE INSTRUCTIONS

**How do I enable analog operating mode?** Connect ANALOG\_CTRL (pin 12) to GROUND (pin 9, 11, 13, or 15) of analog port prior to power-up to enable remote analog programming for that session. Remote analog control is indicated by "aREM" in status display. The status of ANALOG\_CTRL is sensed at power-up only. Enabling analog operating mode disables the local operating controls on the front panel.(see PAR. 3.7).

**How do I Enable or disable the output?** Connect REM\_INH (pin 8) to GROUND (pin 9, 11, 13, or 15) of analog port to disable power supply output. Opening the connection will enable the output (see PAR. 3.7.1).

**How do I adjust voltage and current setpoints using an external voltage source?** Set analog I/O DIP switch positions 1 and 2 up (factory default position) to use external voltage for remote analog programming of voltage and current, respectively. Full scale programming voltage for output voltage and current is factory set at 10V. To alter full scale value perform calibration (PAR 4.3) and external calibration (PAR. 4.3.3). Apply a 0-10V signal from Vref (pin 1) and Cref (pin 3) to GROUND (pin 9, 11, 13, or 15) of analog port to adjust the setpoint values for output voltage and current proportionally. A maximum combination of programmed voltage and current cannot exceed 1200 watts. Programming input pins are only active when analog port is enabled. (See PAR. 3.7.3 for details.)

**How do I adjust voltage and current setpoints using an external resistance?** Set analog I/O DIP switch positions 1 and 2 down to use external resistance for remote analog programming of voltage and current, respectively. Full scale programming resistance for output voltage and current is factory set at 10KOhms; see PAR 3.2.1.3 for instructions on altering full scale value and use 1KOhm per volt scale factor. Applying a 0-10KOhm resistance from Vref (pin 1) and Cref (pin 3) to GROUND (pin 9, 11, 13, or 15) of analog port adjusts the setpoint values for output voltage and current proportionally. Maximum combination of programmed voltage and current cannot exceed 1200 watts. Programming inputs are only active when analog port is enabled. (See PAR. 3.7.2 for details.)

**How do I Read back operating voltage and current?** Analog signals proportional to actual output voltage and current levels are available at VOLT\_RBACK (pin 6) and CURR\_RBACK (pin 7) of analog I/O port. Full scale signal level is the same as that for full scale programming. Readback signals are always available at analog port, even if analog programming is not enabled.

**How do I exit remote analog programming mode?** Depressing and releasing both Voltage and Current knobs forces the unit to exit remote analog programming mode and return to local operating mode. This can also be done by sending a SYST:KLOC OFF command (PAR. B.81) via the RS 232 or GPIB remote digital inputs. To restore remote analog control recycle source power.

## REMOTE DIGITAL OPERATING MODE INSTRUCTIONS

**How do I enabling digital operating mode?** Sending any digital command via either the GPIB or RS 232 port immediately sets the unit in remote digital operating mode and disables the local operating controls on the front panel. For details on command formatting and communication protocols see PARs 3.4 (RS 232) and 3.5 (GPIB). Additional information about common commands and SCPI commands, including programming examples, are included in Appendices A and B.

**How do I exit remote digital programming mode?** Depressing and releasing both Voltage and Current knobs will force the unit to exit remote digital programming mode and return to local operating mode. Remote digital control is reactivated upon transmission of any digital command by the control (host) computer.

**How do I change the GPIB address?** The factory default GPIB address for all KLP models is 6. Using a thin tool, press FUNCTION repeatedly until status reads ADDR; the active GPIB address shows in the AMPS display. Press FUNCTION to exit or rotate Current knob to change address. Tap DC OUTPUT to accept; unit advances to the next function (see PAR. 3.2.8). The GPIB address can also be changed using the SCPI command SYST:COMM:GPIB:ADDR (PAR B.66).

**How do I adjust RS 232 baud rate?** see PAR. 3.2.9. The factory default RS 232 baud rate for all KLP models is 9600. Using a thin tool, press FUNCTION repeatedly until status reads BAUD; AMPS display shows active baud rate x 1000 (e.g., 9600 is displayed as 9.6). Press FUNCTION to exit or rotate Current knob to change the baud rate. Tap DC OUTPUT to accept; unit advances to the next function. The baud rate can also be changed using the SCPI command SYST:COMM:SER:BAUD (PAR B.68).