Enhanced Optical Unit for 79853C VWD

In June 1995, the design of the optical unit for the 79853C Variable Wavelength Detector (VWD) was changed to improve its performance under unstable temperature conditions.

Together with the enhanced optical unit (“D”), the standard flow cell was changed (Part number 79853-60000).

NOTE In this document the term “D” is used for the new enhanced optical design and “C” for the original optical design.

Compatibility

This new enhanced optical unit (“D”) is fully backward compatible with all 79853C VWDs shipped since January 1992.

The new standard flow cell (Part number 79853-60000) is backward compatible with the “C” optical unit.

Some of the parts for the enhanced optical unit (“D”) are not usable in the “C” version.

In case of replacing a “C” optical unit with an enhanced “D” optical unit, the new standard flow cell is required.

Support of Previous Optical Units

The optical unit (Part number 79853-69007) will be replaced by the enhanced “D” version. The parts for the “C” optical unit will continue to be available as a repair part.

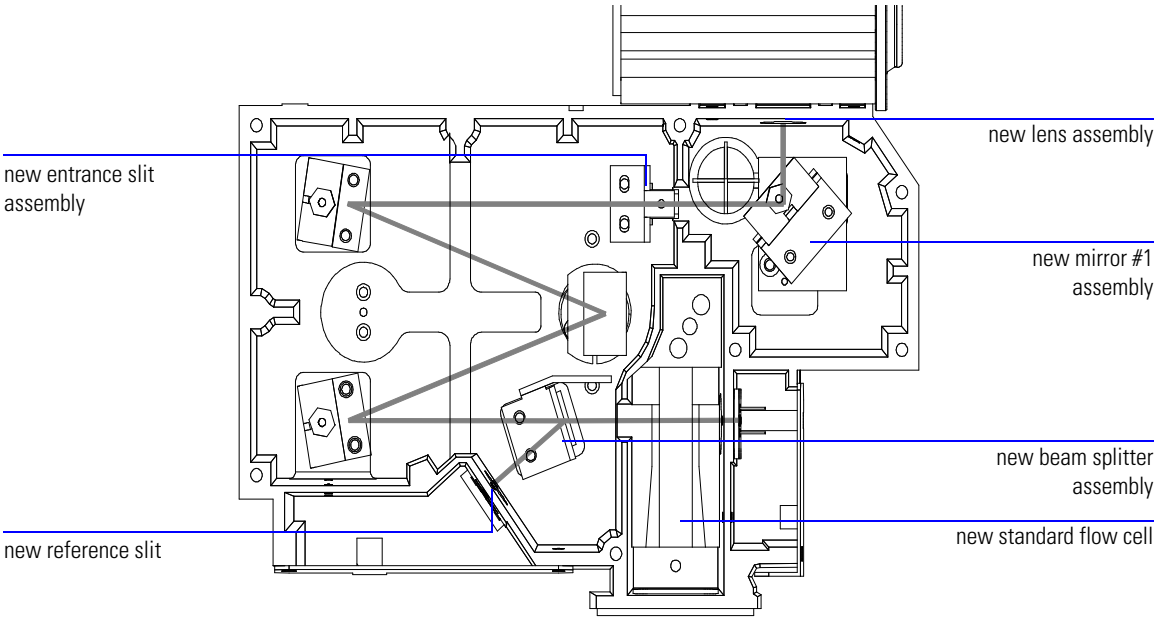
Introduction

To overcome wander problems due to temperature variations of the lab environment, the optical unit of the 79853C Variable Wavelength Detector (VWD) has been modified.

Following hardware modifications were implemented in June 1995:

- different coupling of the lamp housing (lens between lamp housing and optical casting).
- area around mirror M1 and M2 has been redesigned to eliminate one mirror - result is a mirror #1 assembly with a plane mirror.
- redesigned entrance slit holder. Slits are changeable (standard/test).
- beam splitter assembly no longer vertically adjustable.
- reference slit assembly redesigned for better optimization.
- new standard flow cell with different aperture material and different inlet capillary.

Figure 1 **Optical Path of Enhanced Optical Unit**



Support Considerations

Prefix Change

The enhanced Optical Unit (“D” version) was introduced in production units in June 1995. Since the detector appears to look the same as before, a prefix change was made. All units with prefix **3522 J 04305** and above have the new optical installed.

NOTE Some units with a prefix lower than 3522 J 04305 have been installed on customer sites prior to the official shipments.

Identification

Following identifications for the enhanced “D” version are available:

- Prefix and serial number **3522 J 04305** and above (rear of instrument)
- firmware revision **4.31** (press CTRL 12 ENTER ENTER ▼)
- label on the optical unit “**ENHANCED ILLUMINATION SYSTEM**”
- handle of new reference slit looking out of the optical’s cover plate (see Figure 4 on page 9).

Compatibility Matrix

Due to a redesign, several components are usable in the enhanced “D” version only. Refer to Table 1 on page 4 for details.

NOTE Both optical unit versions (“C” and “D”) can be operated with firmware revision 4.24 (79853-13005). Due to the modifications, the photocurrent readings are about 50% of those of the original “C” opticals. To make them comparable the firmware for the enhanced “D” version got a new revision and part number.

Part Numbers for Enhanced "D" Optical Unit

Table 1 Enhanced "D" Version Part Numbers

Part Number	Description	Comments
79853-60000	Standard Flow Cell	backward compatible*, for details see Table 2.
79853-69014	Exchange "D" Optical **includes** firmware 79853-13000	when "D" optical should be replaced, needs Standard Flow Cell 79853-60000
79853-69015	Exchange "D" Optical **includes** a Standard Flow Cell 79853-60000 and firmware 79853-13000	when "C" optical should be replaced
79853-68110	"D" Mirror 1 Assembly	for "D" only, includes test slit
79853-68111	"D" Mirror 3/4 Assembly	backward compatible**, includes test slit
79853-68112	"D" Beam Splitter	for "D" only, includes test slit
79853-68113	"D" Lens Assembly	for "D" only, includes test slit
79853-66508	Pre-amplifier Board REF	from "C" used for SAMPLE and REFERENCE on "D"
79853-61109	Diode Sample	from "C" used for SAMPLE and REFERENCE on "D"
79853-64605	Grating Assembly	same part number as before, but test slit added
79853-13000	Firmware "D" rev 4.31	for "D" only, added also to 79853-69014/15 and 79853-69511 (DCB)

* with "C" version optical units
** with "C" version optical units; part number 79853-68109 should only be used for 79853C optical until stock has expired.

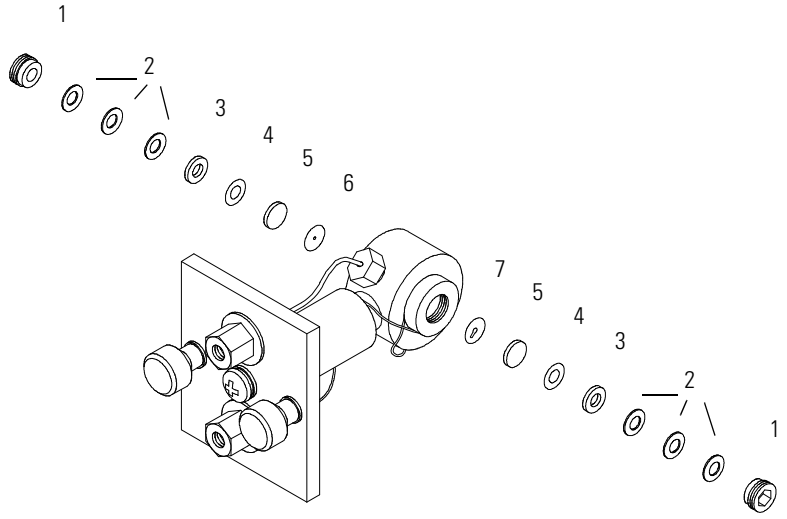
NOTE The part numbers 79853-68110, -68111, -68112, -68113 and -64605 include beside the test slit in addition a seal to close the hole for Mirror 4 adjustment setscrew. Close the hole with this seal during replacements (see Figure 4 on page 8 for the location).

Standard Flow Cell “D” Repair Parts

Table 2 **Standard Flow Cell “D” Repair Parts**

Item	Description	Part Number
	STD Flow Cell “D”, complete assembly	**79853-60000**
1	Cell Screw	79853-27200
	Kits:	
	Cell Kit STD “D”, consists of: two windows, two gaskets #1, one gasket #2 and one gasket #3.	79853-68741
2	Conical Spring “D”, Qty=10	79853-29100
3	Ring SST “D”, Qty=2	79853-22500
5	Window Quartz “D”, Qty=2	79853-68742
4	Gasket #1 “D”, PTFE, Qty=10	79853-68743
6	Gasket #2 “D”, Aperture, gold, Qty=5	79853-68744
7	Gasket #3 “D”, PTFE, Qty=5	79853-68745

Figure 2



Preparations

WARNINGS

These procedures need special knowledge on servicing the 79853C VWD and should be done by trained Service Engineers only.

These procedures should be carried out in a room where the light can be reduced.

Since the deuterium lamp emits intensive ultraviolet light, it is dangerous to perform optical alignment without eye protection.

Tools required:

- ❏ Test Slit (supplied with mirror or grating assembly)
- ❏ Pozi Driv PT1
- ❏ hexagonal wrench (1.5 mm)
- ❏ hexagonal wrench (2.5 mm)
- ❏ pair of tweezers (not too sharp points)

Pre-requisites:

- ❏ Assure that the flow cell is clean, flushed with water and bubble free.
- ❏ Remove detector from system.
- ❏ Place the detector on a bench.
- ❏ Remove the main cover.

Additional Information

Additional information about replacements and the use of the Service control Functions are available in the 1050 Service Handbook, (Part number part number 01050-90102).

This document should be added to the existing 050 Service Handbook, (Part number 01050-90102).

Additional information is available in the Information Note “New Standard Flow Cell 79853-60000” (Part number 79853-90102).

Replacements and Calibrations

The following procedures describe the replacements of parts separately.

NOTE It is important that only one assembly (mirror, grating, beam splitter, ...) is changed and calibrated at a time. Otherwise you will lose correct optical assembly alignment during the calibration process.

WARNING **Do not remove the Entrance Slit Holder nor loosen it. Otherwise the optical unit has to be exchanged completely.**

NOTE The photocurrent readings with test slit installed are much lower than with the standard slit.

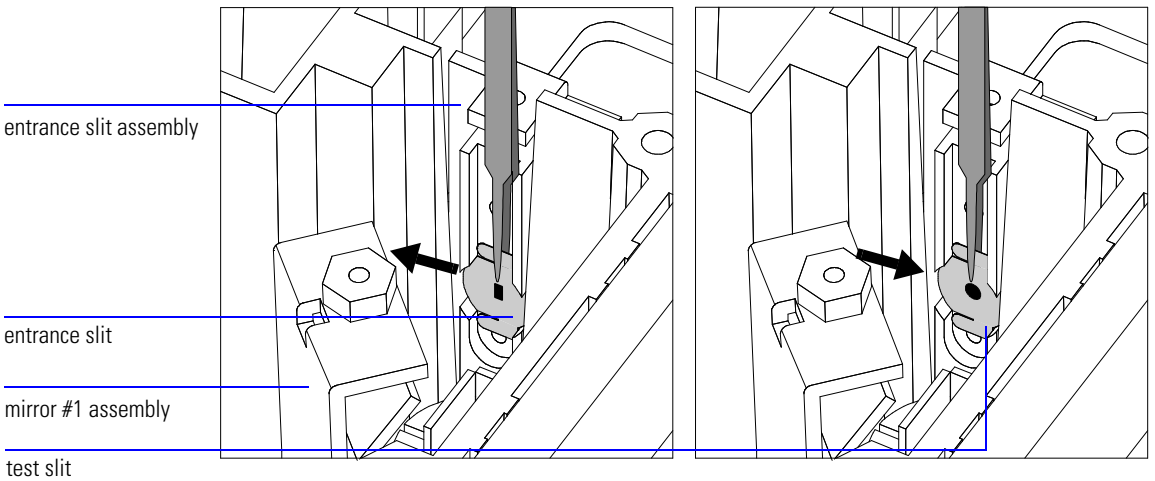
Installing the Test Slit

The small diameter of the test slit allows a straight forward alignment of the optical path. It enables the lamp image to be positioned optimally. This ensures correct illumination of the Entrance Slit and the Reference Slit.

NOTE This procedure has to be carried out at the beginning of all replacement procedures.

1. Turn on the detector and the lamp.
2. Set the wavelength to 250 nm.
3. Carefully remove the cover of the optical unit. Take care for the reference aperture handle, see Figure 4 on page 9.
4. Remove the standard slit from the entrance slit holder using a pair of tweezers and place it safe.

Figure 3 **Replacing the Entrance Slit**



5. Carefully insert the test slit (with round hole) into the entrance slit holder. The slit must sit flat on the holder with the white side towards the incoming light.

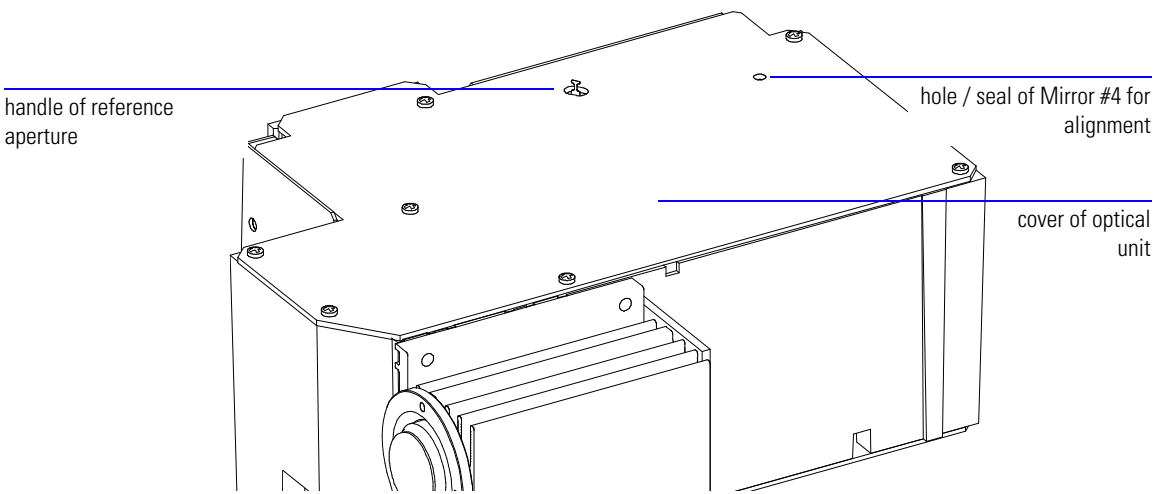
Replacing Mirror #1 Assembly

1. Install the Test Slit, see “Installing the Test Slit” on page 8.
2. Remove mirror #1 assembly.
3. Install new Mirror #1 assembly.

NOTE DO NOT remove or change its position of adapter plate underneath the mirror #1 assembly.

4. Position the lamp image onto the test slit hole:
   - horizontally by rotating the mirror,
   - vertically using the setscrew on the mirror.
5. Fix the mirror.
6. Install the Standard Slit and perform grating calibrations, see “Installing the Standard Slit” on page 19.
7. Carefully replace the cover of the optical unit. Take care for the reference aperture handle.
8. Reassemble the detector.

Figure 4 **Handle of Reference Aperture**

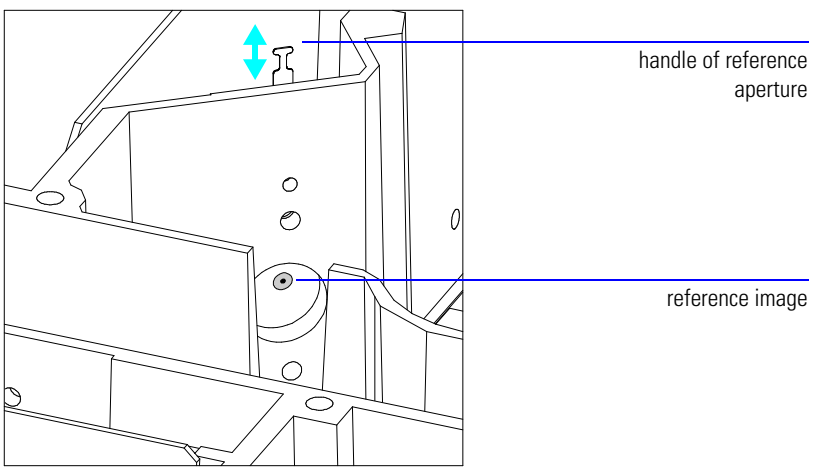


Replacing Mirror #3 or #4 Assembly

NOTE Replace and calibrate one mirror at a time.

1. Install the test slit, see “Installing the Test Slit” on page 8.
2. Carefully replace the cover of the optical unit. Take care for the reference aperture handle, see Figure 4 on page 9.
3. Execute CTRL 20: 0th CALIB.
4. Activate service function CTRL 40: 0TH TEST ON.
5. Carefully remove the cover of the optical unit. Take care for the reference aperture handle, see Figure 4 on page 9.
6. Unlock the reference aperture, see “Unlocking the Reference Aperture” on page 16.
7. Center the reference slit on the white image by moving the aperture up or down, see Figure 5. The image diameter is nearly equal to the reference slit diameter.

Figure 5 **Aligning the Reference Slit**



8. Install new mirror #3 or #4 assembly.

9 Position the white image precisely onto the reference slit:
- horizontally by rotating the mirror,
- vertically using the setscrew of the mirror

10 Carefully replace the cover of the optical unit. Take care for the reference aperture handle.

11 De-activate CTRL 40: 0TH TEST OFF, press CLEAR, CLEAR and BALANCE.

12 Set λ=250 nm.

13 Activate CTRL 16: PHOTOCURRENT.

14 Optimize the sample readings using the setscrew of mirror #4 through the hole in the optical unit cover, see Figure 4 on page 9.

15 Optimize the reference readings with the reference aperture, see “Optimizing the Reference Readings” on page 18.

16 Install the standard slit and perform electronic calibrations, see “Installing the Standard Slit” on page 19.

Replacing the Grating or Grating Motor

NOTE To replace the Grating and/or the Grating Motor refer to the 1050 Service Handbook, section “Replacing Grating Assembly Parts” and continue with the Alignment Procedure below.

1 Install the test slit, see “Installing the Test Slit” on page 8.

2 Carefully replace the cover of the optical unit. Take care for the reference aperture handle, see Figure 4 on page 9.

3 Execute CTRL 20: 0th CALIB.

4 Activate service function CTRL 40: 0TH TEST ON.

5 Carefully remove the cover of the optical unit. Take care for the reference aperture handle, see Figure 4 on page 9.

6 Unlock the reference aperture, see “Unlocking the Reference Aperture” on page 15.

7 De-activate CTRL 40: 0TH TEST OFF.

8 Center the reference slit on the white image by moving the aperture up or down. The image diameter is nearly equal to the reference slit diameter.

9 Remove the grating and reassemble new grating.

NOTE Assure that the grating is not fixed on the shaft with the setscrew.

10 Set the Param. λ0=200, using service function CTRL 31: SET λ PARAM.

11 Activate service function CTRL 40: 0TH TEST ON.

12 Turn the grating so that the center of the image is on the reference slit (a small horizontal and vertical deviation can be accepted).

13 Fix the grating with the setscrew.

14 De-activate and re-activate CTRL 40: 0TH TEST and check the position of the image on the reference slit.

If not correct, loosen the grating and repeat steps 12 to 14.

15 Do a vertical adjustment with Mirror #4 for precise vertical fit of image on reference slit, using the setscrew of mirror #4 through the hole in the optical unit cover, see Figure 4 on page 9.

16 Carefully replace the cover of the optical unit. Take care for the reference aperture handle.

17 De-activate CTRL 40: 0TH TEST OFF, press CLEAR, CLEAR and BALANCE.

18 Execute CTRL 20: 0th CALIB.

19 Activate CTRL 40: 0TH TEST ON and readjust the Beam Splitter for ideal horizontal fit.

20 De-activate CTRL 40: 0TH TEST OFF.

21 Set λ=250 nm.

22 Activate CTRL 16: PHOTOCURRENT.

23 Optimize the sample readings, using the setscrew of mirror #4 through the hole in the optical unit cover, see Figure 4 on page 9.

24 Unlock the reference aperture, see “Unlocking the Reference Aperture” on page 16.

25 Optimize the reference readings with the reference slit, see “Optimizing the Reference Readings” on page 18.

26 Install the standard slit and perform electronic calibrations, see “Installing the Standard Slit” on page 19.

Replacing the Beam Splitter

1 Install the test slit, see “Installing the Test Slit” on page 8.

2 Execute CTRL 20: 0th CALIB.

3 Carefully remove the cover of the optical unit. Take care for the reference aperture handle, see Figure 4 on page 9.

4 Activate service function CTRL 40: 0TH TEST ON.

5 Unlock the reference aperture, see “Unlocking the Reference Aperture” on page 16.

6 Center the reference slit on the white image by moving the aperture up or down. The image diameter is nearly equal to the reference slit diameter.

7 Install the new beam splitter assembly.

8 Position horizontally the white image center of the beam splitter onto the reference slit.

9 Fix the beam splitter after precise image fit.

10 Correct new vertical position with reference slit.

11 Carefully replace the cover of the optical unit. Take care for the reference aperture handle.

12 De-activate CTRL 40: 0TH TEST OFF, press CLEAR, CLEAR and BALANCE.

13 Set λ=250 nm.

14 Activate CTRL 16: PHOTOCURRENT.

15 Optimize the sample readings using the setscrew of mirror #4, using the setscrew of mirror #4 through the hole in the optical unit cover, see Figure 4 on page 9.

16 Optimize the reference readings, see “Optimizing the Reference Readings” on page 18.

17 Install the standard slit and perform electronic calibrations, see “Installing the Standard Slit” on page 19.

Cleaning or Replacing the Lens

The lens is located between lamp housing and casting and can be cleaned or replaced.

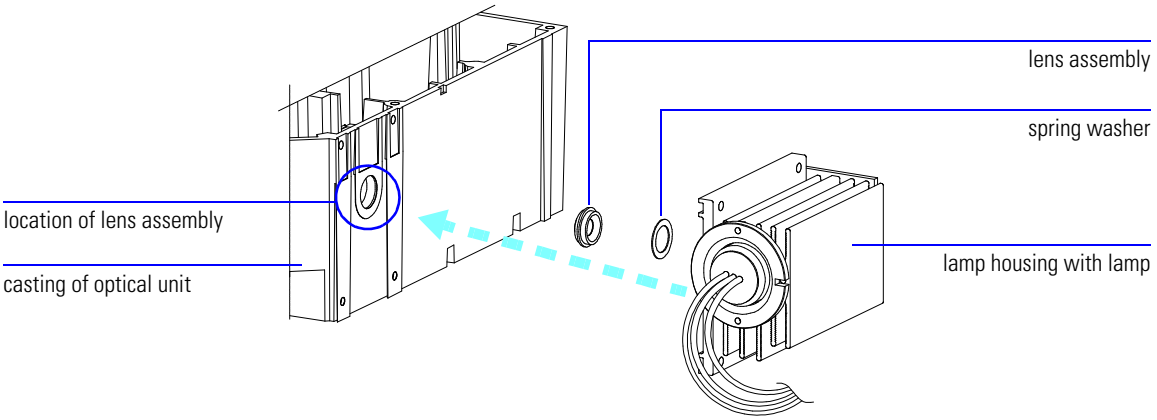
1 Turn the detector off.

2 Disconnect the lamp connector and all other connectors to the DCB board.

3 Remove the optical unit completely from the instrument.

4 Unscrew the four screws of the lamp housing and remove lamp housing.

Figure 6 **Lens Assembly Location**

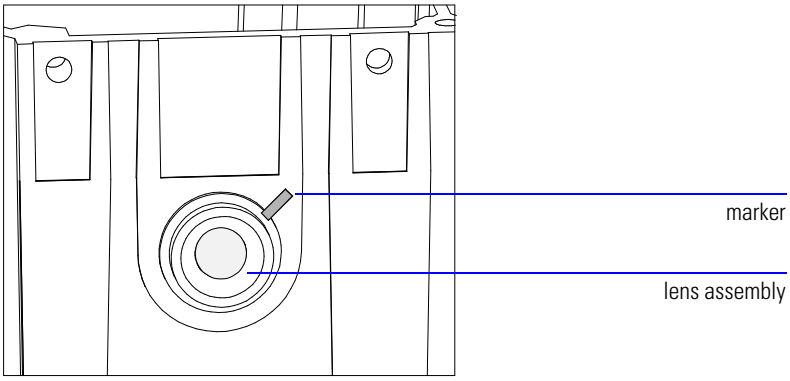


NOTE

For easier repositioning the lens ring is marked with color paint, see Figure 7 on page 15. The position of the marker could differ from instrument to instrument and may be different to the position shown in the figure.

5 Remove, clean or replace the lens. If reusing old lens use markings for repositioning.

Figure 7 **Lens Position**



NOTE The more plane lens side with smaller aperture faces towards the lamp.

NOTE If a new lens is installed, mirror #1 assembly has to be realigned after this procedure, see “Replacing Mirror #1 Assembly” on page 9.

6 Reassemble the flat spring.

7 Replace the Lamp housing and tighten it.

8 Reassemble the detector.

Unlocking the Reference Aperture

NOTE Only necessary, if required during a replacement procedure.

For performance reasons, the reference aperture is fixed by one screw only and has to be unlocked prior to any replacement/calibration within the optical unit.

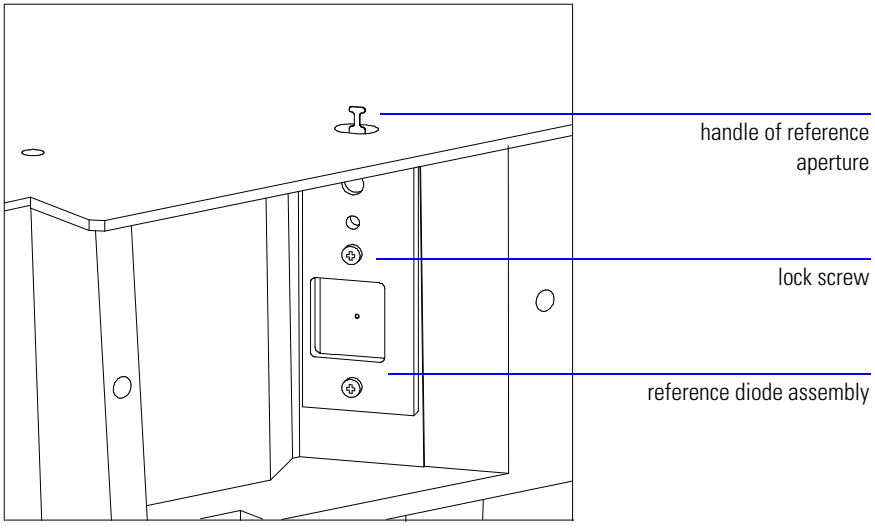
1 Unscrew the front panel and place it in front of the detector to have access to the reference pre-amplifier area.

NOTE When moving the front panel, assure that the keyboard cable is not partially disconnected - damage to the electronics is possible.

2 Unscrew the right screw of the reference pre-amplifier cover and loosen the left screw.

3 Turn the cover counter-clockwise until you can loosen the top screw of the photo diode holder sheet.

Figure 8 **Unlocking the Reference Slit**



4 Replace the reference pre-amplifier cover (to prevent stray light).

5 Fit the front panel with one screw at the right of the mainframe.

6 Turn on the detector and the lamp

7 Set wavelength to 250 nm.

8 Return to your replacement procedure.

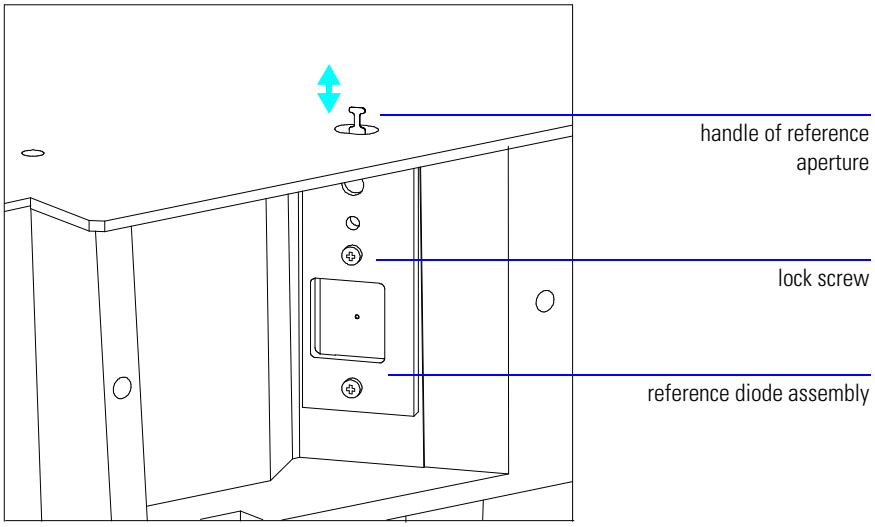
Optimizing the Reference Readings

1 Carefully replace the cover of the optical unit. Take care for the reference aperture handle.

2 Activate CTRL 16: PHOTOCURRENT.

3 Shift reference aperture vertically for maximum reference readings.

Figure 9 **Optimizing the Reference Readings**



4 Fix the reference slit with the top lock screw of the photo diode assembly.

5 Replace the reference photodiode cover.

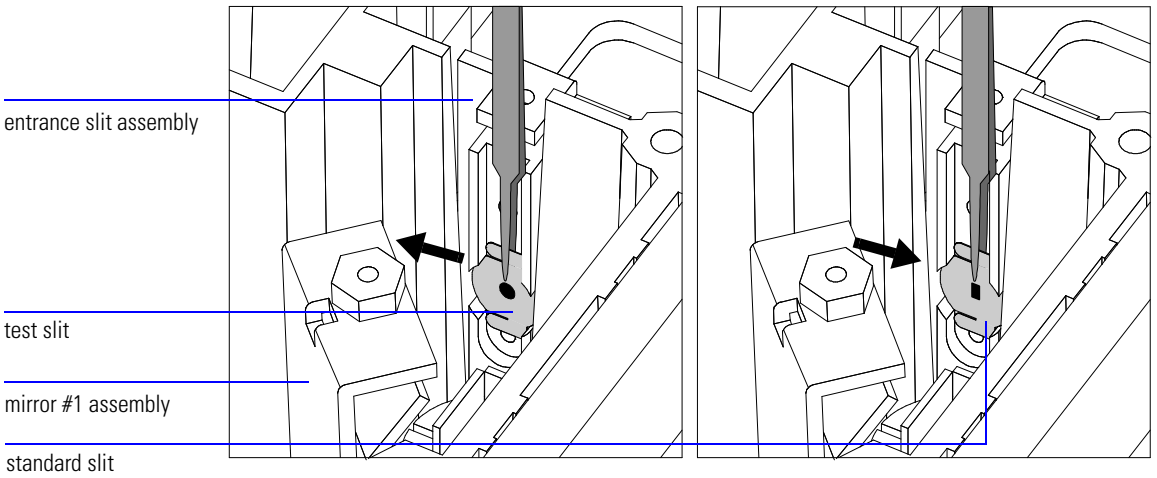
6 Continue with the next step of the procedure of the assembly you are replacing.

Installing the Standard Slit

NOTE This procedure has to be carried out at the end of all replacement procedures.

1. Carefully remove the cover of the optical unit. Take care for the reference aperture handle, see Figure 4 on page 9.
2. Remove the test slit from the entrance slit holder using a pair of tweezers and place it safe.

Figure 10 **Replacing the Entrance Slit**



3. Carefully insert the standard slit into the entrance slit holder. The slit must sit plane on the holder.
4. Carefully replace the cover of the optical unit. Take care for the reference aperture handle, see Figure 4 on page 9.
5. Execute CTRL 20: 0th CALIB.
6. Execute CTRL 21: λ CALIBRATION.
7. Reassemble the detector.

What's in this Information Note

This document describes the new replacement and calibration procedures for the enhanced optical unit of the 79853C Variable Wavelength Detector introduced in June 1995.

This document should be added to the existing 1050 Service Handbook, (Part number 01050-90102).

Printed in Germany 06/95
Part No. 79853-90103

79853-90103