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 numbers. 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 Documentation Office in New York, (718) 461-7000, requesting the correct revision for your particular model and serial number.

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P/N 243-0807

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THE POWER SUPPLIER™

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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

	SPECIFICATIONS	CONDITION	RATING/ DESCRIPTION
	INPUT		
FROM:	Current	Max Load 110 Vac	1.4A
TO:	Current	Max Load 110 Vac	DPS 12.5-6M: 1.7 A DPS 25-3M: 1.4 A DPS 40-2M 1.3 A DPS 125-0.5M: 1.1 A

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 (2^0) through 5 (2^5) to values between 0 and 31. This address is added to the Power Supply base address which is always $E0_{HEX}$, $224_{DECIMAL}$. Thus, a KOIB address of 1 is added to the base address to produce a Device Select address of $225_{DECIMAL}$ (1 + 224 = 225), $E1_{HEX}$. 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)

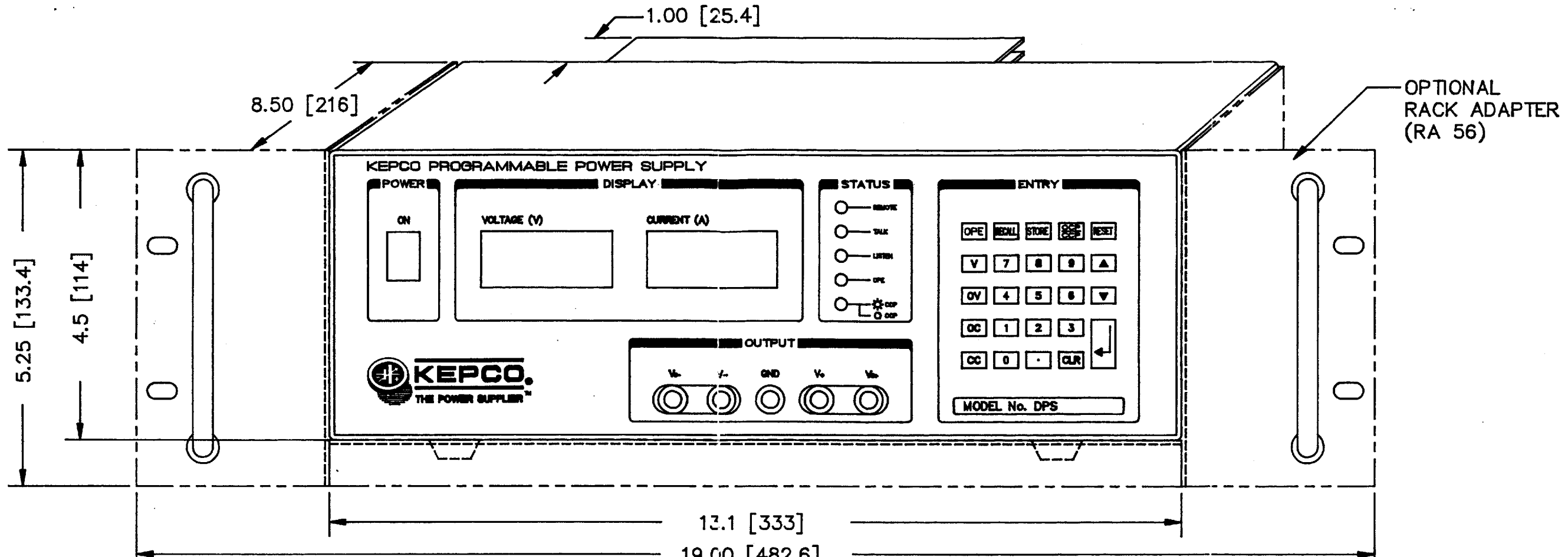
Each DPS Power Supply can operate in either LOCAL mode, via an integral keypad, or in REMOTE mode, via an RS-232C data link.

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.

MODEL	VOLTAGE RANGE High-Range (Low-Range)	CURRENT RANGE High-Range (Low-Range)	RESOLUTION	
			Voltage	Current
DPS 12.5-6M	0-12.5V (0-6V)	0-6A (0-8A)	0.05V	0.04A
DPS 25-3M	0-25V (0-9V)	0-3A (0-5A)	0.1V	0.02A
DPS 40-2M	0-40V (0-15V)	0-2A (0-3A)	0.2V	0.02A
DPS 125-0.5M	0-125V (0-60V)	0-0.5A (0-0.96A)	0.5V	0.004A

TABLE 1-1 VOLTAGE AND CURRENT RATINGS



NOTE: DIMENTIONS IN INCHES (MILLIMETERS)

FIGURE 1–1 DPS SERIES, OUTLINE DRAWING

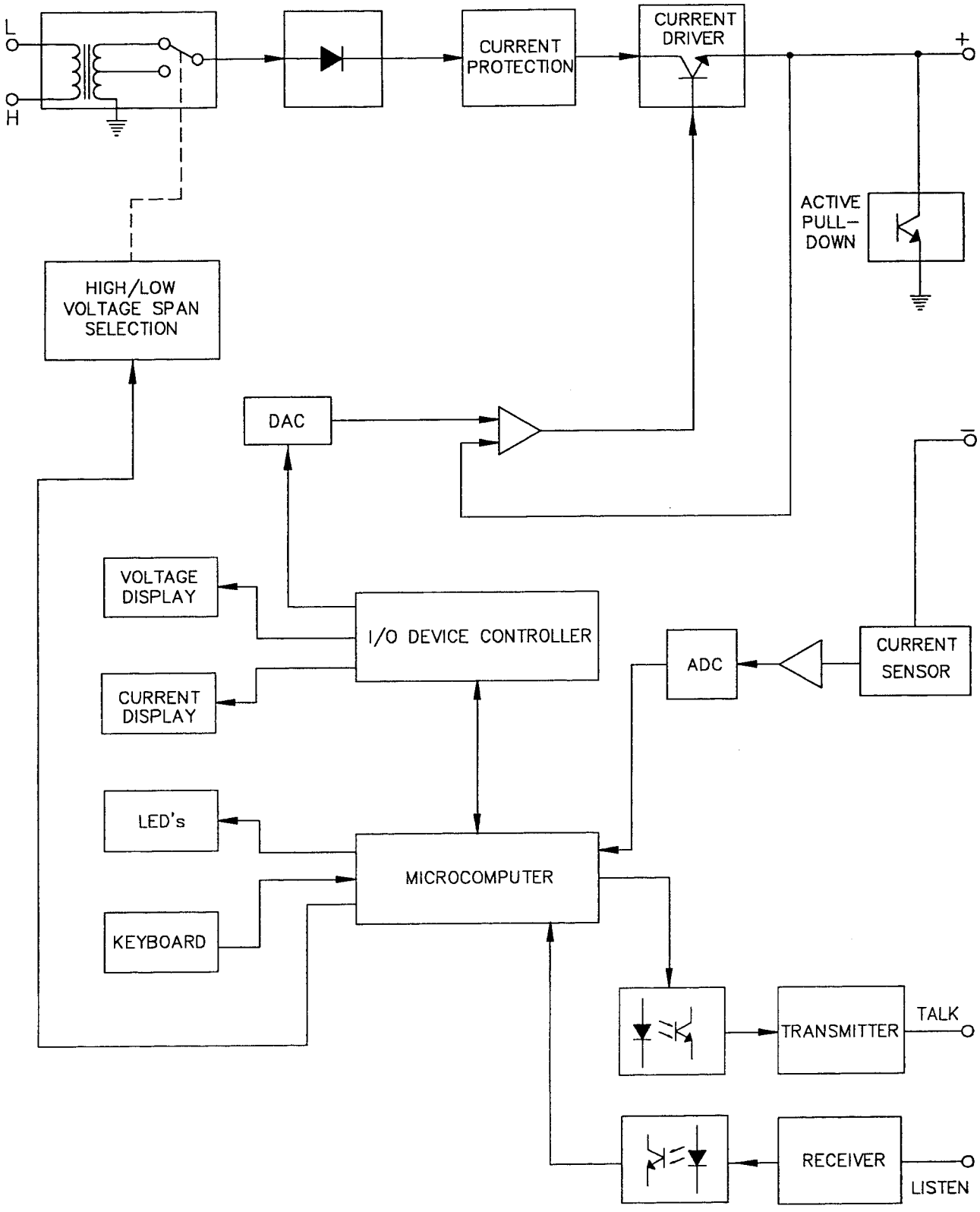


FIGURE 1-2 DPS Series, Functional Block Diagram

SECTION 2 — SPECIFICATIONS

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

DPS STATIC SPECIFICATIONS		
INFLUENCE QTY	**CONDITION**	**OUTPUT EFFECTS VOLTAGE MODE**
Source	Min - Max	±0.02%+3 mV
Load	No Load - Full Load	±0.2% +3 mV
Time	0.5 - 8.5 Hours	0.1%
Temperature	per Degree C	0.1%
Ripple & Noise (BW = 100 MHz)	rms	5mV
	p-p	50mV

INTERFACE		
Connectors	Control In	9-pin D Female
	Control Out	9-pin D Male
Levels		RS232C Standard
Isolation		Optically Isolated
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		
Operating Temperature		0 - 40 °C
Storage Temperature		-40 to +75 °C
Relative Humidity		0 - 95% Non-condensing
Shock		5g 3-axes
Vibration		2g 10 - 55 Hz 9-axis

VOLTAGE AND CURRENT RATINGS		
MODEL	**VOLTAGE RANGE** High-Range (Low-Range)	**CURRENT RANGE** High-Range (Low-Range)
DPS 12.5-6M	0-12.5V (0-6V)	0-6A (0-8A)
DPS 25-3M	0-25V (0-9V)	0-3A (0-5A)
DPS 40-2M	0-40V (0-15V)	0-2A (0-3A)
DPS 125-0.5M	0-125V (0-60V)	0-.5A (0-0.96A)

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.

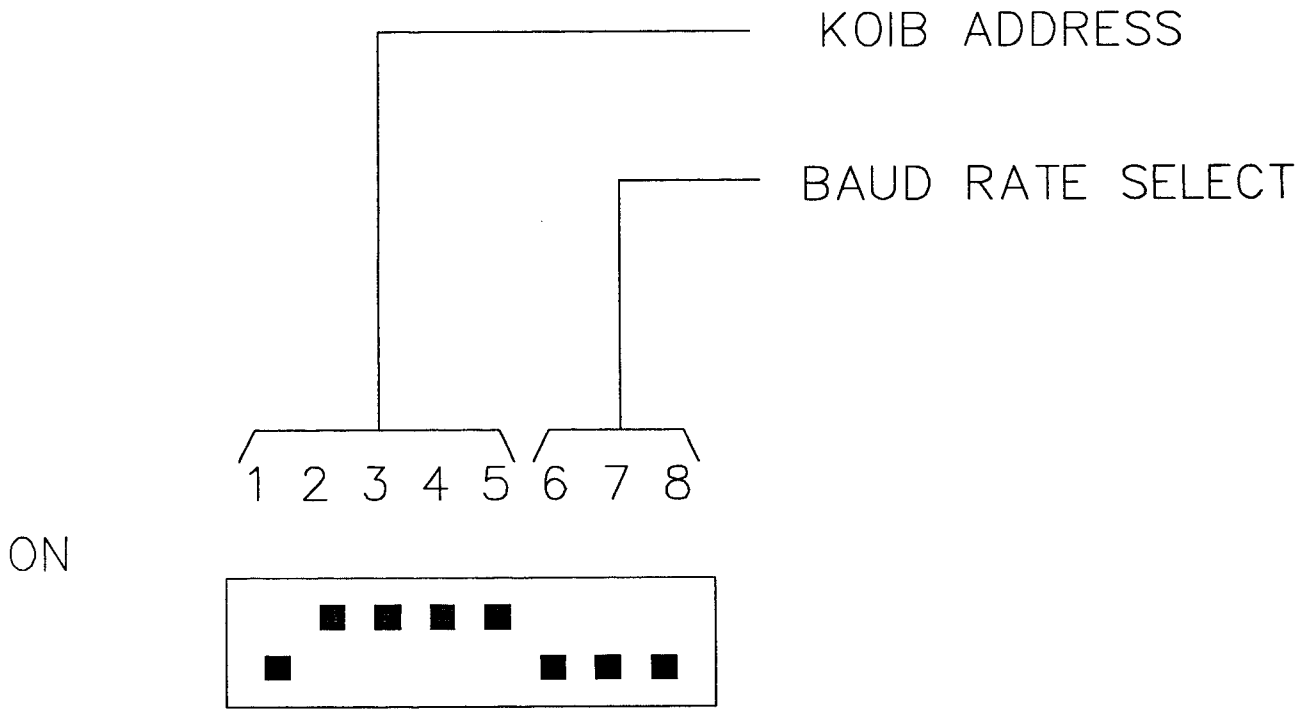


Figure 3-1 KOIB Address And Baud Rate Selection Switch

SWITCH NUMBER	FUNCTION	DEFAULT
1	KOIB Address	OFF
2	KOIB Address	ON
3	KOIB Address	ON
4	KOIB Address	ON
5	KOIB Address	ON
6	Baud Rate Setting	OFF
7	Baud Rate Setting	OFF
8	Baud Rate Setting	X

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

TABLE 3-1 Default Address \Baud Rate Setting

SW6	SW7	SW8	BAUD RATE
ON	ON	X	1200
OFF	ON	X	2400
ON	OFF	X	4800
OFF	OFF	X	9600

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 inadverdently 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.

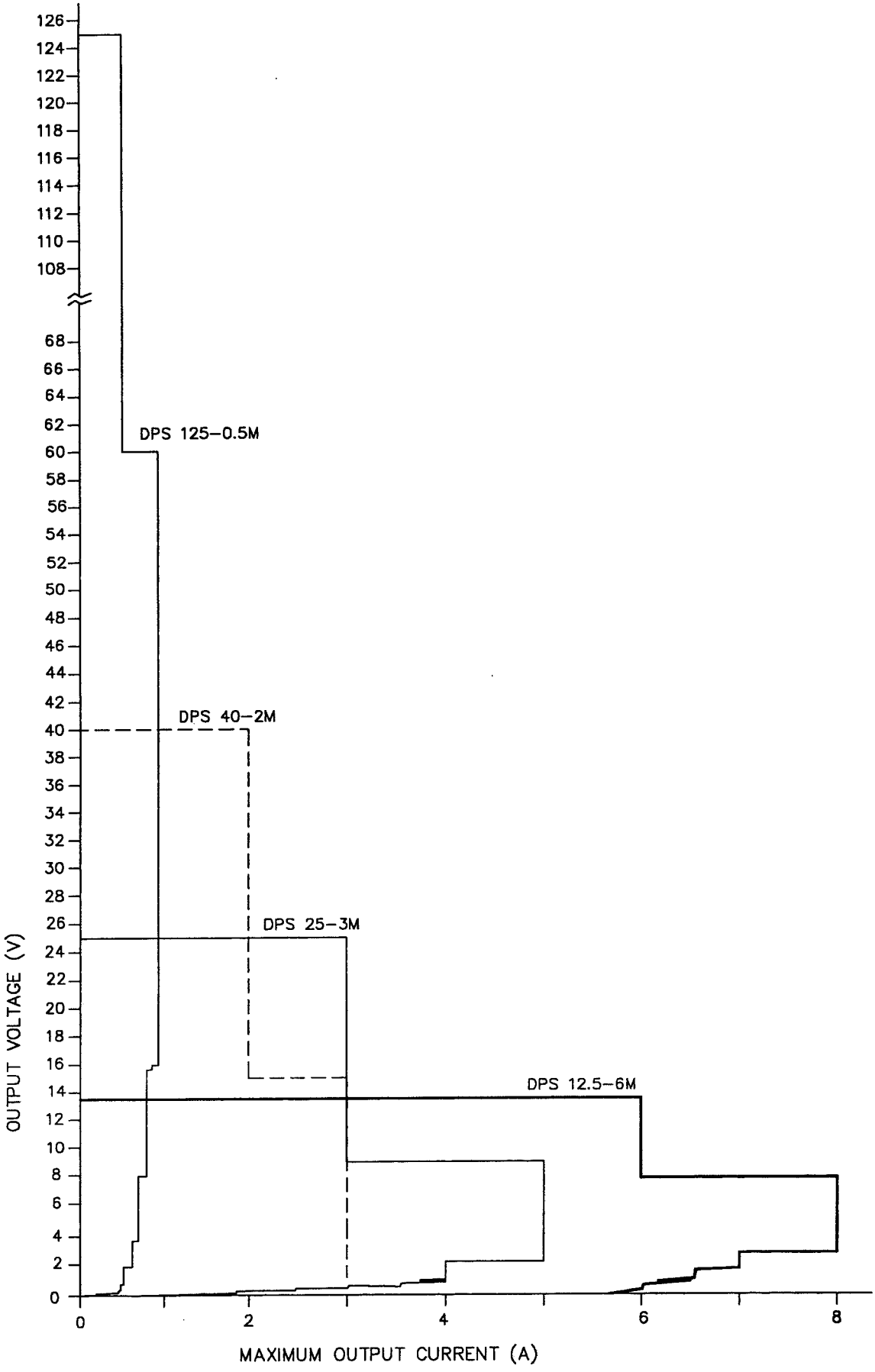


FIGURE 4-1 OUTPUT VOLTAGE AND CURRENT PROFILE

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.

	DPS POWER SUPPLY MODEL			
	12.5-6M	**25-3M**	**40-2M**	**125-0.5M**
MODE	Local			
CURRENT PROTECTION	CC (Constant Current Protection)			
OVERVOLTAGE (OV)	12.5V	25V	40V	125V
OVERCURRENT (OC)	6A	3A	2A	0.5A
CONSTANT CURRENT (CC)	6A	3A	2A	0.5A
VOLTAGE (V)	0V	0V	0V	0V
OUTPUT ENABLE (OPE)	OFF			

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.

[0] [9] [.] 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.

[V] This key sets the output voltage (V) value.

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

[CC] * 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 sucessful recall of the stored settings, where X will be 1, 2, or 3. The DPS sill 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.

baud rate x distance = 960,000 (approximately)
thus: for 1200 baud rate, distance = 800 feet maximum
for 2400 baud rate, distance = 400 feet maximum
for 4800 baud rate, distance = 200 feet maximum
for 9600 baud rate, distance = 100 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 outut capacitor will cause erroneous reading, thus, current changes within 20msec from a voltage change will not be taken into the reading calculation.

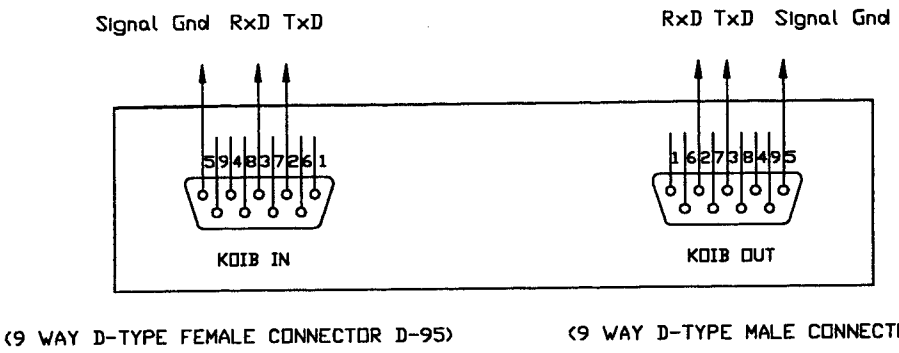
5.3 NO RESPONSE TO COMMAND CONDITION

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".



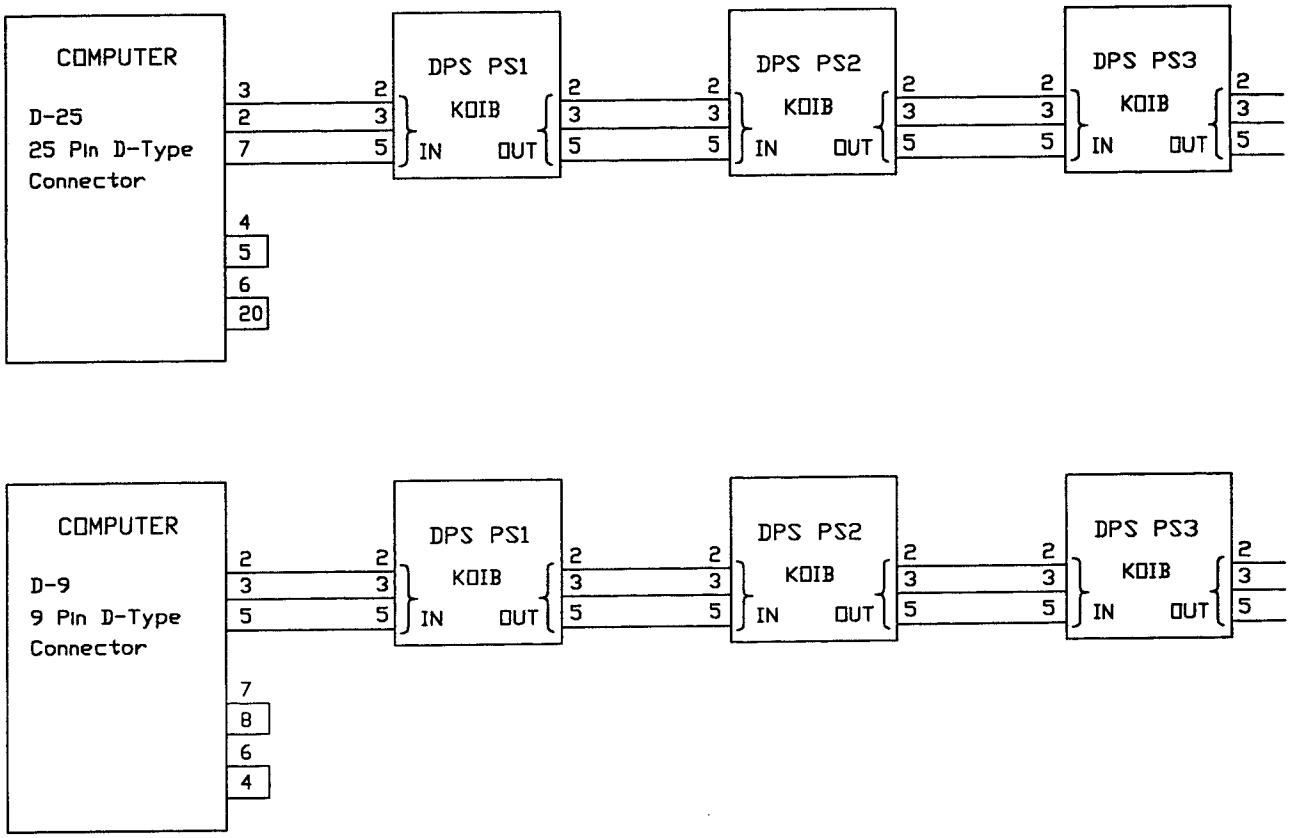


Figure 5-1 RS-232C Controller to DPS Power Supplies, Interface

SECTION 6 — SOFTWARE COMMANDS REFERENCE

6.1 COMMAND LIST

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

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= <RETURNCODE>
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:

ERR#	CODE EXAMPLE:ERR#00 No error
ERR#01	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)
ERR#03	Syntax error or unknown command

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

```
/********************************* RTESTC.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.ah & 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]);
         printf("\n");
        } /* end io() */
/******************************** main() *********************************/
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) + 0xE0;
         do{
             printf("Enter command > ");
             (void) gets(command);
             strcat (command, "\r");
             if(strlen(command) > 1)
                io();
           } while (strlen(command) > 1);
} /* end main */
```