HIGH VOLTAGE
POWER SUPPLY
Model 3105
Operator's Manual
HIGH VOLTAGE POWER SUPPLY
MODEL 3105

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HIGH VOLTAGE POWER SUPPLY
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Section 1
INTRODUCTION

1.1 GENERAL DESCRIPTION

The Canberra Model 3105 is a NIM high voltage power supply designed primarily for operation with semiconductor detectors. It is particularly well suited for use with high resolution detector systems. By design, the 3105 will accommodate all types of detectors requiring up to 5kV bias and up to 100µA of current.

The Model 3105 will withstand any overload or direct output short circuit for an indefinite period of time and provide normal output after the ON-OFF switch is reset. Output voltage is continuously adjustable over the full range from 0 to ±5000 volts by means of a five turn control. The output voltage can also be turned on and off through the INHIBIT BNC on the rear panel. Grounding the INHIBIT BNC shuts it down. This feature is desirable for detector and preamplifier protection in numerous applications. A large edgewise front panel meter is provided to monitor the output voltage.

A polarity reversal connector provides selection of positive or negative output polarity. To prevent inadvertent polarity reversal, the connector is located inside the module. The polarity is indicated by illumination of either the positive or negative LED on the front panel for the safety and the convenience of the user.
Section 2
SPECIFICATIONS

2.1 INPUTS
INPUT POWER
Powered from standard NIM bin and power supply, such as Model 2000.

2.2 OUTPUTS
REGULATED HIGH VOLTAGE
0 to ± 5000 VDC, continuously adjustable; 0 to 100μA output current capability; one rear panel SHV high voltage coaxial connector.

2.3 CONTROLS
2.3.1 FRONT PANEL
ON-OFF
Front panel 2-position toggle switch to enable or disable output.

OUTPUT VOLTAGE
Front panel 5-turn direct readout dial permits continuous adjustment of the output voltage from 0 to ± 5000 VDC.

2.3.2 REAR PANEL
INHIBIT
Rear panel BNC to turn off the high voltage. Short circuit turns it off. Open circuit resumes output.

2.3.3 INTERNAL
POLARITY
Internal connector changes output polarity by reversing orientation.

2.4 INDICATORS
OUTPUT VOLTAGE
Edgewise panel meter to monitor output voltage.

POLARITY
Front panel LED indicator lights for positive or negative polarity indication.

2.5 PERFORMANCE
RIPPLE AND NOISE
≤ 2mV peak to peak.

OUTPUT STABILITY
Long term drift of output voltage is ≤ 0.01%/hr. and ≤ 0.02%/8 hr. at a constant input line voltage, load, and ambient temperature after a 30 minute warmup.

REGULATION
≤ 0.001% variation in output voltages for line and load changes within the operating range at constant ambient temperature.
TEMPERATURE COEFFICIENT

≤ ± 50ppm/°C after 30 minute warmup, operating range 0 to 50°C.

OVERLOAD PROTECTION

Power supply will withstand any overload, including a short circuit for an indefinite period, and will resume normal operation after manual reset.

CALIBRATION ACCURACY

0.5% of dial setting +0.25% of full scale.

RESETABILITY

Output voltage can be reset to within 10 volts.

OUTPUT LOAD CAPACITY

0 to 100μA.

OUTPUT RANGE

0 to ± 5000 VDC.

2.6 CONNECTORS

2.7 POWER REQUIREMENTS

Rear panel SHV.

Rear panel BNC, UG 1094/U.

Provided by Model 2000 BIN/power supply as required:

+12V — 50mA

-12V — 50mA

+24V — 83mA

-24V — 83mA

2.8 PHYSICAL

SIZE

Standard single width NIM module (1.35 x 8.714 inches), (3.42 cm x 22.13 cm) per TID-10893 (rev.).

NET WEIGHT

2 lbs. (0.9 kg).

SHIPPING WEIGHT

7 lbs. (3.15 kg).
BASIC WARRANTY

Equipment manufactured by Canberra Industries, Inc. is warranted against defects in materials and workmanship for a period of twelve months from date of shipment, provided that the equipment has been used in a proper manner as detailed in the instruction manuals. During the warranty period, repairs or replacement will be made at Canberra's option on any equipment returned to Canberra which is found, to the satisfaction of Canberra, to be defective. This warranty is non-transferrable to subsequent owners.

The customer must notify Canberra of any equipment defects within 30 days of receipt of equipment. Any claim not so notified will be void. If repairs or replacement are made, the equipment will be returned to the customer at the customer's expense and risk.

The warranty does not cover damage caused by misuse, accident, or neglect, or by alteration or modification of the equipment. The warranty also does not cover defects resulting from incorrect operation, installation, or maintenance.

SOFTWARE

Canberra warrants software media from defects discovered within 30 days after receipt.

Installation assistance for software development is available and can be contracted through the Sales Department.

INSTALLATION

Installation of equipment purchased from Canberra shall be the sole responsibility of the customer unless the installation is specifically contracted for at the prevailing Canberra field service rates. To ensure timely installation after receipt of equipment, it is recommended that installation be contracted for at the time the equipment is ordered.

ON-SITE WARRANTY OPTION

The On-Site Warranty Option provides for on-site warranty work (Canberra pays all travel and living expenses) within the first 90 days after delivery of equipment to the customer. If installation is ordered from Canberra, the 90-day period commences upon completion of the initial installation. After the 90-day period, labor and materials used on site will still be covered by the basic warranty, but the customer shall pay all travel expenses and living expenses incurred for any on-site service.

A maintenance contract may be purchased covering the period after the 90-day on-site warranty period, or after initial installation of the equipment.

REPAIRS

Any Canberra-manufactured instrument no longer in its warranty period may be repaired, freight prepaid, to our factory for repair and realignment. When returning instruments for repair, contact the Customer Service Department for shipping instructions and an authorized customer service return number.

All correspondence concerning repairs should include the Model number and a description of the problem observed.

Once repaired, all equipment passes through our normal preshipment checkout procedure. Return shipping expense on out-of-warranty repairs will be charged to the customer.

FOR INSTRUMENTS OUT OF WARRANTY, THE CUSTOMER MUST SUPPLY A PURCHASE ORDER NUMBER FOR THE REPAIR BEFORE THE ITEM WILL BE RETURNED.

SHIPPING DAMAGE

Shipment should be carefully examined when received for evidence of damage caused by shipping. If damage is found, immediately notify Canberra and the carrier making delivery, as the carrier is normally responsible for damage caused in shipping. Carefully preserve all documentation to support your claim. Canberra will provide all possible assistance in processing damage claims.

Due to the delicate nature of cooled detectors (Ge(Li) and SI(Li)), Canberra requires that all equipment be delivered to and from air freight terminals be handled with special care. Do not ship such Detectors without first obtaining advice from your Traffic Department.

RETURN SHIPMENTS

Canberra Customer Service Department must be notified in advance if equipment is to be returned for any reason. Canberra can suggest the best means of shipping and will be able to expedite the shipment in case it is lost or delayed in transit.

The customer must obtain an authorized customer service return number before returning any equipment to the Canberra factory. Compliance with this provision by the customer shall be a condition of this warranty. In giving shipping instructions, Canberra shall not be deemed to have assumed any responsibility or liability in connection with the shipment.

Equipment should be returned to your area service center or to Canberra, Meriden. For shipment from outside the U.S., our shipping address is: Kawasaki Air Transport, Inc., JFK International Airport, New York. FOR: CANBERRA INDUSTRIES, INC., Meriden, Connecticut 06450 U.S.A.

SERVICE AND SERVICEABILITY

Canberra has gone to great lengths to insure that the instruments provided are functionally modular and therefore easy to service. In addition to modular construction, Canberra has embarked on an extensive System Service Program to provide a totally responsive service capability. Complete Service Contracts with special arrangements for 24-hour response and weekend standby services are available from Canberra. For a detailed description of our Customer Service Program, please contact your System Service Department in Meriden, Connecticut, U.S.A.
Section 3
CONTROLS, INDICATORS, ADJUSTMENTS AND CONNECTORS

3.1 GENERAL

Complete understanding of the purpose of the various controls and connectors is required for the proper operation of the Model 310S, and it is recommended that this Section be read before proceeding with the operation of the instrument.

3.2 FRONT PANEL

![Diagram of Front Panel Controls]

Figure 3-1
Front Panel Controls

3-1
3.3 REAR PANEL

INHIBIT BNC used to inhibit output ("0" inhibits)

Output voltage, SHV connector muting connector: KINGS P/N1705-1

Figure 3-2
Rear Panel Connectors

3.4 INTERNAL

POLARITY REVERSAL PLUG

Figure 3-3
Internal Controls

3-2
Section 4
OPERATING INSTRUCTIONS

4.1 GENERAL

The purpose of this section is to familiarize the user with the operation of the Model 3105 High Voltage Power Supply and to check that the unit is functioning correctly. Since it is difficult to determine the exact system configuration in which the module will be used, explicit operating instructions cannot be given. However, if the following procedures are carried out, the user will gain sufficient familiarity with this instrument to permit its proper use in the system at hand.

4.2 INSTALLATION

The Canberra Model 2000 bin and power supply or other bin and power supply systems conforming with the mechanical and electrical standards set by AEC Report TID-20893 (Rev.) will accommodate the Model 3105. The right side cover of the NIM module acts as a guide for insertion of the instrument. Secure the module in place by turning the two front panel captive screws clockwise until finger tight. It is recommended that the NIM bin power switch be OFF whenever the module is installed or removed.

The Model 3105 can be safely operated where the ambient air temperature is between 0°C and +50°C (120°F maximum). Perforations in the top and bottom sides permit cooling air to circulate through the module. When relay rack mounted along with other “heat generating” equipment, adequate clearance should be provided to allow for sufficient air flow through both the perforated top and bottom covers of the NIM bin.

4.3 OPERATION

4.3.1 POLARITY SELECTION

Polarity reversal is achieved by removing the smaller left side panel cover on the Model 3105 and rotating the polarity selector plug, on the high voltage potted assembly, 180°. A label containing the phrase OUTPUT POSITIVE or OUTPUT NEGATIVE as applicable will be visible when viewing the polarity selector plug on the side of the high voltage potted assembly. It is recommended that the output voltage controls be set to 0 and the output polarity indicator LEDs observed for indication of the proper output polarity before the power supply is reset for high voltage.

CAUTION:

THE MODULE MUST BE REMOVED FROM THE BIN, INPUT POWER TURNED OFF AND HIGH VOLTAGE OUTPUT FULLY DISCHARGED TO GROUND AT THE OUTPUT CONNECTOR BEFORE ATTEMPTING TO REVERSE POLARITY.

4.3.2 SETUP

1. After selecting the proper output voltage polarity, connect load to output SHV connector and set all controls to their OFF or '0' positions. Set the ON-OFF toggle switch to ON. The applicable polarity LED should light.

2. Set the output amplitude control to the desired setting, remembering the output amplitude is equal to the setting of the fine control. The meter will provide a course indication at the output voltage.
4.3.3 INHIBIT FEATURE

The output voltage may be remotely commanded to turn off by using the INHIBIT input on the rear panel. This feature is achieved by presenting a ground or logic '0' (TTL Compatible) to the INHIBIT BNC. This INHIBIT functions at all voltage settings. The output voltage may be returned by removing the ground or driving the INHIBIT with a logic '1' (TTL compatible).

4.3.4 AUTOMATIC SHUTDOWN

The Model 3105 contains automatic protection against sustained overloading. A sustained overload will cause the high voltage to shut down completely. This will be clearly indicated by the 0 output reading on the meter independent of the voltage control settings. A short duration ARC-OVER or turn-on charging transient will not cause shut down. To reset, the unit must be turned OFF for approximately 5 seconds, then turned back on. Gating the unit off via the INHIBIT BNC will also reset the automatic shut down condition.

4.3.5 PERFORMANCE TESTS

1. The following test equipment is required to perform the measurements:
   a) Oscilloscope.
   b) Digital Voltmeter.
   c) High Impedance, high voltage precision DC divider (1000:1), with capacitive coupled AC viewing circuit.
   d) High Voltage load resistor, 50 meg ohms.
   e) High Voltage shorting stick.

   Connect the high voltage output of the Model 3105 to the 1000:1 DC voltage divider. Connect the low voltage output of the divider. Make sure a good ground is provided for all instruments.

2. Turn the front panel voltage controls to their maximum positions. The digital voltmeter should indicate the maximum rated output of the unit.

3. Connect an end of the load resistor to ground and the other end to the shorting stick. Then, with the shorting stick, connect the load resistor to the high voltage output and observe the change in output voltage. During this no-load to full-load test, the DVM reading should not change more than 0.001%.

4. With the load connected, measure the AC ripple. The ripple should be less than the specified peak to peak ripple under this condition of full load at maximum output.
5.1 GENERAL

This Section describes the overall function, operation and circuitry of the Model 3105 High Voltage power supply.

5.2 CIRCUIT DESCRIPTION

A functional schematic of the Model 3105 is shown in Figure 6-1. The high voltage module is basically a DC to DC converter which converts low voltage DC power to a high voltage DC output. This output voltage is highly regulated and filtered and can be varied by the front panel controls. The input to the high voltage DC to DC converter is obtained from a conventional NIM power supply and utilizes ±12 VDC and ±24 VDC.

An oscillator determines a high frequency (≈20kHz) at which all amplification, high voltage transformation, rectification and filtering occurs. The amplification is a function of a control voltage which performs the functions of control and regulation. A sample of the output voltage is compared with a reference voltage in the sensing circuit. The sensing circuit generates the control voltage to set and maintain a fixed high voltage output.
NOTES:
UNLESS OTHERWISE SPECIFIED:
1. THERE ARE NO WAY TIES ON THIS SCHEMATIC.
2. ALL CAPACITORS ARE IN µF.
3. ALL RESISTORS ARE IN OHMS, 1/4W, ±5%.
4. ⌀ INDICATES COM TERM.
5. ( ) INDICATES WIRE POINT ON P.C. BOARD.
6. (B) SYMBOL INDICATES RN565, ±1% (±5) RN565, ±1%, + RN565, ±2%.
7. OVERVOLTAGE DETECTOR INCORPORATED EFFECTIVE WITH SW 7000.