Chapter 5
Verification Procedures

OVERVIEW

This chapter describes the adjustments, calibrations, checks, and other verification procedures (VPs) for the ABBOTT SPECTRUM® Series II™ Analyzer. In addition, robotics training and various cleaning, decontamination, configuration, and reinitialization procedures are included.

For procedures that are typically performed by the customer, refer to the appropriate customer manuals (operations, maintenance and troubleshooting).

For ISE procedures, refer to the ISE Service Manual.

For quick cross-reference, lists of the VPs in this chapter are organized in two ways. The two lists are:
- numerical order by VP number in Chapter Contents (page 5-1)
- alphabetical order by procedure name (page 5-4)

WARNING !

Procedures in this chapter require following biohazard, electrical hazard, and electrostatic discharge precautions.

CHAPTER CONTENTS

Robotics Training (cont)

Additional Procedures

Additional Procedures (cont)

VERIFICATION PROCEDURES (ALPHABETICAL LIST)

ADJUSTMENTS/ALIGNMENTS OVERVIEW

This section of Chapter 5 contains these adjustments and alignments:

WARNING !

Procedures in this section of the chapter require following biohazard, electrical hazard, and electrostatic discharge precautions.

VP - 1: 24V POWER SUPPLY ADJUSTMENT

Purpose

Ensure 24V Power Supply voltage is within specification

Procedure

1. Remove CRT/Keyboard Bezel (**RR - 13.1**).
2. Ensure voltage across J303 and J304 on the 24V Power Supply is 24V ± 0.05V. Adjust V1 if necessary.

   To increase voltage adjust V1 CW
   To decrease voltage adjust V1 CCW
3. Check that the voltage from J303 to chassis is 24V ± 0.05V and voltage from J304 to chassis is 0V.

Specifications

Location	Voltage specification
Across J303 and J304	24V ± 0.05V
From J303 to chassis	24V ± 0.05V
From J304 to chassis	0V

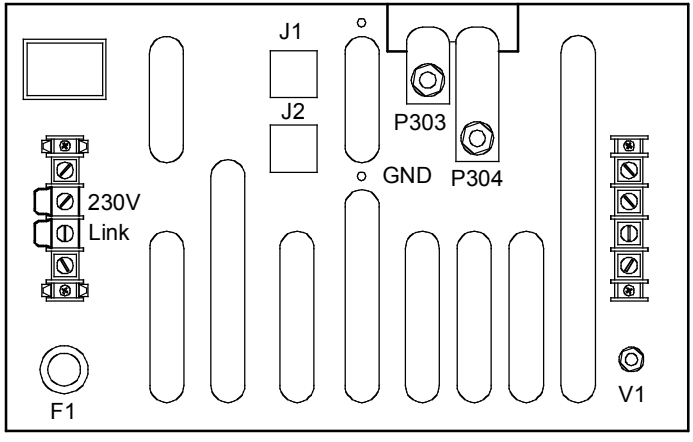


Figure 5-1: 24V Power Supply Adjustment

VP - 2: CALIBRATION WHEEL ADJUSTMENT

Purpose

Center the light beam in the calibration wheel window(s)

Procedure

1. Remove Top Deck (**RR - 1.3**).
2. Remove Sample Wash Cup (**RR - 11.4**). Move the wash cup to allow access to the calibration wheel dual sensor L-bracket.
3. Reinstall Reagent Probe. (It was removed in step # 1, Top Deck removal.)
4. Remove Sample Probe tubing from the arm and place it in the Sample Wash Cup.
5. Slightly loosen 2 screws that secure the calibration wheel sensor L-bracket to the optics housing. Ensure that the sensor bracket can be moved.
6. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   OTHER DEVICES
   HOME ROBOTICS
7. OPEN SHUTTER
8. Look between the cuvette carrier and calibration wheel and verify that the light is centered in the calibration wheel window.

If the light is...	Then...
centered	Go to step #9.
not centered	Move sensor bracket as necessary. Repeat steps #6 through #8 until light is centered.

9. Tighten 2 L-bracket screws.
10. Reinstall Sample Wash Cup.
11. Reinstall sample probe tubing.
12. Reinstall Top Deck.
13. Perform AD Read Check (**VP - 23**).

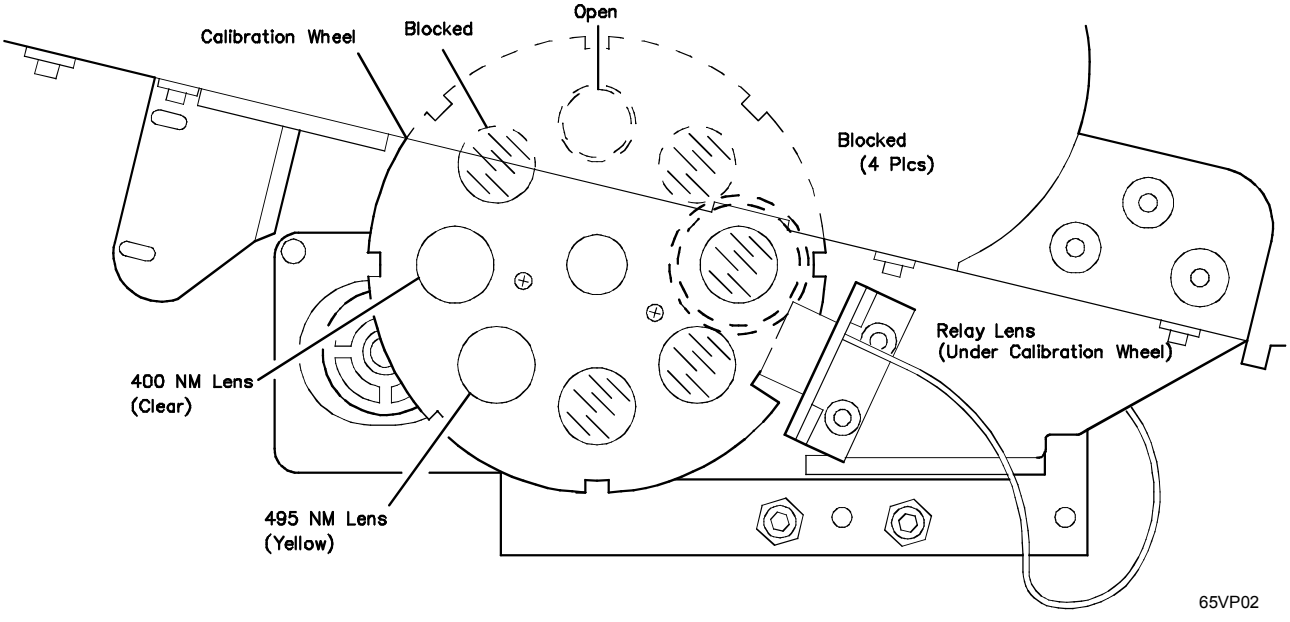


Figure 5-2: Calibration Wheel Adjustment

VP - 3: CUVETTE CARRIER CENTERING

Purpose

- Ensure the Cuvette Carrier does not bind and cuvettes are not being scratched during operation
- Ensure correct tensioning of the Cuvette Carrier Drive Belt

Procedure

1. Remove Top Deck (**RR - 1.3**).
2. Remove all cuvettes from Cuvette Carrier. Drain Incubator.
3. Clamp Incubator tubing to prevent water from entering Incubator in the following steps.
4. Loosen 4 screws that hold Cuvette Carrier Motor.
5. Push the motor toward Cuvette Carrier, loosening the tension on the belt.
6. Loosen screws holding the left bearing bracket and the right bearing bracket.
7. Move the left and right carrier bearings in and out as necessary to physically center the carrier in Incubator.
8. Tighten screws for left and right bearings.
9. Remove 3 screws that hold the skirt to the Incubator Optics assembly.
10. Mount the Cuvette Carrier Belt Tension Tool bracket to Incubator Optics Assembly.
11. Attach Cuvette Carrier Belt Tension Tool gauge to the bracket.
12. Ensure that pulley foot is centered on motor pulley and is not rubbing on the belt.
13. Turn adjustment knob until tension on belt is 9.50 lbs +/- 0.25 lbs.
14. Check Cuvette Carrier centering again to verify that its position hasn't shifted. Adjust the bearings if needed.
15. Tighten 4 screws that hold the carrier motor.
16. Remove the Cuvette Carrier Belt Tension Tool.
17. From Main Menu:
    SPECIAL PROCEDURES
    ROBOTICS
    REAGENT ARM
    HOME ROBOTICS

18. Place clean cuvettes in positions 2, 4, 6, and 8 of Cuvette Carrier.

19. In Cuvette field:
    1
    ENTER (carrier rotates to position #1)
    12
    ENTER (carrier rotates to position #12)

20. Repeat step #19 ten times.

21. Check each cuvette for scratches:

If there are...	Then...
no scratches	Cuvette Carrier is centered. Go to step #22.
scratches	Cuvette carrier is not centered. Repeat steps #4 through #21.

22. Unclamp incubator fill tubing.

23. Reinstall incubator skirt.

24. Perform Light Beam Alignment (**VP - 8**).

25. Reinstall Top Deck.

Specifications

Tension on the Cuvette Carrier Belt	9.50 lb. ± 0.25 lb.

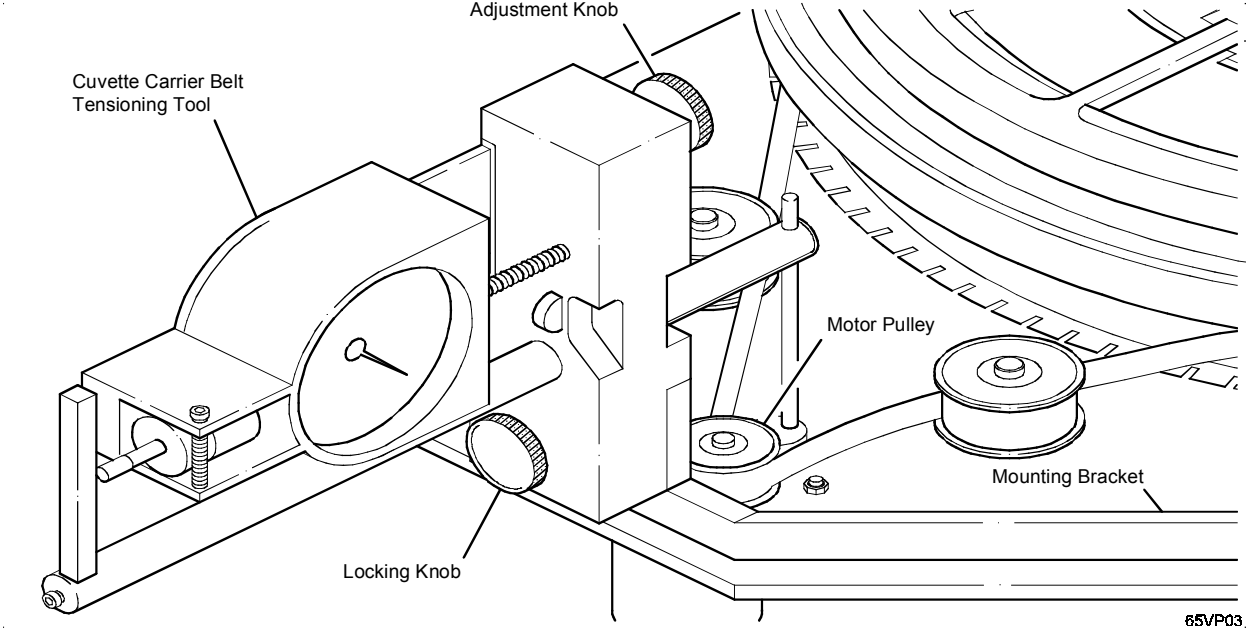


Figure 5-3: Cuvette Carrier Centering

VP - 4: CUVETTE CARRIER HEIGHT ADJUSTMENT

*NOTE: Cuvette Carrier should be centered before beginning this procedure. (Refer to **VP - 3**: Cuvette Carrier Centering.)*

Purpose

Ensure the cuvette carrier is the correct height for proper optical readings

Procedure

1. Power Off analyzer (**VP 47**).
2. Remove Top Deck (**RR 1.3**).
3. Remove all cuvettes from Cuvette Carrier. Drain Incubator.
4. Remove the bottom of a cuvette segment.
5. Place the bottomless cuvette in the cuvette carrier at locations close to each of the bearings.

   Note: Do not place the cuvette in front of the light path.
6. Use the Micrometer tool to measure the depth from the top of a cuvette to the bottom of the incubator.
7. Use a 5/64 Allen™ wrench to adjust the bearing to obtain a depth of 1.463 +/-.005 inch.

To...	Turn...
raise the bearing slide	CW
lower the bearing slide	CCW

   This depth is required at all points around the carrier.
8. Tighten the locking screws securely when the proper height is obtained.

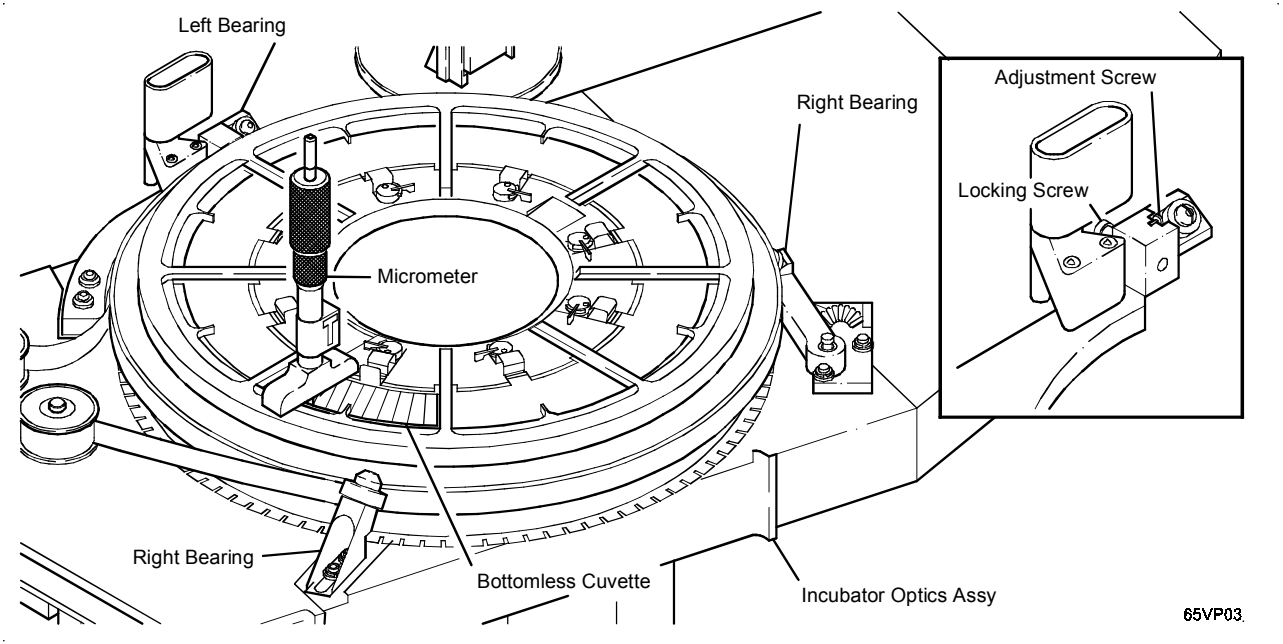


Figure 5-4: Cuvette Carrier Height Adjustment

VP - 5: INCUBATOR LEVEL SENSE ADJUSTMENT

Purpose

Ensure proper level of water in Incubator

Procedure

1. Remove Front Panel (**RR - 1.4**).

2. From Main Menu:
   SPECIAL PROCEDURES
   PUMPS & VALVES
   INCUBATOR VALVE OPEN
   to change to CLOSED

3. Aspirate the water from Incubator.
   PUMPS & VALVES
   to update the screen

If these conditions are met...	**Then...**
Incubator level indicates **LOW** *AND* LED on Incubator Optics Interface Bd is ON	Skip steps #4 and #5. Go to step #6.
Incubator level does not indicate **LOW** *OR* LED on Incubator Optics Interface Bd is OFF	Go to step #4.

4. Adjust R6 (green pot) on Incubator Optics Interface Board until the LED just goes out. Reverse the adjustment until the LED just comes on, then continue 1/4 turn.

   *NOTE: **Do not** adjust R12 (blue pot). It sets the sensitivity of the lamp photodiode.*

5. PUMPS & VALVES
   to update the screen

   Incubator level should indicate **LOW**.

6. INCUBATOR VALVE CLOSED
   to display OPEN

7. As water fills Incubator and approaches Level Sense probes:
   PUMPS & VALVES
   to update screen.

   When fluid touches the Incubator level sense probes, **LOW** should change to **OK**. The LED on Incubator Optics Interface Board should be off. If not, go back to step #3.

8. HOME ROBOTICS

9. Reinstall Front Panel.

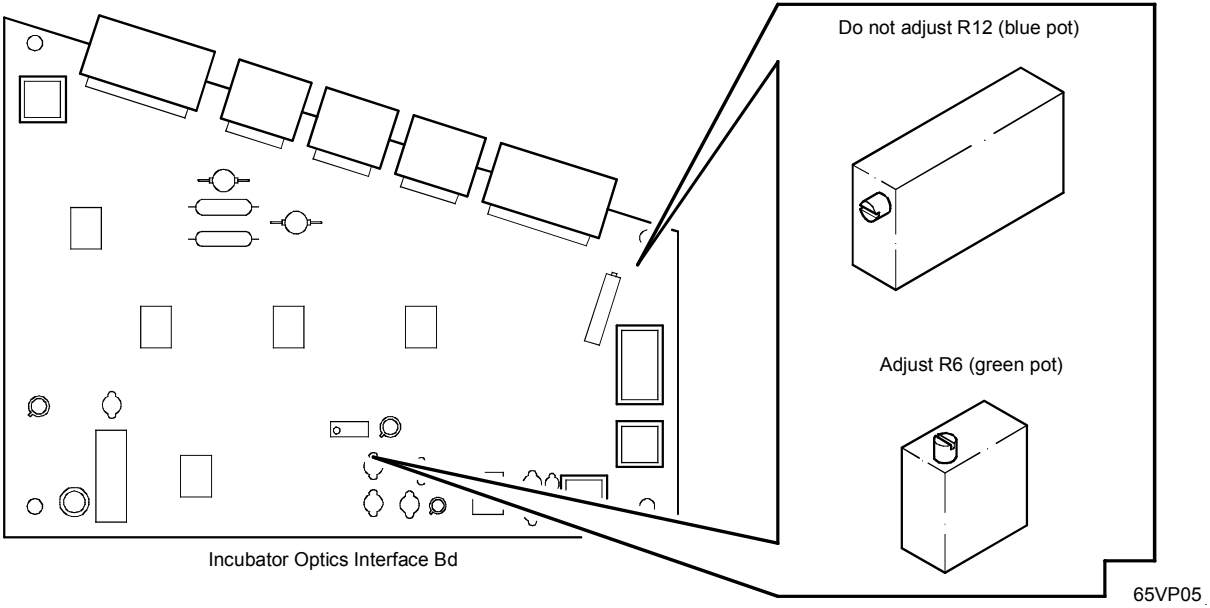


Figure 5-5: Incubator Level Sense Adjustment

VP - 6: INCUBATOR SERVO ADJUSTMENT

Purpose

Set the sensitivity of the Incubator Thermistor

Procedure

1. Unfasten screw at bottom right side of upper center door. Open upper center door, then upper right door.
2. Remove Front Panel (**RR - 1.4**).
3. Disconnect the Incubator Thermistor at P282 (located to the right of the Incubator Optics Assembly).
4. Install a 30 KÌ resistor (P/N 2-07338-01) across P282.
5. Monitor the voltage between TP1 and TP5 on Incubator Servo Board. Adjust R60 (top) until the voltage is 1.217V ± 0.001V.
6. Short between TP2 and TP5 on the board.
7. Monitor the voltage between TP3 and TP4 on the board. Adjust R61 (bottom) until the voltage is 0.00V ± 0.05V.
8. Remove the short between TP2 and TP5.
9. Reconnect the thermistor at J282.
10. Reinstall Front Panel.
11. Close upper right door; close upper center door. Fasten screw at bottom right side of upper center door.
12. Perform Temperature Calibration (**VP - 34**).

Specifications

Voltage measured on the Incubator Servo Board	Voltage specifications
between TP1 and TP5	1.217V ± 0.001V
between TP3 and TP4	0.00V ± 0.05V

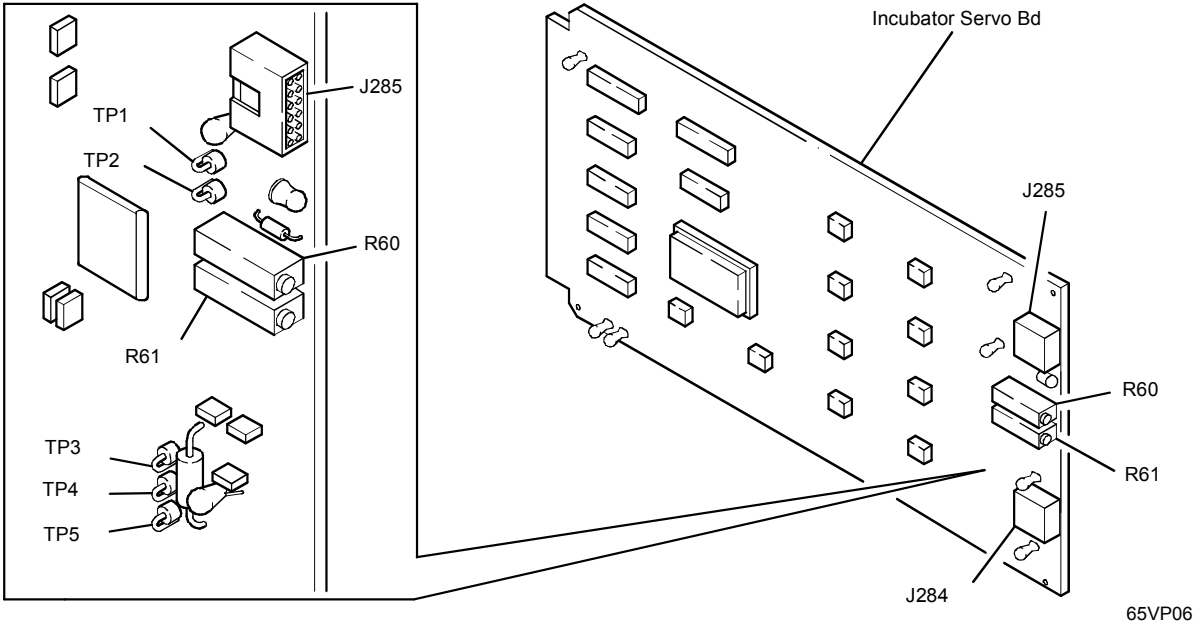


Figure 5-6: Incubator Servo Adjustment

VP - 7: LAMP ADJUSTMENT

CAUTION !

Lamp must have been on for at least 15 minutes before performing this procedure.

Purpose

Optimize lamp position

Procedure

1. Remove Front Panel (**RR - 1.4**).
2. Unfasten screw at bottom right side of upper center door. Open upper center door, then open upper right door.
3. Remove cuvette segment one.
4. From Main Menu:
   SPECIAL PROCEDURES
   AD OFFSET
   RECALCULATE

   After the screen changes:
   EXIT
5. AD READ
6. Edit these parameters on AD Read screen:
   REPEAT = 1000
   INTERVAL = 1
   MODE = CHAN 1
   SCALE FACTOR = VOLTS

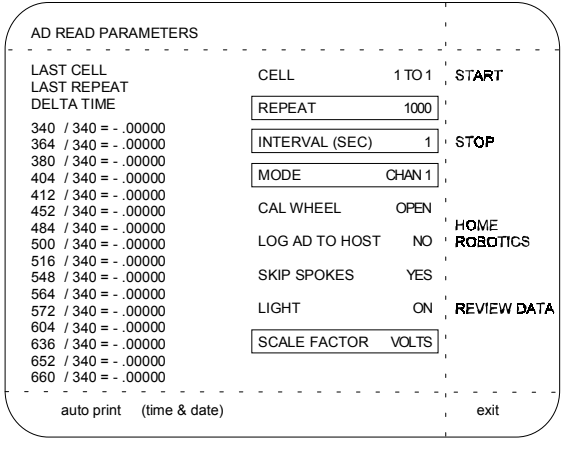


Figure 5-7: Example AD Read Parameters Screen

7. START

   Observe the 340/340 channel wavelength voltage (all readings will be assumed to be absolute values).

   Voltage reading must be < 7.3 volts. If voltage is > 7.3, adjust R–39 on Lamp Servo Board until the reading is <7.3 volts.

8. Open Lamp Adjustment Cover.

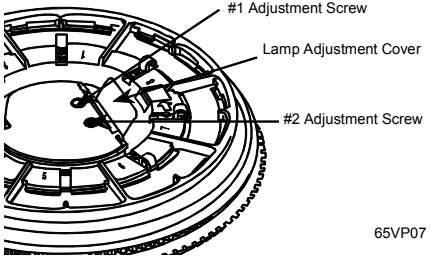


Figure 5-8: Lamp Adjustment Screws

NOTE: If the LED on the Lamp Servo Board lights during any adjustments, turn R-39 in the opposite direction and allow the analyzer to stabilize. Then repeat the lamp adjustment.

9. Turn the #1 adjustment screw in Lamp Housing to achieve the highest voltage reading possible. If voltage exceeds 7.3, adjust R-39 on Lamp Servo Board until reading is <7.3V.

10. Adjust the #2 adjustment screw in the same manner.

11. Adjust R–39 to achieve a reading of 6.8 to 7.3 volts with a nominal voltage of 7.0 volts.

12. Check the Lamp Drive voltage at connector J394. This should be between 8.5V and 10.5V.

13. Monitor the readings for all wavelength pairs. Ensure that they meet these specifications:

Wavelength Pair	**Acceptable Voltage Range (absolute values)**
340/340	6.8 to 7.3
364/340	2.5 to 6.5
380/340	2.0 to 6.2
404/340 through 660/340	1.4 to 6.2

14. When voltage is properly set:
    STOP

15. Close lamp adjustment cover.

16. Reinstall center of Cuvette Carrier.

17. Reinstall cuvette segment one.

18. Reinstall Front Panel.

19. Close upper right door; close upper center door.
    Fasten screw at bottom right of upper center door.

Specifications

Lamp Drive voltage at connector J394: between 8.5V and 10.5V

Wavelength Pair	Acceptable Voltage range
340/340	6.8 to 7.3
364/340	2.5 to 6.5
380/340	2.0 to 6.2
404/340 through 660/340	1.4 to 6.2

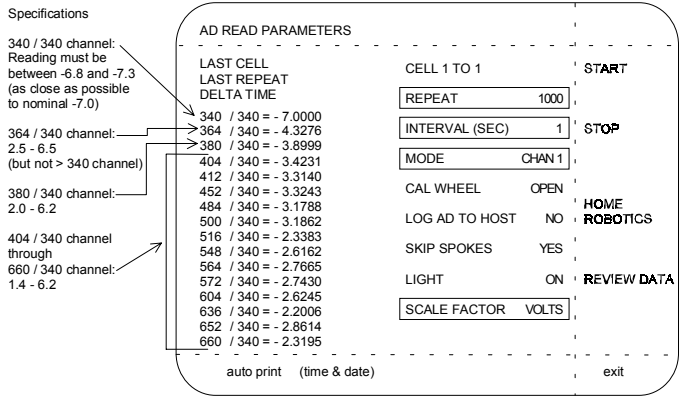


Figure 5-9: Example AD Read Parameters Screen

VP - 8: LIGHT BEAM ALIGNMENT

Purpose

Align the lamp through the cuvettes

Procedure

1. Ensure that the incubator level is full.
2. Turn the lamp on.

   From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   OTHER DEVICES
   SHUTTER OPEN
3. Place an empty cuvette in position 8 of the Cuvette Carrier.
4. Verify that the light beam is centered on the back wall of the cuvette.

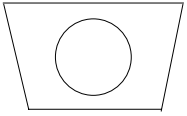


Figure 5-10: Light Beam Centered on Cuvette Back Wall

5. If the light beam is not centered, adjust the Cuvette Carrier Dual Optics Sensor:
   a. Loosen the lower locking screw.
   b. Turn the adjustment screw as needed:

To move Cuvette Carrier...	**Turn adjustment screw...**
CW	CCW
CCW	CW

6. HOME ROBOTICS
   Verify the centering of the light beam in cuvette cell 95.

7. Repeat steps #5 and #6 until the light beam is centered.
8. Check the centering in each of the other 7 cuvette segments.
9. Check probe positioning.

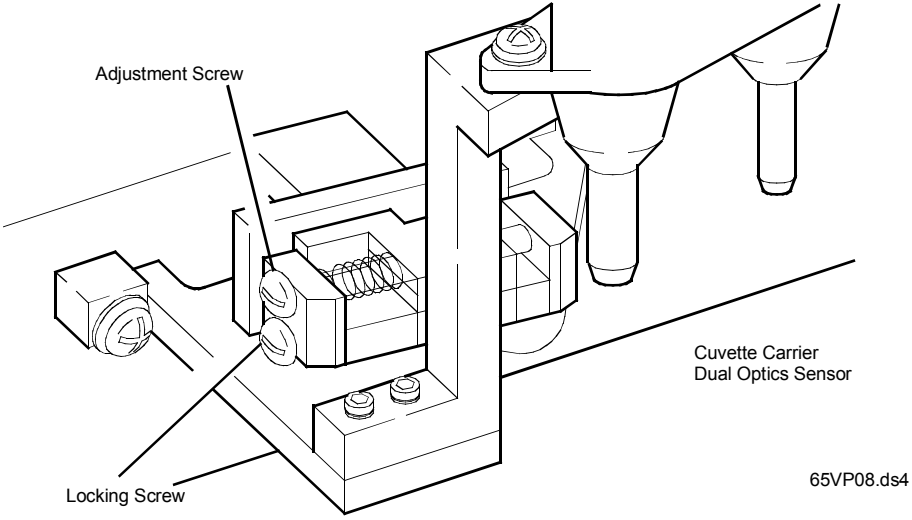


Figure 5-11: Light Beam Alignment

VP - 9: MIRROR 1 ALIGNMENT

*Note: Verify proper Lamp alignment before performing this procedure. Perform Lamp Adjustment (**VP - 7**) if needed.*

Purpose

Optimize the optical path alignment

Procedure

1. Remove Top Deck (**RR - 1.3**)
2. Remove cuvette segment 1.
3. Ensure Incubator is clean and there are no bubbles on the lenses.
4. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   HOME ROBOTICS
5. AD READ
6. On the AD Read Screen, edit these fields:
   Repeat 500
   Interval 0
   Mode CHAN 1
   Scale Factor VOLTS

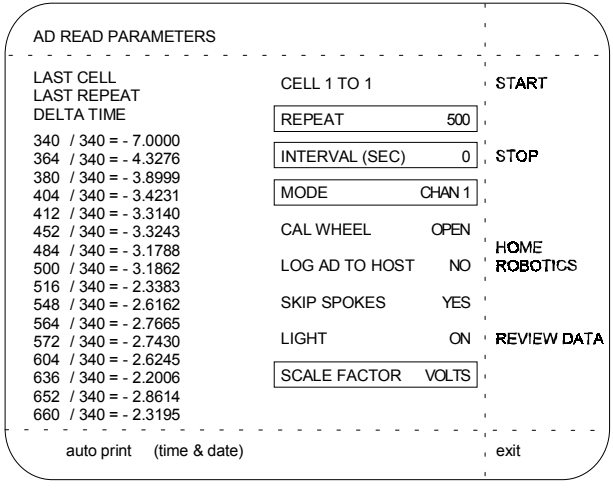


Figure 5-12: AD Read Screen for Mirror 1 Alignment

7. START

8. Locate 2 Mirror adjustment screws.

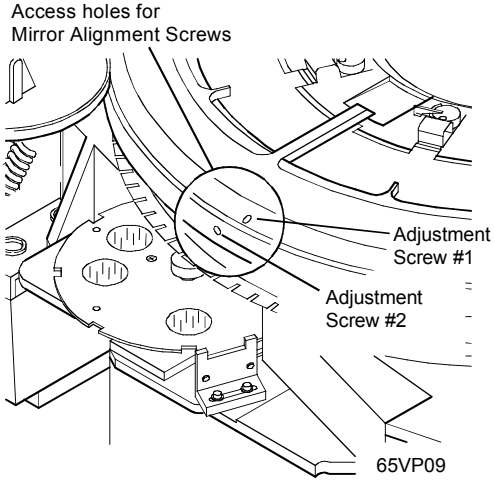


Figure 5-13: Mirror 1 Alignment

9. Observe the 340/340 channel wavelength voltage.

   Turn adjustment screw #1 (using a 1/16 Allen™ wrench) until a peak voltage reading is achieved.

> **CAUTION !**
>
> Excessive adjustment of the screws can cause the Mirror mounting bracket to become twisted.

10. Turn adjustment screw #2 until a peak voltage reading is achieved.

11. Repeat steps #9 and #10 until 340/340 channel voltage is peaked.

12. Perform Lamp Adjustment (**VP -7**).

13. Reinstall Top Deck.

Specifications

Location		**Output Voltage**
Mirror adjustment screws	peak reading at 340 wavelength	Maximum output ≤ -7.3V

VP - 10: MIXER DRIVE ASSEMBLY ALIGNMENT

Purpose

Optimize Mixer Drive positioning

Procedure

1. Remove Top Deck (**RR - 1.3**).
2. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   MIX ARM
   HOME ROBOTICS
3. Loosen 3 screws that hold the Mixer Drive Assembly to the Mixer Assembly mounting bracket.
4. CUVETTE
   BOTTOM
5. Move the Mixer Drive Assembly backward or forward as needed to position the Mix Arm in the center of cuvette position 95.

   Note: If needed, touch the LEFT or RIGHT positions on the Touchscreen to center the Mix Arm from side to side.
6. Tighten 3 screws that hold the Mixer Drive Assembly to the Mixer Assembly mounting bracket.

   Note: Be sure Mix Arm positioning doesn't shift when tightening the screws.
7. WASHCUP
   BOTTOM
8. Loosen 2 screws that hold the Mix Wash Cup to the Incubator.
9. Move the wash cup from side to side as needed to center the Mix Arm in the water inlet well.

   Note: If needed, touch the LEFT or RIGHT positions on the touchscreen to center the Mix Arm side-to-side position in the wash cup.
10. Tighten 2 screws that secure the wash cup to the Incubator.
11. HOME ROBOTICS
12. Reinstall Top Deck.
13. Perform Mix Arm Robotics Training (**VP - 36**).

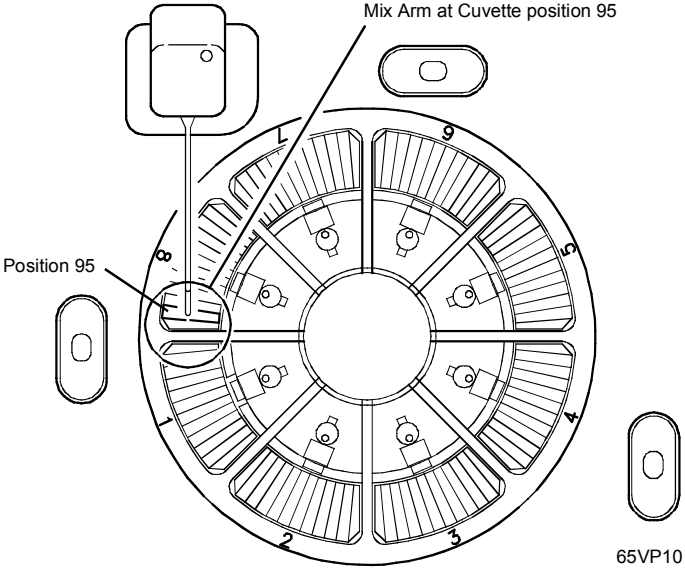


Figure 5-14: Mixer Drive Assembly Alignment

VP - 11: MULTI-OUTPUT POWER SUPPLY ADJUSTMENT

Purpose

Ensure Multi-Output Power Supply voltages are within specification

Procedure

1. Remove CRT/Keyboard Bezel (**RR - 13.1**).

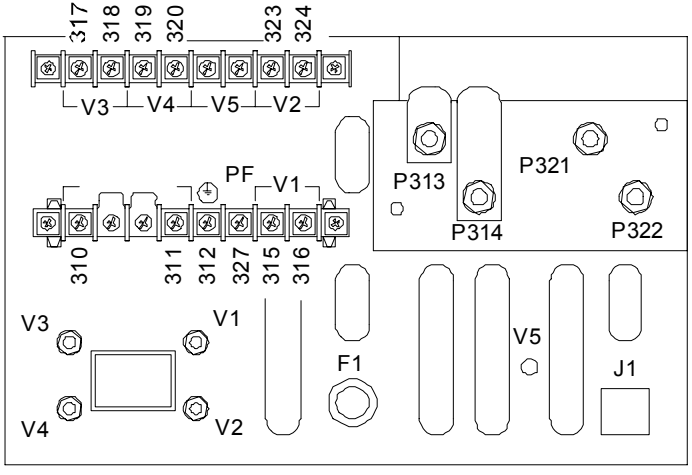
2. Measure these voltages on the Multi-Output Power Supply. Adjust if needed:

Location	Voltage Range	Adjustment
Between J321 and J322	19V ± 0.10V	V2
Between J313 and J314	5V ± 0.02V	V1
Between J317 and J318	+12V ± 0.05V	V3
Between J319 and J320	-12V ± 0.05V	V4

To increase voltage adjust CW
To decrease voltage adjust CCW

Specifications

Voltages should be within voltage range specifications in chart in step #2 above.



65VP11

Figure 5-15: Multi-Output Power Supply

VP - 12: REAGENT BAR CODE READER ALIGNMENT

Purpose

Ensure Reagent Bar Code labels can be read accurately

Procedure

1. Remove the Front Panel (**RR - 1.4**).
2. Fill the Reagent Cooler with reagent cartridges.
3. From Main Menu:
   SPECIAL PROCEDURES
   BAR CODE TEST
   START

   NOTE: To avoid possible overheating of the motor, do not allow the reader to rotate for longer than approximately 10 minutes.
4. Allow the bar code reader to make a minimum of 10 reads. There should be a minimum of 7 lines with no no-reads, the remaining reads can have no more than one no-read per line.

   NOTE: For one "read", the head rotates CW then CCW 3 times.

If these specifications...	Then...
are met	Go to step #9.
are not met	Go to step #5.

5. Loosen the locking screw on the Reagent Bar Code Dual Optics Sensor.
6. Turn the adjustment screw 1/4 turn at a time until the specifications are met.
7. STOP
8. Tighten the locking screw.
9. Reinstall Front Panel.

Specifications

The Reagent Bar Code Reader should make a minimum of 10 reads. There should be a minimum of 7 lines with no no-reads, the remaining reads can have no more than one no-read per line.

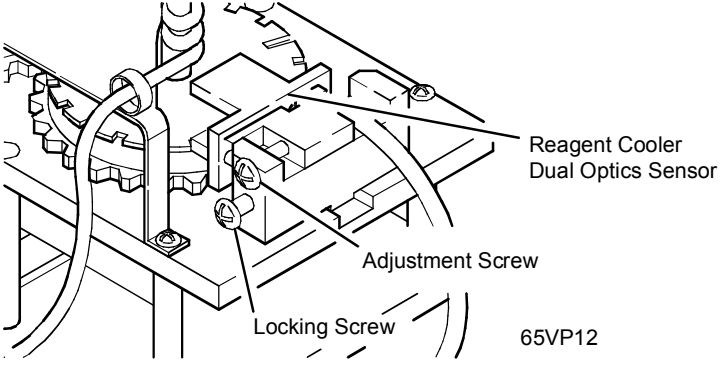


Figure 5-16: Reagent Bar Code Reader Alignment

VP - 13: SAMPLE ARM ALIGNMENT

NOTE: Use an old Sample Probe for this procedure because the probe could be damaged during the procedure.

Purpose

Physically set the position of the Sample Arm

Procedure

1. Remove ISE Shroud (**RR - 2.2**).
2. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   SAMPLE ARM
   HOME ROBOTICS
3. Loosen 4 screws that secure Sample Arm to mounting brackets.
4. CUVETTE TOP
5. Physically position the probe over cuvette position 95.
6. OTHER DEVICES
   SHUTTER OPEN
7. SAMPLE ARM
   BOTTOM

   Note: If the Sample Probe hits the bottom of the cuvette, it will be necessary to train the Bottom Position up until the Probe no longer touches the bottom.
8. Physically position the probe in the center of cuvette position 95.
9. Tighten 4 screws that hold the Sample Arm to the mounting brackets. Ensure positioning doesn't shift while tightening screws.
10. OTHER DEVICES
11. SHUTTER OFF
12. Perform Sample Wash Cup Alignment (**VP - 18**).
13. Perform Sample Arm Robotics Training (**VP - 37**).
14. Reinstall ISE shroud.
15. Close upper left door; close upper center door. Fasten screw at bottom right of upper center door.

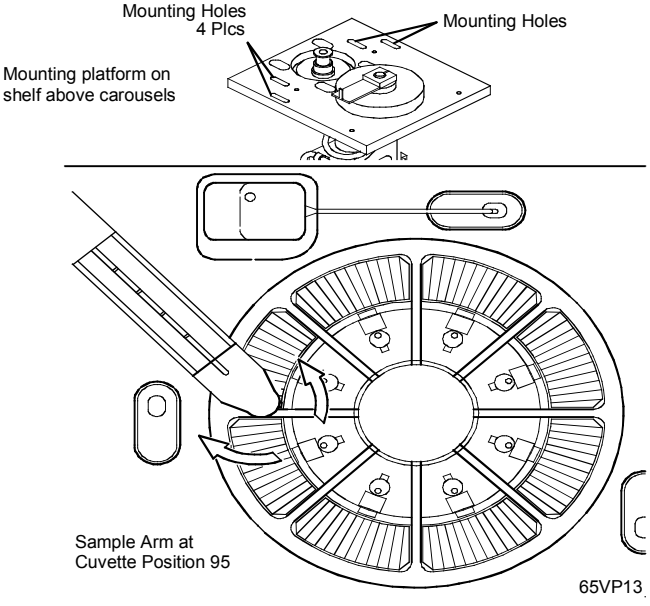


Figure 5-17: Sample Arm Alignment

VP - 14: SAMPLE CAROUSEL ALIGNMENT

Purpose

Ensure sample carousel is aligned to both the Sample Probe and the ISE Probe

Procedure

1. Remove Top Deck (**RR - 1.3**).

2. Loosen 4 screws that hold the Sample Carousel Drive Assembly to stand-off posts.

3. Remove Sample Diluent Tray (**RR - 8.6**).
   Install a shorting wire between Sample Diluent Switch connectors J566 and J567.

4. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   SAMPLE ARM
   HOME ROBOTICS

5. Remove Sample Carousel Tray from the carousel assembly.

6. OUTER CUP BOTTOM

7. Manually move the Sample Carousel Drive Assembly until the Sample Probe is centered within the dimple on the conductive plate.

8. INNER CUP BOTTOM

9. Verify that the Sample Probe is centered within the dimple on the conductive plate. Adjust Sample Probe as necessary using LEFT or RIGHT on Robotics screen.

10. WASH CUP TOP
    HOME ROBOTICS

11. Perform ISE Probe Alignment.

    If both Sample Probe and ISE Probe are not centered, repeat steps #5 through #11 until optimal alignment is achieved.

12. Tighten Sample Carousel Drive Assembly screws.

13. Reinstall Sample Diluent Tray.

14. Reinstall Top Deck.

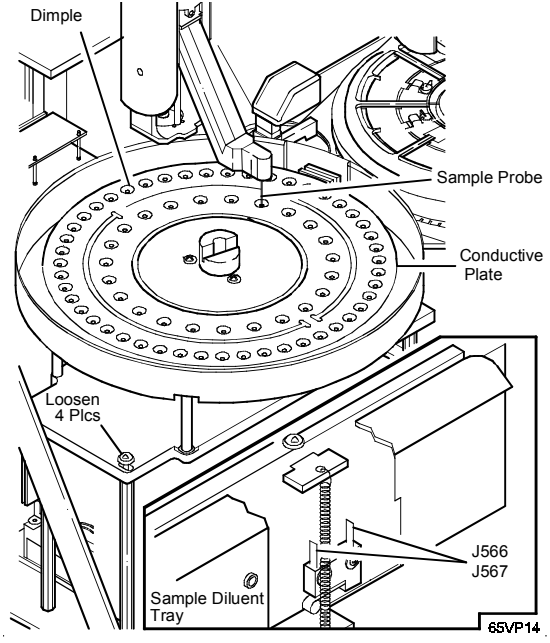


Figure 5-18: Sample Carousel Alignment

VP - 15: SAMPLE CAROUSEL ID READER BOARD ALIGNMENT

Purpose

Align the Sample Carousel ID Reader board so that it correctly reads Sample Carousel

Procedure

1. Remove Top Deck (**RR - 1.3**).
2. Install a Sample Carousel Tray.
3. From Main Menu:
   REVIEW & RUN
4. Verify that number displayed in the **Carousel number read was...** field matches the number of the installed carousel tray.
5. If the numbers do not match, slightly loosen 2 screws that hold Sample Carousel ID Reader Board to Sample Carousel Assembly. Position the board as necessary. Align sensors so that center sensor aligns with cup 9.

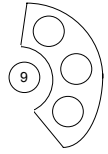


Figure 5-19: Center Sensor Aligned with Cup 9

6. N
   EXIT (twice)
7. Repeat steps #3 through #6 until the number read by the analyzer matches the number of the installed carousel tray.
8. Repeat steps #3 through #7 with another carousel (different ID number).
9. Tighten the 2 screws that hold Carousel ID Reader Board to the Sample Carousel Assembly. Ensure board position does not shift while screws are being tightened.
10. Reinstall Top Deck.

Specifications

Number displayed in the **Carousel number read was...** field matches the number of the installed carousel tray.

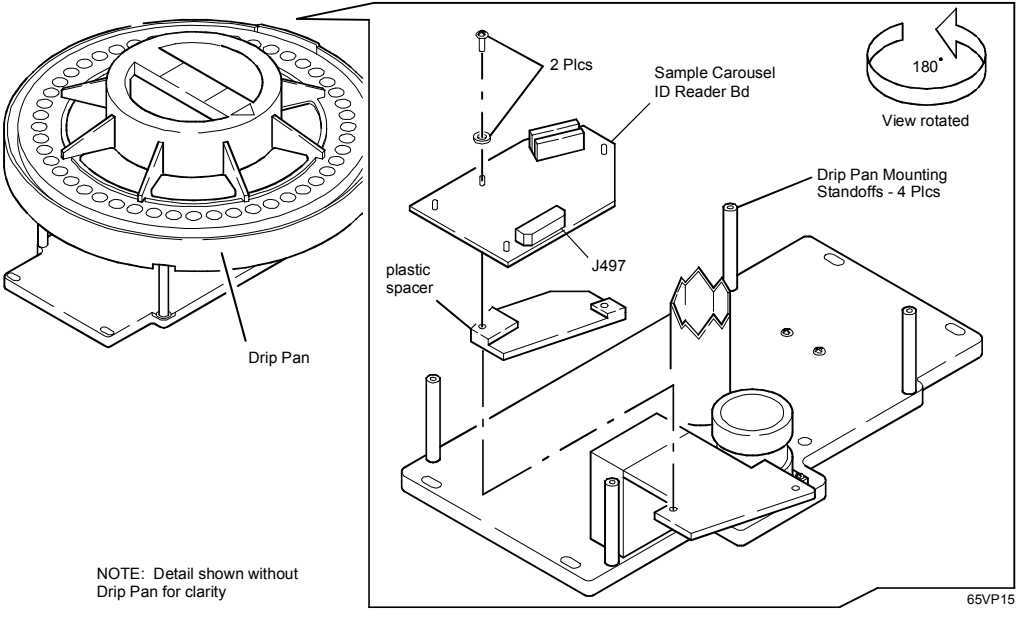


Figure 5-20: Sample Carousel ID Reader Board Alignment

VP - 16: SAMPLE DILUENT LEVEL ADJUSTMENT

Purpose

Ensure a Diluent Level Low status is detected at the proper diluent level

Procedure

1. Open Sample Diluent Bottle access door.
2. Ensure that the Sample Diluent Bottle is ONLY 1/4 full with Type II water.
3. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   PUMPS & VALVES

   Diluent Level field should indicate **LOW**.

If indication is...	Then...
LOW	Go to step 5
OK	Go to step 4

4. Turn the adjustment screw located under the platform of the Sample Diluent Tray until the indication is **LOW**.

   PUMPS & VALVES
   to update the screen
5. Add a small amount of Type II water to the Sample Diluent Bottle.

   PUMPS & VALVES
   to update the screen

   Diluent Level field should indicate **OK**.
6. Fill Sample Diluent Bottle.
7. Close Sample Diluent Reservoir access door.

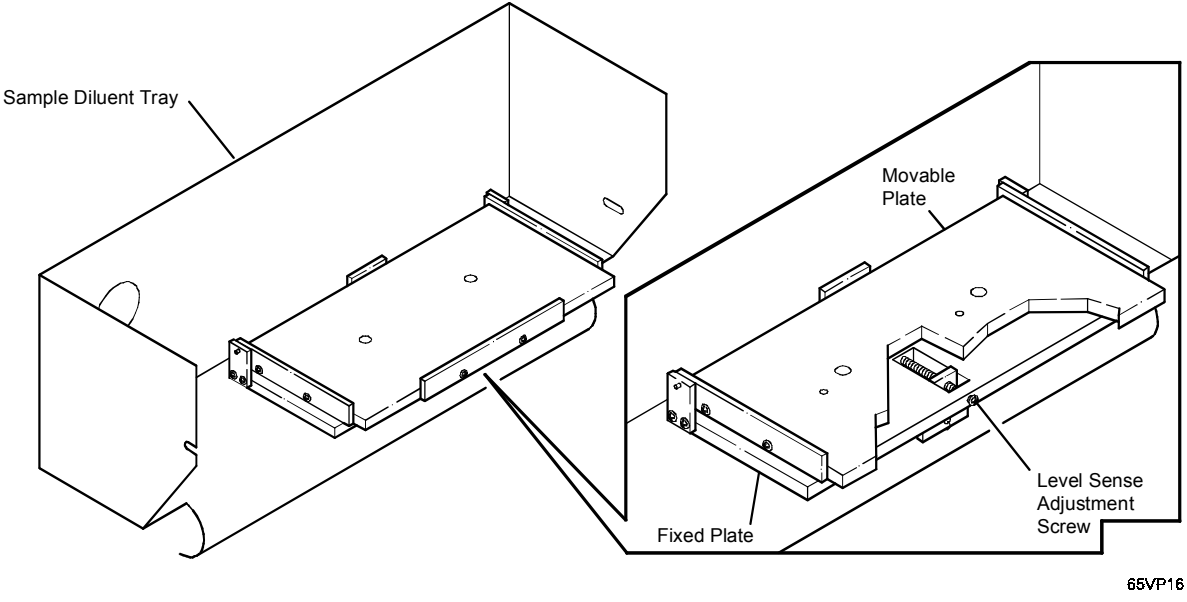


Figure 5-21: Sample Diluent Level Adjustment

VP - 17: SAMPLE DILUENT PUMP ADJUSTMENT

Purpose

Ensure diluent volume dispensed is within specifications

Procedure

1. Verify that Sample Diluent bottle is full.

2. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   PUMPS & VALVES
   HOME ROBOTICS

   Look for a steady stream of water in tubing:
   - from Sample Diluent bottle to Sample Diluent Pump
   - from Sample Diluent 35-Micron Filter to Sample Diluent Valve
   - from Sample Diluent Valve to Sample Probe

   If bubbles are seen, tap tubing to dislodge;
   HOME ROBOTICS until no bubbles are seen.

3. Remove Sample Probe and place the free end of the tubing into a 10 mL graduated cylinder.

4. HOME ROBOTICS

   When the robotics cycle is complete, check dispense volume. The amount should be 5.8 mL ± 0.2 mL.
   Repeat this step 5 times to ensure consistent measurement.

If dispense volume...	Then...
meets specifications	Go to step #10.
does not meet specifications	Go to step #5.

5. Remove Sample Diluent Tray (**RR - 8.6**) without disconnecting the tubing.

   Install a shorting wire between Sample Diluent Switch connectors J566 and J567.

6. Loosen the locking screw on the Sample Diluent Pump:

To...	Turn adjustment screw...
increase output	CW
decrease output	CCW

7. Repeat steps #4 through #6 until 5.8 ± 0.2 mL tolerance is met.

8. Tighten the locking screw.

9. Reinstall Sample Diluent Tray and Sample Diluent Bottle.

10. Reinstall Sample Probe.

Specifications

Dispense volume 5.8 mL ± 0.2 mL

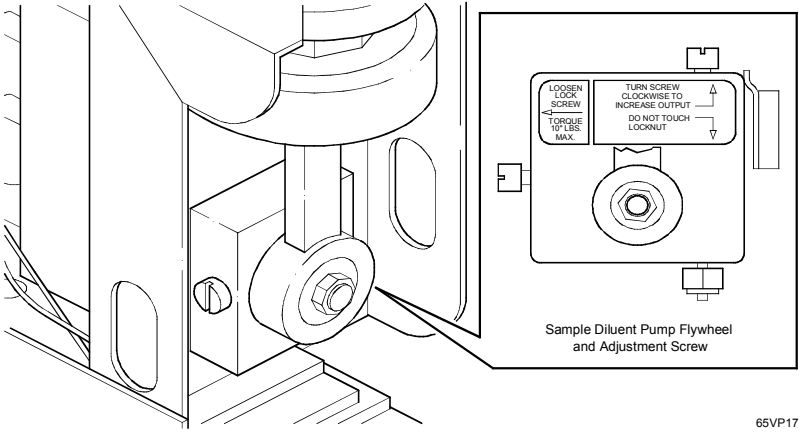


Figure 5-22: Sample Diluent Pump Adjustment

VP - 18: SAMPLE WASH CUP ALIGNMENT

NOTE: Use an old Sample Probe for this procedure because the probe could be damaged during the procedure.

Purpose

Position the Sample Wash Cup for proper Sample Probe washing

Procedure

1. Remove Top Deck (**RR - 1.3**).
2. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   SAMPLE ARM
   HOME ROBOTICS
3. Loosen 2 screws that hold the Sample Wash Cup to Incubator Optics Assembly.
4. Visually align the wash cup under the Sample Probe.
5. WASHCUP BOTTOM
6. Position the wash cup so that the probe is centered front to back.
7. WASHCUP TOP
8. Tighten 2 screws that hold Sample Wash Cup to Incubator Optics Assembly. Ensure position does not shift while screws are being tightened.
9. Reinstall Top Deck.
10. Perform Sample Arm Robotics Training (**VP - 37**).

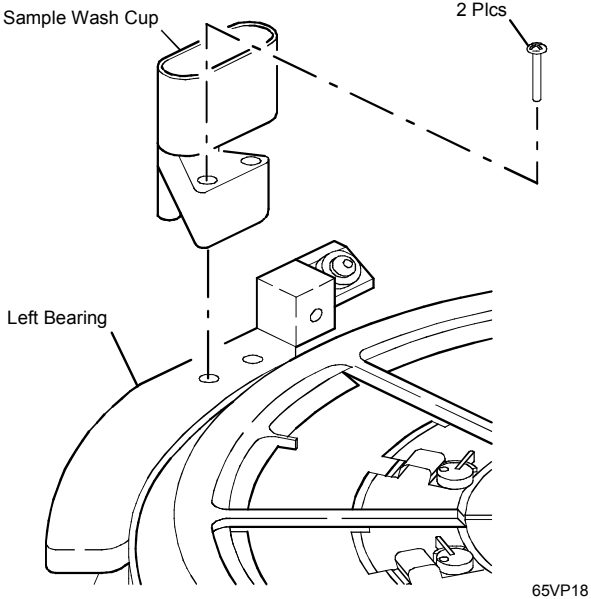


Figure 5-23: Sample Wash Cup Alignment

VP - 19: SYRINGE DRIVE MOTOR ALIGNMENT

Purpose

Align the Sample and/or Reagent Syringe Drive Motor(s)

Procedure

1. Loosen the set screw that attaches the stop to the motor shaft.
2. Pull the stop down so it is resting on the housing.
3. Grasp the shaft of the drive motor and turn the drive screw up to allow the alignment tools to be inserted.
4. Push the alignment tool into the opening for the drive motor shaft so it will rest even with the drive housing.

If...	Then...
the alignment tool **can** be inserted over the motor shaft	Alignment is correct. Go to step #6.
the alignment tool **can not** be inserted over the motor shaft	Perform step 5.

5. a. Loosen the 2 screws that secure the motor.
   b. Slide the alignment tool into the housing.
   c. Position the motor over the alignment tool.
   d. Realign the motor shaft.
   e. Tighten the 2 screws.
6. Remove the alignment tool from the drive assembly.
7. Lift the stop so the flag is between the 2 sensors on the Syringe Limit Board.
8. Grasp the drive motor shaft and turn the drive screw down until it mates with the stop.
9. Tighten the set screw to secure the stop to the drive screw.

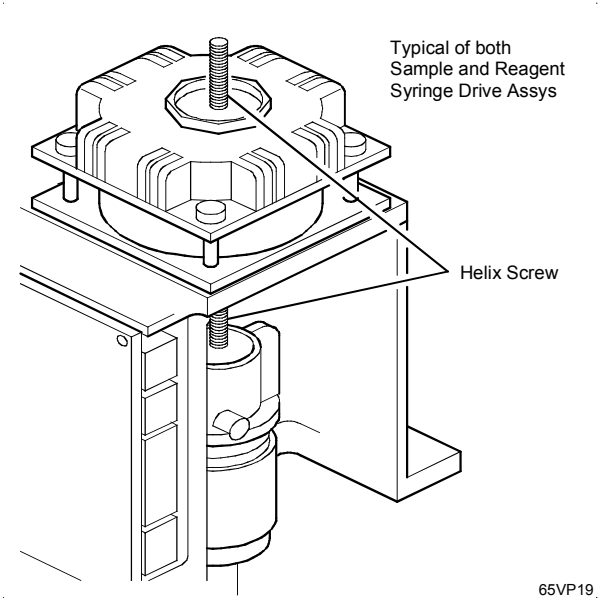


Figure 5-24: Syringe Drive Motor Alignment

VP - 20: TOP DECK HEIGHT ADJUSTMENT

Purpose

Adjust height of Top Deck to ensure clearance for probes and covers

Procedure

1. Remove Front Panel (**RR - 1.4**).
2. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   HOME ROBOTICS
3. Ensure that the Reagent, Cuvette and Sample covers are properly seated.
4. Remove 2 screws that hold the Top Deck to the analyzer.
5. Locate the deck support posts underneath the Top Deck, on the left and right sides of the Incubator Optics Assembly.
6. Loosen the lock nut located below the adjustment bolt.
7.

To...	Turn the adjustment bolt...
raise the Top Deck	CCW
lower the Top Deck	CW

   Home Robotics after every half turn of the adjustment bolt to verify that the probes and mixer are not in contact with the covers and that the cuvette tabs do not rub on the Cuvette Carrier cover.

   If Probe(s) or Mix Arm come in contact with the Cuvette Carrier Cover or Reagent Cooler Cover, perform the Robotics Training procedure for that arm.
8. Tighten the lock nut on each deck support post.
9. Reinstall 2 screws that hold Top Deck to analyzer.
10. Reinstall Front Panel.

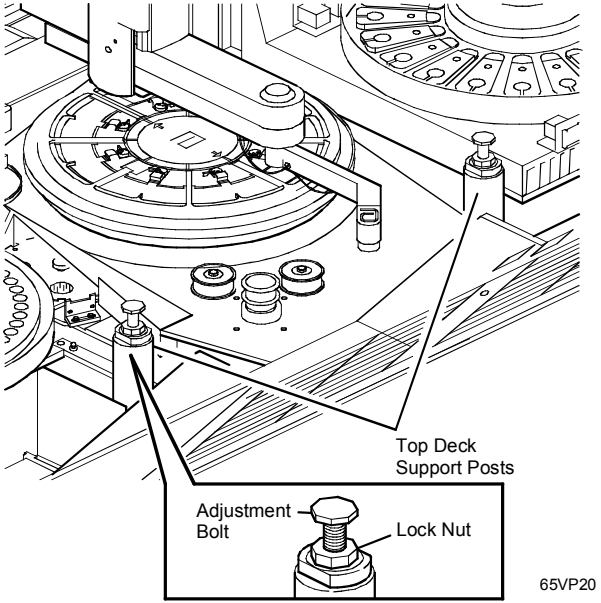


Figure 5-25: Top Deck Height Adjustment

VP - 21: WATER QUALITY STATION ADJUSTMENT

Purpose

Ensure water pressure is within specifications

Procedure

1. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   PUMPS & VALVES

2. REAGENT WASH VALVE CLOSED
   to display OPENED
   MIX WASH VALVE CLOSED
   to display OPENED
   INCUBATOR FILL VALVE CLOSED
   to display OPENED

3. Ensure that the water pressure on output gauge meets 5 to 7 psi specification.

   Adjust pressure regulator below gauge:

To...	Turn regulator...
To increase pressure	CW
decrease pressure	CCW

4. HOME ROBOTICS
   to close valves

Specifications

Water pressure on the output gauge	5 to 7 psi
Water quality light	1 MΩ

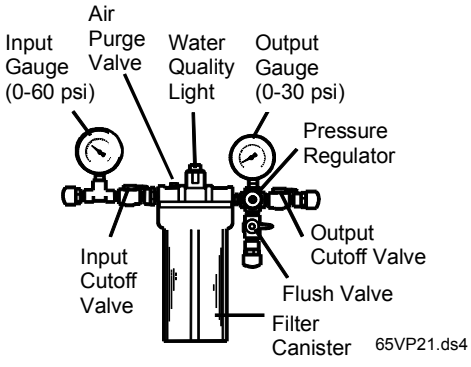


Figure 5-26: Water Quality Station

CALIBRATIONS, CHECKS, TESTS, VERIFICATIONS OVERVIEW

WARNING !

Procedures in this section of the chapter require following biohazard, electrical hazard, and electrostatic discharge precautions.

VP - 22: AD OFFSET CHECK

Purpose

Verify all AD Offset specifications before performing Lamp Adjustment

Procedure

1. Remove cuvette segment one.

2. From Main Menu:
   SPECIAL PROCEDURES
   AD OFFSET
   RECALCULATE

   Allow 30 seconds for the screen to update.

3. Ensure readings are within specification.
   Recalculate AD offset screen 5 more times. Print all 6 screens.

   The last 5 printouts must have DARK CURRENTS CH 1 340 within 15 of each other and must pass the specifications shown in the Specifications table.

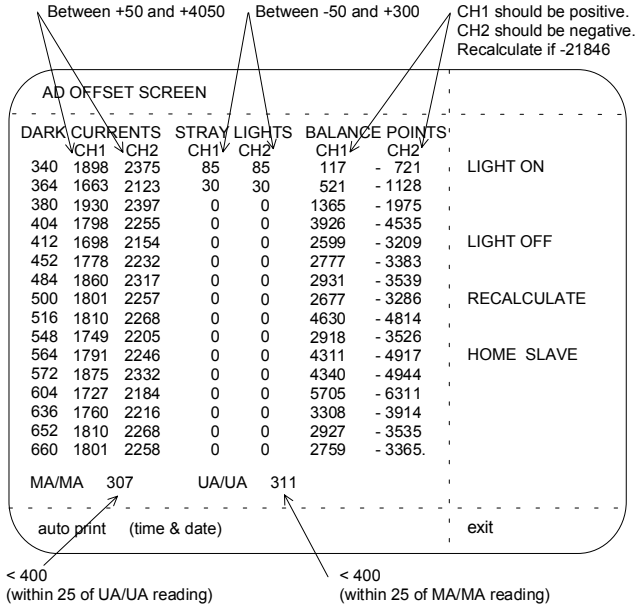


Figure 5-27: Example AD Offset Screen

Specifications

Field	Specification	Description of Calculation
DARK CURRENT	Between +50 and +4050 All positive values; no zeros	System noise with the calibration wheel blocked
STRAY LIGHTS	Channels 340 and 364 between -50 and +300 Readings should be zero on all other channels	Uses the 450 nm calibration wheel filter Is calculated for only the 340 and 364 channels

Field	Specification	Description of Calculation
BALANCE POINTS	CH1 (channel 1) should be positive CH2 (channel 2) should be negative Recalculate if any reading is -21846 No zeros	Calibration wheel open The difference between CH1 and CH2
MA/MA	< 400 Within 25 of the UA/UA reading	The difference between CH1 and CH2 in milliamps
UA/UA	< 400 Within 25 of the MA/MA reading	The difference between CH1 and CH2 in microamps

VP - 23: AD READ CHECK

Purpose

Check function of optics to ensure proper alignment and function

Procedure

1. Remove cuvette segment one.

2. From Main Menu:
   SPECIAL PROCEDURES
   AD READ

3. Edit these parameters on the AD Read screen.
   REPEAT = 1000
   INTERVAL = 1
   MODE = CHAN 1
   SCALE FACTOR = VOLTS

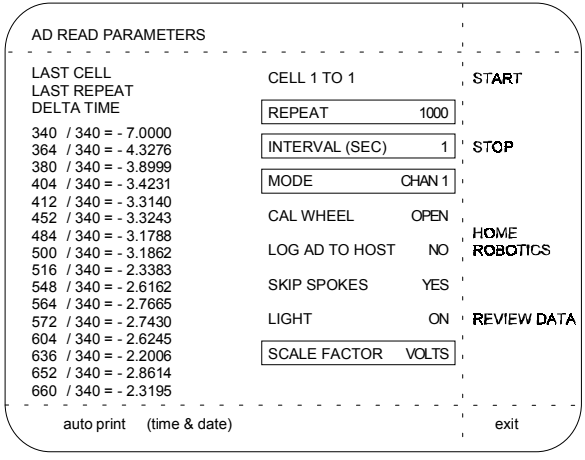


Figure 5-28: Example AD Read Screen

4. START
   Observe the 340/340 channel wavelength voltage. (All readings will be assumed to be absolute values.)

   Adjust potentiometer R-39 on the Lamp Servo Board until voltage reading is between 6.8V and 7.3V. (Adjust as close as possible to the nominal value of 7.0V).

5. Voltage at connector 394 (located in front of the Incubator Optics Assembly) should be between 8.5 and 10.5 volts.

6. Ensure that the rest of the wavelength pairs meet the specifications.

Specifications

Wavelength Pair	Voltage Specifications (absolute values)
340 / 340	6.8 - 7.3 (nominal at 7.0)
364 / 340	2.5 - 6.5
380 / 340	2.0 - 6.2
404 / 340 through 660 / 340	1.4 - 6.2

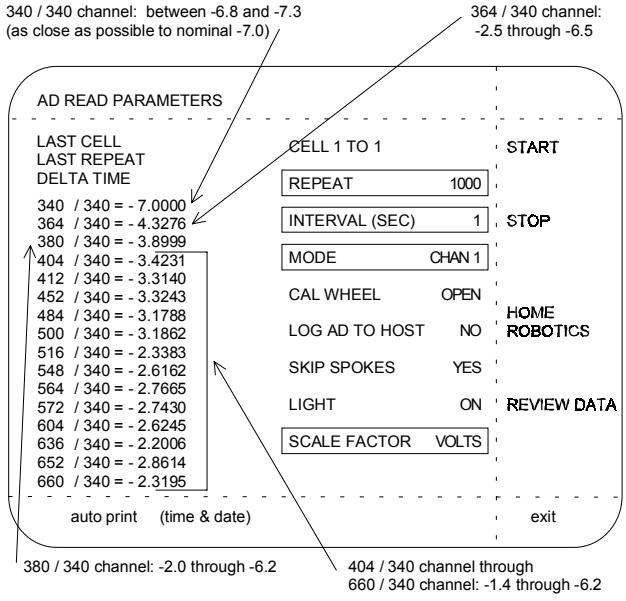


Figure 5-29: Example AD Read Screen

VP - 24: DARK CURRENT TEST

Purpose

Measure leakage current from Optics Diode Array and/or Front End Board

Procedure

1. From Main Menu:
   SPECIAL PROCEDURES
   AD READ

2. Edit the menu as follows:

   All secondary wavelengths MA

Cells:	1 to 96
Repeat:	500
Interval:	1
Mode:	Log Amp
Cal Wheel:	Blocked 1
Scale Factor:	AD LO RES

3. START

4. REVIEW DATA

5. Verify that ALL readings are >4.1 with a delta of 0.1 or less for all wavelengths.

Specifications

All readings:	>4.1 delta of 0.1 or less for all wavelengths

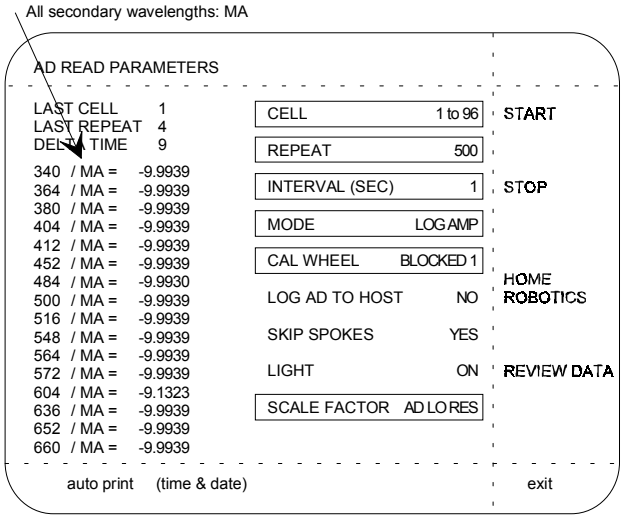


Figure 5-30: Dark Current Test

VP - 25: DARK CUVETTE TEST

Purpose

Check for cuvette and light beam alignment

Procedure

1. From Main Menu:
   SPECIAL PROCEDURES
   AD READ

2. Edit these parameters on the AD Read screen:

   All primary wavelengths to 340.
   All secondary wavelengths to MA.

Cells:	1 to 96
Repeat:	1
Interval:	1
Mode:	Log Amp
Scale Factor:	AD LO RES

3. Place 8 dark cuvettes into Cuvette Carrier.

4. START

5. REVIEW DATA

6. Verify that ALL readings are > 4.2.

Specifications

All readings	> 4.2 delta 0.1 or less for all wavelengths

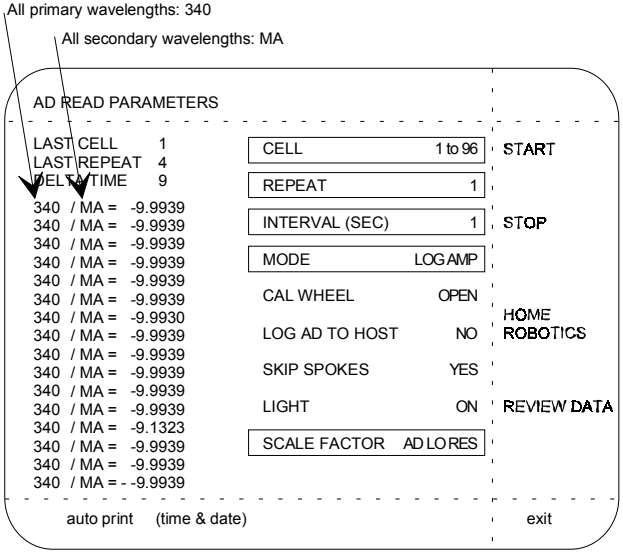


Figure 5-31: Dark Cuvette Test

VP - 26: DUAL OPTICS SENSOR CHECK

Purpose

Check the home and station functions of these dual optics sensors:
- Sample Carousel
- Cuvette Carrier
- Calibration Wheel
- Reagent Bar Code Reader

Procedure

1. Remove holding current from the motor by disconnecting these connectors:

Sensor	Disconnect...	From...
Sample Carousel	P492	Pump & Valve/Home Station Interface Board
Cuvette Carrier	P503	Incubator Optics Interface Board
Calibration Wheel	P505	Incubator Optics Interface Board
Reagent Bar Code Reader	P536	Reagent Bar Code Motor

2. For the **HOME** position:
Measure the voltage between the **black** and **green** wires of the connector:

Sample Carousel	connector 495
Cuvette Carrier	connector 514
Calibration Wheel	connector 513
Reagent Bar Code Reader	connector 576

3. Rotate the **HOME** notch in and out of the dual optics sensor. Verify that the voltages are within specifications.

4. For the **STATION** position:
Measure the voltage between the **black** and **white** wires of the connector:

Sample Carousel	connector 495
Cuvette Carrier	connector 514
Calibration Wheel	connector 513
Reagent Bar Code Reader	connector 576

5. Rotate the **STATION** notch in and out of the dual optics sensor. Verify that the voltages are within specifications.

6. Reapply the holding current to the motors by reconnecting these connectors:

Sensor	Reconnect...	To...
Sample Carousel	P492	Pump & Valve/Home Station Interface Board
Cuvette Carrier	P503	Incubator Optics Interface Board
Calibration Wheel	P505	Incubator Optics Interface Board
Reagent Bar Code Reader	P536	Reagent Bar Code Motor

Specifications

For the HOME and STATION positions:

Sensor	Location	Open	Blocked
24V sensors	Sample Carousel	< 1V	> 18V
24V sensors	Cuvette Carrier	< 1V	> 18V
24V sensor	Calibration Wheel	< 1V	> 18V
5V sensor	Reagent Bar Code Reader	< 1V	> 3V

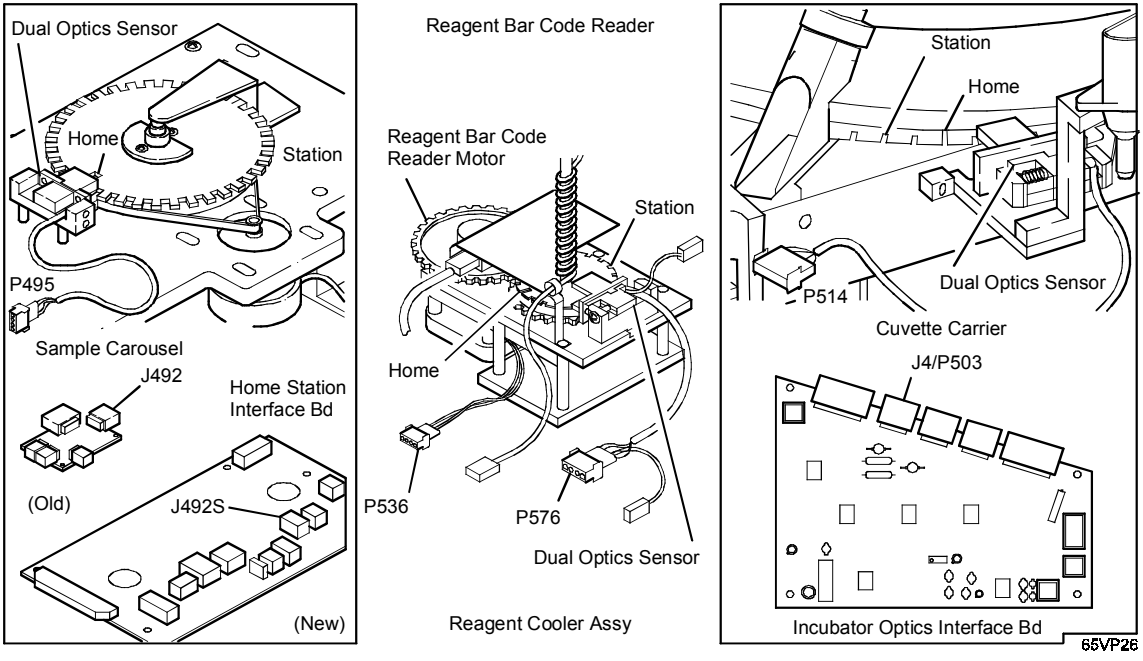


Figure 5-32: Dual Optics Sensor Check

VP - 27: GROUND MODIFICATION CHECK

Purpose

Verify continuity of system ground

Procedure

1. Power Off analyzer (**VP - 47**).
2. Unfasten screw at bottom right side of upper center door. Open upper center door, then upper right door.
3. Remove CRT/Keyboard Bezel (**RR - 13.1**).
4. Measure resistance between chassis and J304 of 24V Power Supply. The resistance should be <1.5 Ω
5. Disconnect P284 from Incubator Servo Board.
6. Measure resistance between chassis and J304 on the 24V Power Supply. Resistance should be >2K Ω
7. Connect P284 to Incubator Servo Board.
8. Measure resistance between chassis and J322 of Multi-output Power Supply. Resistance should be <1.5 Ω
9. Unplug P393 from Lamp Servo Board.
10. Measure resistance between chassis and J322 of Multi-output Power Supply. Resistance should be >2K Ω
11. Reconnect P393.
12. Measure resistance between chassis and frame of CRT Monitor. Resistance should be 1.5 Ω ± 1 Ω
13. Disconnect P382 and P383 from CRT Junction Board.
14. Measure resistance between chassis and frame of CRT Monitor. Resistance should be 100 Ω ± 20 Ω.
15. Reconnect P382 and P383 to CRT Junction Board.
16. Reinstall CRT/Keyboard Bezel.
17. Close upper right door; close upper center door. Fasten screw at bottom right side of upper center door.

Specifications

Resistance between...	With...	Should be...
Chassis and J304 of 24V Power Supply		<1.5 Ω
Chassis and J304 of 24V Power Supply	P284 disconnected from Incubator Servo Board	>2K Ω
Chassis and J322 of Multi-output Power Supply		<1.5 Ω
Chassis and J322 of Multi-output Power Supply	P393 disconnected from Lamp Servo Board	>2K Ω
Chassis and frame of CRT Monitor		1.5 Ω ± 1 Ω
Chassis and frame of CRT Monitor	P382 and P383 disconnected from CRT Junction Board	100 Ω ± 20 Ω

VP - 28: HOST COMMUNICATION

Purpose

Verify that the analyzer communicates through the bi-host port

Procedure

Hardware set-up

Hardware required:

Serial cable (P/N 14207-113) with DB9 (Female) and DB25 (Male) connectors.

NOTE: This is the same cable that is used for IMx® diagnostics. (Figure 5-33.)

1. Connect the DB25 side of serial cable to the analyzer and the DB9 side to the serial port on the computer.

Connector	Port Name	Port ID
J646	AD Read	Port 1
J647	Uni-host	Port 2
J648	Bi-host	Port 3
J649	undefined	Port 4

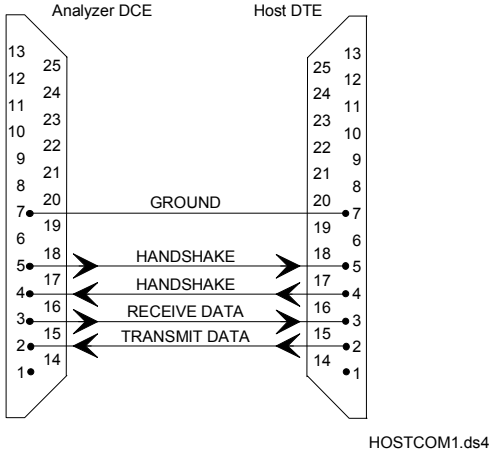


Figure 5-33: Straight-through Cable with Full Handshake

2. Ensure that Bus I/O Board is configured for **DCE** operation. (See **Appendix B: Jumpers**.)

Windows® Control Panel set-up

1. From Windows® Program Manager:
   a. Double click on MAIN
   b. Double click on CONTROL PANEL
   c. Double click on PORTS
   d. Double click on COM2

   NOTE: COM 1 may be the serial port on some computers.

2. a. Click once on SETTINGS

   b. Ensure that the following settings are selected:

BAUD RATE	1200
DATA BITS	8
STOP BITS	2
PARITY	None
FLOW CONTROL	Hardware
CONNECTION	COM2

   NOTE: COM 1 may be the serial port on some computers.

   c. Click on OK

3. a. Close Ports window.
   b. Close Control Panel window.
   c. Close Main window.

Windows® Terminal set-up

1. From Windows® Program Manager:
   a. Double click on ACCESSORIES.
   b. Double click on TERMINAL.
   c. Click on SETTINGS.
   d. Click once on COMMUNICATIONS.
   e. Select OK.

2. a. Select SETTINGS.
   b. Select TERMINAL PREFERENCES.
   c. Click on LOCAL ECHO check box.
   d. Select OK.

3. a. Select SETTINGS.
   b. Select TERMINAL EMULATION.
   c. Ensure that the setting is:
      TERMINAL EMULATION: DEC VT-100 (ANSI)
   d. Click on OK.

4. To save the current terminal parameters:
   a. Select FILE.
   b. Select SAVE AS.
   c. Enter a filename when prompted.
   d. Type SPECTRUM.
   e. Press ENTER or select OK.

   NOTE: The Communications and Terminal Emulation parameters set may be saved in a file for later use. When needed, the terminal parameters may be automatically configured by loading the file.

Establish communications with the analyzer

1. From Main Menu:
   BI-HOST

2. ENTER
   The analyzer should respond with a string of characters.

   NOTE: The string of characters will not necessarily be decipherable. The important information is to determine whether or not the analyzer is communicating.

Response...	**Then...**
Response received	Communication has been established.
No response received	Verify cabling and settings.

Data communications diagnostics

This section describes common ABBOTT SPECTRUM® Host requests that can be simulated with the laptop computer. To see any activity on the analyzer, it is recommended that you go into the BI-HOST screen.

Commands to the analyzer must be in UPPER CASE LETTERS.

ACTIVATE AUTO SEND
Function: This command causes the analyzer to toggle Auto Send ON.

Procedure: Type 040011A#66
ENTER
The analyzer should respond by switching Auto Send from OFF to ON in the BI-HOST screen.

TEST LIST
Function: This command causes the analyzer to send a list of tests to the host computer.

Procedure: Type 000010#22
ENTER
The analyzer should respond with a list of tests. (Although the test information is transmitted it will not be in an easily readable format.)

DEACTIVATE AUTO SEND
Function: This command causes the analyzer to toggle Auto Send OFF.

Procedure: Type 040011D#63
ENTER
The analyzer should respond by switching Auto Send from ON to OFF in the BI-HOST screen.

BYE
Function: This command causes the analyzer to return to the Main Menu.

Procedure: Type 020010#20
ENTER
The analyzer should respond by returning to the Main Menu.

FULL HANDSHAKE
Bi-Host Communication with FULL HANDSHAKE is the most rigorous configuration. Therefore, if communication can be established in this mode, it can be safely assumed that the instrument is able to communicate at the NO HANDSHAKE configuration.

VP - 29: ISE CALIBRATION

Purpose

Verify electrode performance

Procedure

1. From Main Menu:
   CALIBRATION
   ISE STATUS
2. From ISE Status screen:
   CALIBRATE
3. The ISE Assembly will perform a 2-point calibration and display the resulting slope values on the screen.

Specifications

Slope values:

Na	10.20 - 12.90
K	9.43 - 11.70
Cl	9.02 - 13.31

VP - 30: LOOPBACK TEST

Purpose

Verify that analyzer is communicating with the host computer

Procedure

1. Unfasten screw at bottom right side of upper center door. Open upper center door then upper right doors.

2. Press **RESET** button on Bus I/O Board.

3. When prompted:
   - D to access System Diagnostics screen
   - 1 to access Computer
   - 4 to access Dual UART Test screen

4. Configure appropriate RS232 port as follows:

To test	RS-232 Port on Right Back Panel	Place Jumpers
AD Read UART	J646	2 to 3
Uni-Host UART	J647	2 to 3
Bi-Host UART	J648	2 to 3, 4 to 5

5. To initiate UART loopback test:
   1

6. Verify that **10 20 30 40 50** appears on the CRT.

   When the test is complete, the DUAL UART screen reappears. Any other display indicates failure.

7. To exit UART test:
   - 4 to exit Dual UART Test screen
   - 5 to exit Computer screen
   - 4 to exit System Diagnostics screen

8. Close upper right door, then close upper center door. Fasten screw on lower right corner of upper center door.

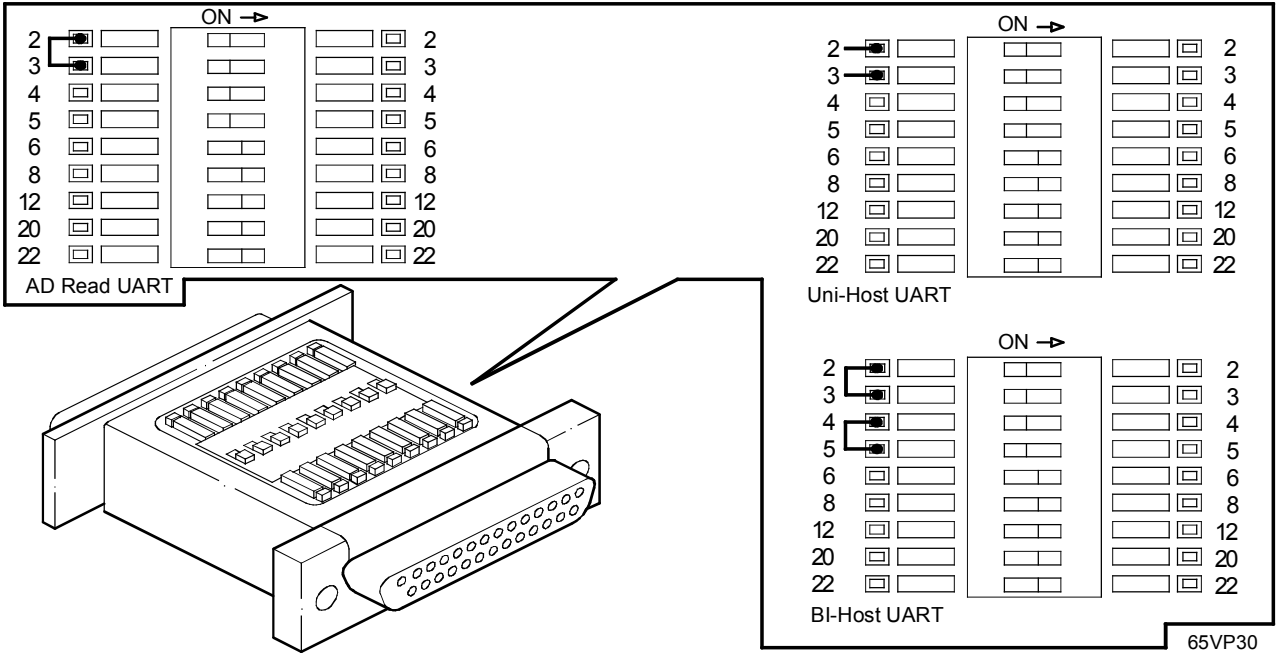


Figure 5-34: Loopback Test

VP - 31: LOW KINETIC NOISE TEST

Purpose

Ensure that light path and all optical components are aligned

Procedure

1. Fill 24 sample cups with Type II water; place cups on Sample Carousel.
2. Fill reagent cartridge with Type II water.
3. Run the test **LAKNT 1** on the 24 sample cups of Type II water. Put results into an **empty** QC file.
4. Load the reagent cartridge of water to location indicated by Reagent Loadlist.
5. When run is complete, review the QC file to ensure results are within specifications.

Specifications

S.D.	< 1.6
Average	approximately 100
Range	< 9.5

Test result	Indicates
Fail	problem in light path or optics
Pass	problem in dispense or mixer functions

VP - 32: OPTICS DRIFT TEST

Purpose

Determine cause of optical instability

Procedure

1. From Main Menu:
   SPECIAL PROCEDURES
   AD READ

2. Edit these parameters on AD Read screen:

   340/340 to 340/660

Repeat	5
Interval	60
Mode	Delta
Scale Factor	AD HI RES

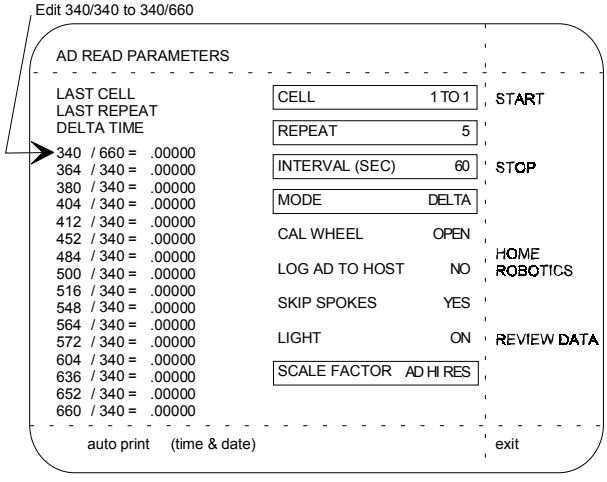


Figure 5-35: Optics Drift Test

3. Dispense 250µL of Type II water into Cuvette 1 cell 1.

4. START
   REVIEW DATA

5. Allow the test to complete.

6. For each wavelength:
   a. Disregard the first reading.
   b. Calculate the difference between repeats 2 and 3, 3 and 4, and 4 and 5.
   c. Add the differences. Divide the total by 3.

   The result must be ≤ 0.0004

7. Repeat this calculation for all wavelength readings.

Specifications

The result must be ≤ 0.0004

AD READ DATA

CELL		1	1	1	1	1	
REPEAT		1	2	3	4	5	START
DELTA TIME		2	63	124	184	144	
340	/ 660 =	-.34933	.00030	.00000^	-.00020^	.00000^	
364	/ 340 =	.12170	.00010	.00020^	.00030^	.00041^	
380	/ 340 =	.17212	-.00051	-.00020^	.00010^	.00031^	STOP
404	/ 340 =	.22336	.00020	.00010^	.00000^	.00000^	
412	/ 340 =	.22906	.00010	.00020^	.00000^	.00010^	
452	/ 340 =	.21604	.00030	.00020^	.00041^	.00030^	
484	/ 340 =	.20771	.00000	.00010^	.00020^	.00000^	HOME ROBOTICS
500	/ 340 =	.21269	.00031	.00010^	.00031^	.00020^	
516	/ 340 =	.36519	.00020	.00030^	.00061^	.00041^	
548	/ 340 =	.26098	.00010	.00020^	.00041^	.00051^	
564	/ 340 =	.23373	.00010	.00010^	.00041^	.00041^	PREVIOUS READ
572	/ 340 =	.23943	.00000	-.00010^	.00010^	.00020^	
604	/ 340 =	.27613	.00030	.00020^	.00000^	.00020^	
636	/ 340 =	.37068	.00000	-.00020^	-.00020^	.00000^	
652	/ 340 =	.25529	-.00010	-.00010^	-.00020^	.00000^	NEXT READ
660	/ 340 =	.34851	.00000	.00000^	.00000^	-.00010^	
auto print	(time & date)						EXIT

Figure 5-36: Example Printout from Optics Drift Test

VP - 33: STATIC TEMPERATURE CHECK

Purpose

Check for temperature gradients within the Incubator which may indicate that one or more TEDs (thermoelectric devices) are defective

Procedure

1. Place clean cuvettes in Cuvette Carrier positions 2 through 8.
2. Dispense 500µl of Type II water into the temperature calibration cuvette position that contains the thermistor.
3. Dispense 500µl of Type II water into the cuvette cells on each side of the position containing the thermistor.
4. Place the calibrator cuvette in position #1 on the Cuvette Carrier.
5. Attach the temperature calibrator cuvette to the calibrator cuvette.

   NOTE: Do not rotate Cuvette Carrier.
6. Wait 5 minutes for temperature to stabilize. Record the reading.
7. Move the temperature calibrator cuvette to cuvette position #2, and place the clean cuvette in position #1.

> **CAUTION !**
>
> Use care when moving the cuvettes. Any unnecessary agitation of the water in the incubator can cause unreliable results.

8. Repeat this procedure for each cuvette position on the carrier. Record each reading after the temperature has stabilized.
9. Remove temperature monitor from calibration cuvette. Replace calibration cuvette with a clean reaction cuvette.

Specifications

Compare the highest reading to the lowest reading. The difference should be less than 2ºC.

A difference higher than 2ºC is an indication that one or more thermoelectric devices (TEDs) in the Incubator are malfunctioning.

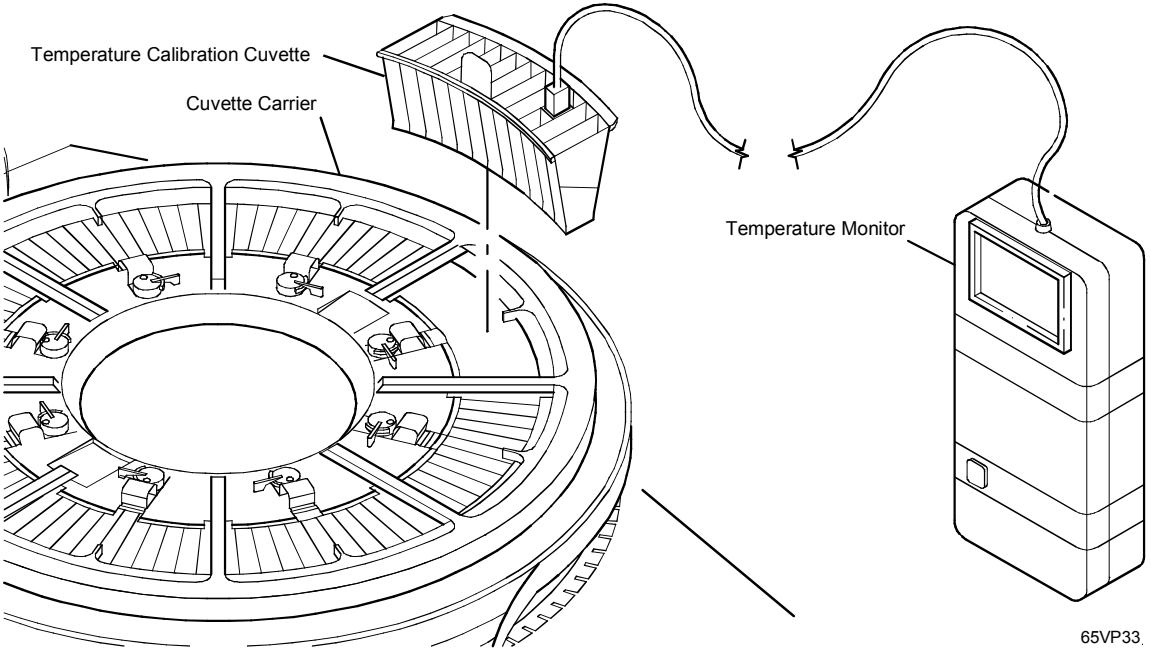


Figure 5-37: Static Temperature Check

VP - 34: TEMPERATURE CALIBRATION

Purpose

Verify that temperature of Incubator water is within assay specifications

Procedure

1. Dispense 500 ul of Type II water into the temperature calibrator cuvette that contains the thermistor.

2. Dispense 500 ul of Type II water into the cuvette cells on each side of thermistor.

3. Insert calibrator cuvette into cuvette segment 2 or 3. Verify that cuvettes are in the remaining segments.

4. From Main Menu:
   CALIBRATION
   MAINTENANCE
   TEMPERATURE CALIBRATION
   ROTATE CUVETTE

5. a. An audible alarm will sound when Cuvette Carrier rotation is complete.
   b. This status message will appear:
   STATUS CODE 00299 -- ROTATION COMPLETE.
   PLEASE VERIFY TEMPERATURE CALIBRATION

6. Insert temperature calibration monitor plug into temperature calibrator cuvette. Press the white button on the front of the monitor.

   NOTE: Temperature must be verified within 10 to 20 seconds after rotation stops.

7. Displayed temperature reading must be within ± 0.1 ºC of desired temperature.

If measured temperature...	**Then...**
is within range	YES Go to step 11.
is not within range	NO Go to step 8.

8. a. Screen will display ENTERED MEASURED TEMP .0000
   b. Touch .0000 field.
   c. Type in measured temperature, including 2 decimal places.
      ENTER
   d. Detach temperature calibration monitor plug.

9. a. WAITING ON TEMPERATURE message will appear.
   b. Wait until this message disappears.
   c. Verify that rotation time is 5 minutes.
   d. ROTATE CUVETTE

10. Repeat steps #5 through #7.

11. EXIT

12. Remove temperature calibrator cuvette from Incubator. Shake water out of the cuvette cells, and allow to dry.

13. Replace cuvette segment 2 or 3 (whichever was removed in step #3) with clean cuvette.

Specifications

Displayed temperature reading must be within ± 0.1ºC of desired temperature.

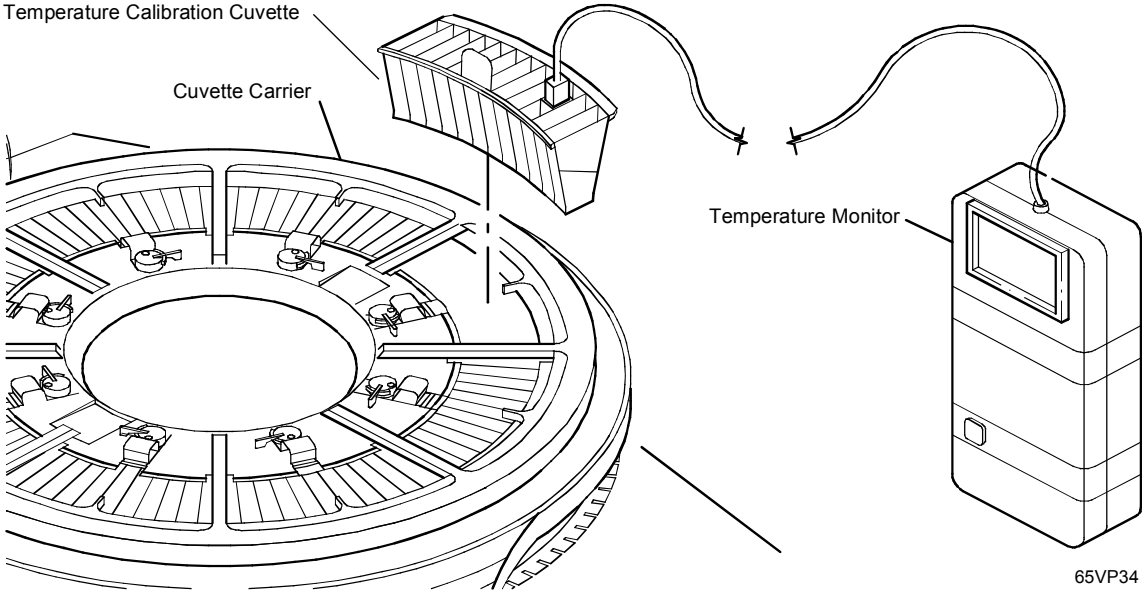


Figure 5-38: Temperature Calibration

ROBOTICS TRAINING OVERVIEW

Probe positioning and robotic arm training are vital to the accurate and precise operation of the analyzer.

Probe positioning: Involves determining the highest physical positions.

Robotic training: Utilizes the appropriate highest physical position. The Mix Arm, Sample Probe, Reagent Probe, and ISE Probe are trained.

Robotics training should be performed in this order:

1. Mix Arm VP - 36
2. Sample Arm VP - 37
3. Reagent Arm VP - 38

After completing the robotics training, print the Step Tables.

Refer to the **Procedure Order Flowchart** on page 5-84 for further information on the hierarchy of probe positioning and robotic training.

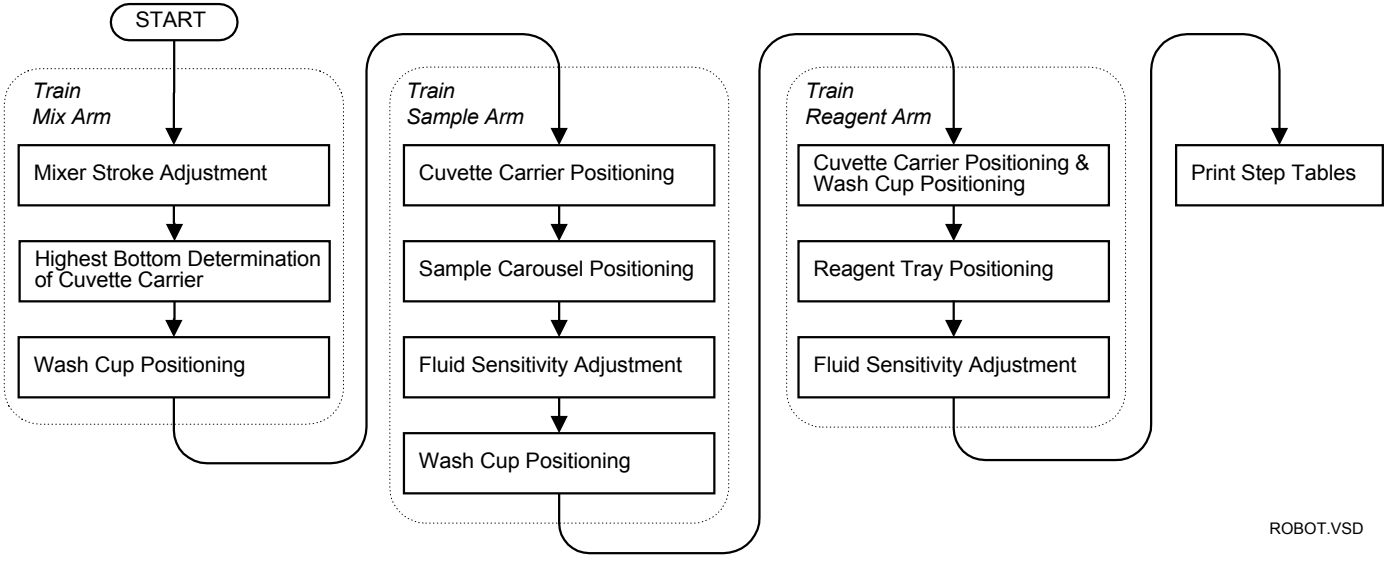
WARNING !

Procedures in this section of the chapter require following biohazard, electrical hazard, and electrostatic discharge precautions.



SECTION CONTENTS

Procedure Order Flowchart



Example Probe Positioning Summary Chart

	Mix Arm Training		Sample Arm Training		Reagent Arm Training	
Highest position trained vertical step value						
	Cuvette Carrier position	**Cuvette physical bottom vertical step**	**Sample Carousel position**	**Sample Carousel physical bottom vertical step**	**Reagent Tray position**	**Reagent Tray physical bottom vertical step**
	95		1		1	
	10		13		3	
	22		25		6	
	34		37		9	
	46		49		12	
	58		61		15	
	70		----------		17	
	82		----------		19	

Example Step Tables

To print Step Tables, from Main Menu:

SPECIAL PROCEDURES
ROBOTICS
STEP TABLES

SAMPLE & MIX ARM TABLE

SAMPLE ARM		HOME & SAVE
ARM TOP	115	
CUVETTE BOTTOM	- 367	
WASH CUP BOTTOM	- 169	
CUP BOTTOM	- 333	
CUVETTE HORZ.	113	
WASH CUP HORZ.	12	REAGENT TABLE
INNER CUP HORZ.	- 92	
OUTER CUP HORZ.	- 34	
MIX ARM		
ARM TOP	- 19	
CUVETTE BOTTOM	162	
WASH CUP BOTTOM	150	
CUVETTE HORZ.	58	
WASH CUP HORZ.	- 181	

AUTO PRINT OFF <date & time> EXIT

REAGENT ARM TABLE

					HOME & SAVE
				INNER OUTER	
ARM TOP	172	CUVETTE HORZ.	CELL 1	- 350 - 97	
CUVETTE BOTTOM	- 308		AUX	- 346 - 70	
REAG CART BOTTOM	- 360	WASH CUP HORZ.		- 7 42	
WASH CUP BOTTOM	- 140				

CORE REAG CART				PERIMETER CART		
	INNER	OUTER	INNER	OUTER	INNER	OUTER
1.	80	- 9	11. 249	47	1. 4	- 60
2.	91	21	12. 228	19	2. 29	1
3.	104	48	13. 200	- 10	3. 47	49
4.	122	74	14. 168	- 39	4. 68	92
5.	146	97	15. 136	- 64	5. 94	131
6.	179	112	16. 95	- 94	6. 149	167
7.	211	116	17. 78	- 97	7. 225	178
8.	243	112	18. 70	- 86	8. 300	164
9.	258	97	19. 68	- 67		
10.	262	77	20. 70	- 43		

SAMPLE & MIX ARM TABLE

AUTO PRINT OFF <date & time> EXIT

steptabl.dx4

Figure 5-39: Example Step Tables: Sample & Mix Arm Step Table and Reagent Arm Step Table

NOTE: The values in these step tables are typical, representative values. Values may vary among analyzers; however, values should be similar to the values in these examples.

VP - 35: ISE PROBE POSITIONING

Purpose

Center ISE Probe within Sample Carousel positions, ensuring accurate aspiration of sample, resulting in precise and accurate ISE results and appropriate utilization of the available sample volume.

Procedure

Step	Action	Goal
1	Open upper left door.	
2	Remove ISE Shroud (**RR - 2.2**).	
3	Remove Sample Carousel.	
4	From Main Menu: CALIBRATION ISE STATUS MOVE TO OUTER	
5	BOTTOM OF CUP	
6	Loosen 4 screws that hold the ISE Analysis Module to chassis.	
7	Move the analysis module so that the ISE Sample Probe is centered in a dimple of the Sample Carousel Conductive Plate.	ISE Sample Probe is centered in a dimple of the Sample Carousel Conductive Plate.
8	Tighten 4 screws that hold the ISE Analysis Module to chassis.	
9	PROBE UP MOVE TO INNER BOTTOM OF CUP	
10	Verify that the ISE Sample Probe is centered in a dimple of the Sample Carousel Conductive Plate.	ISE Sample Probe is centered in a dimple of the Sample Carousel Conductive Plate.
11	Repeat steps #6 through #10 to center the probe in both the inner and outer positions.	
12	Reinstall Sample Carousel.	
13	Reinstall ISE Shroud.	
14	Close upper left door.	

VP - 36: MIX ARM ROBOTICS TRAINING

The procedure described in Mix Arm Robotics Training is used to determine the highest physical bottom position for the Cuvette Carrier using the Mix Arm. This position, after it is determined, is recorded and used in various robotic procedures. The Mix Arm should be positioned properly in the cuvette cell to ensure complete mixing of reagent, water, and sample into a homogeneous solution. Proper training is also necessary in the mix arm wash station to ensure complete cleaning.

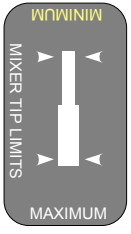
Robotics training should be performed in this order:
1. Mix Arm VP - 36
2. Sample Arm VP - 37
3. Reagent Arm VP - 38

After completing robotics training, print the Step Tables.

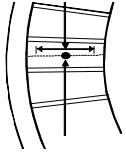
Mix Arm training is performed in this order:
1. Mixer Stroke Adjustment
2. Highest Bottom Determination of Cuvette Carrier
3. Wash Cup Positioning

A. Mixer Stroke Adjustment

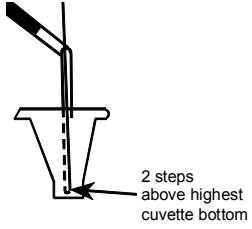
NOTE: Verify that all cuvettes are clean and secure before performing this procedure.

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS MIX ARM HOME ROBOTICS UP or DOWN (as needed)	Mix Arm clears: • Mix Wash Cup cover • Cuvette Carrier cover *NOTE: If additional adjustment is needed for proper clearance, perform Top Deck Adjustment (**VP - 20**).*
2	CUVETTE TOP MIXER OFF	Display shows MIXER ON
3	Place Mix Arm Tip Gauge underneath Mix Arm tip.	
4	Adjust stroke using adjustment screw underneath Mix Arm. **To...** **Turn screw...** decrease width CW increase width CCW **CAUTION !** Do not turn the adjustment screw more than 3 full turns CW. The screw may fall out of the Mix Arm, causing permanent damage.	Stroke is within minimum and maximum range on gauge. 
5	After Mix Arm tip stroke is adjusted: MIXER ON	Display shows MIXER OFF

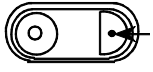
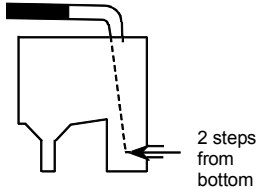
B. Highest Bottom Determination of Cuvette Carrier

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS OTHER DEVICES HOME ROBOTICS SHUTTER OPEN	Shutter is open.
2	MIX ARM CUVETTE BOTTOM Verify front-to-back position. (Perform **VP - 10**: Mixer Drive Assembly Alignment if necessary.)	Mix Arm is centered front-to-back in cuvette.
3	LEFT or RIGHT (as needed)	Mix Arm tip is centered left-to-right in cuvette. 
4	Verify physical bottom of cuvette cell by sight (visual method) or sound (auditory method). Visual method: DOWN (as needed) Auditory method: MIXER OFF (to display MIXER ON) DOWN	Physical bottom of cuvette cell is determined. Visual: Actual Mix Arm tip and reflection of Mix Arm tip in back cell wall meet each other. Auditory: Pitch of Mix Arm tip sound changes when Mix Arm tip touches physical cuvette bottom.
5	Record vertical step for position 95. (Record on probe positioning summary chart.)	
6	UP (10 times) CUVETTE TOP	To avoid damaging the Mix Arm tip
7	CUVETTE _____ field Type 10 ENTER	

Step	Action	Goal
8	After the rotation completes, repeat steps #2 through #7 for positions 10, 22, 34, 46, 58, 70 and 82. If the difference is > 2 steps, replace Cuvette Carrier bearings (**RR - 11.8**).	
9	MIXER ON	Display shows MIXER OFF
10	Determine highest physical bottom position.	The least positive vertical step position
11	CUVETTE _____ Type in the highest cuvette carrier position. ENTER	

Step	Action	Goal
12	After the rotation completes: CUVETTE BOTTOM DOWN (as needed to reach physical bottom) UP (2 times)	Mix Arm tip is 2 steps above the highest position vertical step value. 
13	HOME ROBOTICS	Save position.

C. Wash Cup Positioning

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS MIX ARM HOME ROBOTICS	
2	CUVETTE TOP Remove Wash Cup cover.	
3	WASH CUP TOP LEFT or RIGHT (as needed)	Mix Arm is centered over Wash Cup.
4	WASH CUP BOTTOM LEFT or RIGHT (as needed) If not centered front-to-back, perform Wash Cup Centering (**VP - 10**: Mixer Drive Assembly Alignment).	Mix Arm is centered in Wash Cup well.  *NOTE: Use a mirror to help see into wash cup.*
5	UP (5 times)	
6	MIXER OFF	Display shows MIXER ON
7	DOWN (until pitch of sound changes)	Physical bottom is determined.
8	UP (2 times)	Mix Arm tip is properly positioned 2 steps above the wash cup physical bottom. 
9	MIXER ON	Display shows MIXER OFF
10	HOME ROBOTICS Replace Wash Cup cover.	Save positions.

VP - 37: SAMPLE ARM ROBOTICS TRAINING

The procedure described in Sample Arm Robotics Training is used to determine these positions for the sample carousel:

- sample arm probe assembly positioning
- wash cup positioning
- highest physical bottom position using the sample probe

The highest physical bottom position, after it is determined, is recorded and used in setting the fluid sensitivity to ensure accurate sample aspiration and dispense.

Robotics training should be performed in this order:

1. Mix Arm VP - 36
2. Sample Arm VP - 37
3. Reagent Arm VP - 38

Because the Sample Probe tip may be damaged during these procedures, use an old Sample Probe for robotics training. After training is complete, install a new Sample Probe.

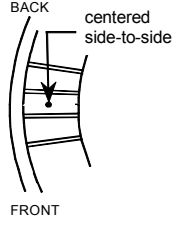
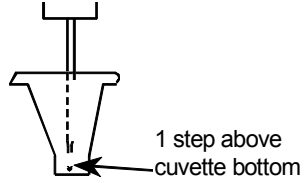
Sample Arm training is performed in this order:

1. Cuvette Carrier Positioning
2. Sample Carousel Positioning
3. Fluid Sensitivity Adjustment
   a. Fluid Sense Status LED mounted on the top
   b. Fluid Sense Status LED mounted on the side
4. Wash Cup Positioning

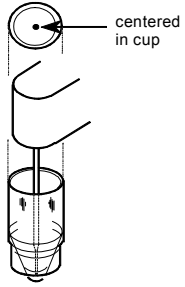
After completing robotics training, print the Step Tables.

Verify Cuvette Carrier Centering (**VP - 3**) and Sample Carousel Alignment (**VP - 14**) before beginning Sample Arm Robotics Training.

A. Cuvette Cell Positioning

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS SAMPLE ARM HOME ROBOTICS UP or DOWN (as needed)	Sample Probe clears: • Sample Wash Cup cover • Sample Carousel cover • Cuvette Carrier cover *NOTE: If additional adjustment is needed for proper clearance, perform Top Deck Adjustment (**VP - 20**).*
2	CUVETTE _____ Type in the highest Cuvette Carrier position [VP 36(B)].	
3	CUVETTE TOP LEFT or RIGHT If not centered, perform Sample Arm Alignment (front-to-back) (**VP - 13**).	Sample Arm is centered above cuvette.
4	OTHER DEVICES SHUTTER OPEN	Shutter is open.
5	CUVETTE BOTTOM LEFT or RIGHT (as needed)	Sample Arm is centered in cuvette. 
6	DOWN (as needed) UP (once)	Sample Probe is 1 step above Cuvette Carrier highest position. 
7	WASH CUP TOP HOME ROBOTICS	Save positions.

B. Sample Carousel Positioning

Step	Action	Goal
1	Place an empty Sample Cup in position 1 on Sample Carousel. From Main Menu: SPECIAL PROCEDURES ROBOTICS SAMPLE ARM HOME ROBOTICS	
2	OUTER CUP TOP LEFT or RIGHT (as needed)	Sample Probe is centered over Sample Cup. 
3	OUTER CUP BOTTOM UP or DOWN (as needed)	Sample Probe is positioned on the physical bottom of Sample Cup.
4	Record vertical step for position 1. (Record on probe positioning summary chart.)	
5	UP (10 times) WASH CUP TOP	To avoid damaging Sample Probe
6	SAMPLE CAROUSEL _____ Type 13. ENTER	
7	After Sample Carousel rotation completes, repeat steps #3 through #6 for Sample Carousel positions 13, 25, 37, 49 and 61. (For positions 49 and 61, touch INNER CUP TOP and INNER CUP BOTTOM in step #2 and #3.)	

Step	Action	Goal
8	Determine the highest physical bottom position.	The least negative vertical step position
9	Place the same Sample Cup in the highest Sample Carousel position. OUTER CUP TOP or INNER CUP TOP (whichever is appropriate)	
10	SAMPLE CAROUSEL _____ Type in the highest Sample Carousel position. ENTER BOTTOM DOWN (as needed to reach physical bottom) UP (2 times)	Sample Probe is 2 steps above highest position vertical step value.
11	HOME ROBOTICS	Save positions.

C-1. Sample Arm Fluid Sense Adjustment (top LED)

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS SAMPLE ARM HOME ROBOTICS	
2	Place an empty Sample Cup in the recorded highest Sample Carousel position. Place Sample Carousel cover on Sample Carousel.	
3	SAMPLE CAROUSEL _____ Type in the highest Sample Carousel position. ENTER	
4	OUTER CUP FLUID or INNER CUP FLUID (whichever is appropriate)	LED on lower Sample Arm Board is illuminated. VERTICAL field displays CLEAR. OUTER CUP or INNER CUP BOTTOM is highlighted.
5	If LED is not illuminated and/or VERTICAL field displays FLUID, fluid sense is too sensitive. Adjust potentiometer on lower Sample Arm Board until LED **just** comes on. Repeat steps #4 and #5 to verify sensitivity in air.	
6	WASH CUP TOP	
7	Place 50 µl of 0.9% NaCl (saline) into the same Sample Cup.	
8	OUTER CUP FLUID or INNER CUP FLUID (whichever is appropriate)	LED on lower Sample Arm Board is NOT illuminated. VERTICAL field displays FLUID.

Step	Action	Goal
9	If LED is still illuminated and VERTICAL field displays CLEAR, fluid sense is not sensitive enough. Adjust potentiometer on lower Sample Arm Board until LED **just** goes out. Repeat steps #8 and #9 to verify sensitivity in fluid. When correct, repeat steps #5 and #6 to verify that adjustment in air has not changed.	
10	WASH CUP TOP	

C-2. Sample Arm Fluid Sense Adjustment (side LED)

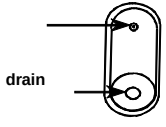
CAUTION !

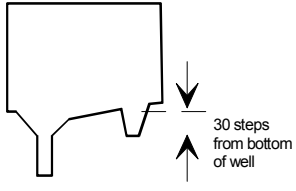
Do not alter the setting of selector switch located directly below fluid sense LED.

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS SAMPLE ARM HOME ROBOTICS	
2	Place an empty Sample Cup in the recorded highest Sample Carousel position. Place Sample Carousel cover on Sample Carousel.	
3	SAMPLE CAROUSEL _____ Type in the highest Sample Carousel position. ENTER	
4	OUTER CUP FLUID or INNER CUP FLUID (whichever is appropriate)	LED on the side of Sample Arm is illuminated. VERTICAL field displays CLEAR. OUTER CUP or INNER CUP BOTTOM is highlighted.
5	WASH CUP TOP	
6	Place 50 µl of 0.9% NaCl (saline) into the same Sample Cup.	

Step	Action	Goal
7	OUTER CUP FLUID or INNER CUP FLUID (whichever is appropriate)	LED on lower Sample Arm Board is NOT illuminated. VERTICAL field displays FLUID.
8	If LED is still illuminated and VERTICAL field displays CLEAR, replace Sample Arm Fluid Sense Board (**RR - 4.7**).	
9	WASH CUP TOP	

D. Wash Cup Positioning

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS SAMPLE ARM HOME ROBOTICS	
2	CUVETTE TOP Remove wash cup cover.	
3	WASH CUP TOP LEFT or RIGHT (as needed)	Sample Probe is centered over wash cup.
4	WASH CUP BOTTOM LEFT or RIGHT (as needed)	Probe should be 1 step off–center. 

Step	Action	Goal
5	DOWN (as needed to reach physical bottom)	Probe is physically touching bottom of wash cup well.
6	UP (30 times)	Sample Probe is positioned 30 steps above physical bottom of wash cup well. 
7	CUVETTE TOP Replace wash cup cover.	
8	HOME ROBOTICS	Save positions.

VP - 38: REAGENT ARM ROBOTICS TRAINING

These procedures are used to determine the reagent probe center positioning for these:
- core positions
- the highest physical bottom position for the reagent tray

After the highest physical position has been determined, it is recorded and used in the fluid sensitivity procedure to ensure accurate reagent aspiration and dispense.

Robotics training should be performed in this order:
1. Mix Arm VP - 36
2. Sample Arm VP - 37
3. Reagent Arm VP - 38

After completing robotics training, print the Step Tables.

Reagent Arm training should be performed in this order:
A. Wash Cup Positioning
B. Cuvette Carrier Positioning (includes AUX Dispense Positioning)
C. Reagent Tray Positioning
D. Reagent Tray Perimeter Positioning
E. Fluid Sensitivity Adjustment

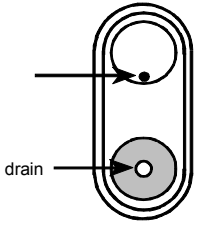
CAUTION !

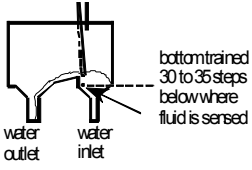
Replace Reagent Probe after Reagent Arm Robotic Training procedure.

A. Wash Cup Positioning

Ensure that the fluid sense is appropriately set.

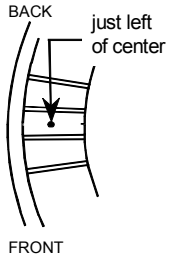
Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS REAGENT ARM HOME ROBOTICS UP or DOWN (as needed)	Reagent Probe clears: • Reagent Wash Cup cover • Reagent Tray cover • Cuvette Carrier cover *NOTE: If additional adjustment is needed for proper clearance, perform Top Deck Adjustment (**VP - 20**).*
2	REAGENT _____ TOP Remove Reagent Wash Cup cover.	
3	WASH CUP TOP INNER RIGHT or LEFT; OUTER RIGHT or LEFT (as needed)	Reagent Probe is centered over inlet well in wash cup.

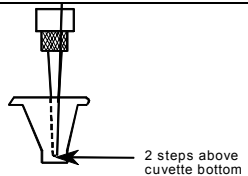
Step	Action	Goal
4	WASH CUP BOTTOM INNER RIGHT or LEFT; OUTER RIGHT or LEFT (as needed)	Position Reagent Probe in 6 o'clock position of wash cup inlet. 
5	WASH OFF	Display shows WASH ON
6	WASH CUP FLUID	
7	Record vertical step value where fluid is being sensed by reagent arm tip.	
8	Repeat steps #6 and #7 five times.	

Step	Action	Goal
9	Calculate the average of the 5 vertical step values at which fluid was sensed. *NOTE: Large fluctuations in readings could indicate water pressure problems.*	
10	WASH CUP BOTTOM UP or DOWN (as needed)	There should be a 30-35 vertical step difference between the average recorded in step #9 and the displayed vertical step value for WASH CUP BOTTOM. 
11	WASH ON	Display shows WASH OFF
12	HOME ROBOTICS	Save positions.

B. Cuvette Carrier Positioning

NOTE: Verify that all cuvettes are clean and secure before performing this procedure.

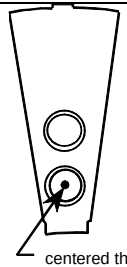
Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS REAGENT ARM HOME ROBOTICS	
2	CUVETTE _____ Subtract 3 from the highest cuvette position and type this number in the CUVETTE _____ field. ENTER	
3	OTHER DEVICES SHUTTER OPEN	Shutter is open.
4	REAGENT ARM DISPENSE __1_ TOP	Reagent Probe is positioned over cuvette cell entered in step #3.
5	BOTTOM OUTER RIGHT or LEFT; INNER RIGHT or LEFT (as needed)	Reagent Probe is centered in cuvette front to back and left of center. 
6	DOWN (as needed) Verify positioning by lightly pressing down on the top of Reagent Probe. When resistance is felt and no vertical deflection of the Reagent Probe is detected, the physical bottom of cuvette cell has been reached.	Reagent Probe is physically touching cuvette cell bottom.

Step	Action	Goal
7	UP (2 times)	
8	WASH CUP TOP Replace cuvette cover.	
9	DISPENSE _____ TOP Loosen 2 screws that secure splash shield to Cuvette Carrier. Position splash shield to center the opening around Reagent Probe.	Opening of splash shield is centered around Reagent Probe.
10	After opening is centered: DISPENSE _____ BOTTOM Carefully tighten splash shield screws.	
11	WASH CUP TOP	
12	HOME ROBOTICS	Save positions.

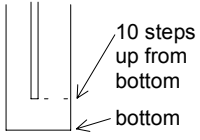
AUX Dispense Positioning

Step	Action	Goal
13	DISPENSE _____ TOP Type 102 ENTER	
14	INNER RIGHT or LEFT; OUTER RIGHT or LEFT (as needed to center the Reagent Probe above cuvette 95 front-to-back and left of center)	Reagent Probe is centered above cuvette 95 front to back and left of center.
15	HOME ROBOTICS	Save positions.

C. Reagent Tray Positioning

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS REAGENT ARM HOME ROBOTICS	
2	Beginning with quadrant 1, place 5 empty reagent cartridges with clean septums in quadrant 1.	
3	Place Reagent Tray cover on Reagent Tray.	
4	REAGENT 1 TOP INNER RIGHT or LEFT; OUTER RIGHT or LEFT (as needed)	Reagent Probe is centered over core position 1.
5	REAGENT 1 BOTTOM INNER RIGHT or LEFT; OUTER RIGHT or LEFT (as needed)	Fine-tune the centering.
6	Repeat steps #4 and #5 for each of the 20 core positions, moving the 5 empty cartridges as needed.	
7	REAGENT 1 TOP REAGENT 1 BOTTOM. DOWN (as needed) Lightly press down on the top of Reagent Probe. When resistance is felt and no vertical deflection of the Reagent Probe is detected, the physical bottom of cartridge has been reached.	Physical bottom of empty cartridge is determined.

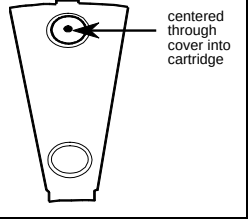
Step	Action	Goal
8	Record vertical step for position 1. (Record on probe positioning summary chart.)	
9	UP (10 times)	To avoid damaging reagent arm tip
10	REAGENT _____ Type 3. ENTER REAGENT 3 TOP	
11	After Reagent Arm accesses core position 3, repeat steps #7 through #10 for each of these: Quadrant Core Position 1 1, 3 2 6, 9 3 12, 15 4 17, 19	
12	Place 5 empty cartridges in the highest determined position quadrant. Replace Reagent Tray cover.	The least negative vertical step position.

Step	Action	Goal
13	REAGENT _____ Type in the highest Reagent Tray position. ENTER	
14	BOTTOM UP or DOWN (as needed) to touch bottom UP (10 times)	Reagent Probe is trained to a position 10 steps above the highest position vertical step value. 
15	HOME ROBOTICS	Save positions.

D. Reagent Tray Perimeter Positioning

NOTE: Robotic highest bottom training for the perimeter positions (P1-8) ***IS NOT*** *necessary. The software automatically determines the physical bottom for these positions.*

Centering the Reagent Arm over the perimeter positions ***IS*** *required.*

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS REAGENT ARM HOME ROBOTICS	
2	REAGENT _____ Type P1 ENTER	
3	Verify that Reagent Arm tip is centered over the opening in Reagent Tray cover of Perimeter Position 1. INNER RIGHT or LEFT; OUTER RIGHT or LEFT (as needed)	

Step	Action	Goal
4	REAGENT P1 Type P2 ENTER	
5	Repeat steps #3 and #4 for each Perimeter Position utilizing P1-P8.	
6	HOME ROBOTICS	Save positions.

E. Fluid Sensitivity Adjustment

Step	Action	Goal
1	From Main Menu: SPECIAL PROCEDURES ROBOTICS REAGENT ARM HOME ROBOTICS	
2	Place an empty cartridge with clean septum in the highest bottom position. Ensure Reagent Tray cover is on.	
3	REAGENT _____ Type in highest position number. ENTER	
4	REAGENT _____ FLUID	LED on the reagent outer arm is illuminated. VERTICAL field displays CLEAR. REAGENT _____ BOTTOM is highlighted.
5	If LED is not illuminated and/or VERTICAL field displays FLUID, adjust potentiometer on reagent outer arm until LED just comes on. Repeat steps #4 and #5 to verify adjustment in air.	VERTICAL field displays CLEAR. REAGENT _____ BOTTOM is highlighted.
6	WASH CUP TOP	
7	Pipette 2.0 ml of 0.9% NaCl (saline) into the empty cartridge.	

Step	Action	Goal
8	FLUID	LED on reagent outer arm is not illuminated. VERTICAL field displays FLUID.
9	If the LED is illuminated and VERTICAL field displays CLEAR, adjust potentiometer until LED just goes out. Repeat steps #8 and #9 to verify adjustment in fluid. When correct, repeat steps #4 and #5 to verify adjustment in air has not changed.	
10	WASH CUP TOP	
11	Replace Reagent Probe.	
12	HOME ROBOTICS	

ADDITIONAL PROCEDURES OVERVIEW

This section contains additional maintenance and service procedures for the analyzer:

- Cleaning, lubricating
- Decontamination
- Configuration, initialization
- Power on/power off

Pre-Warming Chamber and Water Quality Station Maintenance procedures are also included.

The procedures in this section are provided in alphabetical order, as shown in the Section Contents list on this page. A cross-referenced list, with procedures grouped into categories, is shown on page 5-114.

WARNING !

Procedures in this section of the chapter require following biohazard, electrical hazard, and electrostatic discharge precautions.



SECTION CONTENTS

Other procedures, grouped by category

VP - 39: ANALYZER DECONTAMINATION

Purpose

The OSHA Bloodborne Pathogen Rule, 29 CFR 1910.1030, requires the decontamination of laboratory equipment prior to the following:

- Service and maintenance
  - FSR service
  - Component replacement (for example, probe replacement)
- Shipment

CAUTION !

Consider all clinical specimens and reagents, controls, calibrators, etc. that contain human blood or serum and contaminated instruments as potentially infectious. Wear gloves, lab coats, and safety glasses, and follow other biosafety practices as specified in the 29 CFR 1910.1030, or other equivalent biosafety procedures.

This VP includes information for these:

- Sharps/Contaminated sharps
- Waste Treatment
- Solid Waste
- Liquid Waste
- Spills

Procedure: Surface Decontamination

CAUTION !

This procedure **does not** decontaminate the inside of the analyzer.

Use the following procedure to decontaminate the surface of the analyzer.

1. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   HOME ROBOTICS
   (to flush the probes and mixer arm tip, and purge waste and reagents from the tubing)
2. Remove all samples, reagents, controls, calibrators, standards, cuvettes, and other disposables from the instrument. Dispose of in accordance with local, state, and federal regulations governing the treatment of regulated medical waste.
3. Empty all waste containers and rinse with disinfectant or water.
4. Wipe the surface of the instrument with a detergent solution to remove any soiling. Then wipe the unit down with a tuberculocidal disinfectant, such as 10% chlorine bleach solution.

Sharps/Contaminated Sharps

Sharps, such as contaminated probes, must be placed in an appropriately marked, puncture–resistant container prior to treatment and disposal.

CAUTION !

Use caution when contacting the Sample Probe, Reagent Probe, and Mix Arm Tip. They are sharp and potentially contaminated with infectious materials. Avoid any contact with the probes or the Mix Arm Tip.

Waste Treatment

Dispose of all clinical specimens, reagents, controls, calibrators, standards, cuvettes, and other disposables that may be contaminated in accordance with local, state, and federal regulations governing the treatment of regulated medical waste.

Solid Waste
Generally accepted procedures for the treatment of potentially infectious solid waste include incineration or autoclaving. If an autoclave is used, the effectiveness of the decontamination cycle must be verified.

Liquid Waste
Liquid waste containing acid should be neutralized prior to the addition of a disinfectant and disposal. Addition of disinfectant to the waste container helps inactivate the infectious organisms that may collect with the waste.

Spills

Consider all samples, reagents, calibrators and controls that contain human blood or serum as potentially infectious. Clean up spills of potentially infectious materials in accordance with established biosafety practices. A generally accepted procedure for cleaning such spills is to absorb the spill with toweling or other absorbent material, wipe the area with a detergent solution, and then wipe the area with an appropriate tuberculocidal disinfectant, such as 10% chlorine bleach solution.

VP - 40: CRT BEZEL/TOUCHSCREEN ARRAY CLEANING

Purpose

Clean dust from the Touchscreen Array

Procedure

1. Power Off analyzer (**VP - 47**).
2. Remove CRT/Keyboard Bezel (**RR - 13.1**).
3. Remove 4 thumbscrews that hold plastic CRT Bezel to Touchscreen.
4. Wipe CRT Bezel with cloth that has been dampened with Type II water.
5. Clean dust from diode array with canned air.
6. Reinstall plastic CRT Bezel.
7. Power On analyzer (**VP - 48**).

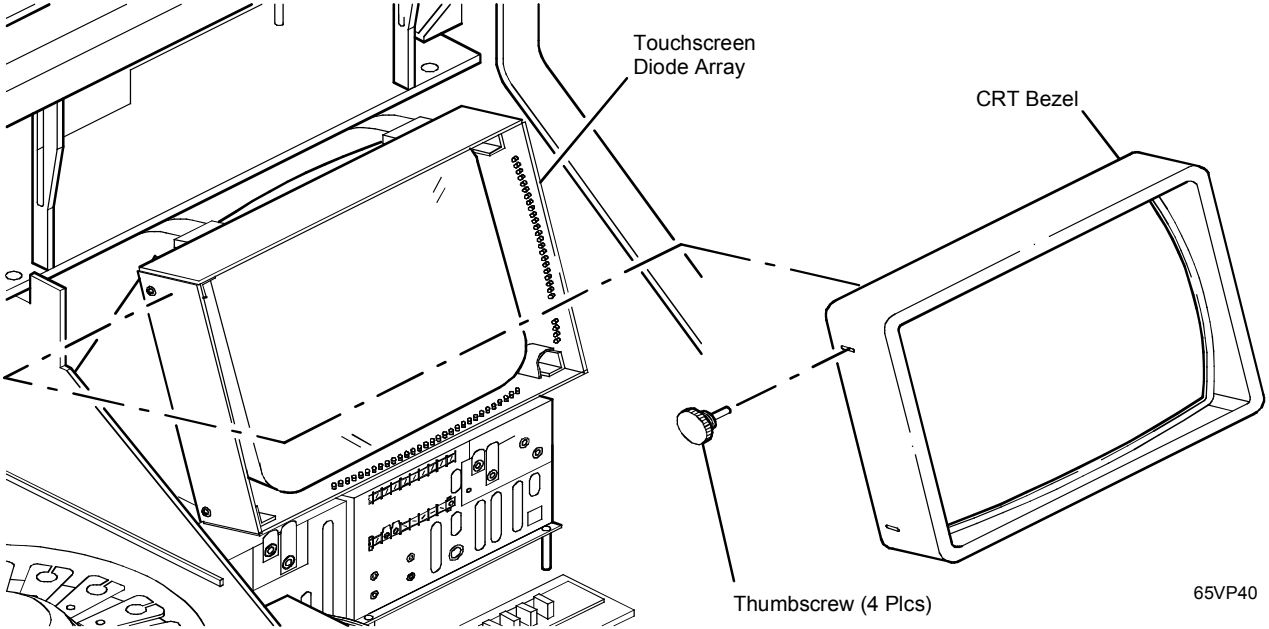


Figure 5-40: CRT Bezel/Touchscreen Array

VP - 41: DILUENT SYSTEM CLEANING

CAUTION !

Failure to adhere to this procedure may result in contamination and possible interference during the measurement of optical assays.

Purpose

Decontaminate Sample Diluent System

Procedure

1. Prepare a 0.5% Benzalkonium Chloride* solution by mixing 1 ml of 50% Benzalkonium Chloride in 99 ml of Type II water. Mix thoroughly. Place 50 mL into each of 2 beakers.

   * Benzalkonium Chloride is an antimicrobial agent used to inhibit growth and reduce build-up.

2. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   HOME ROBOTICS

3. Open the Sample Diluent Reservoir access door and remove the Sample Diluent bottle from the platform.

4. Remove the diluent line cap from the bottle.

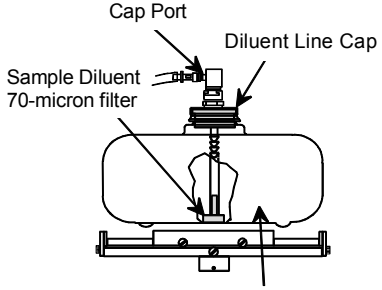


Figure 5-42: Sample Diluent Bottle

5. Set aside the bottle.

6. Immerse the end of the sample diluent tubing in one of the beakers that contain 50 ml of the solution.

7. PUMPS & VALVES

8. DILUENT VALVE CLOSED
to display OPENED

CAUTION !

To prevent damage to the Sample Diluent Valve, **DO NOT** leave the valve open for more than 2 minutes without fluid flow.

9. SINGLE STROKE
to display PURGE # PURGES 1
Type 10
DILUENT PUMP

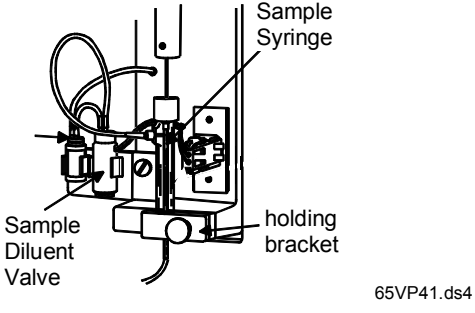


Figure 5-43: Sample Diluent Syringe

10. While the solution is being aspirated:
    a. Disconnect the Sample Syringe from the holding bracket.
    b. Manually move the syringe barrel up and down on the plunger to dislodge debris or bubbles. Do not bend the plunger.
    c. Replace the Sample Syringe in the holding bracket.
    d. Tighten the knurled knob.

11. Use the remaining 50 ml of Benzalkonium Chloride solution to clean the Sample Diluent bottle. Thoroughly rinse the bottle with Type II water. Refill the bottle with Type II water.

12. Attach a 5cc syringe to the end of the diluent line at the cap. Backflush with Type II water to clean the 70-micron filter. Insert the diluent line into a beaker of 100 ml of Type II water.

    PURGE a minimum of 10 times

13. Insert the diluent line into the bottle. Verify that the diluent line is properly installed and that the tubing is secure on the cap port. Return the bottle to the platform and close the access door.

14. DILUENT VALVE OPENED
to display CLOSED

15. Replace the Sample Diluent 35–Micron Filter (**RR - 6.8**).

VP - 42: DILUENT SYSTEM PURGE

Purpose

Purge air from diluent system lines

Procedure

1. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   PUMPS & VALVES

2. DILUENT VALVE CLOSED
   to display OPENED

> **CAUTION !**
>
> To prevent damage to the Sample Diluent Valve, **do not** leave the valve open for longer than 2 minutes without fluid flow.

3. SINGLE STROKE to display PURGE # PURGES 1
   Type 10
   DILUENT PUMP

   While system is purging, observe Sample Syringe movement. Dislodge any air bubbles.

4. After cycle is complete:
   DILUENT VALVE OPENED
   to display CLOSED

5. HOME ROBOTICS

VP - 43: FAN SCREENS CLEANING

Purpose

Clean the fan screens. (Dirty fan screens cause electronic components to be exposed to higher temperatures.)

NOTE: If a laboratory is exceptionally dusty, fan screens may need to be cleaned more frequently.

Procedure

1. Power Off analyzer (**VP - 47**).
2. Locate 3 turn-screws on the panel behind Reagent Arm. Turn each screw CCW 1/4 turn.
3. Tilt the top of the panel toward the front of the analyzer and remove the panel. (The reagent arm may be manually moved to facilitate removal of the panel.)
4. Remove the Incubator fan screen and Reagent Cooler fan screen by pulling straight up on the white tabs located on top of each fan screen.
5. Clean the screens with running water. Pat dry, ensuring that the screens are completely dry.
6. Reinstall the fan screens. Verify that the airflow directional arrows point toward the front of the analyzer.
7. Reinstall the panel. Return the reagent arm to the wash cup position.
8. Power On analyzer (**VP - 48**).

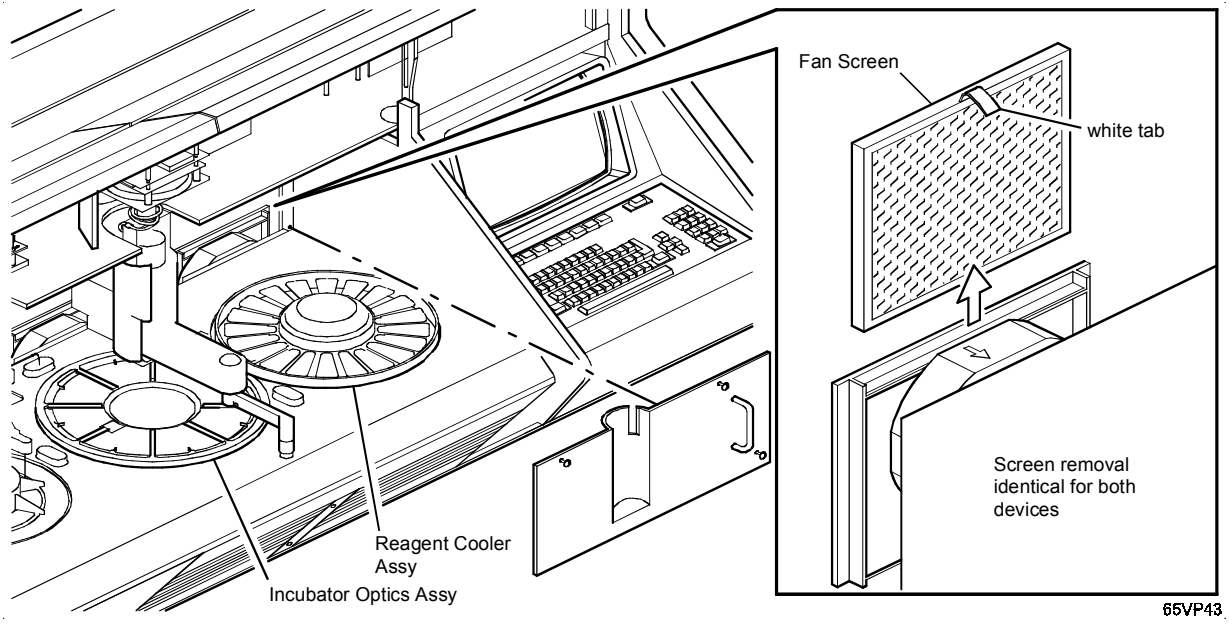


Figure 5-44: Fan Screens Cleaning

VP - 44: INCUBATOR CLEANING

CAUTION !

Do not use powdered gloves.

Purpose

Ensure Incubator water is free of debris

Procedure

1. Remove all cuvettes from Cuvette Carrier.

2. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   PUMPS & VALVES
   INCUBATOR VALVE OPENED
   to display CLOSED

3. Aspirate water from Incubator. Dry Incubator thoroughly, using non-abrasive, lint-free tissues.

CAUTION !

Do not scratch the lenses.

Do not touch the optical portion of the lenses. Fingerprints will interfere with optical readings.

Do not remove the lenses. Improper replacement may cause water leakage.

4. Clean the optical portion of the lenses with lens paper that is slightly moistened with Type II water.

5. INCUBATOR VALVE CLOSED
   to display OPENED

   Observe Incubator as it fills. Aspirate and discard floating debris.

6. Inspect the lenses for bubbles. If bubbles are observed, dislodge them with a transfer pipette and remove by aspiration.

> **CAUTION !**
>
> Bubbles on the lenses will cause erratic results.

7. After Incubator has filled, place new cuvettes into Cuvette Carrier.
   HOME ROBOTICS

8. Simultaneously press:
   SHIFT
   CUVETTE CHANGE

VP - 45: LINE VOLTAGE SELECTION PLUG CONFIGURATION

Purpose

Adjust output of Isolation Transformer to within specifications

Procedure

1. Measure AC voltage from the Oneac® line conditioner. Voltage should be between 198VAC and 242VAC. If voltage is not in range, reconfigure Oneac® line conditioner (**VP - 46**).

2. Remove CRT/Keyboard Bezel (**RR - 13.1**).

3. Measure AC voltage at P224 on Isolated AC Distribution Board. Voltage should be between 110VAC and 125VAC.

If...	Then...
Voltage **is** in range	Go to step #6.
Voltage **is not** in range	Go to step #4.

4. Power Off analyzer (**VP - 47**).

5. Reconfigure Line Voltage Selection Plug P262:

	Input Line Voltage	Jumpers
For 220VAC	200 220 230 240	3 to 15 1 to 12 3 to 7 1 to 14 3 to 9 1 to 14 3 to 9 1 to 6
For 110VAC	100 110 120	2 to 3 1 to 11 12 to 15 2 to 3 1 to 14 7 to 13 2 to 3 1 to 5 6 to 9

5. Repeat step #3.

6. Reinstall CRT/Keyboard Bezel.

Specifications

AC voltage	Specification
From the Oneac® line conditioner	between 198 and 242 VAC
At P224 on Isolated AC Distribution Board	between 110 and 125 VAC

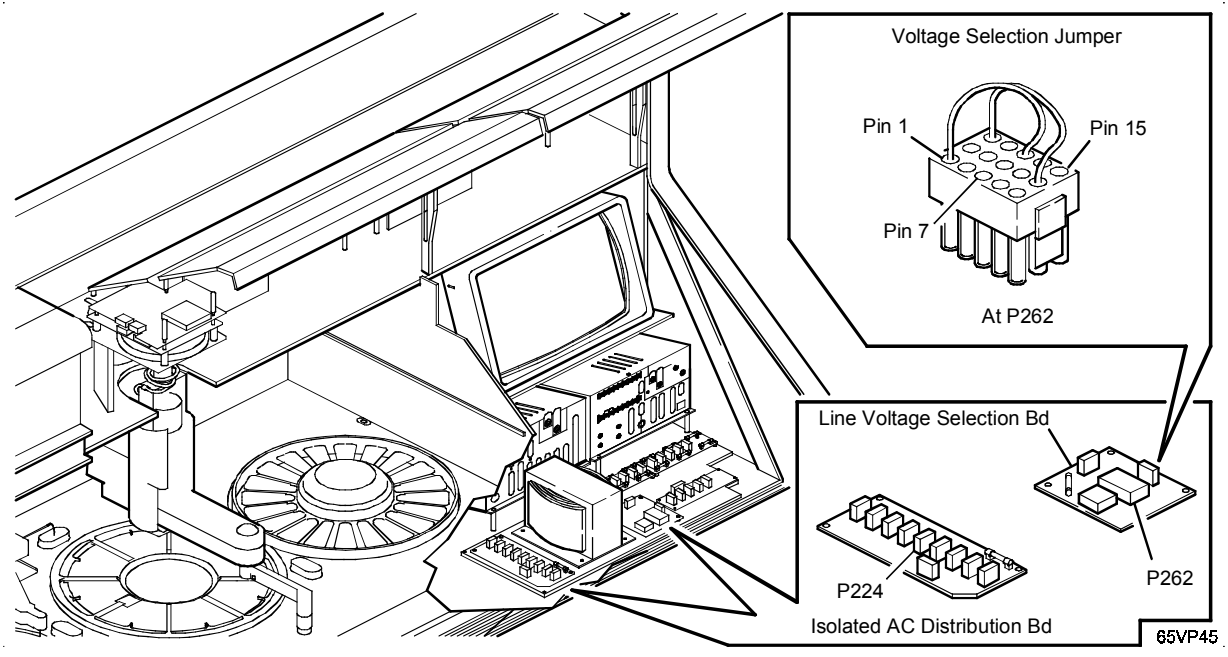


Figure 5-45: Line Voltage Selection Plug Configuration

VP - 46: ONEAC® LINE CONDITIONER CONFIGURATION

Purpose

Configure Oneac® line conditioner for system power requirements

NOTE: The 110 VAC Oneac® line conditioner does not have any configuration changes.

Procedure

1. Power off Oneac® line conditioner.
2. Ensure line conditioner is not plugged in to the wall outlet.
3. Measure the voltage at the wall outlet (input voltage).
4. Use the chart below to select settings for the actual input voltage.

   NOTE: Do not remove the connection at PSCR, PAO, or PBO.

Input Voltage	Connect Black Lead to	Connect Orange Strap
190 VAC	PB2	PA1 to PB0
200 VAC	PB3	PA1 to PB0
228 VAC	PB3	PA3 to PB0
240 VAC	PB3	PA3 to PB0
260 VAC *	PB3	PA3 to PB0

** NOTE: Only line conditioners with manufacturer's part number 012-663A can be configured to accommodate input voltages of 240 VAC to 260 VAC.*

5. Use the table below to select the desired output:

Output Voltage	Connect Black Lead to	Connect White Strap
212 VAC	SB1	SA1 to SB0
226 VAC	SB2	SA1 to SB0
240 VAC	SB2	SA2 to SB0

NOTE: Do not remove the connection at SA0 and SB0.

6. Plug in line conditioner.

7. Power On line conditioner.

8. Verify power output of line conditioner meets specifications.

Specifications

Power output of line conditioner	220 VAC ± 10% (198 VAC - 242 VAC)

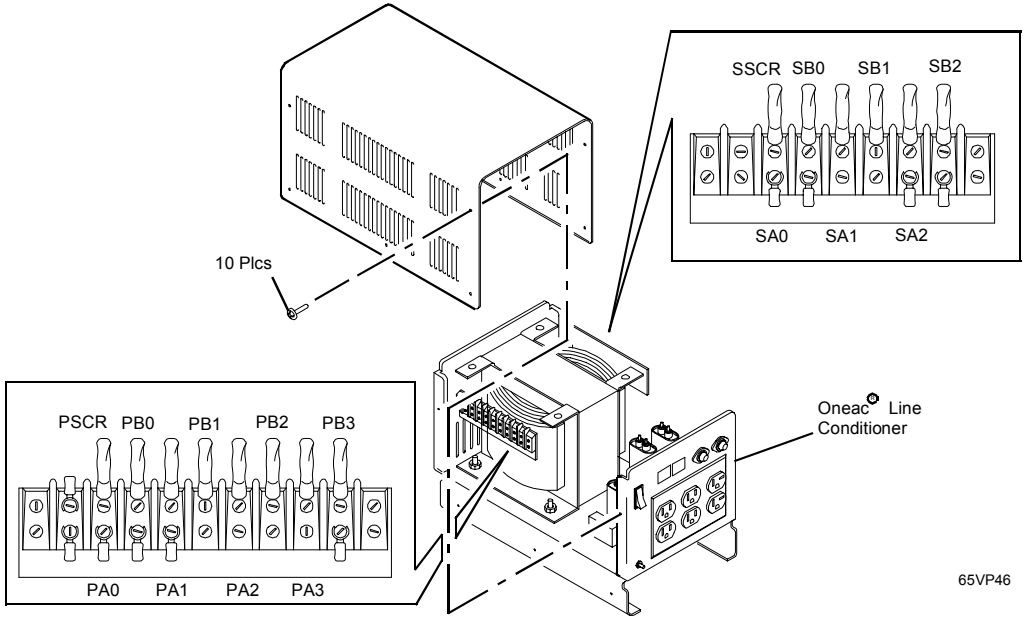


Figure 5-46: Oneac® Line Conditioner Configuration

VP - 47: POWER OFF SEQUENCE

This VP includes two Power Off procedures. Select the appropriate procedure based upon the length of time the analyzer will be off:

- less than 15 minutes Procedure A page 5 - 131
- 15 minutes or longer Procedure B page 5 - 132

For both procedures (A and B), refer to **Figure 5 - 47** on page 5 - 133.

Purpose

Properly shut off the power to the analyzer

WARNING !

ELECTRICAL SHOCK HAZARD !

High voltage exists in the analyzer when the Maintenance Power is **OFF** and the Main Power is **ON**. Visually locate the power switches before touching them.

Procedure A: Power off for less than 15 minutes

1. Turn Maintenance power switch OFF.
2. Turn Main power switch OFF.
3. When power is to be restored, follow Power On procedure (**VP - 48**).

Procedure B: Power off for 15 minutes or longer

1. Remove reagents from quadrants 2, 3, and 4 of Reagent Cooler. Cap and refrigerate the reagents.
2. Place absorbent towels under ISE module. Remove A, B and R tubing from ISE reagent pack, wiping each tubing individually to prevent contamination.
3. Place A, B and R tubing on absorbent towels.

   From Main Menu:
   CALIBRATION
   ISE STATUS
   PURGE
4. Place tubing in a beaker of TYPE II water.
   PURGE
5. Remove tubing from water and place on absorbent towels.
   PURGE
6. Remove R and W tubing from electrode train. Release the tubing from the peristaltic pump.
7. Turn Maintenance power switch OFF.
8. Turn Main power switch OFF.
9. When power is to be restored, follow Power On procedure (**VP - 48**).
10. Reconnect ISE tubing.
11. Replace reagents on Reagent Cooler Tray.
12. Perform ISE Calibration (**VP - 29**).

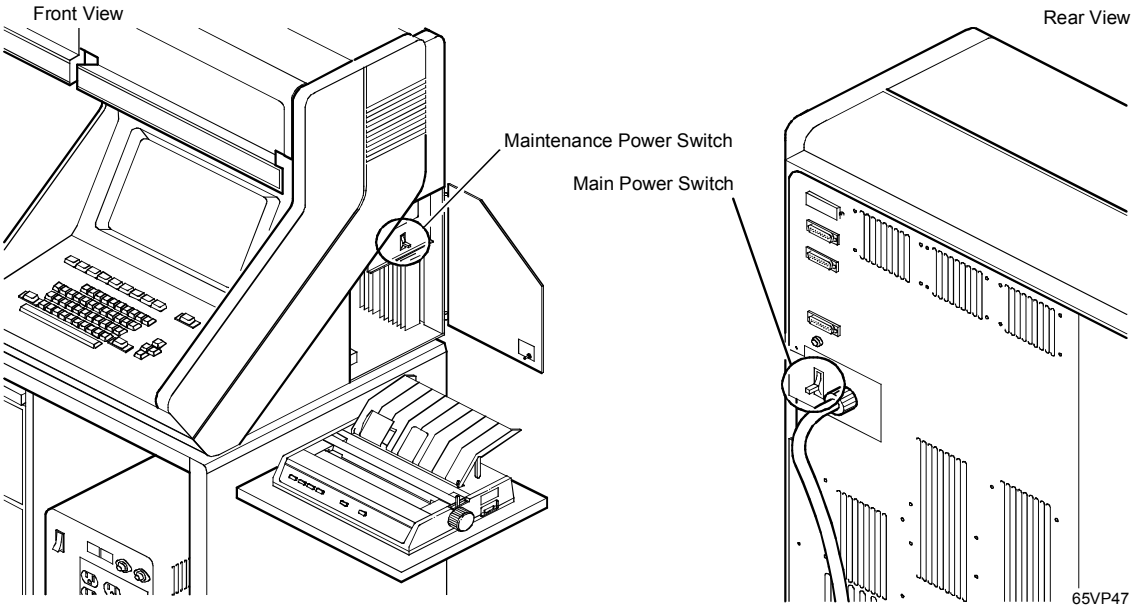


Figure 5-47: Main Power Switch and Maintenance Power Switch

VP - 48: POWER ON SEQUENCE

Purpose

Ensure analyzer powers on properly

WARNING !

ELECTRICAL SHOCK HAZARD !

High voltage exists in the analyzer when the Maintenance Power is OFF and the Main Power is ON. Visually locate the power switches before touching them.

Procedure

1. Turn Main power switch ON. Wait 10 seconds.
2. Turn Maintenance power switch ON.
3. The System Power On Screens will appear.

   If an error occurs during Power On, a banner message will appear at bottom of screen or ERROR displays in right column. Troubleshoot error before proceeding.
4. Verify that the sample diluent reservoir is full.
   Verify that all cuvette segments are clean.
5. Enter DATE and TIME.
   PROCEED
6. If instrument is interfaced with a host computer, re-establish communication by entering Bi-host Interface Screen.

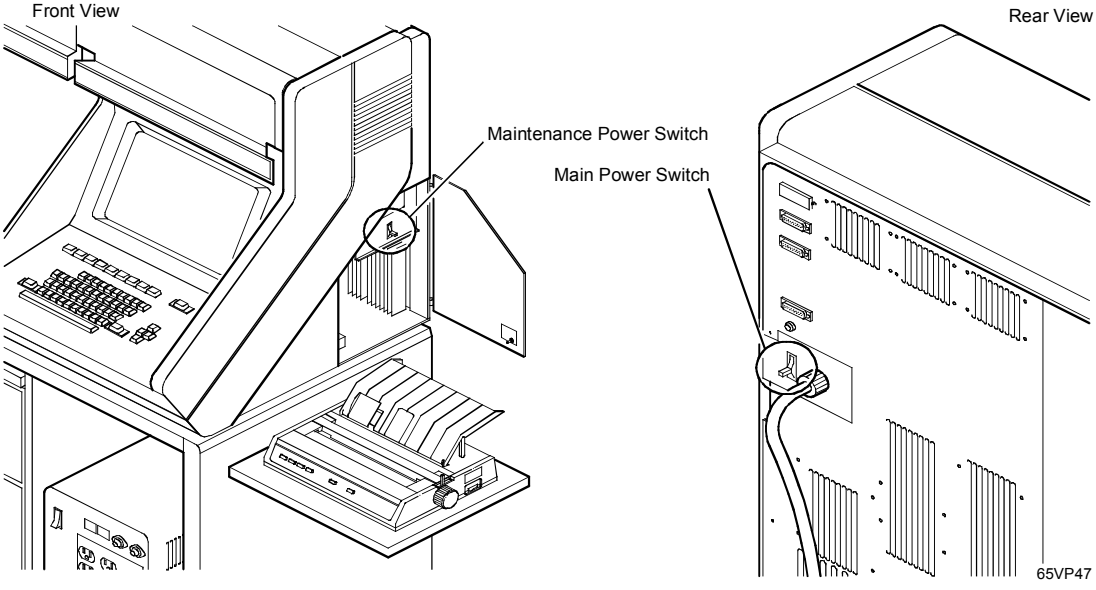


Figure 5-48: Main Power Switch and Maintenance Power Switch

VP - 49: PRE-WARMING CHAMBER MAINTENANCE

Purpose

Clean Incubator Pre-Warming Chamber

Procedure

1. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   PUMPS & VALVES
   INCUBATOR VALVE OPEN
   to display CLOSED
2. Remove Cuvette Carrier (**RR - 11.1**).
3. At the 9 o'clock position, pull straight up on the black plastic ring that covers Pre-warming Chamber.
4. Empty Incubator and Pre-warming Chamber.
5. Coat Incubator and Pre-warming Chamber with undiluted Benzalkonium Chloride. Let sit for minimum of 15 minutes.
6. Open the Incubator Valve and allow Incubator to fill completely. Flush for 15 minutes.
7. While Incubator is flushing, wipe away any residual Benzalkonium Chloride.
8. Close Incubator Valve.
9. Empty Incubator and Pre-warming Chamber.
10. Dry Incubator and Pre-warming Chamber.
11. Reinstall the black plastic ring.
12. Reinstall Cuvette Carrier.

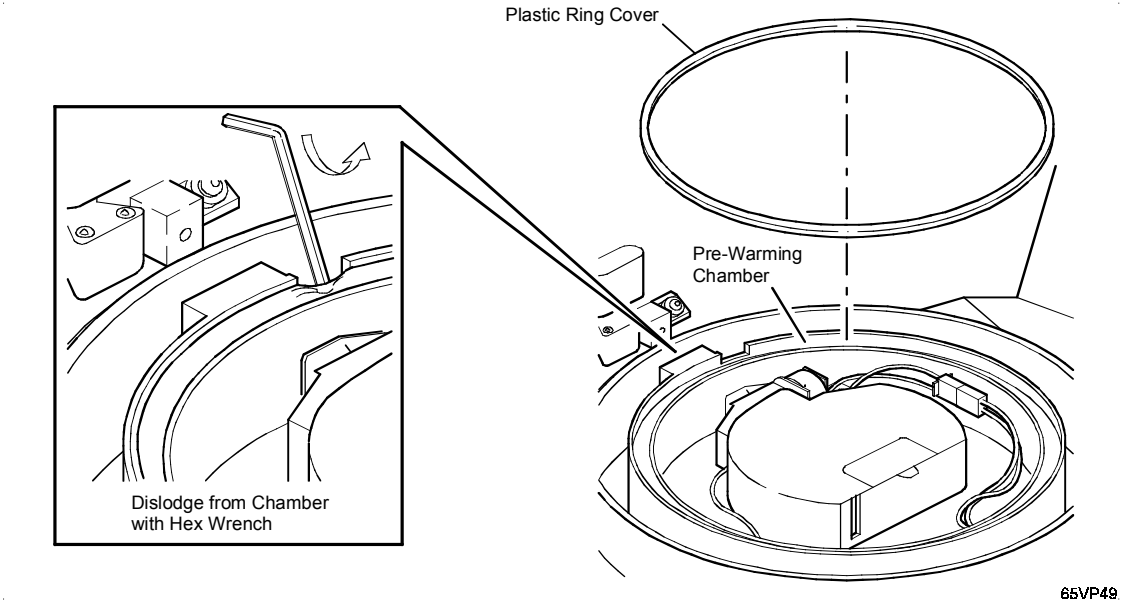


Figure 5-49: Pre-Warming Chamber

VP - 50: RELAY LENS CLEANING

Purpose

Clean optical path to permit the maximum amount of light energy transfer

Procedure

1. Remove Top Deck (**RR - 1.3**).
2. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   OTHER DEVICES
   OPEN (to open Shutter)
3. From the front of the analyzer, insert cotton swab under Calibration Wheel to access Relay Lens.
4. Wipe lens with cotton swab moistened with Type II water. Repeat this, using a clean moist swab each time, until lens is clean.
5. Dry the lens using a dry cotton swab.
6. Perform Lamp Adjustment (**VP - 7**).

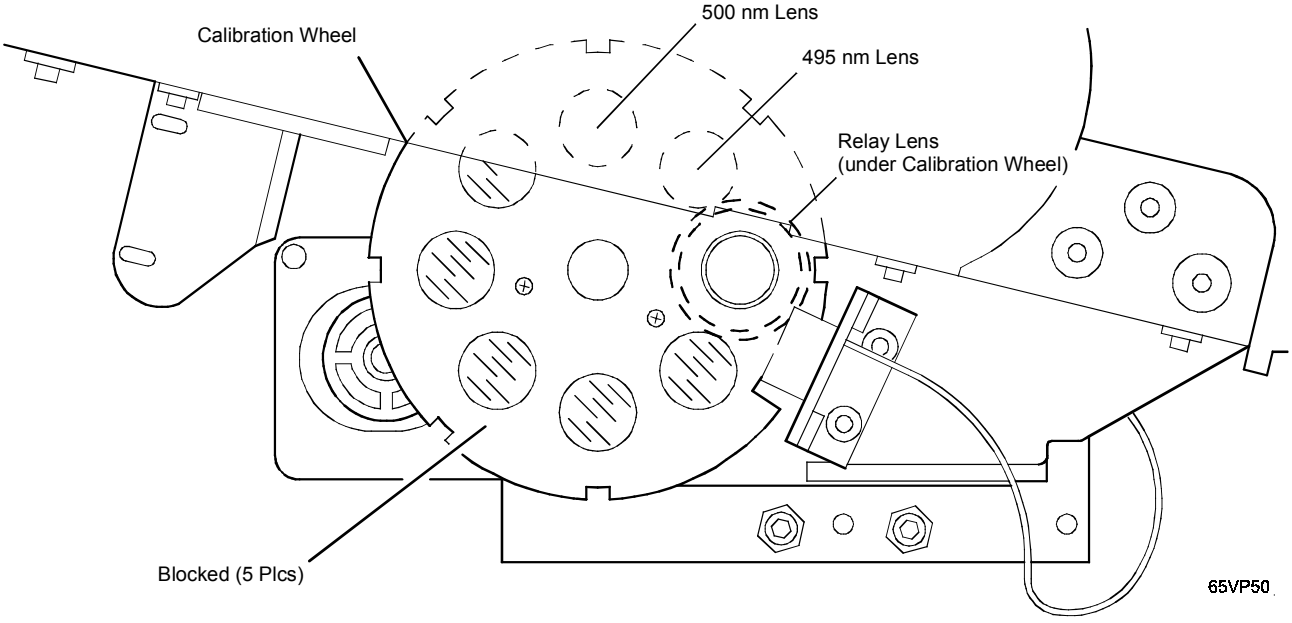


Figure 5-50: Relay Lens Cleaning

VP - 51: RUN: CALCIUM/AST

Purpose

To use when validating or troubleshooting an analyzer's performance. The mean, standard deviation (SD) and % coefficient of variation (CV) can be used to interpret if an assay is within NCCLS guidelines for precision estimates.

Procedure

1. From Main Menu:
   - SYSTEM FILES
   - INSTRUMENT OPTIONS

   Edit Scheduling Mode to Random

2. Delete QC data entries for Level 3 for both Calcium and AST (if acceptable with customer):

   From Main Menu:
   - QUALITY CONTROL
   - CALC
   - PRINT SCREEN
   - DELETE
   - LEVEL
   - 3
   - PROCEED

   (to return LEVEL 3 MEAN, SD AND %CV entries to zero)

3. Repeat step #1 for AST.

4. Delete QC ranges for Level 3 for both Calcium and AST (if acceptable with customer):
   - LOW VALUE (for Level 3)
   - BACKSPACE (once)
   - HIGH VALUE (for Level 3)
   - BACKSPACE (once)
   - SAVE FILE

5. Repeat step #3 for AST.

6. Run 12 cups of normal control in replicate for Calcium and AST.

   From Main Menu:
   - PATIENT SAMPLES
   - /C 3 (in the PATIENT NAME field)
   - CALC and AST
   - NEXT SAMPLE
   - REVIEW AND RUN

   Review loadlist(s) if highlighted.

   When the loadlists complete and 12 sample cups of control are on board:
   - RUN

7. When the run is complete, review the results printout.

8. Review Quality Control files for Calcium and AST:

   From Main Menu:
   - QUALITY CONTROL
   - CALC

   Review the Mean, SD and % CV.

9. Repeat step #7 for AST.

10. Edit Scheduling Mode back to original setting.

11. Delete QC data from this run by repeating step #2.

12. Re-enter low and high QC values for level 3 (if deleted).

Specifications

CALCIUM	SD ≤ 0.3	%CV ≤ 3.0
AST	SD ≤ 3.0	%CV ≤ 6.0

Refer to customer reagent manual for specific assay information.

VP - 52: RUN: REPRODUCIBILITY

Purpose

Precision runs are similar to random runs, except the scheduling mode is usually left in FLEX-BATCH. This test can be used when validating or troubleshooting an analyzer's performance. The mean, standard deviation (SD) and % coefficient of variation (CV) can be used to interpret if an assay is within NCCLS guidelines for precision estimates.

Refer to the customer reagent manual for specific assay information.

Procedure

1. Delete QC data entries for Level 3 for both Calcium and AST (if acceptable with customer):

   From Main Menu:
   - QUALITY CONTROL
   - CALC
   - PRINT SCREEN
   - DELETE
   - LEVEL
   - 3
   - PROCEED
     (to return LEVEL 3 MEAN, SD AND %CV entries to zero)

2. Repeat step #1 for AST.

3. Delete QC ranges for Level 3 for both Calcium and AST (if acceptable with customer):
   - LOW VALUE (for Level 3)
   - BACKSPACE (once)
   - HIGH VALUE (for Level 3)
   - BACKSPACE (once)
   - SAVE FILE

4. Repeat step #3 for AST.

5. Run 12 cups of normal control in replicate for Calcium and AST.

   From Main Menu:
   - PATIENT SAMPLES
   - /C 3 (in the PATIENT NAME field)
   - CALC and AST
   - NEXT SAMPLE
   - REVIEW AND RUN

   Review loadlist(s) if highlighted.

   When the loadlists complete and 12 sample cups of control are on board:
   - RUN

6. When the run is complete, review the results printout.

7. Review Quality Control files for Calcium and AST:

   From Main Menu:
   - QUALITY CONTROL
   - CALC

   Review the Mean, SD and % CV.

8. Repeat step #7 for AST.

9. Delete QC data from this run by repeating step #2.

10. Re-enter low and high values for Level 3 (if deleted).

Specifications

Refer to customer reagent manual for specific assay information.

VP - 53: SRAM BOARD INITIALIZATION

Purpose

Initialize system files

Procedure

1. Power On analyzer (**VP -48**).

2. Initialize the analyzer. During Power-On sequence:
   - D Diagnostics
   - 3 Reinitialize the system
   - Y (Yes) to proceed

3. After initialization is complete:
   - 4 Restart analyzer

4. Edit these files as needed:
   - Test Parameter Files
   - Test Panels
   - Quality Control Files
   - Processing Order
   - Print Order
   - Instrument Options
   - Robotics Positions
   - Wash Matrix
   - Bar Code Index
   - Interface Parameters

VP - 54: SYRINGE LUBRICATION

Purpose

Lubricate these:
- Reagent Syringe Drives
  Sample Syringe Drive
- Reagent Arm
- Sample Arm

For...	Use Procedure...
Reagent Syringe Drive	A (page 5 - 146)
Sample Syringe Drive	A (page 5 - 147)
Reagent Arm S/N 06250-107 and above	B (page 5 - 147)
Reagent Arm S/N 06250-106 and below	B (page 5 - 147)
Sample Arms	B (page 5 - 147)

Procedure A: Syringe Drives (Reagent and Sample)

1. Place a paper towel under the assembly.
2. Apply 1 or 2 drops of LO-17 Oil to the helix screw.

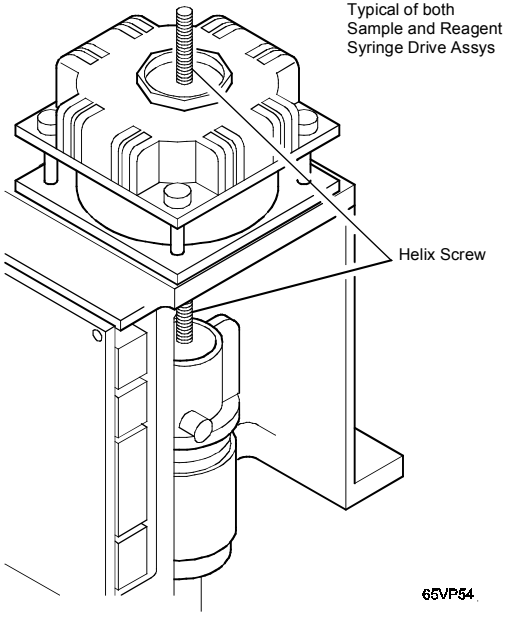


Figure 5-51: Syringe Drive Lubrication (Procedure A)

Procedure B: Reagent Arm, Sample Arm

1. Place a paper towel under the assembly.

2. Apply 1 or 2 drops of grease to the guide rods.

	P/N	Use
Reagent Arms	06250-107 and above 06250-106 and below	Lithium Grease Krytox® Grease
Sample Arm	all	Krytox® Grease

Spread this grease over the exposed length of the guide rods.

NOTE: Avoid spilling Krytox®. Alcohol may be used to clean up a spill, but alcohol will not completely remove the Krytox® grease.

3. Apply 2 or 3 drops of Krytox® grease to the lead screw helix.

CAUTION !

Do not wipe the lead screw.

4. Move arm up and down several times to evenly spread the grease.

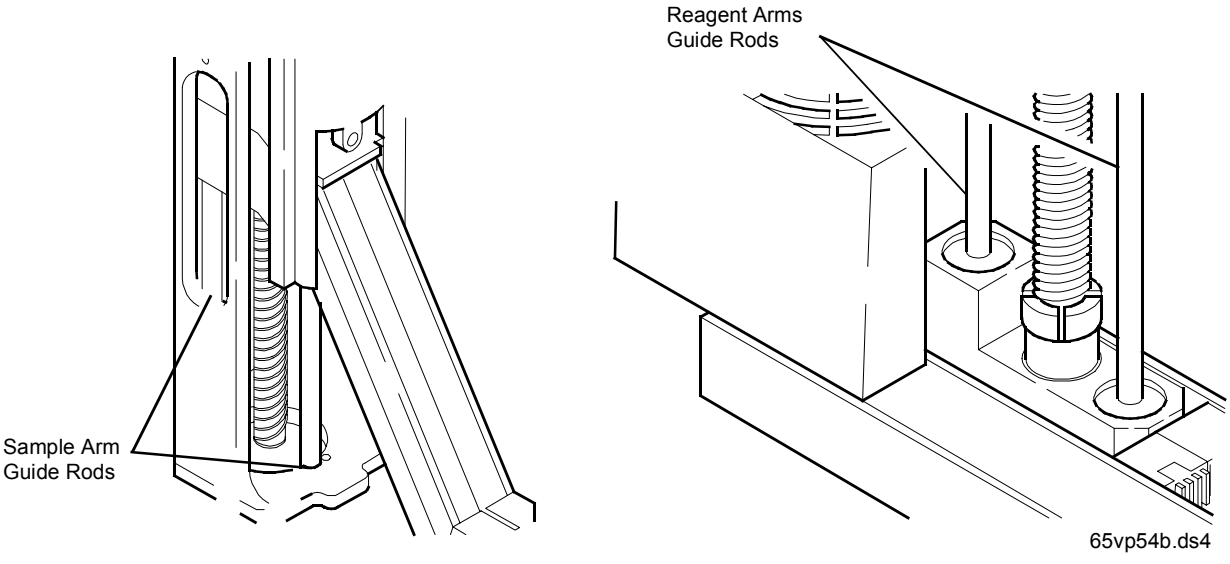


Figure 5-52: Reagent and Sample Syringe Lubrication (Procedure B)

VP - 55: WATER QUALITY STATION MAINTENANCE

Purpose

Perform inlet water system cleaning

Procedure

1. Remove all cuvettes from Cuvette Carrier.
2. Turn off the water to the water quality station at the input cutoff valve or at the water source.

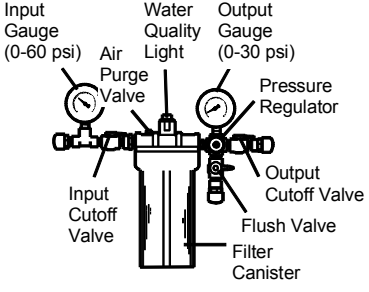


Figure 5-53: Water Quality Station

3. Open the Flush Valve to drain excess water from the Water Quality Station. Close the Flush Valve when the pressure is relieved.
4. Remove the blue filter canister. Discard the used filter.
5. Clean the canister with 1-3 ml of Benzalkonium Chloride. Rinse the canister thoroughly with Type II water.
6. Add 20 ml of Benzalkonium Chloride to the canister. Fill the canister with Type II water and reconnect canister to the Water Quality Station.
7. Slowly turn on the water to the water quality station at the input cutoff valve or at the water source.
8. From Main Menu:
   SPECIAL PROCEDURES
   ROBOTICS
   PUMPS & VALVES
   REAGENT WASH VALVE
   to display OPENED
   MIX WASH VALVE
   to display OPENED
   INCUBATOR VALVE
   to display OPENED

9. Ensure WASTE PUMP displays ON.

10. Flush for two hours with 50% Benzalkonium Chloride and water.

    NOTE: During the flush cycle, other maintenance procedures may be performed, for example: probe cleaning, syringe checks, and diluent reservoir cleaning. However, if Home Robotics is performed, the reagent wash, mix wash and incubator valves must be reopened to continue the flush cycle.

11. When the 2–hour flush is completed, from Pumps & Valves screen:
    REAGENT WASH VALVE
    to display CLOSED
    MIX WASH VALVE
    to display CLOSED
    INCUBATOR VALVE
    to display CLOSED

12. Close the input cutoff valve at the water quality station.

13. Open the Flush Valve to drain excess water from the Water Quality Station. Close the Flush Valve when pressure is relieved.

14. Remove the filter canister. Rinse thoroughly with Type II water. Install a new 0.2-micron filter on the Water Quality Station and reconnect the canister.

15. Close the Output Cutoff Valve.

16. Adjust the Flush Valve so that it is 1/4 to 1/3 open.

17. Turn on the water at the input cutoff valve.

18. Press the Air Purge Valve (red button) on the top of the Water Quality Station until water is visible.

19. Fully open the Flush Valve and allow water to flow for 7 to 10 minutes.

20. Slowly open the Output Cutoff Valve and close the Flush Valve.

21. Perform Incubator Cleaning (**VP -44**).

22. Replace Incubator Lenses (**RR - 11.13**).