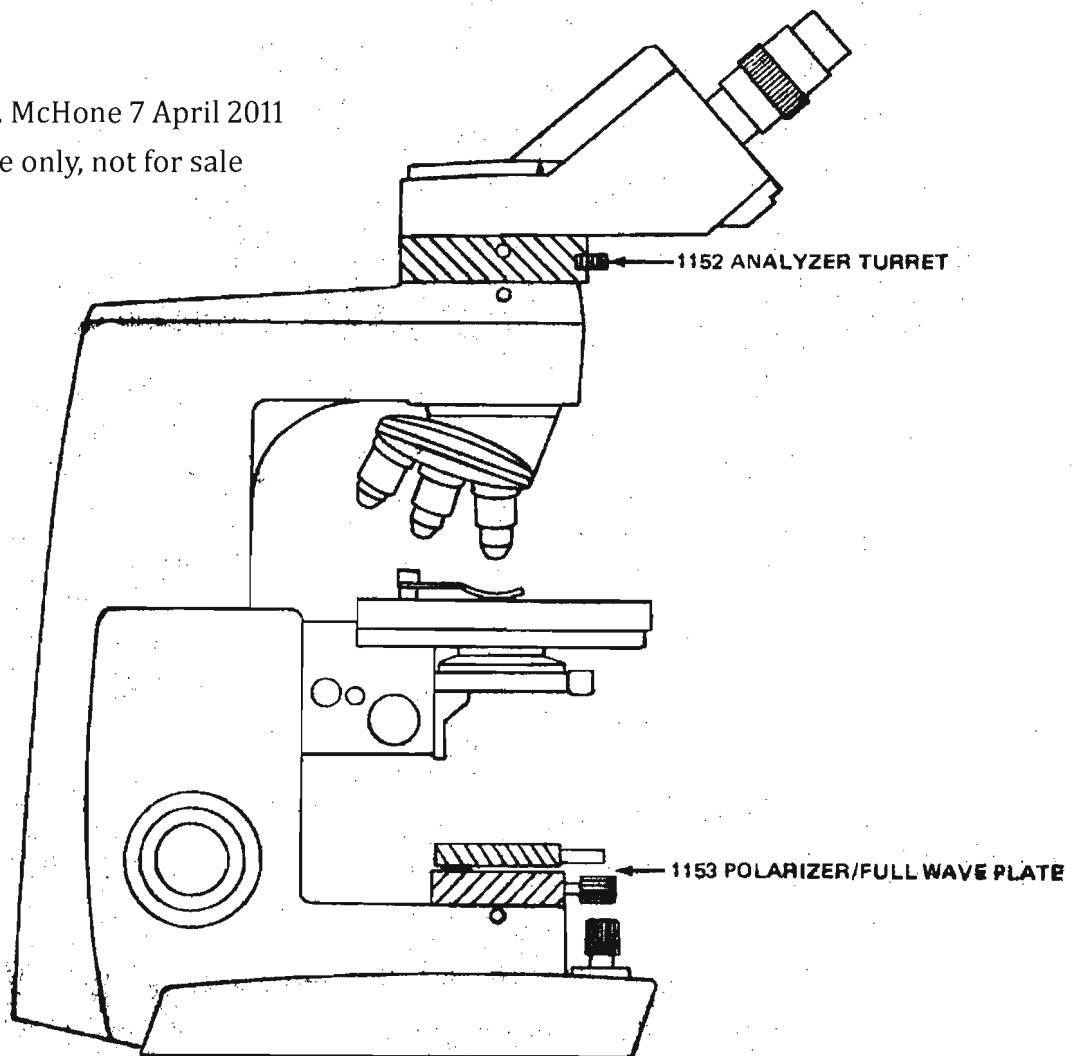


# REFERENCE MANUAL

## 1152 ANALYZER TURRET And 1153 POLARIZER/FULL WAVE PLATE

### Installation And Operation On Series One-Ten and One-Twenty MICROSTAR® Microscopes, Series Ten MICROSTAR Microscopes

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## I. INTRODUCTION

The addition of an 1152 Analyzer Turret and an 1153 Polarizer/Full Wave Plate Assembly to your present Series 110 or 120 Microscope will enable you to use compensated polarized light techniques in crystal identification.

Section II ("INSTALLATION") describes the proper installation and alignment of the 1152 and the 1153. Special attention should be paid to the alignment of the polarizer, analyzer, and full wave plate relative to one another and the microscope stage.

Section III ("OPERATION") presents two examples of crystal identification. The importance of testing a crystal for color change under BOTH POSITIONS of the Full Wave Plate slow axis is explained in detail.

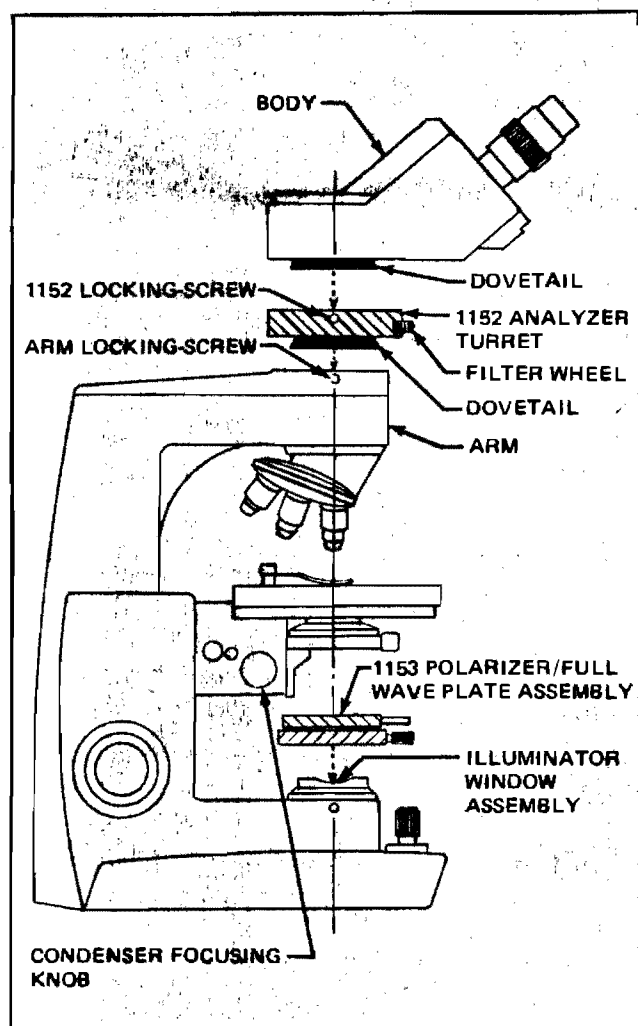


Figure 1

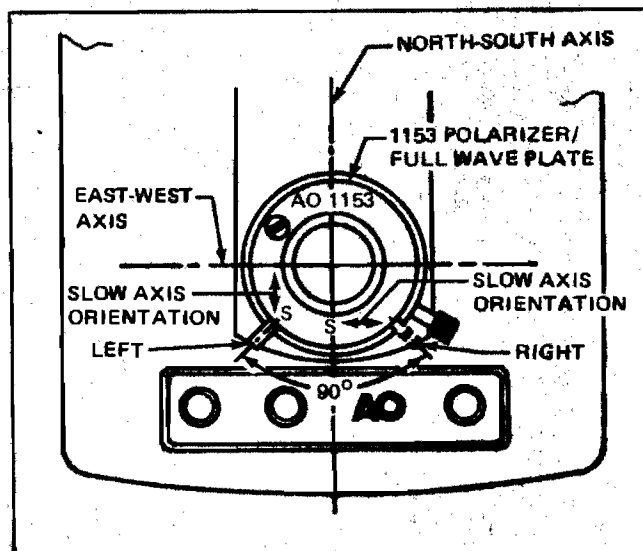


Figure 2

American Optical would like to thank Dr. Arnold S. Hartman, Associate Pathologist, Faulkner Hospital, Boston, MA for his help in preparing these instructions.

## II. INSTALLATION

Installation of the 1152 Analyzer Turret and the 1153 Polarizer/Full Wave Plate is a simple, straightforward operation. Care should be taken, however, to ensure proper alignment of the parts relative to one another and the microscope stage. Filters and accessories such as Vertical Fluorescent Illuminators, Aperture Viewers, Dual Viewing Attachments should be removed from the microscope prior to installing the 1152 Analyzer Turret.

### A. Removing the Body

The 1152 Analyzer Turret is installed in the light path between the objective and the eyepieces as shown in Figure 1. Installation requires removal of the Body. Proceed as follows:

1. Steady the Body with one hand and loosen the knurled Arm Locking-Screw (Figure 1) with the other so the Body can be removed.
2. Remove the Body and set it aside.

### B. Installing and Aligning the 1152 Analyzer Turret

Examine Figure 3. You will notice the 1152 has a dovetail similar to the one on the Body, which you have just removed.

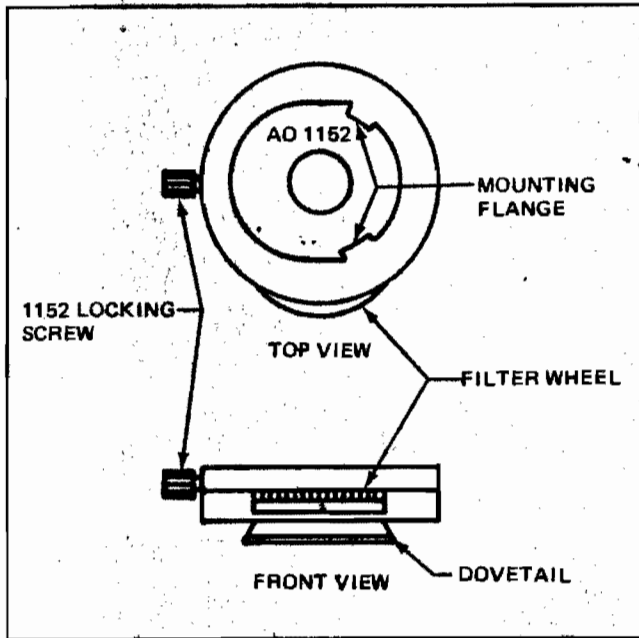


Figure 3

1. Insert the 1152 Dovetail into the Arm in the same way you insert the Body Dovetail when installing the Body.
2. Position the 1152 Analyzer Turret so that the 1152 Filter Wheel faces front and the knurled 1152 Locking-Screw is directly above the Arm Locking-Screw as shown in Figure 1.
3. Lock the 1152 Analyzer Turret in this position by tightening the Arm Locking-Screw. The polarization plane of the analyzer now makes an angle of  $45^\circ$  with the North-South Axis of the microscope stage (Figure 2).
4. Loosen the 1152 Locking-Screw so the Body Dovetail can be inserted into the 1152 Mounting Flange (Figure 3).
5. Mount the Body on the 1152 Analyzer Turret with the eyepieces facing front and lock it in place by tightening the 1152 Locking-Screw.

#### C. Installing the 1153 Polarizer/Full Wave Plate

The 1153 Polarizer/Full Wave Plate (Figure 4) is mounted on the Illuminator Window Assembly Mounting Flange as shown in Figure 2. Proceed as follows:

1. Raise the Condenser by rotating the Condenser Focusing Knob (Figure 1) until it hits the stop

on the microscope stage. If the Condenser has an Auxiliary Swing-In Condenser, move it out of the light path by rotating it on its pivot. Adjust Condenser diaphragm until it is fully open. You now have plenty of room to mount the 1153 Polarizer/Full Wave Plate.

2. Loosen the 1153 Locking-Screw (Figure 4) so the 1153 Polarizer/Full Wave Plate can be mated with the Illuminator Window Assembly.
3. Install the 1153 Polarizer/Full Wave Plate so the engraved left Slow Axis marking is parallel to the North-South Axis of the microscope stage (Figure 2). DO NOT tighten the 1153 Locking-Screw.

#### D. Aligning the 1153 Polarizer/Full Wave Plate

When the 1153 is positioned as indicated in Figure 2, the polarization plane of the polarizer (in the 1153) is "crossed" with the polarization plane of the analyzer (in the 1152). Fine adjust as follows:

1. Dial in the analyzer by rotating the 1152 Filter Wheel to Position 1 (Figure 3). Make sure the Filter Wheel achieves a positive lock by means of its detent stop.
2. Remove the 1153 Swing-In Full Wave Plate from the light path by rotating it on its pivot (Figure 4).

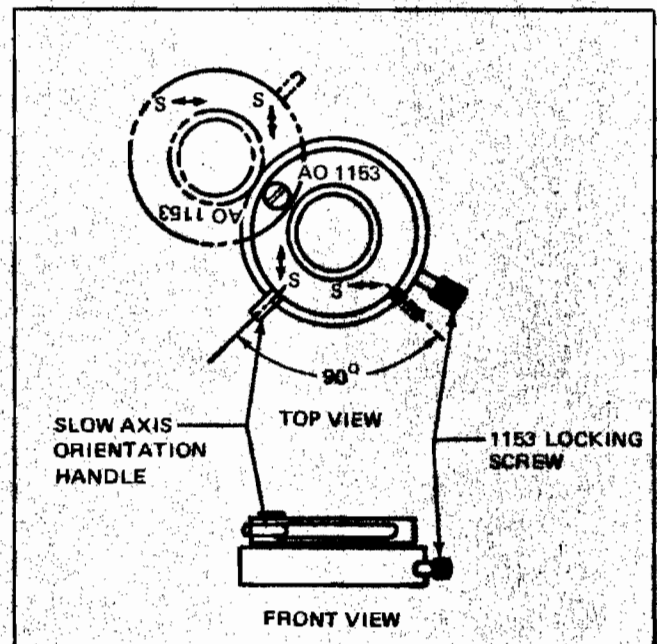


Figure 4

3. Turn on the Illuminator, and look through the eyepieces. The field should be totally or nearly black.
4. Rotate the 1153 Polarizer/Full Wave Plate Assembly slightly in both directions to find the point of maximum extinction.
5. Lock the 1153 at the point of maximum extinction by tightening the 1153 Locking-Screw.

### III. OPERATION

#### A. Operating the Slow Axis Orientation Handle

After properly installing and aligning the 1152 Analyzer Turret and the 1153 Polarizer/Full Wave Plate, familiarize yourself with the operation of the Slow Axis Orientation Handle as follows:

1. Swing the Full Wave Plate out of the light path.
2. Dial in Position 0 (empty aperture) on the 1152 Filter Wheel.
3. Turn on the Illuminator; and, using the 10X objective, follow standard procedure for adjusting the Field Diaphragm and Condenser for bright field illumination.
4. Dial in Position 1 (analyzer) on the 1152 Filter Wheel. The field will be black.
5. Swing in the Full Wave Plate making sure it achieves a positive lock by means of its detent stop.
6. Move the Slow Axis Orientation Handle (Figure 4) to its extreme left position. The Slow Axis of the Full Wave Plate is now parallel to the North-South Axis of the microscope stage (Figure 2). The field will be magenta. (Note: For best results, use 1087S Strain-Free Condenser.)
7. Move the Orientation Handle to its extreme right position. The Slow Axis is now parallel to the East-West Axis of the stage (Figure 4). The field will once again be magenta.

#### B. Normal Polarizing Operation

For ordinary polarizing work follow the installation procedure described previously. The swing-in Full Wave Plate is to be removed from the light path.

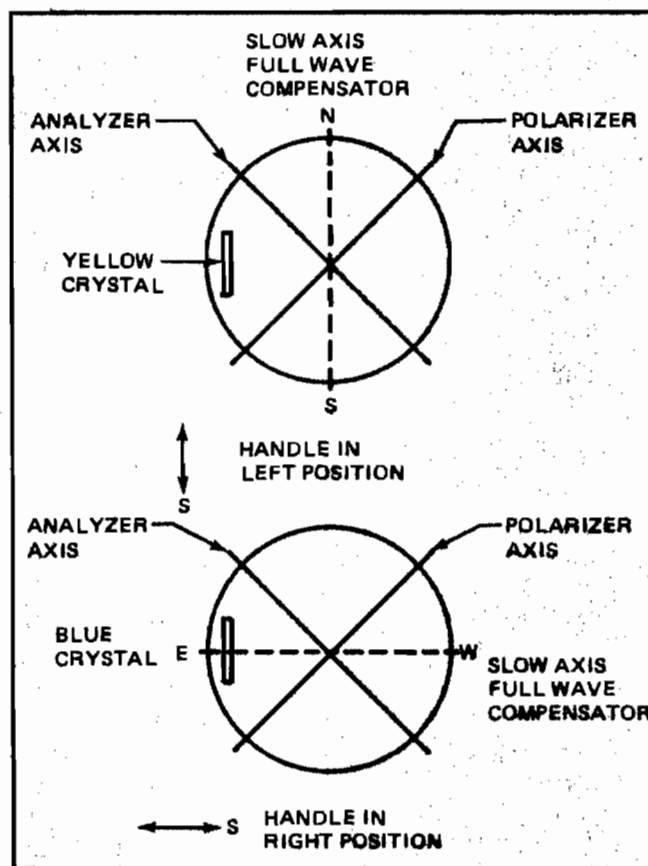


Figure 5

#### C. Identification of Monosodium Urate Crystals

Monosodium Urate crystals are birefringent.

Paulding Phelps, MD, et al have shown that compensated polarized light microscopy provides a rapid and accurate method of identifying Monosodium Urate and Calcium Pyrophosphate Dihydrate crystals.<sup>1</sup>

When the long dimension of the Monosodium Urate crystal is parallel to the slow axis of the compensator, the crystal appears yellow. (The slow axis of the Monosodium Urate Crystal is perpendicular to its long mechanical dimension.)

Using a slide of known Monosodium Urate crystals, proceed as follows:

1. Swing out the Full Wave Plate so the field will go black.

<sup>1</sup>P. Phelps, A.D. Steele, and D.J. McCarty, Jr., "Compensated Polarized Light Microscopy: Identification of Crystals in Synovial Fluids from Gout and Pseudogout," *JAMA*, 203, No. 7 (1968), 166-70.

2. Place slide on the stage and bring crystals into sharp focus. The needle-shaped crystals will appear white regardless of their orientation.
3. Swing in the Full Wave Plate, and put the Orientation Handle in the extreme left position so that the Slow Axis is parallel to the North-South Axis of the stage. Yellow crystals with long dimension North-South and blue crystals with long dimension East-West may be Monosodium Urate crystals. Positive identification requires testing the crystals for color change when the Slow Axis is rotated 90°.
4. Pick one yellow crystal with long dimension running North-South for examination. Move the Orientation Handle to its extreme right position so the Slow Axis is perpendicular to the North-South oriented crystal. If the crystal does not turn from yellow to blue, the presence of an artifact is suspect.

The color changes for Monosodium Urate crystals are summarized below. It is important to remember that positive identification requires testing a crystal in BOTH positions of the Slow Axis.

#### D. Identification of Calcium Pyrophosphate Crystals

Like Monosodium Urate crystals, Calcium Pyrophosphate Dihydrate crystals are birefringent.\* They appear blue when parallel to the Slow Axis and yellow when perpendicular to it, just the reverse of Monosodium Urate crystals.

The color changes for Calcium Pyrophosphate crystals are summarized below.

\*Calcium pyrophosphate crystals are weakly birefringent.

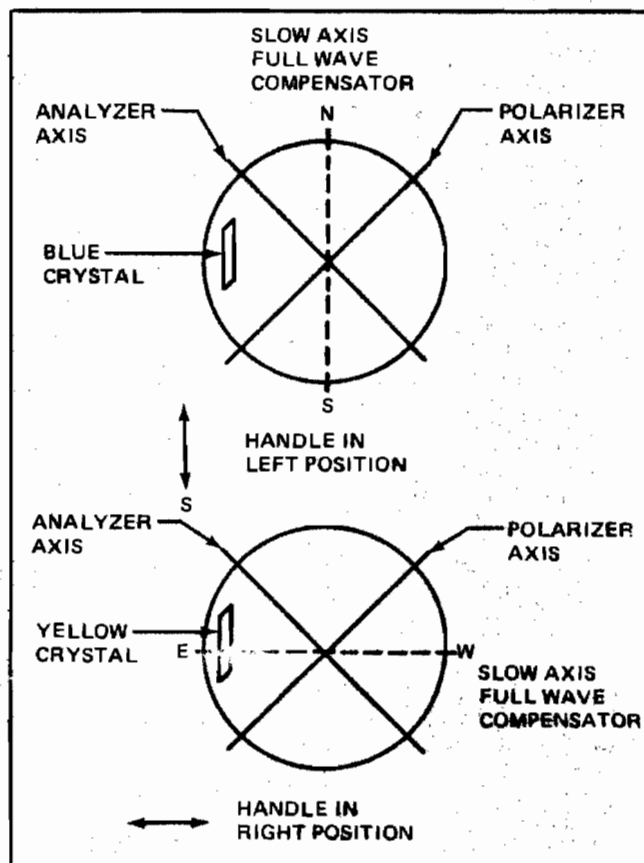


Figure 6

#### IV. INSTALLATION OF 1114 ANALYZER TURRET AND 1153 POLARIZER/FULL WAVE PLATE WITH ADAPTER ON SERIES 10 MICROSCOPES

##### A. Installing and Aligning the 1114 Analyzer Turret

1. Position the 1114 Analyzer Turret so that the Filter Wheel faces left or right (90° from front of scope) and lock by tightening screw.
2. Mount the Body on the 1114 Analyzer Turret with the eyepieces facing front and lock it in place by tightening the Locking-Screw.

##### B. Installing the 1153 Polarizer/Full Wave Plate and Adapter

1. The 1153 Polarizer/Full Wave Plate and Adapter is mounted on the Illuminator Window Assembly Mounting Flange as shown in Figure 1.
2. Lock the Adapter to the Illuminator Window Assembly.

##### C. Proceed with Alignment and Operating Instructions

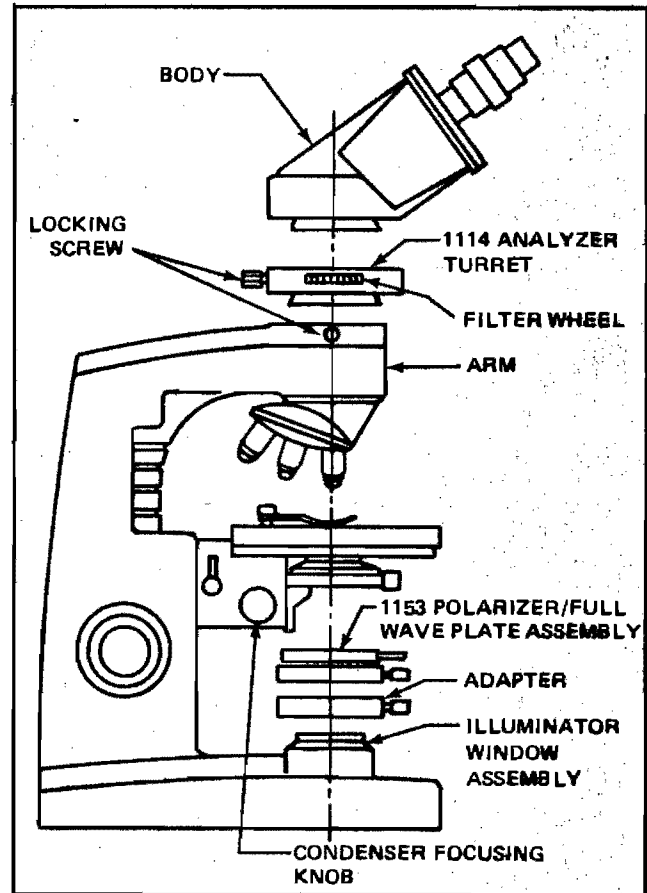


Figure 7