DH-2000 Deuterium-Halogen Light Source

Installation and Operation Manual

Document: 000-10000-025-02-201510

WARNING

Protective Eye Wear Must Be Worn When Using This Instrument - Intense Ultraviolet Radiation Present

See Important Safety Notices inside.
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Important Safety Notices

1. Do not remove or modify any installed safety device on this equipment. Doing so will void your warranty and create an unsafe operating environment.
2. Dangerous voltages are present in this device. There are NO user serviceable parts inside.
3. Only allow qualified personnel to service this unit.
4. Do not use the unit if it is damaged in any way. Contact your dealer for repair or replacement information.
5. Always screw in the fiber optic cables before starting the instrument.

*WARNING*
Protective eyewear must be worn when using this equipment - Intense ultraviolet radiation present.
**Never look directly into the light beam**, as this can cause eye damage.

Warranty

Our 3-Year Warranty covers Ocean Optics miniature fiber-optic spectrometers, spectral sensors, light sources and sampling accessories – regardless of the application – from manufacturing defects. It also covers fibers and probes for a full 12 months: [http://oceanoptics.com/services/exclusive-3-year-warranty/](http://oceanoptics.com/services/exclusive-3-year-warranty/).

This comprehensive warranty ensures you of the highest level of craftsmanship and reliability for years to come. No other manufacturer offers such a solid guarantee of quality and reliability.

The Ocean Optics 3-Year Warranty applies to Ocean Optics equipment (excluding OEM configurations) purchased on or after July 1, 2010. The warranty covers parts and labor needed to repair manufacturing defects that occur during the warranty period. We also will cover the costs of shipping warranty-related repairs from our customers to Ocean Optics and from us to our customers.
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About This Manual

Document Purpose and Intended Audience

This document provides you with an installation section to get your system up and running.

What’s New in this Document


Document Summary

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1: Setup</td>
<td>Contains a list of package contents and unpacking instructions.</td>
</tr>
<tr>
<td>Chapter 2: DH-2000 Specifications</td>
<td>Contains operating environment specifications, as well as other physical details of the product.</td>
</tr>
<tr>
<td>Chapter 3: Operating Instructions</td>
<td>Provides instructions for operating the DH-2000 Light Source.</td>
</tr>
<tr>
<td>Chapter 4: Troubleshooting</td>
<td>Contains troubleshooting information for the power supply and both the deuterium and halogen lamps.</td>
</tr>
<tr>
<td>Appendix A: Maintenance</td>
<td>Provides instructions for changing the bulb.</td>
</tr>
</tbody>
</table>

Product-Related Documentation

You can access documentation for Ocean Optics products by visiting our website at http://www.oceanoptics.com. Select Support → Technical Documents, then choose the appropriate document from the available drop-down lists.

Ocean Optics offers a Glossary of spectroscopy terms to help you further understand your state-of-the-art products and how they function, located at: http://oceanoptics.com/glossary/.

Upgrades

Occasionally, you may find that you need Ocean Optics to make a change or an upgrade to your system. To facilitate these changes, you must first contact Ocean Optics and obtain a Return Merchandise
Authorization (RMA) number. Please contact Ocean Optics for specific instructions when returning a product.
Chapter 1

Setup

Overview

The following sections provide instructions on unpacking and setting up your DH-2000 Light Source.

Before using the DH-2000 for the first time check for transport damage. Be sure to adhere to all warnings on the unit and in this manual.

Unpacking the DH-2000

► Procedure

1. Unpack your lamp assembly and power supply carefully. Although the lamp is rigidly mounted, dropping this instrument can cause permanent damage.

2. Inspect the outside of the instrument and make sure that there is no damage. Do not use the instrument if damage is present.

3. Use this instrument in a clean laboratory environment (see Operating Environment).
Contents

Your DH-2000 package should contain the following:

- DH-2000 unit
- Power cord
- UV safety goggles

Connecting the Cables

**Procedure**

1. Connect the power cord to an outlet and to the rear of the unit.
3. Connect the fiber optic cable (see *Connecting the Fiber Optic Cable*).

Connecting the Fiber Optic Cable

Use the following procedure to connect the cable to the lamp.

**Procedure**

To connect the fiber optic cable to the DH-2000,

1. Locate the cap on the front of the DH-2000.
2. Lift the cap on the front of the DH-2000 to expose the SMA connector.
3. Connect the fiber optic cable to the SMA connector.
Chapter 2

DH-2000 Specifications

This section provides information on the operating environment, physical controls, and dimensions of the DH-2000.

Operating Environment

The following table provides information on optimizing the operating environment of your DH-2000 unit.

<table>
<thead>
<tr>
<th>Operating Environment</th>
<th>The DH-2000 Unit . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>Is designed for operation in dry rooms only.</td>
</tr>
<tr>
<td>Ventilation</td>
<td>Should be situated so that its location or position does not interfere with proper ventilation.</td>
</tr>
<tr>
<td>Heat</td>
<td>Should be situated away from any device that emits excessive heat.</td>
</tr>
<tr>
<td>Object and Liquid Entry</td>
<td>Should be positioned so that objects do not fall on top of the unit. Additionally, ensure that no liquids are spilled into the enclosure through openings.</td>
</tr>
<tr>
<td>Power Sources</td>
<td>Should be connected to a power supply with the following specifications:</td>
</tr>
<tr>
<td></td>
<td>- Units manufactured since April 2003 are equipped with power supplies that can handle voltage input of 90 to 240 VAC. These units have a serial number formatted as 23XXXX.</td>
</tr>
<tr>
<td></td>
<td>- Units manufactured before April 2003 are equipped with power supplies that can handle either 110 VAC or 240 VAC. These units have serial numbers formatted as 02000XXX.</td>
</tr>
<tr>
<td></td>
<td>The power type should be listed on a sticker on the rear of the light source.</td>
</tr>
</tbody>
</table>

DH-2000 Components

The following sections describe the components located on the front and rear of the DH-2000 unit. Also see Supplementary Information for Models DH-2000-S and DH-2000-FHS if you have one of these models.
# Front Panel

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deuterium On/Off</td>
<td>Press the blue DEUTERIUM button to turn the Deuterium lamp on or off. The bulb requires a warm-up time of 20 seconds before the Deuterium lamp is illuminated. You must allow the bulb to warm up to receive accurate data from the lamp. LED lights green upon successful illumination, or red to indicate lamp malfunction.</td>
</tr>
<tr>
<td>Power LED</td>
<td>Indicates the power state of the DH-2000.</td>
</tr>
<tr>
<td>Mechanical Protection – SMA Connector</td>
<td>Covered to protect users from unintentionally looking directly at the beam of light. Connect the fiber cable to the DH-2000 BEFORE turning the lamp on to avoid unnecessary exposure to UV radiation. Always wear proper eye protection when using the DH-2000 lamp.</td>
</tr>
<tr>
<td>Halogen On/Off</td>
<td>Press the red HALOGEN button to turn the Halogen lamp on or off. Requires a warm-up time of 20 seconds before the Halogen lamp is illuminated. LED lights green upon successful illumination, or red to indicate lamp malfunction.</td>
</tr>
<tr>
<td>For DH-2000-S and -BAL models:</td>
<td></td>
</tr>
<tr>
<td>Shutter Mode Switch</td>
<td>Sets the operational mode of the shutter. Open indicates that the shutter is constantly open; Closed indicates that the shutter is constantly closed; TTL indicates that the shutter is operated via 5V TTL signal (see Rear Panel).</td>
</tr>
</tbody>
</table>
# Rear Panel

## Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable Resistor</td>
<td>Use a screwdriver to adjust the intensity of the halogen lamp to optimize the intensity between deuterium and halogen light in UV-VIS applications.</td>
</tr>
<tr>
<td></td>
<td><strong>DH-2000-(S)-(FHS)-(DUV)-(BAL)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Voltage</strong></td>
</tr>
<tr>
<td></td>
<td>Halogen Adjustment</td>
</tr>
<tr>
<td>Power Terminal Input</td>
<td>Connect power cable to provide voltage to DH-2000:</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Only connect the power cable to the lamp when the Main Power Switch is in the OFF position.</td>
</tr>
<tr>
<td>Main Power Switch</td>
<td>Turn on to supply power to the DH-2000. The Power LED illuminates when this switch is in the On position.</td>
</tr>
<tr>
<td>Fuse</td>
<td>Contains the fuse to protect the unit against overload:</td>
</tr>
<tr>
<td></td>
<td><strong>European Fuse Type:</strong> Miniature fuse 5 x 20 mm, 1 Amp slow blow</td>
</tr>
<tr>
<td></td>
<td><strong>USA Fuse Type:</strong> Miniature fuse 5 x 20 mm, 2.5 Amp slow blow</td>
</tr>
<tr>
<td>Cooling Fan</td>
<td>Cools the interior of the DH-2000. Do not obstruct.</td>
</tr>
<tr>
<td>Type Sign</td>
<td>Information about:</td>
</tr>
<tr>
<td></td>
<td>– Type       – Version</td>
</tr>
<tr>
<td></td>
<td>– Order No.  – Serial No.</td>
</tr>
<tr>
<td></td>
<td>– Main connection – Max. Ambient. Temperature</td>
</tr>
<tr>
<td></td>
<td>– Warnings   – CE-Marking</td>
</tr>
<tr>
<td>15-pin TTL Connector</td>
<td>On TTL Connector-equipped DH-2000 Series lamps, this connector allows for external TTL control of lamp shuttering (-S and _BAL models only) and individual lamp operation (TTL model only). See Pinout information.</td>
</tr>
</tbody>
</table>
Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Deuterium Lamp Criteria</th>
<th>Tungsten-Halogen Lamp Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength Range</td>
<td>210–400 nm</td>
<td>300–1500 nm</td>
</tr>
<tr>
<td>Stability</td>
<td>≤0.01 % / h@ 254 nm</td>
<td>≤0.01 % / h@ 700 nm</td>
</tr>
<tr>
<td>Drift</td>
<td>≤0.01 % / h@ 254 nm</td>
<td>≤0.01 % / h@ 700 nm</td>
</tr>
<tr>
<td>Warm-Up Time</td>
<td>20 minutes</td>
<td>40 minutes</td>
</tr>
<tr>
<td>Lamp Voltage</td>
<td>Ignition 580V / 20°</td>
<td>12V DC / 1.67A</td>
</tr>
<tr>
<td>Lamp Current</td>
<td>Operating 85 V / 0.3A</td>
<td></td>
</tr>
<tr>
<td>Lamp Lifetime</td>
<td>1000 hours</td>
<td></td>
</tr>
<tr>
<td>Radiation Characteristics</td>
<td>Aperture 0.5mm NA 26°</td>
<td>Focused</td>
</tr>
<tr>
<td>PIN Position at SUB-D 15 Pin Connector (Only -S / -FHS / -BAL models) (Only -TTL model)</td>
<td>Shutter PIN 13: TTL / PIN 10: Ground PIN 2 Deuterium / PIN3 Halogen / PIN 4 Ground</td>
<td></td>
</tr>
<tr>
<td>Possible Filter Dimensions (only -FHS model)</td>
<td>Up to diameter or square 25mm x 4mm, or 20mm x 6mm</td>
<td></td>
</tr>
<tr>
<td>Performance Guaranteed Temperature</td>
<td></td>
<td>5°C – 35°C</td>
</tr>
<tr>
<td>Humidity</td>
<td></td>
<td>5 - 95% without condensation at 40°</td>
</tr>
<tr>
<td>Internal Power Consumption</td>
<td>25 W</td>
<td>20 W</td>
</tr>
<tr>
<td>Total Power</td>
<td></td>
<td>100 Watt/190 Watt (Heating D-Lamp for 20 seconds)</td>
</tr>
<tr>
<td>Power Requirements:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>European Version (prior to 4/2003)</td>
<td></td>
<td>230-240V 50/60 Hz</td>
</tr>
<tr>
<td>USA Version (prior to 4/2003)</td>
<td></td>
<td>110-115V 50/60 Hz</td>
</tr>
<tr>
<td>All units manufactured after 4/2003</td>
<td></td>
<td>90-240V 50/60 Hz</td>
</tr>
<tr>
<td>Markings / Directives</td>
<td>CE; VDI/VDE 0160; EN 61010</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Approximately 6 kg</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>150 x 135 x 319 mm</td>
<td></td>
</tr>
</tbody>
</table>

Pinout Information

The following table contains pinout information for the DH-2000 Series of Lamps. Consult the appropriate column for pinout information on your lamp.
If your lamp is not listed, pinout information in this chart is not applicable for your particular model.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Deuterium Lamp – Turns the Deuterium Lamp on when 5V is applied to the pin</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Halogen Lamp - Turns the Halogen Lamp on when 5V is applied to the pin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>Ground (TTL versions only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Ground</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>TTL Signal – Shutter control</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

na = not applicable

### 15-pin Connector Pinout Diagram

![15-pin Connector Pinout Diagram](image)

**Note**

Modification of specifications and design to improve device performance are possible without notice.
Chapter 3

Operating Instructions

Operating the Lamp

The following sections provide instructions on operating the Deuterium and Halogen lamps in the DH-2000. The Halogen lamp is only available in the DH-2000, DH-2000-UV, and DH-2000-BAL models.

**Caution**

The unit must operate in a horizontal position.

Starting the Lamp

Press the Deuterium or Halogen On/Off switch down to preheat the desired lamp. The LED blinks green until the lamp illuminates (approximately 20 seconds). The bulb requires a 20-second preheating period. You must allow this warm up period in order to receive accurate data. After the warm up period, the lamp will light.

After successful illumination, the two-color LED beneath the lamp’s On/Off switch lights up green to indicate that the lamp is on. Should the lamp fail to light, the two-color LED lights up red. This indicates a malfunction of the lamp. Press the On/Off switch again to reset the lamp. See Troubleshooting for more information.

**WARNING**

Protective eyewear must be worn when using this equipment - Intense ultraviolet radiation present.

**Never look directly into the light beam**, as this can cause eye damage.

Turning the Lamp Off

Turn the lamp off by pressing the appropriate On/Off switch.

Warming Up the Lamp

The Deuterium lamp requires 10–15 minutes, while the Tungsten-Halogen lamp requires 5–10 minutes of operation to reach a state of thermal equilibrium. During this warm-up period, the intensity of the UV output power can vary substantially.
If applications require extreme intensity stability, the Halogen lamp should be warmed up for an additional 15 minutes. Once warmed up for this amount of time, the lamp will reach specified drift values.
# Troubleshooting

## Deuterium Lamp

If the power supply or Deuterium lamp does not seem to functioning properly, check the following:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Probable Cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power switches on, but no LEDs light.</td>
<td>Line power not present</td>
<td>Check line voltage</td>
</tr>
<tr>
<td></td>
<td>Fuse defective</td>
<td>Check fuse</td>
</tr>
<tr>
<td>Deuterium lamp does not light. The two-color LED under the Deuterium</td>
<td>Deuterium lamp too hot</td>
<td>Allow the Deuterium lamp to cool down (20 minutes). Press On/Off switch</td>
</tr>
<tr>
<td>On/Off switch lights up red, indicating an error.</td>
<td></td>
<td>again to reset the Deuterium Tungsten-Halogen lamp, then press again to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>restart.</td>
</tr>
<tr>
<td></td>
<td>Deuterium lamp life exhausted</td>
<td>Replace Deuterium lamp</td>
</tr>
<tr>
<td></td>
<td>Deuterium lamp’s internal connection plug is not</td>
<td>Open unit (see the <a href="#">Maintenance</a>) and close connector plug.</td>
</tr>
<tr>
<td></td>
<td>closed correctly.</td>
<td></td>
</tr>
<tr>
<td>Deuterium lamp turns off during operation.</td>
<td>Deuterium lamp too hot</td>
<td>Turn off the unit. Allow the unit to cool down for at least 20 minutes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Once the unit has cooled down, turn the Deuterium lamp back on.</td>
</tr>
</tbody>
</table>
Halogen Lamp

If the Halogen lamp does not seem to functioning properly, check the following:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Probable Cause</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Halogen lamp does not work after pressing On/Off switch</td>
<td>Deuterium lamp is warming up</td>
<td>Wait until the Deuterium lamp has lit and try again</td>
</tr>
<tr>
<td></td>
<td>Halogen lamp is defective</td>
<td>Replace the Halogen lamp</td>
</tr>
<tr>
<td>LED does not light after switching on the Halogen lamp</td>
<td>Internal power supply is defective</td>
<td>Disconnect the unit from the main power source and contact your dealer for repair or replacement</td>
</tr>
</tbody>
</table>

Appendix A

Maintenance

Overview

Maintenance of your DH-2000 unit involves periodic replacing the light source bulbs, when necessary. DH2000 units produced before 2003 CANNOT be repaired or have the bulbs replaced. The bulbs for a DH2000 unit manufactured before 2003 are no longer available. See the figure below to determine which unit you have before ordering new bulbs or requesting an RMA:

Rear panel of Repairable DH2000 (manufactured after 2003)

Rear panel of Nonrepairable DH2000 (manufactured before 2003)

Bulb Replacement

You can manually change the Deuterium and Halogen bulbs in the DH-2000. To order replacement bulbs for the DH-2000, order the following item number(s):

- Deuterium Spare Bulb (210 – 400 nm): D-2000-B
- Deuterium Spare Bulb Deep UV (190 – 400 nm): D-2000-B-UV
- Halogen Spare Bulb (300 – 1500 nm): DH-2000-B
WARNING

Before replacing the bulb in the DH-2000, disconnect the lamp from your power source and allow the unit to cool for at least twenty minutes, if necessary.

Do not touch the lamp glass directly, as contact with bare fingers will reduce the lifetime of the bulb.

Replacing the Deuterium Bulb for All Models Except DH-2000-BAL

Procedure
1. Open the six slotted screws (14) and open the casing cover.

2. Open the screws (15) with the tool (18) that is delivered with the spare bulb (16).
3. Disconnect the old bulb and connect the new Deuterium Tungsten-Halogen lamp only with the originally supplied connection plugs (17).

Replacing the Deuterium Bulb for DH-2000-BAL Model

Procedure
1. Open the six slotted screws (14) and open the casing cover and rotate or remove the cover to expose the bulb housing.
2. Open the screws (15) with the tool (18) that is delivered with the spare bulb (16).

3. Disconnect the old bulb and connect the new Deuterium lamp only with the originally supplied connection plugs (17).

4. Reassemble the lamp housing by reversing Steps 1-3.

**Replacing the Halogen Bulb for All Models Except DH-2000-BAL**

**Procedure**

1. Open the six slotted screws (14) and open the casing cover.
2. Remove the screw (21) with the tool (20) provided with the spare bulb (19).
3. Disconnect the old Halogen bulb from the connection plugs (18)
4. Open the screws of the cable-clamp on the lamp-side and remove the defective Halogen lamp module.
5. Insert the new Halogen lamp module and Replace the screw (21).
6. Reattach the two cables of the Halogen lamp module to the cable-clamp. To do this, attach the Halogen lamp’s blue cable to Port 1 and the black cable to Port 2 of the connector.

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**Replacing the Halogen Bulb for DH-2000-BAL Model**

► **Procedure**

1. Open the six slotted screws (14) and open the casing cover.

2. Remove the screw (21) with the tool (20) provided with the spare bulb (19).

3. Disconnect the old Halogen bulb from the connection plugs (18).

4. Open the screws of the cable-clamp on the lamp-side and remove the defective Halogen lamp module.

5. Insert the new Halogen lamp module and replace the screw (21).

6. Reattach the two cables of the Halogen lamp module to the cable-clamp.
7. Reassemble the unit by reversing the disassembly steps.
Appendix B

Supplementary Information for Models DH-2000-S and DH-2000-FHS

Overview

The following information applies to specific models of the DH-2000. Read the instructions and refer to the figures on page 23.

DH-2000-S (With TTL Shutter Control)

Automatic Operation

Plug SUB-D 15-pin TTL connector into socket on rear of DH-2000-S.

Manual Operation

Manually set operating mode using the toggle switch on the front of the DH-2000-S:

- Open - Shutter open (left position)
- Close - Shutter closed (center position)
- TTL - Controls shutter with external TTL signal (High = Open, Low = Close) using software and spectrometer
DH-2000-FHS (With Filter Holder and TTL Shutter Control) and DH-2000-BAL

TTL Function Operating Instructions

Automatic Operation
Plug the SUB-D 15-pin TTL connector into the socket on the rear of the DH-2000-FHS.

Manual Operation
Manually set operating mode using the toggle switch on the front of the DH-2000-FHS:

- Open - Shutter open
- Close - Shutter closed
- TTL - Controls shutter with external TTL signal (High = Open, Low = Close)

Operating Instructions – Filter (DH-2000-FHS Only)

► Procedure
1. Open the filter slit by rotating the light beam protection cap.
2. Insert a filter with a maximum size of 1” (round or square) into the filter slit.
3. Close the filter slit by rotating the light beam protection cap until the slit is closed.
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