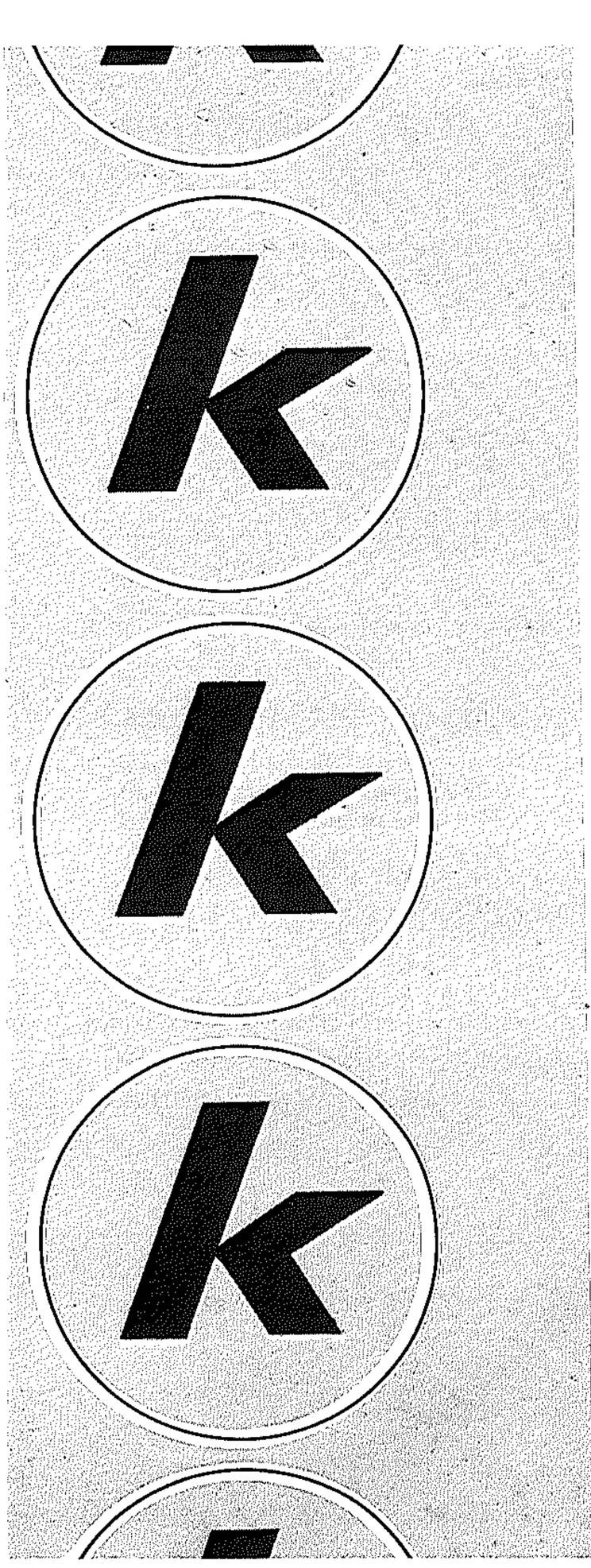


OPERATOR'S MANUAL

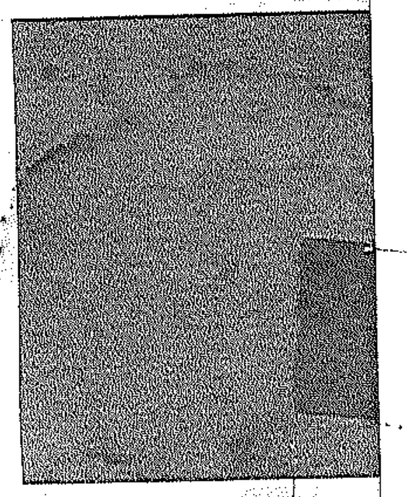
knight®

KG-664 REGULATED HIGH VOLTAGE POWER SUPPLY

SPECIFICATIONS

OUTPUTS	
B+ Voltage	0 to 400 volts DC at 0 to 200 ma. (continuous)
Bias Voltage	0 to —100 volts DC at 1 ma.
Filament Voltage	6.3 volt AC at 3 amps 6.3 volt AC (center tapped) at 3 amps
	Parallel connected 6.3 volts at 6 amps Series connected 12.6 volts at 3 amps
OUTPUT REGULATION	Less than .25% variation in output voltage from no load to full load
INPUT REGULATION	Less than .6% variation in output voltage for ±10 volts variation at 120 volts AC input.
RIPPLE, JITTER AND NOISE	Less than 5 mv RMS
OUTPUT IMPEDANCE	Less than 10 ohms
METERS (2)	Voltmeter switched 0–150 volts 0–400 volts Milliammeter 0–300 ma.

TUBES (7)	4–6L6GC Pass tubes 1–6DK6 Control tube 1–OA2 Regulator 1–OB2 Regulator
SILICON DIODES (7)	750 ma, 800 PIV
OUTPUT TERMINALS	Regulated Output — and + Bias — and + 6.3 VAC 6.3 VAC CT. Chassis ground
SWITCHES	Power Operate—Standby Meter
CONTROLS	C— B+
POWER REQUIREMENTS	110–130 volts AC, 50/60 hz 70 watts—no load
SIZE	7¾" x 14¾" x 9¾" (HWD)
WEIGHT	20 lbs.



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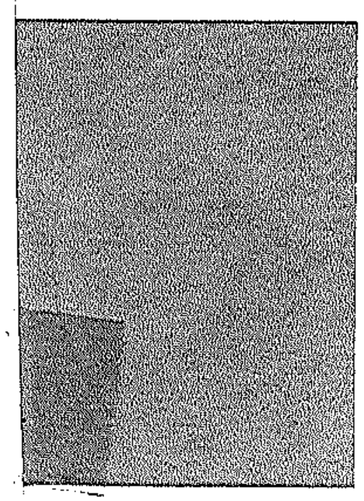

KNIGHT ELECTRONICS CORPORATION
2100 Maywood Drive
Maywood, Ill. 60154

CONNECTING AND OPERATING THE POWER SUPPLY

SWITCHES

METER — This slide switch connects the output voltage meter to either the BIAS or HIGH VOLTAGE circuits so either voltage can be monitored.

POWER — This toggle switch controls the AC line voltage going to the power supply. Voltage is being applied to the power transformer when the switch is in the POWER position.

OPERATE-STANDBY — This toggle switch controls the DC HIGH VOLTAGE at the output terminals. In the STANDBY position the current path to the output terminals is open and no current will flow.

CONTROLS

BIAS (C—) — The BIAS control allows you to set the bias voltage between 0 and —100 volts.

HIGH VOLTAGE (B+) — This control permits precise adjustment of the B+ DC output from 0 to +400 volts at 0 to 200 milliamps output current.

OUTPUT TERMINALS AND CONNECTIONS

The output terminals on the High Voltage power supply are heavy-duty six-way binding posts. They are mounted on ¾" centers, for use with dual banana plugs.

HIGH VOLTAGE OUTPUT CONNECTIONS

CAUTION: To avoid possible shock hazard, always keep the OPERATE-STANDBY switch in the STANDBY position when making connections to the supply.

High Voltage connections are made to the jacks marked "REGULATED OUTPUT" — and +. Connect a wire from the jack marked — to the negative or common point in your circuit, and the + to the positive side.

BIAS VOLTAGE OUTPUT CONNECTIONS

Bias voltage connections are made to the jacks marked BIAS — and +. The jack marked + is usually connected to the negative or common point in your circuit. The jack marked — is connected to the bias point.

FILAMENT VOLTAGE OUTPUT CONNECTIONS

Filament voltage connections are made to the five black jacks marked 6.3 VAC.

For 6.3 volts AC at 3 amps, use either set of jacks marked 6.3 VAC. One set of jacks has a center tap provision.

For 6.3 volts AC at 6 amps, connect the two sets of 6.3 VAC jacks in parallel as shown in Figure 1.

For 12.6 volts AC at 3 amps, connect the two sets of 6.3 VAC jacks in series by adding a wire "link" between the binding posts.

NOTE: An out of phase condition will exist if the filament windings are connected in a manner other than described above. The result will be little or no output from the series or parallel connection.

GROUND CONNECTION

A binding post marked CHASSIS GROUND can be used to ground the entire supply to the circuit to which power is being fed. Since the output of the supply is completely insulated from the chassis, either the + or — of the supply can be connected to the chassis ground. A common connection exists between the — terminal of the Regulated output and the + of the Bias output.

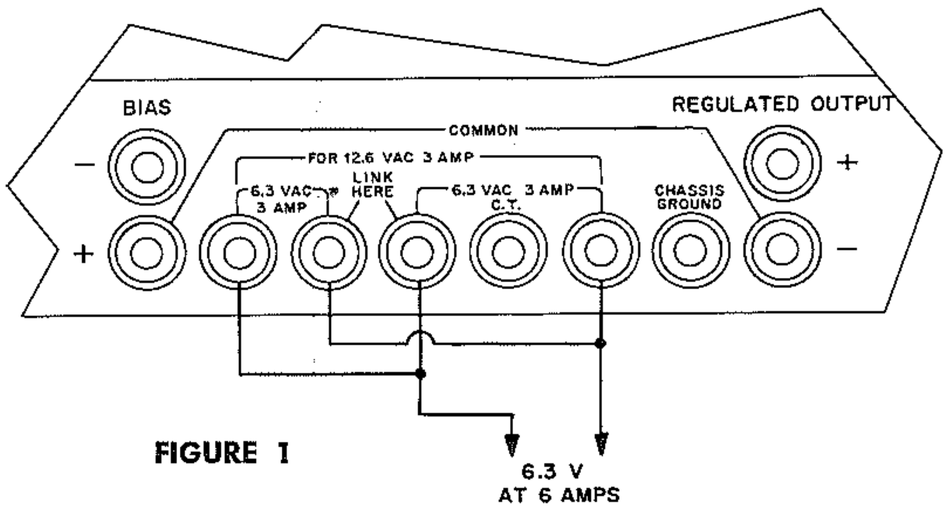

FIGURE 1

HOW TO OPERATE

- ☐ Make your connections to the supply as described under "Output Terminals and Connections".
- ☐ Place the front panel controls and switches in the following positions:
  - C— Fully counterclockwise
  - B+ Fully counterclockwise
  - Power Off
  - Operate-Standby In Standby
- ☐ Attach the line cord to the power supply and insert the plug into a 110-120 volt, 60 hz AC outlet.
- ☐ Place the POWER switch on.
- ☐ Allow 2 minutes for the tubes to warm up.
- ☐ Place the METER switch in the HIGH VOLTAGE position.
- ☐ Adjust the B+ control to the desired voltage.
- ☐ Place the OPERATE-STANDBY switch to OPERATE. The amount of current being drawn will be indicated by the current meter.
- ☐ If you desire to also use the BIAS output, make your connections and set the meter switch to BIAS. Adjust the C— control for the bias you want as indicated by the meter.

MAINTENANCE

Your High Voltage power supply has been designed for many years of trouble-free service. With proper care and handling, very little maintenance should be required. The following suggestions will increase the usefulness of the instrument.

Always keep the OPERATE-STANDBY switch in the STANDBY position when making connections to the supply. When the unit is outside of its case, voltages at some points in the chassis reach as high as 700 volts. USE EXTREME CARE WHEN TAKING VOLTAGE MEASUREMENTS OR MAKING ADJUSTMENTS.

If any tubes or components are replaced, check the calibration of the unit before placing it back in service. Replacement of tubes V-1 thru V-5 requires proper "aging" prior to adjustment. See "Calibrating The Power Supply" for complete information.

To assure long tube and component life, do not block the bottom of the case. The cabinet feet will provide for proper air flow. Allow at least three inches on each side of the case for circulation of air.

DO NOT remove tubes V-5, V-6 or V-7 from their sockets while the supply is turned on. Removal of any one of these tubes will alter the reference voltage for the regulators causing possible damage to other components.

CALIBRATING THE POWER SUPPLY

Calibration of the power supply should be performed on New Kits, or when tubes are replaced. Wired unit are adjusted at the factory.

Tubes V-1 thru V-5 should be "aged" for a period of 8 hours prior to calibration. This "aging" period provides for stabilization of the tubes.

- ☐ Set the METER switch to the HIGH VOLTAGE position. Place the OPERATE-STANDBY switch in the STANDBY position.
- ☐ Turn the POWER switch ON and allow 5 minutes for the tubes to warm up.
- ☐ Set the B+ control to its maximum counterclockwise position.
- ☐ Adjust the ZERO SET control until the meter needle is indicating zero.
- ☐ Rotate the B+ control to its maximum clockwise position.
- ☐ Adjust the 400 V SET control until the meter needle is indicating 400.
- ☐ Repeat the above four steps until the meter needle tracks at both positions of the B+ control.

This completes adjustment of the power supply.

TROUBLESHOOTING

If you should experience difficulty with your power supply, a definite step-by-step routine should be used to locate the trouble. A schematic with key voltage and resistances is supplied to aid you in locating the difficulty.

First check the obvious! Connections to the supply and to the circuit under test.

Next check the tubes on a good mutual conductance tube checker. A weak or defective tube is usually the cause of most troubles.

If you are still unable to locate the difficulty, the following chart with specific troubles has been compiled to give you additional help. The trouble is listed with its probable cause.

TROUBLE	POSSIBLE CAUSE
Power supply dead	Fuse blown. Switch S-1 open. Transformer T-1 open.
No Bias voltage. High Voltage erratic.	Tube V-7 defective.
No control of B+ voltage. Volt meter needle pins.	Tube V-5 or V-6 defective. Resistor R-1 smokes. Diode rectifiers CR-6 or CR-7 shorted.
No High Voltage	Rectifier CR-1 open. Resistor R-1 open. No screen voltage on tubes V-1 thru V-4.
Fuse keeps blowing	Rectifier CR-2, 3, 4, or 5 shorted. Transformer T-1 shorted. 400 volt line shorted.
Tubes not lit	Open filament winding on T-1. Tubes V-6 and V-7 do not require filament current.
Meter will not read DC volts when in High Voltage position	Resistor R-25 open.
Meter will not calibrate on 0-400 volts	Tube V-5 weak or defective. Defective resistors R-17 and R-19.

PARTS LIST

CAPACITORS

Symbol	Description	Part No.
C-1	20/20 μf, 350 volt electrolytic	216-358
C-2	NOT USED	
C-3	100 μf, 350 volt electrolytic	225-488
C-4	100 μf, 350 volt electrolytic	225-488
C-5	.22 μf, 250 volt mylar	299-083
C-6	.1 μf, 600 volt tubular	257-014
C-7	40 μf, 350 volt electrolytic	209-051
C-8	40 μf, 350 volt electrolytic	209-051
C-9	20 μf, 450 volt electrolytic	225-486
C-10	40 μf, 450 volt electrolytic	225-487
C-11	.22 μf, 250 volt mylar	299-083
C-12	.02 μf, 1.6KV disc	298-001
C-13	.02 μf, 1.6KV disc	298-001
C-14	.02 μf, 1.6KV disc	298-001
C-15	.02 μf, 1.6KV disc	298-001

RESISTORS

R-1	1.5K, 2-watt, 5%	334-717
R-2	220K	301-224
R-3	220K	301-224
R-4	100Ω	301-101
R-5	100Ω	301-101
R-6	100Ω	301-101
R-7	100Ω	301-101
R-8	1K	301-102
R-9	1K	301-102
R-10	1K	301-102
R-11	1K	301-102
R-12	1 meg, 5%	302-105
R-13	680K	301-684
R-14	150K	301-154
R-15	1 meg, 5%	302-105
R-16	500K control	392-242
R-17	1 meg, 5%	302-105
R-18	500K control	390-159
R-19	220K	301-224
R-20	250K control	392-210
R-21	27K, 2-watt	307-273
R-22	27K, 2-watt	307-273
R-23	27K, 2-watt	307-273
R-24	27K, 2-watt	307-273
R-25	400K, 1%	344-003
R-26	150K, 1%	341-503
R-27	8.2K	301-822
R-28	50K control	390-106
R-29	2.7K, 5-watt, 5%	382-001
R-30	1.5K, 2-watt, 5%	334-717
R-31	220K	301-224
R-32	220K	301-224

SILICON DIODES

Symbol	Description	Part No.
CR-1	750 ma, 800 PIV	630-051
CR-2	750 ma, 800 PIV	630-051
CR-3	750 ma, 800 PIV	630-051
CR-4	750 ma, 800 PIV	630-051
CR-5	750 ma, 800 PIV	630-051
CR-6	750 ma, 800 PIV	630-051
CR-7	750 ma, 800 PIV	630-051

SWITCHES

S-2	Power	437-169
S-2	Standby	437-169
S-3	Meter	437-117

TRANSFORMER

T-1	Power	107-320

TERMINAL STRIPS

TS-1	13-terminal	440-902
TS-2	8-terminal	440-801
TS-3	13-terminal	440-902
TS-4	8-terminal	440-801
TS-5	8-terminal	440-801
TS-6	2-terminal	440-201
TS-7	2-terminal vertical	442-956

TUBES

V-1	6L6GC	614-295
V-2	6L6GC	614-295
V-3	6L6GC	614-295
V-4	6L6GC	614-295
V-5	6DK6	610-060
V-6	OA2	610-019
V-7	OB2	610-051

MISCELLANEOUS

Description	Quantity	Part No.
Binding post, red	2	534-086
Binding post, black	8	534-087
Bracket, meter switch	1	470-876
Case, top	1	702-135
Case, bottom	1	702-136
Chassis	1	463-658
Clamp, cable	2	880-107
Feet, rubber	4	831-001
Front panel	1	463-659
Fuse, 2.5 amp, slo-blo	1	491-022
Fuse holder	1	492-200
Grommet, 3/8"	2	830-004
Handle, with end pieces	1	860-166
Knob	2	765-074
Line cord	1	809-084
Line cord receptacle	1	509-136
Milliameter, M-2	1	659-284
Pilot lamp, #44	1	640-003
Pilot lamp jewel, red	1	644-575
Pilot lamp shield	1	712-001
Socket, 7-pin miniature	3	501-070
Socket, octal	4	501-180
Socket, pilot lamp	1	644-574
Voltmeter, M-1	1	659-283

HARDWARE

Description	Quantity	Part No.
Screws		
4-40 x 1/4"	16	560-222
6-32 x 5/16"	17	560-343
6-32 x 3/4"	4	560-347
6-32 x 1/2"	5	560-446
#8 Black, sheet metal	12	569-825
Lockwashers		
#4 internal tooth	16	582-200
#6 internal tooth	21	582-300
#8 internal tooth	11	582-400
#8 split-ring	4	587-977
3/8" internal tooth	2	582-700
Nuts		
4-40	16	570-221
6-32	21	570-340
8-32	5	570-440
3/8-32	4	570-840
8-32, knurled	1	572-441
Flat Washers		
3/8"	2	580-702
1/2"	2	580-902
Solder Lugs		
#8	10	553-002
#10	4	553-004

WIRE, SOLDER, TUBING

2" red	10	807-022
3" orange	18	807-023
4" yellow	15	807-024
5" green	5	807-025
6" blue	2	807-026
7" violet	2	807-027
8" gray	2	807-028
9" white	1	807-029
10" brown	1	807-030
11" white/brown	1	807-036
12" white/red	1	807-032
Bare wire	12"	800-600
Solder	12'	930-005
Tubing	24"	812-001

CIRCUIT DESCRIPTION

The Knight-Kit Regulated Power Supply has been designed to supply an output current which can be varied over a wide range (from 0 to 200 ma) while the output voltage remains constant.

The High Voltage (B+) is supplied from a full wave bridge circuit, using four silicon diode rectifiers. This voltage is fed to the plates of four parallel 6L6GC series regulator tubes, the cathodes of which are connected to the output. Meter M-1 indicates the output current in milliamps. To allow the regulator tubes to operate as pentodes, a separate power supply provides the screen grid voltage. This supply consists of a half-wave rectifier, using a silicon diode and a dual section filter capacitor. The common is connected to the regulator cathodes. In this manner, a constant voltage is maintained on the screen grids.

Operating in this manner, the four regulator tubes act as a large variable resistor, the value of which is controlled by a small voltage applied to the control grids. This voltage is produced by the 6DK6 control tube, which operates as a DC voltage feed back amplifier. Its grid is fed from a DC voltage divider connected to the B+ output, while its plate is direct coupled to the regulator grids by four 1K resistors.

These resistors limit the current. This way any voltage variation (caused by changes in output load and/or input voltage) at the output is amplified and fed back to the grids of the regulator tubes. The amplifier output is reversed in polarity and produces a corresponding resistance change in the series regulators. This results in a voltage variation which is in opposition to the output variation, thus cancelling it out.

Screen voltage for V-5 the control amplifier is taken from a DC voltage divider connected between the high voltage supply and the regulated —150 volt supply. The high voltage varies inversely to the changes in the output current. This variation is fed into the screen grid through the divider network. The output impedance of the Power Supply is less than 10 ohms.

The negative bias voltage is produced by two silicon diodes connected in a full wave rectifier circuit. The output feeds two regulator tubes (OA2 and OB2) connected in series, to supply a stable —150 and —255 volts. These two regulated voltages supply a reference for the 6DK6 control amplifier and its DC divider network.

The bleeder resistor network consists of four 27K resistors connected in series between the B+ output and the —255 volt source. This circuit will maintain current flow through the series regulators at all output voltage settings.

R-28, a 50K control, connected across the —150 volt source, provides the variable bias voltage. Bias voltage is coupled to the output terminal through an 8.2K current limiting resistor. This resistor prevents damage to the supply in the event the bias output should accidentally be shorted.

A switch located on the front panel allows the selection of either the B+ or Bias voltage to be read by the output voltmeter.

Heater voltage for the four regulator tubes and control tube is supplied by separate windings on the power transformer. Two additional windings also supply 6.3 volts AC at 3 amps each for the external filament voltage output. These can be connected in parallel for 6.3 volts at 6 amps or in series for 12.6 volts at 3 amps.