OPERATOR’S MANUAL
DPS SERIES

75 WATT PROGRAMMABLE DIGITAL POWER SUPPLY

KEPCO INC.
An ISO 9001 Company.

MODEL
DPS SERIES
POWER SUPPLY

ORDER NO.  REV. NO.

IMPORTANT NOTES:

1)   This manual is valid for the following Model and associated serial numbers:

       MODEL          SERIAL NO.       REV. NO.

2)   A Change Page may be included at the end of the manual. All applicable changes and
     revision number changes are documented with reference to the equipment serial num-
     bers. Before using this Operator’s Manual, check your equipment serial number to identify
     your model. If in doubt, contact your nearest Kepco Representative, or the Kepco Docu-
     mentation Office in New York, (718) 461-7000, requesting the correct revision for your par-
     ticular model and serial number.

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KEPCO, INC. • 131-38 SANFORD AVENUE • FLUSHING, NY. 11352 U.S.A. • TEL (718) 461-7000 • FAX (718) 767-1102
email: hq@kepcopower.com • World Wide Web: http://www.kepcopower.com

THE POWER SUPPLIER™
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<td>B1</td>
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ADDENDUM 1 TO DPS SERIES OPERATOR'S MANUAL

This addendum to the DPS Series Operator's Manual documents changes to the input current specification in Section 2, changes to paragraphs 3.2 and 5.2.1 to explain the base address as it pertains to the RS-232 device address (KOIB address) and provide the COM port settings, and documents the DPSDEMO2 program (Appendix A) which is now included on the software disk, P/N 254-0003.

CHANGE: SECTION 2 - SPECIFICATIONS

<table>
<thead>
<tr>
<th>SPECIFICATIONS</th>
<th>CONDITION</th>
<th>RATING/DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT FROM:</td>
<td>Current</td>
<td>Max Load 110 Vac</td>
</tr>
<tr>
<td>TO:</td>
<td>Current</td>
<td>Max Load 110 Vac</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Replace paragraphs 3.2 and 5.2.1 with new paragraphs follows:

3.2  KOIB ADDRESS AND BAUD RATE SELECTION (REMOTE MODE ONLY)

An 8-position DIP switch is located on the back panel. The DIP switch is used for KOIB (Kepco Interface Bus) communication address and baud rate setting.

The DPS Power Supply is supplied with factory default settings of KOIB address 1 and baud rate 9600. Optional settings are possible via an 8-position DIP switch located on the back panel. Refer to Figure 3-1 and Tables 3-1 and 3-2.

The KOIB address can be set via switch positions 1 (2⁰) through 5 (2⁵) to values between 0 and 31. This address is added to the Power Supply base address which is always $E0_{\text{HEX}}$, $224_{\text{DECIMAL}}$. Thus, a KOIB address of 1 is added to the base address to produce a Device Select address of $225_{\text{DECIMAL}}$ ($1 + 224 = 225$), $E1_{\text{HEX}}$. Device Select must be sent prior to each command without a carriage return <CR> (see sample programs, Appendices A and B).

5.2.1  COMMUNICATION CONFIGURATION

All DPS Power Supplies are connected in a daisy chain manner starting from the controller (computer with a RS-232C port or an RS-232C Controller), see Figure 5-1. DPS Power Supplies are shipped with default COM port requirements of 9600 baud, no parity bit, 8 data bits, and 1 stop bit. When set at the correct baud rate (see Paragraph 3.2), DPS Power Supplies can be connected in any sequence in the daisy chain. Each DPS Power Supply MUST have its own unique address (see paragraph 3.2). The hardware connection sequence is totally independent of the address of each DPS Power Supply.
Add the following Introduction to APPENDIX A

INTRODUCTION

The "QUICKBASIC®" Language Program Example listed in this Appendix is included on the enclosed DPS Series Software disk as file DPSDEMO2. To run the program proceed as follows:

1. Turn on the computer and the DPS Power Supply.

2. Run program DPSDEMO2.EXE. This program incorporates "Pull Down" menus to simplify the illustration of DPS features. The first screen observed immediately after you load the program will prompt you to select a Power Supply model. Use the arrow keys to highlight the appropriate model and press ENTER. Note that the model selected is immediately shown at the top right of the screen. The software version is also indicated there.

4. Navigate through the program by following the self-explanatory instructions on the screen.
SECTION 1 — INTRODUCTION

1.1 PURPOSE OF MANUAL
This manual describes the installation and operation of KEPCO's DPS Power Supply series and associated software. Associated software is contained on a Kepco-supplied disk and allows remote operation.

This manual contains five sections and an appendix. Section 1 contains a General Description. Section 2 contains Specifications. Section 3 describes Installation. Section 4 describes Output Power Protection. Section 5 describes Operation. An appendix contains a program example in QuickBasic® language.

1.2 GENERAL DESCRIPTION (See Figures 1-1 and 1-2)
Each DPS Power Supply can operate in either LOCAL mode, via an integral keypad, or in REMOTE mode, via an RS-232C data link.

In the REMOTE mode of operation, the DPS Power Supply uses standard RS-232C serial interface hardware and Kepco's KOIB interface bus, allowing a single RS-232C data link to selectively control up to 31 DPS Power Supplies in a daisy chain configuration.

The DPS Power Supply automatically switches between "high-range" and "low-range" operation (see Table 1-1). The switch occurs when the selected voltage falls within the "low-range" for that model. Conversely, the DPS Power Supply will revert back to "high-range" operation when the selected voltage falls out of the "low-range". The advantage of "low-range" at these "low voltage" settings is higher output current capability and lower power dissipation in the power supply.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>VOLTAGE RANGE</th>
<th>CURRENT RANGE</th>
<th>RESOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High-Range (Low-Range)</td>
<td>High-Range (Low-Range)</td>
<td>Voltage</td>
</tr>
<tr>
<td>DPS 12.5-6M</td>
<td>0-12.5V (0-6V)</td>
<td>0-6A (0-8A)</td>
<td>0.05V</td>
</tr>
<tr>
<td>DPS 25-3M</td>
<td>0-25V (0-9V)</td>
<td>0-3A (0-5A)</td>
<td>0.1V</td>
</tr>
<tr>
<td>DPS 40-2M</td>
<td>0-40V (0-15V)</td>
<td>0-2A (0-3A)</td>
<td>0.2V</td>
</tr>
<tr>
<td>DPS 125-0.5M</td>
<td>0-125V (0-60V)</td>
<td>0-0.5A (0-0.96A)</td>
<td>0.5V</td>
</tr>
</tbody>
</table>

TABLE 1-1 VOLTAGE AND CURRENT RATINGS
FIGURE 1-2  DPS Series, Functional Block Diagram
SECTION 2 — SPECIFICATIONS

<table>
<thead>
<tr>
<th>DPS GENERAL SPECIFICATIONS</th>
<th>CONDITION</th>
<th>RATING/DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Voltage</td>
<td>User Selectable</td>
<td>115/230 ± 10%</td>
</tr>
<tr>
<td>Current</td>
<td>Max Load 110 Vac</td>
<td>1.4A</td>
</tr>
<tr>
<td>Fuse</td>
<td>115 Vac</td>
<td>3A (Fast Blow, 5X20)</td>
</tr>
<tr>
<td></td>
<td>230 Vac</td>
<td>2A (Fast Blow, 5X20)</td>
</tr>
<tr>
<td>Frequency Range</td>
<td></td>
<td>50 - 60 Hz</td>
</tr>
<tr>
<td><strong>OUTPUT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC output</td>
<td>Microprocessor controlled</td>
<td>Linear, series-pass</td>
</tr>
<tr>
<td>Type of Stabilizer</td>
<td></td>
<td>Voltage</td>
</tr>
<tr>
<td>Voltage</td>
<td>0 to 40°C</td>
<td>0 - 100% rating in two ranges</td>
</tr>
<tr>
<td>Current Protection</td>
<td>CCP</td>
<td>Current Limited Mode</td>
</tr>
<tr>
<td></td>
<td>OCP</td>
<td>Over current protection Disables output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short circuit protect Disables output after 10 seconds</td>
</tr>
<tr>
<td>Error Sense</td>
<td>Drop</td>
<td>0.25V per Lead</td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>Output to Ground</td>
<td>400 Vdc or Peak</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>rms @ 110 Vac</td>
<td>50 Micro Amperes</td>
</tr>
<tr>
<td>Output to Ground</td>
<td>p-p @ 110 Vac</td>
<td>0.5 Millamperes</td>
</tr>
<tr>
<td>Series Connection</td>
<td>Max Voltage Off Ground</td>
<td>400V</td>
</tr>
<tr>
<td>Parallel Connection</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>OVP</td>
<td>Control Limit</td>
<td>Voltage Stop</td>
</tr>
<tr>
<td><strong>CONTROL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Local</td>
<td>Keypad</td>
</tr>
<tr>
<td></td>
<td>Remote</td>
<td>RS232C</td>
</tr>
<tr>
<td>Dynamics</td>
<td>Rise Time (resistive load)</td>
<td>&lt;16 msec</td>
</tr>
<tr>
<td></td>
<td>Fall Time (resistive load)</td>
<td>&lt;75 msec</td>
</tr>
<tr>
<td>Isolation</td>
<td>Control Output</td>
<td>Optical</td>
</tr>
<tr>
<td>Range</td>
<td>Current Capacity</td>
<td>Automatic</td>
</tr>
<tr>
<td>Memory</td>
<td>Store Settings</td>
<td>3 Volatile Locations</td>
</tr>
<tr>
<td><strong>MECHANICAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Connection</td>
<td>Detachable Line Cord</td>
<td>IEC Type</td>
</tr>
<tr>
<td>Output Connections</td>
<td>Front</td>
<td>Binding Posts</td>
</tr>
<tr>
<td>Meters</td>
<td>Two LED</td>
<td>Three Digit</td>
</tr>
<tr>
<td>Indicators</td>
<td>LED</td>
<td>Remote</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Talk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Listen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPE (Output Enable)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OCP/CCP</td>
</tr>
<tr>
<td>Mounting</td>
<td>19&quot; Rack (optional)</td>
<td>RA 56</td>
</tr>
<tr>
<td>Cooling</td>
<td></td>
<td>Convection</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Outside H x W x D</td>
<td>4.5&quot; (114) x 13.1&quot; (333) x 8.5&quot; (216)</td>
</tr>
<tr>
<td>Panel Finish</td>
<td>Fed Std 595</td>
<td>Color 26440, Gray</td>
</tr>
<tr>
<td>Weight</td>
<td>Packed for Shipment</td>
<td>14.5 lbs</td>
</tr>
<tr>
<td></td>
<td>NET</td>
<td>6.6 Kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13 lbs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.9 Kg</td>
</tr>
</tbody>
</table>
### DPS Static Specifications

<table>
<thead>
<tr>
<th>Influence Qty</th>
<th>Condition</th>
<th>Output Effects Voltage Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>Min - Max</td>
<td>±0.02% +3 mV</td>
</tr>
<tr>
<td>Load</td>
<td>No Load - Full Load</td>
<td>±0.2% +3 mV</td>
</tr>
<tr>
<td>Time</td>
<td>0.5 - 8.5 Hours</td>
<td>0.1%</td>
</tr>
<tr>
<td>Temperature</td>
<td>per Degree C</td>
<td>0.1%</td>
</tr>
<tr>
<td>Ripple &amp; Noise (BW = 100 MHz)</td>
<td>rms</td>
<td>5mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p-p</td>
</tr>
</tbody>
</table>

### Interface

<table>
<thead>
<tr>
<th>Connectors</th>
<th>Control In</th>
<th>9-pin D Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Out</td>
<td>9-pin D Male</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Levels</th>
<th>RS232C Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolation</td>
<td>Optically Isolated</td>
</tr>
</tbody>
</table>

| Handshake             | Signal             | None                       |
| Baud Rates            | DIP Switch Select  | 1200, 2400, 4800, 9600    |
| Word Length           | 8 Bits             |
| Parity                | None               |
| Stop Bit              | 1                  |
| Protocol              | KOIB               |

One Std RS232C Links up to 31 Devices

### Environmental

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>0 - 40 ºC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>-40 to +75 ºC</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>0 - 95% Non-condensing</td>
</tr>
<tr>
<td>Shock</td>
<td>5g 3-axes</td>
</tr>
<tr>
<td>Vibration</td>
<td>2g 10 - 55 Hz 9-axis</td>
</tr>
</tbody>
</table>

### Voltage and Current Ratings

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage Range High-Range (Low-Range)</th>
<th>Current Range High-Range (Low-Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPS 12.5-6M</td>
<td>0-12.5V (0-6V)</td>
<td>0-6A (0-8A)</td>
</tr>
<tr>
<td>DPS 25-3M</td>
<td>0-25V (0-9V)</td>
<td>0-3A (0-5A)</td>
</tr>
<tr>
<td>DPS 40-2M</td>
<td>0-40V (0-15V)</td>
<td>0-2A (0-3A)</td>
</tr>
<tr>
<td>DPS 125-0.5M</td>
<td>0-125V (0-60V)</td>
<td>0.5A (0-0.96A)</td>
</tr>
</tbody>
</table>

DPS SERIES-071593
SECTION 3 — INSTALLATION

3.1 STANDARD EQUIPMENT
The following standard items are provided with the DPS Power Supply:
1. Power Cord
2. Instruction Manual
3. Floppy Disk (5¼) with QuickBasic® Sample Program
The following Optional accessory is available for the DPS Power Supply:
   Rack Adapter (RA 56).

3.2 KOIB ADDRESS AND BAUD RATE SELECTION (REMOTE MODE ONLY)
An 8-position dip switch is located on the back panel. The dip switch is used for KOIB (Kepco Interface Bus) communication address and baud rate setting.

The DPS Power Supply is supplied with factory default settings of KOIB address 1 and baud rate 9600. Optional settings are possible via an eight position dip switch located on the back panel. Refer to Figure 3-1 and Tables 3-1 and 3-2.

Figure 3-1  KOIB Address And Baud Rate Selection Switch
<table>
<thead>
<tr>
<th>SWITCH NUMBER</th>
<th>FUNCTION</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KOIB Address</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>KOIB Address</td>
<td>ON</td>
</tr>
<tr>
<td>3</td>
<td>KOIB Address</td>
<td>ON</td>
</tr>
<tr>
<td>4</td>
<td>KOIB Address</td>
<td>ON</td>
</tr>
<tr>
<td>5</td>
<td>KOIB Address</td>
<td>ON</td>
</tr>
<tr>
<td>6</td>
<td>Baud Rate Setting</td>
<td>OFF</td>
</tr>
<tr>
<td>7</td>
<td>Baud Rate Setting</td>
<td>OFF</td>
</tr>
<tr>
<td>8</td>
<td>Baud Rate Setting</td>
<td>X</td>
</tr>
</tbody>
</table>

ADDRESS = 1, BAUD RATE = 9600  
X = Don't Care

**TABLE 3-1 Default Address \ Baud Rate Setting**

<table>
<thead>
<tr>
<th>SW6</th>
<th>SW7</th>
<th>SW8</th>
<th>BAUD RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>X</td>
<td>1200</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>X</td>
<td>2400</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>X</td>
<td>4800</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>X</td>
<td>9600</td>
</tr>
</tbody>
</table>

X = Don't Care

**TABLE 3-2 Baud Rate Selection**

3.3 **INPUT POWER SELECTION**

The DPS is factory configured for 115 Vac or 230 Vac input power. Refer to the label affixed to rear panel. To reconfigure the input voltage three steps must be followed:

1. Remove the DPS cover. Locate the 115/230 switch behind the input power receptacle.

   Position the switch to the desired input voltage (selected voltage will be visible).

2. Install the proper fuse for the selected input voltage: 115 Vac = 3A (Fast Blow, 5X20)

   230 Vac = 2A (Fast Blow, 5X20)

3. Note the revised input voltage configuration on the rear panel label utilizing an opaque substance and a marking pen.
SECTION 4 — OUTPUT POWER PROTECTION MODES

4.1 OVERCURRENT PROTECTION (OCP)
Overcurrent protection (OCP) is used when testing current sensitive devices. When the DPS Power Supply output current exceeds the OCP limit setting, the output is immediately disabled and the Output Enable (OPE) LED goes off. After clearing the fault or setting a new OCP limit, the user can restart by pressing the OPE key.

The OC operation will be activated (if selected) 20 msec after the terminal is switched on. This is due to the output capacitor and the DPS’s command response time of approximately 16 msec.

During steady voltage operation, the OC mode will be triggered any time a current pulse width of 0.2 msec to 1 msec is detected. This high speed trigger protects most of the sensitive circuit components under test.

However, when the terminal voltage is increased (e.g., from 7.5V to 7.6V) or OPE is pressed to enable output voltage, there is a 20 msec delay in OC protection. This is to allow sufficient time for the output voltage to stabilize and the system output capacitor to charge.

4.2 CONSTANT CURRENT PROTECTION (CCP)
When the DPS Power Supply reaches the CCP limit, the output voltage is reduced to maintain the output current at the CCP limit. An increase in load current drives the voltage down. If the output current returns to a value below the CCP limit, the output voltage returns to normal.

An indication that the CCP circuit has been activated is provided by the flashing of the CURRENT display.

To protect the DPS heatsink assembly and avoid unnecessary power dissipation, the voltage/current characteristic has a software controlled foldback (see Figure 4-1).

4.3 OVERVOLTAGE PROTECTION (OVP)
Overvoltage protection (OVP) is used to restrict the operator from inadvertently entering too high a voltage. When the voltage entered exceeds the OVP setting, the output voltage is automatically set to the overvoltage value.

The OV setting prevents accidentally programming the voltage to any level higher than the OV limit. The user has to be aware that the SAVE/RECALL memory function also saves the OV limit value in volatile memory (refer to Paragraph 5.1.2.5). NOTE: The OV setting will not be able to prevent accidental voltage setting by means of RECALL memory.

4.4 SHORT CIRCUIT PROTECTION
Approximately 12 seconds after detecting a short circuit the DPS Power Supply disables the output and displays "SHO" in the CURRENT display.

4.5 PROGRAMMED ACTIVE CURRENT PULL DOWN
To enable fast voltage fall time, the pull down circuit will be activated every time the output is set to a voltage lower than the one in operation.

The pull down circuit will be switched on for a fixed time and then switched off again. Pull down time is 0.4 msec per 0.1 volt drop.

When the pull down circuit is activated, and the output voltage is above 1.2 Volts, it will pull approximately 2 to 3 Amps of current from the positive output terminal to negative terminal; when the output voltage drops to 1.2 volt or below, it pulls approximately 20 mA. All of the above operations will operate for 75 msec after a drop voltage command is issued (both in Local and Remote Modes).
The pull down time is designed to allow for a 5000μF capacitor to be discharged. For example, discharging from 25 Volts to below 1.2 Volts in less than 100 msec (by calculation it would require only 62 msec).

In most applications, the capacitive load is usually paralleled with a resistive load which also helps in pulling down the voltage.

This pull down operation speeds up the DPS fall time significantly.

4.6 CURRENT LIMITS

All panel limit settings (i.e., OV, CC, OC) will not change due to rangeswitching (refer to Table 2-1). However, depending on the selected output voltage, the DPS does impose different limits on the output current.

NOTE: Model 125-0.5M only: current values entered in milliamperes.

The DPS, without modifying the user limit set value, will operate within the range defined by the lower of the user's set limit and the DPS range limit. For example, if the user set CC limit is 3.5A with the DPS set to 5 volts, the limit is 3.5A (the user’s set limit is lower than the DPS low range limit). However, if the DPS is set to 12 volts, the DPS will restrict itself to 3A (the high range limit). During operation the user's selected limits remain unchanged but the CURRENT display indicates the derated condition by placing an extra decimal point at the end of the CURRENT display value.

Independent of the terminal voltage, OV setting, and range selected, the user can key in values from 0.02A to 5.00A to the CC and OC limits.
FIGURE 4-1 OUTPUT VOLTAGE AND CURRENT PROFILE
SECTION 5 — OPERATION

The DPS Power Supply can be operated in either LOCAL or REMOTE modes. Upon turn on, the VOLTAGE and CURRENT displays show the model and software version for several seconds and the DPS Power Supply assumes the default values shown in Table 5-1.

<table>
<thead>
<tr>
<th>DPS POWER SUPPLY MODEL</th>
<th>12.5-6M</th>
<th>25-3M</th>
<th>40-2M</th>
<th>125-0.5M</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODE</td>
<td>Local</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CURRENT PROTECTION</td>
<td>CC (Constant Current Protection)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERVOLTAGE (OV)</td>
<td>12.5V</td>
<td>25V</td>
<td>40V</td>
<td>125V</td>
</tr>
<tr>
<td>OVERCURRENT (OC)</td>
<td>6A</td>
<td>3A</td>
<td>2A</td>
<td>0.5A</td>
</tr>
<tr>
<td>CONSTANT CURRENT (CC)</td>
<td>6A</td>
<td>3A</td>
<td>2A</td>
<td>0.5A</td>
</tr>
<tr>
<td>VOLTAGE (V)</td>
<td>0V</td>
<td>0V</td>
<td>0V</td>
<td>0V</td>
</tr>
<tr>
<td>OUTPUT ENABLE (OPE)</td>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5-1  DPS Series Power Supplies, Start-Up Defaults

5.1 LOCAL MODE OPERATION

5.1.1 KEYPAD OPERATION

In LOCAL mode, all parameter settings and operations are via a 24 key rubber keypad located on the right hand side of the front panel.

Numerical keys "0 - 9", and "." are used to input all parameter values.

The Enter key is used to confirm the input data of the parameter setting.

The up and down arrow keys operate only when the output is enabled. These two keys sweep the output voltage up or down in 0.1 volt steps.

This key sets the output voltage (V) value.

This key sets the maximum current limit for overcurrent protection (OC).

This key sets the maximum current limit for constant current protection (CC).

NOTE: * Model DPS 125-0.5M only: current values entered in milliamperes
The Overvoltage (OV) key sets the upper limit of the output voltage to avoid accidentally sweeping to an excessive voltage with the up arrow key.

The RESET key returns the DPS Power Supply to the initial power-on default values (see Table 5-1).

The Clear (CLR) key is used to clear an incorrect parameter entry.

The Output Enable (OPE) key is a toggle used to enable / disable the output voltage. 
LED on = output enabled
LED off = output disabled

The OCP/CCP key is a toggle used to select the two different current protection modes (refer to Section 4). At start-up the DPS Power Supply defaults to the Constant Current Protection (CCP) mode. 
LED off = Overcurrent Protection (OCP) mode
LED on = Constant Current Protection (CCP) mode

The STORE key, when used simultaneously with numerical keys 1, 2, or 3, stores the selected V, OV, OC, CC values and status in volatile memory. It will display " - - S " on the VOLTAGE display and " X - - " on the CURRENT display for a successful store, where X will be 1, 2, or 3.

The RECALL key, when used simultaneously with numerical keys 1, 2, or 3, recalls stored settings from volatile memory. It will display " - - P " on the VOLTAGE display and " X - - " on the CURRENT DISPLAY for a successful memory recall where X is 1, 2, or 3.
5.1.2 LOCAL MODE PROCEDURES

5.1.2.1 SETTING OUTPUT VOLTAGE
a. Press the "V" key, the original voltage setting is displayed for approximately 1 second, display then blanks out.

b. Input the new voltage value.

c. Press "Enter" to confirm or CLR for any correction.

d. If the entered value is out of range, the display will show "-E-" and wait for the user to clear the error by pressing the CLR key. After the CLR key is pressed, or a several second lapse, the DPS Power Supply will exit from the "setting" mode, keeping the previously set value.

Model DPS 125-0.5M only: when decimal point above arrow is lit, digit following decimal point is 5 or greater

e. When the display is blank, press the "Enter" key to retain the previous value.

5.1.2.2 SETTING OVERVOLTAGE
a. Press the "OV" key, the original overvoltage setting is displayed for approximately one second, display then blanks out.

b. Input the new overvoltage value.

c. Press "Enter" to confirm or CLR for any correction.

d. If the entered value is out of range, the display will show "-E-" and wait for the user to clear the error by pressing the CLR key. After the CLR key is pressed, or a several second lapse, the DPS Power Supply will exit from the "setting" mode, keeping the previously set value.

e. When the display is blank, press the "Enter" key to retain the previous value.

5.1.2.3 SETTING OVERCURRENT
a. Press the "OC" key, the original overcurrent setting is displayed for approximately one second, display then blanks out.

b. Input the new overcurrent value.

Model DPS 125-0.5M only: enter value in milliamperes

c. Press "Enter" to confirm or CLR for any correction.

d. If the entered value is out of range, the display will show "-E-" and wait for the user to clear the error by pressing the CLR key. After the CLR key is pressed, or a several second lapse, the DPS Power Supply will exit from the "setting" mode, keeping the previously set value.

e. When the display is blank, press the "Enter" key to retain the previous value.

5.1.2.4 SETTING CONSTANT CURRENT
a. Press the "CC" key, the original constant current setting is displayed for approximately one second, display then blanks out.

b. Input the new constant current value.

Model DPS 125-0.5M only: enter value in milliamperes

c. Press "Enter" to confirm or CLR for any correction.

d. If the entered value is out of range, the display will show "-E-" and wait for the user to clear the error by pressing the CLR key. After the CLR key is pressed, or a several second lapse, the DPS Power Supply will exit from the "setting" mode, keeping the previously set value.

e. When the display is blank, press the "Enter" key to retain the previous value.
5.1.2.5 STORE SETTING
NOTE: Before "storing" preset desired values and protection mode:

a. Simultaneously press STORE key and numerical key 1, 2, or 3.
b. It will display "- - S " on the VOLTAGE display and " X - - " on the CURRENT DISPLAY for a successful "store", where X will be 1, 2, or 3.

5.1.2.6 RECALL SETTING
a. Simultaneously press RECALL key and numerical key 1, 2, or 3.
b. " - - P " on the VOLTAGE display and " X - - " on the CURRENT DISPLAY indicates a successful recall of the stored settings, where X will be 1, 2, or 3. The DPS will be set to these stored values.

5.1.3 CURRENT DISPLAY
The display for CURRENT reading will be refreshed every 100 msec. The reading is an arithmetic average of the current.

However, when the terminal voltage is increased, current through the output capacitor will cause an erroneous reading, hence, current changes within 20msec from the voltage change will not be taken into the reading calculation.

5.2 REMOTE MODE OPERATION
5.2.1 COMMUNICATION CONFIGURATION
All DPS Power Supplies are connected in a daisy chain manner starting from the controller (computer with a RS-232C port or an RS-232C Controller), see Figure 5-1. When set at the correct baud rate, the DPS Power Supplies can be connected in any sequence in the daisy chain. Each DPS Power Supply MUST have its own unique address. The hardware connection sequence is totally independent of the address of each DPS Power Supply.

5.2.2 RANGESWITCHING
During remote operation, the band switching algorithm will be exactly the same as in Local (front panel) mode. Note: that the DPS will not respond to any command for the conditions described in paragraph 5.3.

---

**CAUTION**

- Frequent switching between high and low ranges (especially by pressing the RECALL key to set voltages across the ranges while the output is heavily loaded) may significantly shorten the life of the range selection relays.

- The DPS is designed to accommodate high speed voltage selection within the SAME range. However, high speed voltage jumping across ranges will result in excessive heat on the heat sink and power transistors, and potential damage to the DPS.

The operator using the remote control function to program high speed across-range voltage jumping must take the following precautions:

- for every time unit of low voltage setting, set the output voltage to either OPE DISABLE or back to any high range voltage for at least three time units. For example, if the DPS is programmed to jump from 12 volts to 5 volts for a 100 ms in your test cycle, the DPS will be unable to switch to low range.

- use a dummy load for program testing. Measure the heat sink temperature, ensuring that enough ventilation is provided for the heat sink (used forced ventilation when necessary).
5.2.3 KOIB CABLE REQUIREMENT
For maximum communication length and reliability, the use of a cable specified by the RS-232C standard is recommended.

However, due to optical buffers at each communication node, any four wire cable (or three wire cable... without shielding) will give good reliability at a distance of approximately 50 feet at 9600 baud.

5.2.4 MAXIMUM DISTANCE BETWEEN UNITS
The distance between the RS-232C controller and DPS Power Supply, or DPS Power Supply to DPS Power Supply is dependent on the communication speed of the equipment.

For example, by using the fastest speed, 9600 baud, the maximum distance between two devices is 100 feet.

\[ \text{baud rate} \times \text{distance} = 960,000 \text{(approximately)} \]
\[
\text{thus: for 1200 baud rate, distance} = 800 \text{ feet maximum} \\
\text{for 2400 baud rate, distance} = 400 \text{ feet maximum} \\
\text{for 4800 baud rate, distance} = 200 \text{ feet maximum} \\
\text{for 9600 baud rate, distance} = 100 \text{ feet maximum}
\]

NOTE: ALL UNITS IN THE DAISY CHAIN MUST BE SET TO THE SAME BAUD RATE

5.2.5 REMOTE CURRENT READING
The CURRENT reading will be refreshed every 100 msec; the reading is an arithmetic average of the current.

However, when the terminal voltage is increased, current through the output capacitor will cause erroneous reading, thus, current changes within 20msec from a voltage change will not be taken into the reading calculation.

5.3 NO RESPONSE TO COMMAND CONDITION
In general, for both Remote and Local modes, the DPS will immediately respond to any command, with the following exceptions:

there will be no response from the DPS for 10 ms after OPE ENABLE, OPE DISABLE, or SET VOLTAGE commands.

While the DPS is switching the range relays, there will be no response.

For integral keypad operation (Local Mode), the above "black-out" time will not be noticeable. For remote operation, although the DPS CPU is not responding, there is a 1 byte hardware buffer for the KOIB interface which captures the last character from the master computer for immediate processing after the "black-out".
(9 WAY D-TYPE FEMALE CONNECTOR D-95)  (9 WAY D-TYPE MALE CONNECTOR D-98)

Figure 5-1 RS-232C Controller to DPS Power Supplies, Interface
### SECTION 6 — SOFTWARE COMMANDS REFERENCE

#### 6.1 COMMAND LIST

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>IDentification message to KOIB device</td>
</tr>
<tr>
<td>LOC</td>
<td>LOCal &quot;ON&quot; return to local mode</td>
</tr>
<tr>
<td>RCC</td>
<td>Read Constant Current limit setting</td>
</tr>
<tr>
<td>RCL=X</td>
<td>ReCaLl the settings in volatile memory</td>
</tr>
<tr>
<td>RCS</td>
<td>Read Current protection Status</td>
</tr>
<tr>
<td>RMD</td>
<td>Read MoDe of current protection</td>
</tr>
<tr>
<td>ROC</td>
<td>Read OverCurrent limit setting</td>
</tr>
<tr>
<td>ROP</td>
<td>Read OutPut status</td>
</tr>
<tr>
<td>ROV</td>
<td>Read OverVoltage protection setting</td>
</tr>
<tr>
<td>RSV</td>
<td>Read Setting Voltage value</td>
</tr>
<tr>
<td>RTC</td>
<td>Read Terminal output Current</td>
</tr>
<tr>
<td>RTV</td>
<td>Read Terminal output Voltage</td>
</tr>
<tr>
<td>SCC=XXX</td>
<td>Set Constant Current limit</td>
</tr>
<tr>
<td>SMD=OC</td>
<td>Select current protection MoDe = OverCurrent mode</td>
</tr>
<tr>
<td>SMD=CC</td>
<td>Select current protection MoDe = Constant Current mode</td>
</tr>
<tr>
<td>SOC=XXX</td>
<td>Select OverCurrent limit</td>
</tr>
<tr>
<td>SOP=ON</td>
<td>Set Output = ON (enable output)</td>
</tr>
<tr>
<td>SOP=OFF</td>
<td>Set Output = OFF (disable output)</td>
</tr>
<tr>
<td>SOV=XXX</td>
<td>Set OverVoltage limit</td>
</tr>
<tr>
<td>STO=X</td>
<td>STOre the current settings in volatile memory</td>
</tr>
<tr>
<td>STV=XXX</td>
<td>Set Terminal Voltage value</td>
</tr>
<tr>
<td>ZER</td>
<td>Zero ERRor status (read error status first and clear the error)</td>
</tr>
</tbody>
</table>

**NOTE:** Each command requires a carriage return to indicate the ending of the command. In addition, all commands must be in capital letters (the DPS does not recognize lower case letters). All commands, including "carriage return", are limited to nine characters.

#### 6.2 ALPHABETICAL COMMAND DETAILS

##### 6.2.1 ID

**PURPOSE:** Read the device model no.

**SYNTAX:** ID

**EXAMPLE:** The DPS will respond to this command by sending the following: KEPCO DPS 12.5-6M

##### 6.2.2 LOC

**PURPOSE:** Release the DPS to stand alone (local) mode without affecting any parameter setting.

**SYNTAX:** LOC

##### 6.2.3 RCC

**PURPOSE:** Read constant current limit setting.

**SYNTAX:** RCC

**REMARK:** The DPS will respond to the command by sending an ASCII string to the host computer. The return string indicates a number which is in the range that corresponds to the low voltage range of the particular DPS model being used (see Table 1-1)

**Return String Format:** RCC=<RETURN CODE>

**EXAMPLE:** RCC=1.28A

**NOTE:** If the DPS is in current protection mode of any kind, the return string will be RCC=1.28P.

##### 6.2.4 RCL=X

**PURPOSE:** Recall the settings stored in memory locations 1, 2 or 3 using commands STO=1, STO=2 or STO=3.
The settings include V, OV, OC, CC settings and current protection mode.

**NOTE:** When using the RCL command, the computer does not respond with a string. However, the voltage setting will be displayed on the panel of the power supply.

**SYNTAX:** RCL=X where X is 1, 2 or 3  
**EXAMPLE:** RCL=1 Recall the settings in memory 1

### 6.2.5 RCS

**PURPOSE:** Read current protection status.

**SYNTAX:** RCS

**REMARK:** The DPS will return an ASCII string in the following format:

- RCS=00 "normal", the load current is within the limit
- RCS=01 OC mode protected, the computer has to send the SOP=ON command to re-enable the output
- RCS=02 CC mode protected
- RCS=03 Short circuit protected, the computer has to send the SOP=ON command to re-enable the output.

### 6.2.6 RMD

**PURPOSE:** Read mode of current protection

**SYNTAX:** RMD

**REMARK:** The DPS will return an ASCII string in the following format:

- RMD=CC Constant Current Mode
- RMD=OC Overcurrent Mode

### 6.2.7 ROC

**PURPOSE:** Read the overcurrent limit setting.

**SYNTAX:** ROC

**REMARK:** The DPS will respond to the command by sending an ASCII string to the host computer. The return string indicates a number which is in the range that corresponds to the low voltage range of the particular DPS model being used (see Table 1-1).

**Return string format:** ROC= <RETURN CODE>

**EXAMPLE:** ROC= 2.60A

**NOTE:** If the DPS is in current protection mode of any kind, the return string will be ROC=2.60P.

### 6.2.8 ROP

**PURPOSE:** Read the output status.

**SYNTAX:** ROP

**REMARK:** The DPS will return an ASCII string in the following format:

- ROP=ON OUTPUT is ENABLED
- ROP=OFF OUTPUT is DISABLED

### 6.2.9 ROV

**PURPOSE:** Read overvoltage limit setting

**SYNTAX:** ROV

**REMARK:** The DPS will respond to the command by sending an ASCII string to the host computer. The return string indicates a number which is in the range that corresponds to the high voltage range of the particular DPS model being used (see Table 1-1).

**Return string format:** ROV= <RETURN CODE>

**EXAMPLE:** ROV= 22.1V

**NOTE:** If the DPS is in current protection mode of any kind, the return string will be ROV=22.1P.
6.2.10 RSV

PURPOSE: Read the voltage setting value
SYNTAX: RSV
REMARK: The DPS will respond to the command by sending an ASCII string to the host computer.

Return string format: RSV= <RETURN CODE>
EXAMPLE: RSV=17.2V

NOTE: If the DPS is in current protection mode of any kind, the return string will be RSV=17.2P.

6.2.11 RTC

PURPOSE: Read the output current
SYNTAX: RTC
REMARK: The DPS will respond to the command by sending an ASCII string to the host computer.

Return string format: RTC= <RETURN CODE>
EXAMPLE: RTC=1.36A

NOTE: If the DPS is in current protection mode of any kind, the return string will be RTC=1.36P.

6.2.12 RTV

PURPOSE: Read terminal output voltage
SYNTAX: RTV
REMARK: The DPS will respond to the command by sending an ASCII string to the host computer.

Return string format: RTV= <RETURN CODE>
EXAMPLE: RTV=15.0V

NOTE: If the DPS is in current protection mode of any kind, the return string will be RTV=15.0P.

6.2.13 SCC=XXX

PURPOSE: To set the constant current limit so that the output current will be constant when the load current is over the limit.

SYNTAX: SCC=XXX
EXAMPLE: SCC=0.86 set current limit to 0.86A
         SCC=1.28 set current limit to 1.28A
         SCC=1.0 set current limit to 1.00A
         SCC=5 set current limit to 5.00A

6.2.14 SMD=OC

PURPOSE: Select overcurrent mode, the current mode LED will be turned off.

SYNTAX: SMD=OC

6.2.15 SMD=CC

PURPOSE: Select constant current mode, the current mode LED will be turned on.

SYNTAX: SMD=CC

6.2.16 SOC=XXX

PURPOSE: To set the overcurrent limit.

SYNTAX: SOC=XXX
EXAMPLE: SOC=0.86 set overcurrent to 0.86A
         SOC=1.28 set overcurrent to 1.28A
         SOC=1.0 set overcurrent to 1.00A
         SOC=5 set overcurrent to 5.00A

6.2.17 SOP=ON

PURPOSE: To enable the output.
SYNTAX: SOP=ON
REMARK: When the output is enabled, the OPE LED is on.
6.2.18  **SOP=OFF**

**PURPOSE:**
To disable the output.

**SYNTAX:**
SOP=OFF

**REMARK:**
When the output is disabled, the OPE LED is off.

6.2.19  **SOV=XXX**

**PURPOSE:**
To set maximum voltage limit.

**SYNTAX:**
SOV=XXX

**REMARK:**
Any attempt to enter a value exceeding the overvoltage setting will cause the DPS to restrict the output voltage to this value.

**EXAMPLE:**
SOV=14.7 set overvoltage to 14.7V  
SOV=22 set overvoltage to 22.0V  
SOV=5 set overvoltage to 5.0V  
SOV=.866 set overvoltage to 0.8V

6.2.20  **STO=X**

**PURPOSE:**
Store the desired settings in memory locations 1, 2 or 3 by using commands STO=1, STO=2 and STO=3.
The settings include V, OV, OC, CC settings and current protection mode.

**SYNTAX:**
STO=X where X = 1, 2 or 3

**EXAMPLE:**
STV=15 set the terminal voltage to 15.0V  
SCC=0.86 set the current limit to 0.8A  
STO=1 store the current settings in memory 1

6.2.21  **STV=XXX**

**PURPOSE:**
To set terminal output voltage.

**SYNTAX:**
STV=XXX

**REMARK:**
Any attempt to enter a value exceeding the overvoltage setting will cause the DPS to restrict the output voltage to this value.

**EXAMPLE:**
STV=14.7 set terminal voltage to 14.7V  
STV=22 set terminal voltage to 22.0V  
STV=5 set terminal voltage to 5.0V  
STV=0.866 set terminal voltage to 0.8V

6.2.22  **ZER**

**PURPOSE:**
In case of errors due to any reason, user can use this command to read back the error code and reset the error bit.

**SYNTAX:**
ZER

The return string format:

<table>
<thead>
<tr>
<th>CODE</th>
<th>EXAMPLE</th>
<th>ERR#</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERR#00</td>
<td>No error</td>
<td></td>
</tr>
<tr>
<td>ERR#01</td>
<td>Input value out of range (includes V settings greater then OV setting, V setting greater then rated V, OC or CC setting greater then rated C)</td>
<td></td>
</tr>
<tr>
<td>ERR#03</td>
<td>Syntax error or unknown command</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX "A"

"QUICKBASIC"® LANGUAGE PROGRAM EXAMPLE

*************************************************************************** TEST2.BAS***************************************************************************

'This program demonstrates the capabilities of the DPS Power Supplies

'DEVSEL must be sent without a <CR> prior to each command
'(DEVSEL = ADDRESS + &HE0)
'RXOK is returned (without a <CR>) in response to DEVSEL
'(RXOK = ADDRESS + &HC0)

***************************************************************************

INPUT "Enter the address of your DPS: ", ADDRESS

DEVSEL = ADDRESS + &HE0
RXOK = ADDRESS + &HC0

'Open and initialize the controller communications channel for I/O
OPEN "COM1:9600,N,8,1" FOR RANDOM AS #1

DO
  'Input command string
  INPUT "Enter command > ", CMD$ i = LEN(CMD$)
  IF i <2 THEN END 'Examine length of command and exit if <2
  GOSUB IO 'Go to main I/O subroutine

LOOP WHILE (i)

CLOSE
END

***************************************************************************Main I/O subroutine***************************************************************************

IO:
  PRINT #1, CHR$(DEVSEL); 'Send DEVSEL byte to DPS
  N = 0
  'Await input buffer to become non-zero, exit if not successful in 5000 tries
  DO
    IF N >5000 THEN PRINT "COM ERROR - INPUT BUFFER EMPTY"; END
    N = N + 1
  LOOP WHILE (LOC(1) = 0)

  A$ = INPUT$(1, #1) 'Input RXOK byte

  PRINT #1, CMD$
  'Await input buffer to become non-zero
  DO
    LOOP WHILE (LOC(1) = 0)
    A$ = INPUT$(1, #1) 'Input first (non-ASCII) character of string and discard

  INPUT #1, B$ 'Input balance of string
  'Print returned string followed by a blank line
  PRINT B$: PRINT

RETURN
APPENDIX "B"

C LANGUAGE PROGRAM EXAMPLE

/**************************************************** RTSTC.C ****************************************************/

#include <stdio.h>
#include <string.h>
#include <stdlib.h>
#include <dos.h>

#define BAUDRATE 9600
#define PORTNO 0   /* use 1 for COM2, 0 for COM1 */

unsigned char port = PORTNO;
unsigned char DEVSEL;
char command[16];
char Device_Address[2];

/************************************ main serial port input/output function **********************/

void io(void)
{
    union REGS r;
    int i, j, count;
    unsigned char buff[24];

    /* send DEVSEL to DPS, exit to DOS if unsuccessful */
    r.x.dx = port;
    r.h.ah = 1;
    r.h.al = DEVSEL;
    (void) int86(0x14, &r, &r);
    if(r.h.ah & 128)
    {
        printf("\nSend error timeout in serial port, program \
"aborted\n");
        exit(1);
    }

    /* await RXOK byte from DPS, exit to DOS if unsuccessful */
    /* RXOK = Device_Address + 0xC0 */
    r.x.dx = port;
    r.h.ah = 2;
    (void) int86(0x14, &r, &r);
    if(r.h.ah & 128)
    {
        printf("\nRead error timeout in serial port, program \
"aborted\n");
        exit (1);
    }

    /* send command string to DPS, exit to DOS if unsuccessful */
    for(i = 0; i < (int)strlen(command); i++)
    {
        r.x.dx = port;
        r.h.ah = 1;
        r.h.al = (unsigned char)command[i];
        (void) int86(0x14, &r, &r);
        if(r.h.ah & 128)
        {
            printf("\nSend error timeout in serial port, program \
"aborted\n");
            exit(1);
        }
    }
}
/* input returned string from DPS, exit to DOS if unsuccessful */
count = 0;
do{
    r.x.dx = port;
    r.h.ah = 2;
    (void) int86(0x14, &r, &r);
    if(r.h.dh & 128)
        {printf("\nRead error timeout in serial \\
        "port, program aborted\n");
            exit (1);
        }
    buff[count] = r.h.al;
    count++;
} while (r.h.al != 0x0D);

/* print returned string to screen, */
/* deleting first character (non-ASCII) */
for(j = 1; j < count; j++)
    {void) putchar(buff[j]);
}

} /* end io() */

/****************************************************************************
void main(void)
{
    /* initialize specified com port (port) to desired BAUDRATE and N-8-1 */
    int com_settings = BAUDRATE;
    union REGS r;
    r.x.dx = port;
    r.h.ah = 0;
    switch (com_settings)
    {
    case 9600:
        r.h.al = 0xE3;
        break;
    case 4800:
        r.h.al = 0xC3;
        break;
    case 2400:
        r.h.al = 0xA3;
        break;
    case 1200:
        r.h.al = 0x83;
        break;
    default:
        r.h.al = 0xE3; /* 9600 baud */
    }
    (void) int86(0x14, &r, &r);

    printf("Enter the address of your DPS: ");
    (void) gets(Device_Address);
    DEVSEL = (unsigned char)atoi(Device_Address) + 0x0E0;
    do{
        printf("Enter command > ");
        (void) gets(command);
        strcat (command, "\r");
        if(strlen(command) > 1)
            io();
    } while (strlen(command) > 1);

} /* end main */