OPERATOR'S MANUAL

KLN 750W

PROGRAMMABLE D-C POWER SUPPLY

1U HALF RACK

KEPCO INC.
An ISO 9001 Company.

CE

MODEL
KLN 750W
POWER SUPPLY

ORDER NO.

IMPORTANT NOTES:

1) This manual is valid for the following Firmware Versions:

FIRMWARE VERSION	NOTE.
1.60 and higher	

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 Instruction Manual, check your equipment firmware version 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 firmware version number.

3) The contents of this manual are protected by copyright. Reproduction of any part can be made only with the specific written permission of Kepco, Inc.

Data subject to change without notice.

P/N 243-1339-r4b

KEPCO®
THE POWER SUPPLIER™

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OPERATOR
SAFETY INSTRUCTIONS

Read these safety instructions, as well as the applicable installation and operating instructions contained in this manual before using the power supply.

WARNING

Do not touch the output terminals. The output is dangerous. Electric shock can cause injury or death.

Do not remove the cover or disassemble the unit. There are no operator serviceable components or adjustments inside the unit. High voltage components inside the unit can cause serious injury even with input power disconnected.

Service must be referred to authorized personnel. Using the power supply in a manner not specified by Kepco. Inc. may impair the protection provided by the power supply. Observe all safety precautions noted throughout this manual. Table 1-5 lists symbols used on the power supply or in this manual where applicable.

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SECTION 1 - INTRODUCTION

1.1 SCOPE OF MANUAL

This manual contains instructions for the installation and operation of the KLN series of 750 Watt programmable, voltage and current stabilized d-c power supplies, hereafter referred to as KLN 750W, from Kepco, Inc., Flushing, New York, U.S.A.

1.2 GENERAL DESCRIPTION

The KLN 750W power supply is a voltage and current stabilized d-c source with a sharp cross-over between the constant voltage and constant current mode of operation. Eleven models are offered, with rated d-c output voltage ranging from 6V to 600V and rated d-c output current ranging from 1.25A to 100A (see Table 1-1).

KLN 750W switching power supplies operate from wide range 100-240V a-c, 50/60 Hz input source power and employ active power factor correction (PFC). Since there are no internal adjustments, KLN 750W Power Supplies offer excellent output voltage/current stability and easy calibration.

Output voltage and current are displayed on independent LED displays. Control of the KLN 750W can be either local, via the front panel controls and displays, or remote, using 1) either analog signals (applied to the Programming Control Port), or 2) digital programming. Digital programming of standard models is via RS-485 communication bus. Optional IEEE 488.2 (GPIB) and LAN interfaces are also available.

KLN 750W output and readback are high resolution: 16 bits D/A to set output voltage and current, 24 bits A/D for readback of output voltage and current. These units feature a low temperature coefficient: Constant Voltage mode: 100ppm/°C, Constant Current mode: 300ppm/°C, and built-in remote sensing with a maximum compensation of 5V.

The KLN 750W series is suitable for ATE automatic test, burn- in test and other applications that require lots of testing power.

The KLN 750W power supply acts as a constant voltage source for comparatively large values of load resistance, and as a constant current source for comparatively small values of load resistance. The transition between these two modes of operation occurs automatically at a “critical” or “crossover” value of load resistance Rc = Es/Is, where Es is the voltage control setting and Is is the current control setting (see Figure 1-1).

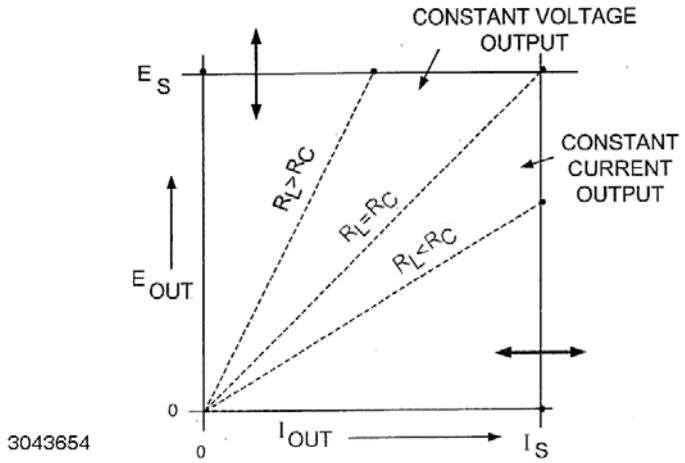


FIGURE 1-1. KLN 750W POWER SUPPLY, AUTOMATIC CROSSOVER CHARACTERISTICS

1.3 SPECIFICATIONS

Table 1-1 below indicates parameters that vary for different KLN 750W models; Table 1-2 lists general specifications that apply to all KLN 750W models.

TABLE 1-1. KLN 750 WATT MODEL PARAMETERS

Model (8)(9)(11)(12)	d-c Output Range		Ripple(3)		Line Regulation(5)		Load Regulation(10)		Response Time(7)			Remote Sense Voltage drop (max.)
	Constant Voltage (CV)(1)	Constant Current (CC)(2)	CV	CC(4)	CV	CC	CV(6)	CC(6)	Full Load Up	Full Load Down	No Load Down	
	V d-c	A d-c	mV rms	mA rms	0.05% mV	0.1% mV	0.05% mV	0.1% mV	Sec	Sec	Sec	V
KLN 6-100	0 to 6	0 to 100	10	180	2.8	11	2.8	23	0.08	0.05	0.6	1
KLN 8-90	0 to 8	0 to 90	10	180	2.8	11	2.8	23	0.08	0.05	0.6	1
KLN 20-38	0 to 20	0 to 38	10	76	4	5.8	4	12.6	0.08	0.05	0.8	1
KLN 30-25	0 to 30	0 to 25	10	63	5	4.5	5	10	0.08	0.08	0.9	1.5
KLN 40-19	0 to 40	0 to 19	10	48	6	3.9	6	8.8	0.08	0.08	1	2
KLN 60-12.5	0 to 60	0 to 12.5	10	38	8	3.25	8	7.5	0.08	0.08	1.1	3
KLN 80-9.5	0 to 80	0 to 9.5	10	29	10	2.95	10	6.9	0.15	0.15	1.2	4
KLN 100-7.5	0 to 100	0 to 7.5	10	23	12	2.75	12	6.5	0.15	0.15	1.5	5
KLN 150-5	0 to 150	0 to 5	16	18	17	2.5	17	6	0.15	0.15	2	5
KLN 300-2.5	0 to 300	0 to 2.5	25	13	32	2.25	32	5.5	0.15	0.15	3	5
KLN 600-1.25	0 to 600	0 to 1.25	75	8	62	2.13	62	5.26	0.25	0.3	4	5

NOTES:
1. Actual output voltage should be ≤0.1% of rated voltage when output voltage is set to zero.
2. Actual output current should be ≤0.1% of the rated current when output current is set to zero (resistive load).
3. Measured when output is within 10%-100% of rated value; ripple bandwidth: 300kHz (rms), noise bandwidth: <20MHz (p-p).
4. For 6V model: measured when output voltage 2-6V and rated current; all other models measured when output 10-100% of rated voltage and rated current.
5. Input voltage 100-240V a-c, 50/60Hz.
6. Constant input voltage and output from 10% of loading to full load.
7. With rated input, resistive load.
8. Rated power output with input 115V or 230V a-c
9. Specifications met after 30 minutes of operation, ambient temperature 23±5°C, humidity under 80% R. H, a-c input voltage ±5% of nominal, THD ≤2%, not using the remote compensation, not operating in series or parallel.
10. For example, the spec for KLN 6-100 line regulation and load regulation in CV mode is 0.05% + 2.8mV (or 6 x 0.0005 = ±3mV +2.8mV =5.8mV), so line and load regulation are within 0.2mV to 5.8mV for the 6V model.
11. Add G suffix for models with optional GPIB interface, add E suffix for optional LAN interface.
12. Specifications subject to change without notice.

TABLE 1-2. KLN 750W GENERAL SPECIFICATIONS

SPECIFICATION		RATING/DESCRIPTION
INPUT CHARACTERISTICS		
Input voltage		100~240Vac, 50/60Hz 127~373V d-c (1)
Input current (Full load)		115Vac - 8.1A; 230V a-c - 4.1A
Inrush current		230Vac - 12.5A
Power Factor (PF)		0.99 (at 115V a-c, rated output)
OUTPUT CHARACTERISTICS		
Type of Stabilizer		Constant Voltage (CV)/Constant Current (CC), automatic crossover
Adjustment Range	Voltage: Current:	0 to 100% of rated voltage 0 to 100% of rated current
Protective functions		Programmable overvoltage (OVP), Programmable overcurrent (OCP), Overtemperature (OTP), Fuse blown
Protection setting range	Overvoltage: Overcurrent:	0% to 110% of rated voltage 10% to 110% of rated current
Remote Error Sense Compensation		5V max. (See Table 1-1.)
Parallel Operation		Up to 5 units maximum, automatic load sharing
Series Operation		2 units maximum (total voltage must not exceed 600V)
Temperature. Coefficient	Constant Voltage Mode, Constant Current Mode:	100ppm/°C of rated output voltage or current, after 30 minute warm-up
Temperature. Drift	Constant Voltage Mode, Constant Current Mode:	0.05% of rated output voltage or current over 8hrs interval following 30 minutes warm-up. Constant line, load and temperature.
Transient response time	Constant Voltage mode:	20V and under: ≤1.5ms; 30V~100V: ≤1ms 150V~600V: ≤2ms
Efficiency		76% – 87%
Power Factor (PF)		0.99 (at 155/230 V a-c, rated output)
Isolation Voltage	Input - Outputs: Input - Ground: Output - Ground (6V-150V) Output - Ground (300V-600V)	2000V a-c: 1 minute 2000V a-c: 1 minute 500V d-c, leakage current: 100μA 1200V d-c, leakage current: 100μA
PROGRAMMING CHARACTERISTICS - LOCAL		
Display resolution	Voltage and Current:	4 digits (setting and display)
Display setting accuracy	Voltage: Current:	±0.1% ± 3C(2) at rated voltage ±0.5% ± 3C(2) at rated current
Display reading accuracy	Voltage: Current:	±0.2% ± 3C(2) at rated voltage ±0.5% ± 3C(2) at rated current

(1) Connect (+) to L and (–) to N. Safety agency approvals apply to a-c input operation only.
(2) C = 1 count of the last displayed digit.

TABLE 1-2. KLN 750W GENERAL SPECIFICATIONS (CONTINUED)

SPECIFICATION		RATING/DESCRIPTION
PROGRAMMING CHARACTERISTICS - DIGITAL		
Command setting resolution		±0.002% of full scale
Command reading resolution		±0.002% of full scale
Command and D/A setting accuracy	Voltage: Current:	±0.1% ± 3C(1) at rated voltage ±0.5% ± 3C(1) at rated current
Command and A/D Measurement accuracy	Voltage: Current:	±0.2% ± 2C(1) at rated voltage (Average Measurement) ±0.5% ± 3C(1) at rated current (Average Measurement)
Command response time		≤20ms (After received)(2)
RS-485 Digital Interface (standard)	Max baud rate:	115,200
	Max number of units connected to bus:	254
	Max. effective control distance:	1000 meters.
GPIB Digital Interface		Optional
LAN Digital Interface		Optional
PROGRAMMING CHARACTERISTICS - ANALOG		
Analog setting accuracy		
Constant Voltage mode (CV):	Voltage: Current:	± 5% ± 5%
Constant Current mode (CC):	Voltage: Current:	± 5% ± 5%
Analog monitor accuracy	Rated voltage output:	10.00V ± 0.25V
	Zero voltage output:	0.00V ± 0.25V
	Rated current output:	10.00V ± 0.25V
	Zero current output:	0.00V ± 0.25V
PHYSICAL CHARACTERISTICS		
Weight		Less than 11.2 lbs (5.1 Kg)
Dimensions	W x H x D:	8.46" x 1.73" x 18.5" (215mm x 44mm x 470mm)
Source Power Connector		IEC 320 inlet
Load Connections	6V to 100V models: 150V to 600V models:	± bus bars with protective cover 5-position Euroblock
Programming Control port		26-pin connector
SER IN port		2-position Euroblock (mating connector supplied)
Sense port		3-position Euroblock (mating connector supplied)
RS-485 port		3-position Euroblock (mating connector supplied)
LAN port (optional)		RJ 45 connector
GPIB port (optional)		Standard IEEE 488.2 GPIB connector

(1) C = 1 count of the last displayed digit.
(2) Programming time = Command response time + Output response time. The output response time differs for different models, from 30mS ~ 200mS

TABLE 1-2. KLN 750W GENERAL SPECIFICATIONS (CONTINUED)

SPECIFICATION		RATING/DESCRIPTION
GENERAL (ENVIRONMENTAL) SPECIFICATIONS		
Temperature	Operating: Storage:	0 to 50°C (indoor use) -20 to 70°C
Humidity	Operating: Storage:	30%~90% RH (no condensation) 10%~90% RH (no condensation)
Altitude		3000m max
Cooling		Speed-Controlled Fan
Noise		<70 dB (A)
EMC Standard		EN 61326-1:2006
EMC Emissions (EN 61326-1)	Conducted Disturbance:	EN 55011:2007 +A2:2007 Class B
	Radiated Disturbance:	EN 55011:2007 +A2:2007 Class B
	Harmonic Distortion:	EN 61000-3-2:2006 Class A
	Voltage Fluctuations and Flicker:	EN 61000-3-3:2008 Section 5
EMC Immunity (EN 61326-1)	Electrostatic Discharge (ESD):	EN 61000-4-2:2009 Class B
	Radiated RF Magnetic Field:	EN 61000-4-3:2006 + A1:2008 + A2:2010 Class A
	Electrical Fast Transients and Bursts:	EN 61000-4-4:2004 + A1:2010 Class B
	Surge:	EN 61000-4-5:2006 Class B
	Conducted Disturbance Induced by RF Fields:	EN 61000-4-6:2009, Class A
	Voltage Dips and Short Interruptions:	EN 61000-4-11:2004, Class C

NOTE:
All specifications apply after power on for 30 minutes, ambient temperature: 23±5°C, Humidity: under 80% RH, AC Voltage: ±5%, Frequency: ±5%.

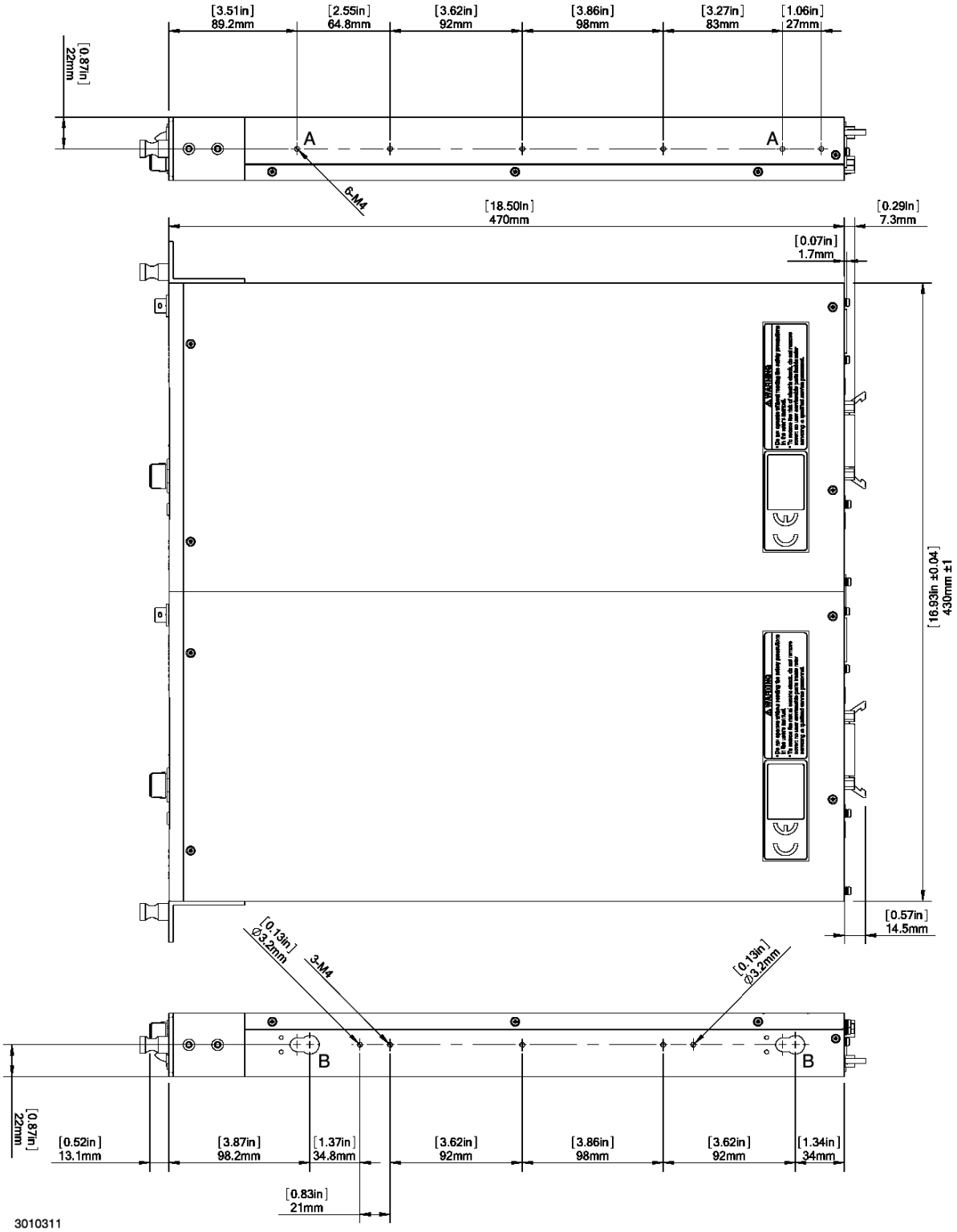


FIGURE 1-2. KLN 750W POWER SUPPLY, OUTLINE DRAWING (TWO UNITS MOUNTED IN RACK) (SHEET 1 OF 2)

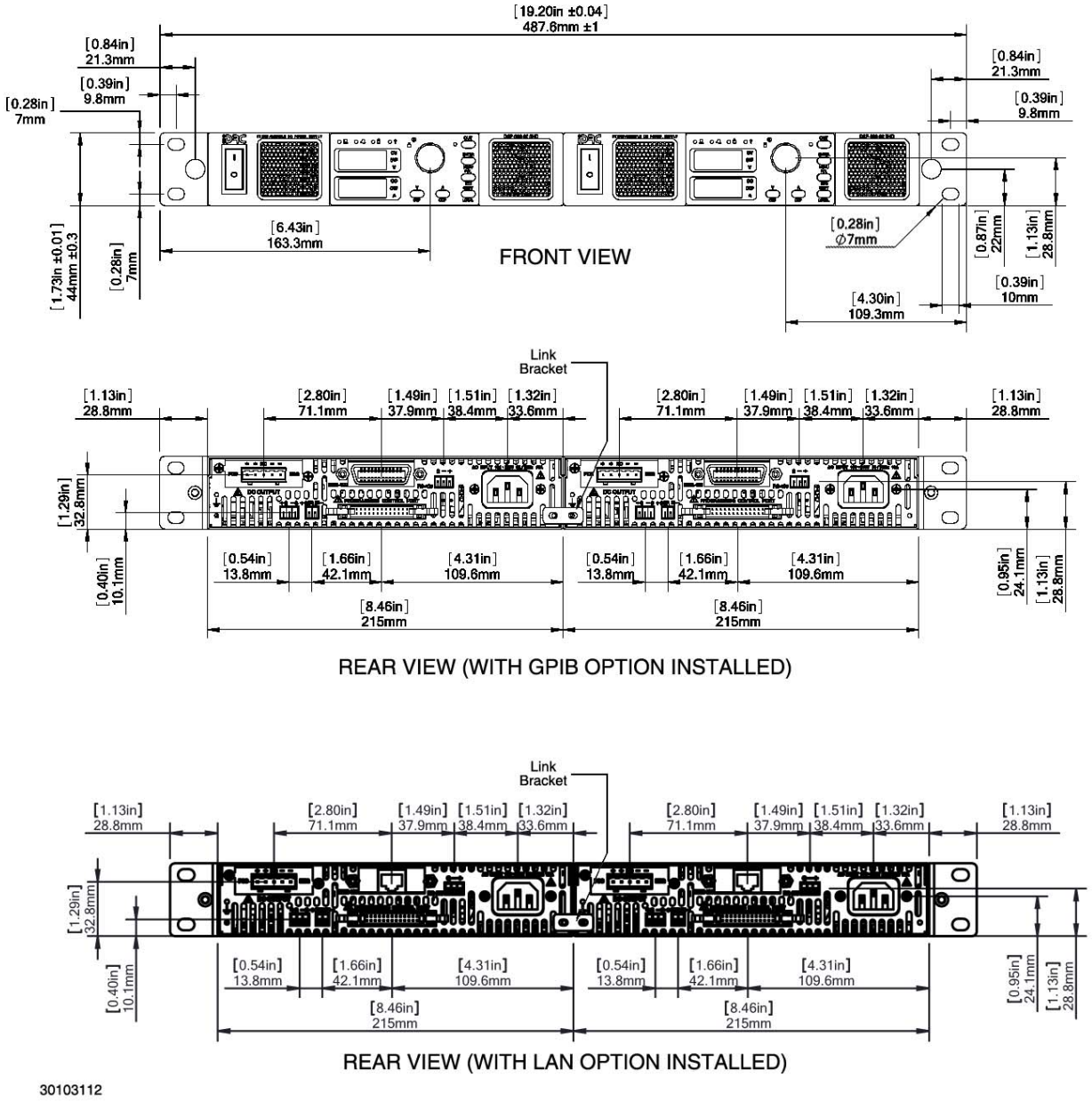


FIGURE 1-2. KLN 750W POWER SUPPLY, OUTLINE DRAWING (SHEET 2 OF 2)

1.4 LOCAL CONTROL

The front panel encoder can set and adjust output voltage and current under local control. The display uses two 4-digit LED displays to provide a digital readout of output voltage and current.

1.5 REMOTE CONTROL

The KLN 750W Power Supply can be remotely controlled directly via the built-in RS-485 interface using SCPI commands (see Appendix A and B). Most features available in local mode can also be accessed remotely via the RS-485 (standard), and GPIB (optional) or LAN (optional)

digital interfaces. The transmission rate of RS-485 can be up to 115.2K bps. The RS-485 interface can be used to connect multiple power supplies, up to a maximum of 254 units. The maximum effective control distance can be up to 1000m.

Digital remote control is also available via optional GPIB (suffix G) and LAN (suffix E) interfaces.

1.6 ANALOG CONTROL

External reference signals, provided through the Programming Control port (see Table 2-4), can be used to control the output voltage and current of the KLN 750W. The Programming Control port allows control of output on/off and permits emergency shutdown of the output. Output signals allow remote monitoring of whether the unit is powered on, output on/off, alarm condition, output voltage and current, and operating mode: Constant Current (CC) or Constant Voltage (CV). Refer to PAR. 3.5 for further details on using external signals to control and monitor the output.

1.7 FEATURES

1.7.1 DIGITAL CALIBRATION

The KLN 750W Power Supply features high stability and long intervals between calibration. The unit contains no user-required internal adjustments. Calibration is done by means of software (see Section 4).

1.7.2 PROTECTION

The following protection is provided: OVP (Overvoltage protection), OCP (overcurrent protection), OTP, (overtemperature protection) and blown fuse.

1.7.3 SAVING AND RECALLING SETTINGS

The KLN 750W offers 16 memory locations accessible from the front panel that can be used to store a set of operating parameters for later use. For each location, the user can store voltage and current values. The stored settings can then be recalled to quickly program the unit to the predetermined setting. Refer to PAR. 3.3.6 and 3.3.7 for further details.

1.7.4 PARALLEL AND SERIES CONFIGURATIONS

Identical KLN 750W units may be configured in series (up to two units including master) or parallel (up to five units including master) configurations. Parallel configurations provide for automatic current sharing (see PAR. 2.8 for details).

1.7.5 MISCELLANEOUS FEATURES

- Both positive and negative output ramps can be independently programmed (see PAR's. 3.3.10 and 3.3.11).
- Last setting is automatically restored upon power-up. Output can be programmed to be either on or off upon power-up (see PAR's. 3.3.9).
- One key recall of up to 16 memory locations storing voltage and current settings (see PAR's. 3.3.26 and 3.3.7).
- Variable speed fan reduces noise and extends fan life.
- Non-gap stacking; No ventilation holes at top or bottom.

1.8 EQUIPMENT SUPPLIED

Equipment supplied with the KLN 750W power supply is listed in Table 1-3.

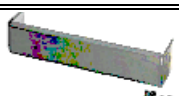
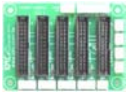
TABLE 1-3. EQUIPMENT SUPPLIED

ITEM	DESCRIPTION	KEPCO PART NUMBER
Power Cable, (125V/15A)	Connects unit to 115V a-c source power.	118-1136
Sense wires: Red, black	Used to connect output to local sensing connections: red: (+) to +S, black: (–) to –S	N/A
RS-485 Mating connector	Supplied installed on RS-485 port to allow access to RS 485 interface. 	542-0037
Programming Control Port Mating connector	Supplied installed on Programming Control port to allow access to pins for analog control and monitoring. 	143-0394
Sense Mating Connector	Supplied installed on Sense connector to provide access to sense connections used to compensate for voltage drop on load connections 	542-0035
SER IN mating connector	Supplied installed on SER IN connector to allow series connection of two units. 	542-0036
L-type Brackets (2) with mounting screws (4)	Used with optional rack mounting Kits RA 81-1 or RA 81-2 to install one or two units in 19-inch rack. 	N/A
Output Protective Cover	Supplied with 6V through 100V models only; used to cover output terminals	N/A

1.9 ACCESSORIES

Accessories (not supplied) for the KLN 750W Power Supply are listed in Table 1-4.

TABLE 1-4. ACCESSORIES

ITEM	FUNCTION	KEPCO PART NUMBER
Rack Mount Kit	Allows mounting of one half-rack KLN 750W unit in standard 19-inch rack (L-type brackets supplied with unit, not included in Kit). 	RA 81-1
Rack Mount Kit	Allows mounting of two half-rack KLN 750W units side-by-side in standard 19-inch rack (L-type brackets supplied with unit, not included in Kit). 	RA 81-2
Parallel Socket Board	Provides convenient connections for parallel operation of up to five units 	536-0129
Series Socket Board	Provides convenient connections for series operation of two units. 	536-0130
Programming Port Cable	Provides connections between two programming ports for parallel and series operation. 	518-0119

1.10 SAFETY

Service must be referred to authorized personnel. Using the power supply in a manner not specified by Kepco. Inc. may impair the protection provided by the power supply. Observe all safety precautions noted throughout this manual (see listing on Safety page A, preceding the Table of Contents). Table 1-5 lists symbols used on the power supply or in this manual where applicable.

TABLE 1-5. SAFETY SYMBOLS

SYMBOL	Meaning
	WARNING! RISK OF ELECTRIC SHOCK!
	CAUTION: REFER TO REFERENCED PROCEDURE.
	FRAME OR CHASIS TERMINAL
	GROUND TERMINAL
	PROTECTIVE GROUND CONDUCTOR TERMINAL
WARNING	INDICATES THE POSSIBILITY OF BODILY INJURY OR DEATH.
CAUTION	INDICATES THE POSSIBILITY OF EQUIPMENT DAMAGE.

SECTION 2 - INSTALLATION

2.1 UNPACKING AND INSPECTION

This instrument has been thoroughly inspected and tested prior to packing and is ready for operation. After careful unpacking, inspect for shipping damage before attempting to operate. Perform the preliminary operational check as outlined in PAR. 2.3. If any indication of damage is found, file an immediate claim with the responsible transport service.

2.2 TERMINATIONS AND CONTROLS

a) Front Panel: Refer to Figure 3-1 and Table 3-1.

b) Rear Panel: Refer to Figure 2-1 and Table 2-1.

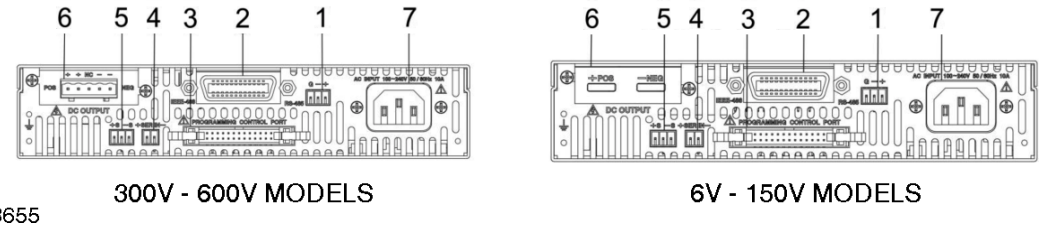


FIGURE 2-1. KLN 750W SERIES REAR PANEL

TABLE 2-1. REAR PANEL CONNECTOR FUNCTIONS

NUMBER (FIGURE 2-1)	CONNECTOR/TERMINAL	FUNCTION
1	RS-485 3-pin pluggable terminal block	Allows connection to RS-485 bus. See Table 2-2 for details.
2	Optional: either 24-pin GPIB connector (shown) or LAN ethernet connector (not shown)	Allows connection to GPIB bus or LAN (optional) when installed. See Table 2-3 for GPIB connector details.
3	Programming Control Port	Allows access to analog input/output signals that allow monitoring and control of the power supply by analog means. See Table 2-4 for pin assignments.
4	SER IN	Provides output voltage reference from master to slave to ensure voltage slave matches the master when two units connected in series.
5	+S, –S	Remote sensing voltage compensation.
6	DC Output	Allows connection to load.
7	AC input	Allows connection to mains supply using power cord supplied.

TABLE 2-2. RS-485 PORT INPUT/OUTPUT PIN ASSIGNMENTS

PIN (FIGURE 2-2)	SIGNAL NAME	FUNCTION
G	Ground	Reduce external interference
+	+RX	Connect to +TX of computer and/or +RX of next unit on RS-485 bus (see Figure 2-9).
–	–RX	Connect to –TX of computer and/or –RX of next unit on RS-485 bus (see Figure 2-9).
NOTE: Connect 120 Ohm termination resistor across + and – of last unit connected to RS-485 bus (furthest from computer) See PAR. 2.7.2.		

FIGURE 2-2. RS-485 PORT

TABLE 2-3. GPIB (IEEE 488) PORT INPUT/OUTPUT PIN ASSIGNMENTS

PIN	SIGNAL NAME	FUNCTION
1	DI01	I/O Line
2	DI02	I/O Line
3	DI03	I/O Line
4	DI04	I/O Line
5	EOI	End or Identify
6	DAV	Data Valid
7	NRFD	Not Ready for Data
8	NDAC	Not Data Accepted
9	IFC	Interface Clear
10	SRQ	Service Request
11	ATN	Attention
12	SHIELD	Shield
13	DI05	I/O Line
14	DI06	I/O Line
15	DI07	I/O Line
16	DI08	I/O Line
17	REN	Remote Enable
18	GND	Ground (signal common)
19	GND	Ground (signal common)
20	GND	Ground (signal common)
21	GND	Ground (signal common)
22	GND	Ground (signal common)
23	GND	Ground (signal common)
24	LOGIC GND	Logic Ground

TABLE 2-4. PROGRAMMING CONTROL PORT I/O PIN ASSIGNMENTS

PIN (FIGURE 2-3)	SIGNAL NAME	FUNCTION
1, 2	RECALL	External recall control (dry contact). Same function as RCL key on front panel.
3, 4, 5, 6	---	Not used
7	Power on/off status	Output signal. Active (low between pin 7 and pin 8) to indicate unit is turned on. (1)
8	Status common	Common for Status signal pins 7, 9, 10, 11 and 12 (1)
9	Alarm status	Output signal. Active (low between pin 9 and pin 8) to indicate whether alarm (OVP or OCP trips or shutdown signal applied to pin 23) has occurred. (open collector via optocoupler). (1)
10	On/off status	Output signal. Active (low between pin 10 and pin 8) to indicate output is on (open collector by optocoupler). (1) (See PAR. 3.3.25 to enable.)
11	CC status	Output signal. Active (low between pin 11 and pin 8) to indicate unit is in constant current mode (open collector by optocoupler). (1)
12	CV status	Output signal. Active (low between pin 12 and pin 8) to indicate unit is in constant voltage mode (open collector by optocoupler). (1)
13	EXT 5V input+	Input signal. Used to supply +5V for the relay providing remote output on/off function.
14	EXT V input common	Common for Pin 13 (remote output on/off function).
15	PRL IN+	Input signal. For units operating in parallel, used for signal input into MASTER of current sharing between MASTER and SLAVE(s) (see PAR. 2.8.2.1).
16	EXT CV	Input signal. External voltage to control output voltage of unit. 0 to 10V d-c corresponds to zero to full scale output voltage (see PAR. 3.3.26 to enable).
17	PRL OUT+	Output signal. For units operating in parallel, used for signal output of current sharing from SLAVE to MASTER (see PAR. 2.8.2.1).
18	EXT CC	Input signal. External voltage to control output current of unit. 0 to 10V d-c corresponds to zero to full scale output current (see PAR. 3.3.27 to enable).
19	PRL IN–/OUT–	V common for pins 15 and 17.
20	V Monitor	Output signal. Zero to 10V d-c corresponds to zero to full scale voltage,
21	ON/OFF Control	Input Signal. Used to power unit on (short) or off (open). Dry contact.
22	A Monitor	Output signal. Zero to 10V d-c corresponds to zero to full scale current.
23	Shutdown	Short between pin 23 and analog ground (pins 24 or 26) causes emergency shutdown of unit.
24, 26	Analog Common	Analog signal control ground, connected to pin 19.
25	Digital Common	Digital signal control ground.
(1) Open collector output: maximum voltage 30V, maximum current 8mA; Low: <0.4V.		

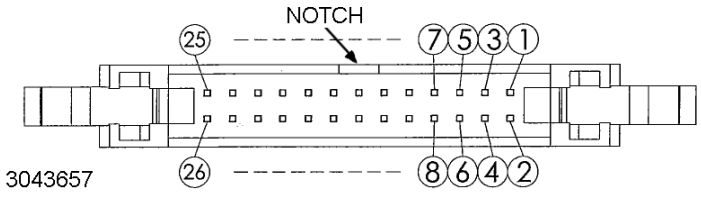


FIGURE 2-3. PROGRAMMING CONTROL PORT

2.3 PRELIMINARY OPERATIONAL CHECK

A simple operational check after unpacking and before equipment installation is advisable to ascertain whether the power supply has suffered damage resulting from shipping.

Refer to Figures 2-1 and 3-1 for location of operating controls and electrical connections. Tables 3-1 and 3-2 explain the functions of operating controls/indicators and keypad keys, respectively. Refer to PAR. 3.2 for a description of basic operating techniques.

1. With power supply disconnected from source power verify that sense connections are correct: +S is connected to +POS and –S is connected to –NEG (see PAR. 2-6).

2. With front panel power circuit breaker to OFF position, connect the power supply to source power (see PAR. 2.5.2).

3. With no load connected, set power circuit breaker to ON. Each time the unit is turned on it beeps and an internal self-test is performed (see PAR 3.2.1). After the test has been successfully completed, the 4-digit Voltage Display and Current Display show the last programmed voltage and current values, respectively, in Volts and Amperes.

4. Press **SHIFT**/LOCAL key. Verify blue ⬆ LED goes on. Press V/**OVP** key: Least significant digit of Voltage Display and integral red OVP LED at the right of the display blink. Verify blue ⬆ LED goes off.

5. Rotate encoder to change the digits for adjustment. Turn clockwise to increase the value, counterclockwise to decrease the value. Tap encoder to move to the next digit. Continue until the maximum OVP value is displayed (e.g., 33.00 for 30V model).

6. Press ENTER key to accept programmed OVP value.

7. Press **SHIFT**/LOCAL key. Verify blue ⬆ LED goes on. Press A/**OCP**. Least significant digit of Current Display and integral red OCP LED at the right of the display blink. Verify blue ⬆ LED goes off.

8. Rotate encoder to change the digits for adjustment. Turn clockwise to increase the value, counterclockwise to decrease the value. Tap encoder to move to the next digit. Continue until the maximum OCP value is displayed (e.g., 26.25 for 25 Ampere model).

9. Press ENTER key to accept programmed OCP value.

10. Press **V**/OVP key. Least significant digit of Voltage Display blinks.

11. Rotate encoder to change the digits for adjustment. Turn clockwise to increase the value, counterclockwise to decrease the value. Tap encoder to move to the next digit. Continue until the rated output voltage value (e.g., 30.00 for 30V model) is displayed.

12. Press ENTER key to accept programmed voltage value.

13. Press **A**/OCP key. Least significant digit of Current Display blinks.

14. Rotate encoder to change the digits for adjustment. Turn clockwise to increase the value, counterclockwise to decrease the value. Tap encoder to move to the next digit. Continue until a value of several Amperes of output current is displayed.

15. Connect a digital voltmeter (DVM) to the (+S) and (-S) terminals on the rear panel. Verify that DVM shows there is no output voltage from the power supply.

16. Press red OUT key. Verify that red LED at left of OUT key goes on.

17. Compare the programmed output voltage value (e.g., 30.00V for 30V model per step 11) with the voltage reading of the DVM; Verify that the difference between the two does not exceed ±0.1% ± 3C(*).

18. Compare the voltage reading of Voltage Display with that of the DVM; Verify that the difference between the two does not exceed ±0.2% ± 3C(*).

19. Disable the output by pressing the OUT key; verify front panel Voltage and Current displays show programmed values of Voltage and Current, respectively and DVM reads 0V.

20. Set power switch to OFF. The unit issues a long beep as it powers down. Disconnect unit from source power, then disconnect test equipment.

(*) C = 1 count of the last displayed digit.

2.4 INSTALLATION

2.4.1 RACK MOUNTING

One or two (side by side) KLN 750W units can be mounted in a standard 19-inch rack. The units are 1U high and do not require any gaps between equipment above and below. Airflow is front to back only. Use the RA 81-1 Mounting Kit (see Table 1-4) to mount a single unit. Use Mounting Kit RA 81-2 (optional, see Table 1-4) to mount two half-rack units side by side in a 19-inch rack.

2.4.1.1 MOUNTING ONE 1/2-RACK UNIT IN 19-INCH RACK

1. On one side of the unit, mount one L-type bracket with knob (supplied with unit) to the unit using two screws supplied with unit.

2. Mount the U-type bracket supplied in the Kit to the other side of the unit using two screws supplied in Kit.

3. Mount the other L-type bracket with knob (supplied with unit) to the end of the U-type bracket using two screws supplied with unit. The knobs can now be used to support the assembled unit while installing in a 19-inch rack.

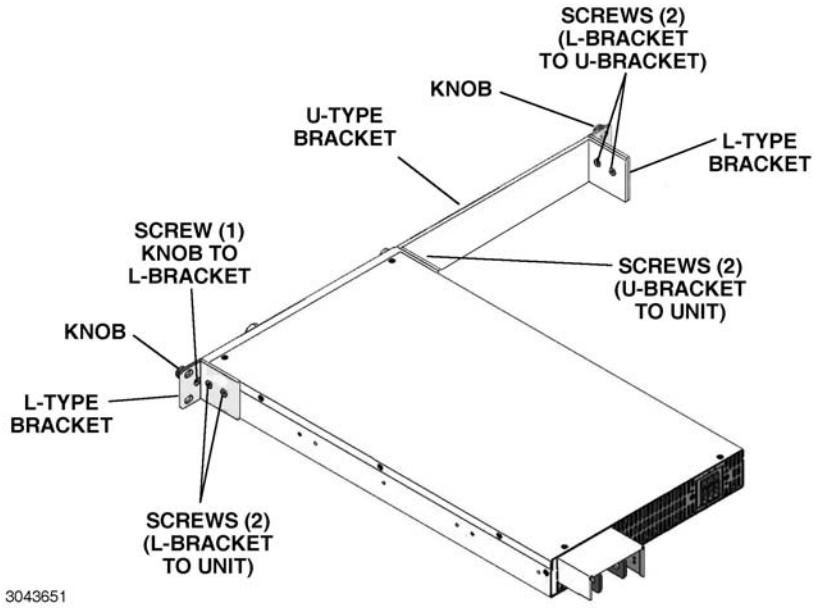


FIGURE 2-4. MOUNTING ONE KLN 750W UNIT IN 19-INCH RACK

2.4.1.2 MOUNTING TWO 1/2-RACK UNITS IN 19-INCH RACK

To mount two KLN 750W units side-by-side in a 19 inch rack, use the RA 81-2 mounting kit (not supplied, see Accessories, Table 1-4).

1. Place the two units side by side as they would be installed in the rack. On the outer side of each unit (not facing the other unit), mount one L-type bracket with knob (supplied with unit) to each unit using two screws supplied with unit for each (see Figure 1-2).

2. Separate the two units. Install two shoulder screws, flat washers and lockwashers (supplied with Kit) at two locations on one unit (two threaded holes, A, Figure 1-2).

3. Move the two units together and insert the shoulder screws into the keyhole-shaped opening in the other unit (two holes, B, Figure 1-2). Then slide the unit with the shoulder screws forward until the front panels of both units are flush.

4. Connect the two units at the rear using linking bracket (see Figure 1-2, sheet 2) and two screws supplied with Kit. The two units can now be handled as an assembly and can be installed directly into a 19-inch rack.

2.5 WIRING INSTRUCTIONS

Interconnections between an a-c power source and a power supply, and between the power supply and its load are as critical as the interface between other types of electronic equipment. If optimum performance is expected, certain rules for the interconnection of source, power supply and load must be observed by the user. These rules are described in detail in the following paragraphs.

CAUTION: WHEN WORKING WITH ACTIVE LOADS, THE VOLTAGE OR CURRENT OF THE ACTIVE LOAD MUST NOT EXCEED THE MAXIMUM VOLTAGE OR CURRENT RATING OF THE KLN 750W. OTHERWISE THE OVERVOLTAGE OR OVERCURRENT PROTECTION WILL SHUT DOWN THE POWER SUPPLY.

2.5.1 SAFETY GROUNDING

To minimize shock hazard, the product chassis must be connected to an electrical ground. The product must be connected to the AC power supply mains through a three-conductor power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet.

Local, national and international safety rules dictate the grounding of the metal cover and case of any instrument connected to the a-c power source, when such grounding is an intrinsic part of the safety aspect of the instrument. The ground terminal of the source power connector (Figure 2-1) is connected to the chassis and the instructions below suggest wiring methods which comply with these safety requirements. In the event that the specific installation for the power system is different from the recommended wiring, it is the customer's responsibility to ensure that all applicable electric codes for safety grounding requirements are met. As a precaution, always connect the screw marked ⏚ at the rear panel to proper earth ground.

2.5.2 SOURCE POWER CONNECTIONS

Source power is connected to the power supply via three-wire input power using the source power cable supplied (see Table 1-3). See Table 1-2 for source power specifications. This power supply operates from single phase a-c mains power (or between two phases of 3-phase a-c mains power) over the specified voltage and frequency ranges (Table 1-2) without any need for range selection.

CAUTION: DO NOT USE AC SUPPLY WHICH EXCEEDS THE INPUT VOLTAGE AND FREQUENCY RATING OF THIS INSTRUMENT. THE INPUT VOLTAGE AND FREQUENCY RATING OF THE POWER SUPPLY ARE SHOWN IN TABLE 1-2. FOR SAFETY REASONS, THE MAINS SUPPLY VOLTAGE FLUCTUATIONS MUST NOT EXCEED ±10% OF NOMINAL VOLTAGE.

2.5.3 D-C OUTPUT GROUNDING

Connections between the power supply and the load and sensing connections may, despite all precautions such as shielding, twisting of wire pairs, etc., be influenced by radiated noise, or “noise pick-up”. To minimize the effects of this radiated noise the user should consider grounding one side of the power supply/load circuit. The success of d-c grounding requires careful analysis of each specific application, however, this recommendation can only serve as a general guideline.

One of the most important considerations in establishing a successful grounding scheme is to avoid GROUND LOOPS. Ground loops are created when two or more points are grounded at different physical locations along the output circuit. Due to the interconnection impedance between the separated grounding points, a difference voltage and resultant current flow is superimposed on the load. The effect of this ground loop can be anything from an undesirable increase in output noise to disruption of power supply and/or load operation. The only way to avoid ground loops is to ensure that the entire output/load circuit is fully isolated from ground, and only then establish a single point along the output/load circuit as the single-wire ground point.

The exact location of the “best” d-c ground point is entirely dependent upon the specific application, and its selection requires a combination of analysis, good judgement and some amount of empirical testing. If there is a choice in selecting either the OUTPUT or COMMON output terminals of the power supply for the d-c ground point, both sides should be tried, and preference given to the ground point producing the least noise. For single, isolated loads the d-c ground point is often best located directly at one of the output terminals of the power supply; when remote error sensing is employed, d-c ground may be established at the point of sense lead attachment. In the specific case of an internally-grounded load, the d-c ground point is automatically established at the load.

The (+) and (–) terminals of KLN 750W power supplies are d-c isolated (“floating”) from the chassis in order to permit the user maximum flexibility in selecting the best single point ground location. Care must be taken in measuring the ripple and noise at the power supply: measuring devices which are a-c line operated can often introduce additional ripple and noise into the circuit.

There is, unfortunately, no “best” method for interconnecting the load and power supply. Individual applications, location and nature of the load require careful analysis in each case. Grounding a single point in the output circuit can be of great importance. It is hoped that the preceding paragraphs will be of some assistance in most cases. For help in special applications or difficult problems, consult directly with Kepco's Application Engineering Department.

2.5.4 POWER SUPPLY/LOAD INTERFACE

The general function of a voltage- or current-stabilized power supply is to deliver the rated output quantities to the connected load. The load may have any conceivable characteristic: it may be fixed or variable, it may have predominantly resistive, capacitive or inductive parameters; it may be located very close to the power supply output terminals or it may be a considerable distance away. The perfect interface between a power supply and its load would mean that the specified performance at the output terminals would be transferred without impairment to any load, regardless of electrical characteristics or proximity to each other.

The stabilized d-c power supply is definitely not an ideal voltage or current source, and practical interfaces definitely fall short of the ideal. All voltage-stabilized power supplies have a finite source impedance which increases with frequency, and all current-stabilized power supplies have a finite shunt impedance which decreases with frequency. The method of interface between the power supply output and the load must, therefore, take into account not only the size with regard to minimum voltage drop, but the configuration with regard to minimizing the impedance introduced by practical interconnection techniques (wire, bus bars, etc.). The series inductance of the load wire must be as small as possible as compared to the source inductance of the power supply: although the error sensing connection to the load compensates for the d-c voltage drop in the power leads, it cannot compensate for the undesirable output effects of the power lead inductance. These lead impedances (both power and sensing leads) are especially important if the load: is constantly modulated or step-programmed; has primarily reactive characteristics; or where the dynamic output response of the power supply is critical to load performance.

2.5.5 LOAD CONNECTION - GENERAL

Power connections to the load are achieved via the +POS and –NEG DC OUTPUT terminals located on the rear panel. Terminal connections for low voltage models (6V to 150V) are shown in Figure 2-5. The 300V and 600V models employ Euroblock-style terminal blocks that accept bare wire ends.

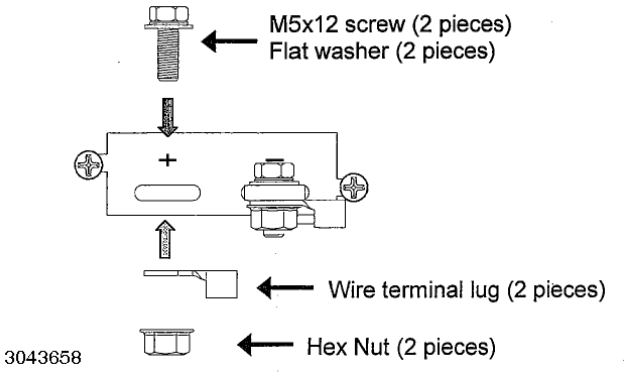


FIGURE 2-5. LOAD CONNECTION TERMINALS FOR 6V - 150V MODELS

Kepco strongly recommends the use of stranded (not solid) wire with (+) and (–) wires tightly twisted to reduce self-inductance; wire end ferrules are suggested to prevent fraying of the strands.

NOTE REGARDLESS OF OUTPUT CONFIGURATION, EITHER LOCAL OR REMOTE OUTPUT SENSE LINES SHOULD BE CONNECTED FOR OPTIMUM OPERATION.

- OBSERVE POLARITIES: The +S sensing wire must be connected to the (+) load wire, and the –S sensing wire must be connected to the (–) load wire.
- IF LOCAL SENSING IS USED: Install red and black sense leads supplied (see Figure 2-6).

2.5.6 LOAD CONNECTION USING LOCAL SENSING

Figure 2-6 shows a typical configuration using local sensing. Local sensing is recommended for a high noise or switching mode load such as d-c to d-c or d-c to a-c.

CAUTION: CONNECT +S ONLY TO + AND –S ONLY TO –. CONNECTING +S TO –S, +V TO –S, OR –V TO +S WILL DAMAGE THE UNIT.

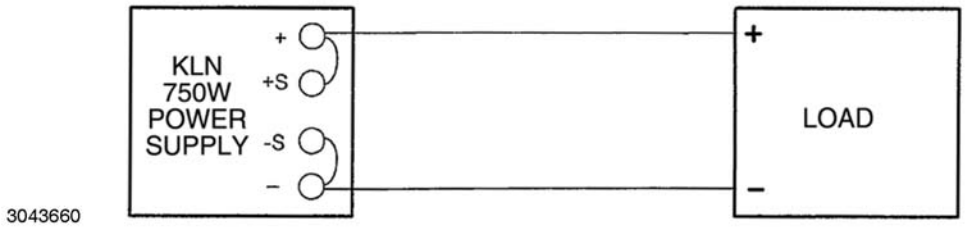


FIGURE 2-6. LOAD CONNECTIONS, LOCAL SENSING

Use the following formula and Figure 2-7 to calculate the voltage drop based on expected current and wire resistance. Refer to Table 2-5 for wire resistance for standard AWG sizes, as well as maximum recommended length of load wires for a voltage drop of less than 1V with expected load current of 5, 10, 20, 50 or 150 Amperes.

$V_{DROP} = (I \times r1) + (I \times r2)$

where r1 and r2 is the load wire resistance
I is output current

Voltage across Load RL = Voltage (displayed on front panel display) – V_{DROP}

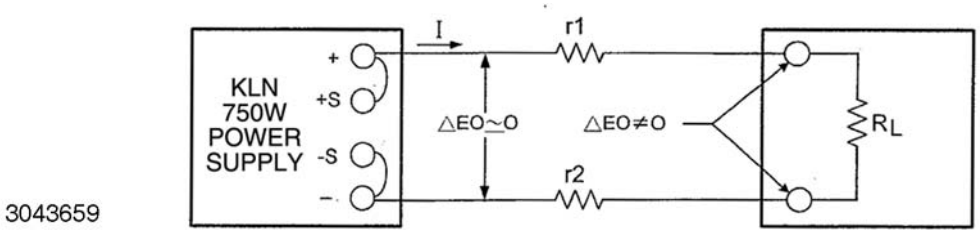


FIGURE 2-7. LOAD WIRE VOLTAGE DROP, EQUIVALENT SCHEMATIC DIAGRAM

TABLE 2-5. MAXIMUM LOAD WIRE LENGTH FOR VOLTAGE DROP LESS THAN 1V

AWG SIZE	Wire Diameter mm^2	Resistance* (Ohm/100m)	Maximum Load Wire Length for Voltage drop less than 1V				
			Load Current 5A	Load Current 10A	Load Current 20A	Load Current 50A	Load Current 150A
14	2	0.8	24.4m	12.2m	6.1m	2.4m	0.6m
12	3.5	0.5	36.6m	18.3m	9.1m	3.7m	1.0m
10	5.5	0.3	61.0m	30.5m	15.2m	6.1m	1.8m
8	8	0.2	97.5m	48.8m	24.4m	9.8m	3.0m
6	14	0.1	152.4m	61m	38.1m	15.2m	4.9m
4	22	0.1	243.8m	121.9m	61.0m	24.4m	7.9m
2	38	0.1	365.7m	182.9m	91.4m	38.1m	12.2m
0	60	0.0	696m	304.8m	152.4m	61.0m	20.7m

* Values shown are rounded up.

2.5.7 LOAD CONNECTION USING REMOTE SENSING

Figure 2-8 shows a typical configuration using remote sensing. Use #22 AWG wire, twisted pair for remote sense connections. Table 2-5 shows typical load wire length, AWG wire size and load current required for a voltage drop of less than 1V. Table 1-1 lists the maximum voltage drop compensation for each model that will allow voltage measured at the load to be the same as the voltage shown on the front panel display.

CAUTION: CONNECT +S ONLY TO + AND –S ONLY TO –. CONNECTING +S TO –S, +V TO –S, OR –V TO +S WILL DAMAGE THE UNIT.

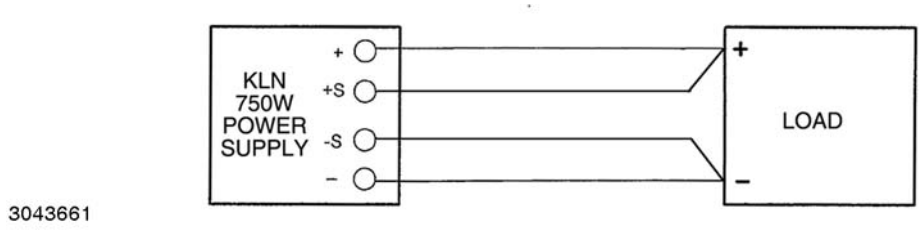


FIGURE 2-8. LOAD CONNECTIONS, REMOTE SENSING

2.6 COOLING

The power devices used within the power supply are maintained within their operating temperature range by means of internal heat sink assemblies and a variable speed fan with air flow from front to back. There are no intake or exhaust ports at the top or bottom, permitting stacked rack mounting with no air gaps between stacked units. If the power supply is located within a confined space, take care that the ambient temperature, which is the temperature of the air immediately surrounding the power supply, does not rise above the specified limits (see Table 1-2).

2.7 SETTING UP THE UNIT

The following paragraphs describe the connections and initial KLN 750W setup needed to operate in the desired mode.

2.7.1 SETUP FOR LOCAL OPERATION

After connecting the unit using either local (PAR. 2.5.7) or remote sensing (PAR. 2.5.7), the unit will power up in Local mode with no further setup required.

2.7.2 SETUP FOR REMOTE OPERATION VIA RS-485

CAUTION: DO NOT CONNECT THE POSITIVE OUTPUT TO GROUND WHEN RS-485 IS USED. THERE IS A POTENTIAL SHOCK HAZARD AT THE RS-485 PORT WHEN POWER SUPPLIES ARE USED WITH RATED OR COMBINED VOLTAGE GREATER THAN 400V AND THE POSITIVE OUTPUT OF THE POWER SUPPLY IS GROUNDED.

Connect the KLN 750W to the controlling computer or to the previous unit in the RS-485 daisy chain per Figure 2-9. It is recommended that double shielded wire be used to ensure the quality of remote communication. The last unit on the RS-485 bus requires a 120-Ohm terminating resistor as shown in Figure 2-9.

With all power off, connect the load to the KLN 750W using either local or remote sensing (refer to PAR. 2.5). If units are to be connected in series or parallel, refer to PAR. 2.8.

Turn power on and refer to PAR. 3.2 for power supply basics. See PAR. 3.3.16 to establish RS-485 baud rate and PAR. 3.3.18 to establish the RS-485 Address.

SCPI programming is described in PAR. 3.7; Appendices A and B provide syntax for SCPI common and subsystem commands and queries implemented in this unit. For RS-485 communica-

tion the RS-485 address (Axxx) must precede every command (e.g., to set the brightness to 3 and output voltage to 30 of a unit with RS-485 address 001, send
A001DISP:CONT 3;A001VOLT 30)

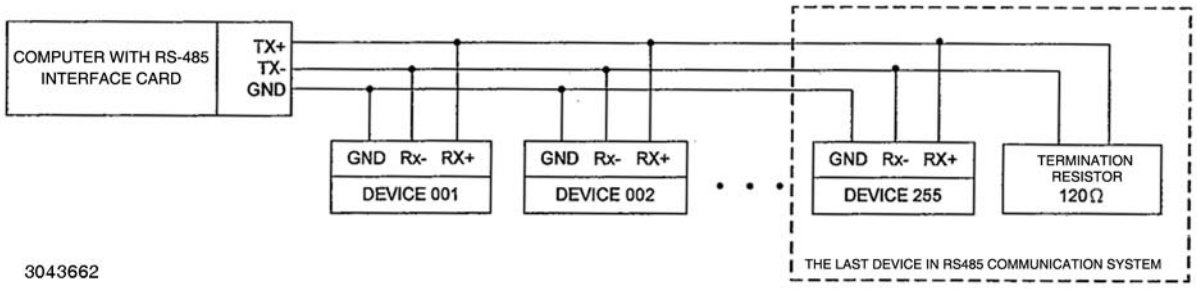


FIGURE 2-9. RS-485 CONNECTIONS

2.7.3 SETUP FOR REMOTE OPERATION VIA GPIB

CAUTION: DO NOT CONNECT THE POSITIVE OUTPUT TO GROUND WHEN IEEE 488 IS USED. THERE IS A POTENTIAL SHOCK HAZARD AT THE IEEE 488 (GPIB) PORT WHEN POWER SUPPLIES ARE USED WITH RATED OR COMBINED VOLTAGE GREATER THAN 400V AND THE POSITIVE OUTPUT OF THE POWER SUPPLY IS GROUNDED.

Operation via GPIB is possible if the optional GPIB interface is installed. With all power off, connect the load to the KLN 750W using either local or remote sensing. If units are to be connected in series or parallel, refer to PAR. 2.8. Connect the GPIB connector to the GPIB port (see Figure 2-1 and Table 2-1). Turn power on and refer to PAR. 3.2 for power supply basics and PAR. 3.6 for remote mode programming.

The default GPIB address is 07; to change it refer to PAR 3.3.17. The unit automatically enters remote mode when a command is accepted.

SCPI programming is described in PAR. 3.7; Appendices A and B provide syntax for SCPI common and subsystem commands and queries implemented in this unit. All the features described for Local Mode operation can be accomplished using remote SCPI commands.

2.7.4 SETUP FOR REMOTE OPERATION VIA LAN

Operation via LAN is possible if the optional LAN interface is installed.

Connect a computer to the LAN connector at the rear panel using a standard RJ 45 Ethernet cable (not supplied). The LAN interface uses LAN Port 8003 for Telnet connections.

See PAR. 3.6.3 to operate the unit via the LAN interface.

2.8 MULTIPLE UNIT CONFIGURATIONS

Parallel and series configurations of identical KLN 750W units increase the rated current and voltage range of the power supply. Up to five units (including the master) can be connected in

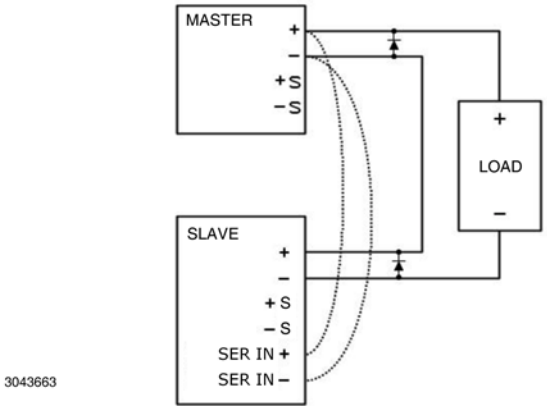
parallel to increase the current: $I_{MAX\ (one\ unit)} \times N_P = I_{MAX\ (parallel\ combination)}$ where N_P = number of units in parallel. Similarly, up to two units (including the master) can be connected in series to increase the voltage: $E_{MAX\ (one\ unit)} \times N_2 = E_{MAX\ (Series\ combination)}$ where N_2 = number of units in series.

2.8.1 SERIES CONNECTIONS

Two identical KLN 750W units can be operated in series to double the output voltage.

CAUTION: TOTAL VOLTAGE MUST NOT EXCEED 600V TO AVOID DAMAGING THE UNITS.

See Figure 2-10 for series connections without local sensing and Figure 2-11 for series connections with remote sensing. See PAR. 3.4.1 for operating units connected in series.



NOTE:
Adding local sensing wires from + to +S and from – to –S on both the Master and Slave will make the front panel voltage reading slightly more accurate (~10mV).

FIGURE 2-10. SERIES CONNECTIONS WITHOUT REMOTE SENSING

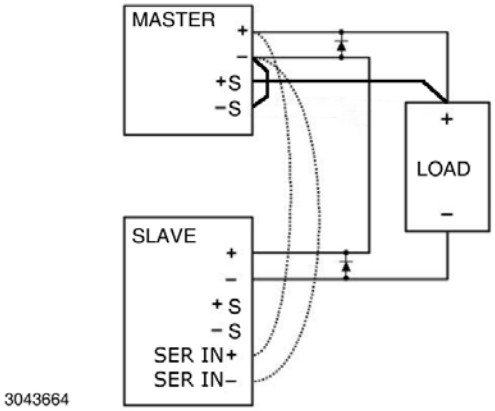


FIGURE 2-11. SERIES CONNECTIONS WITH REMOTE SENSING

2.8.1.1 SERIES CONNECTIONS USING OPTIONAL SERIES CONNECTION KIT

Connections for two identical KLN 750W units operated in series to double the output voltage can be simplified by using the optional Series ConnectIon Kit (see Table 1-4).

CAUTION: TOTAL VOLTAGE MUST NOT EXCEED 600V TO AVOID DAMAGING THE UNITS.

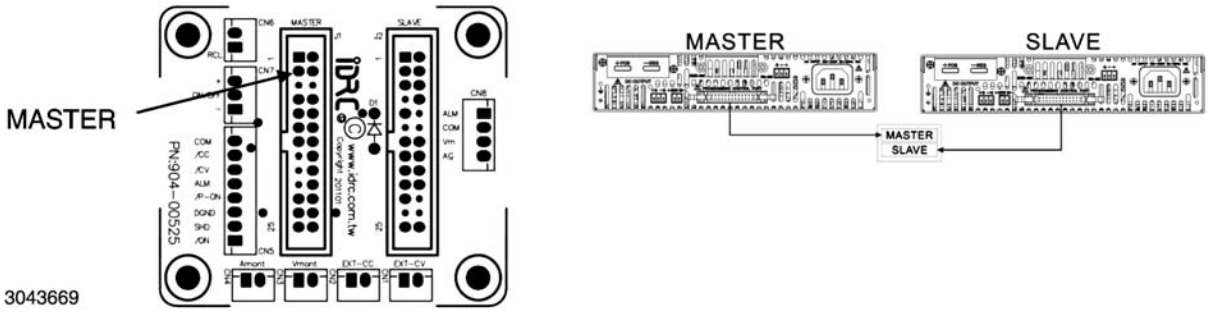


FIGURE 2-12. OPTIONAL SERIES CONNECTION KIT

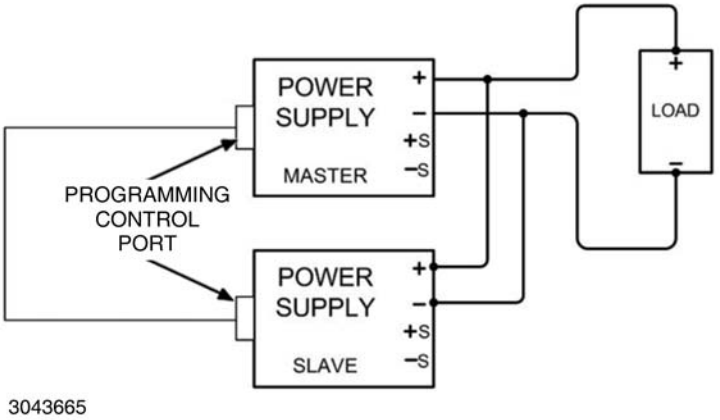
2.8.2 PARALLEL CONNECTIONS

Up to five identical KLN 750W units (one master and up to four slaves) can be operated in parallel to increase the output current. Output current of the parallel combination = number of units in parallel x output current of a single unit.

1. See Figure 2-13 for parallel connections without remote sensing and Figure 2-14 for parallel connections with remote sensing. See PAR. 2.5.5 for guideline regarding load connections. See PAR. 3.4.3 for operating units connected in parallel.

CAUTION: OBSERVE CORRECT POLARITY FOR ALL CONNECTIONS.

2. See Figure 2-15 for Programming Control Port Connections for parallel operation.



NOTE:
Adding local sensing wires from + to +S and from – to –S on both the Master and Slave will make the front panel voltage reading slightly more accurate (~10mV).

FIGURE 2-13. PARALLEL CONNECTIONS WITHOUT REMOTE SENSING

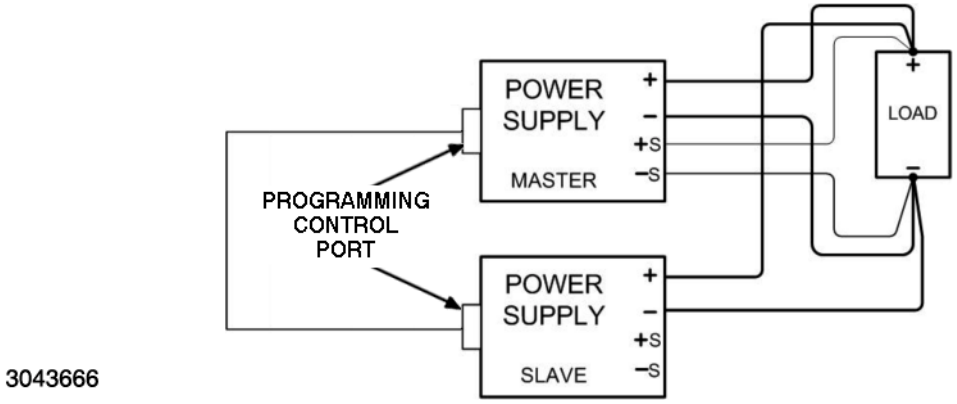


FIGURE 2-14. PARALLEL CONNECTIONS WITH REMOTE SENSING

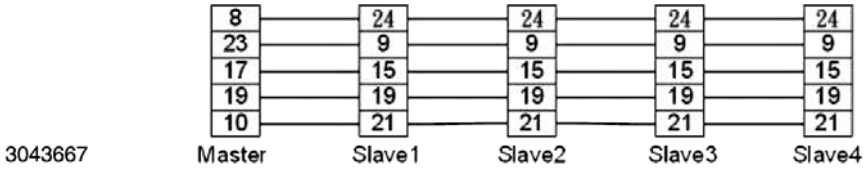


FIGURE 2-15. PROGRAMMING CONTROL PORT CONNECTIONS FOR PARALLEL OPERATION

2.8.2.1 PARALLEL CONNECTIONS USING OPTIONAL PARALLEL CONNECTION KIT

Connections for up to five identical KLN 750W units (one master and up to four slaves) can be simplified by using the optional Parallel Connection Kit (see Table 1-4).

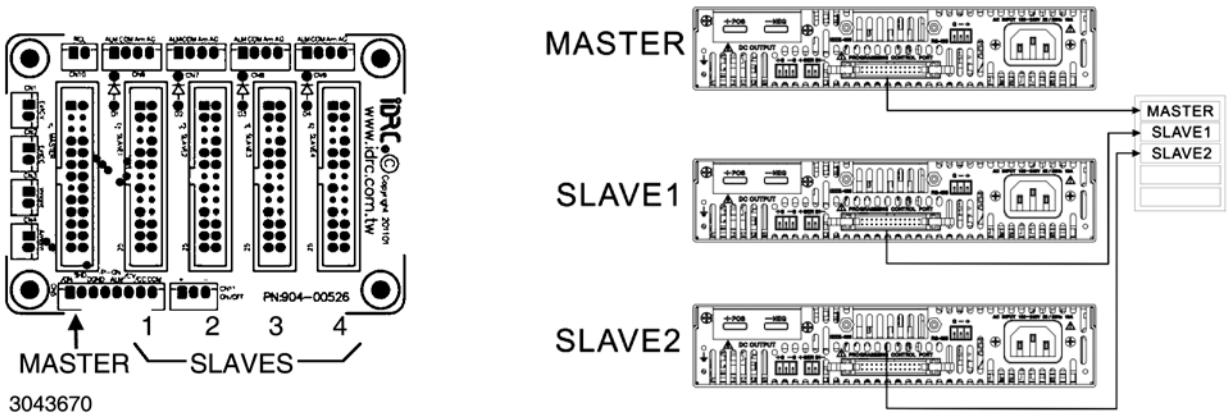


FIGURE 2-16. OPTIONAL PARALLEL CONNECTOR BOARD

SECTION 3 - OPERATION

3.1 GENERAL

This section explains how to operate the KLN 750W Power Supply. KLN 750W Power Supplies feature three modes of operation:

- Local Mode (see PAR. 3.3): This is the default operating mode, providing full access to all programming and readback functions via front panel displays, controls, and indicators.

- Analog Remote Mode (see PAR. 3.5): The unit can be controlled using analog signals applied via the Programming Control port, regardless of whether local or digital remote is active.

- Digital Remote Mode (see PAR. 3.6): This mode is selected via commands transmitted through one of the digital ports. One port is for RS-485 port [standard models] The second port is optional: either an IEEE-488 (GPIB) (G-suffix models) port or a LAN port [E-Suffix models]. The power supply automatically goes into digital remote mode when commands are accepted via one of the digital ports. All communication is via SCPI commands which afford full functionality of the KLN 750W (see PAR. 3.7, Appendix A and Appendix B).

3.2 POWER SUPPLY BASICS

The following paragraphs describe basic operation of the front panel controls, which are used to configure and operate the power supply.

Refer to Table 3-1 and Figure 3-1 for a description of front panel controls and indicators.

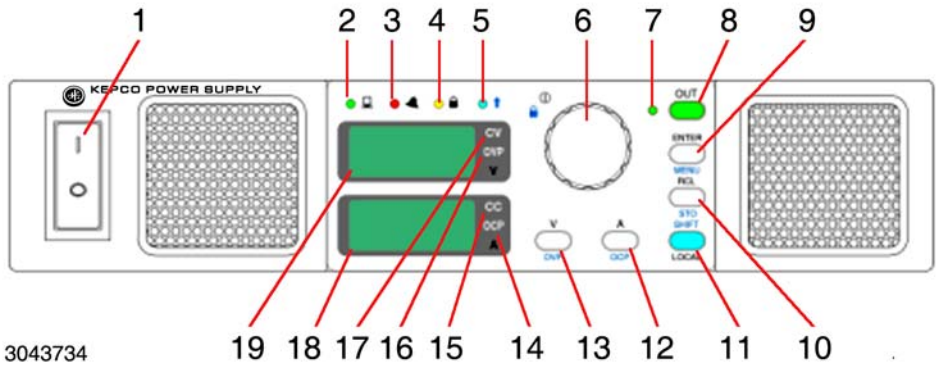


FIGURE 3-1. KLN 750W SERIES FRONT PANEL

TABLE 3-1. FRONT PANEL CONTROLS AND INDICATORS

NUMBER (FIGURE 3-1)	CONTROL/INDICATOR	FUNCTION
1	POWER ON/OFF circuit breaker A7CB1	Applies source power to unit
2	REMOTE status LED	Green LED, lights when unit is under remote control. Press **SHIFT**/LOCAL key to restore local control.
3	ALARM status LED	Red LED, lights if OVP, OCP or OTP are triggered or there is a command error, front panel operation error, or power supply failure. Refer to Table B-2 for an explanation of error codes.
4	KEYLOCK status LED	Yellow LED, lights when front panel keys are locked. To lock the front panel keys and encoder, press SHIFT and tap the encoder. Repeat to unlock the front panel.
5	SHIFT status LED	Blue LED, lights when SHIFT mode is active.
6	Encoder	The encoder Increases (clockwise) or decreases (counterclockwise) the highlighted digit of the Voltage or Current display, then press ENTER key to confirm. Tap the encoder to change the highlight. The highlighted digit blinks slowly.
7	Output ON/OFF status LED	Green LED, lights when output is on.
8	OUT on/off key	Output ON/OFF enable/disable. The DC power output will be set to OFF automatically in the following situations: a. Restart of the AC input. (See PAR. 3.3.9 to configure whether unit powers up with out off at previous setting.) b. The mains supply is interrupted for more than 100mS. c. The mains supply exceeds or is under the rated input range more than 500ms. d. If OCP - OVP - OTP are detected. e. When a user is operating the Menu function on the front panel.
9	ENTER/MENU dual function key	a. Press ENTER to confirm value set by encoder. b. Press SHIFT+ENTER to get access to MENU function. See PAR. 3.2.2 c. When output is ON, the access to the Menu will be denied. d. The OUT on/off key will be disabled while using the Menu function.
10	RCL/STO dual function key	A maximum of 16 memory settings can be stored or recalled. See PAR's. 3.3.6 and 3.3.7 for details. a. Press RCL as many times as needed to view the stored voltage/current settings in sequence, press ENTER to confirm recall, press V to exit recall function. b. Press SHIFT + STO to store settings. Rotate encoder to scroll through memory cells. Press ENTER to store programmed voltage and current settings, press ENTER to exit storage function.
11	SHIFT/LOCAL dual function key	When unit is operated manually in local mode, this key functions as a SHIFT key. When blue ⬆ LED is ON, the functions noted in blue text for the front panel keys can accessed when SHIFT is pressed. b. When the unit is remote controlled, press this key to exit remote control and restore local front panel operation.
12	A/OCP dual function key	a. Press **A**/OCP key to adjust the A set current value: the last digit of the Current display will be blinking. Turn the encoder to adjust the value of the blinking digit, then press ENTER to confirm. A cannot be set more than programmed value of OCP. Tap the encoder to go to the next digit. b. To set OCP press SHIFT key, then press A/**OCP** key. Use encoder and ENTER to set OCP. OCP cannot be set less than programmed value of A. c. Press ENTER key to exit A set or OCP set mode.
13	V/OVP dual function key	a. Press **V**/OVP key to adjust the V set voltage value: the last digit of the Voltage display will be blinking. Turn the encoder to adjust the value of the blinking digit, then press ENTER to confirm. V cannot be set more than programmed value of OVP. Tap the encoder to go to the next digit. b. To set OVP press SHIFT key, then press V/**OVP** key. Use encoder and ENTER to set OVP. OVP cannot be set less than programmed value of V. c. Press ENTER key to exit V set or OVP set mode.
14	OCP indicator	Overcurrent Protection indicator. Lights if overcurrent has occurred. Blinks while setting overcurrent protection.

TABLE 3-1. FRONT PANEL CONTROLS AND INDICATORS (CONTINUED)

NUMBER (FIGURE 3-1)	CONTROL/INDICATOR	FUNCTION
15	CC indicator	Lights when unit is in Constant Current mode
16	OVP indicator	Overvoltage Protection indicator. Lights if overvoltage error has occurred. Blinks while setting overvoltage protection value.
17	CV indicator	Lights when unit is in Constant Voltage mode
18	Current Display 4 digit LED	Displays output current or setting value in Amperes. CC indicator at right lights when unit is in constant current mode. OCP indicator lights if overcurrent error has occurred. OCP blinks while setting OCP value. Refer to Figure 3-2 to translate limited 7-segment display characters into standard alphanumeric characters.
19	Voltage Display 4 digit LED	Displays output voltage or setting value in Volts. CV indicator at right lights when unit is in constant voltage mode. OVP indicator lights if overvoltage error has occurred. OVP blinks while setting OVP value. Refer to Figure 3-2 to translate limited 7-segment display characters into standard alphanumeric characters.

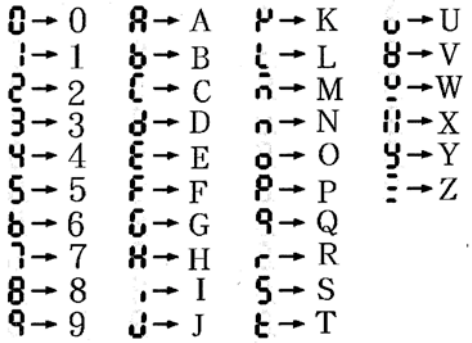


FIGURE 3-2. 7-SEGMENT DISPLAY CHARACTERS

3.2.1 TURNING THE POWER SUPPLY ON

1. To turn the power supply on, set **POWER** ON/OFF circuit breaker (1, Figure 2-1) to ON. Apply firm, continuous pressure to rocker actuator until fully engaged.

2. When the power supply is turned on, it beeps and performs a self-test which sequentially checks the power status, PFC module (DC bus voltage), A/D converter, display board, SENSE status, and EEPROM.

3. While the self-test is in process, the following occurs:

   - For 1 second all the indicators on the front panel are lit.

   - For 1.6 seconds the Voltage display shows rated voltage and the Current display shows rated current. The rest of the indicators are unlit and the digital and analog interfaces are temporarily disabled.

   - For 1.2 seconds the Voltage display shows Hx.xx (hardware version) and the Current display shows Fx.xx (firmware version). The rest of the indicators are still unlit.

   - For 1.2 seconds the Voltage display shows Ax.xx (A/D converter version) and Current display shows Dx.xx (display board version). The rest of the indicators are still unlit.

4. When the self-test is complete, the Voltage display shows the last voltage setpoint value and the Current display shows the last current setpoint value. All the front panel keys are functional and the remote-controlled functions can be enabled.

   - If an error occurs, the red  (alarm) LED goes on. Refer to PAR. 3.3.45 to view the error code.

5. After a successful self test, the factory default conditions upon power up are as shown in Table 3-2.

TABLE 3-2. FACTORY DEFAULTS

Parameter	Factory Default
Output V	10% of rated voltage (0V for E- or G- suffix models)
Output C	10% of rated current (0A for E- or G- suffix models)
OVP	110% of rated Voltage
OCP	110% of rated Current
Output: On/off	OFF
Power On: LAST/OFF	OFF
RAMP UP time	0.1
RAMP down time	0
Undervoltage Limit	0
BEEP: On/Off	On
I/O Select	RS 485
RS 485 Baud rate	115200
GPIB address	07
RS 485 address	007
Parallel/Series: PM/PS/SM/SS	PM
External Control of output: ON/OFF	OFF
Voltage Control: LOC/EXT	LOC
Current Control: LOC/EXT	LOC
Front panel lockout	OFF
Voltage Set: Direct/Enter	Direct
DHCP: On/Off	On
SYST:COMM:LAN:GATE	DHCP On: from DHCP server DHCP Off: 0.0.0.0
SYST:COMM:LAN:IP	DHCP On: From DHCP server DHCP Off: 192.168.0.100
SYST:COMM:LAN:IPAD	192.168.0.100
SYST:COMM:LAN:SMAS	255.255.255.0
SYST:COMM:LAN:MAC	70-46-42-XX-XX-XX
SYST:COMM:LAN:TEL:PORT	8003

NOTES:
(1) Parameters changed via front panel are saved when unit is powered off, and will be restored upon power-up. Parameters changed via SCPI command are not saved when unit is turned off and are restored to the last value entered from front panel when power is cycled on.
(2) *RST resets the following: Output to OFF, Output V to 10% of rated voltage, Output A to 10% of rated current, OVP to 110% of rated voltage, OCP to 110% of rated current, Undervoltage Limit to 0, and front panel lockout to OFF. All other parameters shown above are restored to the last value entered from front panel.
(3) Cycling power resets the following: Output to setting determined by Power On setting (see PAR. 3.3.9), Undervoltage Limit to 0 and front panel lockout to OFF. All other parameters shown above are restored to the last value entered from front panel.

3.2.2 MENU STRUCTURE

Many of the KLN 750W functions are accessed via MENU mode (see Table 3-3 for complete list of MENU functions).

1. Press SHIFT key to enter SHIFT mode. Verify blue ⬆ LED lights, then press ENTER key to enter MENU mode.

NOTE: Menu functions can not be accessed if the output is set to ON.

2. Rotate encoder to select MENU functions. Functions are displayed in the order shown in Table 3-3. Menu functions are shown in the Voltage display and the corresponding value of the function is shown in the Current display.

3. When the desired MENU function is shown in the Voltage display, press ENTER key to access the selected function and setting.

4. To change the digit tap the encoder. The highlighted digit can be changed by rotating the encoder. Tap the encoder to move to the next digit. When the setting is complete press ENTER key to confirm.

5. Rotate encoder to move to the next MENU function.

6. Press SHIFT key to enter SHIFT mode. Verify blue ⬆ LED lights, then press ENTER key to leave MENU mode.

3.3 LOCAL MODE OPERATION

Local operation of the KLN 750W power supply is accomplished from the front panel via the front panel keys and the encoder. All indications are provided by the two 4-digit LED displays, each with two integral status indicators, and five front panel status LEDs.

3.3.1 SETTING LOCAL/REMOTE MODE

When the power supply is turned on, it is automatically set to Local mode. If digital remote mode is active, the (REMOTE 💻 indicator is lit) the unit can be restored to local mode by pressing the SHIFT/LOCAL (LOCAL) key on the front panel.

NOTE: It is recommended that the unit be reset (see PAR. 3.3.43) when changing from digital remote to local control to avoid conflicts with digital commands.

The power supply will automatically go into digital remote mode when digital remote commands are accepted via the GPIB, RS-485, or LAN ports. Analog remote control signals via the Programming Control port (see Table 2-4) are available when enabled; analog status signals from the Programming Control port are always available.

TABLE 3-3. MENU FUNCTIONS

Voltage Display	Current Display	Description	Reference
ERR	000 ~ 999	Error Code	PAR. 3.3.45
OUT	DIR or ENT	Output Mode Setting	PAR. 3.3.8
P.ON	LAST or OFF	Power ON Mode	PAR. 3.3.9
R.UPT	00.0 ~99.9	Ramp Up Time	PAR. 3.3.10
R.DNT	00.0 ~99.9	Ramp Down Time	PAR. 3.3.11
MEM.F	01 ~ 16	Memory Flag	PAR. 3.3.12
BEEP	ON or OFF	Key Beep On/Off	PAR. 3.3.13
BRIT	0 ~ 5	Display Brightness	PAR. 3.3.14
I.O	485 or GPIB(1) or LAN(2)	Interface Select	PAR. 3.3.15
485	4.8K, 9.6K, 19.2K, 38.4K, 57.6K, 115.2K	RS-485 baud rate	PAR. 3.3.16
GPIB(1)	01 ~ 31	GPIB Address	PAR. 3.3.17
485	001 ~ 254	RS-485 Address	PAR. 3.3.18
DHCP(2)	OFF or ON	DHCP function	PAR. 3.3.19
S.IP1(2)	001 ~ 254	Set first part of IP Address	PAR. 3.3.20
S.IP2(2)	001 ~ 254	Set second part of IP Address	PAR. 3.3.21
S.IP3(2)	001 ~ 254	Set third IP part of Address	PAR. 3.3.22
S.IP4(2)	001 ~ 254	Set fourth IP part of Address	PAR. 3.3.23
PSOP	PM, PS, SM or SS	Parallel Master, Parallel Slave, Series Master, Series Slave	PAR. 3.3.24
EO.C	OFF or ON	External On/Off control enable/disable	PAR. 3.3.25
CV.M	LOC or EXT	Voltage set, either LOC (Local) using the front panel or EXT (External) using the analog signal from the Programming Control port.	PAR. 3.3.26
CC.M	LOC or EXT	Current set, either LOC (Local) using the front panel or EXT (External) using the analog signal from the Programming Control port.	PAR. 3.3.27
CAL	0000	Calibration password.	PAR. 3.3.28
SNnn	nnnn	Serial Number, where nnnnnn = 6 numbers, two numbers in Voltage Display, four numbers in Current display.	PAR. 3.3.29
FW	x.xx	Firmware version where xx.x = numbers (cannot be modified)	PAR. 3.3.30
HW	y.yy	Hardware version where y.yy = numbers.	PAR. 3.3.31
V.IP1(2)	001 ~ 254	View first part of IP Address	PAR. 3.3.32
V.IP2(2)	001 ~ 254	View second part of IP Address	PAR. 3.3.33
V.IP3(2)	001 ~ 254	View third part of IP Address	PAR. 3.3.34
V.IP4(2)	001 ~ 254	View fourth part of IP Address	PAR. 3.3.35
V.SN1(2)	001 ~ 254	View first part of Subnet Address	PAR. 3.3.36
V.SN2(2)	001 ~ 254	View second part of Subnet Address	PAR. 3.3.37
V.SN3(2)	001 ~ 254	View third part of Subnet Address	PAR. 3.3.38
V.SN4(2)	001 ~ 254	View fourth part of Subnet Address	PAR. 3.3.39
V.MA1(2)	001 ~ 254	View first part of MAC Address	PAR. 3.3.40
V.MA2(2)	001 ~ 254	View second part of MAC Address	PAR. 3.3.41
V.MA3(2)	001 ~ 254	View third part of MAC Address	PAR. 3.3.42
RST	OFF or ON	Reset Function.	PAR. 3.3.43
RSTI(2)	OFF or ON	IP Address Reset Function.	PAR. 3.3.44

(1) Only if optional GPIB interface installed. (2) Only if optional LAN interface installed.

3.3.1.1 FRONT PANEL LOCKOUT

To prevent unauthorized setting of the power supply, KEYLOCK can be enabled which disables the front panel keys and the encoder.

Press SHIFT key to enter SHIFT mode (⬆ LED lit), then tap the encoder to enable KEYLOCK. The yellow 🔒 indicator goes on and all the front panel keys (except SHIFT) and the encoder are disabled.

To exit KEYLOCK tap the encoder while in SHIFT mode (⬆ LED lit).

3.3.2 SET VOLTAGE OR OVERVOLTAGE PROTECTION (OVP)

The maximum setting for voltage is 110% of rated voltage and cannot be adjusted to exceed the OVP setting. The maximum setting for OVP is 110% of rated voltage and cannot be set to less than the programmed value of V. See PAR. B.25 and B.29 for SCPI commands.

1. Verify Output Mode set to ENTER (see PAR. 3.3.8)

2. To set voltage, press **V**/OVP (V set) key. To set OVP, first press SHIFT key (blue ⬆ LED goes on), then press V/**OVP** key.

3. The right-most digit blinks. Rotate the encoder to change the value. Tap the encoder to go to the next digit. When adjustment is complete, press ENTER to confirm.

3.3.3 SET CURRENT OR OVERCURRENT PROTECTION (OCP)

The maximum setting for current is 110% of rated current and cannot be adjusted to exceed the OCP setting. The maximum setting for OCP is 110% of rated current and cannot be set to less than the programmed value of A. See PAR. B.10 and B.12 for SCPI commands.

1. Verify Output Mode set to ENTER (see PAR. 3.3.8)

2. To set current, press **A**/OCP (A set) key. To set OCP, first press SHIFT key (blue ⬆ LED goes on), then press A/**OCP** key.

3. The right-most digit blinks. Rotate the encoder to change the value. Tap the encoder to go to the next digit. When adjustment is complete, press ENTER to confirm.

3.3.4 OVP/OVC OPERATION AND RECOVERY

If the unit detects an overvoltage or overcurrent condition, the OVP or OCP indicator and the red ALARM indicator on the front panel light, the unit starts beeping and the output is set to OFF (output voltage and current are zero). To recover, recycle power by turning the unit off then on: the unit power up with output off, no beeps and OVP/OVC indicator not lit. Before turning the output ON, either 1) programmed voltage or current must be reduced, or 2) OVP or OCP setting must be increased; otherwise the unit will again detect OVP or OVC condition resulting in output OFF, unit beeping and OVP or OVC indicator lit. Note that OVP and OCP can not be set to less than the programmed value for voltage and current respectively, and voltage and current can not be programmed to be higher than the OVP and OCP setpoint, respectively.

CAUTION: The unit may detect OVP or OCP if voltage/current is programmed very close to the OVP/OCP limits. For this case, changing the settings as outlined above is acceptable. However, detection of OVP/OCP normally indicates a malfunction, either in the load, or in the KLN power supply itself, therefore the cause of the malfunction should be determined before setting the output to ON.

3.3.5 ENABLING/DISABLING DC OUTPUT POWER

To enable the output press the OUT key on the front panel. The green LED (7, Figure 3-1) adjacent to the OUT key goes on to indicate the output is enabled.

If the output is enabled, press the OUT key to disable the output (the red LED goes out).

3.3.6 STORING POWER SUPPLY OUTPUT SETTINGS

Up to 16 memory locations can be used to store power supply settings for later use. The only settings saved are V set and A set. Protection (OVP and OCP) values are not saved.

1. Program voltage (PAR. 3.3.2) and current (PAR. 3.3.3) settings to be stored.

2. Press SHIFT key to enter SHIFT mode (blue ⬆ indicator goes on), then press RCL/**STO** key to access storage function. The voltage display shows 01.

3. Rotate the encoder to change the number of the storage location.

4. When the desired memory location is showing in the Voltage display, press ENTER key to store setting programmed in step 1. Settings previously saved in that location will be overwritten.

5. Press ENTER to exit storage function.

3.3.7 RECALLING POWER SUPPLY OUTPUT SETTINGS

To recall the setting previously stored in one of 16 memory locations (see PAR. 3.3.6) proceed as follows. When settings are recalled they can not exceed the OVP/OCP values in effect at the time of recall. Power supply settings can also be recalled using the Programming Control port (see PAR. 3.5.5).

CAUTION:

- Before applying recalled settings to a load, verify that the OVP and OCP settings are correct. OVP and OCP do not change automatically.

- If the output is on when **RCL**/STO key is pressed, the Voltage and Current displays show the recalled settings and blink for three seconds.

- If the output is off when **RCL**/STO key is pressed, the Voltage and Current displays show the recalled settings and blink until ENTER key is pressed

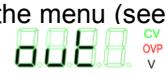
1. Press **RCL**/STO key to access recall function. The voltage and current displays blink and show the contents of memory location 01. (If the output is ON, the blinking stops after three seconds.)

2. Press **RCL**/STO key to scroll through remaining memory locations with stored settings. Only those memory locations that have stored settings are displayed (see PAR. 3.3.12).

3. When the voltage and current displays show the desired settings to recall, press ENTER key to confirm. Press **V**/OVP key to exit recall function.

3.3.8 OUTPUT MODE (VOLTAGE SET: DIRECT OR ENTER)

There are two ways to program output voltage: DIRECT or ENTER. When output mode is set to DIRECT, rotating the encoder with the output set to ON changes the output immediately as the encoder is turned. When set to ENTER, the settings are not applied to the output until confirmed by pressing ENTER.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (OUT) to access OUTPUT mode.

2. Press ENTER key to view setting.

   DIRECT mode displayed as  (DIR) in Current display.

   ENTER mode displayed as  (ENT) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.9 POWER ON SETTING

When the unit is powered on or recovering from a loss of mains supply, the output can be configured to restart with output status LAST or OFF. When set to LAST, output status is restored to the last output status (ON or OFF) before the unit was turned off. When set to OFF, the output status will always be off upon power supply restart.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (P.ON) to access POWER ON setting.

2. Press ENTER key to view setting.

   LAST mode displayed as  (LAST) in Current display.

   OFF mode displayed as  OFF) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.10 RISE TIME (RAMP UP)

When the output is enabled, the time for the output to go from 0 to the programmed voltage is referred to as the ramp up (rise) time, and is adjustable from 00.0 to 99.9 seconds. The time setting affects the slope of the increase in output voltage.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (R.UPT) to access RAMP UP setting.

2. Press ENTER key to view setting.

   Ramp time displayed as  (0.00) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.11 FALL TIME (RAMP DOWN)

When the output is disabled, the time for the output to go from the programmed voltage to 0 is referred to as the ramp down (fall) time, and is adjustable from 00.0 to 99.9 seconds. The time setting affects the slope of the decrease in output voltage.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (R.DNT) to access RAMP DOWN setting.

2. Press ENTER key to view setting.

   Ramp time displayed as  (0.00) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.12 MEMORY FLAG

There are 16 memory locations that can be used to store and recall power supply settings. MEM.F is used to limit the range of locations that can be accessed. For example, when the MEMORY FLAG is set as 05, it means that RECALL can only be executed from memory locations 01 through 05.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (MEM.F) to access MEMORY FLAG setting.

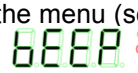
2. Press ENTER key to view setting.

   Memory flag displayed as  (01) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.13 BEEP

The BEEP function enables or disables the audible beep each time a front panel key is pressed.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (BEEP) to access BEEP function.

2. Press ENTER key to view setting.

   Beep ON (default) displayed as  (ON) in Current display.

   Beep OFF displayed as  (OFF) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.14 DISPLAY BRIGHTNESS

The brightness level for the Voltage and Current displays can be set from 0 (dimmest) to 5 (brightest).

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (BRIT) to access BRIGHTNESS setting.

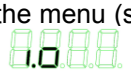
2. Press ENTER key to view setting

   Brightness level (0, 1, 2, 3, 4 or 5) displayed in Current display, e.g.,  (3).

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.15 I/O SELECT

Used to select either RS-485 (standard) or optional GPIB or LAN interfaces for remote digital control.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (I.O) to access I/O SELECT setting.

2. Press ENTER key to view setting.

   RS-485 mode displayed as  (485) in Current display.

   GPIB mode displayed as  GPIB) in Current display if GPIB interface installed.

   LAN mode displayed as  LAN) in Current display if LAN interface installed.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.16 RS-485 BAUD RATE

Used to select baud rate for RS-485 communication. Default setting is 19.2K

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (485) to access RS-485 BAUD RATE setting.

2. Press ENTER key to view setting.

   4800 baud rate displayed as  (4.8K) in Current display.

   9600 baud rate displayed as  (9.6K) in Current display.

   19200 baud rate displayed as  (19.2K) in Current display.

   38400 baud rate displayed as  (38.4K) in Current display.

   57600 baud rate displayed as  (57.6K) in Current display.

   115200 baud rate displayed as  (115K) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.17 GPIB ADDRESS (GPIB INTERFACE ONLY)

Used to set the GPIB address. Available addresses from 01 to 31. Default GPIB address is 07.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (GPIB) to access GPIB ADDRESS setting.

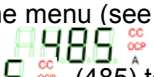
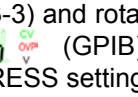
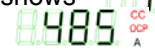
2. Press ENTER key to view setting.

   GPIB address (default) displayed as  (07) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.18 RS-485 ADDRESS

Used to set the RS-485 address. Available addresses from 001 to 254. Default RS-485 address is 007.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (485), then  (GPIB) if GPIB option is installed, then  (485) to access RS-485 ADDRESS setting.

2. Press ENTER key to view setting.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.19 DHCP FUNCTION ON/OFF CONTROL (LAN INTERFACE ONLY)

Used to allow the IP address to either be assigned from the DHCP server (on) or assigned by the user when connecting the unit directly to a computer (off). Refer to V.IP functions (see PAR. 3.3.32 through 3.3.35) to view IP address. Refer to S.IP functions (see PAR. 3.3.20 through 3.3.23) to set static IP address.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (DHCP) to access DHCP on/off setting.

2. Press ENTER key to view setting.

   DHCP ON displayed as  (ON) in Current display.

   DHCP ON displayed as  (OFF) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.20 SET 1ST PART OF IP ADDRESS (LAN INTERFACE ONLY)

Used to set first part (nnn) of the 4-part IP address (nnn.xxx.xxx.xxx) where nnn can be set from 0 to 254. Set DHCP on/off to OFF before using this function (see PAR. 3.3.19).

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (S.IP1) to access first part of IP address.
2. Press ENTER key to view setting.

   For example,  (192) displayed in Current display for IP Address 192.xxx.xxx.xxx
3. Rotate encoder until Current display shows desired setting (tap encoder to adjust 10's or 100's digit more rapidly). Press ENTER to confirm.

3.3.21 SET 2ND PART OF IP ADDRESS (LAN INTERFACE ONLY)

Used to set second part (nnn) of the 4-part IP address (xxx.nnn.xxx.xxx) where nnn can be set from 0 to 254.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (S.IP2) to access second part of IP address.
2. Press ENTER key to view setting.

   For example  (168) displayed in Current display for IP Address xxx.168.xxx.xxx.
3. Rotate encoder until Current display shows desired setting (tap encoder to adjust 10's or 100's digit more rapidly). Press ENTER to confirm.

3.3.22 SET 3RD PART OF IP ADDRESS (LAN INTERFACE ONLY)

Used to set third part (nnn) of the 4-part IP address (xxx.xxx.nnn.xxx) where nnn can be set from 0 to 254.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (S.IP3) to access third part of IP address.
2. Press ENTER key to view setting.

   For example  (0) displayed in Current display for IP Address xxx.xxx.0.xxx.
3. Rotate encoder until Current display shows desired setting (tap encoder to adjust 10's or 100's digit more rapidly). Press ENTER to confirm.

3.3.23 SET 4TH PART OF IP ADDRESS (LAN INTERFACE ONLY)

Used to set fourth part (nnn) of the 4-part IP address (xxx.xxx.xxx.nnn) where nnn can be set from 0 to 254.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (S.IP4) to access fourth part of IP address.

2. Press ENTER key to view setting.

   For example,  (100) displayed in Current display for IP Address xxx.xxx.xxx.100.

3. Rotate encoder until Current display shows desired setting (tap encoder to adjust 10's or 100's digit more rapidly). Press ENTER to confirm.

3.3.24 PARALLEL/SERIAL MASTER/SLAVE SETUP

Used to establish unit as Master or Slave for parallel (maximum of five units including Master) or series operation (maximum of two units including Master).

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (PSOP) to access Parallel/Serial Master/Slave Setting.

2. Press ENTER key to change setting.

   Parallel Master displayed as  (PM) in Current display.

   Parallel Slave displayed as  (PS) in Current display.

   Serial Master displayed as  (SM) in Current display.

   Serial Slave displayed as  (SS) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.25 EXTERNAL CONTROL OF OUTPUT ON/OFF

This function enables or disables external control of output on/off using the Programming Control port.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (EO.C) to access EXTERNAL OUTPUT ON/OFF CONTROL function.

   OFF (default) displayed as  (OFF) in Current display.

   ON displayed as  (ON) in Current display.

2. Press ENTER key to change setting. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.26 ENABLE VOLTAGE CONTROL VIA PROGRAMMING CONTROL PORT

Allows voltage control either from the front panel (LOCAL) or from the analog signal via the Programming Control port (EXTERNAL)

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (CV.M) to access CONSTANT VOLTAGE MODE CONTROL setting.

2. Press ENTER key to view setting.

   LOCAL (front panel) mode displayed as  (LOC) in Current display.

   EXTERNAL (Programming Control port) mode displayed as  (EXT) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.27 ENABLE CURRENT CONTROL VIA PROGRAMMING CONTROL PORT

Allows current control either from the front panel (LOCAL) or from the analog signal via the Programming Control port (EXTERNAL)

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (CC.M) to access CONSTANT CURRENT MODE CONTROL setting.

2. Press ENTER key to view setting.

   LOCAL (front panel) mode displayed as  (LOC) in Current display.

   EXTERNAL (Programming Control port) mode displayed as  (EXT) in Current display.

3. Rotate encoder until Current display shows desired setting, then press ENTER to confirm.

3.3.28 CALIBRATION ACCESS

Allows access to calibration mode which is password protected.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (CAL) to access CALIBRATION mode.

2. Press ENTER key to access setting (password).

3. Rotate encoder until Current display shows desired setting for blinking digit.

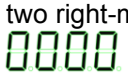
4. Tap encoder to go to next digit and repeat step 3 for all digits of the password, then press ENTER to confirm.

5. Refer to PAR. 4.1 to calibrate the unit.

3.3.29 VIEW SERIAL NUMBER

Allows viewing of 6-digit serial number.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (SN) in the two left-most characters.

2. Serial Number displayed starting with two right-most digits  (10) in Voltage display and four digits in Current display  (0000).

3.3.30 VIEW FIRMWARE VERSION

Allows viewing of firmware version

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (FW). to view the unit firmware version.

2. Firmware Version displayed as  1.00 (typical) in Current display.

3.3.31 VIEW HARDWARE VERSION

Allows viewing of hardware version

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (HW). to view the unit hardware version.

2. Hardware Version displayed as  1.00 (typical) in Current display.

3.3.32 VIEW 1ST PART OF IP ADDRESS (LAN INTERFACE ONLY)

Used to view first part (nnn) of the 4-part IP address (nnn.xxx.xxx.xxx) where nnn is a number from 0 to 254. The IP address shown is either assigned by the DHCP server or the static address entered manually. The default IP address is 192.168.0.100.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.IP1).

2. Press ENTER key to view setting.

   For example,  (192) displayed in Current display for IP Address 192.168.0.100.

3. To change the IP address from the front panel, first set DHCP function to OFF (see PAR. 3.3.19) then refer to PAR. 3.3.20 through PAR. 3.3.23 to change the address. Cycle power off, then on before returning to PAR. 3.3.32 through 3.3.35 to view the changes. The IP address can also be changed using SCPI commands (see Appendix B, PAR. B.37).

3.3.33 VIEW 2ND PART OF IP ADDRESS (LAN INTERFACE ONLY)

Used to view second part (nnn) of the 4-part IP address (xxx.nnn.xxx.xxx) where nnn is a number from 0 to 254. The IP address shown is either assigned by the DHCP server or the static address entered manually. The default IP address is 192.168.0.100.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.IP2).

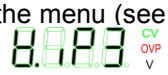
2. Press ENTER key to view setting.

   For example,  (168) displayed in Current display for IP Address 192.168.0.100.

3. To change the IP address from the front panel, first set DHCP function to OFF (see PAR. 3.3.19) then refer to PAR. 3.3.20 through PAR. 3.3.23 to change the address. Cycle power off, then on before returning to PAR. 3.3.32 through 3.3.35 to view the changes. The IP address can also be changed using SCPI commands (see Appendix B, PAR. B.37).

3.3.34 VIEW 3RD PART OF IP ADDRESS (LAN INTERFACE ONLY)

Used to view third part (nnn) of the 4-part IP address (xxx.xxx.nnn.xxx) where nnn is a number from 0 to 254. The IP address shown is either assigned by the DHCP server or the static address entered manually. The default IP address is 192.168.0.100.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.IP3).

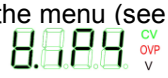
2. Press ENTER key to view setting.

   For example,  (0) displayed in Current display for IP Address 192.168.0.100.

3. To change the IP address from the front panel, first set DHCP function to OFF (see PAR. 3.3.19) then refer to PAR. 3.3.20 through PAR. 3.3.23 to change the address. Cycle power off, then on before returning to PAR. 3.3.32 through 3.3.35 to view the changes. The IP address can also be changed using SCPI commands (see Appendix B, PAR. B.37).

3.3.35 VIEW 4TH PART OF IP ADDRESS (LAN INTERFACE ONLY)

Used to view fourth part (nnn) of the 4-part IP address (xxx.xxx.xxx.nnn) where nnn is a number from 0 to 254. The IP address shown is either assigned by the DHCP server or the static address entered manually. The default IP address is 192.168.0.100.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.IP4).

2. Press ENTER key to view setting.

   For example,  (100) displayed in Current display for IP Address 192.168.0.100.

3. To change the IP address from the front panel, first set DHCP function to OFF (see PAR. 3.3.19) then refer to PAR. 3.3.20 through PAR. 3.3.23 to change the address. Cycle power off, then on before returning to PAR. 3.3.32 through 3.3.35 to view the changes. The IP address can also be changed using SCPI commands (see Appendix B, PAR. B.37).

3.3.36 VIEW 1ST PART OF SUBNET MASK ADDRESS (LAN INTERFACE ONLY)

Used to view first part (nnn) of the 4-part Subnet Mask address (nnn.xxx.xxx.xxx) where nnn is a number from 0 to 255. The default subnet mask address is 255.255.255.0.

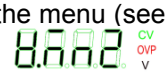
1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.MN1).

2. Press ENTER key to view setting.

   For example,  (255) displayed in Current display for subnet mask address 255.255.255.100.

3.3.37 VIEW 2ND PART OF SUBNET MASK ADDRESS (LAN INTERFACE ONLY)

Used to view second part (nnn) of the 4-part Subnet Mask address (xxx.nnn.xxx.xxx) where nnn is a number from 0 to 255. The default subnet mask address is 255.255.255.0.

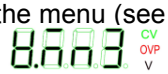
1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.MN2).

2. Press ENTER key to view setting.

   For example,  (255) displayed in Current display for subnet mask address 255.255.255.100.

3.3.38 VIEW 3RD PART OF SUBNET MASK ADDRESS (LAN INTERFACE ONLY)

Used to view third part (nnn) of the 4-part Subnet Mask address (xxx.xxx.nnn.xxx) where nnn is a number from 0 to 255. The default subnet mask address is 255.255.255.0.

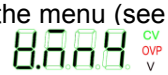
1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.MN3).

2. Press ENTER key to view setting.

   For example,  (255) displayed in Current display for subnet mask address 255.255.255.100.

3.3.39 VIEW 4TH PART OF SUBNET MASK ADDRESS (LAN INTERFACE ONLY)

Used to view fourth part (nnn) of the 4-part Subnet Mask address (xxx.xxx.xxx.nnn) where nnn is a number from 0 to 255. The default subnet mask address is 255.255.255.0.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.MN4).

2. Press ENTER key to view setting.

   For example,  (100) displayed in Current display for subnet mask address 255.255.255.100.

3.3.40 VIEW 1ST PART OF MAC ADDRESS (LAN INTERFACE ONLY)

Used to view first two hex numbers (aa.bb) of the 6-character MAC address (aa.bb.cc.dd.ee.ff) where aa and bb are Hex numbers from 00 to FF. The default MAC address is 70.60.42.00.00.00.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.MA1).

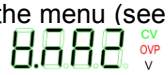
2. Press ENTER key to view setting.

   For example,  (70.46) displayed in Current display for MAC address 70.46.42.00.00.00.

3. The MAC address can be changed using SCPI commands (see Appendix B., PAR. B.41).

3.3.41 VIEW 2ND PART OF MAC ADDRESS (LAN INTERFACE ONLY)

Used to view second two hex numbers (cc.dd) of the 6-character MAC address (aa.bb.cc.dd.ee.ff) where cc and dd are Hex numbers from 00 to FF. The default MAC address is 70.60.42.00.00.00.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.MA2).

2. Press ENTER key to view setting.

   For example,  (42.00) displayed in Current display for MAC address 70.60.42.00.00.00.

3. The MAC address can be changed using SCPI commands (see Appendix B., PAR. B.41).

3.3.42 VIEW 3RD PART OF MAC ADDRESS (LAN INTERFACE ONLY)

Used to view third two hex numbers (ee.ff) of the 6-character MAC address (aa.bb.cc.dd.ee.ff) where ee and ff are Hex numbers from 00 to FF. The default MAC address is 70.60.42.00.00.00.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (V.MA3).

2. Press ENTER key to view setting.

   For example,  (00.00) displayed in Current display for MAC address 70.60.42.00.00.00.

3. The MAC address can be changed using SCPI commands (see Appendix B., PAR. B.41).

3.3.43 RESET

The RESET function resets the value of V set and A set to 0, resets the value of OVP and OCP to the default values (110% of rated voltage and 110% of rated current, respectively), resets undervoltage limit to 0,and sets the output to OFF.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (RST) to access RESET function.

2. Press ENTER key to view setting.

   OFF (default) displayed as  (OFF) in Current display.

   ON mode displayed as  (ON) in Current display to initiate RESET.

3. Rotate encoder until Current display shows  , then press ENTER to confirm.

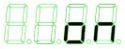
3.3.44 IP ADDRESS RESET

The IP Address reset function resets the IP Address and Subnet Mask address to the default value of 192.168.0.100 and 255.0.0 respectively.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (RSTI) to access RESET IP ADDRESS function.

2. Press ENTER key to view setting.

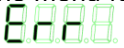
   OFF (default) displayed as  (oFF) in Current display.

   ON mode displayed as  (on) in Current display to initiate RESET IP ADDRESS.

3. Rotate encoder until Current display shows  , then press ENTER to confirm.

3.3.45 VIEWING ERROR CODES.

When the red  (alarm) LED on the front panel is lit, use the ERR function of the menu to read the error.

1. Enter the menu (see PAR. 3.2.2 and Table 3-3) and rotate the encoder until Voltage display shows  (ERR) to access Error Codes.

2. Error code displayed in Current display  (0, no error). Refer to Table B-2 for a complete list of error codes.

3. Press ENTER key to erase code in Current display and read the next error code. When Current display reads 0, all error codes have been read.

3.4 SERIES/PARALLEL OPERATION

The following paragraphs describe operation of multiple units connected in series or parallel

3.4.1 SERIES OPERATION

- The front panel voltage displays of the Master and Slave each show 1/2 of the total output voltage of the series combination. The front panel current display of the Master shows the current for the series combination

- The voltage monitoring function at pin 20 (V MON) of the Control Programming port is functional for both Master and Slave, 0 - 10V corresponding to 0 to full scale voltage of the individual units. Voltage monitor for the series combination is the sum of the output of pin 20 of the Master plus pin 20 of the Slave.

- The current monitoring function at pin 22 (A MON) of the Control Programming port is functional for both Master and Slave, 0 - 10V corresponding to 0 to full scale current of the individual units.

- The alarm status function at pin 9 (ALARM) of the Control Programming port is functional for both Master and Slave. If the Master alarm status is active, the Master and Slave will be shut down. If the Slave alarm status is active, only the Slave will be shut down.

- When using remote control, only the Master can be operated and controlled by remote commands.

To operate units connected in series, proceed as follows:

1. Verify that the units are connected as shown in either Figure 2-10 (without remote compensation) or Figure 2-11 (with remote compensation)

2. Turn on power to Master unit first and then Slave unit.

3. Set PSOP (Parallel/Series operation) function in the menu to SM (Series Master) for the Master unit and to SS (Series Slave) for the Slave unit (see PAR. 3.3.24). After setting PSOP, output ON/OFF of the series combination is controlled by the Master.

CAUTION: TO ENSURE THE PROTECTION FUNCTIONS WORK PROPERLY, SET OVP/OCP VALUES HIGHER FOR THE SLAVE UNIT.

4. Set OVP and OVC of the Slave to a higher value than that for the Master to ensure that overvoltage and overcurrent protection work properly.

5. When powering off a series combination, first turn off the Slave, then the Master.

3.4.2 DISCONTINUING SERIES OPERATION

To allow units connected in series to function independently, proceed as follows:

1. Turn off power to Slave, then Master.

2. Disconnect all series connections shown in either Figure 2-10 (without remote compensation) or Figure 2-11 (with remote compensation), including SER IN connections.

3. After turning on each unit, set PSOP (Parallel/Series operation) to PM (Parallel Master) in the Menu (see PAR. 3.3.24).

3.4.3 PARALLEL OPERATION

- The front panel current displays of the Master and Slave(s) each show the output current of the individual units. The front panel voltage display of the Master shows the output voltage for the parallel combination

- The voltage monitoring function at pin 20 (V MON) of the Control Programming port is functional for the Master and all Slaves, 0 - 10V corresponding to 0 to full scale voltage of each individual unit.

- The current monitoring function at pin 22 (A MON) of the Control Programming port is functional for Master and all Slaves, 0 - 10V corresponding to 0 to full scale current of the individual units. Current monitor for the parallel combination is the sum of the output of pin 22 of the Master, plus pin 22 of all Slaves.

- The alarm status function at pin 9 (ALARM) of the Control Programming port is functional for Master and all Slaves. If the Master alarm status is active, the Master and all Slaves will be shut down. If a Slave alarm status is active, only that Slave will be shut down.

- Remote sensing for Slave units is disabled when operating in parallel configurations.

- When using remote digital control, only the MASTER can be operated and controlled by remote commands.

To operate units connected in parallel, proceed as follows:

1. Verify that the units are connected as shown in either Figure 2-13 (without remote compensation) or Figure 2-14 (with remote compensation)

2. Verify that Programming Control Port connections are as shown in Figure 2-15.

3. Turn on Master unit first, then Slave units.

4. Set menu function for Ramp Down Time of Master to 0 (see PAR. 3.3.11).

5. Set PSOP (Parallel/Series operation) function in the menu to PM (Parallel Master) for the Master unit and to PS (Parallel Slave) for the Slave unit (see PAR. 3.3.24). After setting PSOP, output ON/OFF of the series combination is controlled by the Master.

6. Set OVP and OVC of the Slave(s) to a higher value than that for the Master to ensure that overvoltage and overcurrent protection work properly.

7. When powering off a parallel combination, first turn off the Slave(s), then the Master.

3.4.4 DISCONTINUING PARALLEL OPERATION

To allow units connected in parallel to function independently, proceed as follows:

1. Turn off power to Slaves, then Master.

2. Disconnect all parallel connections shown in either Figure 2-13 (without remote compensation) or Figure 2-14 (with remote compensation), including SER IN connections.

3. Disconnect Programming Control Port connections shown in Figure 2-15.

4. After turning on each unit, set PSOP (Parallel/Series operation) to PM (Parallel Master) in the Menu (see PAR. 3.3.24).

3.5 ANALOG REMOTE MODE PROGRAMMING

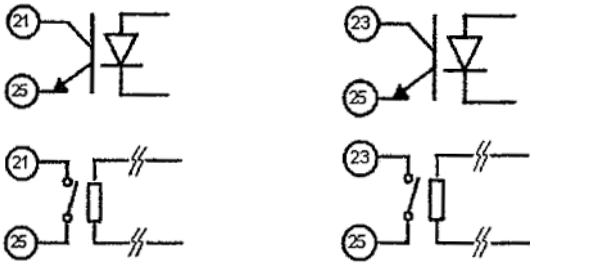
The KLN 750W can be programmed remotely using analog signals applied to the remote Programming Control port at the rear panel (see Figure 2-1 and Table 2-4). Analog remote programming allows the user to 1) control output on/off (PAR. 3.5.1), 2) initiate emergency shutdown of the output (PAR. 3.5.2), 3) control output voltage (PAR. 3.5.3) or current (PAR. 3.5.4) and 4) monitor power supply status (PAR. 3.5.6).

3.5.1 REMOTE OUTPUT ON/OFF

The output can be set on or off using the Programming Control port pins 21 and 25. When the pins are shorted the output is on, when they are open the out is off. This can be accomplished using either an optocoupler or relay. (See Figure 3-4). This feature must first be enabled from the front panel by setting external control of output on/off to ON (see PAR. 3.3.25).

3.5.2 REMOTE EMERGENCY SHUTDOWN

Remote emergency shutdown of the output can be accomplished using Programming Control port pins 23 and 25. When the pins are open, operation is normal. When they are shorted, the output is immediately set to off. This can be accomplished using either an optocoupler or relay. (See Figure 3-3).



OUTPUT ON/OFF
PINS 21 AND 25

EMERGENCY SHUTDOWN
PINS 23 AND 25

NOTES:
1. Control can be either by optocoupler or relay.
2. Recommended that contacts be positioned as close to pins as possible.

CAUTION:
Observe proper polarity.

FIGURE 3-3. REMOTE CONTROL USING PROGRAMMING CONTROL PORT AND OPTOCOUPLER OR RELAY

3.5.3 REMOTE CONTROL OF OUTPUT VOLTAGE USING AN ANALOG SIGNAL

Connect an analog voltage, adjustable from 0 to +10V d-c (corresponding to 0 to rated output voltage) between pin 16 (+) and pin 26 (–) of the Programming Control Port. The analog voltage will control the output only after the function is enabled by setting Constant Voltage control to EXT from the front panel (see PAR. 3.3.26).

CAUTION: TO AVOID OVP FROM TRIPPING WHEN THE OUTPUT IS SET TO ON, THE ANALOG PROGRAMMING VOLTAGE MUST NOT EXCEED 10.5V D-C.

3.5.4 REMOTE CONTROL OF OUTPUT CURRENT USING AN ANALOG SIGNAL

Connect an analog voltage, adjustable from 0 to +10V d-c (corresponding to 0 to rated output current) between pin 18 (+) and pin 26 (–) of the Programming Control Port. The analog voltage will control the output only after the function is enabled by setting Constant Current control to EXT from the front panel (see PAR. 3.3.27).

CAUTION: TO AVOID OCP FROM TRIPPING WHEN THE OUTPUT IS SET TO ON, THE ANALOG PROGRAMMING VOLTAGE MUST NOT EXCEED 10.5V D-C.

3.5.5 RECALLING PREVIOUSLY STORED SETTING USING PROGRAMMING CONTROL PORT

Connect a switch or relay (dry contactor) across pins 1 and 2 of the Programming Control Port. Each time the pins are shorted together is equivalent to pressing the RCL key (see PAR. 3.3.7). Closures of the switch or relay can be used to select the desired memory cell.

3.5.6 MONITORING OUTPUT STATUS USING PROGRAMMING CONTROL PORT

The Programming Control port allows monitoring of output voltage and current, operating mode (CC or CV), power on/off, output on/off and alarm status (occurrence of OVP, OCP, or output shutdown).

3.5.6.1 MONITOR OUTPUT VOLTAGE OR CURRENT

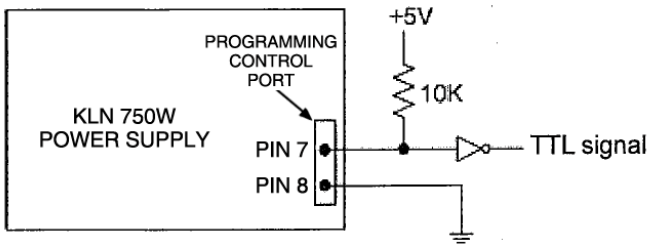
CAUTION: DO NOT ALLOW SHORT BETWEEN PROGRAMMING CONTROL PORT PINS 20 (A MONITOR), 22 (V MONITOR) OR 24 (ANALOG COMMON) TO AVOID DAMAGE TO THE UNIT.

Voltage: The analog voltage between 0 to +10V d-c at pin 20, referenced to pin 24, represents 0 to the rated voltage of the unit. Accurate within 5% of Voltage display reading. Output resistance: approximately 100 Ohms, maximum output current: approximately 10mA.

Current: The analog voltage between 0 to +10V d-c at pin 22, referenced to pin 24, represents 0 to the rated current of the unit. Accurate within 5% of Current display reading. Output resistance: approximately 100 Ohms, maximum output current: approximately 10mA.

3.5.6.2 MONITOR UNIT STATUS

The following status signals are open collector TTL signals via an optocoupler referenced to Programming Control port pin 8: maximum voltage is 30V, maximum current is 8mA. See Figure 3-4. Status noted in Figure 3-4 is present when signal is TTL high, absent when TTL low.



STATUS PIN	DESCRIPTION
7	Unit power on
9	Alarm (OVP, OCP or output shut-down applied to pin 23)
10	Output on
11	Constant Current (CC)
12	Constant Voltage (CV)

FIGURE 3-4. PROGRAMMING CONTROL PORT STATUS MONITORING

3.6 DIGITAL REMOTE MODE PROGRAMMING

KLN 750W models may be digitally programmed over a control bus using SCPI (Standard Commands for Programmable Instruments). SCPI provides a common language conforming to IEEE 488.2 for instruments used in an automatic test system (see PAR. 3.7). The control bus used must be either the IEEE 488 standard communication bus (General Purpose Interface Bus, GPIB), or the RS-485 Serial Bus.

Refer to Table 2-3 for input/output signal allocations for communication via the GPIB and Table 2-2 for RS-485.

This section includes required setup for GPIB (address) and RS-485 (address and baud rate) (PAR. 3.6.3.1), a discussion of GPIB bus protocols (PAR. 3.6.3.1) followed by a detailed explanation of SCPI programming (PAR. 3.7).

3.6.1 RS-485 OPERATION

See PAR. 2.7.2 for RS-485 connections.

See PAR. 3.3.18 to change the RS-485 Address.

See PAR. 3.3.16 to change the RS-485 Baud Rate.

3.6.2 GPIB OPERATION (IF OPTION INSTALLED)

See PAR. 2.7.3 for GPIB connections.

See PAR. 3.3.17 to change the GPIB Address.

3.6.2.1 IEEE 488 (GPIB) BUS PROTOCOL

Table 3-4 defines the interface capabilities of the KLN 750W power supply (Talker/Listener) relative to the IEEE 488 (GPIB) bus (reference document *ANSI/IEEE Std 488: IEEE Standard Digital Interface for Programmable Instrumentation*) communicating with a Host Computer—Controller (Talker/Listener). Tables 3-5 and 3-6 define the messages sent by the KLN 750W, or received by the KLN 750W, via the IEEE 488 bus in IEEE 488 command mode and IEEE 488 data mode, respectively. These messages are enabled during the “handshake” cycle, with the KLN 750W power supply operating as either a Talker or a Listener. (See PAR. 3.6.3.1 to change the GPIB address.

TABLE 3-4. IEEE 488 (GPIB) BUS INTERFACE FUNCTIONS

FUNCTION	SUBSET SYMBOL	COMMENTS
Source Handshake	SH1	Complete Capability (Interface can receive multiline messages)
Acceptor Handshake	AH1	Complete Capability (Interface can receive multiline messages)
Talker	T6	Basic talker, serial poll, unaddress if MLA (My Listen Address) (one-byte address)
Listener	L4	Basic listener, unaddress if MTA (My Talk Address) (one-byte address).
Service Request	SR0	No Capability.
Remote/Local	RL1	Complete capability. Interface selects either local or remote information. In local mode the KLN 750W executes front panel commands, but can be set to remote mode via IEEE 488 bus. When in Remote mode all front panel keys are disabled except LOCAL function key.
Parallel Poll	PP0	No Capability
Device Clear	DC1	Complete Capability. KLN 750W accepts DCL (Device Clear) and SDC (Selected Device Clear).
Device Trigger	DT0	No Capability
Controller	C0	No Capability

TABLE 3-5. IEEE 488 (GPIB) BUS COMMAND MODE MESSAGES

MNEMONIC	MESSAGE DESCRIPTION	COMMENTS
ATN	Attention	Received
DAC	Data accepted	Received or Sent
DAV	Data Valid	Received or Sent
DCL	Device Clear	Received
IFC	Interface Clear	Received
MLA	My Listen Address	Received
MTA	My Talk Address	Received
OTA	Other Talk Address	Received
RFD	Ready for Data	Received or Sent
SDC	Selected Device Clear	Received
SPD	Serial Poll Disable	Received
SPE	Serial Poll Enable	Received
SRQ	Service Request	Sent
UNL	Unlisten	Received
UNT	Untalk	Received

TABLE 3-6. IEEE 488 (GPIB) BUS DATA MODE MESSAGES

MNEMONIC	MESSAGE DESCRIPTION	COMMENTS
DAB	Data Byte	Received or Sent
END	End	Received or Sent
EOS	End of String	Received or Sent
RQS	Request Service	Sent
STB	Status Byte	Sent

3.6.3 LAN OPERATION (IF OPTION INSTALLED)

See PAR. 2.7.4 for LAN connections.

See PAR. 3.3.19 to set the DHCP server function on or off.

See PAR. 3.3.32 through PAR. 3.3.35 to view the IP address.

See PAR. 3.3.20 through PAR. 3.3.23 to set the IP address.

See PAR. 3.3.36 through PAR. 3.3.39 to view the subnet mask address.

See PAR. 3.3.40 through PAR. 3.3.42 to view the MAC address.

3.6.3.1 LAN CONNECTION

The factory default for the DHCP function default is ON. Leave this set to ON to allow a DHCP server to set the IP address. If there is no DHCP server available, refer to PAR. 3.3.19 to set DHCP to OFF, then either refer to PAR. 3.3.20 through PAR. 3.3.23 to set the static IP address from the front panel or refer to PAR. 3.3.44 to reset the IP address to the default value (192.168.0.100).

1. Refer to PAR. 3.3.32 through PAR. 3.3.35 to view the IP address.

2. Enter the IP address of the unit in the browser and press ENTER on the computer keyboard. This launches the Instrument home page. This allows viewing of the following information about the unit: Model, Manufacturer, Serial Number, Firmware Revision, Visa Resource, Description, MAC Address, IP Address and Subnet Mask. This information can not be modified from the browser

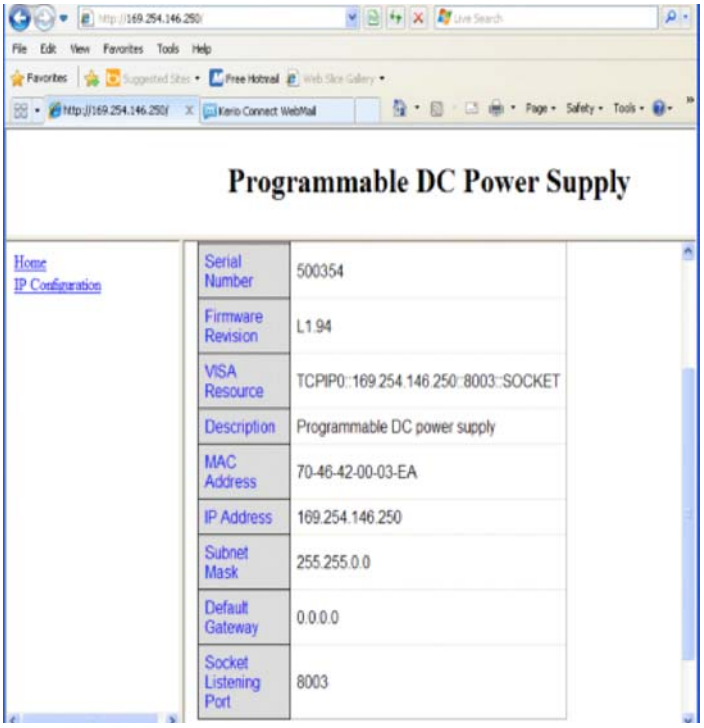


FIGURE 3-5. INSTRUMENT HOME PAGE

3. Click IP Configuration in the front page to view the TCP/IP Mode, IP address, Subnet Mask, Default Gateway and Socket Listening Port (see Figure 3-6).

   The user can change the Socket Listening Port by keying in the new port number and clicking Apply. The new port number must then be used to communicate with the unit in the following steps.

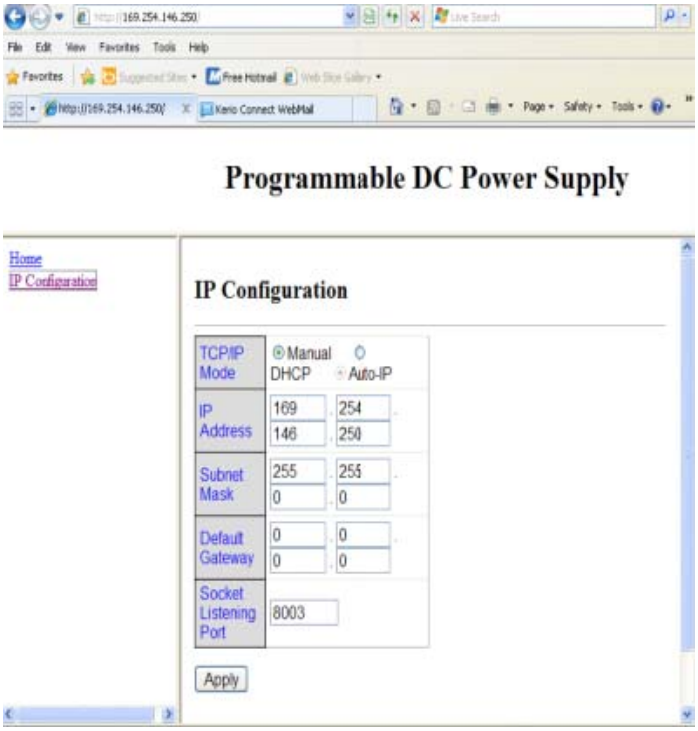


FIGURE 3-6. IP CONFIGURATION

4. Use HyperTerminal to operate the unit remotely. From the computer, launch HyperTerminal (Start - Programs - Accessories - Communications - HyperTerminal) and key in the name of the connection, e.g., KLN 20-38E.

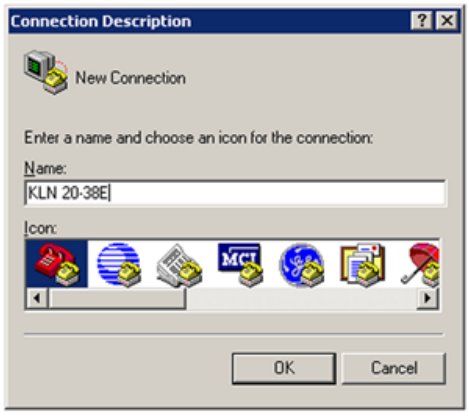


FIGURE 3-7. OPEN HYPERTERMINAL CONNECTION

5. At the “Properties” dialog box, open the “Connect using“ drop-down menu and select “TCP/IP(Winsock)” then key in the Host address (see step 1) and socket port (8003). HyperTerminal window shows screen with blinking cursor while connecting.

a. If a Message box opens that says “Unable to Connect to 192.168.0.100 port 8003” click OK, then click File - Properties at the top menu bar of the HyperTerminal window to open the Properties Dialog Box (Figure 3-8).

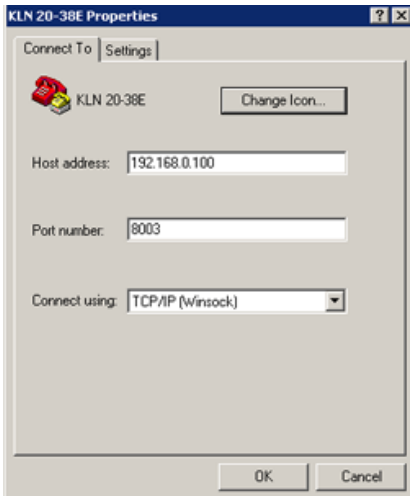


FIGURE 3-8. HYPER TERMINAL PROPERTIES

b. Click the Settings tab, then click ASCII setup (see Figure 3-9).

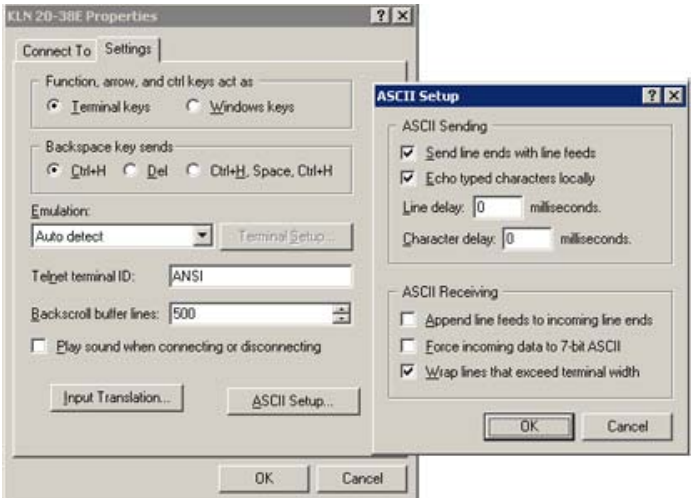


FIGURE 3-9. HYPER TERMINAL ASCII SETUP

c. Check the “Send line ends with line feeds” and “Echo typed characters locally” boxes.

6. Repeat steps 4 and 5, then, from the computer via the blank HyperTerminal screen, send syst:rem and ENTER. The green remote LED at the KLN front panel goes on.

7. Send *idn? query to verify unit is operating properly via the LAN interface. A typical response for a successful LAN connection is:

```
KEPCO,KLN 20-38E,500354,01.60
```

3.7 SCPI PROGRAMMING

SCPI (Standard Commands for Programmable Instruments) is a programming language conforming to the protocols and standards established by IEEE 488.2 (reference document *ANSI/IEEE Std 488.2, IEEE Standard Codes, Formats, Protocols, and Common Commands*). The KLN 750W Power Supply supports long and short form syntax as defined in this standard. All other aspects of this standard are specified in appendix B of this manual. The unit ignores all incorrectly formatted messages, emitting an audible beep for each incorrect command sequence; the reason for the beep is placed in the error queue.

Different programming languages (e.g., BASIC, C, PASCAL, etc.) have different ways of representing data that is to be put on the IEEE 488 bus. It is up to the programmer to determine how to output the character sequence required for the programming language used. See Table 3-7 for VISA resource strings corresponding to RS-485, GPIB (G-suffix models only) or LAN (E-suffix models only) interfaces.

TABLE 3-7. VISA RESOURCE STRING CORRESPONDING TO INTERFACE

INTERFACE	VISA RESOURCE STRING	COMMENT
GPIB	GPIB::xx::INSTR	The GPIB address replaces xx. Address information not included with command sequences. See PAR. 3.3.17 to set GPIB address.
RS-485	ASRLy::INSTR	The com port number replaces y. RS 485 address must be included in each command sequence. See PAR. 3.3.18 to set RS-485 address.
LAN	TCIP::192.168.0.100::5025::SOCKET	5025 is the default socket. See PAR 3.6.3.1, step 3 to verify or change the socket port. Address information not included with command sequences.

3.7.1 SCPI MESSAGES

There are two kinds of SCPI messages: program messages from controller to power supply, and response messages from the power supply to the controller. Program messages consist of one or more properly formatted commands/queries and instruct the power supply to perform an action; the controller may send a program message at any time. Response messages consist of formatted data; the data can contain information regarding operating parameters, power supply state, status, or error conditions.

3.7.2 COMMON COMMANDS/QUERIES

Common commands and queries are defined by the IEEE 488.2 standard to perform overall power supply functions (such as identification, status, or synchronization) unrelated to specific power supply operation (such as setting voltage/current). Common commands and queries are preceded by an asterisk (*) and are defined and explained in Appendix A.

3.7.3 SCPI SUBSYSTEM COMMAND/QUERY STRUCTURE

Subsystem commands/queries are related to specific power supply functions (such as setting output voltage, current, etc.) Figure 3-10 is a tree diagram illustrating the structure of SCPI subsystem commands used in the KLN 750W Power Supply with the root at the left side, and specific commands forming the branches. The following paragraphs introduce the subsystems; subsystem commands are defined and explained in Appendix B.

3.7.3.1 CALIBRATE SUBSYSTEM

This subsystem is used to calibrate the unit, however these commands and queries are not accessible to the user.

3.7.3.2 DISPLAY SUBSYSTEM

This subsystem is used to set and ascertain the brightness on the front panel Voltage and Current displays.

3.7.3.3 FETCH SUBSYSTEM

This subsystem is used to measure and return both voltage and current measurements.

3.7.3.4 OUTPUT SUBSYSTEM

This subsystem is used to control whether the output is on or off, and whether the power supply powers up with the output set to the reset state or to the last settings in effect when the unit was powered off.

3.7.3.5 SOURCE SUBSYSTEM

This subsystem is used to program the output voltage and current of the power supply, associated protection levels and limits and output ramp up and down times. This subsystem is also used to control the memory locations used to store power supply settings for later recall.

3.7.3.6 SYSTEM SUBSYSTEM

This subsystem is used to control the audible beep upon key presses, enabling/disabling the front panel keys and reading of error codes and SCPI version.

3.7.4 UNDERSTANDING THE COMMAND STRUCTURE

Understanding the command structure requires an understanding of the subsystem command tree illustrated in Figure 3-10. The “root” is located at the top left corner of the diagram. The parser goes to the root if:

- a message terminator is recognized by the parser
- a root specifier is recognized by the parser

Starting at the root, there are various branches or paths corresponding to the subsystems. The root keywords for the KLN 750W Power Supply are :CALibrate, :DISPlay, :FETCh, :OUTPut, :SOURce and :SYSTem.

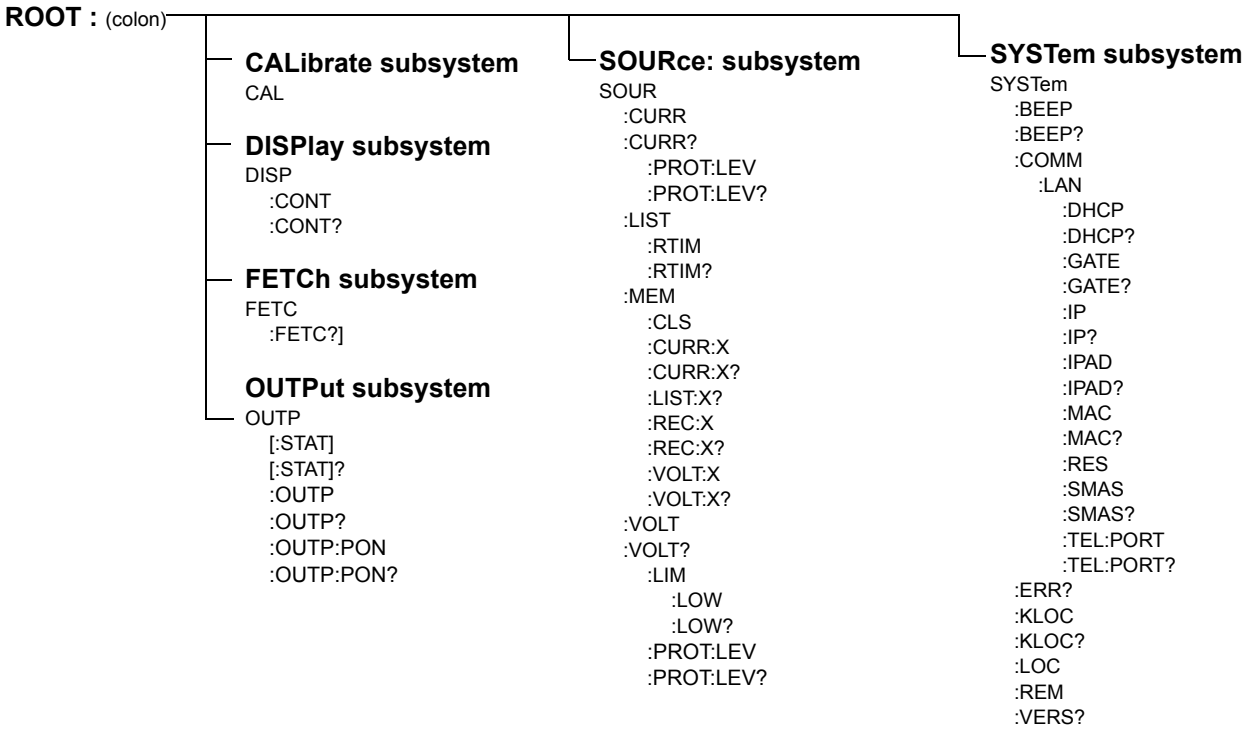


FIGURE 3-10. TREE DIAGRAM OF SCPI COMMANDS USED WITH KLN 750W POWER SUPPLY

SECTION 4 - CALIBRATION

4.1 GENERAL

This section contains the calibration instructions for the Power Supply. It is recommended that the user be familiar with Local Mode operation (PAR. 3.3) before calibrating the unit.

CAUTION: IT IS RECOMMENDED THAT CALIBRATION BE PERFORMED ONLY BY AUTHORIZED PERSONNEL FAMILIAR WITH ELECTRONIC TEST AND CALIBRATION EQUIPMENT.

A full calibration consist of a voltage calibration and a current calibration. Both voltage and current calibrations consist of a full scale calibration.

Calibration of the KLN 750W is performed locally using the front panel controls

NOTE: Calibration of a master/slave configuration requires that both units be restored to standalone operation (see PAR. 3.4.2 or 3.4.4 for instructions) and calibrated individually.

4.2 EQUIPMENT REQUIRED

The following equipment is required to calibrate the KLN Power Supply.

- Digital Voltmeter (DVM) with 6 digits resolution and at least 0.002% accuracy for d-c measurements.

NOTE: Because the voltage measured will be used as a reference for calibration, the DVM used must be accurately calibrated prior to calibrating the power supply.

- Precision Shunt Resistor (with a tolerance of 0.01%, power rating of at least 10 times larger than the maximum stress, and a temperature coefficient equal to or better than 20 ppm per degree C).

NOTE: Proper cooling of the external precision shunt resistor ensures the accuracy of the calibration.

4.3 VOLTAGE CALIBRATION PROCEDURE

1. Turn off power supply and disconnect load from output terminals at the rear of unit.

2. Verify that power supply is configured for local error sensing (PAR. 2.5.7) and connect unit as shown in Figure 4-1.

3. Connect DVM to points “A” of sense terminal block at the rear of power supply as shown in Figure 4-1.

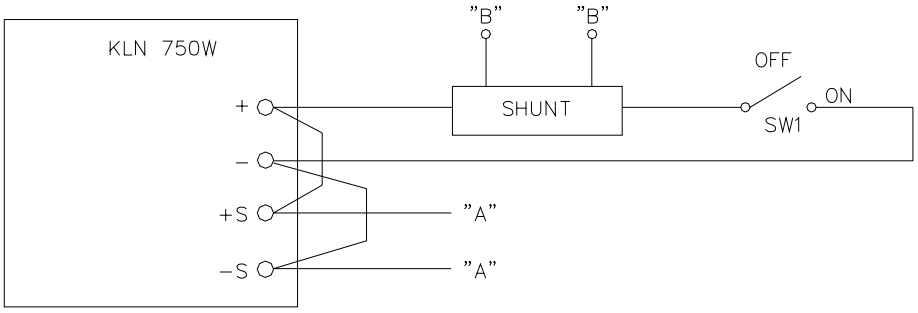


FIGURE 4-1. CALIBRATION SETUP

4. Turn on power to the KLN 750W unit.

5. At KLN 750W front panel, press SHIFT, then press V/OVP key. Use encoder to set Overvoltage protection (see PAR. 3.3.2) to maximum (110% of rated voltage).

6. Press SHIFT, then press A/OCP key. Use encoder to set Overcurrent protection (see PAR. 3.3.3) to maximum (110% of rated current).

7. Press V/OVP key and use encoder to set voltage (see PAR. 3.3.2) to rated voltage of the unit as shown on front panel display.

8. Press A/OCP key and use encoder to set current (see PAR. 3.3.3) to rated current of the unit as shown on front panel display.

9. Refer to Figure 4-1 and set switch SW1 to OFF position.

10. Press OUT key to enable the output.

11. Record voltage shown on front panel display.

12. Record voltage at +S and –S sense terminals using the DVM connected to points “A” as shown in Figure 4-1.

13. Press OUT key to disable the output.

14. Use the menu to gain access to calibration (see PAR. 3.3.28) using password 5958.

15. The Voltage display shows VOL.r and the Current display shows the Voltage Deviation Ratio setting in effect:

    Voltage Deviation Ratio = DVM reading /Front panel reading

16. Press ENTER key to access setting.

17. Calculate the new Voltage Deviation Ratio = (step 12 value)/(step 11 value).

18. Enter the new Voltage Deviation ratio by rotating encoder until Current display shows desired setting for blinking digit. Tap encoder to go to next digit and repeat for all digits, then press ENTER to confirm.

NOTE: If necessary to recalibrate, set Voltage Deviation Ratio to 1.000 and repeat Voltage Calibration procedure.

19. Press SHIFT and ENTER keys to exit.

20. Turn off power to the unit, disconnect DVM and proceed to Current Calibration (PAR. 4.4).

4.4 CURRENT CALIBRATION PROCEDURE

NOTE: This procedure continues from step 20 of Voltage Calibration procedure above.

1. Verify power is off. Connect DVM to points “B” across shunt resistor terminals as shown in Figure 4-1 and set switch SW1 to ON position.

2. Turn on power to the unit and press OUT key to enable the output.

3. Record current displayed on front panel.

4. Connect DVM to points “B” as shown in Figure 4-1, then measure voltage across shunt (DVM reading) and use this value to calculate output current using I (Amperes) = E/R where E is the voltage across the shunt (Volts) and R is the value of the shunt resistor (ohms). Record calculated value.

5. Press OUT key to disable the output.

6. Use the menu to gain access to calibration (see PAR. 3.3.28) using password 5958.

7. Rotate encoder until the Voltage display shows Cur.r and the Current display shows the Current Deviation Ratio setting in effect:

   Current Deviation Ratio = measured output current/front panel reading

8. Calculate the new Current Deviation Ratio = (step 4 value)/(step 3 value).

9. Press ENTER key to access setting.

10. Enter the new Current Deviation Ratio by rotating encoder until Current display shows desired setting for blinking digit. Tap encoder to go to next digit and repeat for all digits, then press ENTER to confirm.

NOTE: If necessary to recalibrate, set Current Deviation Ratio to 1.000 and repeat Current Calibration procedure.

11. Press SHIFT and ENTER keys to exit.

12. Turn off power to the unit, disconnect DVM and disconnect shunt.

APPENDIX A - SCPI COMMON COMMAND/QUERY DEFINITIONS

A.1 INTRODUCTION

This appendix defines the SCPI common commands and queries used with the KLN 750W power supply. Common commands and queries are preceded by an asterisk (*) and are defined and explained in paragraphs A.2 through A.7, arranged in alphabetical order. Table A-1 provides a quick reference of all SCPI common commands and queries used in the Interface Card.

TABLE A-1. IEEE 488.2 COMMAND/QUERY INDEX

COMMAND	PAR.	COMMAND	PAR.
*CLS	A.2	*RST	A.6
*IDN?	A.3	*TST?	A.7
*OPC, ?	A.4, A.5		

A.2 *CLS — CLEAR STATUS COMMAND *CLS

Syntax: *CLS

Description: **Clears status data.** Clears the following registers without affecting the corresponding Enable Registers: Standard Event Status Register (ESR), Operation Status Event Register, Questionable Status Event Register, and Status Byte Register (STB). Also clears the Error Queue.

A.3 *IDN? — IDENTIFICATION QUERY *IDN?

Syntax**:** *IDN?
Return value: Character string

Description: **Identifies the instrument.** This query requests identification. The power supply returns a string which contains the manufacturer name, the model, the serial number and the firmware level. The character string contains the following fields: <Manufacturer>, <Model>, <Serial Number>, <Firmware revision> where: <Manufacturer> = KEPCO, <Model> = KLN 750W model number, <Serial Number> = SSSSSS <Firmware revision=n.m, (e.g, 1.0).

A.4 *OPC — OPERATION COMPLETE COMMAND *OPC

Syntax**:** *OPC

Description: **Causes power supply to set status bit 0 (Operation Complete) to "0" indicating the unit is busy. When pending operations are complete this status bit is set to "1."** This command sets Standard Event Status Register bit 0 to "0." Subsequent *OPC? commands return "0" until all previous commands have been executed and changes in output level have been completed. When all microprocessors are idle, *OPC? return "1."

*OPC? must be proceeded by *OPC to first clear status bit 0, otherwise the *OPC? will return a "1" that has no meaning. This command does not prevent processing of subsequent commands, but bit 0 will not be set until all pending operations are completed. (1 = set = enable function, 0 = reset = disable function). As an example, the controller sends command(s), then sends *OPC. If controller then sends *ESR?, the power supply responds with either a "0" (if the power supply is busy executing the programmed commands), or a "1" (if the previously programmed commands are complete).

A.5 *OPC? — OPERATION COMPLETE QUERY

*OPC?

Syntax**:** *OPC?
Return value: <1 or 0> (ASCII)
0 placed in output queue if power supply has not completed operation after prior *OPC command.
1 placed in output queue when power supply has completed operation.

Description: **Indicates when pending operations have been completed.** *OPC command must be sent to first to clear status bit 0 (Operation Complete). *OPC? will return “0” until all pending operations are complete (all previous commands have been executed and changes in output level have been completed) At that time *OPC? will return “1.” Subsequent commands are not inhibited while status bit 0 is “0.” *OPC? is intended to be used at the end of a command line so that the application program can monitor the bus for data until it receives the “1” from the power supply Output Queue.

A.6 *RST — RESET COMMAND

*RST

Syntax**:** *RST

Description: **Resets power supply to the power on default state.** The power supply output set to power-on default state.

After sending *RST, output voltage is set to 0, output current is set to 0, OVP is set to rated voltage +10% and OCP is set to rated current +10%. It is recommended that this command is always the first command set after remote digital control starts, to ensure that the output is set to zero and control of output on/off is properly enabled.

A.7 *TST? — SELF TEST QUERY

*TST?

Syntax**:** *TST? Returned value: 0 or 1

Description: **Power Supply test.**This query causes the power supply to do a self test and provide the controller with pass/fail results. A 0 is returned if the unit passes the test. A 1 is returned to indicate the unit failed self test.

APPENDIX B - SCPI COMMAND/QUERY DEFINITIONS

B.1 INTRODUCTION

This appendix defines the SCPI subsystem commands and queries used with the KLN 750W power supply. Subsystem commands are defined in PAR. B.3 through B.51. Table B-1 provides a quick reference of all SCPI subsystem commands and queries used in the KLN 750W.

TABLE B-1. SCPI SUBSYSTEM COMMAND/QUERY INDEX

COMMAND	PAR.	COMMAND	PAR.
DISP:CONT, ?	B.3, B.4	SOUR:VOLT:PROT:LEV, ?	B.29, B.30
FETC?	B.5	SYST:BEEP, ?	B.31, B.32
OUTP, ?	B.6, B.7	SYST:COMM:LAN:DHCP, ?	B.33, B.34
OUTP:PON, ?	B.8, B.9	SYST:COMM:LAN:GATE, ?	B.35, B.36
SOUR:CURR, ?	B.10, B.11	SYST:COMM:LAN:IP, ?	B.37, B.38
SOUR:CURR:PROT:LEV, ?	B.12, B.13	SYST:COMM:LAN:IPAD, ?	B.39, B.40
SOUR:LIST:DTIM, ?	B.14, B.15	SYST:COMM:LAN:MAC, ?	B.41, B.42
SOUR:LIST:RTIM, ?	B.16, B.17	SYST:COMM:LAN:RES	B.43
SOUR:MEM:CLS	B.18	SYST:COMM:LAN:SMAS, ?	B.44, B.45
SOUR:MEM:CURR:X, ?	B.19, B.20	SYST:COMM:LAN:TEL:PORT, ?	B.46, B.47
SOUR:MEM:LIST:X?	B.21	SYST:ERR?	B.48
SOUR:MEM:REC:X, ?	B.22, B.23	SYST:KLOC, ?	B.49, B.50
SOUR:MEM:VOLT:X, ?	B.23, B.24	SYST:LOC	B.51
SOUR:VOLT, ?	B.25, B.26	SYST:REM	B.52
SOUR:VOLT:LIM:LOW, ?	B.27, B.28	SYST:VERS?	B.51
NOTE: Commands listed above that are followed by “, ?“ have a related query.			

B.2 NUMERICAL VALUES

<NR1> Refers to integer

<NRf> Refers to Floating (scientific notation: digits with decimal point and Exponent, e.g., 2.71E1 for 27.1.)

B.3 DISP:CONTrast COMMAND — DISP:CONT

Syntax: Short Form: DISP:CONT <NR1> Long Form: DISPlay:CONTrast <NR1>

Description: **Sets the brightness of front panel Voltage and Current displays.**

Argument: <NR1> is a value in the range from 0 to 5.

Example: DISPlay:CONTrast 3 sets display contrast to level 3.

B.4 DISP:CONTrast? QUERY — DISP:CONT?

Syntax: Short Form: DISP:CONT? Long Form: DISPlay:CONTrast

Description: **Returns the brightness level set by DISP:CONT.**

Return Format: <NR1>

B.5 FETCh? QUERY — FETC?

Syntax: Short Form: FETC? Long Form: FETCh?

Description: **Measures actual output voltage and current.** The query performs a measurement and returns the value of DC output current in amperes and DC output voltage in volts.

Return Format: <NRf>

Example: FETC? returns 1.41000E-01, 3.00100E-00 (current is 14.1A and voltage is 3.001V).

B.6 OUTPut COMMAND — OUTP

Syntax: Short Form: OUTP { ON | OFF| 1 | 0 } Long Form: OUTPut { ON | OFF| 1 | 0 }

Description: **Enables or disables the power supply output.**
To enable DC power supply output: <ON> or 1. To disable DC power supply output: <OFF> or 0.

Argument: <ON> or 1 to enable power supply output
<OFF> or 0 to disable power supply output

Example: OUTP ON enables the DC output of the power supply.

B.7 OUTPut? QUERY — OUTP?

Syntax: Short Form: OUTP? Long Form: OUTPut?

Description: **Indicates whether power supply output is enabled or disabled.** Returns 0 if output disabled, returns 1 if output enabled.

Return Format: { 1 | 0 }

Example: OUTP? returns 1 (the DC output of the power supply is enabled).

B.8 OUTPut:PON COMMAND — OUTP:PON

Syntax: Short Form: OUTP:PON { OFF| LAST } Long Form: OUTPut:PON { OFF| LAST }

Description: **Determines power up status of output and operation of OUTP command after power up or recovery from mains loss.** When set to OFF (recommended), the power supply will power up with output off; output on/off can be controlled with OUTP command. When set to LAST (NOT recommended), the power supply will return to the output setting (on or off) in effect when power turned off or lost. If output was off, unit powers up with output off. If output was on, unit powers up with output on, however OUTP command can no longer turn the output off and *RST is required to set output off.

Argument: <OFF> Programs the unit to output off upon power up or recovery from mains loss.
<LAST> Programs the unit to output on/off setting in effect just before the unit was turned off.

Example: OUTP:PON OFF Programs the unit to output off state upon power up or recovery from mains loss and allows OUTP command to set output to on or off.

B.9 OUTPut:PON? QUERY — OUTP:PON?

Syntax: Short Form: OUTP:PON? Long Form: OUTPut:PON?

Description: **Indicates power up status of output and operation of OUTP command after power up or recovery from mains loss.** Returns OFF if unit set to power up with output disabled, returns LAST if unit set to power up with output set to setting in effect before unit was turned off

Return Format: { OFF | LAST }

Example: OUTP:PON? returns OFF (the unit will power up with output off.

B.10 SOURce:CURRent COMMAND — SOUR:CURR

Syntax: Short Form: SOUR:CURR <NRf> Long Form: SOURce:CURRent <NRf>

Description: **Sets the output current value.** Maximum output current is rated current; minimum current is zero.

Argument: <NRf> is a value in the range from 0 to rated current of unit. Rated voltage and current are defined by model (e.g., for KLN 6-100, rated voltage is 6V, rated current is 100A).

Example: SOURce:CURRent 25 sets output current value to 25A.

B.11 SOURce:CURRent? QUERY — SOUR:CURR?

Syntax: Short Form: SOUR:CURR? Long Form: SOURce:CURRent?

Description: **Indicates programmed output current (in amperes).**

Return Format: <NRf>

Example: SOURce:CURRent? returns 2.50000E+01 to indicate output current is programmed to 25A.

B.12 SOURce:CURRent:PROTection:LEVel COMMAND — SOUR:CURR:PROT:LEV

Syntax: Short Form: SOUR:VOLT:PROT:LEV <NRf>
Long Form: SOURce:CURRent:PROTection:LEVel <NRf>

Argument: <NRf> is a value in the range from 10% to 110% of rated current.
MIN is the value programmed for output current (SOUR:CURR)
MAX is 110% of rated current of unit

Description: **Sets the overcurrent protection (OCP) value (in amperes).** OCP values set using this command are in effect once the unit is returned to local operation. Maximum value is 110% of rated voltage. MIN sets OCP to be the same as the value programmed for output current. *RST sets SOUR:CURR:PROT:LEV to maximum value.

Example: SOURce:CURRent:PROtection:LEVel 27.5 sets the overcurrent protection level to 27.5A. This is the maximum value if the unit is a 30V, 25A model. SOUR:CURR:PROT:LEV MIN sets the overcurrent protection level to be the same as the programmed value of output current (SOUR:CURR).

B.13 SOURce:CURRent:PROTection:LEVel? QUERY — SOUR:CURR:PROT:LEV?

Syntax: Short Form: SOUR:CURR:PROT:LEV? Long Form: SOURce:CURRent:PROtection:LEVel?

Description: **Indicates programmed overcurrent protection (OCP) level for output current (in amperes).**

Return Format: <NRf>

Example: SOURce:CURRent:PROtection:LEVel? returns 2.75000E+01 to indicate overcurrent protection level is programmed to 27.5A.

B.14 SOURce:LIST:DTIMe COMMAND — SOUR:LIST:DTIM

Syntax: Short Form: SOUR:LIST:DTIM <NRf> Long Form: SOURce:LIST:DTIMe <NRf>

Description: **Sets the output ramp-down time.**

Argument: <NRf> is a value in the range from 0.0 to 9.9 seconds.

Example: SOURce:LIST:DTIMe 3.0 programs the output ramp-down time to 3.0 seconds.

B.15 SOURce:LIST:DTIMe? QUERY — SOUR:LIST:DTIM?

Syntax: Short Form: SOUR:LIST:DTIM? Long Form: SOURce:LIST:DTIMe?

Description: **Indicates (in seconds) how long output voltage takes to reach zero from programmed value.**

Return Format: <NRf>

Example: SOURce:LIST:DTIMe? returns 3.00000+E00 to indicate ramp-down time is 3.0 seconds.

B.16 SOURce:LIST:RTIMe COMMAND SOUR:LIST:RTIM

Syntax: Short Form: SOUR:LIST:RTIM <NRf> Long Form: SOURce:LIST:RTIMe <NRf>

Description: **Sets the output ramp-up time.**

Argument: <NRf> is a value in the range from 0.0 to 9.9 seconds.

Example: SOURce:LIST:RTIMe 3.0 programs the output ramp-up time to 3.0 seconds.

B.17 SOURce:LIST:RTIMe? QUERY SOUR:LIST:RTIM?

Syntax: Short Form: SOUR:LIST:RTIM? Long Form: SOURce:LIST:RTIMe?

Description: **Indicates (in seconds) how long output voltage takes to reach programmed value.**

Return Format: <NRf>

Example: SOURce:LIST:RTIMe? returns 3.00000E+00 to indicate ramp-up time is 3.0 seconds.

B.18 SOURce:MEMory:CLS COMMAND SOUR:MEM:CLS

Syntax: Short Form: SOUR:MEM:CLS Long Form: SOURce:MEMory:CLS

Description: **Clears all memory locations used for storing and recalling power supply settings.**

Argument: None

Example: SOURce:MEMory:CLS clears all memory locations.

B.19 SOURce:MEMory:CURRent:X COMMAND SOUR:MEM:CURR:X

Syntax: Short Form: SOUR:MEM:CURR:X <NRf> Long Form: SOURce:MEMory:CURRent:X <NRf>

Description: **Sets the memory location defined by X to the current value <NRf>.**

Argument: <NRf> is a value in the range from 0 to rated current of unit.

Example: SOURce:MEMory:CURRent:5 11.6 sets memory location 5 to 11.6A.

B.20 SOURce:MEMory:CURRent:X? QUERY SOUR:MEM:CURR:X?

Syntax: Short Form: SOUR:MEM:CURR:X? Long Form: SOURce:MEMory:CURRent:X?

Description: **Returns current value stored in memory location X (in amperes).**

Return Format: <NRf>

Example: SOURce:MEMory:CURRent:5? returns 11.6 (Voltage stored in memory location 3 is 11.6A).

B.21 SOURce:MEMory:LIST:X? QUERY SOUR:MEM:LIST:X?

Syntax: Short Form: SOUR:MEM:LIST:X? Long Form: SOURce:MEMory:LIST:X?

Description: **For the memory location defined by X, returns voltage (Volts) and current (Amperes) in scientific notation.**

Return Format: <NRf>

Example: SOURce:MEMory:LIST:3? returns 5.00000E+02, 2.50000E-00 (Voltage/Current stored in memory location 3 is 50V, 2.5A).

B.22 SOURce:MEMory:RECall:X COMMAND SOUR:MEM:REC:X

Syntax: Short Form: SOUR:MEM:REC:X Long Form: SOURce:MEMory:RECall:X

Description: **Restores power supply settings to the voltage and current values stored in memory location defined by X.** If the output is off, the recalled voltage and current set values are shown on the front panel Voltage and Current displays. If the output is on, the output changes to the recalled voltage and current values which are also shown on the front panel Voltage and Current displays.

Argument: X is a number from 0 to 15 representing one of 16 memory locations

Example: SOURce:MEMory:RECall:3 sets power supply setpoints to 50V and 2.5A (values previously stored via either front panel or SOURce:MEMory:VOLTage:X and SOURce:MEMory:CURRent:X commands). If output is on, output is changed to 50V, 2.5A. If output is off, set values of 50V and 2.5A are displayed on the front panel.

B.23 SOURce:MEMory:VOLTage:X COMMAND SOUR:MEM:VOLT:X

Syntax: Short Form: SOUR:MEM:VOLT:X <NRf> Long Form: SOURce:MEMory:VOLTage:X <NRf>

Description: **Sets the memory location defined by X to the voltage value <NRf>.**

Argument: <NRf> is a value in the range from 0 to rated voltage of unit.

Example: SOURce:MEMory:VOLTage:5 62.4 sets memory location 5 to 62.4V.

B.24 SOURce:MEMory:VOLTage:X? QUERY SOUR:MEM:VOLT:X?

Syntax: Short Form: SOUR:MEM:VOLT:X? Long Form: SOURce:MEMory:VOLTage:X?

Description: **Returns voltage value stored in memory location X (in volts).**

Return Format: <NRf>

Example: SOURce:MEMory:VOLTage:5? returns 6.24000E+01 (Voltage stored in memory location 5 is 62.4V).

B.25 SOURce:VOLTage COMMAND SOUR:VOLT

Syntax: Short Form: SOUR:VOLT <NRf> Long Form: SOURce:VOLTage <NRf>

Description: **Sets the output voltage value.** Maximum output voltage is 105% of rated voltage; minimum voltage is zero.

Argument: <NRf> is a value in the range from 0 to 105% of rated voltage of unit. Rated voltage and current are defined by model (e.g., for KLN 6-100, rated voltage is 6V, rated current is 100A).

Example: SOURce:VOLTage 30 sets output voltage value to 30V.

B.26 SOURce:VOLTage? QUERY SOUR:VOLT?

Syntax: Short Form: SOUR:VOLT? Long Form: SOURce:VOLTage?

Description: **Indicates programmed output voltage (in volts).**

Return Format: <NRf>

Example: SOURce:VOLTage? returns 3.00000E+01 to indicate output voltage is programmed to 30V.

B.27 SOURce:VOLTage:LIMit:LOW COMMAND SOUR:VOLT:LIM:LOW

Syntax: Short Form: SOUR:VOLT:LIM:LOW <NRf> { MIN | MAX }
Long Form: SOURce:VOLTage:LIMit:LOW <NRf> { MIN | MAX }

Argument: <NRf> is a value in the range from 0 to 95% of rated voltage of unit.
MIN is the minimum value for lower limit
MAX is the maximum value for lower limit

Description: **Sets the lower limit of output voltage (in volts).** The lower limit can be set to a maximum of 95% of rated voltage. Minimum value for lower limit is 0. *RST sets this value to 0.

Example: SOURce:VOLTage:LIMit:LOW 10 sets lower limit for output voltage to 10V. For a 40V model this means that output voltage could not be programmed lower than 10V. SOURce:VOLTage:LIMit:LOW programs the lower limit for the 40V model 38V.

B.28 SOURce:VOLTage:LIMit:LOW? QUERY SOUR:VOLT:LIM:LOW?

Syntax: Short Form: SOUR:VOLT:LIM:LOW? Long Form: SOURce:VOLTage:LIMit:LOW?

Description: **Indicates programmed lower limit for output voltage (in volts).**

Return Format: <NRf>

Example: SOURce:VOLTage:LIMit:LOW? returns 1.00000E+01 to indicate lower limit for output voltage is programmed to 10V.

B.29 SOURce:VOLTage:PROTection:LEVel COMMAND SOUR:VOLT:PROT:LEV

Syntax: Short Form: SOUR:VOLT:PROT:LEV <NRf> { MIN | MAX }
Long Form: SOURce:VOLTage:PROtection:LEVel <NRf> { MIN | MAX }

Argument: <NRf> is a value in the range from 0% to 110% of rated voltage.
MIN is the value programmed for output voltage (SOUR:VOLT)
MAX is 110% of rated voltage of unit

Description: **Sets the overvoltage protection (OVP) value (in volts).** OVP values set using this command are in effect once the unit is returned to local operation. SOUR:VOLT:PROT:LEV MAX sets OVP to maximum value: 110% of rated voltage. SOUR:VOLT:PROT:LEV MIN sets OVP to the same value as programmed voltage (SOUR:VOLT). *RST sets SOUR:VOLT:PROT:LEV to maximum value.

Example: SOURce:VOLTage:PROtection:LEVel 36 sets the overvoltage protection level to 36V. This is the maximum overvoltage protection value if the unit is a 30V model. SOUR:VOLT:PROT:LEV MIN sets OVP to the same value programmed for output voltage (SOUR:VOLT).

B.30 SOURce:VOLTage:PROTection:LEVel? QUERY SOUR:VOLT:PROT:LEV?

Syntax: Short Form: SOUR:VOLT:PROT:LEV? Long Form: SOURce:VOLTage:PROtection:LEVel?

Description: **Indicates programmed lower limit for output voltage (in volts).**

Return Format: <NRf>

Example: SOURce:VOLTage:PROtection:LEVel? returns 4.40000E+01 to indicate overvoltage protection level is programmed to 44V.

B.31 SYSTem:BEEP COMMAND SYST:BEEP

Syntax: Short Form: SYST:BEEP { ON | OFF | 1 | 0 }
Long Form: SYSTem:BEEP { ON | OFF | 1 | 0 }

Description: **Sets the audible beep each time a front panel key is pressed to on or off.**

Argument: <ON> or 1 enables audible beep
<OFF> or 0 disables audible beep

Example: SYSTem:BEEP 1 turns on the audible beep.

B.32 SYSTem:BEEP? QUERY SYST:BEEP?

Syntax: Short Form: SYST:BEEP? Long Form: SYSTem:BEEP?

Description: **Indicates whether audible beep is on or off.** Returns 1 to indicate the beep is on, 0 to indicate beep is off.

Return Format: { 1 | 0 }

Example: SYSTem:BEEP? returns 1 (audible beep is enabled).

B.33 SYSTem:COMMunicate:LAN:DHCP COMMAND SYST:COMM:LAN:DHCP

Syntax: Short Form: SYST:COMM:LAN:DHCP { ON | OFF | 1 | 0 }
Long Form: SYSTem:COMMunicate:LAN:DHCP { ON | OFF | 1 | 0 }

Description: **Allows the IP address to either be assigned from the DHCP server (on) or assigned manually (static IP Address) by the user (off).**

Argument: <ON> or 1 enables DHCP
<OFF> or 0 disables DHCP

Example: SYST:COMM:LAN:DHCP ON assigns the DHCP server to assign the IP address.

B.34 SYSTem:COMMunicate:LAN:DHCP? QUERY SYST:COMM:LAN:DHCP?

Syntax: Short Form: SYST:COMM:LAN:DHCP? Long Form: SYSTem:COMMunicate:LAN:DHCP?

Description: **Indicates whether DHCP is on (enabled) or off (disabled).** Returns 1 to indicate the DHCP is on, 0 to indicate DHCP is off.

Return Format: { 1 | 0 }

Example: SYST:COMM:LAN:DHCP? returns 1 (DHCP is enabled).

B.35 SYSTem:COMMunicate:LAN:GATEway COMMAND SYST:COMM:LAN:GATE

Syntax: Short Form: SYST:COMM:LAN:GATE <address>
Long Form: SYSTem:COMMunicate:LAN:GATEway <address>

Description: **Sets a static default gateway address to be used during communication via the LAN interface.** This command is invalid if DHCP is enabled (on).

Argument: <address> is text format xxx.xxx.xxx.xxx

Example: SYST:COMM:LAN:GATE 192.168.0.1 assigns the static default gateway address to be 192.168.0.1.

B.36 SYSTem:COMMunicate:LAN:GATEway? QUERY SYST:COMM:LAN:GATE?

Syntax: Short Form: SYST:COMM:LAN:GATE? Long Form: SYSTem:COMMunicate:LAN:GATEway?

Description: **Indicates static default gateway address to be used during communication via the LAN interface.**

Return Format: <address> is text format xxx.xxx.xxx.xxx

Example: SYST:COMM:LAN:GATE? returns 192.168.0.1 (static default gateway address).

B.37 SYSTem:COMMunicate:LAN:IP COMMAND SYST:COMM:LAN:IP

Syntax: Short Form: SYST:COMM:LAN:IP <address>
Long Form: SYSTem:COMMunicate:LAN:IP <address>

Description: **Sets the IP address for communication via the LAN interface.** Changing this address requires that power to the KLN 750W be cycled off, then on.

Argument: <address> is text in the format xxx.xxx.xxx.xxx

Example: SYST:COMM:LAN:IP 192.168.0.100 sets the IP address to 192.168.0.100.

B.38 SYSTem:COMMunicate:LAN:IP? QUERY SYST:COMM:LAN:IP?

Syntax: Short Form: SYST:COMM:LAN:IP? Long Form: SYSTem:COMMunicate:LAN:IP?

Description: **Indicates IP address assigned for communication vi the LAN interface.**

Return Format: <address> is text in the format xxx.xxx.xxx.xxx

Example: SYST:COMM:LAN:IP? returns 192.168.0.100 to indicate the IP address is set to 192.168.0.100.

B.39 SYSTem:COMMunicate:LAN:IPADdress COMMAND SYST:COMM:LAN:IPAD

Syntax: Short Form: SYST:COMM:LAN:IPAD <address>
Long Form: SYSTem:COMMunicate:LAN:IPADdress <address>

Description: **Sets the static IP address for communication via the LAN interface.** Changing this address requires that power to the KLN 750W be cycled off, then on.

Argument: <address> is text in the format xxx.xxx.xxx.xxx

Example: SYST:COMM:LAN:IPAD 192.168.0.100 sets the static IP address to 192.168.0.100.

B.40 SYSTem:COMMunicate:LAN:IPADdress? QUERY SYST:COMM:LAN:IPAD?

Syntax: Short Form: SYST:COMM:LAN:IPAD? Long Form: SYSTem:COMMunicate:LAN:IPADdress?

Description: **Indicates IP static address assigned for communication via the LAN interface.**

Return Format: <address> is text in the format xxx.xxx.xxx.xxx

Example: SYST:COMM:LAN:IPAD? returns 192.168.0.100 to indicate the static IP address is set to 192.168.0.100.

B.41 SYSTem:COMMunicate:LAN:MAC COMMAND SYST:COMM:LAN:MAC

Syntax: Short Form: SYST:COMM:LAN:MAC <string>
Long Form: SYSTem:COMMunicate:LAN:MAC <string>

Description: **Sets the MAC address for communication via the LAN interface.** Changing this address requires that power to the KLN 750W be cycled off, then on.

Argument: <string> is text in the format xx-xx-xx-xx-xx-xx.

Example: SYST:COMM:LAN:MAC 70-62-42-00-00-00 sets the MAC address to 70-62-42-00-00-00.

B.42 SYSTem:COMMunicate:LAN:MAC? QUERY SYST:COMM:LAN:MAC?

Syntax: Short Form: SYST:COMM:LAN:MAC? Long Form: SYSTem:COMMunicate:LAN:MAC?

Description: **Indicates MAC address assigned for communication via the LAN interface.**

Return Format: <string> is text in the format xx-xx-xx-xx-xx-xx.

Example: SYST:COMM:LAN:MAC? returns 70-62-42-00-00-00 to indicate the MAC address is set to 70-62-42-00-00-00.

B.43 SYSTem:COMMunicate:LAN:RESet COMMAND SYST:COMM:LAN:RES

Syntax: Short Form: SYST:COMM:LAN:RES
Long Form: SYSTem:COMMunicate:LAN:RESet

Description: **Resets the LAN settings used for communication via the LAN interface to the factory defaults.** This includes the IP address and hostname, so LAN communications could be lost. Factory default LAN settings are: DHCP set to On and IP address set to 192.168.0.100

Argument: none

Example: SYST:COMM:LAN:RES resets LAN settings to factor defaults described above.

B.44 SYSTem:COMMunicate:LAN:SMAS COMMAND SYST:COMM:LAN:SMAS

Syntax: Short Form: SYST:COMM:LAN:SMAS <address>
Long Form: SYSTem:COMMunicate:LAN:SMAS <address>

Description: **Sets the Subnet Mask address for communication via the LAN interface.** Changing this address requires that power to the KLN 750W be cycled off, then on.

Argument: <address> is text in the format xxx.xxx.xxx.xxx

Example: SYST:COMM:LAN:SMAS 255.255.0.0 sets the Subnet Mask address to 255.255.0.0.

B.45 SYSTem:COMMunicate:LAN:SMAS? QUERY SYST:COMM:LAN:SMAS?

Syntax: Short Form: SYST:COMM:LAN:SMAS?Long Form: SYSTem:COMMunicate:LAN:SMAS?

Description: **Indicates Subnet Mask address assigned for communication via the LAN interface.**

Return Format: <address> is text in the format xxx.xxx.xxx.xxx

Example: SYST:COMM:LAN:IP? returns 255.255.0.0 to indicate the Subnet Mask address is set to 255.255.0.0.

B.46 SYSTem:COMMunicate:LAN:TELnet:PORT COMMAND SYST:COMM:LAN:TEL:PORT

Syntax: Short Form: SYST:COMM:LAN:TEL:PORT <Nr1>
Long Form: SYSTem:COMMunicate:LAN:TELnet:PORT <Nr1>

Description: **Assigns port to be used for Telnet communication via the LAN interface.** KLN 750W units use port 8003 for Telnet sessions. Changing this address requires that power to the KLN 750W be cycled off, then on.

Argument: <Nrf> in text format, a number from 0 to 65535

Example: SYST:COMM:LAN:TEL:PORT 8003 assigns port 8083 to be used during Telnet sessions. A Telnet session can typically be started from a host computer shell by sending the IP address followed by the port number, e.g., telnet 192.168.0.100 8003.

B.47 SYSTem:COMMunicate:LAN:TELnet:PORT? QUERY SYST:COMM:LAN:TEL:PORT?

Syntax: Short Form: SYST:COMM:LAN:TEL:PORT?
Long Form: SYSTem:COMMunicate:LAN:TELnet:PORT?

Description: **Indicates port assigned for Telnet communication via the LAN interface.**

Return Format: <Nr1> in text format, a number from 0 to 65535

Example: SYST:COMM:LAN:TEL:PORT? returns 8003 to indicate port 8083 is assigned to be used during Telnet sessions.

B.48 SYSTem:ERRor? QUERY SYST:ERR?

Syntax: Short Form: SYST:ERR? Long Form: SYSTem:ERRor?

Description: **Returns error codes and messages.**

Return Format: <string> is text format in -XXX XXXXXXXXXXXXX

Example: Input command S0URce:VOLTage 2w will cause error. SYSTem:ERR? returns error code “-138,” and sending SYSTem:ERR? again returns no error code “+0,”. Refer to Table for a complete list of error codes.

TABLE B-2. ERROR CODES

Error Code	Explanation
0,“No error”	No error
72, “OVP”	Overvoltage protection error: a. The output voltage is exceeding the OVP value. b. The Analog Programming input for output voltage setting is too high (higher then OVP value).
73, “OCP”	Hardware overcurrent protection error: Output current exceeds 110% of rated current, this OCP value is restricted by hardware and not adjustable.
74, “REMOTE SENSE OVER”	The max. compensation voltage is 5V d-c (the sum of two wires, i.e. 2.5V d-c for each).
75, ““D2D Module 1 fault”	The DC to DC converter module number 1 is failed. There is only one DC to DC module in KLN 750W models.
76, ““D2D Module 2 fault”	Not applicable
77, “Analog shut-off shutdown”	a. The slave unit(s) failed when operate in parallel/series. b. The Pin 23 and Pin 24 of the Analog Programming Port are shorted to shut-off the output.
78, “Software OCP”	Software over current protection error: The output current exceeds the set OCP value (adjustable manually or remotely) for more than 1 second.
79, “AC Fault“	Ac line input abnormal
83, “FAN failed”	One or more fan failed.
84, “D2D Module 3 fault”	Not applicable
85, “D2D Module 4 fault”	Not applicable
-102, “Syntax error”	An unrecognized command or data type was encountered; for example, a string was received when the device does not accept strings.
-104, “Data type error”	The parser recognized a data element different than one allowed; for example, numeric or string data was expected but block data was encountered.
-109, “Missing parameter”	Fewer parameters were received than required for the header; for example, the SYST:BEEP command requires one parameter, so SYST:BEEP is not allowed, while SYST:BEEP ON is allowed.
-221, “Settings confect”	Indicates that a legal program data element was parsed but could not be executed due to the current device state

TABLE B-2. ERROR CODES (CONTINUED)

-222, "Data out of range"	Indicates that a legal program data element was parsed but could not be executed because the interpreted value was outside the legal range as defined by the device.
-223, "Too much data"	Indicates that a legal program data element of block, expression, or string type was received that contained more data than the device could handle due to memory or related device-specific requirements.
-224, "Illegal parameter valid"	Used where exact value was expected. from a list of possible values,
-241, "Hardware missing"	Indicates that a legal program command or query could not be executed because of missing device hardware; for example, an option was not installed.
-313, "Calibration memory lost"	Indicates that nonvolatile calibration data used by the *CAL? command has been lost.
-430, "Query Deadlocked"	Indicates that a condition causing an Deadlocked Query error occurred for example, both input buffer and output buffer are full and the device cannot continue.
-440, "Query Unterminated after indefinite response"	Indicates that a query was received in the same program message after a query requesting an indefinite response was executed
-500 OVP Setting too low	The OVP setting value is lower than output setting value. Error code generated but power unit remains in present condition.
-599, "IP conflict"	The desired IP address already exists on the network.

B.49 SYSTem:KLOCk COMMAND — SYST:KLOC

Syntax: Short Form: SYST:KLOC { ON | OFF | 1 | 0 } Long Form: SYSTem:KLOCk { ON | OFF | 1 | 0 }

Description: **Disables front panel keys and encoder.** Pressing SHIFT/LOC key on the front panel restores functionality to front panel keys and encoder

Argument: <ON> or 1 keys are locked.
<OFF> or 0 key are unlocked.

Example: SYSTem:KLOCk 1 disables the front panel keys and encoder.

B.50 SYSTem:KLOCk? QUERY — SYST:KLOC?

Syntax: Short Form: SYST:KLOC? Long Form: SYSTem:KLOCk?

Description: **Indicates whether front panel keys and encoder are enabled or disabled.** Returns 1 to indicate keys are enabled, 0 to indicated keys are disabled.

Return Format: { 1 | 0 }

Example: SYSTem:KLOCk? returns 1 (front panel keys and encoder are unlocked).

B.51 SYSTem:LOCal COMMAND — SYST:LOC

Syntax: Short Form: SYST:LOC Long Form: SYSTem:LOCal

Description: **Sets the power supply to be in local mode.** The front panel [REMOTE] indicator goes off and the front panel keys and encoder are enabled.

Argument: None

Example: SYSTem:LOCal puts the power supply in local mode.

B.52 SYSTem:REMote COMMAND — SYST:REM

Syntax: Short Form: SYST:REM Long Form: SYSTem:REMote

Description: **Sets the power supply to be in remote mode.** The front panel [REMOTE] indicator lights and the front panel keys and encoder are disabled. Pressing SHIFT/LOC key on the front panel restores the unit to local mode.

Argument: None

Example: SYSTem:REMote puts the power supply in remote mode.

B.53 SYSTem:VERSion? QUERY

SYST:VERS?

Syntax: Short Form: SYST:VERS? Long Form: SYSTem:VERSion?

Description: **Indicates the SCPI version to which unit complies.**

Return Format: <string> where <string> is text in XXXX.X format corresponding to SCPI year and revision.

Example: SYSTem:VERSion? returns 1990.0 (unit complies with SCPI version 1990.0.)