B3

linearity 932.67
− 75.15
857.52

or 5600

5500 SYSTEM CHECKOUT PROCEDURE
ESCA

OPERATION LOG SHEET 1 OF 1 ISSUE NO : 14.0

OP #	REV	OPERATION DESCRIPTION
1.0	4	Continuity checks and Hipot tests.
2.0	2	Power distribution checks and AVC setup.
3.0	4	Laserjet and plotter switch setup.
4.0	7	Card Rack switch and setpoint setup..
5.0	6	Check SCA boards and burn-in X-ray source.
6.0	6	Ion gun burn-in/cal: include 04-303.
7.0	2	RVG 050 calibration.
8.0	5	MCD Start-up.
9.0	9	Work Function and Pass Energy Tracking calibration.
10.0	6	Sample contamination coupon trace.
11.0	13	System data acquisition.
12.0	5	X-ray source data.
13.0	8	04-090 Neutralizer option
14.0	7	10-410 Monochromator option
15.0	3	ISS Calibration
16.0	3	Scanning Stage option
17.0	4	System Clean-up

Ag $3d_{5/2}$ 368.27

Cu Auger 335

5600 SYSTEM CHECKOUT PROCEDURE

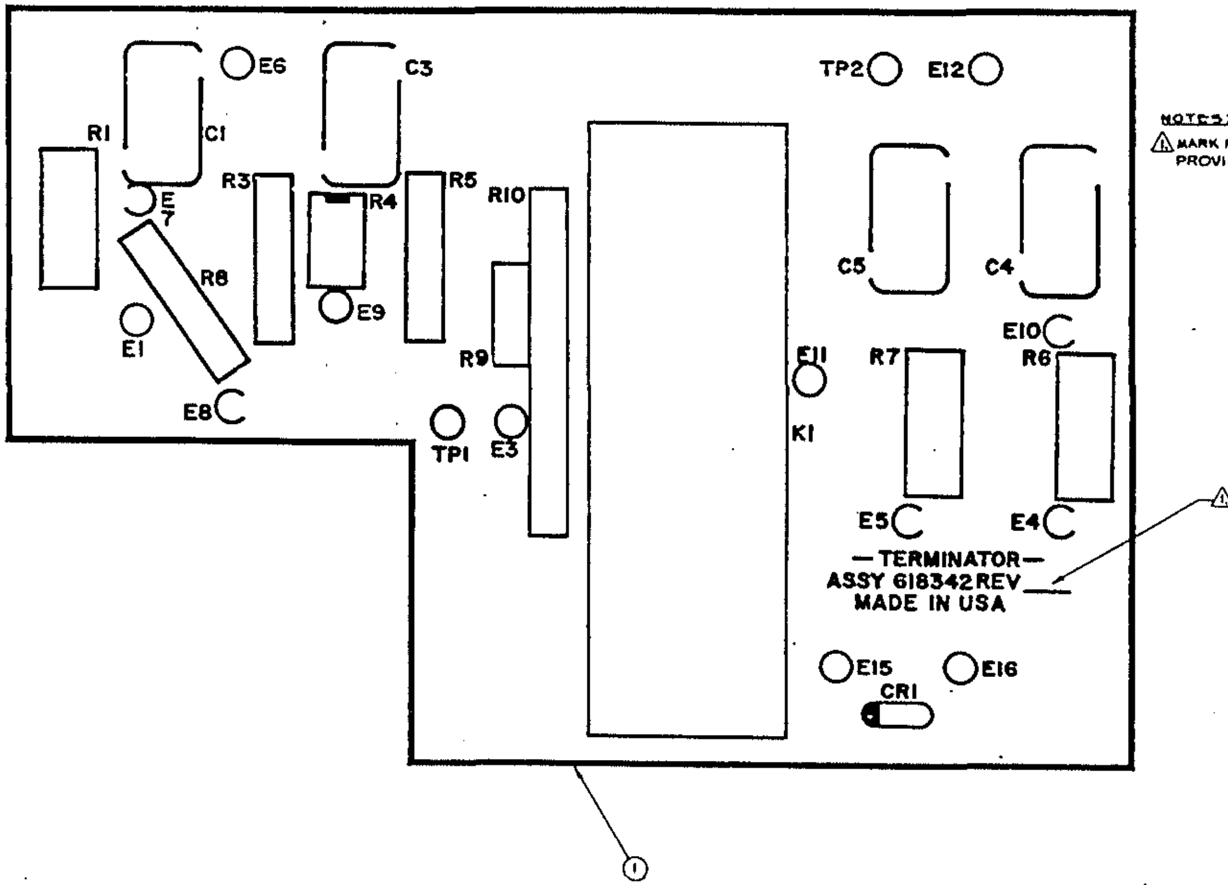
PERKIN-ELMER CORP.
PHYSICAL ELECTRONICS DIV.

PROCESS UPDATE LOG

SHEET 1 OF 1

ISSUE	REASON FOR CHANGE	BY	DATE
1.00	INITIAL DRAFT	JMG	6/6/89
2.00	DRAFT UPDATES	JMG	4/6/90
3.00	FINAL UPDATES FOR RELEASE	JMG	7/31/90
4.00	OPS RENUMBERED	JMG	9/24/90
5.00	REVISED OP#11.0	JMG	10/17/90
6.00	UPDATED OP'S 3-5,8-10,12	JMG	11/12/90
7.00	UPDATED OP'S 5,8-14, ADDED 15,16	JMG	1/4/91
8.00	UPDATED OP'S 1,4,7,9,11,14,16	JMG	3/14/91
9.00	UPDATE AUGER SECTION	JMG	5/29/91
10.00	UPDATED OP 11.0 & TEST OPS SHEET	JMG	6/18/91
11.00	UPDATED OP'S 8,11-16	JMG	8/21/91
12.00	UPDATED OP'S 9,15	JMG	10/24/91
13.00	UPDATED SIMS OP'S 3,4,9 & ADD OP17	JMG	12/19/91
14.00	UPDATED ESCA OP'S 13 & 17	JMG	1/21/92
15.00	UPDATED ESCA OP'S 8,10,11,16	JMG	2/5/92
16.00	UPDATED ESCA OP 16	JMG	8/14/92

C	SEE ECO 9180	



NOTES:

1. MARK REVISION OF THIS DRAWING IN SPACE PROVIDED.

PERKIN ELMER
Physical Electronics Division

BOARD ASSEMBLY-
TERMINATOR

D 618342 C

SCALE NONE

72-150   [illegible]
80-360   10 slots ect.

RDK

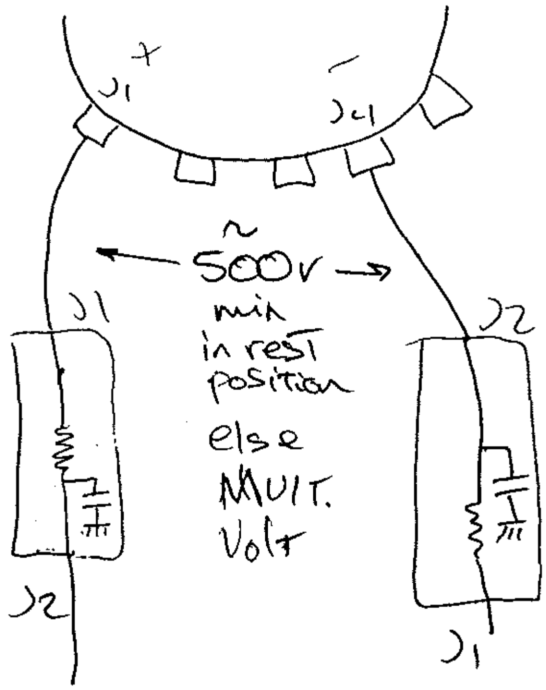
7X-XXX → model number
↳ number of slots

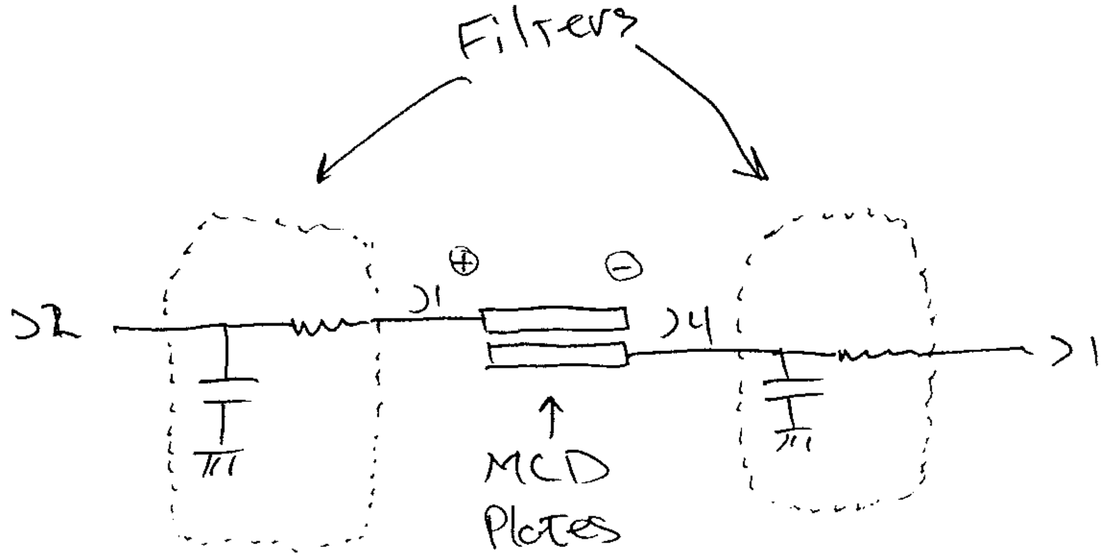
chassis size

XX-XXX	
~~32~~ 30	⇒ 3.5"
20	⇒ 5.25"
11	⇒ 7.0"
18	⇒ 10.5
22	⇒ 12.25

Flange size

OPTICS	
04-XXX	⇒ 2 3/4"
06- "	⇒ 4 1/2"
10- "	⇒ 6"
15- "	⇒ 8"
25- "	⇒ 10"
32- "	⇒ Huge 12.55?


J1 +
-
J4
J1
~ 500v
min
in rest
position
else
MULT.
Volt
J2
J2
J1


Filters
⊕
⊖
J2
J1
J4
J1
MCD
Plates

0.0 REFERENCE DOCUMENTS

0.1 608146 MOD 10-360 PRCN ENERGY ANALY, SCA

0.2 618312 KIT, 10-323 STAGE ASSY

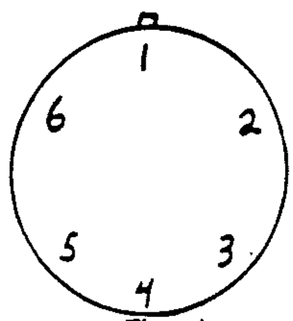
0.3 617308 04-548 X-RAY SOURCE MANUAL

0.4 621205 TEST PROCEDURE, MCD

1.0 OPTICS CONTINUITY CHECKS

1.1 SCA Resistance Check

1.1.1 Measure the resistance on V2 and V3 as follows:



looking into connector on analyser

Fig. 1

pin1 inner sphere
pin 2 mid ring
pin 3 outer sphere
pin 4 lens element 4
pin 5 lens element 3 V3
pin 6 lens element 2 V2

V1 to GND: < 1 ohm
V2 to pin 6: < 1 ohm
V3 to pin 5: < 1 ohm
Pin 1 to Pin 2: 4.35 Megohms
Pin 2 to Pin 3: 3.15 Megohms 2.9
Pin 1 to Pin 3: 7.50 Megohms
Pins 1-6 to GND: Infinite
Pin 1 to Pins 4,5,6: Infinite
Pin 2 to Pins 4,5,6: Infinite
Pin 3 to Pins 4,5,6: Infinite

Inside chamber "Up To Air" lens exposed

Central & Fwd lens Read to and Infinite

J1 pos +
J4 neg −
J1 to J4 18 MΩ

Pin 4 to Pins 1,2,3,5,6: Infinite

Pin 5 to Pins 1,2 3,4,6: Infinite

Pin 6 to Pins 1,2,3,4,5: Infinite

1.2 04-303 Ion Gun

1.2.1 On the HV connector:

< 5 ohms between Pins 1 and 2 (Filament)

Pins 1 through 6 - Infinite resistance with respect to gnd

Pins 1 through 6 - Infinite resistance pin to pin

1.3 04-548 X-Ray Source

1.3.1 Check the resistance on the 4-pin connector as follows:

Pin 1 to Pin 2: < 1 ohm

Pin 3 to Pin 4: < 1 ohm

Pin 1 to GND: Infinite

Pin 2 to GND: Infinite

Pin 3 to GND: Infinite

Pin 4 to GND: Infinite

1.3.2 Check that the x-ray anode resistance with respect to GND and pins 1-4 above reads infinite.

1.4 10-325 Stage Contiuity Check

1.4.1 Check the resistance on the labeled connectors as follows:

TARGET connector to GND: Infinite

ION connector to GND: Infinite

TARGET to ION: Infinite

1.4.2 From / To / Reading

From	To	Reading
TARGET	TARGET contact	0Ω
ION	ION contact	0Ω

"up to air"

1.4.3 With the Model 175 Heating Module:

On the -pin connector:

Pin I to Pin J: < 1 ohm

Pin I to GND: Infinite

Pin J to GND: Infinite

Pin E to Pin G: < 1 ohm

Pin I to TARGET: < 1 ohm

Pin J to TARGET: < 1 ohm

1.5 04-090 Neutralizer Continuity check:

	FROM	TO	
1.5.1	Pin A	Primary Electrode	0 ohms
1.5.2	Pin B	Pin C	0 ohms
1.5.3	Pin D	Y- deflection plate	0 ohms
1.5.4	Pin E	Y+deflection plate	0 ohms
1.5.5	Pin G	X-deflection plate	0 ohms
1.5.6	Pin I	X+deflection plate	0 ohms
1.5.7	All pins	Each other pin	Infinite
		Ground	Infinite

2.0 SCA Hipot Procedure

NOTE: DO NOT hipot with a MCD detector installed.

2.1 Hipot tester setup

2.1.1 Jumper pins 1,2 and 3 together on the hipot test fixture TO1712.

2.1.2 Hipot tester switch settings: (Hippotronics Model HD125)
Voltage Range: MED Output Current: DCuA X1
Raise Voltage knob: FCCW Overload Sens knob: FCW

2.1.3 Attach the GRN/YEL gnd lead from the hipot to the chamber.

2.2 Attach one side of the hipot output to the jumpered leads and increase the voltage slowly up to 6KV RMS. Leakage should be less than 1 uA.

2.3 Hold at this voltage for at least 1 minute. Then return hipot to zero.

2.4 Jumper pins 4 and 5 on the hipot test fixture .

2.5 Attach one side of the hipot output to the jumpered leads and increase the voltage up slowly to 3KV RMS. Leakage should be less than 1 uA.

2.6 Hold this voltage for at least 1 minute. then return hipot to zero.

2.7 Repeat steps 2.5 and 2.6 with pins 4 and 6 jumpered.

2.8 Repeat steps 2.5 and 2.6 with pins 5 and 6 jumpered.

2.9 Hipot the FWD lens to 8KV for 30 min. Leakage should be less than 0.1 uA.

3.0 MCD Pre-installation steps

3.1 Connect one lead of the capacitance meter to the positive (+) SHV connector on the transit case. See Fig. 1.

3.2 At each of the 16 channel outputs on the 20 pin MS connector, measure the value of the capacitance. A reading in excess of 250pf is acceptable. The pin-out for the 20 pin connector is shown in Fig. 2.

3.3 Using an Ohmmeter, check the resistance between the positive and negative SHV connectors. A value between 12 and 20 megohms is acceptable. Also, the resistance between positive and negative and GND should be infinite.

3.4 Ensure that the 10-360 and FWD lens have been hipotted per the Vacuum Assembly procedure.

Fig. 1

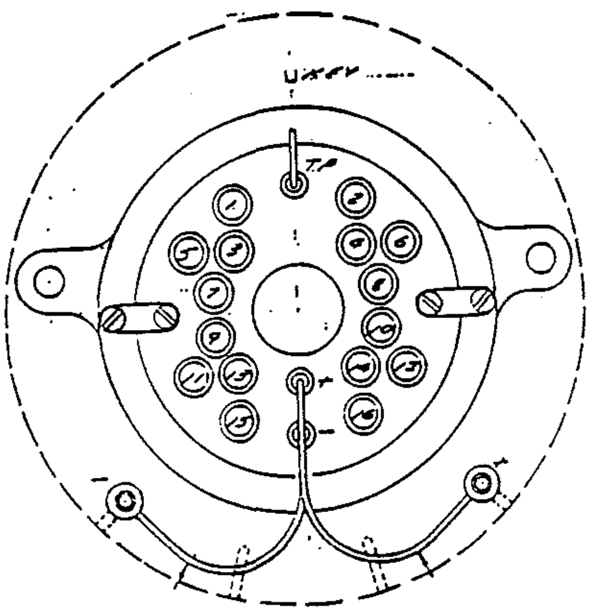
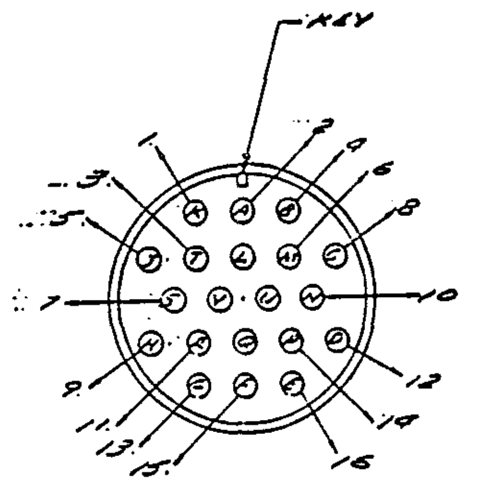


Fig. 2



4.0 MCD Installation

4.1 Install the MCD using 3-4 studs in the 10-360 mounting flange to guide the MCD into place.

4.2 Repeat the MCD test procedure 621205.

4.3 Bake the system for 12 hours prior to power up.

5.0 MCD Post-installation steps

5.1 Ground all the MCD output pins.

5.2 Float the Neg. input and connect the 609460 filter to the Pos. input.

5.3 Attach the positive HV lead to the filter and hipot to 5KV for 30 minutes with the leakage less than 0.1 uA.

5.4 After completing the +5KV hipot procedure, repeat the above steps for -5KV.

5.5 Use the MCD test plug to straighten all the output pins.
CAUTION: output pins are easily bent by probes and test clips.

5.6 As a precaution, ground all the MCD output pins to discharge the capacitors completely prior to installing the Amp/Disc box.

0.0 REFERENCE DOCUMENTS

0.1 621126 5500 SYSTEM CABLE INTERCONNECT DIAG.

0.2 616459 PWR SUPPLY, CARD RACK, INTERNATIONAL

0.3 616459 SCHEMATIC DIAG, CARD RACK PWR SUPPLY

0.4 613524 Autovalve Control Assy

0.5 606052 Autovalve Board Assy

1.0 POWER DISTRIBUTION CHECK

1.1 Ensure all boards are removed from both card racks.

1.2 Check the resistance between the supply terminals on the card rack power supply. Check for shorts between supplies and to GND.

1.3 Check the resistance on each fuse block on the card rack fuse panel. Check for shorts between supplies and GND.

1.4 Turn on Main Electronics power .

1.5 Check all power supplies for correct output.

1.6 Turn Main Electronics Power off.

1.7 Install all PCB,s and repeat step 1.5.

2.0 AUTO VALVE CONTROL SETUP

2.1 Verify that the switches inside the control are set as follows: See Fig. 1:

Single Turbo : S10-1, 2 closed All others open

3.0 AUTO VALVE CONTROL FUNCTION CHECK

3.1 Check for the proper AVC Remote box overlay.

3.2 Check to see that all functions operate.

4.0 REMOTE BOX PRESSURE DISPLAY CALIBRATION

4.1 Adjust R103 in the AVC assy (See Fig. 1) so that the 4th display

3.0 AUTO VALVE CONTROL FUNCTION CHECK

3.1 Check for the proper AVC Remote box overlay.

3.2 Check to see that all functions operate.

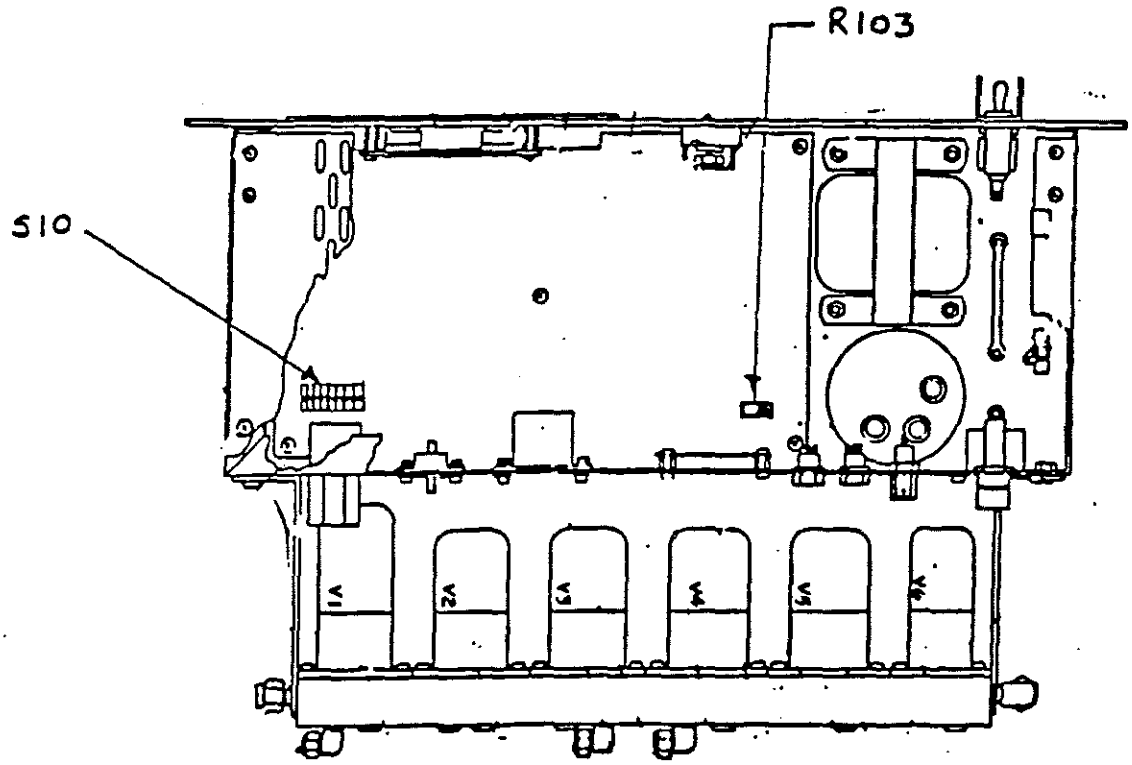
4.0 REMOTE BOX PRESSURE DISPLAY CALIBRATION

4.1 Adjust R103 in the AVC assy (See Fig. 1) so that the 4th display light does not come on until 9.0 X 10(-4) is achieved on the DGC III.

FIG. 1

Autovalve Control switch and pot locations

(AVC top cover removed)



5600 SYSTEM CHECKOUT PROCEDURE

ESCA

OPERATION NO: 4.0 SHEET 1 OF 3 ISSUE NO: 8

0.0 REFERENCE DOCUMENTS

0.1 618743 Label-Card Rack, 5500 System

0.2 622983 Rack Layout, 5600 System

0.3 616459 Power Supply, Card Rack, International

0.4 617602 DGC III Manual

1.0 CORE CARD SETUP

1.1 Top Core card switch settings

1.1.1 DR11-488 : Card position

DR11-488 CONV 5 :SW1: 8 - Closed, All others Open

1.1.2 74-500 DASH : Card Position

CONTROL COUNTER 1 : SW1- 4 &8 CLOSED

1.1.3 72-030 NEUTRALIZER CNTL: Card Position

CONTROL BOARD 7 : SW1- ALL 4 sections to N.O.

: SW2- 1,3-6,8 OPEN, 2,7 CLOSED, ALL OTHERS, DON'T CARE

: SW3- ALL 4 sections to N.O.

: SW4- ALL 4 sections to N.O.

1.2 Bottom Core card switch settings:

1.2.1 71-205 DIG MOTOR CNTL : Card Position

MOTOR CONTROL	4 (45-300), 5(40-710)	
AUTO TILT OR INDEX ONLY		: SW1- 1,8 OPEN, ALL OTHERS CLOSED
AUTO TILT W/AUTO INDEX		: SW1- 1,8 OPEN, ALL OTHERS CLOSED,
		: SW2- 1,4,8 OPEN
XYZ SCANNING		:OPEN SW'S SPECIFIED, ALL OTHERS CLOSED
		: SW1-1&8 OPEN,
		: SW2-1,4,8 OPEN,
		: SW3-1,5,8 OPEN,
		: SW4-1,4,5,8 OPEN,
		: SW5-1,6,8 OPEN,
ZALAR ROTATION		: SW1- 1&8 OPEN, ALL OTHERS CLOSED
		: SW2-1,4,8, ALL OTHERS CLOSED

NOTE: If the Scanning Stage option is selected, use EPROM PN 621878.
If the Zalar option w/o scanning stage is slected, use EPROM PN 615498.

1.2.2 74-062 DIGITAL SCOPE Card Position:

INTERFACE DATA	8	: SW1-2,4 CLOSED ALL OTHERS CLOSED

2.0 APOLLO 257 BOARD

2.1 Ensure that the switch settings are as follows:

Sn1 : 1,2,5,6,7 OPEN

Sn2 : 12 15 for PC

3.0 DGC III SETPOINT SETUP

3.1 Set the DGC III setpoints as follows:

#1 - Card Rack Electronics Interlock

7.0×10^{-5} Torr

#2 - Ion Gun Interlock

1.0×10^{-6} Torr 8-10⁻⁵

#3 - X-Ray Source Interlock

5.0×10^{-8} Torr

#4 - Bakeout Interlock

8.0×10^{-6} Torr

4.0 RVG 050 REGULATED LEAK VALVE CONTROL

4.1 Set the SETPOINT switch on the rear of the unit to the INTERNAL position.

0.0 REFERENCE DOCUMENTS

0.1 620939 5600 SYSTEM MANUAL

0.2 620177 32-096 X-RAY SOURCE CONTROL MANUAL

1.0 80-365 SCA ANALYZER VOLTAGE SETUP

1.1 Enter the X-RAY SETUP menu and select Mg.

1.2 Select aperture 4 in the ANALYZER/DETECTOR PARAMETER menu.

1.3 Select the EMS menu and set the Multiplier Voltage to 500 and the Bias Voltage to 80.

1.4 Select the SETUP ALIGN menu.

2.0 LENS VOLTAGES CHECK

2.1 If problems are encountered during this operation, the following table will help verify that the proper voltages are being applied at each pass energy.

2.2 Set the following before measuring the voltages:
MG Anode = 1253.6
ALIGN Mode = B.E. = 1000
RANGE = 0.1 ev (NOTE: for 58.7 P.E., select 0.2 ev)
APERTURE #4 (In S/W)

2.3 Use the 5 1/2 digit voltmeter with a HV probe and measure the following voltages on the SCA Terminator box.

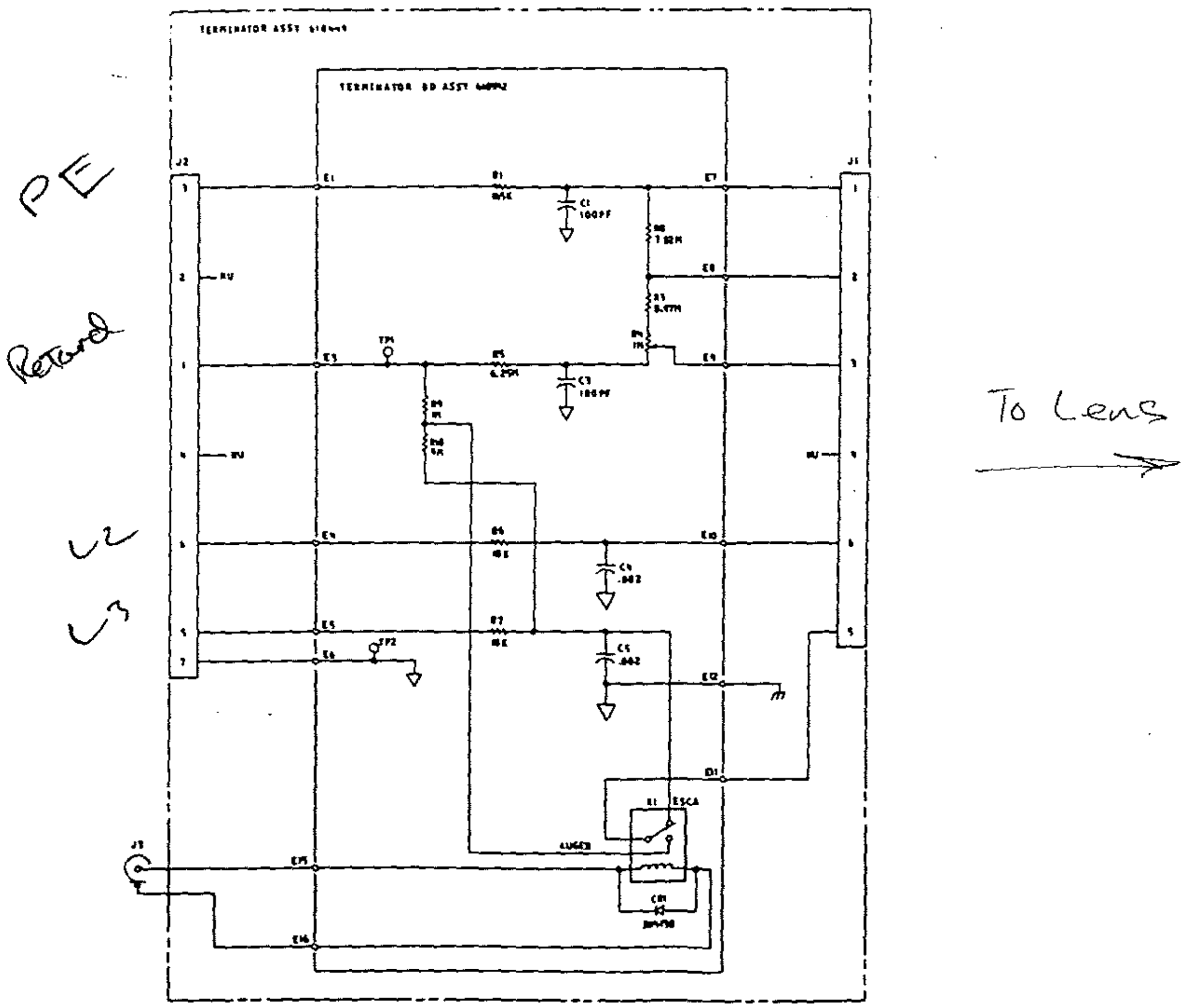
2.4 Press REFRESH ACQUIRE to measure the voltages with S/W V3.0 B.

	PE	R	L2	L3	MR
PASS ENERGY	E1	E3	E4	E5	E8
2.95	-245	-249	-174	-210	-244
5.85	-241.6	-249	-214	-87	-241.3
11.75	-233	-249	-192	+123	-235
23.5	-218	-249	-174	+239	-224
58.70	-170	-250	-136	~~+682~~ 592.2	-189

in refresh

MCD test under Common Holder

FIG. 1



0.0 REFERENCE DOCUMENTS

0.1 04-303 Ion Gun Manual

0.2 11-065 Ion Gun Control Manual

0.3 Balzers RVG 050 Regulated Leak Valve Control Manual

1.0 ION GUN SETUP

1.1 This procedure must be performed whenever the ion gun is used for the first time, when one of the internal components has been replaced or when the test chamber has been brought up to atmospheric pressure.

NOTE: The Ion Gun Control can indicate ionization chamber pressures in the 0 to 50 X 10(-3) Pa range. However, this represents an accurate measurement only when the EMISSION current is equal to 25 mA and the BEAM voltage is greater than 500 volts. With the leak valve closed while outgassing, the pressure indicated(Ion Gun Cntl or computer) represents residual gas present in the ionization chamber. This pressure should decrease to zero when the ion gun has been fully outgassed. Any leaks present in the gun assembly will prevent this pressure from reaching zero.

1.2 Ensure that the test chamber has been pumped down to 10(-7) Torr without differential pumping or 10(-8) Torr with differential pumping. When first turning the ion gun ON, care should be taken to guard against sudden, excessive outgassing. The EMISSION current and BEAM voltage should be increased slowly to allow time for the gun to slowly outgas.

1.3 The amount of time required for this procedure depends on how gaseous the ion gun is. The outgas procedure could require several hours, if the gun was exposed to atmospheric pressure for maintenance. The EMISSION setting should be increased up to 25 mA in 5 mA steps while the BEAM voltage setting should be increased in 500 volt steps.

2.0 04-303 ION GUN IONIZATION GAS INTRODUCTION

2.1 Adjust the EMISSION current for 25 mA and the BEAM voltage for 3-4 KV. The indicated pressure should be zero. If not, perform the outgassing procedure in steps 1.1-1.3.

2.2 If the differential pumping is used, turn the turbo pump on.

2.3 Slowly open the leak valve while monitoring the pressure. Care should be taken when opening this valve since gas will be admitted rapidly once the turn-on point has been reached. For normal operatior 15-25 X 10(-3) Pa of gas should be supplied to the ionization chamber by the leak valve.

3.0 ION GUN SHUTOFF

3.1 During short intervals, less than one hour, when the ion gun is not needed, it can be turned OFF simply by turning the BEAM voltage OFF. When the ion gun is not to be used for an extended period of time, the following procedure should be used for shutdown.

3.2 Turn the BEAM voltage OFF.

3.3 Close the leak valve to stop the gas supply.

Note: After switching off the RVG 050, always allow the thermovalve a minimum of 5 minutes of cooldown before closing the valve completely by hand.

3.4 Close the valve on the gas bottle and turn off differential pumping.

3.5 Turn the EMISSION current to OFF.

3.6 Turn the RASTER OFF.

3.7 Turn the POWER OFF.

NOTE: The ion gun filament should be allowed to cool for at least 30 minutes before the test chamber is exposed to atmospheric pressure.

5500 SYSTEM CHECKOUT PROCEDURE

ESCA

OPERATION NO: 7.0 SHEET 1 OF 1 ISSUE NO: 2

0.0 REFERENCE DOCUMENTS

- 0.1 RVG 050 Thermovalve Controller Manual
- 0.2 RVG050 Thermovalve Manual

1.0 RVG 050 CALIBRATION

1.1 Procedure

1.1.1 To set the desired pressure, turn differential pumping to ON on the AVC. Set the ion gun to normal operating conditions: 25mA and 3-4KV by selecting the ION GUN Setup Menu.

1.1.2 Open the manual leak valve on the ion gun until the desired operating pressure is reached. (Typically 1 X 10(-7) Torr)

1.1.3 Set the Limit switch to the LIMIT position and limit at zero.

1.1.4 Turn the power switch to ON.

1.1.5 Slowly turn the Limit pot until the System pressure decreases to the original base pressure. (This Limit switch is for manually opening and closing the valve.)

1.1.6 Set the Reset time to 5 and the Proportional gain to 5.

1.1.7 With the setpoint set at zero, toggle the Limit-Setpoint switch to Setpoint.

1.1.8 Adjust for the desired regulated pressure. (Typically 25mT or 1 X 10(-7) T as read on the 11-065)

Note: After switching off the RVG 050, always allow the thermovalve a minimum of 5 minutes of cooldown before closing the valve completely by hand.

0.0 REFERENCE DOCUMENTS

0.1 620939 5600 SYSTEM MANUAL

0.2 621205 TEST PROCEDURE-MCD

1.0 MCD POWER-UP PROCEDURE

1.1 MCD Outgassing procedure
(To be done on initial start-up and after bakeouts)

1.1.1 In the system software, enter ESCA, select EMS, set the Bias Voltage to 200V and the Multiplier to 1000V, then Exit.

1.1.2 Enter PSD/MCD Test and select a Pass Energy of 58.7. Ensure all channels are selected.

1.1.3 Begin ramping the voltage up in 50V increments up to 2000V while monitoring the DGC III for pressure bursts.
CAUTION: Do not exceed 2000 V.

1.1.4 Set the multiplier voltage for 1000 V.

1.1.5 Turn on the X-ray source which has been previouly burned-in.

1.1.6 Repeat the above procedure .

1.1.7 During this test, the MCD trace should look as shown in Fig. 1. If channels are missing or defective, the trace will exhibit notches at the defective channel postion.

1.1.8 If the MCD trace shows missing channels, perform the missing channels test to determine if the MCD or electronics is defective.

Fig. 1

[illegible]

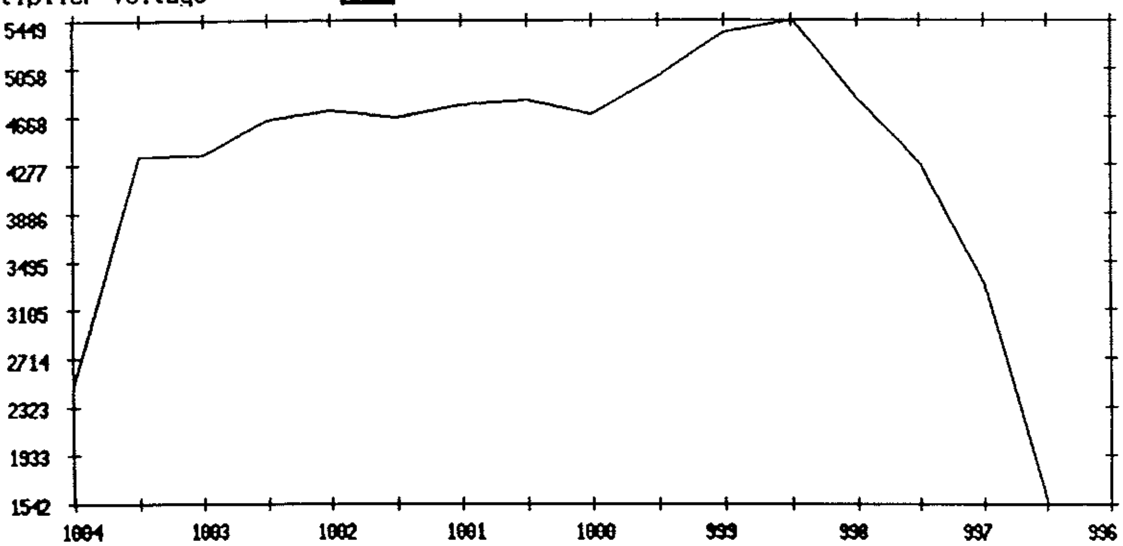
[illegible] Maximum Vacuum Change (Torr) [illegible]e-10
[illegible] Analyzer Kinetic Energy (eV) [illegible] [illegible] Resolution [illegible] UTIL HRES
[illegible] Maximum Multiplier Voltage (V) [illegible] Pass Energy (eV) [illegible]

Acquisition Time Per Step (ms)
[illegible] Blanked Beam [illegible]
[illegible] Unblanked Beam [illegible]

Multiplier Voltage (V)	Step Voltage (V)		Step Time (Min)	
0 - 1000	[illegible]	[illegible]	[illegible]	[illegible]
1000 - 2400	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] [illegible] [illegible] No
[illegible] Multiplier Voltage (V) [illegible]
[illegible] Collection Interval (Min) [illegible]
[illegible] Total Length (Hours) [illegible]

[illegible] Test Diagnostics
[illegible] Energy (eV) [illegible]
[illegible] Resolution SURV [illegible] HRES
Pass Energy (eV) [illegible] [illegible] Channel # [illegible] 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
[illegible] Time/channel (ms) [illegible]
[illegible] Multiplier Voltage [illegible]



1.2 Defective Channel Test

1.2.1 Shut off the Electronics power and disconnect the Amp/Disc box from the MCD.

1.2.2 Reboot and set the multiplier and bias voltages to 0V.

1.2.3 Set the Test Signal Generator for a 2-3V peak square wave.

1.2.4 Verify that the threshold level is 2.3V on the Amp/Disc. See the diagram.

1.2.5 Enter MCD Test and select Acquire.

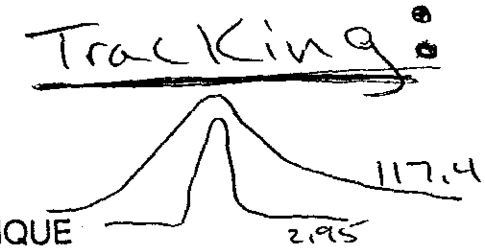
1.2.6 At a Test Signal of 2 KHZ, the output should be as shown.

1.2.7 If this Test shows constant counts, the Amp/Disc or 16 Channel board are good, but the MCD may be defective.

1.2.8 If this Test shows no counts or inconsistant counts, the electronics are defective and the MCD is probably good. Check the MCD.

5600 SYSTEM CHECKOUT PROCEDURE
ESCA

OPERATION NO: 9.0 SHEET 1 OF 2 ISSUE NO : 10



0.0 REFERENCE DOCUMENTS

0.1 620939 5600 SYSTEM MANUAL

0.2 618449 ASSY, TERMINATOR, MULTITECHNIQUE

1.0 WORK FUNCTION CALIBRATION

1.1 This operation is done to align the Ag $3d_{5/2}$ peaks, which are the main silver peaks.

1.1.1 Select the Resolution select menu and setup for: 117.4 Pass Energy with the lowest ev/step available in the UTIL mode.

1.1.2 Select the HI RES mode and set up for: 2.95 Pass Energy and the lowest ev/step available.

1.1.3 Select the setup Align menu and setup for: 370 Upper Limit with a Range of 4 and 2.95 Pass Energy.

1.1.4 Press Refresh Acquire and note where the peak is. If the counts are low, open up the aperture to the largest.

1.1.5 Abort Acquire and select the Setup X-Ray Source menu.

1.1.6 Adjust the Work Function until the 368.27 peak is at 368.27 +/- 0.1ev (@2.95 P.E.). If the peak needs to be moved to a higher binding energy, lower the work function number in the X-ray source menu. Example: If the Ag $3d_{5/2}$ peak is located at 367.97 binding energy, lower the work function number to 4.5 from 4.8. This will raise the binding energy to 368.27, which is where the peak should be located.

1.1.7 Press Setup Align and note where the peak is now.

1.1.8 Align the peak position so that it is the same in both the 2.95 and 117.4 Pass Energies by adjusting R4 on the SCA Terminator box after selecting the 117.4 Pass Energy.

1.1.9 Repeat steps 1.1.3 - 1.1.8. The peak should be located at 368.27ev for both the 117.4 and 2.95 Pass Energies.
Note: this is a coarse adjustment. Continue to step 1.1.10 for fine tuning.

1.1.10 Set up a Survey for: 370 with a Range of 4.

0.0 REFERENCE DOCUMENTS

0.1 COD 550 Coupon Testing For System Cleanliness

0.2 620939 5600 System Manual

1.0 SAMPLE CONTAMINATION TRACE ANALYSIS PROCEDURE

1.1 Run a 1000-0 ev Survey at 93.7 P.E. and 0.40ev/step per COD 550.

1.2 Copy the trace.

1.3 Run an AUTO PEAK ID to identify the major peaks.

1.4 Set up for Multiplex. Enter all regions from step 1.3.
Include (min.) O1, C1, F1, Al2, Cl1, Si2. See Fig.1.

1.5 Select 58.50 Pass Energy, 0.1 ev/step, 50ms/step, 800um aperture and a 5 min acquisition time. See Fig. 2.

1.6 Acquire a Mulitiplex.

1.7 Display the Multiplex file.

1.8 Press AC/PEAK ID.

1.9 Press AC SETUP.

1.10 Select the Area mode.

1.1.1 Select the left and right endpoint for each Region.

1.1.2 Press AC TABLE.

1.13 Print out the Atomic Concentration Table and 1000-0 Trace.

1.14 Check the atomic concentrations of all regions and refer to COD 550 for acceptable limits.

1.15 Label and file all traces and tables in the System logbook.

5500 SYSTEM CHECKOUT PROCEDURE
ESCA

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Fig.1

ESCA Multiplex-1

a Settings   Previous   New   File   SPECS

b P/N Acquisition   Yes   No

	1	2	3	4	5	6	7	8
Region selection								
c Element name	O1	C1	F1	Al2	Cl1	Si2	N1	Cu2
Acquisition window								
d Lower limit (eV)	525.0	280.0	680.0	113.0	194.0	145.0	394.0	924.0
e Range (eV)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	50.0
Upper limit (eV)	545.0	300.0	700.0	133.0	214.0	165.0	414.0	974.0
f Resolution	UTIL	UTIL	UTIL	UTIL	UTIL	UTIL	UTIL	UTIL
eV/Step	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Time/Step	50	50	50	50	50	50	50	50
Pass energy (eV)	58.70	58.70	58.70	58.70	58.70	58.70	58.70	58.70
g Sweeps	5	5	5	5	5	[illegible]	5	[illegible]

Fig. 2

Analyzer/Detector Parameters

a Detector   Single Channel   Position Sensitive   Multiple Channel

b Input lens   Standard   Extended   Omni Focus   Omni Focus A   Omni Focus II   Omni Focus III

c Omni Focus lens area   Small   Large   Minimum

d Aperture   1   2   3   4   5

e ISS scattering angle (Deg)   134.8

0.0 REFERENCE DOCUMENTS

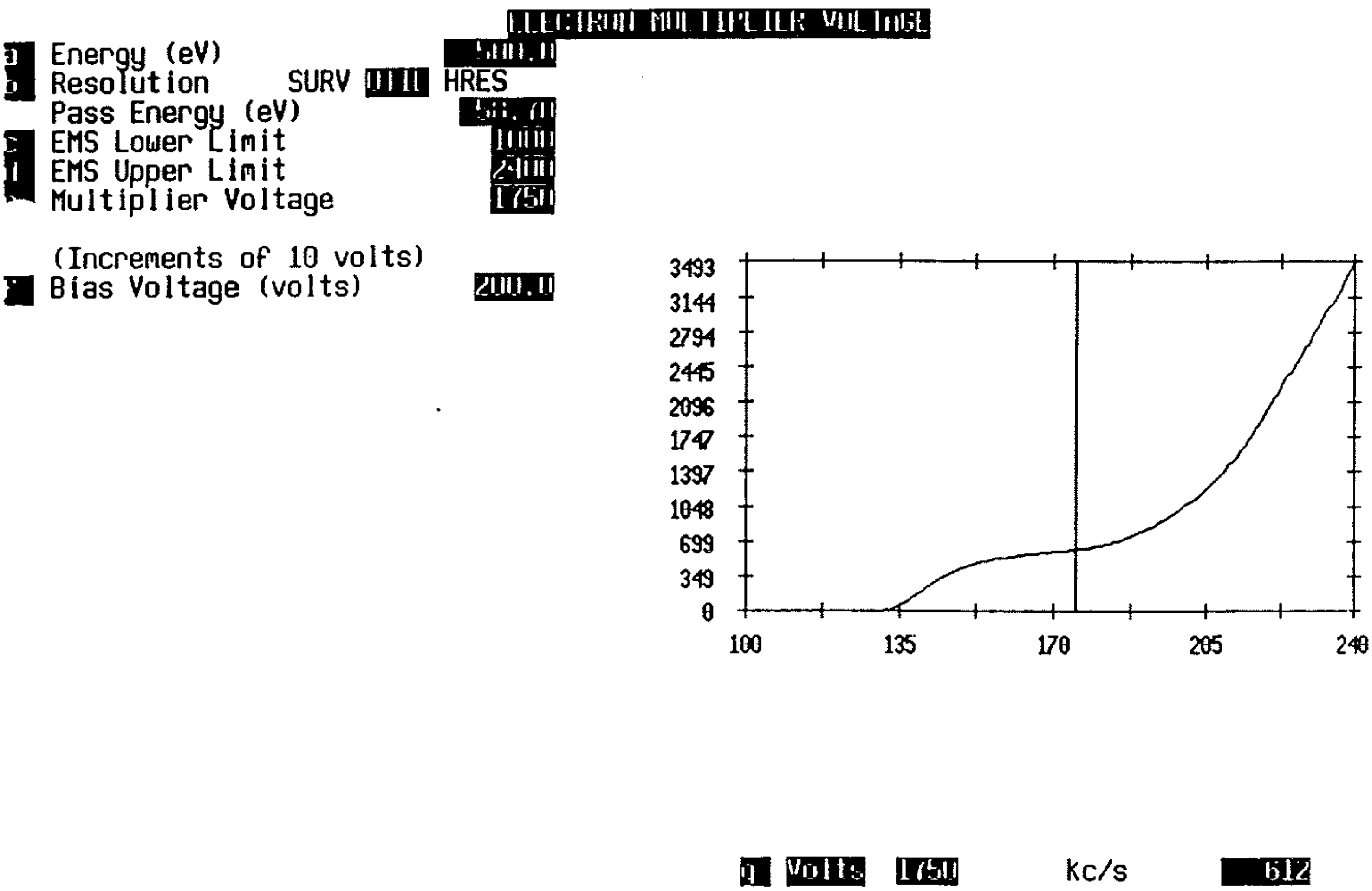
0.1 620939 5500 SYSTEM MANUAL

0.2 617636 04-035 MICROSCOPE MANUAL

1.0 SYSTEM DATA ACQUISITION

1.1 EMS Voltage setup

1.1.1 Enter the Electron Multiplier Voltage menu and position the cursor on the "plateau" as shown:



1.1.2 Make a copy of the EMS curve and file it in the system logbook.

1.1 Focal Point and Spot Size Acqusition

1.1.1 Mount the slotted silver sample on to a recessed sample mount. Ensure copper clips have been removed. Load this sample into the system.

Note: Ensure that the slots are parallel to the Y-axis.

1.1.2 Lightly sputter clean the slotted sample.

1.1.3 Ensure that the Minimum Area mode has been selected in the Hardware Configuration menu and that the 400um aperture has been selected.

1.1.4 Enter the Analyzer/Detector Paramenters menu through the "hidden" key. Type in the lens constants for apertures 4 and 5 as follows:

Analyzer/Detector Parameters

a	Detector	Single Channel	Position Sensitive	Multiple Channel			
b	Input lens	Standard	Extended	Omni Focus	Omni Focus A	Omni Focus II	Omni Focus III
c	Omni Focus lens area	Small	Large	Minimum			
d	Aperture	1	2	3	4	5	
e	ISS scattering angle (Deg)	134.6					
	WARNING!!! For service use only. Do not change.						
f	Pass Energy (eV)	2.95					
g	c2b =	307					
h	c2c =	0					
i	c3c =	200					
j	Resolution						
k	c1 =						
l	c2 =						
m	c3 =						

1.1.5 Set the X-ray source for Mg at 400W, 15KV.

1.1.6 Vertically position the sample mount so that the sample surface is on the same plane as the horizontal machine mark on the inside of the test chamber. Adjust the X and Y axis on the 10-325 stage so that the sample is somewhat centered under the lens.

1.1.7 While acquring data in the Align menu (select whatever parameters are convienent), Refresh Aquire, with the lens set for the 400um aperture, move the sample in the X direction until the silver peaks are a minimum. Move the sample back until the silver peak drops off again. The first slot now has been located.

1.1.8 Focus and align the microscope to that slot. Move the sample in the Y direction along that slot and find the end of that slot. Realign the crosshairs of the microscope to that position.

1.1.9 Reposition the sample to the middle of the largest slot. Adjust the X,Y and Z so that the counts are zero.

1.1.10 Change the lens aperture to 150um and move to the middle slot. The counts again should be very close to zero.

1.1.11 Realign the microscope if needed. Note the counts on silver and be sure that the X-ray source is aligned to maximum counts, then move to the smallest slot. The goal is to get about one third of the counts in the slot than on the silver.

1.1.12 Check that the microscope is aligned at this point.

1.1.13 Exit the Align menu and set up a Survey starting at a binding energy Lower Limit of 362ev and a range of 18ev. Select a Pass Energy of 23.5, 100ms/step and 0.025 ev/step. The number of cycles is not critical from slot to slot, but the acquisition time outside the slot and inside the slot should be equal.

1.1.14 Acquire data outside the slot and inside the slot for each of the following:

small slot	150um aperture #2
middle slot	400um aperture #3
large slot	800um aperture #4

1.1.15 Display the data and find the area under the curve in terms of counts in the data massage menu. The requirement is that the (area in slot)/(area out of slot) is less than or equal to 0.32.

1.1.16 Print/plot a hardcopy of each and save the data.

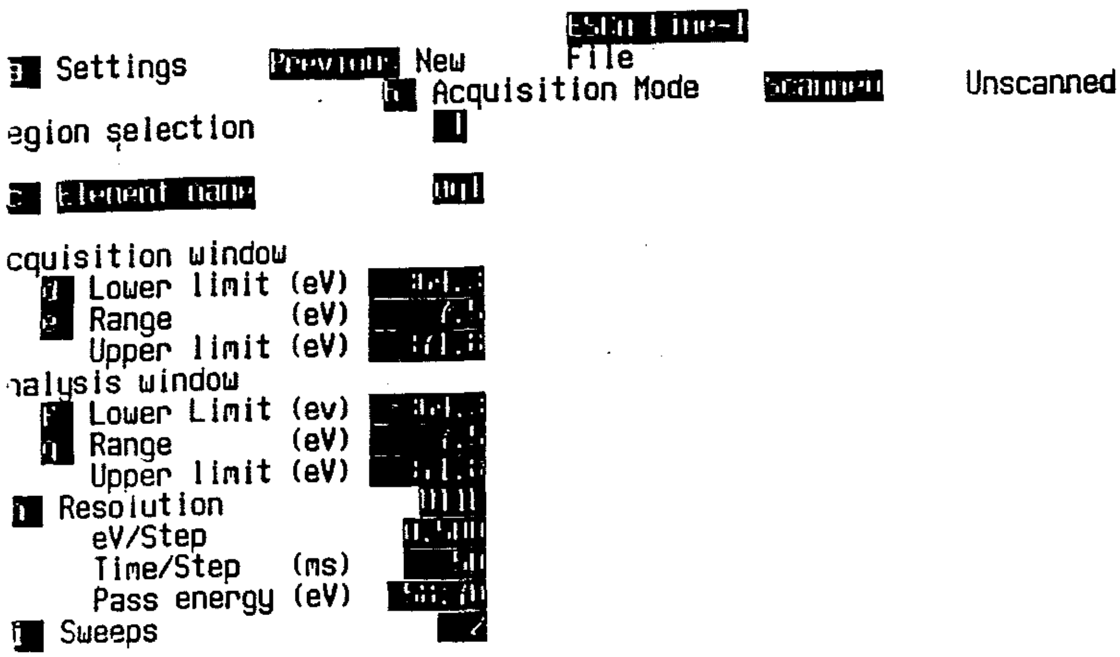
1.1.17 If the specs cannot be met, try to realign the sample to the analysis area. The X, Y and Z axis of the stage can be adjusted to meet the specs. Once the spec is met, fine tune the microscope to the center hole with the conditions set for the .15 mm aperture. Move the stage X and Y for minimum counts in the center hole. Adjust the microscope focus and telescoping as needed without moving the stage. Determining the spot size is finding the focal point of the analyzer where the rest of the data will be taken . When loading another sample, the Z axis will be used to focus the sample and the X and Y used to align to the crosshairs to ensure the same analysis area.

1.1.0 Analysis Area Calculation(Scanning stage)

1.1.1 Load the slotted sample onto the stage and ensure that the slots are aligned on the Y-axis.

1.1.2 Perform the spot size measurement procedure per the 5600 Checkout procedure as a starting point.

1.1.3 Enter the ESCA Line menu and setup the following parameters using the 75um aperture:



1.1.4 Perform the line scan on the 1100um slit.

1.1.5 Enter the Stage Control menu and do a Refresh Acquire.

1.1.6 Do a 200um scan for the 75um aperture. The intent is to locate the point where the counts go from max to min and use this as the middle of the scan.

1.1.7 Setup the scan for the proper length in the Stage Control menu.

1.1.8 Enter the ESCA Line menu and set the resolution to 2 to check for proper scan length. Then increase the Resolution to 16 for the final line scan.

1.1.9 The Analysis area is calculated by entering the Expand menu and setting the upper and lower cursors to the 84 and 16 points on the line scan and then moving the left and right cursors to the point on the curve where these cursors intersect the curve.

1.1.10 The difference between the micron markers is the analysis area. See Fig. 1A.

[illegible]
urrent Previous

Position Definition Centered Variable
Offset from sample position)
X Offset [illegible] -40 .2
Y Offset [illegible]
Theta Offset [illegible]
Resolution
2 4 8 16 32 64 128

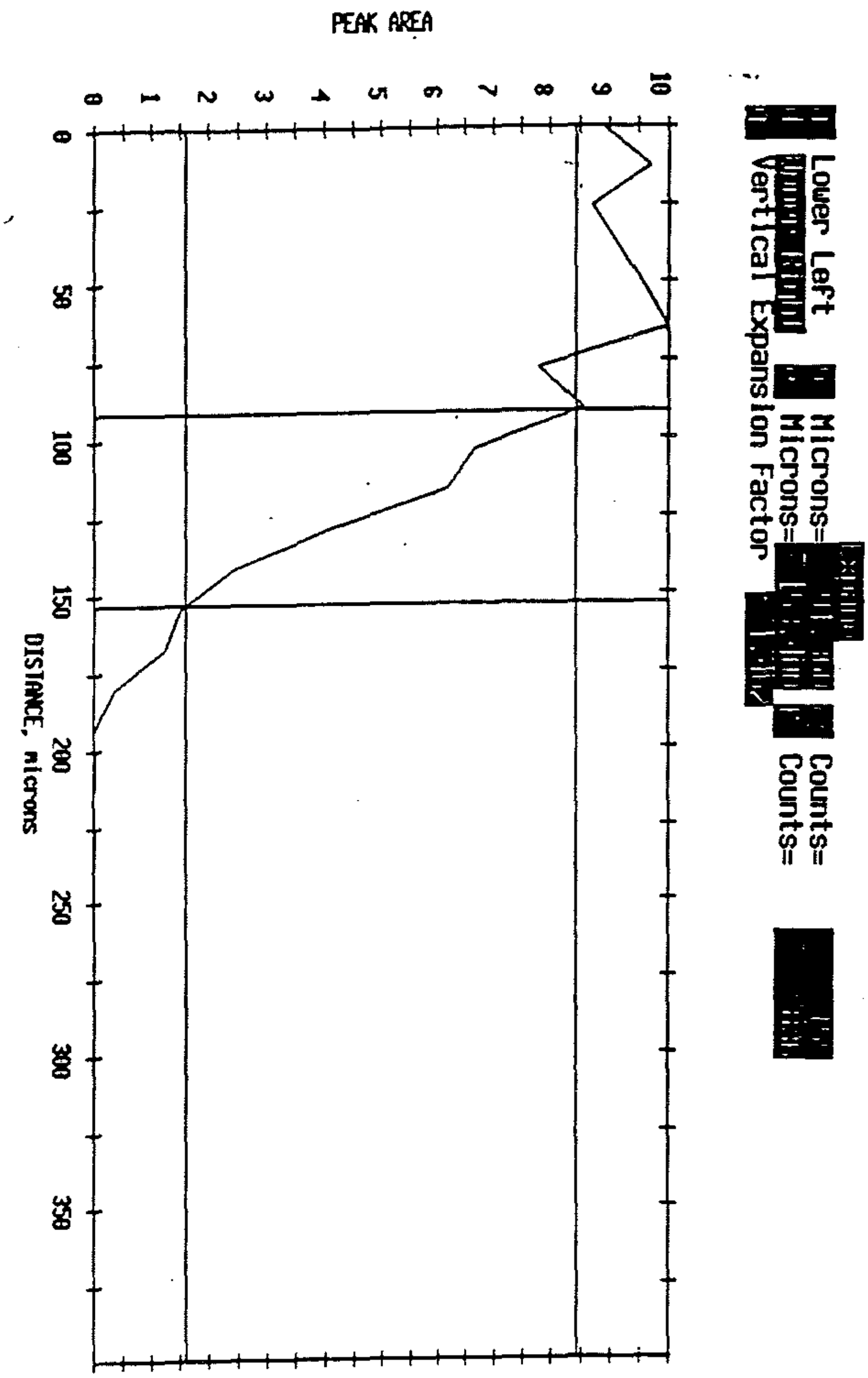
-RAY source
X-RAY anode Mg Standard BOTH Standard REF Mg Al Monochromated filament 1
Al Standard BOTH Standard REF Al Al Monochromated filament 2
Anode 1 [illegible] Power (w) [illegible]
Anode 2 [illegible] Power (w) [illegible]
Filament 1 [illegible] Power (w) [illegible]
Filament 2 [illegible] Power (w) [illegible]
X-RAY voltage [illegible]

Peak measurement use Area Height

Neutralizer Off

Take off angle (Deg) [illegible]

Fig. 1 A



30 min.
30 sweep
Unscanned
Res 32
Integrated.

1.2 Analyzer Data

1.2.1 Setup:

1.2.1.1 Load a silver sample into the system and position it to the focal point of the analyzer.

1.2.1.2 Set the lens to the 400um(#3) aperture and select for an Survey with parameters of 380 ev and a Range of 25 and the Pass Energy of 11.56.

1.2.1.3 After the Survey is complete, set the right and left endpoints, range and background values.

1.2.1.4 Note the Signal-to-Background Ratio value in the Height/FWHM Setup Menu.

1.2.1.5 Adjust the Amp/Disc box pot approx. 1/2 turn in either direction.

1.2.1.6 Take another Survey and recheck the Signal-to-Background Ratio value. Readjust the Amp/Disc box pot as necessary until the optimum value is attained.

1.2.1.7 Remove the cover from the Amp/Discriminator box and measure the Threshold voltage across the test points. Note this value on the EMS trace that is filed in the system logbook.

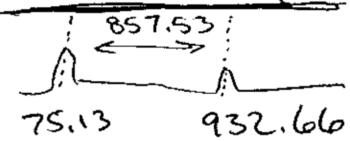
1.2.2 New Data Acquisition

1.2.2.1 Acquire the data by running a Multiplex set up per Fig. 1 and Table 1.

1.2.2.2 Set the Background Energy(Node H) to 365.7 with a Range of 0.4v.

1.2.2.3 Set the Noise Energy(Node G) to same as above.

Linearity 8



932.66
-75.13
857.53

Note: 1.2.6.1-.2 give values to allow exit from the Setup menu only. The values for the S/B and Peak-to-Noise Ratios are not meaningful with this range.

1.2.2.4 Set the Upper and Lower endpoints for each region in the Height/FWHM Setup menu as follows:

Right Endpoint(Node E): All P.E.'s, all apertures - 366.5 ev

Left Endpoint(Node B): 2.95-23.5 P.E.'s, all aperutres - 371.275 ev

Left Endpoint: 58.7 P.E., all apertures - 371.25 ev

1.2.2.5 After the Multplex has been completed, do an 11 point smooth on each region in the multiplex.

1.2.2.6 Enter the Height/FWHM menu for each region of the multiplex to print out each data point.

1.2.2.7 Plot all the <u>Full Width at Half Maximum</u> and <u>Peak Height</u> from the Height/FWHM Summary printout points to draw the curves on the appropriate spec data sheet. See Fig. 2.

1.3 Copper Data

1.3.1 The Cu data may be run in any of the apertures except the largest because the count rate is too high (typically 800um).

1.3.2 Acquire a Survey with a range of 1000-0 and a Pass Energy: of 58.7. See Fig. 3.

1.3.3 Save a hardcopy of the Survey.

1.3.4 Set up a Multiplex using a 23.5 Pass energy per Fig.3: Cu1, Cu3 and Cu4. Save a hardcopy of each region.

1.3.5 Check each peak using the cursor. The peaks should be :

75.13 +/- 0.1 for Cu1

334.94 +/- 0.1 for Cu3

932.66 +/- 0.1 for Cu4

Look at Au

1.3.6 If the peaks are not within the tolerance listed, return the Retard Supply board to the Electronics call area for re-cal.

CW increase Lin R59 Fine R71 course

TABLE 1

Standard Source

PASS ENERGY:	2.95	5.85	11.75	23.5	58.7	
Aperture 1 :	30.13	24.10	20.08	10.04	0.82	Minutes
		75	60	30	25	
75um	75	60	50	25	20	Sweeps
Aperture 2 :	10.04	6.03	2.41	1.21	0.12	min
		20	10	5	4	
150um	25	15	6	3	3	sweeps
Aperture 3 :	0.80	0.40	0.40	0.40	0.04	min
		3	3	2	2	
400um	2	1	1	1	1	Sweeps
Aperture 4 :	0.40	0.40	0.40	0.40	0.04	
		2	2	2	2	
800um	1	1	1	1	1	
Aperture 5 :	0.40	0.40	0.40	0.40	0.04	
		2	2	2	2	
Slit	1	1	1	1	1	

Omni III	V
75	30
150	120
400	400
800	800
800X2000	800X2000

Lower → 365

Range → 6

FIG.1

```
                                          ESCA Multiplex-2
Current        Previous

a. Acquisition time (Min)                 1.0
b  X-RAY anode Mg Standard   BOTH Standard REF Mg    Al Monochrom
               Al Standard   BOTH Standard REF Al    Al Monochrom
   Anode 1      Mg  Power (w)             400
   Anode 2      Al  Power (w)             400      Neutralizer
   Filament 1   Al  Power (w)             400
   Filament 2   Al  Power (w)             400
   X-RAY voltage                          15.0

   Take off angle (Deg)                   45
```

FIG. 2

Height/FWHM Summary

Filename: data39
Region: 3
Comment: large area specs

Full Width at Half Maximum: 0.964
Signal to Background Ratio: 10.110
Peak Height to Noise Ratio: 2048.510

Points to use on Spec curves.

	Energy	Range	Counts	Counts/Sec
Left Endpoint:	371.275	------	32495	324950
Right Endpoint:	366.525	------	32683	326830
Peak Height:	368.325	------	292937	2929370
Signal at Peak:	368.325	------	325549	3255490
Background:	365.750	0.500	32201	322010
Noise:	365.750	0.500	143	1430

FIG. 3

ESCA Multiplex-1

a Settings Previous New File SPECS

b P/N Acquisition Yes No

	1	2	3
Region selection			
c Element name			
Acquisition window			
d Lower limit (eV)	65.0	325.0	923.0
e Range (eV)	20.0	20.0	20.0
Upper limit (eV)	85.0	345.0	943.0
f Resolution	HRES	HRES	HRES
eV/Step	0.025	0.025	0.025
Time/Step	100	100	100
Pass energy (eV)	23.50	23.50	23.50
g Sweeps	2	2	2

0.0 REFERENCE DOCUMENTS

0.1 620939 5600 SYSTEM MANUAL

1.0 X-RAY SOURCE DATA

1.1 Select the appropriate X-ray Source Data Sheet.
Note: the following procedure will use the Mg/Al anode as an example, but it can apply to any of the other optional anodes.

1.2 The sample used must be clean Al.

1.3 Select the 800um aperture, Pass Energy of 93.9and 1ev/step. See Fig.1.

1.4 Set the X-ray source for anode 1 at 15KV and 400W.

1.5 Take a Survey from 0ev with a range of 1000ev.

1.6 Set up for a Multiplex as follows:

Region	Mg Ev	Al Ev	Range	Sweeps
1	64.0	64	20	2
2	792.7	102.5	20	2
3	387.9	620.9	20	2
4	-169.0	297.0	20	2

Acquire for 5 minutes.

1.7 Measure the counts above background for the O_2 ghost peak at 802.7ev. The Cu ghost at 397.9ev and the Al crosstalk at -159.0ev.

1.8 Calculate the percentage of these counts compared to Al. Compare these figures to the table on the spec sheet. The numbers should be less than or equal to those in the table.

1.9 Change the X-ray source to anode 2 and repeat steps1.5 - 1.8. Keep in in mind that different peaks are now being referenced and change the Multiplex accordingly. See Fig.2.

1.10 If the O_2 ghost peak is "high," this is a good indication that an oxide layer has formed on the anode and must be corrected. If the Cu ghost is "high," this is a good indication that there are holes in the anode coating exposing the base metal. If there is a large amount of crosstalk from the other anode, this is an indication that either the filament is too high or not aligned, or the fence between the anodes has material from the anode on it. Both of these conditions are unacceptable.

see next page

1.11 Take a trace from 1000 - 0ev in the dual anode mode referenced to the anode with the highest primary photon energy. In this case, it would be Al.

1.12 Complete the data sheet. See Fig.3 for the complete list of anode types and specs for each.

(X) Realign source on AL after Mg.

7927
233
1025.7

5600 SYSTEM CHECKOUT PROCEDURE
ESCA

OPERATION NO: 12.0 SHEET 3 OF 4 ISSUE NO : 6

Clean Al sample

FIG. 1

Mg Anode

ESCA Multiplex-1

a Settings Previous New File SPECS

b P/N Acquisition Yes No

	1	2	3	4
Region selection				
c Element name				
Acquisition window				
d Lower limit (eV)	64.0	792.7	387.9	-169.0
e Range (eV)	20.0	20.0	20.0	20.0
Upper limit (eV)	84.0	812.7	407.9	-149.0
f Resolution	UTIL	UTIL	UTIL	UTIL
eV/Step	0.125	0.125	0.125	0.125
Time/Step	50	50	50	50
Pass energy (eV)	58.70	58.70	58.70	58.70
g Sweeps	2	2	2	2
	Al	O_2	Cu	Al

Ghosts

FIG. 2

Al Anode

ESCA Multiplex-1

a Settings Previous New File SPECS

b P/N Acquisition Yes No

+233

	1	2	3	4
Region selection				
c Element name				
Acquisition window				
d Lower limit (eV)	64.0	1025.7	620.9	297.0
e Range (eV)	20.0	20.0	20.0	20.0
Upper limit (eV)	84.0	1045.7	640.9	317.0
f Resolution	UTIL	UTIL	UTIL	UTIL
eV/Step	0.125	0.125	0.125	0.125
Time/Step	50	50	50	50
Pass energy (eV)	58.70	58.70	58.70	58.70
g Sweeps	2	2	2	2
	Al	O_2	Cu	Mg

Ghosts

FIG. 3

Ghost B.E. with Al 2p at 74 ev B.E. referenced to First primary Anode photon energy

Photon Energies	h v (ev)
Mg Ka	1253.6 > 233,2
Al Ka	1486.8
Si Ka	1739.6
Zr La	2042.4
Au Ma	2122.9
Ag La	2984.3
Ti Ka	4510.9

Ghost peaks on Al2p (74ev) primary/ghost	Peak Position	Spec. Percent
Mg/Cu	397.9	4.0%
Al/Cu	630.9	4.0%
Al/O	1035.7	10.0%
Mg/O	802.7	5.0%
Si/O	1288.7	26.0%
Zr/O	1591.5	100.0%
Au/O	1672.0	166.0%
Ag/O	2533.4	250.0%
Ti/O	4060.0	1000.0%

Crosstalk Peaks primary/ghost	Peak Position 74-233=-159	Spec. Percent
Mg/Al	-159.0	2.00%
Mg/Si	-412.0	0.76%
Mg/Zr	-714.8	0.20%
Mg/Au	-795.3	0.12%
Mg/Ag	-1656.7	0.08%
Mg/Ti	-3183.3	0.02%
Al/Si	-179.0	1.52%
Al/Zr	-481.8	0.40%
Al/Au	-562.3	0.24%
Al/Ag	-1423.7	0.16%
Al/Ti	-2950.3	0.04%

Crosstalk Peaks primary/ghost	Peak Position	Spec. Percent
Al/Mg	307.0	8.0%
Si/Mg	560.0	21.0%
Zr/Mg	862.8	80.0%
Au/Mg	943.3	135.0%
Ag/Mg	1804.7	200.0%
Ti/Mg	3331.3	800.0%
Si/Al	327.0	10.5%
Zr/Al	629.8	40.0%
Au/Al	710.3	67.0%
Ag/Al	1571.7	100.0%
Ti/Al	3098.3	400.0%

The 1st element denotes primary anode being run & the 2nd element is the ghost or crosstalk peak (see example)

Mg/Si The Mg anode is the one that is being run and you are looking for the Si crosstalk peak.

0.0 REFERENCE DOCUMENTS

0.1 617922 10-420 MONOCHROMATOR

0.2 617699 MANUAL, 10-420 MONOCHROMATOR

1.0 10-410 Alignment Procedure

1.1 Ensure that the microscope is aligned to the focal point of the analyzer and the ion gun and the neutralizer are aligned before aligning the monochromator.

1.2 Select the minimum area mode and the largest lens aperture (slit).

1.3 Position a clean, flat phosophor/silver specimen at the focal point of the analyzer.

1.4 Attain 250 watts at 14KV from the 22-040.

1.5 Image the phosphor sample on the TV by using the X alignment adjust on both the 10-420 and 10-600.

1.6 Once the x-ray spot on the phosphor sample is found, adjust the crystal Z, Y and X and the 10-600 source X and Y until the spot is at the focal point of the analyzer and the sharpest blue spot is achieved on the screen.

1.7 Move the stage horizontally to the silver sample to check for reasonable target current.

1.8 Do a Refresh Acquire and check for a reasonable count rate.

1.9 Close the 10-420 shutter and sputter clean the silver sample.

1.10 Set the 10-360 aperture to 0.80 and open the 10-420 shutter.

1.11 Do a Refresh Acquire and adjust the 10-420 X and Y for maximum counts.

1.12 Enter the Set Up Align menu. Choose the Ag3D5/2 region and the energy region from 370 to 366 ev.

1.1.3 Take data with the standard source Al side and note where the Ag lines are falling with the Al x-rays.

1.14 Select the 10-600 source and Refresh /Acquire and start an acquisition.

1.15 Maximize the counts in the acquisition and the current being read on the picoammeter. When the maximum counts and maximum current are achieved together, the 10-420 has been focussed correctly.

1.16 As the crystal Y micrometer at the top of the 10-420 is moved, the light is brought to shine on the focal point of the analyzer, increasing the count rate.

1.17 Maximize the count rate by moving the 10-420 crystals and the 10-560 source onto the Roland circle.

1.18 While adjusting the crystal tilt and monitoring the count rate on the computer, monitor the photocurrent to the sample. When the maximum count rate has been achieved, maximize the target current by adjusting the 10-600 source Y. This will change the count rate slightly. It will be necessary to iterate between the crystal Y and the source Y to miaximize both the count rate and the target current at the same point. When this is attained, the focus of the 10-420 at that crystal setting has been acheived.

1.19 Check the resolution by taking a survey at 370ev, range of 4, lowest ev/step and tilt the sample to 65° (20° toward the analyzer from horizontal).

1.20 Redisplay the data and determine the resolution by entering the Height Full-Width Half Max Set Up menu.

1.21 Once the best FWHM and count rate at this crystal position have been determined, adjust the Z position of the 10-420 crystals either up or down sightly with this micrometer.

1.22 Use the crystal Y and the source Y micrometers to remaximize the photocurrent and the count rate at this new crystal position.

1.23 Redetermine the FWHM. If the FWHM is better than the previous reading, continue moving the Z postion in the same direction until a maximum is found. However, if the FWHM is worse than the previous reading, move the Z position in the opposite direction until a maximum is found. This is an iterative process which will generate a curve of FWHM versus Z position. From this curve the focal plane of the crystals can be determined and the crystals set accordingly.

14Kv 1.24 Acquire data at 400W for each of the aperture curves on the Data sheet for 10-420 with the 10-600. Set up the number of sweeps for the Multiplex as shown in Table 1.

Acq 5/2 368,27

TABLE 1

10-420 Source

PASS ENERGY:	2.95	5.85	11.75	23.5	58.7	93.7	
Aperture 1:	-	-	-	-	-	-	Minutes
75um	66	52	36	22	12	9	Sweeps
Aperture 2 :	9	7	5	3	-	-	min
150um	33	26	18	11	6	4	Sweeps
Aperture 3 :	4	3	2	-	-	-	Min
400um	14	11	7	4	3	2	Sweeps

	2.95	5.85	11.75	58.7	93.7
Aperture 4 :	2	1.5 / 7	1 / 5	- / 3	- / 2
800um	7	5	3	2	2
Aperture 5 :	2	1.5	1	-	-
Slit	2	1	1	1	1

0.0 REFERENCE DOCUMENTS

0.1 617663 MODEL 04-090 NEUTRALIZER MANUAL

1.0 Specimen Neutralization

1.1 After the software is loaded, press the HARDWARE CONFIG function in the System Control Command Bank to display the hardware configuration menu. Set the Neutralizer Type to 04-090.

1.2 Press the ALN function key to display the ESCA alignment menu. The operator can change the following neutralizer parameters in the alignment menu: NEUTRALIZER, EMISSION CONTROL, ELECTRON ENERGY and EXTRACTION ENERGY.

1.3 Address Align routine, turn on the neutralizer with the following parameters: Kinetic Energy = 1.5eV, Emission = 25. Allow 1 hour for the optics to stabilize.

1.4 The microscope and monochromator must have been previously calibrated before this procedure is performed.

1.5 Introduce a PET film sample under a mask with a 5mm diameter hole (under the moly mask) at the center of the sample holder.

1.6 With the sample tilt at 65-70°, position the sample so that the center of the masked area is at the focal point of the analyzer.

1.7 Select the 400um diameter analysis area.

1.8 Set up the Alignment menu for initial alignment per Fig. 1.

1.9 Set the X-ray source power to 200W and start at 1 uA target current with no bias. If this does not provide enough neutralization, increase the Elec. Energy by 1 or as necessary and adjust the Emission to move the peak position.

1.10 Turn on the monochromator x-ray source and begin a Refresh Acquire. The carbon 1s spectrum should be visible.

1.11 Make a final adjustment of the y or z sample position to maximize the counts/sec. Note the micrometer settings.

1.12 Adjust the deflection controls to minimize the apparent C1s binding energy. (that is, shift the C1s peak as far as possible) Make a final small adjustment of the deflection controls, kinetic energy and emission for best visual separation of C1s peaks.

Note: Continuous irradiation of the PET sample with x-rays for more than 15-20 minutes permanently changes the sample surface compostion. It is therefore necessary to introduce a fresh PET sample when trying to achieve the FWHM specification of 0.80eV.

1.13 Set the ESCA SURVEY mode per Fig. 2 and set the X-ray source power to 14.5KV.

1.14 Acquire the C1s spectrum and do an 11 point smooth.

1.15 Select the Curve Fit menu and Curve Fit Setup, then Gaussian-Lorenzian.

1.16 Select the Band menu and fit the lowest peak for the best curve fit.

1.17 Add a Band and fit the next highest peak.

1.18 Finally, add the last Band and fit the C1s peak.

1.19 Press the Curve Fit key and with optimum neutralization on a fresh sample, the highest binding energy peak must exhibit a FWHM <= 0.80eV. See Fig. 3.

Fig. 1

[illegible]

Element Name [illegible]
Upper Limit (eV) [illegible]
Range (eV) 10.0

Resolution SURV [illegible] HRES
Pass Energy (eV) [illegible]
eV/step 0.125
Test Acq time/step (ms) [illegible]
Refresh time/step (ms) [illegible]
Manual time/step(ms) [illegible]
Sweeps 1

Neutralizer ON [illegible]
Emission Control 25.0
Electron Energy (%) 1.0

Fig. 2

[illegible]

a Settings Previous [illegible] File SPLIT

b lower limit (eV) [illegible]
c Range (eV) 10.0
Upper limit (eV) [illegible]

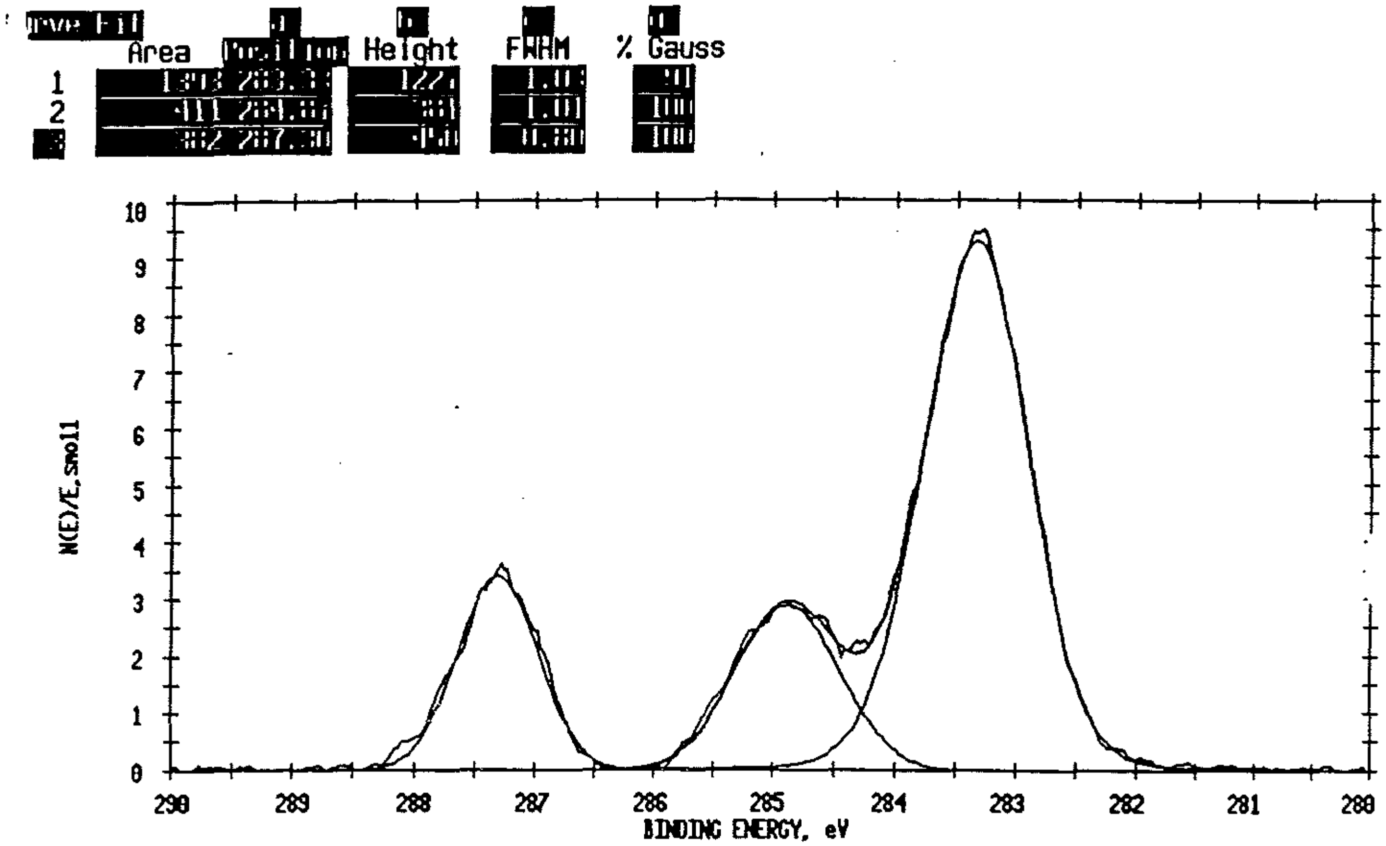
Neutralizer On
Emission current (mA) [illegible]
Electron energy (eV) [illegible]

d Resolution SURV UTIL [illegible]
eV/Step [illegible]
Time/Step (ms) [illegible]
Pass energy (eV) [illegible]

Take off angle (Deg) [illegible]

e Acquisition time (Min) 3.0
f [illegible] Mg Standard. BOTH Standard REF Mg [illegible]
Al Standard BOTH Standard REF Al Al Monochromated filament 2
Anode 1 [illegible] Power (w) 400
Anode 2 [illegible] Power (w) 400
Filament 1 [illegible] Power (w) 200
Filament 2 [illegible] Power (w) [illegible]
X-RAY voltage 15.0

Fig. 3



2.0 Neutralizer Total Current procedure

2.1 Ensure that a metal sample has been loaded and is positioned flat on the stage.

2.2 Ensure that the x-ray source is off.

2.3 Adjust the Electron Energy and neutralizer deflection controls for maximum current to the sample.

2.4 The specification is => 50uA target current.

0.0 REFERENCE DOCUMENTS

0.1 620939 5600 SYSTEM MANUAL

1.0 ISS Procedure

1.1 Operating conditions

1.1.1 Prealign the ion gun to the analysis position using the Faraday cup sample.

1.1.2 Use the Small or Large Area modes, not the Minimum area mode and the Slit, aperture 5.

1.1.3 Enter a beam voltage in the Ion Gun Set Up menu.

1.1.4 Neutralizer Setup (polymers and insulators only): Ie = 21, Elect Energy <=5, Ib ~= 1uA.

1.1.5 Select the largest Pass Energy in the Resolution Tables.

1.1.6 Set Vmult = 2300v and Vbias = 200v.

CAUTION: HIGH BEAM CURRENTS WILL DESTROY CHANNEL PLATES. ENSURE THAT THE BEAM CURRENT IS LESS THAN 250 nA.

ALSO: ENSURE THAT THE INITIAL OPERATING VALUES ARE RE-ENTERD WHEN ISS OPERATION HAS BEEN COMPLETED.

1.1.7 All target measurements are made using the 90V bias on a conductive surface.

1.1.8 Tilt the sample to 70° for best sensitivity.

1.1.9 Ensure that the electron gun is off.

1.2 04-303 Ion Gun Setup

1.2.1 Set the Ionization Voltage switch on the rear of the 11-065 to the 120v position.

1.2.2 Set the Emission Current to 2.0 mA.

1.2.3 Set the Beam Voltage to:

1KV for Ag (metals)

2KV for PET (insulators)

1.2.4 Set the Condensor = 4 - 4.8 and Objective = 10-100 nA.

1.2.5 Adjust the gas to obtain a beam current 10-100nA.

Note: this measured with the 90V bias.

1.2.6 For Ag (metals) and PET (insulators) use 3He.

1.3 Metals Spec Data

1.3.1 For Ag, refer to Fig.1 for the range to use in Survey or Align.

1.3.2 Select a P.E. = 375.7ev, 0.4 ev/step and 20 ms/step, no raster.

1.3.3 The Small Area mode will give the best count rate, while the Large Area mode will give the best resolution.

1.3.4 Place the sample in the flat position and sputter clean before running the specs.

1.3.5 Use the Align routine to position the ion gun for best counts. Use the position knobs on the 11-065. Adjust the Beam volatge on the 11-065 so that the Ag peak is at 0.910.

1.3.6 Ensure that the sample is tilted to 70° for best count rate.

1.3.7 Acquire Survey to verify the highest counts/nA. Peak width (FWHM) does not need to be checked here.

1.3.8 Print hardcopies of the survey and file in the logbook.

1.4 Insulator Spec Data

1.4.1 Ion Gun setup: Vb=2kV, Ie=2mA, ev/step=0.8,Ib~100-200nA and a 1.5 X 1.5 raster size.

1.4.2 Set the 11-065 to Remote to ensure that the ion gun is only on during the analysis to reduce sample damage.

1.4.3 Position a clean, fresh PET sample in the system.

1.4.4 Set the stage for a 70° tilt angle.

1.4.5 Acquire Survey to verify the highest counts/nA on C and O. Peak width (FWHM) does not need to be checked here.

1.4.6 Do an 11 point smooth on the data.

Note: The oxygen peak will disappear if the PET is sputtered for too long. If so, it will be necessary to move to a fresh area on the sample. Because ISS is surface sensitive, these peaks might not be properly observed on the first few scans due to mono layers of air.

Fig. 1

TABLE OF ENERGY RATIOS FOR SCATTERED IONS AT 134.8 DEGREES

Z	MASS	EL	3HE	4HE	20NE	40AR	KR	XE
1	1.0	H	.000	.000	.000	.000	.000	.000
2	4.0	HE	.033	.000	.000	.000	.000	.000
3	6.9	LI	.202	.101	.000	.000	.000	.000
4	9.0	BE	.305	.194	.000	.000	.000	.000
5	10.8	B	.377	.264	.000	.000	.000	.000
6	12.0	C	.418	.305	.000	.000	.000	.000
7	14.0	N	.476	.366	.000	.000	.000	.000
8	16.0	O	.523	.418	.000	.000	.000	.000
9	19.0	F	.581	.482	.000	.000	.000	.000
10	20.2	NE	.600	.504	.000	.000	.000	.000
11	23.0	NA	.639	.549	.000	.000	.000	.000
12	24.3	MG	.655	.567	.000	.000	.000	.000
13	27.0	AL	.683	.601	.036	.000	.000	.000
14	28.1	SI	.694	.613	.045	.000	.000	.000
15	31.0	P	.718	.642	.070	.000	.000	.000
16	32.1	S	.726	.652	.080	.000	.000	.000
17	35.5	CL	.749	.680	.110	.000	.000	.000
18	39.9	AR	.773	.710	.150	.000	.000	.000
19	39.1	K	.769	.705	.143	.000	.000	.000
20	40.1	CA	.774	.711	.152	.000	.000	.000
21	45.0	SC	.796	.738	.194	.000	.000	.000
22	47.9	TI	.807	.752	.217	.000	.000	.000
23	50.9	V	.818	.765	.241	.024	.000	.000
24	52.0	CR	.821	.769	.249	.028	.000	.000
25	54.9	MN	.830	.780	.270	.039	.000	.000
26	55.8	FE	.832	.783	.277	.043	.000	.000
27	58.9	CO	.840	.793	.298	.056	.000	.000
28	58.7	NI	.840	.792	.297	.055	.000	.000
29	63.5	CU	.851	.806	.328	.076	.000	.000
30	65.4	ZN	.855	.812	.339	.085	.000	.000
31	69.7	GA	.863	.822	.364	.105	.000	.000
32	72.6	GE	.869	.829	.380	.118	.000	.000
33	74.9	AS	.872	.833	.392	.128	.000	.000
34	79.0	SE	.879	.841	.413	.146	.000	.000
35	79.9	BR	.880	.843	.417	.150	.000	.000
36	83.8	KR	.885	.850	.435	.167	.000	.000
37	85.5	RB	.887	.852	.443	.175	.000	.000
38	87.6	SR	.890	.856	.452	.184	.000	.000
39	88.9	Y	.891	.858	.458	.189	.000	.000
40	91.2	ZR	.894	.861	.467	.199	.000	.000
41	92.9	NB	.896	.863	.474	.206	.000	.000
42	95.9	MO	.899	.867	.485	.218	.000	.000
43	98.9	TC	.902	.871	.497	.230	.000	.000
44	101.1	RU	.904	.874	.504	.238	.000	.000
45	102.9	RH	.905	.876	.511	.245	.018	.000
46	106.4	PD	.908	.880	.522	.258	.024	.000
47	107.9	AG	.910	.881	.527	.263	.026	.000
48	112.4	CD	.913	.886	.541	.280	.034	.000
49	114.8	IN	.915	.888	.548	.288	.039	.000
50	118.7	SN	.917	.891	.560	.301	.047	.000

TABLE OF ENERGY RATIOS FOR SCATTERED IONS AT 134.8 DEGREES

Z	MASS	EL	3HE	4HE	20NE	40AR	KR	XE
51	121.7	SB	.919	.894	.568	.311	.053	.000
52	127.6	TE	.923	.899	.583	.330	.065	.000
53	126.9	I	.923	.898	.581	.327	.063	.000
54	131.3	XE	.925	.901	.592	.341	.073	.000
55	132.9	CS	.926	.902	.596	.346	.076	.000
56	137.3	BA	.928	.905	.606	.358	.086	.000
57	138.9	LA	.929	.906	.610	.363	.089	.000
58	140.1	CE	.930	.907	.612	.366	.092	.000
59	140.9	PR	.930	.908	.614	.369	.093	.000
60	144.2	ND	.932	.910	.621	.378	.101	.000
61	145.0	PM	.932	.910	.623	.380	.102	.000
62	150.3	SM	.934	.913	.633	.394	.114	.000
63	152.0	EU	.935	.914	.637	.398	.118	.000
64	157.2	GD	.937	.917	.646	.411	.129	.000
65	158.9	TB	.938	.918	.649	.415	.132	.000
66	162.5	DY	.939	.919	.656	.424	.140	.019
67	164.9	HO	.940	.921	.660	.429	.145	.022
68	167.3	ER	.941	.922	.664	.435	.150	.024
69	168.9	TM	.941	.922	.666	.438	.154	.026
70	173.0	YB	.943	.924	.673	.447	.162	.031
71	175.0	LU	.943	.925	.676	.452	.166	.033
72	178.5	HF	.944	.926	.681	.459	.174	.037
73	180.9	TA	.945	.927	.685	.464	.178	.040
74	183.8	W	.946	.928	.689	.470	.184	.044
75	186.2	RE	.947	.929	.692	.475	.189	.047
76	190.2	OS	.948	.931	.698	.482	.197	.052
77	192.2	IR	.948	.931	.700	.486	.201	.055
78	195.1	PT	.949	.932	.704	.492	.207	.058
79	197.0	AU	.949	.933	.706	.495	.210	.061
80	200.6	HG	.950	.934	.711	.502	.217	.066
81	204.4	TL	.951	.935	.716	.508	.224	.071
82	207.2	PB	.952	.936	.719	.513	.230	.075
83	209.0	BI	.952	.937	.721	.516	.233	.077
84	210.0	PO	.952	.937	.722	.518	.235	.079
85	210.0	AT	.952	.937	.722	.518	.235	.079
86	222.0	RN	.955	.940	.735	.537	.256	.095
87	223.0	FR	.955	.941	.736	.539	.258	.097
88	226.0	RA	.956	.941	.739	.543	.263	.101
89	227.0	AC	.956	.942	.740	.545	.265	.102
90	232.0	TH	.957	.943	.745	.552	.274	.109
91	231.0	PA	.957	.943	.744	.550	.272	.108
92	238.0	U	.958	.944	.750	.560	.284	.117
93	237.0	NP	.958	.944	.749	.559	.282	.116
94	244.0	PU	.959	.946	.756	.569	.294	.126
95	243.0	AM	.959	.945	.755	.567	.292	.124
96	247.0	CM	.959	.946	.758	.573	.298	.130
97	247.0	BK	.959	.946	.758	.573	.298	.130
98	251.0	CF	.960	.947	.762	.578	.305	.135
99	254.0	ES	.961	.948	.764	.582	.309	.139
100	257.0	FM	.961	.948	.767	.585	.314	.143

backplate and gear bracket.

1.3.5 Loosen the clamp on the driveshaft gear and rotate the shaft so that the motor can be mounted without moving the stage position.

1.3.6 Tighten the clamp and reinstall parts.

1.3.7 Pull the intro probe out.

1.4 X-Axis Motor Alignment

1.4.1 Start with the X-axis. Set the Y and Z-axis to 0° in the Stage Control menu.

1.4.2 Rotate the X-axis rotary FCW, then back it out 1 complete turn.

1.4.3 Set the X-position to -9.03 (limit) in the Stage Control menu. Check that the stage moves to the limit.

1.4.4 Install the motor onto the stage.

1.4.5 Set the X-position to 25.76 (limit) in the Stage Control menu. Check that the stage moves to the limit.

1.4.6 Set the X-axis to 0°.

1.5 Y-axis Motor Alignment

1.5.1 Ensure that the X and Z-axis are set to 0° in the Stage Control menu.

1.5.2 Rotate the Y-axis rotary FCW, then back it out 1 complete turn.

1.5.3 Set the Y-position to -12.8 (limit) in the Stage Control menu. Check that the stage moves to the limit.

1.5.4 Install the motor onto the stage.

1.5.5 Set the Y-position to 12.81 (limit) in the Stage Control menu. Check that the stage moves to the limit.

1.5.6 Set the Y-axis to 0°.

1.6 Z-axis Motor Alignment

1.6.1 Dock a 1" flat sample mount onto the stage.

1.6.2 Manually adjust the Z-axis to the focal point of the analyzer.

1.6.3 Install the Z motor onto the stage.

1.6.4 Set the Z-axis to 12.85 (limit) in the Stage Control menu. Check that the stage moves to the limit.

1.6.5 Set the Z-axis to -12.8 (limit) in the Stage Control menu. Check that the stage moves to the limit.

1.7 Sample Dock/Unload Check

1.7.1 Intro a sample and set the stages motions for the optimum docking point and record these values from the Stage Control menu.

1.7.2 Press the Set Dock softkey in the Stage Control menu.

1.7.3 Enter random values for X, Y, Z, tilt and Theta in this menu.

1.7.4 Press the Dock Stage softkey.

1.7.5 Intro the sample again and verify ease of docking of the sample to the stage.

1.7.6 Press the Unload Stage softkey in the Stage Control menu.

1.7.7 Check that the sample can easily be removed from the stage when the probe is retracted.

1.7.8 Press the Load Stage softkey and verify that the sample can easily be docked and remains on the stage when the probe is retracted.

1.8 ESCA Map

1.8.1 Ensure that ESCA/SIMS S/W is loaded, otherwise the map will not be displayed.

1.8.2 Ensure that the motors are setup per steps 1.3-1.6.

1.8.3 Move the sample with the motor control to the area to be mapped. (A sample with good contrast should be used.)

1.8.4 Enter the Map Setup menu.

1.8.5 Type in the proper element name.

1.8.6 Select 1 sweep and the Scanned mode.

1.8.7 In the next page of the menu, select Centered and approximately 2mm size.

1.8.8 Select Traverse Map to verify the actual limits of the map.

1.8.9 Select a Resolution of 16 or 32.

1.8.10 Select the 400um aperture in hardware and S/W and a P.E. of 58.70ev.

1.8.11 Enter the Test Acquire menuand select Test Acquire.

1.8.12 Lower the standard x-ray source to maximize the counts.

1.8.13 After the map is complete, select Acq. Display, then select Map to display the map.

0.0 REFERENCE DOCUMENTS

0.1 5500 SYSTEM VACUUM ASSEMBLY PROCESS

1.0 System Clean-up

1.1 Electronics Console Items

1.1.1 Remove all computer components.

1.1.2 Remove the Matrix Recorder if so equipped.

1.1.3 Remove the keyboard tabletop rails.

Note: Ensure that the keyboard screws are installed in the bottom of the keyboard and the rail screws are installed in the console for shipping.

1.1.4 Remove the color monitor, swivel arms and post.

1.1.5 Install the retaining bars on the front of the card racks.

1.1.6 Install all front panels and check all electronics units for front panel screws and washers.

1.1.7 Remove the air filters from the rear of the console.

1.1.8 Straighten up cables in the console as needed.

1.1.9 Install any cable booting not already installed.

1.1.10 Remove the console power pigtail and return to Assembly.

1.1.11 Retap the power transformer as necessary.

1.1.12 Bubblewrap the exterior cable bundles.

1.1.13 Wipe down the console panels.

1.1.14 Wipe down the table tops.

1.1.15 Touch up any paint nicks.

1.1.16 Drain the heat exchanger/deionizer and put the water lines inside the deionizer cabinet for shipment.

1.2 Vacuum Console Items

1.2.0 Ensure that the monochromator crystals are removed are wrapped and sealed in the shipping suitcase.

1.2.1 Remove the RGA head if still installed.

1.2.2 Remove the 06-600 SIMS analyzer and quadrupole if installed on port number 8.

1.2.3 Drain the turbo oil from the turbo.

1.2.4 Remove any loaner turbos, if so equipped, and return to Assembly. Install the turbo shipping bracket.

1.2.5 Install all shipping brackets, intro cover clamp and UHV intro magnet lock as required.

1.2.6 Install any missing nuts/washers for X-Y adjustments on optics units.

1.2.7 Drain the console air mounts.

1.2.8 Blow out all water from both the standard and the 10-410 x-ray sources.

1.2.9 Tighten down the floating platform shipping bolts.

1.2.10 Check that all aprons are in place and installed properly.

1.2.11 Remove the AVC remote box. Roll up the ribbon cable and secure inside the console.

1.2.12 Install the manual control cover on the Autovalve Control.

1.2.13 Ensure that the console leveling studs are run up.

1.2.14 Crimp the lugs on the vacuum console power cabe.

1.2.15 Attach all side panels.

1.2.16 Install the table top.

1.2.17 Wipe down the chamber, side panels and table top.

1.2.18 Blank off the turbo foreline manifold with the appropriate hardware.

ESCA

Job No. ____________

Customer ____________

Checked By ____________

10-360 S/N ________

Date ________

TEST NO.	DESCRIPTION	FILE NO.	MEASUREMENT	LIMIT
A.	Microscope Alignment: Slotted Sample			
1.	0.075 mil Aperture(for scanning 10-325)		_____ %	=< 32%
1.	0.15 mil Aperture		_____ %	=< 32%
2.	0.4 mil Aperture		_____ %	=< 32%
3.	0.8 mil Aperture		_____ %	=< 32%
B.	Resolution vs Counts		See attached data sheets	
C.	Linearity Check on clean Copper:			
1.	Cu $3p_{3/2}$ peak		_______ ev	75.13 +/- 0.1
2.	Cu $L3_{MM}$ peak		_______ ev	334.95 +/- 0.1
3.	Cu $2p_{3/2}$ peak		_______ ev	932.67 +/- 0.1
C.	X-Ray Source Data: sputter-cleaned		See attached data sheets	
D.	Ion Source			
1.	04-303 Ion Gun : Sample: Faraday cup, 45°			

TEST NO.	DESCRIPTION	FILE NO.	MEASUREMENT	LIMIT
	Current measured w/ 90V bias			
	04-303 Conditions: Vb=5KV Ie=25mA			
	System Pressure (Differential Pumping Option only)		__X10(-__) T	<=5X10^{-8}T
	Maximum Beam Current		______uA	=> 5uA
E.	ISS Data :04-303 IG and 80-366 Analyzer Cntl with 90V bias			
1.	Ag Peak Sensitivity 1KV 3He, no raster		_____cps/nA	=>50Kcps/nA
2.	O2 Peak Sensitivity on PET 2KV 3He, with 1.5X1.5 mm raster		____cps/5nA	=>.5Kcps/5nA
F.	Vacuum Performance			
1.	System Pressure with probe withdrawn and all filaments off.		__10X(-__) T	<=5 X10(-10)T

G. This Specification Compliance Test Sheet is based on :
11-1-91 Performance, Engineering and Environmental Spec

PHI 5600 MULTITECHNIQUE SYSTEMS PN 615163 Rev A