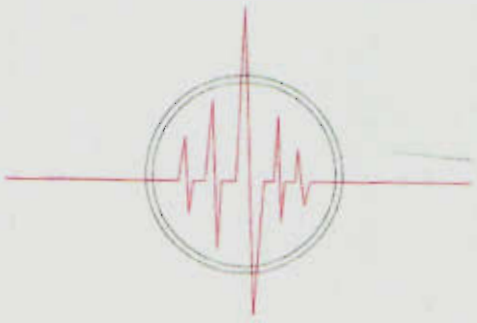


Eurovac

varian

instructions

10 kV electron gun
power supply

model 981- 2745

981- 3356

EUROVAC
Råggatan 7
SE-118 59 STOCKHOLM
Tel: + 46 8 42 99 60 0
Fax: + 46 8 42 99 60 4
E-mail: sales@eurovac.se

TABLE OF CONTENTS

GENERAL

The Varian 10 keV Electron Gun Power Supply, Model 981-2745, is a two-chassis unit designed to operate the 10 keV Integral Electron Gun* used with the Varian surface physics Cylindrical Mirror Analyzer. The Model 981-3356 operates the 10 kV R.E.D. Gun Model 981-3355.

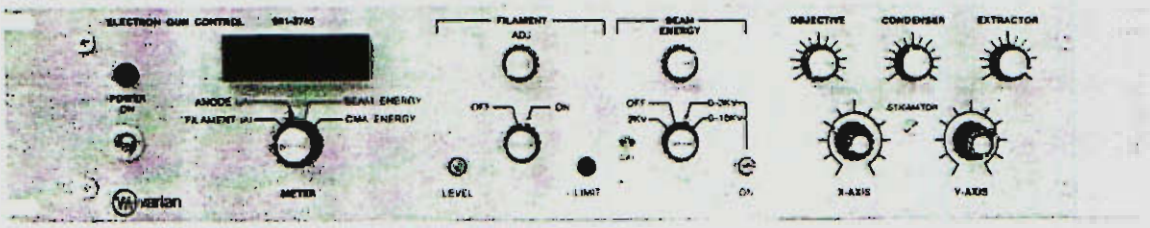
To simplify Auger data-taking, the power supply is designed to keep other electron beam parameters stable as the beam energy is varied. For example, fixed focus and spot size eliminate the need for constant readjustments as the beam voltage is changed.

A built-in digital meter allows monitoring of the filament current, which is regulated to 0.1%. The meter also displays the electron gun first anode current and beam energy. When connected to the CMA control unit, the meter can read the value of the electron energy being transmitted through the CMA.

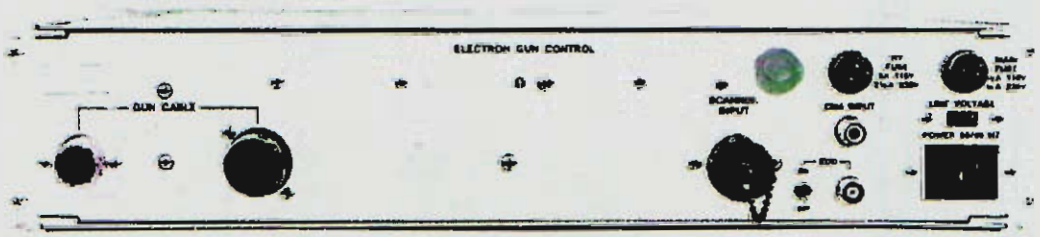
The power supply is compatible with the Varian 3 keV / 5 keV glancing incidence electron gun Model 981-2454, which is useful for special Auger applications such as the examination of insulating surfaces. The power supply can also be used to operate the Varian 3 keV integral electron gun, Model 981-2613. For operating with either 3 keV electron gun, an optional special purpose cable is available which automatically limits the beam energy of the power supply to 3000 / 5000 volts.

*Models 981-2713, 981-2714, and 981-2711

DESCRIPTION



a) Front View



b) Rear View

Figure 1. 10 keV Electron Gun Power Supply

CONTROLS AND INDICATORS

Control Chassis, Front Panel

POWER ON . . . . . Controls main power to unit
Toggle switch and indicator lamp

METER . . . . . Meter functions: Filament (A), Anode (μA), Beam Energy, CMA Energy
Multiposition switch (coupled to digital meter display)

FILAMENT ADJ
(Includes the following)

Filament power switch . . . . . Turns filament power on and off
(unlabeled)
Two-position switch

Adjustment knob . . . . . Adjusts filament current
(unlabeled)
(Ten-turn potentiometer)

LEVEL . . . . . Light intensity varies proportionately with filament voltage
Filament voltage indicator lamp

LIMIT . . . . . Lights when current exceeds 3.2 A
High filament current mode indicator lamp

NOTE

Longest filament life is achieved when operating below normal limit; operation exceeding this limit, while desirable in some applications, should not be continuous.

BEAM ENERGY
(Includes the following)

Beam energy switch . . . . . Functions: 2 kV (CMA calibration position), Off, 0–3 kV, 0–10 kV
(unlabeled)
Four-position switch

NOTE

Switch is interlocked with two cables: HV Interconnect, and Scanning Sample Positioner (video monitor).

DESCRIPTION

CAL Recessed screwdriver adjustment potentiometer	Allows independent CMA system calibration in conjunction with Beam Energy 2 kV switch position
ON Indicator lamp	Beam voltage on lamp
Adjustment knob (unlabeled) Ten-turn potentiometer	Adjusts beam energy when beam energy switch in 0–3 kV and 0–10 kV positions
X-AXIS Single-turn adjustment knob	Provides gun deflection plate voltage to control beam position in X-axis
Y-AXIS Single-turn adjustment knob	Provides gun deflection plate voltage to control beam position in Y-axis
STIGMATOR Recessed screwdriver adjustment potentiometer	Electron beam spot shape adjustment. Used with Scanning Sample Positioner (video monitor) by adjusting for sharpest image
OBJECTIVE Single-turn adjustment knob	Adjusts focus of gun objective lens
CONDENSER Single-turn adjustment knob	Adjusts focus of gun condensor lens No use for R.E.D. Gun.
EXTRACTOR Single-turn adjustment knob	Adjusts extractor voltage (Wehnelt bias voltage), 0 to 100% proportional to gun emission

SPECIFICATIONS

Beam Voltage	
Range	0 — 10,000 volts, continuously adjustable
Regulation	Load: 0.01% + 0.1 V Line: 0.01% + 0.1 V for 10%
Ripple and Noise	0.005% + 0.1 V rms
Stability	Warm-up time 30 min
Resolution	Settable to ± 0.5 V
Deflection Voltage	
Range	0 — 350 V on any deflection electrode; 0 — 700 V differential per axis
Stability	0.5%/hr
Control	Coarse and fine control for each axis
Tracking	Deflection voltages are proportional to beam voltage

Focus	% of Actual Output Voltage	
Condenser Lens Voltage	0.65 to 1.0 Continuous	
Objective Lens Voltage	0.75 to 0.9	
Resolution	0.1%	
Tracking	Focus voltage is proportional to beam voltage	
Filament Supply		
Range	2.2 to 3.6 A at 5 V	
Regulation	Better than 0.1%/hr	
Short Term Stability and ripple at frequencies < 1 kHz	0.01%	
Metering		
Type	Digital	
Functions Monitored	Beam voltage	0 - 10 000 V
	Beam current	0.01 to 99.9 μA
	Filament current	2 to 3.2 A
	CMA Energy	0 to 5000 eV
	Anode current	0 to 9999 μA
Dimensions		
Control Unit	3-1/2"H X 19"W X 17"D	

1. Unpack the two power supply chassis and inspect for obvious damage.

2. Mount the power supply control chassis in a standard 19" wide electronic cabinet as near to the cylindrical mirror analyzer control unit as is practical. The control power chassis requires a vertical mounting space of 3.5 inches.

3. Select the main power fuse appropriate to the line voltage: 1/2 Amp for 115-volt operation; 1/4 Amp for 230-volt operation.

4. Place the line voltage selector switch in the position corresponding to the line voltage in use. Measure the actual line voltage.

5. Connect remaining gun power supply cables as follows.

FROM	TO
PS Control Chassis, Gun Cable*	CMA, Electron Gun Low Volt., R.E.D. Gun Deflection
PS Control Chassis, Gun Cable*	CMA, Electron Gun Hi Volt., R.E.D. Gun Lens
PS Control Chassis, CMA Input	CMA Control Unit, Sweep Voltage Monitor
PS Control Chassis, Scanner Input**	Scanning Sample Positioner CU, To 10 kV Auger Supply

* Cable terminations are non-interchangeable.
** If applicable; otherwise use jumper plug provided.

6. Refer to the system instruction manual, 87–400 338, for overall system interconnection instructions.

7. Do not apply line power to the power supply. Refer to Section III for operating instructions.

GENERAL

The operating instructions listed in this section allow operational checks to be made of the electron gun power supply. Dynamic operating instructions for the power supply in a system configuration are contained in the High Resolution Auger Electron Spectrometer System instruction manual, Publication No. 87–400 338.

Power Supply — Electron Gun Operation

This operational check of the power supply checks the power supply filament and beam energy circuitry. The electron gun filament provides a load on which the filament current is measured and completes a feedback signal for the power supply regulation circuitry to regulate on.

1. Connect the power supply to the electron gun. Do not attempt to perform this procedure without the electron gun and cable connected to the power supply. See installation instructions, Section II.

2. Set Filament power to Off, Beam Energy to Off, Filament Adjust and Beam Energy adjust fully CCW, and deflection controls to center of range.

3. Turn on main power, observe all zeros ± one digit in all meter positions.

4. Turn the meter function switch to the Filament position and turn Filament power on. Observe the Filament Level lamp to be dimly lighted. The meter display should indicate approximately 2A.

5. Slowly turn Filament Adjust fully CW. Notice that the current stops increasing at some point below 3 amperes.

6. Turn the Beam Energy selector switch to the 3 kV position and observe that the Beam Energy lamp lights, and the filament current reading increases to 3.2A. The Filament Limit lamp will also light. This condition will be true for any Beam Energy selector switch position except Off, which returns the unit to the conditions outlined in step 5.

7. Return the Beam Energy selector switch to the 3 kV position and place the meter function switch in the Beam Energy position. The meter reading should be approximately 0 volts. Increase the Beam Energy adjust control (CW) and observe that the meter reading will not increase beyond the 3 kV limit.

8. Reset the Beam Energy adjust control to the fully CCW position (zero volts) and place the Beam Energy selector switch in the 2 kV preset position. The meter should now read 2 kV ± 15 volts.

9. Place the Beam Energy selector switch in the 10 kV position and turn the Beam Energy adjust control to the fully CW position; the meter reading will increase to 10 kV maximum.

NOTE

The voltage will not increase beyond 3 kV if the 3 kV cable is connected.

Power Supply — Cylindrical Mirror Analyzer Operation

This procedure provides an operational check of the power supply when operating with the Cylindrical Mirror Analyzer (CMA). In this operation, the power supply objective, condenser, extractor and X- and Y-axis deflection circuitry is utilized. Besides the electron gun and CMA, an electrometer and an oscilloscope are required. No setup procedures other than those for the power supply are indicated here; if required, refer to the individual component manuals for setup instructions.

1. Turn on the electron gun power supply for the following conditions:

Beam Voltage	2 kV (Calibrate position)
Filament Current	3.0 A
Extractor	10% CW
Condenser	Fully CW
Objective	Center of Range

2. Turn the condenser lens control CCW until a beam current of between 5μA and 10μA as read on the electrometer is obtained.

3. Set up the equipment to display an elastic peak on the oscilloscope.

4. Adjust the X- and Y-axis deflection controls to maximize the peak height. Also, adjust the Objective control to maximize the peak height.

5. The total beam current, read on the electrometer, can be adjusted with the Condenser control. This will require a trade-off between the beam spot size and total beam current. Such a trade-off can only be evaluated through the use of a video display such as that provided by that provided by the Varian Scanning Sample Positioner, or by using a calibrated Faraday cup.

Power Supply - R.E.D. Gun Operation

1. Turn on the Gun Power Supply for the following settings:

Beam Voltage	5 kV
Filament Current	2.5 A
Extractor	CCW
Objective	Center of Range
X - Axis	Center of Range
Y - Axis	Center of Range

2. A spot should be visible on the screen.

3. Use Objective, Extractor and Stigmator Controls to obtain the desired spot.