Preface

This document has been compiled with great care and is believed to be correct at the date of print. The information in this document is subject to change without notice and does not represent a commitment on the part of OMICRON Vakuumphysik GmbH.

Please note: Some components described in this manual may be optional. The delivery volume depends on the ordered configuration.

Please note: This documentation is available in English only.

Attention: Please read the safety information on pages 8 to 9 before using the instrument.

Trademarks: Channeltron® is a registered trademark of Galileo Electro-Optics Corporation. Viton® is a registered trademark of DuPont Dow Elastomers. Kapton® is a registered trademark of DuPont Films. Swagelok® is a registered trademark of the Crawford Fitting Company. MULTIPROBE®, ESCAPROBE® and MULTISCAN LAB® are registered trademarks of OMICRON Vakuumphysik GmbH. Other product names mentioned herein may also be trademarks and/or registered trademarks of their respective companies.

Related Manuals

<table>
<thead>
<tr>
<th>Related Manuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEM / SAM User's Guide</td>
</tr>
<tr>
<td>NGE 52 5 kV E-Gun Control Technical Reference Manual</td>
</tr>
<tr>
<td>DAT 125 Hints and Tips</td>
</tr>
<tr>
<td>Spectra 6.xx Interface and Software Manual</td>
</tr>
<tr>
<td>for SEM 500: Instruction Manual: Microfocus Electron Gun, Staib</td>
</tr>
</tbody>
</table>

Table 1: Related manuals.
Copyright

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose without the express written permission of OMICRON Vakuumphysik GmbH.

Warranty

OMICRON acknowledges a warranty period of 12 month from the date of delivery (if not otherwise stated) on parts and labour, excluding consumables such as filaments, sensors, etc.

No liability or warranty claims shall be accepted for any damages resulting from non-observance of operational and safety instructions, natural wear of the components or unauthorised repair attempts.

Normal Use

The Scan Control Unit SCU shall only be used with one of the following packages

<table>
<thead>
<tr>
<th>Package Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEM 500 Scanning Electron Microscopy Package</td>
</tr>
<tr>
<td>SEG 500 Small Spot Electron Source Package</td>
</tr>
<tr>
<td>SEM 1000 Scanning Electron Microscopy Package</td>
</tr>
<tr>
<td>EKF 1000 Electron Gun with NGE 52 Control Unit.</td>
</tr>
</tbody>
</table>

The Scan Control Unit SCU S shall only be used with one of the following packages

<table>
<thead>
<tr>
<th>Package Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEM 20 Scanning Electron Microscopy Package</td>
</tr>
<tr>
<td>SEG 20 Small Spot Electron Source Package</td>
</tr>
</tbody>
</table>

The Scan Control Unit SCU / SCU S shall always be used

- with original cable sets which are explicitly specified for this purpose
- with all cabling connected and secured, if applicable
- with all electronics equipment switched on
- in an indoor research laboratory environment
- by personnel qualified for operation of delicate scientific equipment
- in accordance with all related manuals.
Conditions of CE Compliance

OMICRON instruments are designed for use in an indoor laboratory environment. For further specification of environmental requirements and proper use please refer to your quotation and the product related documentation (i.e. all manuals, see individual packing list).

The OMICRON Scan Control Unit complies with CE directives as stated in your individual delivery documentation if used unaltered and according to the guidelines in the relevant manuals.

Limits of CE Compliance

This compliance stays valid if repair work is performed according to the guidelines in the relevant manual and using original OMICRON spare parts and replacements.

This compliance also stays valid if original OMICRON upgrades or extensions are installed to original OMICRON systems following the attached installation guidelines.

Exceptions

Omicron cannot guarantee compliance with CE directives for components in case of

- changes to the instrument not authorised by OMICRON, e.g. modifications, add-on's, or the addition of circuit boards or interfaces to computers supplied by OMICRON.

The customer is responsible for CE compliance of entire experimental setups according to the relevant CE directives in case of

- installation of OMICRON components to an on-site system or device (e.g. vacuum vessel),
- installation of OMICRON supplied circuit boards to an on-site computer,
- alterations and additions to the experimental setup not explicitly approved by OMICRON

even if performed by an OMICRON service representative.

Spare Parts

Omicron spare parts, accessories and replacements are not individually CE labelled since they can only be used in conjunction with other pieces of equipment.

Please note: CE compliance for a combination of certified products can only be guaranteed with respect to the lowest level of certification. Example: when combining a CE-compliant instrument with a CE 96-compliant set of electronics, the combination can only be guaranteed CE 96 compliance.
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1. Introduction

The OMICRON Scan Control Units, SCU and SCU S are deflection voltage supplies intended for use as scanning controllers for electron guns in Scanning Electron Microscopy (SEM) and Scanning Auger Microscopy (SAM) applications.

The SCU version supplies the deflection voltages for the EKF 1000 and SEG 500 electron sources using either the internal TV scan generator or external scan input from the PC board. Front panel control includes scan width, beam shift, 90° scan rotation, spot mode and line mode.

The SCU S version is intended for use as a scanning controller for the SEG 20 electron source in Scanning Electron Microscopy (SEM) and Scanning Auger Microscopy (SAM) applications. It supplies the X-Y scan input voltages for the SEG 20 deflection controller using either the internal TV scan generator or external scan input from the PC board.

For both SCU and SCU S the signal contrast and brightness of the secondary electron detector (SED) signal can be adjusted. The output of the scan control unit is either a TV signal that can be monitored on a TV monitor or an analogue signal that can be fed into a PC board. The SCU / SCU S also operates in conjunction with DAT IM and DAT 125 IM software and hardware.
2. Safety Information

**Important:**
- Please read this manual and the safety information in all related manuals before installing or using the electronics equipment.
- The safety notes and regulations given in this and related documentation have to be observed at all times.
- Check for correct mains voltage before connecting any equipment.
- Do not cover any ventilation slits/holes so as to avoid overheating.
- The Scan Control Unit SCU / SCU S may only be handled by authorised personnel.

**Warning: Lethal Voltages!!**
- Adjustments and fault finding measurements may only be carried out by authorised personnel qualified to handle lethal voltages.
- Lethal voltages may be present at parts of the electron gun during operation.
- Lethal voltages are present inside the Scan Control Unit SCU / SCU S.

**Always**
- All connectors which were originally supplied with fixing screws must always be used with their fixing screws attached and tightly secured.
- Always disconnect the mains supplies of all electrically connected units before
  - opening the vacuum chamber or a control unit case,
  - before touching any cable cores or open connectors,
  - before touching any part of the in-vacuum components.
- Leave for a few minutes after switching off for any stored energy to discharge.
Never

- Never have in-vacuum components connected to their electronics in the corona pressure region, i.e. between 10 mbar and 10^-3 mbar, so as to avoid damage due to corona discharge.

This product is only to be used:

- indoors, in laboratories meeting the following requirements:
  - altitude up to 2000 m,
  - temperatures between 5°C / 41°F and 40°C / 104°F (specifications guaranteed between 20°C / 68°F and 25°C / 77°F)
  - relative humidity less than 80% for temperatures up to 31°C / 88°F (decreasing linearly to 50% relative humidity at 40°C / 104°F)
  - pollution degree 1 or better (according to IEC 664),
  - overvoltage category II or better (according to IEC 664)
  - mains supply voltage fluctuations not to exceed ±10% of the nominal voltage
3. Technical Specification

Mains Input

<table>
<thead>
<tr>
<th>Voltage</th>
<th>100 V; 115 V; 230 V; ±10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>max. 120 VA</td>
</tr>
</tbody>
</table>

Inputs

<table>
<thead>
<tr>
<th>External Scan X/Y</th>
<th>Jumper selectable, please refer to table 3 on page 17.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam Energy Tracking</td>
<td>0 to +10 V (adjustable down to a range of 0 to +2.5 V) (not available with SCU S)</td>
</tr>
<tr>
<td>Image Signal IN</td>
<td>0 to 1 V&lt;sub&gt;pp&lt;/sub&gt;, 50 Ω</td>
</tr>
</tbody>
</table>

Outputs

<table>
<thead>
<tr>
<th>Deflection Voltage</th>
<th>±200 V (not available with SCU S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scan Output X/Y</td>
<td>±5 V (1 kΩ) independent of scan width or beam shift</td>
</tr>
<tr>
<td>Video Signal</td>
<td>1 V&lt;sub&gt;pp&lt;/sub&gt;, 75 Ω (CCIR or NTSC norm)</td>
</tr>
<tr>
<td>Image Signal</td>
<td>10 V&lt;sub&gt;pp&lt;/sub&gt;, 50 Ω</td>
</tr>
</tbody>
</table>

Display (not available with SCU S)

<table>
<thead>
<tr>
<th>SCAN WIDTH</th>
<th>5 digit LED display</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCAN OFFSET</td>
<td>4 ½ digit LED panel meter</td>
</tr>
</tbody>
</table>

Mechanical

<table>
<thead>
<tr>
<th>Case type</th>
<th>19&quot; rackmount with 40 mm depth front panel handles</th>
</tr>
</thead>
<tbody>
<tr>
<td>width/height/depth</td>
<td>84 TE (448.5 mm) / 3 U (132.5 mm) / 400 mm</td>
</tr>
<tr>
<td>weight</td>
<td>7.5 kg</td>
</tr>
</tbody>
</table>
4. SCU Controls and Functions

Front Panel Layouts SCU and SCU S

Figure 1. SCU front panel layout

Figure 2. SCU S front panel layout

Front Panel Controls SCU and SCU S

<table>
<thead>
<tr>
<th>MAINS</th>
<th>MAINS on/off push-button. The light indicates that the unit is on. Press again to switch unit off.</th>
</tr>
</thead>
</table>
**SCAN MODE**

**TV SCAN**
Activates the TV scan and inactivates any external scan input. The deflection output is run with TV scan rate (NTSC or CCIR norm). The related signal of the SED detector can be monitored by connecting a TV monitor to VIDEO OUT. Note: the centre of the TV scan can be adjusted using the BEAM SHIFT potentiometers.

**EXT. SCAN**
Activates the external scan input and inactivates TV scan.

**VIDEO SIGNAL**

**OUT OF RANGE**
LED lights up if the VIDEO OUT signal reaches the limit (0.7 V).

**CONTRAST**
270° potentiometer for controlling the image contrast, i.e. the gain of the signal output is varied between 1 and 10.

**BRIGHTNESS**
270° potentiometer for controlling the image brightness, i.e. the offset of the signal output is varied between zero and 2.5 V.

**Front Panel Controls SCU only**

**SCAN MODE**

**FRAME SCAN**
Activates a full frame scan (default). Note: the centre of the frame can be adjusted using the BEAM SHIFT potentiometers.

**SPOT MODE**
Activates the spot mode, i.e. the electron beam is locked to the centre of the frame. EXT. SCAN X IN, Y IN and internal TV SCAN are deactivated. The beam position can be defined using the BEAM SHIFT potentiometers.

**LINE SCAN**
Activates the line scan mode, i.e. the beam is scanned along a single line (i.e. EXT.SCAN Y IN and internal TV frame scan are deactivated). The position of the scan line can be defined using the Y-BEAM SHIFT potentiometer.

**90° SCAN ROT.**
SCAN ROTATION: rotates the scan frame by 90°. Note that the scan rotation is deactivated when the TV SCAN, EXT.SCAN, FRAME SCAN, SPOT MODE or LINE SCAN buttons are pushed.
4. SCU Controls and Functions

SCAN OFFSET

4 ½ digit panel meter shows the beam shift voltages (scan offset) in X- or Y-direction (push button selectable). Numerically this voltage is equal to the offset voltages at the DEFLECTION outputs on the rear panel.

SCAN WIDTH

5 digit display shows the scan width in scientific notation. Numerically this number is 10x the voltage amplitude of the scan signal at the DEFLECTION outputs on the rear panel.

Knob for setting the SCAN WIDTH.

TRACKING

Switches the tracking mode ON or OFF (button lit = tracking ON). In tracking mode the deflection voltage is proportional to the beam energy, keeping the scan width unchanged. The selected frame/line/spot stays on the same sample location when changing the beam energy.

BEAM SHIFT

LED lights up if the deflection voltage is out of range. In this case the deflection voltage is kept at the maximum/minimum possible voltage. If the LED flashes, only part of the selected scan frame or line is out of range.

Ten-turn potentiometer to shift the beam (spot mode), scan line (line mode) or frame centre (frame mode) in X-direction.

Ten-turn potentiometer to shift the beam (spot mode), scan line (line mode) or frame centre (frame mode) in Y-direction.
4. SCU Controls and Functions

Back Panel Layout SCU and SCU S

Figure 3. Back panel layout. Note that for the SCU S the TRACKING BNC is not active and there is no DEFLECTION plug.

Back Panel Components SCU and SCU S

This unit is supplied with a 3-pin standard European mains socket for ac input of 100/115/230 V AC, 120 VA and 50 to 60 Hz. The wire insulation of the standard 3-lead mains cable are coloured in accordance with the following code:

<table>
<thead>
<tr>
<th>Colour</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown</td>
<td>Live</td>
</tr>
<tr>
<td>Green/Yellow</td>
<td>Earth</td>
</tr>
<tr>
<td>Blue</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

Mains fuse(s): 5mm Ø, 20mm long

use 2 x 2 A (T) for 100/115 V AC
2 x 1 A (T) for 230 V AC

To change the fuse
- disconnect mains
- lift the flap using a screw driver for leverage
- replace the fuse as indicated above
- re-fit the fuse holder.

Select the correct line voltage for your country and fit the correct fuses.
### VIDEO

<table>
<thead>
<tr>
<th><strong>TBTK</strong></th>
<th>Switch between normal video output and test image.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CCIR</strong></td>
<td>Switch between CCIR norm and NTSC norm (mode).</td>
</tr>
<tr>
<td><strong>VIDEO OUT</strong></td>
<td>BNC socket for video signal output, 75 Ω, 1 V&lt;sub&gt;PP&lt;/sub&gt;.</td>
</tr>
</tbody>
</table>

### IMAGE

<table>
<thead>
<tr>
<th><strong>SIGNAL IN</strong></th>
<th>BNC socket. SED signal input 0 - 5 V, 50 Ω.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>50 Ohm 1Vpp</strong></td>
<td>BNC socket. Signal output with brightness and contrast enhancement.</td>
</tr>
</tbody>
</table>

### EXT.SCAN

<table>
<thead>
<tr>
<th><strong>X IN</strong></th>
<th>BNC voltage input for controlling the X-deflection voltages SCAN OUT and DEFLECTION. The input range is jumper selectable, table 3 on page 17.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Y IN</strong></td>
<td>BNC voltage input for controlling the Y-deflection voltages SCAN OUT and DEFLECTION. The input range is jumper selectable, see table 3 on page 17.</td>
</tr>
</tbody>
</table>
### SCAN OUT

<table>
<thead>
<tr>
<th>X</th>
<th>BNC output socket -5 V to +5 V depending on EXT.SCAN input. In TV-mode the output ranges from -5 V to +5 V. BEAM SHIFT and SCAN WIDTH potentiometers do not act on this output!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>BNC output socket +5 V to -5 V depending on EXT.SCAN input. In TV-mode the output ranges from -3.75 V to +3.75 V in NTSC mode and from -4.16 V to +4.16 V in CCIR mode. BEAM SHIFT and SCAN WIDTH potentiometers do not act on this output!</td>
</tr>
</tbody>
</table>

### Back Panel Components SCU only

#### TRACKING

<table>
<thead>
<tr>
<th>BEAM ENERGY IN</th>
<th>BNC input socket 0 to 10 V (adjustable) for controlling the deflection voltage proportional to the beam energy. Connect to the BEAM MONITOR socket of the electron gun power supply.</th>
</tr>
</thead>
</table>

#### DEFLECTION

5-pin sub-D deflection voltage outputs, maximum range -200 V to +200 V, depending on EXT.SCAN input and BEAM SHIFT and SCAN WIDTH potentiometer settings.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCU only.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In **TV scan mode** the deflection output signals are scaled by a factor between 0 and 1 depending on the SCAN WIDTH setting. The BEAM SHIFT control voltage is then added and the sum amplified to yield the DEFLECTION output.

In **external scan mode** the EXT.SCAN X IN and Y IN signals are scaled by a factor between 0 and 1 depending on the SCAN WIDTH setting. The BEAM SHIFT control voltage is then added and the sum amplified to yield the DEFLECTION output.
Internal Fuses

The SCU contains a number of internal fuses, these are listed in Table 2 and their location is shown in Figure 4.

<table>
<thead>
<tr>
<th>Motherboard</th>
<th>Deflection Amplifier (SCU only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1, F2</td>
<td>160 mA T</td>
</tr>
<tr>
<td>F1, F2</td>
<td>100 mA T</td>
</tr>
</tbody>
</table>

Table 2. Fuses used in the SCU / SCU S.

Jumper Settings

The jumpers can be set to select the input voltage range of external scan signals for both the X and Y channels, as shown in table 3:

<table>
<thead>
<tr>
<th>X channel sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----</td>
</tr>
<tr>
<td>0 to + 3.9 V</td>
</tr>
<tr>
<td>0 to + 5 V</td>
</tr>
<tr>
<td>0 to + 10 V</td>
</tr>
<tr>
<td>0 to ± 5 V</td>
</tr>
<tr>
<td>0 to ± 10 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Y channel sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----</td>
</tr>
<tr>
<td>0 to + 3.9 V</td>
</tr>
<tr>
<td>0 to + 5 V</td>
</tr>
<tr>
<td>0 to + 10 V</td>
</tr>
<tr>
<td>0 to ± 5 V</td>
</tr>
<tr>
<td>0 to ± 10 V</td>
</tr>
</tbody>
</table>

Table 3: X and Y external input jumper settings. (X indicates the jumper link is to be made.)

Please note: The 0 to + 3.9 V sensitivity value is the factory default value and the input level from the DAT IM software.
Board, Fuse and Jumper Locations

Figure 4. SCU / SCU S board and fuse location, schematic diagram.
R8: beam energy input adjust, see page 20.
R34: video level adjust.
JP: jumper for external scan range, see table 3 on page 17.
5. Installation and Functional Test of Power Supply

Attention: Installation procedures may only be carried out by authorised personnel qualified to handle lethal voltages.

Switch off all units and wait for a few minutes (for discharge of the high voltage supplies) before connecting or disconnecting any cables.

Make sure all high voltage plugs are secured before switching any one of the electronics units on.

Before switching on the Scan Control Unit check on rear panel if:

- mains input voltage is correct
- 3-wire power cable is properly connected.

Without connecting any inputs or outputs you may check proper operation of the power supply by pushing the MAINS switch. The operation light in the mains switch and the digital panel meter (SCU only) should now come on.

For the SCU check correct operation of the digital panel meters by turning the SCAN WIDTH potentiometer or switch on the X-SCAN OFFSET and turn the respective potentiometer. The corresponding voltages are then displayed on the meters.

To check the TV scan generator connect a TV monitor to VIDEO OUT (rear panel). Select the correct norm (mode) for your TV monitor (CCIR or NTSC) and set the second switch in the VIDEO field to TEST. The TV monitor should now display wide horizontal black lines.

Before connecting any cables, make sure that

- all potentiometers are turned fully counter clockwise,
- MAINS is switched OFF.

Connection to Guns and Control Units

Connect the SCU according to the connection instructions in the relevant gun and control unit manuals.
6. Operation

Default Settings (SCU only)

After switching on FRAME SCAN and TV SCAN, the SCAN WIDTH is set to maximum, the SCAN OFFSET DVM is set to X and TRACKING is OFF.

Beam Energy Input Adjustment

Use trim-potentiometer R8 on the ENERGY TRACKING board, see Figure 4, to set the maximum input voltage for the beam energy (10 V or 2.5 V). Normally the input voltage is set to 10 V for the EKF 1000 in order to allow a maximum analysing voltage for the instrument with the DAT IM and DAT 125 IM software.
Service at OMICRON

Should your equipment require service

- Please contact OMICRON headquarters or your local OMICRON representative to discuss the problem. An up-to-date address list is available on our website under http://www.omicron.de/om-adr.html or via e-mail reply service under contact.info@omicron.de.

- Make sure all necessary information is supplied. Always note the serial number(s) of your instrument and related equipment (e.g. head, electronics, preamp...) of your instrument or have it at hand when calling.

If you have to send any equipment back to OMICRON

- Please contact OMICRON headquarters before shipping any equipment.

- Place the instrument in a polythene bag.

- Reuse the original packaging and transport locks.

- Take out a transport insurance policy.

For ALL vacuum equipment:

- Include a filled-in and signed copy of the "Declaration of Decontamination" form which can be found at the back of the equipment manual.

   No repair of vacuum equipment without a legally binding signed decontamination declaration!

- Wear suitable cotton or polythene gloves when handling the equipment.

- Re-insert all transport locks (if applicable).

- Cover the instrument with aluminium foil and/or place it in a polythene bag. Make sure no dust or packaging materials can contaminate the instrument.

- Make sure the plastic transport cylinder (if applicable) is clean.

- Fix the instrument to its plastic cylinder (if applicable).
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