B&K PRECISION®

Instruction Manual

Model 1791 High Current Power Supply CE

Limited Two Year Warranty

B & K Precision Corp. warrants to the original purchaser that its product and the component parts therof, will be free from defects in workmanship and materials for a period of two years from the data of purchase.

B & K Precision Corp. will, without charge, repair or replace, at its' option, defective product or component parts. Returned product must be accompanied by proof of the purchase date in the form a sales receipt.

To obtain warranty coverage in the U.S.A., this product must be registered by completing and mailing the enclosed warranty card to B & K Precision Corp. 1031 Segovia Circle, Placentia, CA 92870 within fifteen (15) days from proof of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unanthorized alternations or repairs. It is void if the serial number is alternated, fefaced or removed.

B & K Precision Corp. shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or execlusion may not apply to you.

This warranty gives you specific right and you may have other rights, which vary from state-to-state.

Model Number: _____ Date Purchased: _____

TABLE OF CONTENTS

SECTION	PARTICULARS	PAGE NO.
1	GENERAL INFORMATION	1
2	SPECIFICATIONS	2
3	INSTALLATION	3
4	OPERATING INSTRUCTIONS	4
5	PART LIST & SCHEMATICS	7

SECTION 1
GENERAL INFORMATION

1.1 DESCRIPTION :

The 1791 High Current Regulated D.C. Power Supply is completely solid and suitable for bench operation or standard 19" rack operation. It is a well regulated constant voltage / constant current supply which delivers 0 - 64V at 0 - 10Amps and can be adjusted continuously throughout the output range. When the supply is used as a constant voltage source the front panel VOLTAGE controls can be used to limit the output voltage. When the unit is used as a constant current source, the front panel CURRENT controls can be used to limit the output current. The unit will automatically cross over from constant voltage to current mode and vice-versa if the output current or voltage exceeds these limits.

Output voltage and current are continuously monitored on two front panel meters. The load terminals and remote sense terminals are provided on the front panel. Either the positive or negative output terminal may be grounded or the power supply can be operated floating at upto a maximum of ±300VDC above ground.

1.2 OUTPUT ON/OFF SWITCH :

The output voltage and Current can be preset without connecting the power supply to the load. With the OUTPUT ON/OFF switch in the OFF position, the maximum voltage and current limits can be set. Pressing the OUTPUT ON switch connects the output of the power supply to the load.

1.3 LIMIT SETTING :

The voltage and current limits can be set when the output is not connected to the load. With the OUTPUT ON/OFF switch in the OFF position and the LIMIT switch pressed, the voltage and current limits can be set with the front panel VOLTAGE and CURRENT potentiometers.

1.4 REMOTE PROGRAMMING :

The output voltage of the unit can be programmed between 0 to 64V by means of an external remote programming voltage resistor. An external resistance programming selector link is provided on the rear panel for this purpose.

1.5 REMOTE SENSING :

The degradation in regulation which occurs at the load due to voltage drop in the load leads can be eliminated by using the power supply in the remote sensing mode operation. The remote sensing mode is selected by a push switch on the front panel.

SECTION 2
SPECIFICATIONS

OUTPUT VOLTAGE	:	0-64V DC continuously variable with coarse and fine voltage controls.
LOAD CURRENT	:	0-10 Amp max., continuously variable with coarse and fine controls.
CONSTANT VOLTAGE MODE REGULATION		
LINE	:	Less than ± 0.01% ± 2mV for ±10% change in line voltage.
LOAD	:	Less than ± 0.01% ± 2mV for load change from zero to full load.
RIPPLE & NOISE	:	Less than 1mV rms max.(20 Hz - 20 MHz)
CONSTANT CURRENT MODE REGULATION		
LINE	:	Less than ± 0.05% ±10mA for ±10% change in line voltage.
LOAD	:	Less than ±0.05% ±10mA for change in output voltage from 0 volts to maximum output voltage.
RIPPLE & NOISE	:	Less than 3mA rms.
OVERLOAD PROTECTION	:	Automatic overload and short circuit protection.
TRANSIENT RESPONSE	:	100µsecs to within 10mV of set output voltage for load change from 10% to 90%.
STABILITY :		
Total drift within 8 hours,after	:	± 0.2% ± 10mV in constant voltage mode.
warm up under constant line, load & temp.	:	± 0.5% ± 10mA in constant current mode.
PANEL METERS	:	Digital panel meters(marked V for voltmeter and A for ammeter) are provided with an accuracy of ± 3 counts.
MODE INDICATION	:	Respective LED lights up when the unit is working in CV or CC mode.
SET LIMIT/ ON-OFF CONTROLS	:	Push Switches for Limit (V & A) and output ON/OFF setting.
OUTPUT CONTROLS	:	Single turn coarse and fine voltage and current controls are provided on the front panel
EXTERNAL PROGRAMMING	:	Output voltage can be programmed by a variable resistance of 20K
OPERATING TEMPERATURE	:	0-40°C.
INPUT VOLTAGE	:	120/230V AC, ± 10% 47 - 63Hz single phase.
DIMENSIONS	:	19"(W) x 15.75"(D) x 5.24"(H).
WEIGHT	:	55 lbs.

SECTION 3
INSTALLATION

3.1 INITIAL INSPECTION :

As soon as the power supply 1791 unit is unpacked, inspect for any damage that may have occurred during transit. Save all packing material until inspection is completed. If any damage is found, notify the carriers immediately. Our authorised representatives should also be notified.

3.2 PHYSICAL CHECK :

This check should confirm that there are no broken knobs or connectors, that the cabinet and panel surfaces are free of dents and scratches and the meters are not scratched and cracked.

3.3 ELECTRICAL CHECK :

The power supply unit 1791 should be checked against electrical specifications. An in-cabinet performance check will verify proper operation.

3.4 INSTALLATION DATA :

The power supply unit 1791 is shipped ready for bench operation. It is necessary only to connect the unit to a rated source of power (120V AC) and it is ready for operation.

3.5 LOCATION :

The power supply 1791 unit is fan cooled. Sufficient space should be kept around the unit while in operation, so that unit do not remain in confined space or close to another heating source.The ambient temperature of the area around the unit should be less than 40°C.

3.6 RACK MOUNTING :

The unit is in rack size and can be rack mounted in a conventional rack using standard mounting screws and the rack attachments optionally supplied.

3.7 INPUT POWER REQUIREMENTS :

The power supply 1791 unit may be operated continuously from input voltage of 120V or 230V AC 47 - 63Hz power source. It is factory wired for 120V AC operation.

3.8 REPACKAGING FOR SHIPMENT :

To ensure safe shipment of the power supply 1791 unit, it is recommended that the package designed for the unit be used. The original packaging material is reusable. Be sure to attach a tag to the unit specifying the owner, and the fault observed with a brief description.

SECTION 4
OPERATING INSTRUCTIONS

4.1 TURN ON SETTING PROCEDURE :

The following procedure describes the use of controls and indicators for Constant Voltage and Constant Current Mode of Operation.

CONSTANT VOLTAGE (CV) MODE :

a. Set 'POWER ON' Switch & keep the OUTPUT ON/OFF switch to OFF position.
b. Press LIMIT switch and adjust the VOLTAGE controls till the desired voltage is indicated on Voltmeter.
c. Press OUTPUT switch to ON position and observe that CV LED lights.

CONSTANT CURRENT VOLTAGE (CC) MODE :

a. Turn off the suppy. Short circuit the output terminals of the power supply & turn on the supply.
b. Keep the OUTPUT ON/OFF switch in the OFF position.
c. Press LIMIT switch and adjust the CURRENT controls till the desired current is indicated on Ammeter.
d. Press OUTPUT switch ON position and observe that CC LED lights.
e. Remove the short circuit.

4.2 SET LIMIT CONTROL (VOLTAGE AND CURRENT) :

To preset the output Voltage and Current, proceed as follows :

a. Set the OUTPUT switch to OFF position.
b. Press the LIMIT switch and adjust the desired output voltage with the VOLTAGE control potentiometers.
c. Release the LIMIT switch, set the OUTPUT switch to ON position and check the output voltage on the voltmeter.
d. Set the OUTPUT switch to OFF position.
e. Press the LIMIT switch and adjust the desired output current limit with the CURRENT control potentiometers.
f. Release the LIMIT switch, set the OUTPUT switch to ON position and check the output current on the ammeter.
g. Set the OUTPUT switch to OFF position.
h. Connect the load to the Output terminals and set the OUTPUT switch to ON position.

4.3 LOAD CONNECTIONS :

The load should be connected to the power supply output terminals using separate pairs of connecting wires. This will minimize mutual coupling effects between loads and will retain full advantage of the low output impedance of the power supply. Each pair of connecting wires should be as short as possible and twisted or shielded to reduce noise pick up. (If a shielded pair is used, connect one end of the shield to ground and leave the other end unconnected).

4.4 If load considerations require that the output power distribution terminals be remotely located from the power supply ,then the power supply output terminals should be connected to the remote distribution terminals via a pair of shielded or twisted wires and each load should be separately connected to remote distribution terminals.

4.5 Positive or negative voltage can be obtained from this supply by grounding either one of the output terminals or one end of the load. Always use two leads to connect load to the supply, regardless of where the setup is grounded. This will eliminate any possibility of the output current return paths through the power source ground which would damage the line cord plug. This supply can also be operated upto ±300V DC above ground, if neither output terminal is grounded.

4.6 REMOTE SENSING :

Warning : Do not Operate the Unit in'REMOTE SENSE' mode without ensuring proper 'REMOTE / 4 TERMINAL' Connections. Serious Damage to Unit or Equipment under test could result.

Remote sensing is used to maintain good regulation at the load and reduce the degradation of regulation which could occur due to the voltage drop in the leads betweeen the power supply and the load. Remote sensing is accomplished by connnecting the load to remote sense terminals on the front panel. The leads from the sensing(+S and -S) terminals to the load will carry much less current than the load leads and it is not required that these leads be as heavy as the load leads. However, they must be twisted or shielded to minimize noise pickup.

For reasonable lengths of load leads, remote sensing greatly improves the performance of the supply. However, if the load is located at a considerable distance from the supply, added precautions must be observed to obtain satisfactory operation. Notice that the voltage in the load leads subtracts directly from the available output voltage and also reduces the amplitude of the feedback error signals that are developed within the unit. Because of these factors, it is recommended that the drop in each load lead does not exceed 0.5Volts.

NOTE : Due to the voltage drop in load leads, it may be necessary to readjust the current limit in the remote sensing mode.

Observance of the precautions in para. 4.8 and 4.9 will result in a low dc output impedance at the load. However, another factor that must be considered is the inductance of long leads.This causes a high ac impedance and could affect the stability of the feed back loop seriously enough to cause oscillations. If this is the case , it is recommended that the following actions be taken:

a) Adjust R145 to remove oscillations, or to achieve best possible transient response for given long load lead configuration.

b) If performing adjustment in step (a) above does not remove oscillation, disconnect output capacitor C2(L-3220 B & K -TER/01 PCB) and connect a capacitor having similar characteristics (approximately the same capacitance, the same voltage rating or greater, and having good high frequency characteristics) directly across load using short leads.
Readjust R145 as in step (a) above after making this change.

4.7 OUTPUT CAPACITANCE :

Internal capacitor C2 (L-3220 B & K -TER/01 PCB) connected across the output terminals of the power supply, helps to supply high current pulses of short duration during constant voltage operation. Any capacitance added externally will improve the pulse current capability, but will decrease the safety provided by the constant current circuit. A high current pulse may damage load components before the average output current is large enough to cause the constant current circuit to operate.

The effects of the output capacitor during constant current operation are as follows:

a. The output impedance of the power supply decreases with increasing frequency
b. The recovery time of the output voltage is longer for load resistance changes.
c. A large surge current causing a high power dissipation in the load occurs when the load resistance is reduced rapidly.

4.8 REVERSE VOLTAGE LOADING :

A diode CR1 is connected across the output terminals. Under normal operation, the diode is reverse biased (anode connected to the negative terminal). If a reverse voltage is applied to the output terminals (positive voltage applied to the negative terminal), the diode will conduct, shunting current across the output terminals to the forward voltage drop of the diode. This diode protects the series transistor and the output electrolytic capacitors.

4.9 REVERSE CURRENT LOADING :

Active loads connected to the power supply may actually deliver a reverse current to the power supply during a portion of its operating cycle.

An external source cannot be allowed to pump current into the supply without loss of regulation and possible damage to the output capacitor. To avoid these effects, it is necessary to preload the supply with a dummy load resistor so that the power supply delivers current through the entire operation cycle of the load device.

4.10 EXTERNAL PROGRAMMING :

Remote external programming can be achieved changing the external program link on rear panel and connecting a variable resistor of 20K across the terminals as shown on the rear panel.

SECTION 5
PART LIST & SCHEMATICS

1. PRSR-0896 PCB ASSY

Reference Designator	Part Description	Reference Designation	Part Description
RESISTORS			
R101	4E7	R129	Not Used
R102	1K5	R130	330K
R103	100K	R131	Not Used
R104	3K9	R132	3K6
R105	10K	R133	Not Used
R106	180K	R134	1K
R107	8K2	R135	4K7 (SEL)
R108	5K, Preset	R136	Not Used
R109	390E	R137	15K
R110	10K	R138	2K
R111	3K3, 2W	R139	Not Used
R112	10K	R140	5K1
R113	270E, 2W	R141	6K8
R114	10K	R142	5.6K
R115	150K (SEL)	R143	3.3K (SEL)
R116	6K8	R144	6.2K (SEL)
R117	390K (SEL)	R145	7.5K
R118	12K	R146	1K
R119	820E	R147	1K
R120	24E	R148	100E (SEL)
R121	65K (SEL)	R149	6K8
R122	3K9	R150	Not Used
R123	680K (SEL)	R151	2K
R124	560E	R152	1K
R125	4K7	R153	Not Used
R126	15E	R154	Not Used
R127	Not Used	R155	Not Used
R128	1K		
PRESETS			
PR101	500E, LIN, (H)	R108	5K, LIN, (H)
PR102	500E, LIN, (H)		
ZENERS			
Z101	10V, 0.4W	Z102	4.7V, 0.4W
DIODES			
CR101	1N4007	CR111	1N4007
CR102	1N4007	CR112	1N4007
CR103	1N4007	CR113	1N4007
CR104	1N4007	CR114	1N4007
CR105	1N4007	CR115	1N4007
CR106	1N4007	CR116	1N4007
CR107	1N4007	CR117	1N4007
CR108	1N4007	CR118	1N4007
CR109	1N4007	CR119	1N4007

1. PRSR-0896 PCB ASSY

Reference Designator	Part Description	Reference Designation	Part Description
CR120	1N4007	CR125	1N4148
CR121	1N4007	CR126	1N4148
CR122	1N4007	CR127	1N4148
CR123	1N4007	CR128	1N4148
CR124	1N4007	CR129	1N4007
BRIDGE			
B101	CSB-1 (1A-100V) X2		
CAPACITORS			
C101	0.1µF/50V, MP	C114	10µF/50V, ELE
C102	470µF/50V, ELE	C115	470µF/50V, ELE
C103	33µF/50V, ELE	C116	Not Used
C104	1µF/50V, ELE	C117	2.2µF/100V, ELE
C105	10µF/50V, ELE	C118	220µF/50V, ELE
C106	4.7µF/50V, ELE	C119	Not Used
C107	100µF/50V, ELE	C120	0.1µF/50V, CD
C108	470µF/35V, ELE	C121	0.1µF/50V, CD
C109	0.1µF/50V, CD	C122	0.1µF/50V, CD
C110	0.1µF/50V, CD	C123	10µF/50V, ELE
C111	1KPF/50V, CD	C124	10µF/50V, ELE
C112	10µF/50V, ELE	C125	0.1µF/50V, CD
C113	1KPF/50V, CD	C126	0.1µF/50V, CD
C127	0.1µF/50V, CD	C128	10µF/50V, ELE
TRANSISTORS			
Q101	MPSA 12	Q104	BC557
Q102	BC109	Q105	BC547
Q103	BC557	Q106	NOT USED
IC			
IC101	LM324	IC102	NOT USED
REGULATORS			
VR101	LM7812	VR104	LM7812 / 7824
VR102	TL431	VR105	79L05
VR103	TL431	VR106	LM7805
CONNECTORS			
CON101	2.54mm PITCH, 12 PIN	CON104	2.54mm PITCH, 5PIN
CON102	2.54mm PITCH, 12 PIN	CON105	Not Used
CON103	2.54mm PITCH, 4 PIN		

2. HPS-PC /03. PCB ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
RESISTORS			
R1	270E/2W, CFR	R3	10E, 0.25W, 5%, MFR
R2	10E, 0.25W, 5%, MFR		
CAPACITOR			
C1	0.1µF/250V AC		
DIODES			
CR1	1N4007	CR2	1N4007
CONNECTORS			
CON1	2.54mm PITCH, 4 PIN	CON2	2.54mm PITCH, 3 PIN
MISCILLANEOUS			
L1	10uH CHOKE	TX1	PULSE X'MER

3. Z-DPM/02 REV - 01 X 2

Reference Designator	Part Description	Reference Designation	Part Description
RESISTORS			
R1	39K, 0.25W, 5%, MFR	R6	2K4, 0.25W, 5%, MFR
R2	470K, 0.25W, 5%, MFR	R7	330K, 0.25W, 5%, MFR
R3	1M, 0.25W, 5%, MFR	R8	330K, 0.25W, 5%, MFR
R4	SEL (INPUT)	R9	6K8 , 0.25W, 5%, MFR
R5	10K, 0.25W, 5%, MFR		
PRESETS			
PR1	25K, LIN, VER (REF ADJ)		
CAPACITOR			
C1	220uF/50V, CD	C4	0.1uF/100V, MP
C2	0.1uF/100V, MP	C5	0.1uF/100V, MP
C3	0.01uF/100V, MP	C6	0.1uF/100V, MP
IC's			
IC1	7107 DECODER DRIVER		
VR1	TL - 431		
FND's			
DS1 to DS3	TSD566 GREEN (V)	DS4 to DS6	TSD566 RED (A)
MISCILLANEOUS			
J1	2.54 PITCH, 3 PIN M	J3	2.54 PITCH, 4 PIN M
J2	Not Used		

L3220 B & K-TER/01. PCB ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
RESISTORS			
R1	1K, 10W		
CAPACITORS			
C1	0.1µF/100V, CD	C2	2200µF, 80V, ELE

HSRECT/01. PCB ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
DIODES			
CR1	70HFR20	CR3	70HF20
CR2	70HFR20	CR4	70HF20
SCR			
SCR1	SKKT 15/08 (BACK TO BACK SCR)		
FAN			
FAN1	12V / 24V DC INNOVATIVE		

5. HSMFT/01. PCB ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
FET			
Q*	2 X IRFP 150		
SHUNT			
R154	0.05E/25W		
ZENER			
Z1	10V, 0.4W		
FAN			
FAN2	24V DC INNOVATIVE		

6. FRONT PANEL ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
POT			
VR1	20K, WWPOT	VR3	1K, WWPOT
VR2	1K, WWPOT	VR4	50E, WWPOT
LED			
CV LED	3mm LED, GRN	CC LED	3mm LED, RED
SWITCH			
SW1	16A/250V ON/OFF SWITCH		

7. MAIN CHASSIS ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
RESISTOR			
R1	4.7K/2W, MOR		
DIODES			
CR1	U30D40C (30AMP/400V DUAL DIODE)		
CAPACITORS			
C1	8 X 4700µF, ELE / 100V		
FILTER	20A, RFI FILTER		
VARISTOR	130V		

8. BACK TROUGH ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
FUSE			
FUSE1	15AMP, TYPE F		

9. L3220RS/01 PCB ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
RESISTORS			
R1	SHORT	R3	68K, 0.25W, 5% MFR
R2	SHORT		
CAPACITORS			
C1	470µF/80V, ELE	C2	100µF, 80V, ELE

10. 1790-PR/03 (030499) PCB ASSLY

Reference Designator	Part Description	Reference Designation	Part Description
RESISTORS			
R1	SEL	R6 & 7	SEL
R2	2K, 0.25W, 5% MFR	R8	1K, 0.25W, 5% MFR
R3	91K, 0.25W, 5% MFR	R9	1K, 0.25W, 5% MFR
R4	SEL	R10	560E, 0.25W, 5% MFR
R5	2K20, 0.25W, 5% MFR	R11	510E, 0.25W, 5% MFR
PRESETS			
PR1 to 4	100E (HORIZONTAL)		

SAFETY

INSULATION CLASS I, POLLUTION DEGREE 2 : IEC 1010 -1

This instrument has been built & tested as per IEC publications prepared by Technical Committee No. 66(Ref. No. CEI/ IEC 1010-1:1990) : Safety requirements for electrical equipment for measurement,control & laboratory use.This instructions manual provides information and warning data which must be taken into consideration by the user for safety of operator and instrument.

SAFETY PRECAUTIONS TO BE TAKEN BEFORE SETTING THE INSTRUMENT INTO SERVICE :

Warning : Any interruption of the safety lead inside or outside the unit or disconnection of the protection ground terminal may render the instrument dangerous. An intentional disconnection is prohibited.

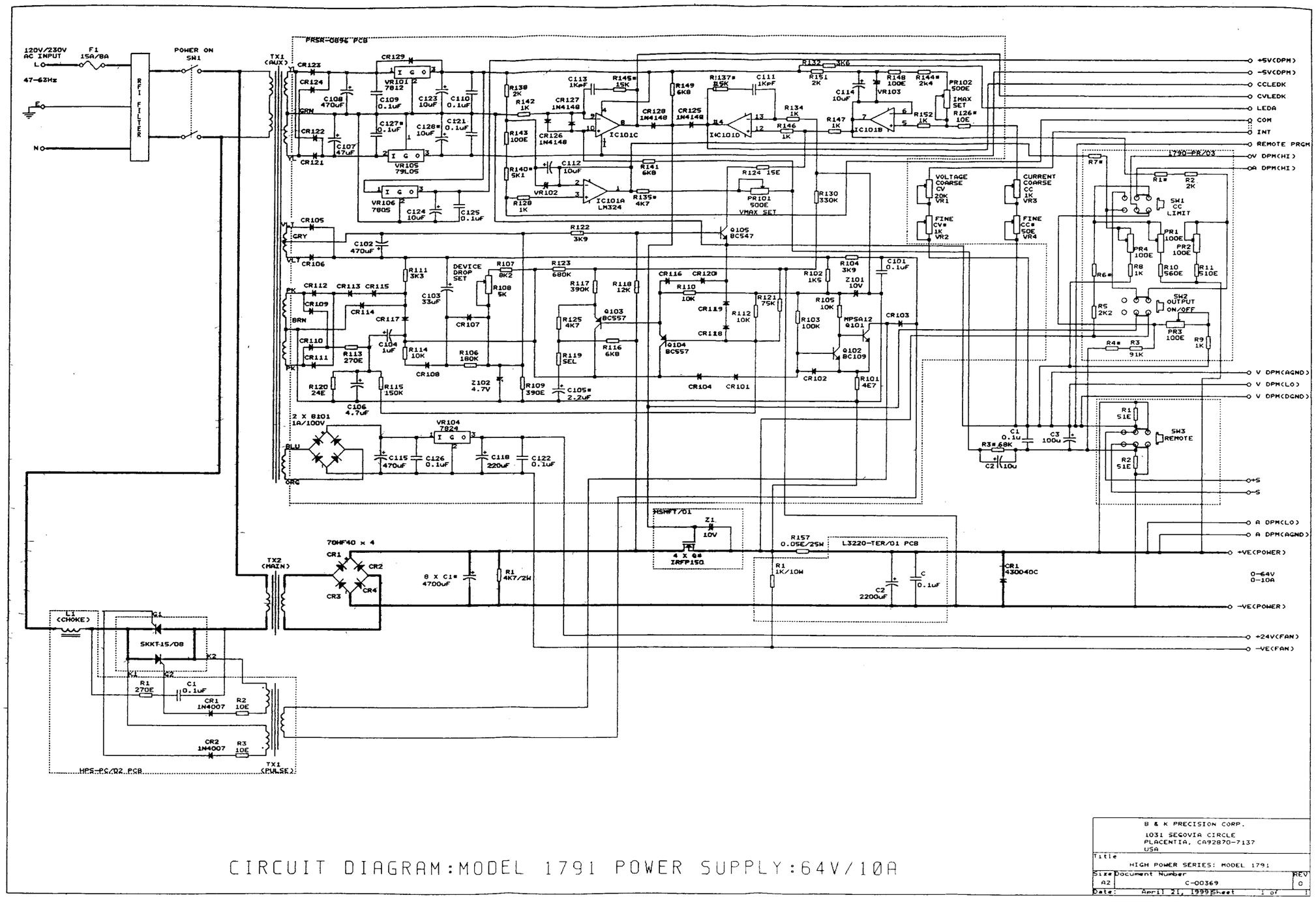
When the instrument is to be supplied via an autotransformer, in order to reduce the supply voltage available, make sure the common terminal is connected to the neutral point (grounded) of the supply circuit. The jack should only be into a plug fitted with a grounding piece. The safety connection should never be interrupted by the use of an extension cord without a protection (ground) lead. The power supply cord must be connected to the mains network (with good value), before connecting the control of the measuring circuits.

SYMBOLS (as marked on equipment or in this manual) :

DANGER High Voltage.

Protective ground (earth) terminal.

ATTENTION - Refer to manual.
This symbol involves a mandatory reference to the operating manual. The User is required to refer and follow the relevant instructions.



CIRCUIT DIAGRAM:MODEL 1791 POWER SUPPLY:64V/10A

B & K PRECISION CORP.
1031 SEGOVIA CIRCLE
PLACENTIA, CA92870-7137
USA

Title	HIGH POWER SERIES: MODEL 1791	
Size: A2	Document Number: C-00369	REV: 0
Date: April 21, 1999	Sheet 1 of 1	

Service Information

Warranty Service : Please return the product in the original packaging with proof of purchase to the below address. Clearly state in writing the performance problem and return any leads, connectors and accessories that you are using with the device.

Non-Warranty Service : Please return the product in the original packaging to the below address. Clearly state in writing the performance problem and return any leads, connectors and accessories that you are using with the device. Customers not on open account must include payment in the form of a money order or credit card. For the most current repair charges contact the factory before shipping the product.

Return all merchandise to B & K Precision Corp. with pre-paid shipping. The flat-rate repair charge includes return shipping to locations in North America. For overnight shipments and non-North America shipping fees contact B & K Precision Corp.

B & K Precision Corp.
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Placentia, CA 92870
Phone: 714-237-09220
Facsimile: 714-237-9214

Include with the instrument your complete return shipping address, contact name, phone number and description of problem.