MININEPH™ PLUS

Service Manual

Binding Site

THE BINDING SITE

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MININEPH™ PLUS Service Manual

MININEPHPLUS™ AD500

Service Manual

Contents

1 Technical specifications

1.1 Description of the MININEPHPLUS

The MININEPHPLUS is a miniature nephelometer designed to measure the concentration of proteins in human and animal body fluids.

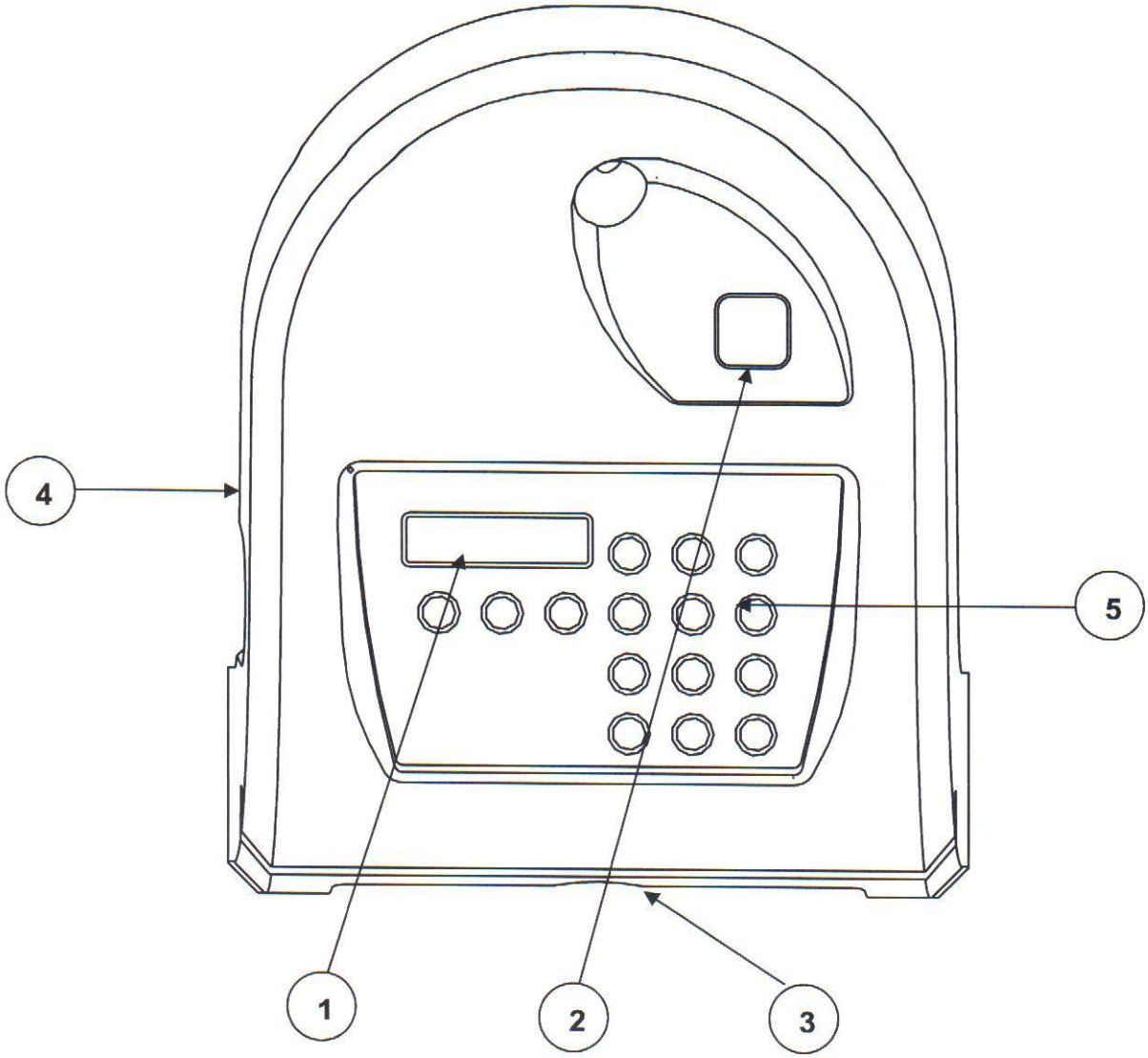
Nephelometry is a method of assaying the reaction between an antibody and an antigen by measuring the amount of light scattered by the reaction mixture. The light source in a MININEPHPLUS is a laser emitting light at 670nm. A detector placed at 18° from the incident detects the light scattered by the reaction mixture contained in a cuvette in the instrument.

The MININEPHPLUS is able to operate at two temperatures, 30°C and 45°C. This enables the MININEPHPLUS to be used to run not only current MININEPH™ assays but also assays which require a higher temperature such as **Freelite®**.

An integrated pipette is also included with the MININEPHPLUS for the aspiration and dispensing of reagents. Fluid is moved through the pipette, by the action of a syringe pump located in the main body of the MININEPHPLUS. The presence of a heating element within the pipette, which heats the onboard buffer, ensures that the assay reagents are at the correct temperature when running assays such as **Freelite**.

1.2 External components of the MININEPHPLUS

Fig 1. Top view



1 **LCD display** - 2 x 16 character alphanumeric LCD display. Displays results and instructions for the user.

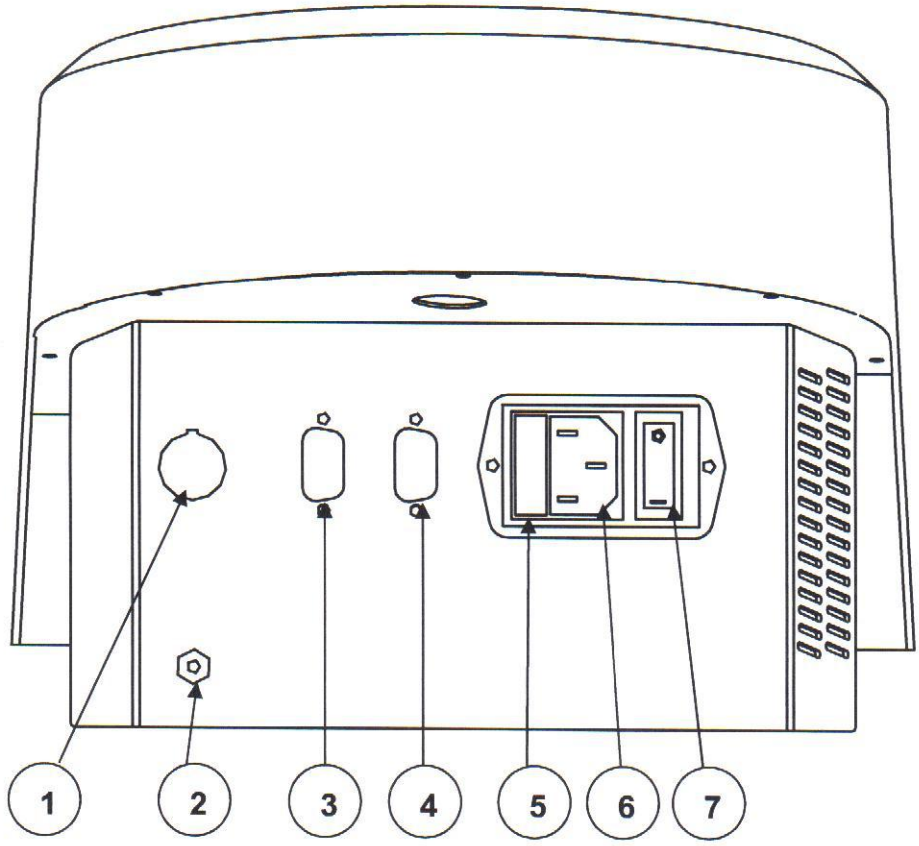
2 **Cuvette chamber** - for positioning of the reaction cuvette during assay.

3 **Swipe card reader** - for the input of curve parameters into the MININEPHPLUS.

4 **Syringe and valve** - moves fluid through the tubing and pipette via the action of the syringe pump housed within the main body of the MININEPHPLUS.

5 **Keypad** - allows manual entry of data.

Fig 2. Rear View



1 **Pipette cable connector** - to supply power to the pipette.

2 **Dispenser outlet** – to supply on-board buffer to the pipette.

3 **Printer port** – use a null modem cable to connect a standard serial printer.

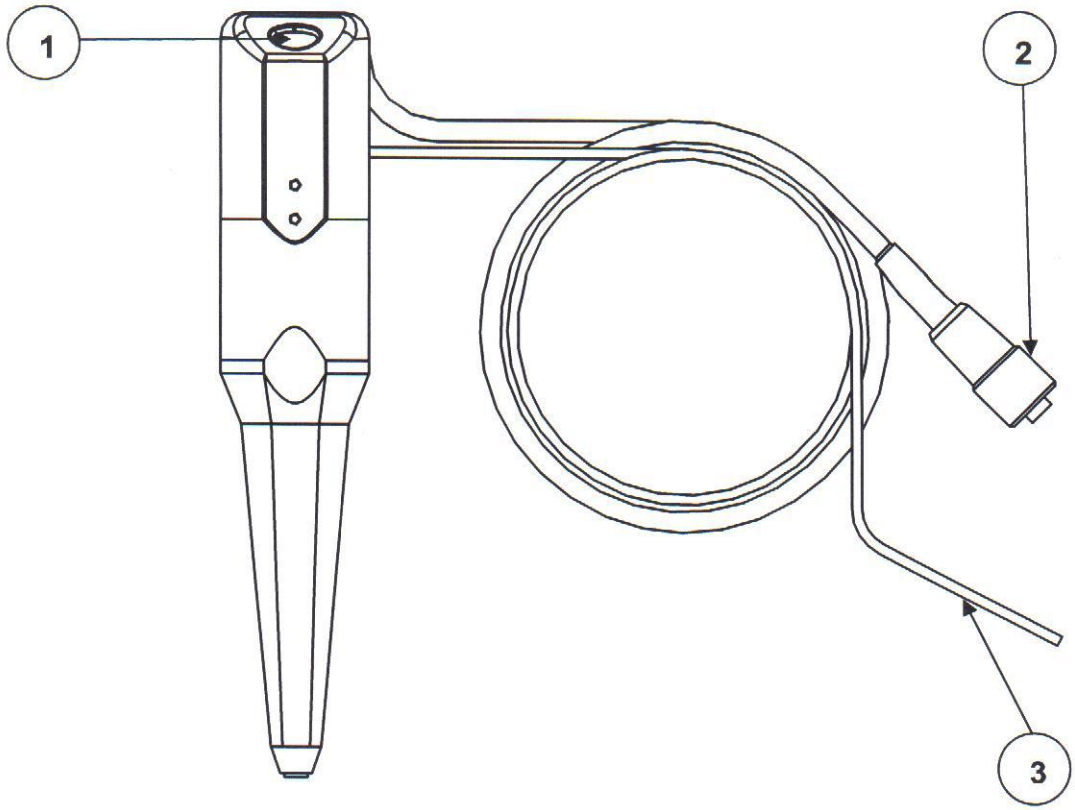
4 **Barcode reader port** – connect a barcode reader (available from Binding Site, order code AD500.2) to read sample identifier barcodes.

5 **Fuse holder** – contains two 800mA fuses.
CAUTION double pole/neutral fusing

6 **Power connector** – connect to the power supply using the supplied power cord.

7 **Power on/off switch** - used to isolate the analyser from the power supply.

Fig 3. Pipette



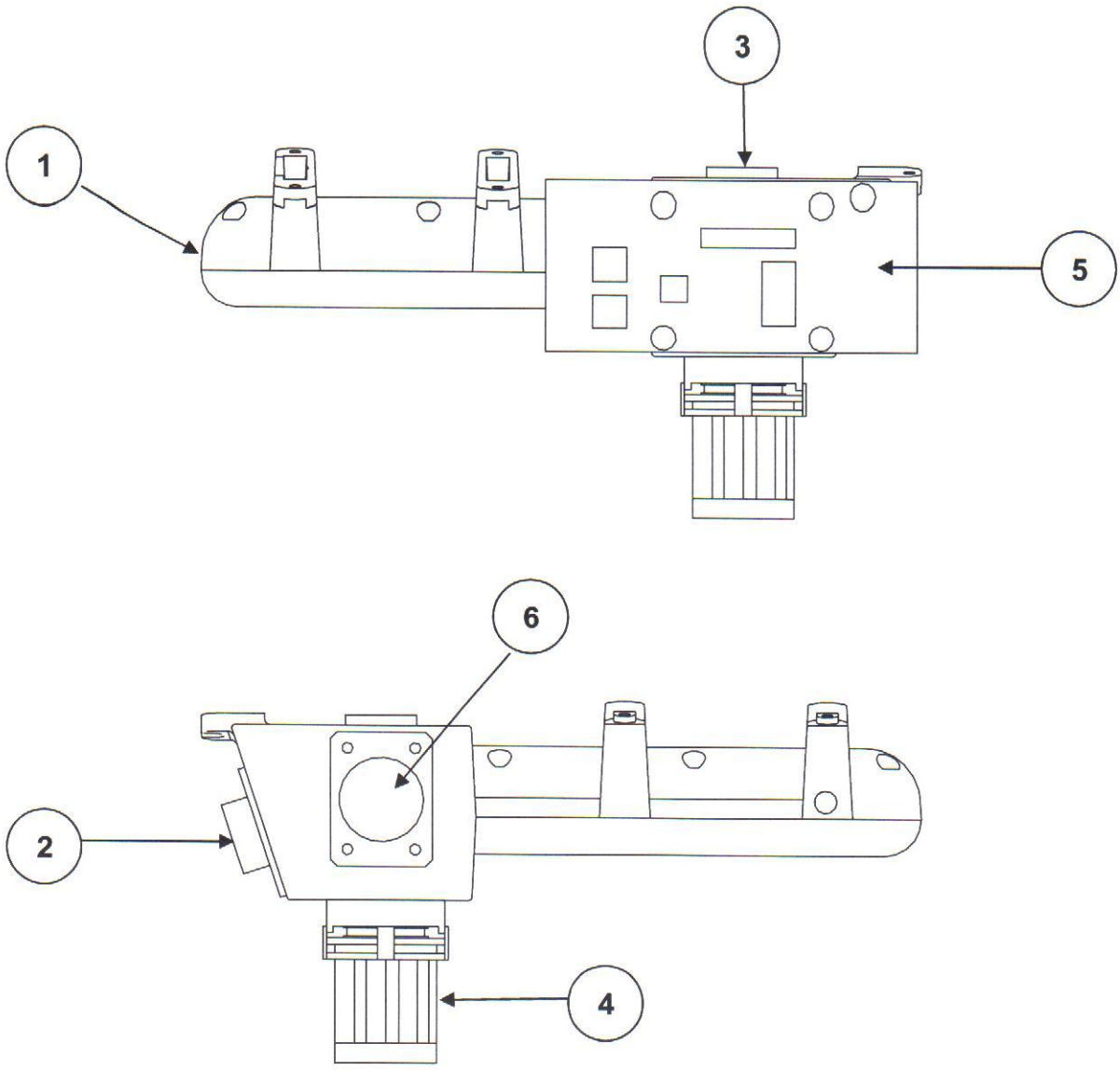
1 **Pipette button** – press to initiate aspiration or dispensing steps.

2 **Round 7-pin plug** – to connect the pipette to the analyser.

3 **Pipette tubing** – to supply onboard buffer to the pipette.

1.3 Internal components of the MININEPHPLUS

Fig 4. Optical block



1 **Laser** - light source emitting light at 670nm. This is a coherent light source meaning no lenses are required.

2 **Detector** - a photodiode that generates an electrical signal when it detects light. The output signal depends on the intensity if the light.

3 **Aluminium cuvette block** - houses the cuvette during the assay.

4 **Heater** - composed of a peltier device and fan. Heats the aluminium cuvette block to either 45°C or 30°C.

5 **Daughter PCB** - controls the components of the optical block, monitors temperature of the cuvette chamber and connects to main PCB. The daughter board houses two potentiometers for adjustment of the temperature of the aluminium cuvette block. Two potentiometers allow two temperatures to be set.

6 **Stirrer motor** - this is composed of a CD quality motor connected to a magnet. Rotation of the magnet results in the movement of the stirrer bar in the cuvette and thereby mixing the reaction solution at the start of an assay.

Main PCB. Houses the microcontroller chip upon which the software that drives the instrument is loaded. The main PCB also has connection sites for communication with, the optical block daughter board, syringe pump, fan, pipette, printer and barcode reader. The keypad and display are also housed on the main PCB.

Fig 5. Main PCB

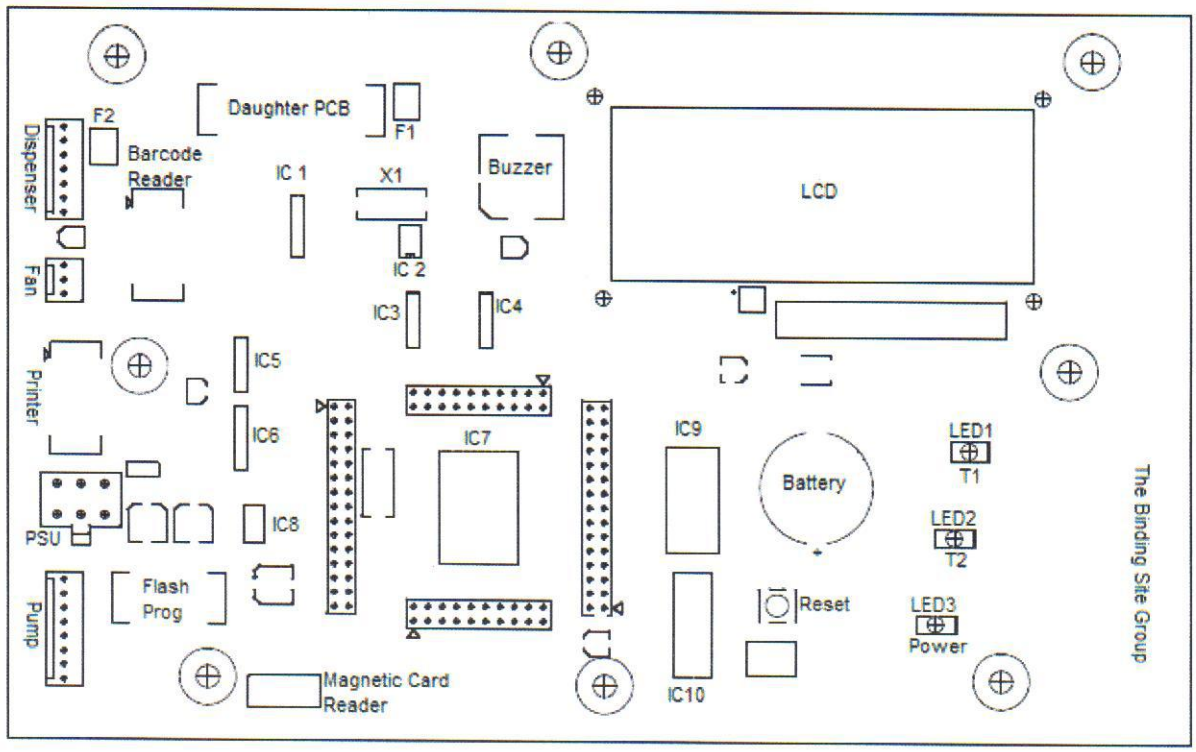
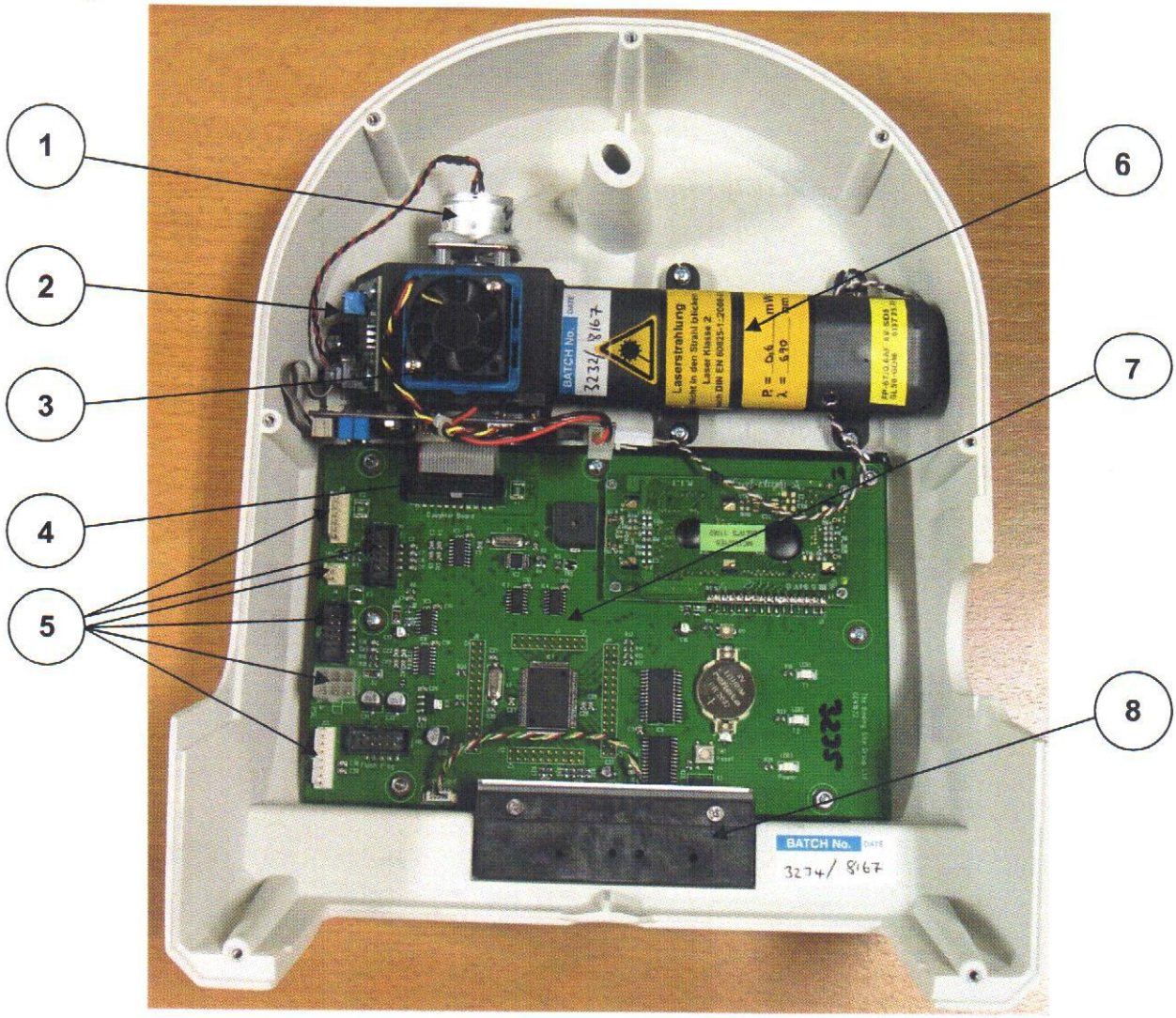


Fig 6. Lid



1 **Stirrer Motor** - mixes the reaction solution at the start of an assay.

2 **Detector PCB** - detects light scattered by the reaction mixture

3 **Cuvette chamber heater assembly** - composed of peltier device and fan.

4 **Connection point for optical block** (see Fig. 5)

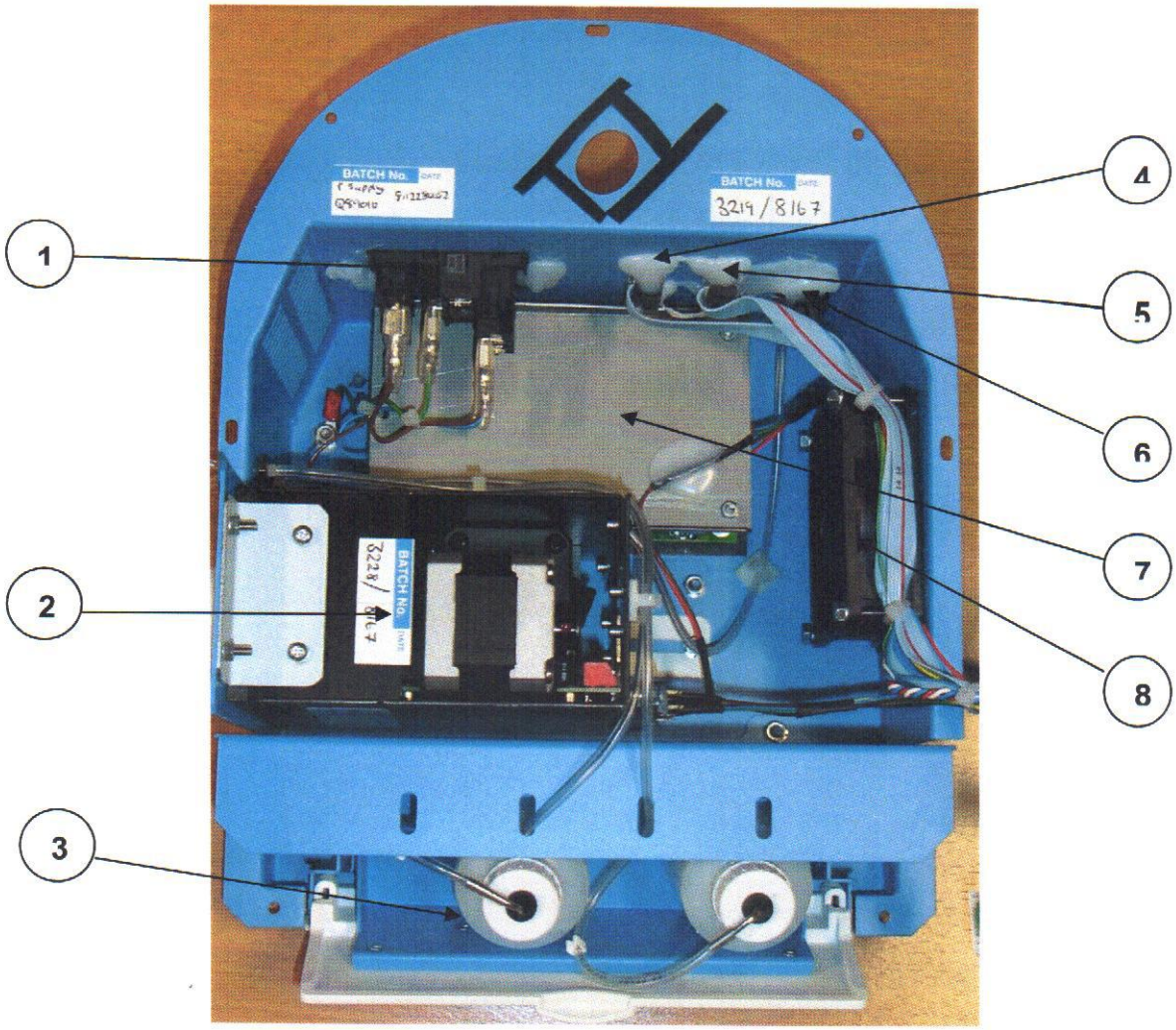
5 **Connection points for fan, pipette, barcode reader, printer and pump.**

6 **Optical block** (see Fig. 4)

7 **Main PCB** (see Fig. 5)

8 **Swipe card reader.** For input of curve parameters.

Fig 7 Base



1 **IEC power switch** (see Fig 2)

2 **Syringe pump** - operates the external syringe to move onboard buffer through the pipette and as well as aspirating and dispensing of reagents.

3 **Onboard buffer bottle** - contains SN107.

4 **Barcode reader** port - connects to barcode reader

5 **Printer port** - connects to printer.

6 **Pipette cable connector** - connects to pipette (see Fig 3).

7 **Power PCB cover and Power supply PCB** - allows the unit to run on voltages between 100 - 240V AC, 50/60Hz, 80VA.

8 **Fan** - maintains internal temperature of the analyser.

2 Caution

1. **Before starting any maintenance operations, the analyser should be switched off and disconnected from the power supply by unplugging the power cable.** Refer to the Diagnosis guide (section 4) if the MININEPHPLUS does not function correctly. If it is impossible to trace the fault, contact the supplier.

2. **Avoid spillage of liquids over the case.** Contamination by fluids can damage the optical system and create a shock hazard. If fluid is spilt over the analyser or into the cuvette chamber, switch off and wipe up excess fluid. Allow the analyser to dry completely before switching back on.

3. 

   Warning: While the MININEPHPLUS alone does not present a biohazard, the samples that are used and all parts and consumables in contact with the samples must be considered biohazardous. Appropriate precautions must be taken when working with biohazards. Always wear protective gloves when handling potentially infectious substances. Technicians must be trained in the safe handling and clean up of potential blood borne pathogens. Universal precautions, appropriate hygiene, and decontamination of surfaces are recommended. Consult the reagent kit insert for precautions on handling potentially hazardous substances.

4. **This equipment is earthed and insulated to ensure operator safety**. Before use, always check the condition of the power cable and the plug for wear or damage. The MININEPHPLUS should only be used with the supplied power cable.

5. This MININEPHPLUS is double pole fused. If the MININEPHPLUS fails to operate check both fuses.

6. This product should only be used by suitably trained persons for the purposes stated. Adherence to the given procedure is recommended. Standard laboratory practice should be used to ensure safety whilst handling potentially infectious agents.

7. Power supply voltage fluctuations should not exceed +/- 10% of the normal voltage.

8. Transient over-voltages should not exceed 1500V. Using the equipment at other voltages may cause damage or failure.

9. The precision of the assays performed will be dependent upon the use of well maintained and calibrated pipettes.

10. **Binding Site MININEPH cuvettes are designed for single use only.** Re-use will lead to false results.

11. If this MININEPHPLUS is not used in accordance with the operating conditions and instructions, electrical protection may be impaired.

12. **Performing procedures other than those described herein may result in hazardous radiation exposure.**

Warning Label

Example

13. **DO NOT PERFORM AN ASSAY IF THE LOT NUMBER OF THE REAGENT IS DIFFERENT TO THAT OF THE CURVE PARAMETERS.**

3 Maintenance

3.1 Cleaning

The equipment should be disconnected from the power supply and carefully wiped with a damp cloth. Avoid spilling fluids into the cuvette chamber. Always allow the equipment to dry before use.

Leaving an empty cuvette in the chamber when the analyser is not in use will help to prevent dust and airborne contamination from entering.

The tubing maybe cleaned by flushing with distilled water. This should be performed if the analyser is to be left unused for 48 hours or more.

1. Ensure the waste pot is empty.
2. Fill an on board buffer bottle with distilled water.
3. Attach the bottle to buffer line B.
4. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2.
5. At the "Prime?" prompt select 'Yes'. The analyser will complete one priming cycle with the water.
6. When the prime has completed remove the bottle and prime the analyser twice with air to remove all liquid from the tubing.

3.2 Changing fuses

Material/Equipment required but not supplied.

- 2x 800mA fuses (order code AD500.1).

1. Disconnect the MININEPHPLUS from the power supply.
2. Pull out the fuse holder (see Fig 2).
3. Pull the two old fuses out of the fuse holder.
4. Insert two new 800mA fuses (order code AD500.1).
5. Push the fuse holder back into its fitting.

3.3 Scatter calibration check

Material/Equipment required but not supplied.

- MININEPH scatter standard (order code AD230).

1. Set the analyser to UPC mode 10, seconds blank, 10 seconds read and T1.
2. Enter a sample ID then, when prompted place the cuvette in the cuvette chamber (do not add a stirrer bar to the cuvette).
3. When the 'Supplementary' prompt is displayed press the pipette button once.
4. When the 'Air gap' prompt is displayed press the pipette button once.
5. When prompted to 'Aspirate reagent' press the pipette button once.
6. When prompted to 'Add reagent' press the pipette button once.
7. The display will change to 'Blanking'.
8. At the end of the blank time add 10 drops of the scatter standard to a cuvette.
9. At the end of the read time compare the value of the delta with the values on the scatter standard label. The result should fall within the acceptable range shown on the label.
10. If the result falls outside of the acceptable range the scatter calibration may require adjustment (see section 6.1).

3.4 Temperature calibration check

The MININEPHPLUS is able to operate at two temperature settings:

- At T1 the cuvette chamber is set to 30°C and the pipette temperature to 23°C.
- At T2 the cuvette chamber and pipette temperatures are both set to 45°C.

3.4.1 Cuvette chamber

1. Turn on the instrument.
2. Set instrument in UPC mode, 5 seconds blank, 5 seconds read and select either T1 (30°C) or T2 (45°C) as appropriate.
3. Allow the temperature of the unit to stabilise for 30 minutes.

4. Add 400µl of room temperature (21-23°C) water to a cuvette (do not add a stirrer bar).

5. Place the cuvette in the cuvette chamber and time 3 minutes for T1 or 10 minutes for T2.

6. After 3 minutes for T1 and 10 minutes for T2 measure the temperature of the water using a suitable K-type thermocouple digital thermometer.
    a. At T1 the cuvette chamber should be 30°C ± 0.4°C.
    b. At T2 the cuvette chamber should be 45°C ± 0.3°C

7. If the analyser fails this test the temperature will need recalibration as described in section 6.2.

3.4.2 Pipette

It is not possible to check the temperature of the pipette. Satisfactory results in the tests performed in section 3.5, demonstrates that the calibration of the analyser is acceptable. If either of the tests in section 3.5 fail but the scatter (see section 3.3) and cuvette chamber temperatures (see section 3.4.1) are within range may suggest an issue with the temperature calibration of the pipette. Return instrument to supplier for recalibration.

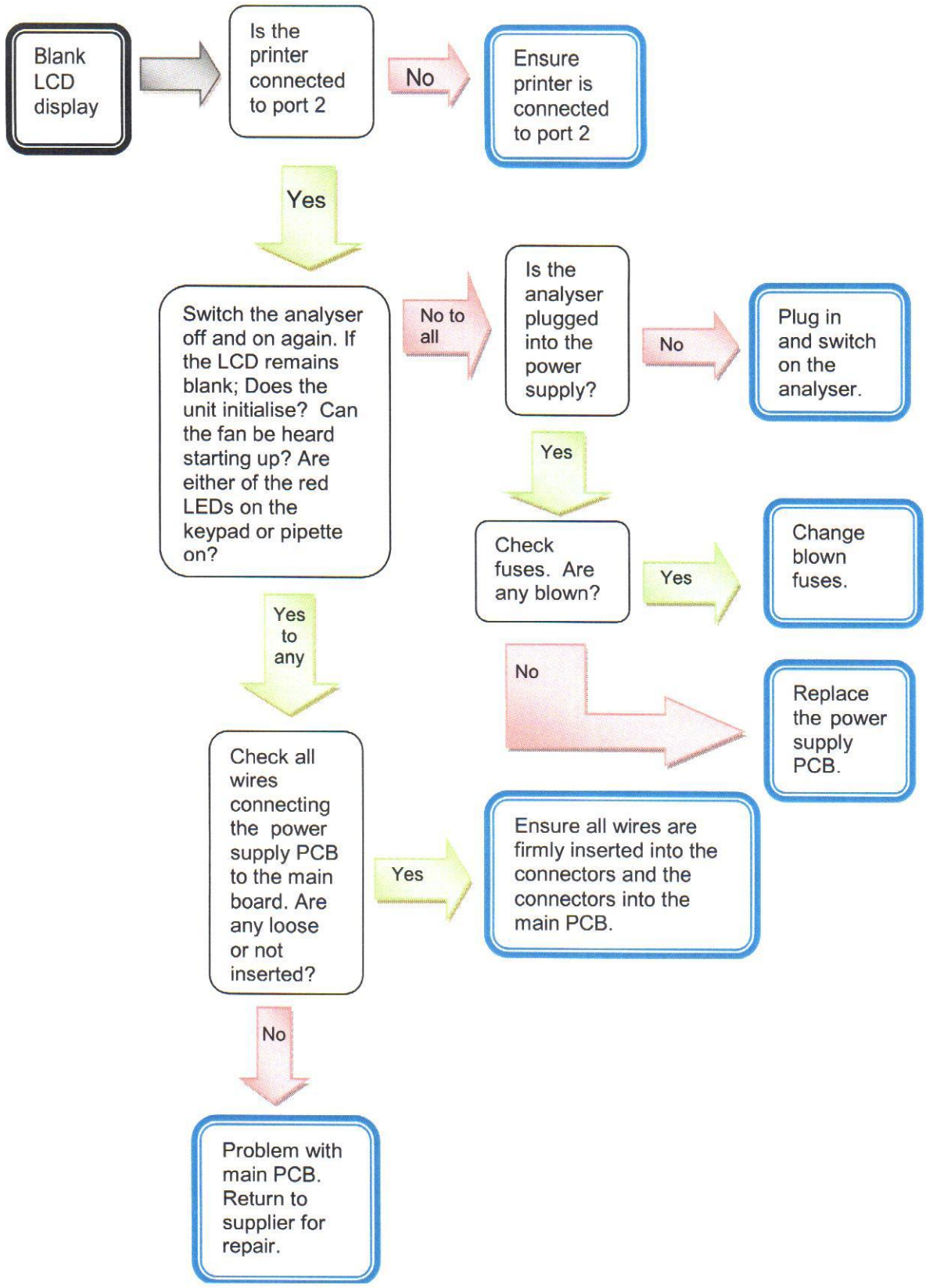
3.5 Calibration testing

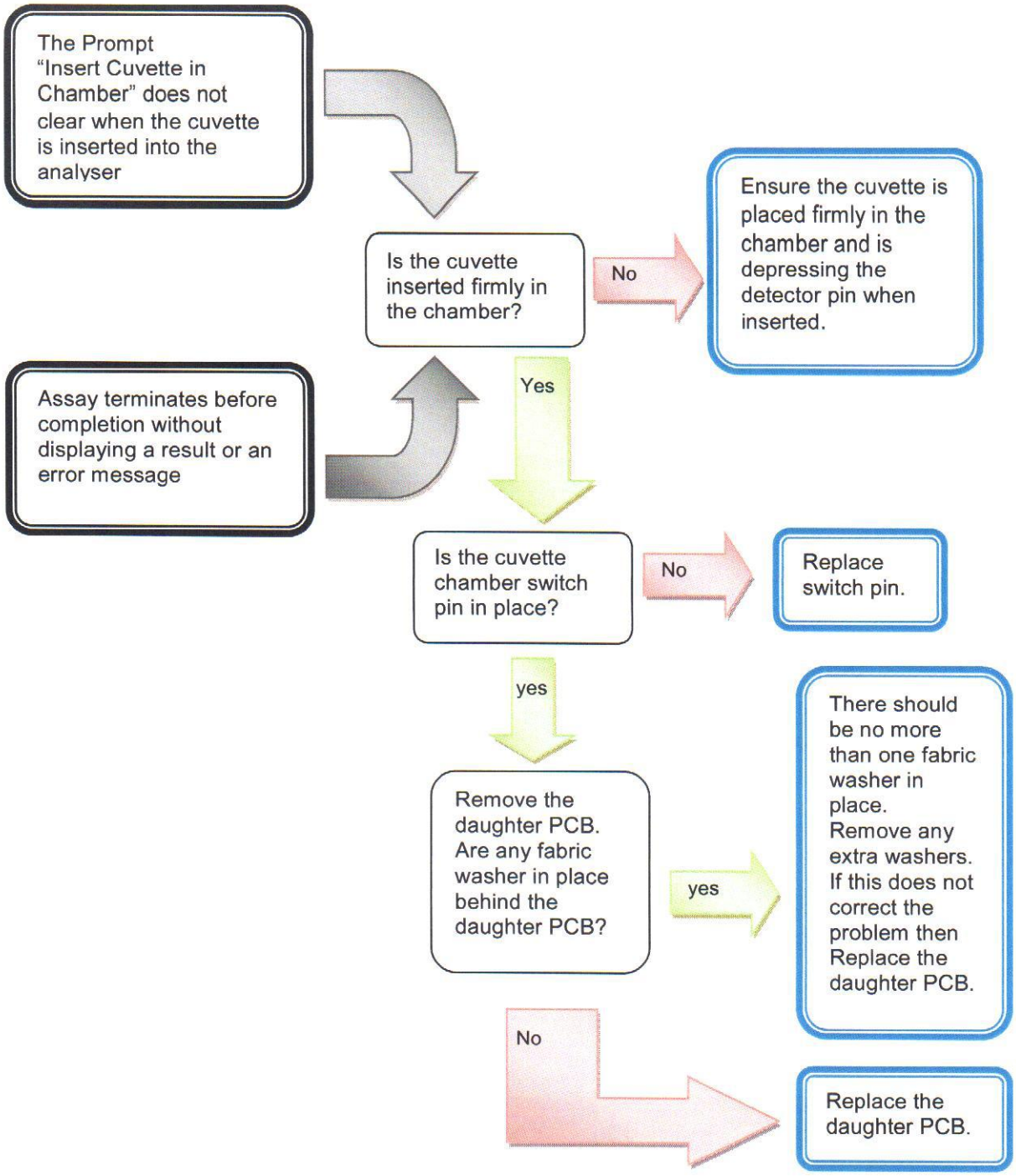
Material/Equipment required but not supplied.

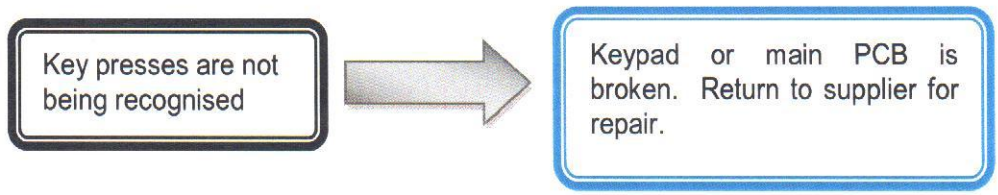
- ZK044.L.R MININEPH Human CRP (latex) kit
- VK016 MININEPHPLUS **Freelite** Human Kappa Free Kit

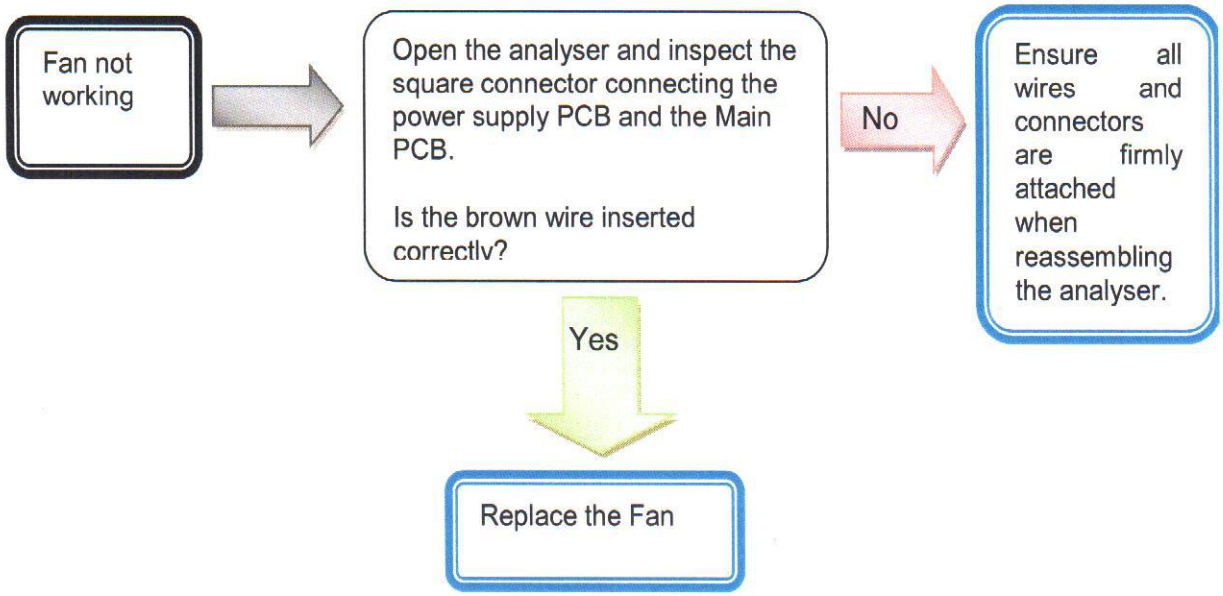
To ensure that the instrument is functioning correctly and still within calibration perform duplicate control assays on the high and low controls using an in date batch of CRP and **Freelite** kappa kits. Results should fall within the control ranges stated in the kits QC certificates. Instruments not achieving this standard will require recalibration (see section 6). If after recalibration these assays still fail, return to supplier.

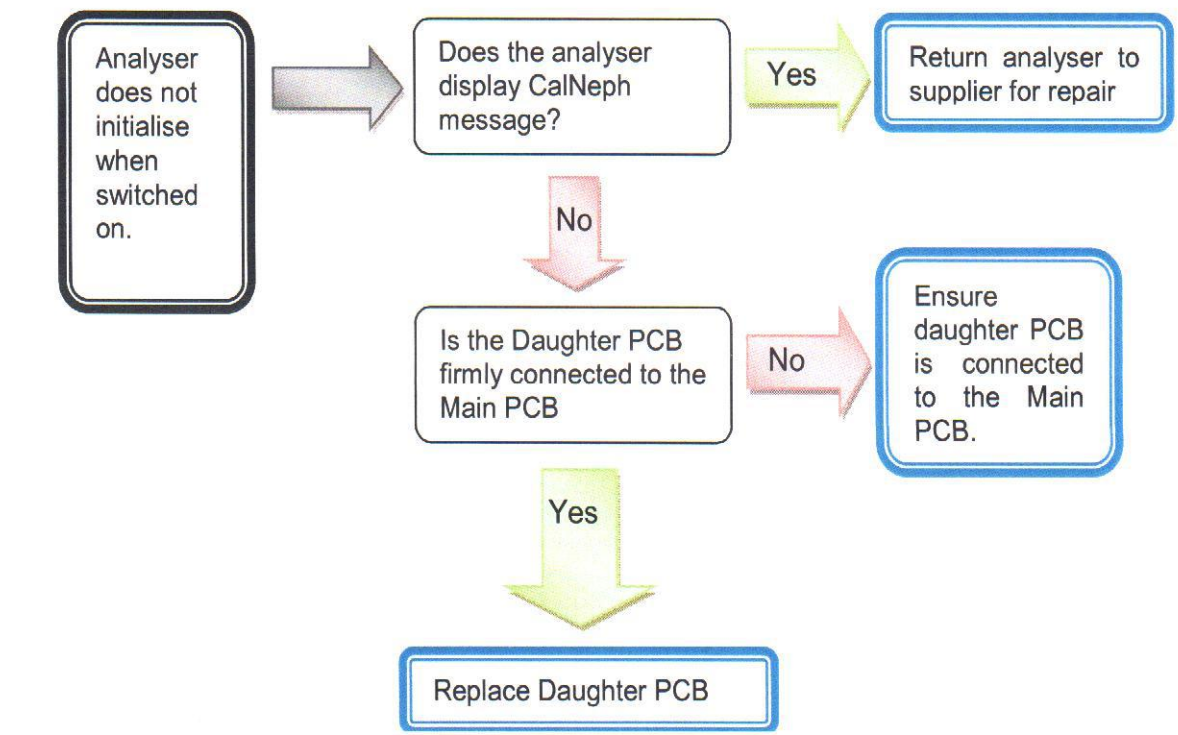
4 Diagnosis

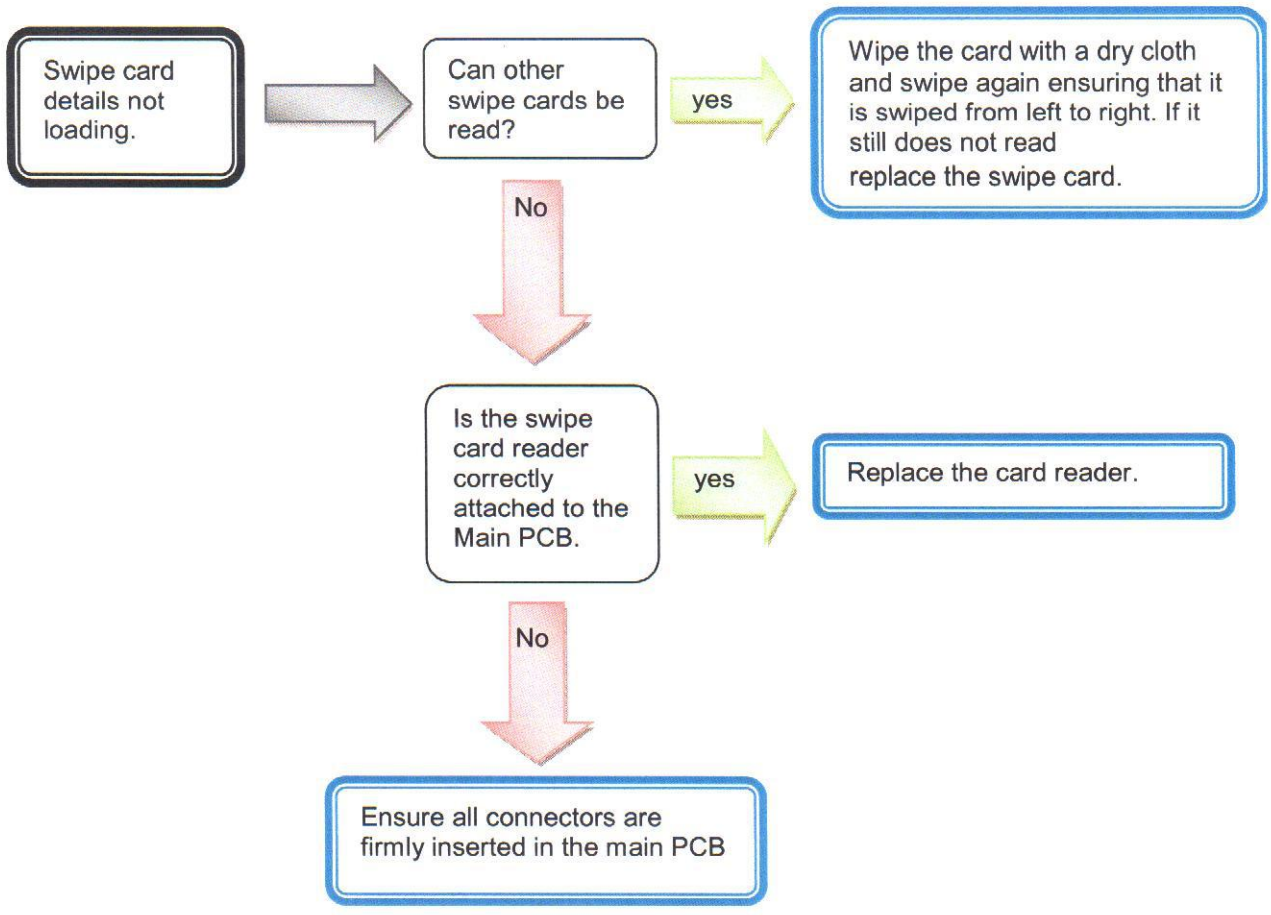

Blank LCD display
Is the printer connected to port 2
No
Ensure printer is connected to port 2
Yes
Switch the analyser off and on again. If the LCD remains blank; Does the unit initialise? Can the fan be heard starting up? Are either of the red LEDs on the keypad or pipette on?
No to all
Is the analyser plugged into the power supply?
No
Plug in and switch on the analyser.
Yes
Check fuses. Are any blown?
Yes
Change blown fuses.
No
Replace the power supply PCB.
Yes to any
Check all wires connecting the power supply PCB to the main board. Are any loose or not inserted?
Yes
Ensure all wires are firmly inserted into the connectors and the connectors into the main PCB.
No
Problem with main PCB. Return to supplier for repair.

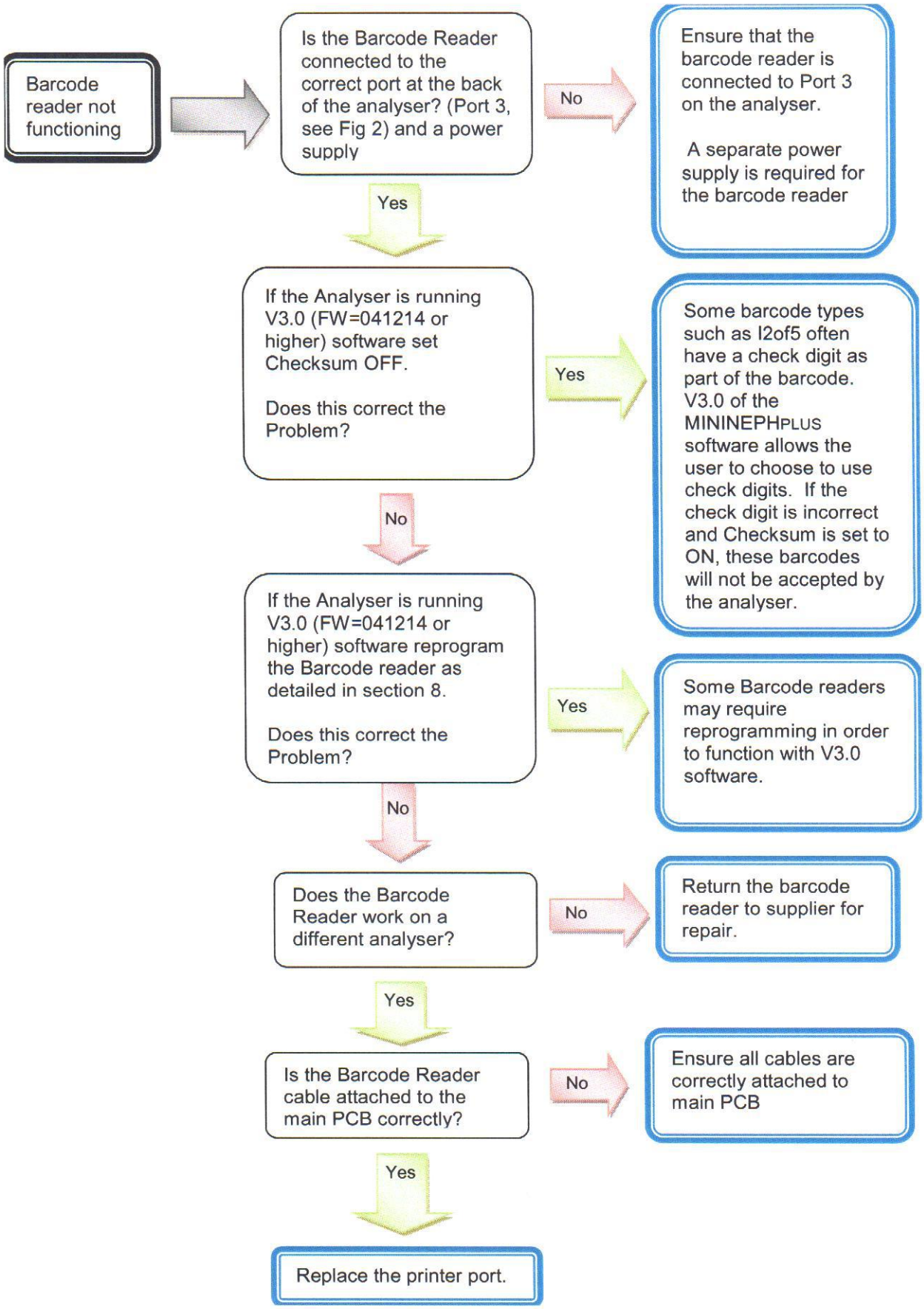

The Prompt "Insert Cuvette in Chamber" does not clear when the cuvette is inserted into the analyser
Is the cuvette inserted firmly in the chamber?
No
Ensure the cuvette is placed firmly in the chamber and is depressing the detector pin when inserted.
Assay terminates before completion without displaying a result or an error message
Yes
Is the cuvette chamber switch pin in place?
No
Replace switch pin.
yes
Remove the daughter PCB. Are any fabric washer in place behind the daughter PCB?
yes
There should be no more than one fabric washer in place. Remove any extra washers. If this does not correct the problem then Replace the daughter PCB.
No
Replace the daughter PCB.

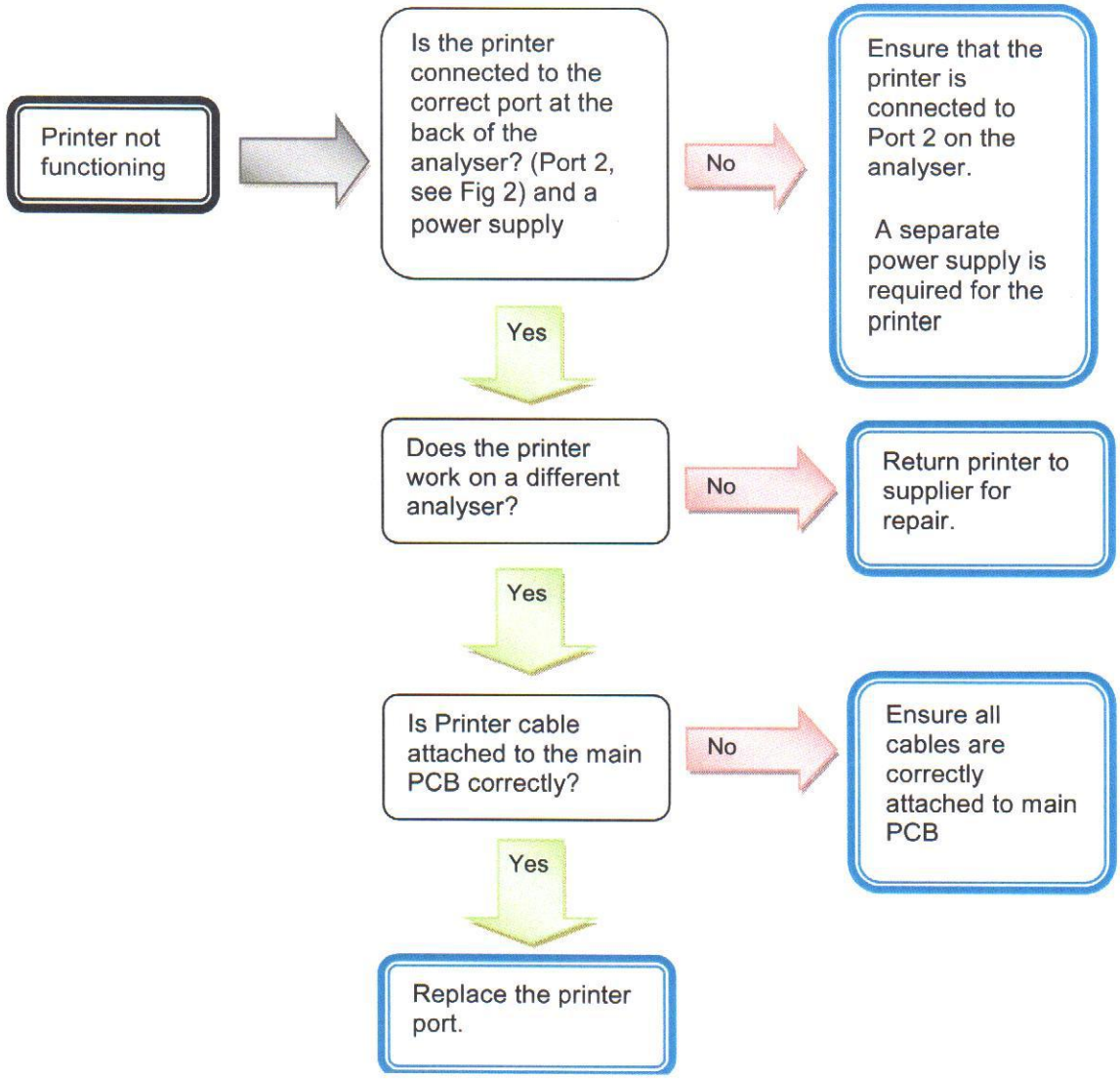

Key presses are not being recognised
Keypad or main PCB is broken. Return to supplier for repair.

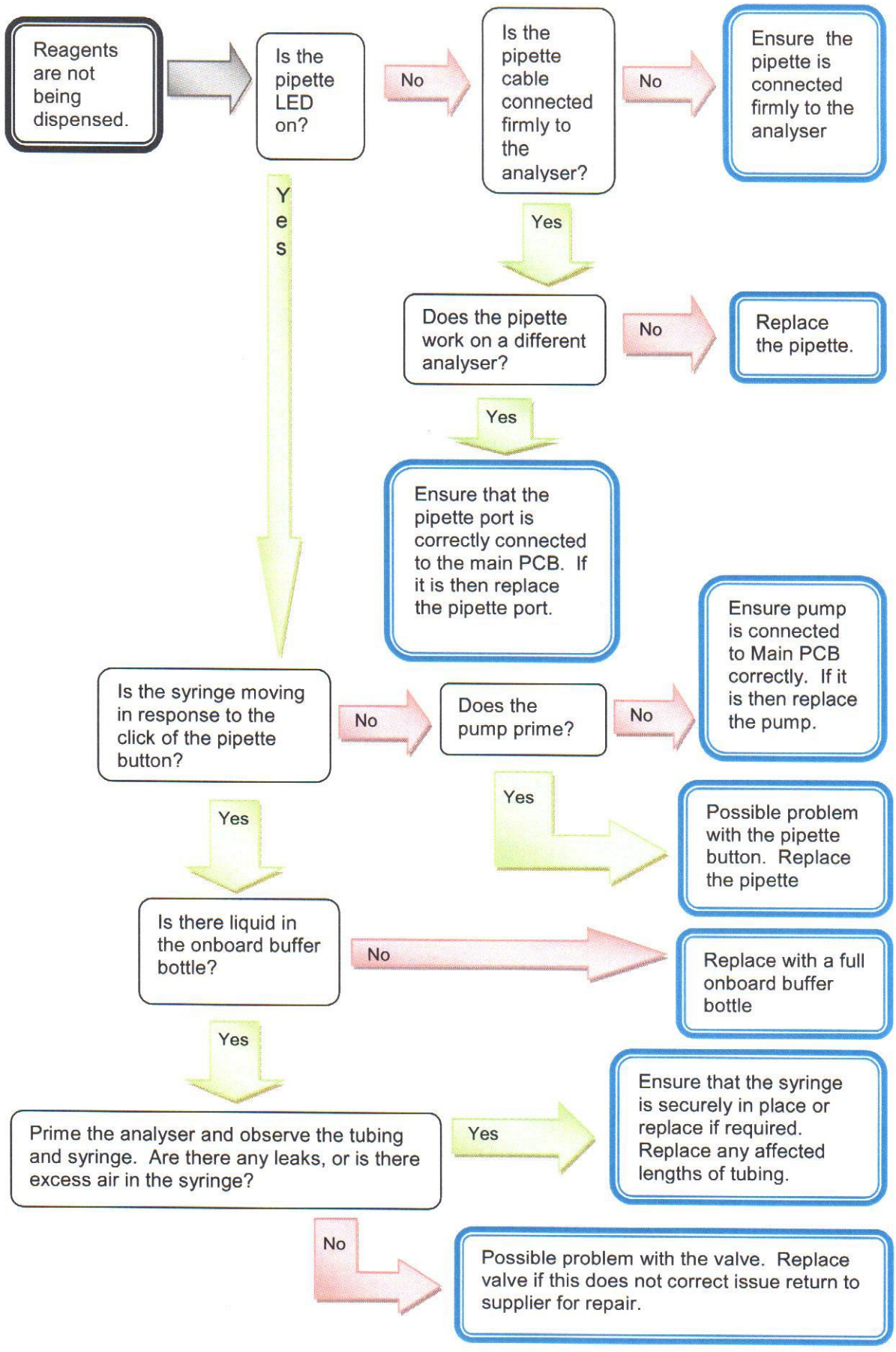

Fan not working
Open the analyser and inspect the square connector connecting the power supply PCB and the Main PCB.
Is the brown wire inserted correctly?
No
Ensure all wires and connectors are firmly attached when reassembling the analyser.
Yes
Replace the Fan

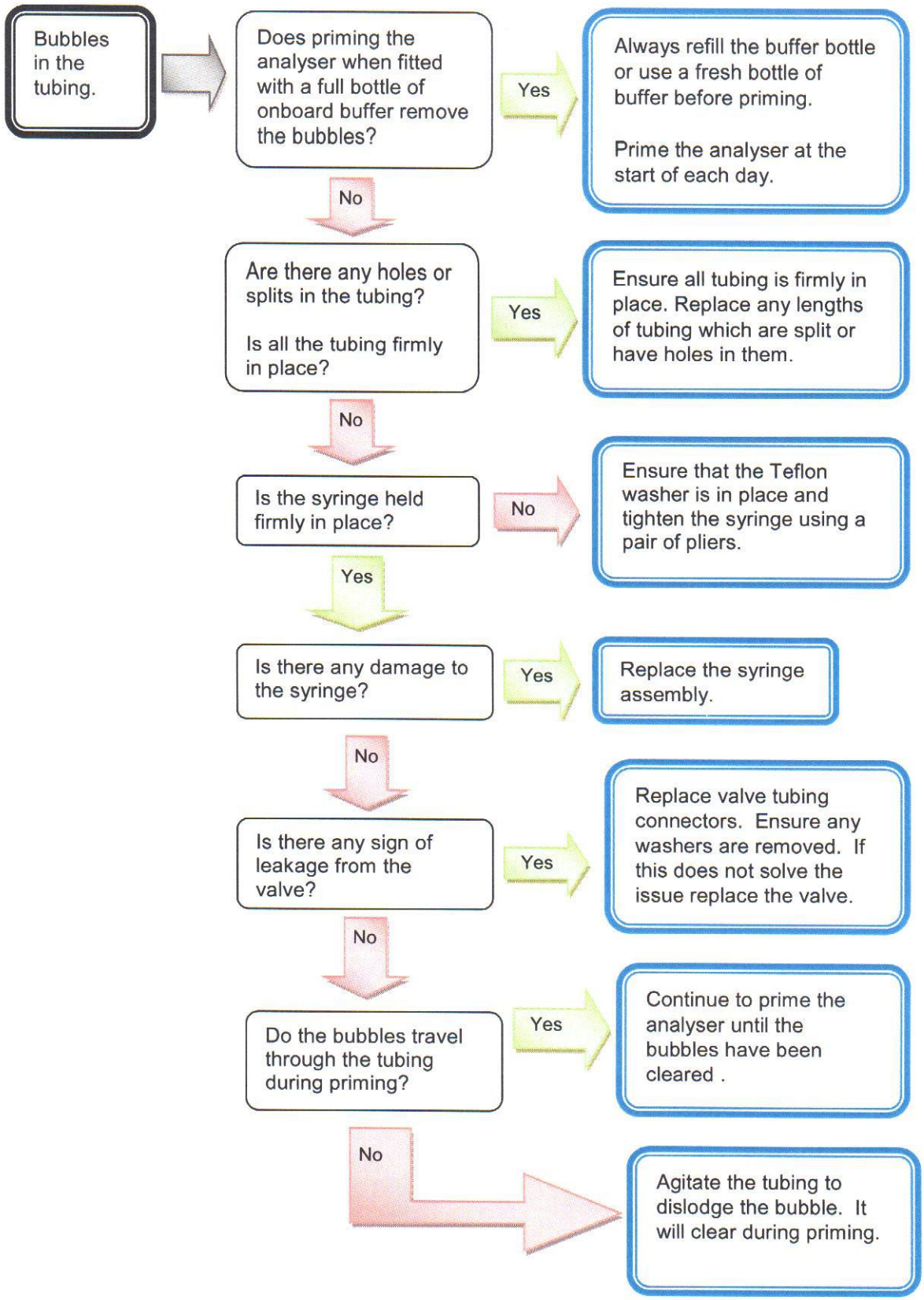

Analyser does not initialise when switched on.
Does the analyser display CalNeph message?
Yes
Return analyser to supplier for repair
No
Is the Daughter PCB firmly connected to the Main PCB
No
Ensure daughter PCB is connected to the Main PCB.
Yes
Replace Daughter PCB

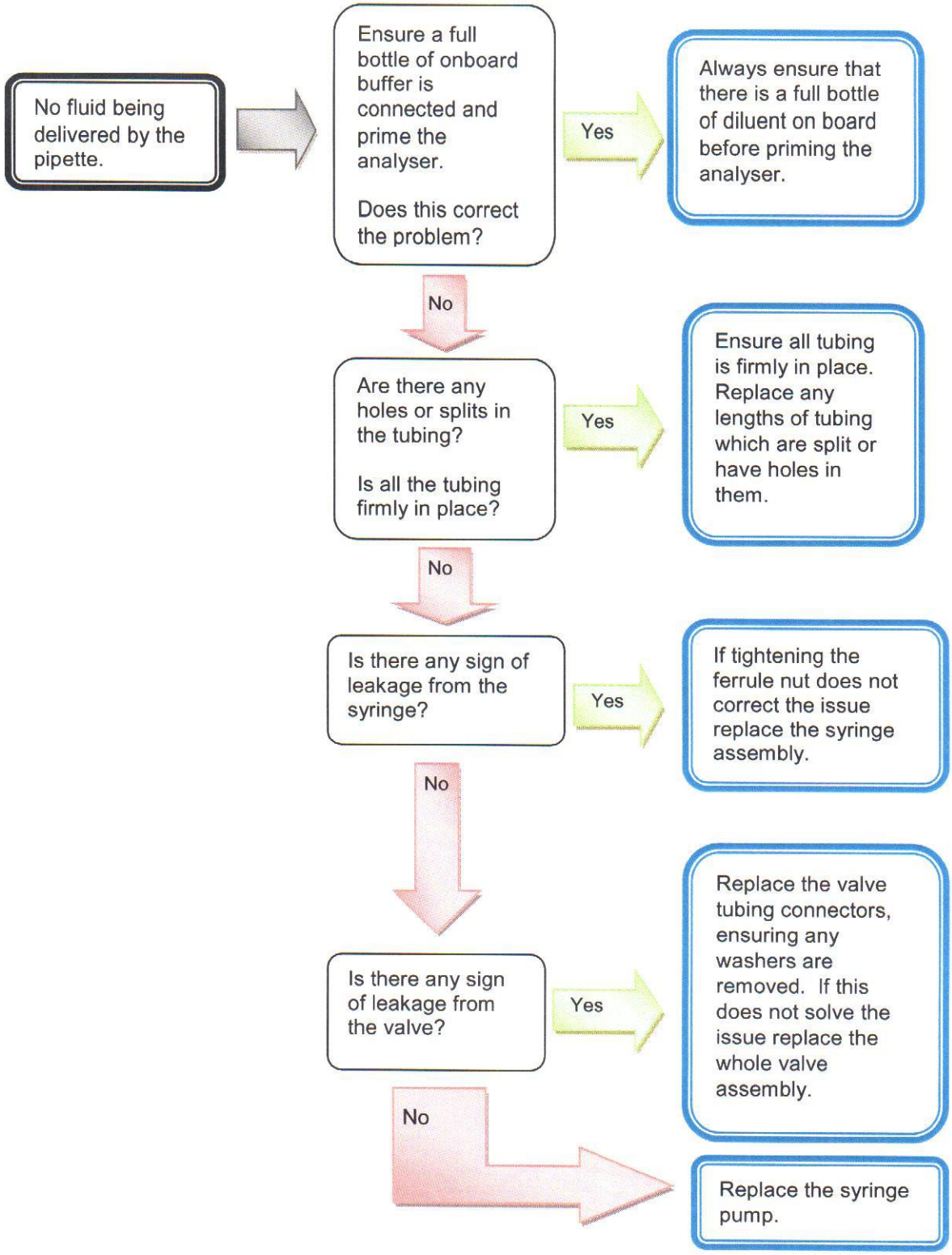

Swipe card details not loading.
Can other swipe cards be read?
yes
Wipe the card with a dry cloth and swipe again ensuring that it is swiped from left to right. If it still does not read replace the swipe card.
No
Is the swipe card reader correctly attached to the Main PCB.
yes
Replace the card reader.
No
Ensure all connectors are firmly inserted in the main PCB

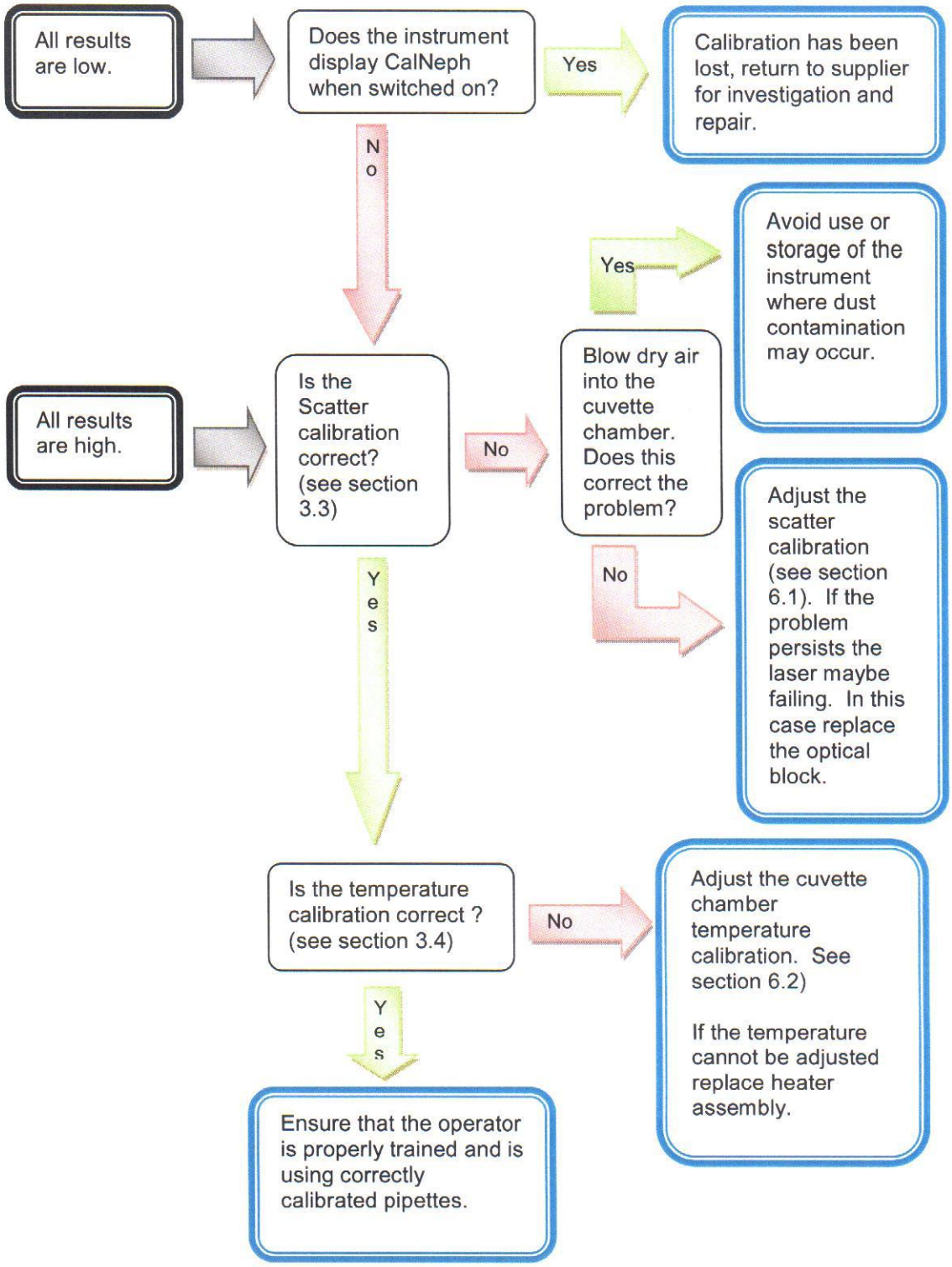

Barcode reader not functioning
Is the Barcode Reader connected to the correct port at the back of the analyser? (Port 3, see Fig 2) and a power supply
No
Ensure that the barcode reader is connected to Port 3 on the analyser.
A separate power supply is required for the barcode reader
Yes
If the Analyser is running V3.0 (FW=041214 or higher) software set Checksum OFF.
Does this correct the Problem?
Yes
Some barcode types such as I2of5 often have a check digit as part of the barcode. V3.0 of the MININEPHPLUS software allows the user to choose to use check digits. If the check digit is incorrect and Checksum is set to ON, these barcodes will not be accepted by the analyser.
No
If the Analyser is running V3.0 (FW=041214 or higher) software reprogram the Barcode reader as detailed in section 8.
Does this correct the Problem?
Yes
Some Barcode readers may require reprogramming in order to function with V3.0 software.
No
Does the Barcode Reader work on a different analyser?
No
Return the barcode reader to supplier for repair.
Yes
Is the Barcode Reader cable attached to the main PCB correctly?
No
Ensure all cables are correctly attached to main PCB
Yes
Replace the printer port.

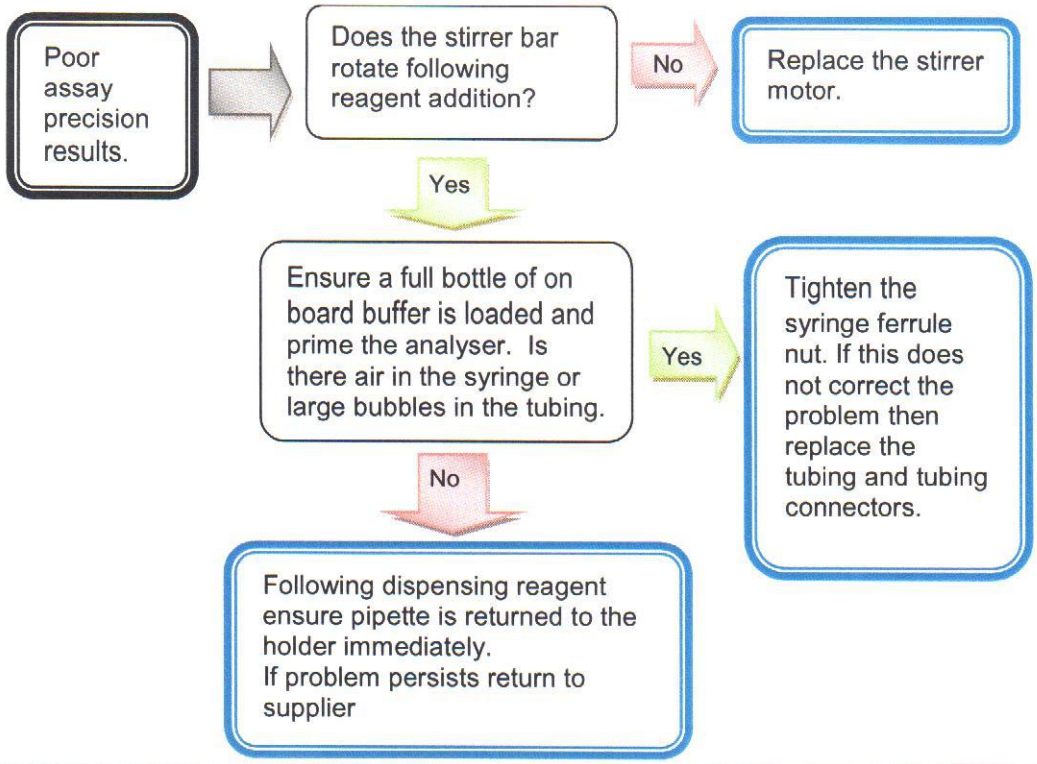

Printer not functioning
Is the printer connected to the correct port at the back of the analyser? (Port 2, see Fig 2) and a power supply
No
Ensure that the printer is connected to Port 2 on the analyser.
A separate power supply is required for the printer
Yes
Does the printer work on a different analyser?
No
Return printer to supplier for repair.
Yes
Is Printer cable attached to the main PCB correctly?
No
Ensure all cables are correctly attached to main PCB
Yes
Replace the printer port.

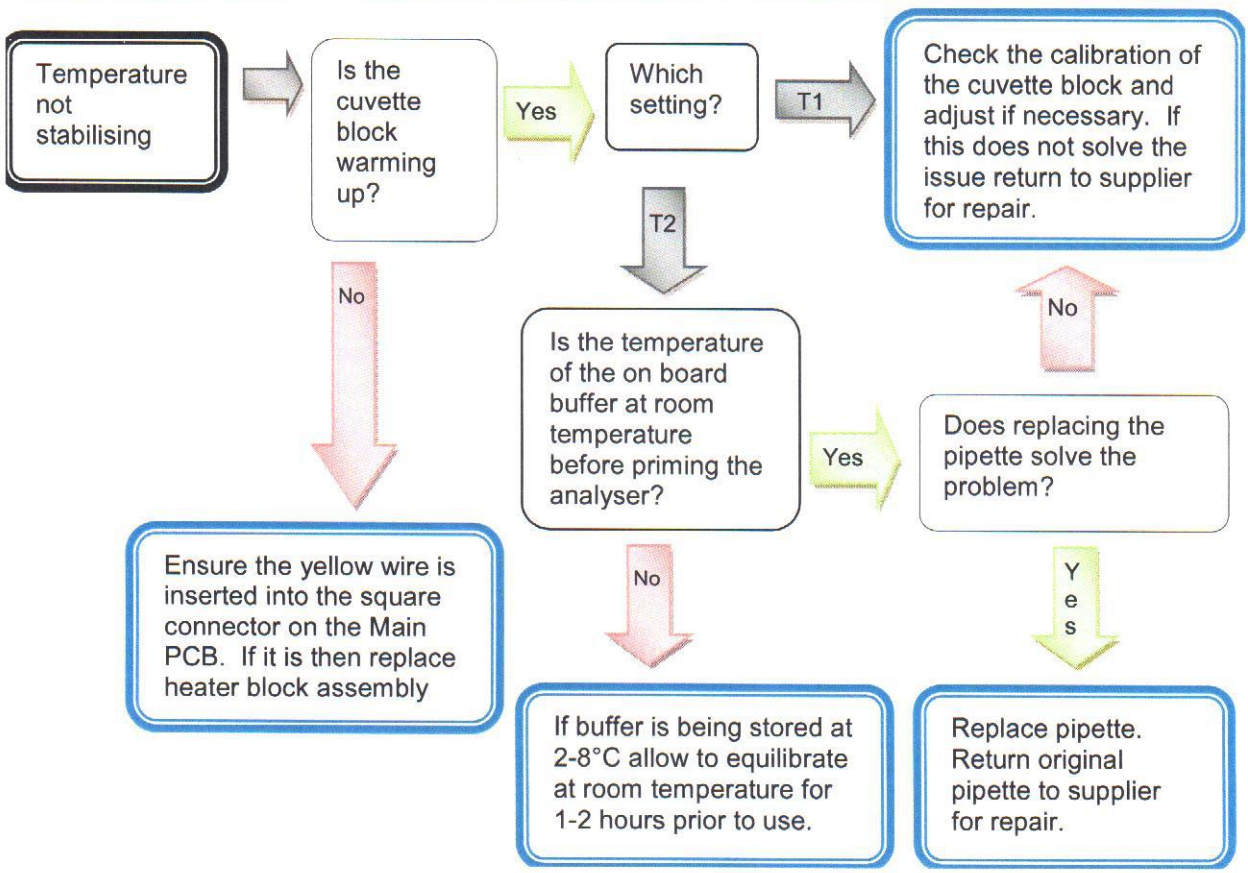

Reagents are not being dispensed.
Is the pipette LED on?
No
Is the pipette cable connected firmly to the analyser?
No
Ensure the pipette is connected firmly to the analyser
Yes
Yes
Does the pipette work on a different analyser?
No
Replace the pipette.
Yes
Ensure that the pipette port is correctly connected to the main PCB. If it is then replace the pipette port.
Is the syringe moving in response to the click of the pipette button?
No
Does the pump prime?
No
Ensure pump is connected to Main PCB correctly. If it is then replace the pump.
Yes
Yes
Possible problem with the pipette button. Replace the pipette
Is there liquid in the onboard buffer bottle?
No
Replace with a full onboard buffer bottle
Yes
Prime the analyser and observe the tubing and syringe. Are there any leaks, or is there excess air in the syringe?
Yes
Ensure that the syringe is securely in place or replace if required. Replace any affected lengths of tubing.
No
Possible problem with the valve. Replace valve if this does not correct issue return to supplier for repair.


Bubbles in the tubing.
Does priming the analyser when fitted with a full bottle of onboard buffer remove the bubbles?
Yes
Always refill the buffer bottle or use a fresh bottle of buffer before priming.
Prime the analyser at the start of each day.
No
Are there any holes or splits in the tubing?
Is all the tubing firmly in place?
Yes
Ensure all tubing is firmly in place. Replace any lengths of tubing which are split or have holes in them.
No
Is the syringe held firmly in place?
No
Ensure that the Teflon washer is in place and tighten the syringe using a pair of pliers.
Yes
Is there any damage to the syringe?
Yes
Replace the syringe assembly.
No
Is there any sign of leakage from the valve?
Yes
Replace valve tubing connectors. Ensure any washers are removed. If this does not solve the issue replace the valve.
No
Do the bubbles travel through the tubing during priming?
Yes
Continue to prime the analyser until the bubbles have been cleared .
No
Agitate the tubing to dislodge the bubble. It will clear during priming.


No fluid being delivered by the pipette.
Ensure a full bottle of onboard buffer is connected and prime the analyser.
Does this correct the problem?
Yes
Always ensure that there is a full bottle of diluent on board before priming the analyser.
No
Are there any holes or splits in the tubing?
Is all the tubing firmly in place?
Yes
Ensure all tubing is firmly in place. Replace any lengths of tubing which are split or have holes in them.
No
Is there any sign of leakage from the syringe?
Yes
If tightening the ferrule nut does not correct the issue replace the syringe assembly.
No
Is there any sign of leakage from the valve?
Yes
Replace the valve tubing connectors, ensuring any washers are removed. If this does not solve the issue replace the whole valve assembly.
No
Replace the syringe pump.


All results are low.
Does the instrument display CalNeph when switched on?
Yes
Calibration has been lost, return to supplier for investigation and repair.
No
Yes
Avoid use or storage of the instrument where dust contamination may occur.
All results are high.
Is the Scatter calibration correct? (see section 3.3)
No
Blow dry air into the cuvette chamber. Does this correct the problem?
No
Adjust the scatter calibration (see section 6.1). If the problem persists the laser maybe failing. In this case replace the optical block.
Yes
Is the temperature calibration correct ? (see section 3.4)
No
Adjust the cuvette chamber temperature calibration. See section 6.2)
If the temperature cannot be adjusted replace heater assembly.
Yes
Ensure that the operator is properly trained and is using correctly calibrated pipettes.


Poor assay precision results.
Does the stirrer bar rotate following reagent addition?
No
Replace the stirrer motor.
Yes
Ensure a full bottle of on board buffer is loaded and prime the analyser. Is there air in the syringe or large bubbles in the tubing.
Yes
Tighten the syringe ferrule nut. If this does not correct the problem then replace the tubing and tubing connectors.
No
Following dispensing reagent ensure pipette is returned to the holder immediately.
If problem persists return to supplier


Temperature not stabilising
Is the cuvette block warming up?
Yes
Which setting?
T1
Check the calibration of the cuvette block and adjust if necessary. If this does not solve the issue return to supplier for repair.
T2
No
No
Is the temperature of the on board buffer at room temperature before priming the analyser?
Yes
Does replacing the pipette solve the problem?
Ensure the yellow wire is inserted into the square connector on the Main PCB. If it is then replace heater block assembly
No
Yes
If buffer is being stored at 2-8°C allow to equilibrate at room temperature for 1-2 hours prior to use.
Replace pipette. Return original pipette to supplier for repair.

5 Procedures

5.1 Replacing swipe card reader

Material/Equipment required but not supplied;

- AD500.SP1: Swipe Card Reader
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and disconnect the power cable, pipette, and if attached the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Locate and disconnect the connector connecting the swipe card reader to the main PCB (see Fig 5).

6. Unscrew the two fixing screws holding the card reader in place (**Note:** The card reader is held in place by two screws and two nuts on the underside of the bracket).

7. Lift the old card reader out of the bracket and fit the replacement reader with the head facing the top of the machine and ensuring that the wire is fed through the bracket.

8. Secure the replacement card reader in place with the two screws and nuts.

9. Connect the molex connector to the main PCB. The black wire should be closest to the card reader.

10. Ensure the other cables are secure and have not been disconnected before placing the lid back onto the base.

11. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws. Reconnect the power cable, pipette and if required the barcode reader and printer.

12. Switch on the analyser. Enter the chemistry number of an assay. When prompted to confirm the lot number of the assay select 2 (No). At the prompt "Swipe Chemistry Card" swipe the card. If the card reader is working correctly the lot number confirmation prompt will be displayed. Press the Enter key and confirm that the card details are correctly displayed. (If possible, use a swipe card that the analyser has not read before).

13. Replace the onboard buffer bottle, waste pot and waste pot holder.

14. Test the calibration of the instrument as described in section 3.5.

5.2 Replacing barcode code reader or printer port

Material/Equipment required but not supplied;

- AD500.SP2: Printer/BCR Port
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and disconnect the power cable, pipette, barcode reader and printer.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Disconnect the connectors of the fan, pump, pipette, barcode reader and printer from the main PCB (see Fig 5). Move the lid to one side.

6. Snip the ties holding the cables together and to the top of the fan being careful not to cut any wires.

7. Unscrew the two retaining screws securing the port to be replaced to the rear of the base (see Fig 2 for port positions). The nuts maybe secured with low melt glue. If so peel off the glue before unscrewing.

8. Remove the port cable.

9. Position the replacement and fix in place with the retaining screws and nuts.

10. Secure the cables together and to the top of the fan with cable ties and snip off the ends.

11. Plug the connectors for the fan, pump, pipette, barcode reader and printer into the main PCB (see Fig 5 for correct positioning).

12. Replace the lid on the base and carefully turn the instrument over. Secure the lid to the base with the seven enclosure screws and shake proof washers.

13. Plug a barcode reader into the barcode reader port and a printer into the printer port. Connect the power cable and pipette.

14. Perform a dummy assay. When prompted to 'Enter sample ID' scan a test barcode. If the barcode reader port is functioning correctly the barcode will be displayed by the instrument. If the printer is functioning correctly the sample ID/ barcode will be printed out along with the result at the end of the test.

15. Replace the onboard buffer bottle, waste pot and waste pot holder.

16. Test the calibration of the instrument as described in section 3.5.

5.3 Replacing the pipette connector port

Material/Equipment required but not supplied;

- AD500.SP3: Pipette Connector Port
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and disconnect the power cable, pipette and if attached the barcode reader and printer from the instrument.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Snip the cable ties holding the cables together and to the top of the fan assembly.

6. Disconnect the connectors of the fan, pump, pipette, barcode reader and printer from the main PCB (see Fig 5). Move the lid to one side.

7. The pipette port maybe secured with low melt glue. If so peel off the glue.

8. Unscrew the silver ring at the back of the pipette port and pass over the molex connector. There are two small notches on the ring. A small flat blade screwdriver maybe used to loosen the ring.

9. Remove the port cable.

10. Unscrew the silver securing ring from the back of the replacement port.

11. Feed the replacement port cable through hole 1 on the rear of the unit. Position the port so that the notch on the port fits into the notch on the enclosure.

12. Feed the silver securing ring back onto the connector cable and screw it into position at the back of the port to hold the port in place. There are two small notches in the silver ring. These should be positioned facing into the instrument. A small flat blade screw driver maybe used to tighten the ring in place.

13. Secure the cables together and to the top of the fan using cables ties.

14. Connect the fan, barcode reader, printer and replacement pipette ports cables to the main PCB. Place the lid back onto the base.

15. Carefully turn instrument over and secure the lid to the base with the seven enclosure screws and shake proof washers.

16. Replace the onboard buffer bottle, waste pot and waste pot holder.

17. Reconnect the power cable, pipette and if in use the printer and barcode reader. Switch on the analyser the red LED on the pipette should come on.

18. Perform an assay in both T1 and T2 to ensure that the main unit is communicating with the pipette.

19. Test the calibration of the instrument as described in section 3.5.

5.4 Replacing tubing and tubing connectors

5.4.1 Replacing external tubing

Material/Equipment required but not supplied;

- AD500.6: Tubing Pack
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read, T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument.

2. Switch off the instrument and disconnect the power cable.

3. Pull the length of tubing from the connectors at both ends and discard it.

4. Push the new length of tubing onto the connectors ensuring a watertight fit.

5. Replace the onboard buffer bottle ensuring that it is full. Ensure that a waste pot and waste pot holder are in place.

6. Reconnect the power cable and switch on the instrument.

7. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for any leaks.

8. Test the calibration of the instrument as described in section 3.5.

Note: The tubing maybe trimmed by 1-2cm using a sharp pair of scissors should a small hole occur near the end of the tube.

5.4.2 Replacing internal tubing

Material/Equipment required but not supplied;

- AD500.6: Tubing Pack
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and disconnect the power cable, pipette and if connected the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down next to the base taking care not to disconnect any cables.

5. Pull the damaged length of tubing from its connector(s) and discard it.

6. Fit the new length of tubing by pushing it onto the connector(s) and pass it through the guides.

7. Ensure the cables are secure and have not been disconnected from the main PCB before placing the lid back onto the base.

8. Carefully turn instrument over and secure the lid to the base with the seven enclosure screws.

9. Reconnect the power cable and the pipette. Load a full bottle of onboard buffer and replace the waste pot holder and waste pot. Switch on the instrument.

10. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for any leaks.

11. Test the calibration of the instrument as described in section 3.5.

5.4.3 Replacing valve tubing connectors

Material/Equipment required but not supplied.

- AD500.11: Valve Tubing Connectors
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument.

2. Switch off the instrument and disconnect the power cable.

3. Pull the tubing from the connector and unscrew the connector from the valve assembly if necessary use a 2 BA spanner to loosen.

4. Screw in the replacement connector and tighten.
   Note, Analysers with serial numbers prior to 8191 may have a washer in place. If so ensure the washer is removed and discarded prior to attaching the new connector. The replacement connectors do not require a washer.

5. Push the tubing onto the new connector.

6. Reconnect the power cable and load a full bottle of onboard buffer. Ensure that the waste pot and waste pot holder are in place. Switch on the instrument.

7. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for any leaks.

8. Test the calibration of the instrument as described in section 3.5.

5.4.4 Replacing chassis tubing connectors

Material/Equipment required but not supplied.

- AD500.12: Chassis Tubing Connectors
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and disconnect the power cable, pipette and if attached the barcode reader and printer.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down next to the base taking care not to disconnect any cables.

5. Pull the length of tubing from the connector to be replaced.

6. Unscrew the locking nut from the inside of the connector and pull out the connector.

7. Push the replacement connector into the hole and fix by screwing on the locking nut. Do not over tighten as this may damage the connector.

8. Push the length of tubing onto the replacement connector.

9. Ensure the cables are secure and have not been disconnected from the PCB before placing the lid back onto the base.

10. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws and shake proof washers.

11. Load a full bottle of onboard buffer and replace the waste pot and waste pot holder. Reattach the power cable and pipette. Switch on the instrument.

12. Set the analyser to UPC mode 5 seconds blank 5 seconds read T2. At the "Prime" prompt select 'Yes' and observe for any leaks.

13. Test the calibration of the instrument as described in section 3.5.

5.4.5 Replacing the bottle cap assembly

Material/Equipment required but not supplied.

- AD500.8: Diluent Bottle Cap Assembly

1. Remove the buffer bottle from the cap.

2. Pull the old buffer bottle cap away from the right angle connector.

3. Push the replacement bottle cap onto the right angle connector. Attach a full bottle of onboard buffer and ensure that the right angle connector touches the bottom of the buffer bottle.

4. Switch on the instrument. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for any leaks.

5.4.6 Replacing the right angled connector

Material/Equipment required but not supplied.

- AD500.9: Right Angled Connector

1. Remove the buffer bottle from the cap and prime the analyser with air.

2. Pull the buffer bottle cap away from the old right angle connector.

3. Pull the tubing away from the old right angled connector (**Note**: Ensure tubing end does not slip into the body of the unit.

4. Push the tubing onto the replacement tubing connector.

5. Push the replacement tubing connector into the grommet of the bottle cap assembly.

6. Attach a full bottle of onboard buffer and ensure that the connector touches the bottom.

7. Switch on the instrument. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for any leaks.

5.5 Replacing the syringe

5.5.1 Replacing the syringe assembly

Material/Equipment required but not supplied.

- AD500.10: Syringe Assembly
- Materials for calibration checks (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument.

2. Switch off the instrument and disconnect the power cable.

3. Unscrew and remove the plunger locating screw.

4. Use the knurled ferrule at the top of the syringe to unscrew the syringe from the valve assembly.

5. Ensure that the PTFE washer is removed from the valve port.

6. Place the new PTFE washer in the valve port and screw in the replacement syringe and plunger assembly.

7. Fix the plunger using the new plunger retaining screw, ensuring that the screw passes through the hole in the plunger.

8. Reconnect the power cable. Attach a full bottle of on board buffer. Switch on the instrument and observe the syringe to ensure that it moves correctly when the analyser initialises.

9. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for any leaks or bubbles. If necessary tighten the ferrule further.

10. Test the calibration of the instrument as described in section 3.5.

5.5.2 Replacing the syringe plunger

Material/Equipment required but not supplied.

- AD500.7: Syringe Plunger
- Materials for calibration checks (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument.

2. Switch off the instrument and disconnect the power cable.

3. Unscrew and remove the plunger locating screw.

4. Withdraw the plunger from the syringe and discard it.

5. Push the replacement plunger into the syringe and fix it in place using the plunger locating screw, ensuring that the screw passes through the hole in the plunger.

6. Reconnect the power cable. Attach a full bottle of onboard buffer. Switch on the instrument and observe the syringe to ensure that it moves correctly when the analyser initialises.

7. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for any leaks.

8. Test the calibration of the instrument as described in section 3.5.

5.6 Replacing the 3 way valve

Material/Equipment required but not supplied.

- AD500.SP4: 3 Way Valve
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument.

2. Press the Esc button to initialise the analyser to ensure the pump is in its home position. Switch off the instrument and disconnect the power cable.

3. Pull the tubing away from the valve.

4. Unscrew the valve tubing connectors. Do not discard.
Note, Also replace the valve tubing connectors if the analysers serial number is prior to 8191 (see section 5.4.3).

5. Unscrew the plunger locating screw.

6. Using a Hex key remove the two screws from the valve.

7. Pull out the valve assembly.

8. Unscrew the syringe assembly from the valve to be replaced. Remove the PTFE washer from the valve.

9. Insert a PTFE washer and screw in the syringe assembly into the replacement valve.

10. Insert the new valve assembly ensuring the locating pin is at the top and inserted correctly (**Note**: before inserting the valve confirm that the notches on the connection points of the replacement valve and inside the pump are at the top. If not they can be manipulated using a flat blade screw driver (pump) or pliers (valve)).

11. Screw in the two securing screws with the Hex key.

12. Secure the syringe plunger with the plunger locating screw.

13. Attach the tubing connectors.

14. Reattach the tubing. Ensure that line A is connected to point A, line B to point B and line C to point C on the valve.

15. Attach a full bottle of onboard buffer. Reconnect the power cable and switch on the instrument.

16. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for any leaks or bubbles, if necessary tighten the ferrule.

17. Test the calibration of the instrument as described in section 3.5.

5.7 Replacing the syringe pump

Material/Equipment required but not supplied.

- AD500.SP5: Syringe Pump
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and disconnect the power cable, pump and if connected the printer and barcode reader.

3. Unscrew the plunger locating screw. Unscrew the screws securing the valve to the pump using the Hex key. Pull the valve with syringe attached away from the pump.

4. Turn the instrument over and unscrew the seven enclosure screws.

5. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base taking care not to disconnect any cables.

6. Feed buffer bottle tubing lines B and C through the guides attached to the back and side of the pump.

7. Unscrew the two nuts securing the top pump bracket to the chassis.

8. Unscrew the single nut securing the bottom pump bracket to the base of the unit.

9. Lift the pump out of the base (**Note:** the pump is still connected to the cable edge connector).

10. Remove the two fixing screws securing the cable edge connector to the back of the pump and disconnect. The screws maybe secured with low melt glue. If so peel off the glue before disconnecting.

11. Remove the bottom pump bracket from the pump and secure to the replacement pump.

12. Remove the top pump bracket from the pump and secure to the replacement pump.

13. Attach the cable edge connector to the pump and secure in place with the two screws.

14. Lower the replacement pump into the base (**Note**: when inserting the pump care should be taken not to place it on top of the tubing line A which runs along the floor of the base).

15. Secure the top pump bracket to the chassis (**Note**: ensure shake proof washers are replaced).

16. Secure the bottom pump bracket to the base (**Note:** ensure shake proof washer is replaced).

17. Ensure that the wire connecting the power PCB to the pump cable edge connector is still running through the guide on the base of the unit and is not in danger of coming into contact with the fan.

18. Feed the buffer bottle tubing lines B and C through the guides positioned on the back and side of the pump.

18. Insert the valve and syringe assembly ensuring the locating pin is at the top and inserted correctly (**Note**: before inserting the valve confirm that the notches on the connection points of the valve and inside the pump are at the top. If not they can be manipulated using a flat blade screw driver (pump) or pliers (valve)).

19. Insert the plunger locating screw and secure in place.

19. Reattach the tubing to the valve.

20. Ensure all the tubing and cables are secure and have not been disconnected before placing the lid back onto the base.

21. Carefully turn instrument over and secure the lid to the base with the seven enclosure screws.

22. Insert a full bottle of onboard buffer and replace the waste pot and waste pot holder. Reattach the pipette and power cable.

23. Switch on the instrument and ensure that the syringe moves correctly when initialising.

24. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' and observe for leaks.

25. Test the calibration of the instrument as described in section 3.5.

5.8 Replacing the onboard buffer drawer front

Material/Equipment required but not supplied.

- AD500.SP6: Onboard Buffer Drawer Front

1. Disconnect the onboard buffer bottles.
2. Close the onboard buffer drawer and press in the clips on the front holding the drawer to the analyser body.
3. Slide the drawer forward to remove from position.
4. Unscrew the four countersunk screws securing the drawer front and separate the drawer front from the drawer hinge. Retain the screws.
5. Fix the replacement drawer front to the drawer hinge using the four countersunk screws.
6. Insert the drawer assembly and carefully clip into place.
7. Replace the onboard buffer bottles.

5.9 Replacing the pipette

Material/Equipment required but not supplied.

- AD500.13: Pipette
- Materials for calibration checks (see section 3.5).

1. Remove buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable.

3. Twist the pipette connector securing ring ¼ turn anticlockwise and remove from the connector from its socket.

4. Pull the pipette tubing away from the pipette and attach to the replacement pipette.

5. Insert the pipette cable of the replacement pipette into the pipette connector port and secure in place by turning the outer ring clockwise ¼ turn.

6. Switch on the analyser. The LED on the pipette should illuminate.

7. Replace the waste pot holder and waste pot and attach a full bottle of onboard buffer.

8. Set up in UPC mode, 5 seconds blank, 5 seconds read, T1.

9. Perform a dummy assay inserting an empty cuvette and using water as the reagent and supplementary. At the prompts press the pipette button and observe the pipette aspirating and dispensing. If the pipette is functioning correctly the unit will perform the correct action and the next prompt will be displayed.

10. Test the calibration of the instrument as described in section 3.5.

5.10 Replacing the optical block.

Material/Equipment required but not supplied.

- AD500.SP7: Optical Block Assembly
- Materials required for scatter and temperature calibration (see section 6).

1. Remove buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, pipette and if in use the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Remove the five screws securing the optical block to the lid.

6. Disconnect the optical block from the main PCB (see Fig 5) and lift the optical block out of the lid.

7. Disconnect the laser, peltier, cooling fan, motor assembly and detector board from the daughter PCB.

8. Unscrew the four screws securing the motor assembly to the optical block and lift out.

9. Position the stirrer motor assembly onto the replacement optical block and secure in place with the four screws and fibre washers. Do not over tighten.

10. Unscrew the four screws securing the detector PCB to the optical block and attach and secure to the replacement optical block.

11. Unclip the heater assembly from the optical block.

12. Spread heat sink transfer compound onto the heater block and place the heater assembly onto the block.

13. Unscrew the four nuts securing the daughter PCB to the optical block.

14. Lift the daughter PCB off the optical block (**Note**: be careful not to lose the detector pin from the cuvette block).

15. Place the detector pin into the cavity of the replacement optical block

16. Coat the thermistor wire of the daughter PCB with heat transfer compound and insert into the thermistor cavity in the replacement optical block (**Note:** ensure detector pin is in place).

17. Secure the daughter PCB in place with the four nuts and fibre washers.

18. Reconnect the laser, detector PCB, peltier, fan and stirrer motor assembly cables to the daughter PCB.

19. Place the replacement optical block in position in the lid and secure in place with the five screws.

20. Attach to the main PCB (see Fig 5).

21. Ensure all the cables are secure and have not been disconnected before placing the lid back onto the base but do not screw the lid to the base.

22. Attach the power cable and pipette. Test the scatter and temperature calibration of the instrument as set out in sections 3.3 and 3.4. If required adjust the calibration of the instrument as described in section 6.1 and 6.2.

23. Disconnect the power cable and pipette and secure the lid to the base with the seven enclosure screws and shake proof washers.

24. Reattach the power cable, pipette, a full bottle of onboard buffer, the waste pot and waste pot holder and if required the printer and barcode reader.

25. Test the calibration test as described in section 3.5

5.11 Replacing the stirrer motor

Material/Equipment required but not supplied.

- AD500.SP8: Stirrer Motor Assembly
- Materials for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, pipette and if connected the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Remove the five screws securing the optical block to the lid.

6. Disconnect the optical block from the main PCB (see Fig 5) and lift the optical block out of the lid.

7. Disconnect the connector linking the stirrer motor assembly to the back of the daughter board.

8. Unscrew the four screws securing the motor assembly to the optical block and lift out.

9. Position the replacement stirrer motor assembly and secure in place with the four screws and fibre washers. Do not over tighten.

10. Attach the motor to the rear of the daughter board. Ensure that the connectors from the detector board, laser, peltier and fan are still securely attached to the daughter PCB.

11. Carefully place the optical block in position in the lid and secure in place with the five screws.

12. Reattach the daughter PCB to the main PCB (see Fig 5).

13. Ensure all the cables are secure and have not been disconnected from the main PCB before placing the lid back onto the base.

14. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws and shake proof washers.

15. Attach the power cable and pipette only.

16. Switch on the analyser. Set up in UPC mode, 5 seconds blank, 5 seconds read, T1. Perform a dummy assay inserting a cuvette containing only a stirrer bar. At the prompts press the pipette button. Following the "Dispense Reagent" prompt press the pipette button and observe the stirrer bar. If the stirrer motor assembly is working correctly the stirrer bar will spin following pressing the pipette button.

17. Switch off the analyser replace the waste pot, waste pot holder and a full bottle of onboard buffer. If required reattach the printer and barcode reader.

18. Test the calibration of the instrument as described in section 3.5.

5.12 Replacing the optical block heater assembly

Material/Equipment required but not supplied.

- AD500.SP9: Optical Block Heater Kit
- Materials required for temperature calibration (see section 3.4 and 6.2)
- Materials required for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, pipette and if in use the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Remove the five screws securing the optical block to the lid.

6. Disconnect the optical block from the main PCB (see Fig 5) and lift the optical block out of the lid.

7. Disconnect the old peltier and fan from the daughter board then unclip the old heater assembly from the optical block.

8. Spread heat sink transfer compound onto the heater block and place the replacement peltier device onto the heater block (**Note**: The wires from the pelter should be facing away from the motor assembly with the BLACK peltier wire closest to the detector).

9. Remove the self adhesive backing from the replacement BGA cooling fan. Clip the replacement BGA cooling fan onto the aluminium heater block with the three wires in the corner closest to the motor assembly and detector. Bring the wires around to the daughter board side of the device passing under the scatter detector.

10. Connect the replacement heater assembly to the daughter board.

11. Place the optical block in position in the lid and secure in place with the five screws.

12. Reattach to the main PCB.

13. Ensure all the cables and tubing are secure and have not been disconnected before placing the lid back onto the base. Do not reattach the lid to the base.

14. Attach the power cable and pipette and switch on the analyser

15. Test the temperature calibration of the instrument and adjust if required (see sections 3.4 and 6.2).

16. Switch off the instrument and disconnect the power cable and pipette.

17. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws.

18. Attach a full bottle of onboard buffer, the waste pot and waste pot holder, power cable, pipette and if required the printer and barcode reader.

19. Test the calibration of the instrument as described in section 3.5.

5.13 Replacing the daughter PCB

Material/Equipment required but not supplied.

- AD500SP10: Daughter PCB
- Materials required for scatter and temperature calibration (see section 6)
- Materials required for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, pipette and if attached the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Remove the five screws securing the optical block to the lid.

6. Disconnect the optical block from the main PCB (see Fig 5) and lift the optical block out of the lid.

7. Disconnect the cables connecting the daughter PCB to the laser, detector PCB, stirrer motor assembly, peltier and cooling fan.

8. Unscrew the four nuts securing the daughter PCB to the optical block.

9. Lift the daughter PCB off the optical block (**Note**: be careful not to lose the detector pin from the cuvette block).

10. Coat the thermistor wire of the replacement daughter PCB with heat transfer compound and insert into the thermistor cavity in the optical block (**Note:** ensure detector pin is in place).

11. Secure the daughter PCB in place with the four nuts and fibre washers.

12. Reconnect the laser, detector PCB, peltier, fan and stirrer motor assembly cables to the replacement daughter PCB.

13. Replace the optical block in position and connect to the main PCB. Secure in place with the five securing screws.

14. Ensure all the cables and tubing are secure and have not been disconnected before placing the lid back onto the base. Do not secure in place at this point.

15. Attach the power cable and pipette only and switch on the instrument.

16. Set up in UPC mode, 5 seconds blank, 5 seconds read, T1.

17. Perform a dummy assay inserting a cuvette just containing a stirrer bar. At the "aspirate" prompts press the pipette button. Following the "dispense reagent" prompt press the pipette button and observe the stirrer bar. If the stirrer motor assembly is working correctly the stirrer bar will spin following pressing the pipette button.

18. Check and if necessary adjust the scatter calibration (see sections 3.3 and 6.1).

19. Check and if necessary adjust the temperature calibration of the instrument (see sections 3.4 and section 6.2).

20. Switch off the instrument and disconnect the power cable and pipette.

21. Carefully turn instrument over and secure the lid to the base with the seven enclosure screws and shake proof washers.

22. Attach a full bottle of onboard buffer, the waste pot and waste pot holder, the power cord, pipette and if in use the printer and barcode reader.

23. Test the calibration of the instrument as described in section 3.5.

5.14 Replacing the detector PCB

Material/Equipment required but not supplied.

- AD500.SP11: Detector PCB
- Materials required for scatter calibration (see sections 3.3 and 6.1)
- Materials required for calibration testing (see section 3.5)

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, pipette and if attached the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Remove the five screws securing the optical block to the lid.

6. Disconnect the optical block from the main PCB (see Fig 5) and lift the optical block out of the lid.

7. Disconnect the cable connecting the daughter PCB to the Detector PCB.

8. Unscrew the screws securing the detector PCB to the optical block.

9. Lift the detector PCB off the optical block and secure the replacement detector PCB in place with the four nuts and fibre washers.

10. Connect the replacement detector to the daughter PCB.

11. Replace the optical block in position and connect to the main PCB. Secure in place with the five securing screws.

12. Ensure all the cables and tubing are secure and have not been disconnected before placing the lid back onto the base. Do not secure in place at this point.

13. Attach the power cable and pipette and switch on the instrument.

14. Set up in UPC mode, 5 seconds blank, 5 seconds read, T1.

15. Check and if necessary adjust the scatter calibrations of the instrument (see sections 3.3 and 6.1).

16. Switch off the instrument and disconnect the power cable and pipette.

17. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws and shake proof washers.

18. Attach a full bottle of onboard buffer, the waste pot and waste pot holder, the power cord, pipette and if in use the printer and barcode reader.

19. Test the calibration of the instrument as described in section 3.5.

4.15 Replacing the power supply PCB

Material/Equipment required but not supplied.

- AD500.SP12: Power Supply PCB
- Materials required for calibration testing (see section 3.5)

1. Remove buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, pipette and if attached the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

4. Snip the cable tie tying the power cables to the power supply PCB cover (see Fig7). Take care not to cut into the wires.

5. Unscrew the securing screws holding the IEC power switch to the chassis and allow the switch to drop forwards. The screws maybe secured by low melt glue. If so peel off before removing.

6. Unscrew the four nuts securing the power supply PCB cover and lift out of the base.

7. Disconnect the cables from the old power supply PCB.

8. Unscrew and lift out the four spacers.

9. Lift the power PCB out of the Unit.

10. Place the replacement power PCB in place so that the edge connector is closest to the fan.

11. Screw on the four spacers.

12. Reconnect the cables to the power PCB

13. Place the power supply PCB cover back on top (**Note:** ensure that the three holes are on the same side as the IEC power switch).

14. Secure the power supply PCB cover with the four nuts and shake proof washers.

15. Secure the IEC power switch in place and tie the cables from the switch to the central hole of the power supply PCB cover with the cable tie.

16. Ensure all the tubing and cables are secure and have not been disconnected before placing the lid back onto the base.

17. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws.

18. Reattach the power cord and pipette. Switch on the analyser. The red power and T2 LEDs on the keyboard will come on, the pump will initialise, the fan will start up and the LCD display will display "Initialising" then "Enter Chemistry No".

19. Attach a full bottle of onboard buffer, the waste pot and waste pot holder. If required attach the printer and barcode reader.

20. Test the calibration of the instrument as described in section 3.5.

5.16 Replacing the power supply switch

Material/Equipment required but not supplied.

- AD500.SP13: IEC Power Switch
- Materials required for calibration tests (see section 3.5).

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Snip the cable tie tying the power cables to the power supply PCB cover.

6. Unscrew the securing screws holding the IEC power switch to the chassis and allow the switch to drop forwards. The nuts maybe secured with low melt glue. If so peel off the glue before unscrewing.

7. Disconnect the cables from the back of the switch. This will allow the switch to be removed.

8. Remove the two fuses from switch.

9. If the fuses have not blown insert the fuses into the replacement switch. If the fuses have blown replace with new fuses (AD500.1).

10. Connect the wires to the replacement switch.

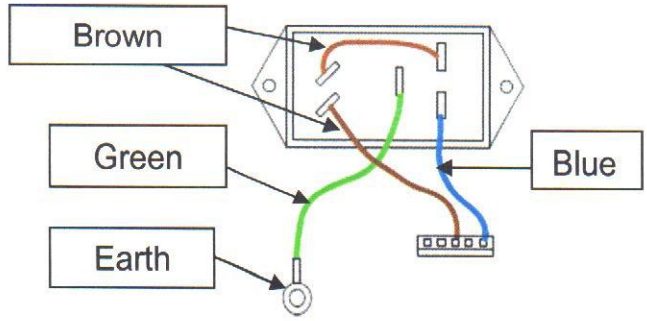


Fig. 8 ISE switch wiring

11. Secure the new IEC power switch to the chassis.

12. Ensure all the cables and tubing are secure and have not been disconnected before placing the lid back onto the base.

13. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws.

14. Reattach the power cord and pipette. Switch on the analyser. The red power and T2 LEDs on the keyboard will come on, the pump will initialise, the fan will start up and the LCD display will display "Initialising" then "Enter Chemistry No".

15. Attach a full bottle of onboard buffer, the waste pot and waste pot holder. If required attach the printer and barcode reader.

16. Test the calibration of the instrument as described in section 3.5.

5.17 Replacing the fan

Material/Equipment required but not supplied.

- AD500.SP14: Fan

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, pipette and if attached the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

5. Snip the cable tie holding the printer, barcode reader and pipette connectors together and to the top of the fan.

6. Disconnect the printer, barcode reader, fan and pump connectors from the main PCB (see Fig 5) and move the lid to one side.

7. Snip the cable tie tying the power cables to the power supply PCB cover.

8. Unscrew the securing screws of the ISE power switch and allow the switch to fall forward.

9. Unscrew the four nuts securing the power supply PCB cover and lift out of the base.

10. Disconnect the ISE power switch and edge connector from the power PCB.

11. Unscrew and lift out the four spacers from the power PCB.

12. Lift the power PCB out of the base.

13. Peel off the guide on the base of the unit taking care not to damage the tubing.

14. Unscrew the four nuts holding the fan to the chassis.

15. Remove the fan from the base.

16. Fit the replacement fan to the locating screws and secure in place with the four nuts.

17. Fit a replacement guide to the base of the unit and ensure that the tubing line A runs through it.

18. Refit the power PCB and secure in place with the spacers. The edge connector should be on the side of the fan.

19. Reconnect the IEC power switch and edge connector to the power PCB. Ensure the wire from the edge connector to the pump is fed through the guide on the base of the unit.

20. Replace the power supply PCB cover, ensuring that the four holes are on the side of the IEC power switch. Secure the IEC power switch to the chassis and tie the power cables to the power supply PCB cover with a cable tie.

21. Cable tie the barcode reader, printer and pipette connector cables together and to the top of the fan.

22. Attach the connectors from the pump, printer, barcode reader, and replacement fan to the main PCB on the lid.

23. Ensure all the cables and tubing are secure and have not been disconnected before placing the lid back onto the base. Ensure none are running near the fan.

24. Reattach the power cable and switch on the analyser. If the fan is functioning correctly it will start immediately.

25. Switch the analyser off again and disconnect the power cable. Carefully turn over and secure the lid to the base with the seven enclosure screws.

26. Attach a full bottle of onboard buffer, the waste pot and waste pot holder. Attach the power cable and pipette and if required the printer and barcode reader.

27. Test the calibration of the instrument as described in section 3.5.

6 Calibration

6.1 Scatter calibration

Material/Equipment required but not supplied.

- MININEPH scatter standard (order code AD230).
- Materials required for calibration testing (see section 3.5).

1. Remove the buffer bottle from the tubing. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air removing any liquid from the instrument. Remove the waste pot and waste pot holder.

2. Switch off the instrument and remove the power cable, pipette and if attached the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws. Place the instrument upright.

4. Reattach the pipette and power cable. Switch on the instrument and start UPC mode enter 10 seconds blank and 10 seconds read and T1

5. Test the scatter of the instrument as set out in section 3.3.

6. If necessary adjust the scatter calibration. Press the Enter key and remove the cuvette from the chamber. Lift the lid and place to the right of the base. Using a small flat blade screwdriver (or an ESD trimmer) adjust the potentiometer located on the detector board at the back of the optical block. Replace the lid on the base firstly ensuring none of the wires have come loose from the main PCB.

7. Repeat steps 5 and 6 until the test result falls within the acceptable range shown on the label of the scatter standard.

8. When the scatter calibration is within the acceptable range, switch off the instrument and disconnect the power cable and pipette. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws and shake proof washers.

9. Reattach the power cable and pipette. Replace the waste pot and waste pot holder and attach a full bottle of onboard buffer.

10. Test the calibration of the instrument as described in section 3.5

6.2 Cuvette chamber temperature calibration

Material/Equipment required but not supplied.

- Materials required for calibration testing (see section 3.5).

1. Remove the onboard buffer bottle from the tubing. Set the analyser to UPC mode. 5 seconds blank 5 seconds read T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot holder and waste pot.

2. Switch off the instrument and remove the power cable, pipette and if in use the printer and barcode reader.

3. Turn the instrument over and unscrew the seven enclosure screws.

4. Place the instrument upright. Reattach the power cable and pipette.

5. Switch on the instrument. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and select T1 or T2 as required.

6. Test the temperature as set out in section 3.4.

7. If necessary adjust temperature calibration. Remove the cuvette from the chamber. Lift the lid off the base and place to the right of the base. Adjust the potentiometer on the daughter board corresponding with the temperature setting (T1 or T2), turn clockwise to increase the temperature and anticlockwise to decrease. Place the lid back on the base.

8. Leave the instrument for at least 10minutes for the new temperature to stabilise then repeat the temperature calibration testing as set out in section 3.4

9. Repeat steps 2 to 8 until the temperature calibration is correct.

10. Disconnect the power cable and pipette, Secure the lid to the base with the seven enclosure screws and shake proof washers

11. Reattach the power cable and pipette. Attach a full bottle of onboard buffer, the waste pot and waste pot holder, if in use attach the printer and barcode reader. Switch on the analyser.

12. Test the calibration of the instrument as described in section 3.5.

7. Programming MININEPHPLUS

It may be periodically necessary to update the version of software installed on a MININEPHPLUS in order to correct known software errors or add functionality. Programming and reprogramming of the device may be performed with the aid of a Segger Flasher 5 Microcontroller Programming Tool (Flash Programmer).

Material and Equipment required but not supplied:

- AD500.SP15: Software Disc
- Flash Programmer (Flasher 5)

7.1 Programming the Flasher

1. Download and install the software for Flasher 5 by following this link http://www.segger.com/cms/downloads.html

2. Connect the Flasher 5 to a serial port on the PC using the RS232 interface cable provided.

3. Connect the Flasher 5 to the power supply and start the Flasher software.

4. Select *Options* | *Device* from the menu to select the correct target device. To program a MININEPHPLUS this must be **M30620FCPFP**. It should not be necessary to change any other options.

5. Load the current Software Disc (AD500.SP15) into the CD drive of the PC.

6. In the Flasher Software select *File* | *Open* from the menu then browse to and open the target data file (*Minineph plus V3.0 041214.mot*). This can be found on the Software Disc. **Note**; this should always be a *.mot* file type.

7. Select *Options* | *Download file to Flasher* to load the Flasher with the program. The software will now remain on the Flasher until it is reprogrammed.

8. Disconnect the Flasher from its power supply and the PC.

7.2 Programming a MININEPHPLUS using the Flasher

1. Ensure that the Flasher is programmed with the current version of the MININEPHPLUS software as described above.

2. Remove the buffer bottle from the MININEPHPLUS. Set the analyser to UPC mode, 5 seconds blank, 5 seconds read and T2. At the "Prime" prompt select 'Yes' to prime the analyser with air to remove any liquid from the instrument. Remove the waste pot and waste pot holder.

3. Switch off the instrument and disconnect the power cable, pipette, and if attached the printer and barcode reader.

4. Turn the instrument over and unscrew the seven enclosure screws.

5. Place the instrument upright and carefully lift the lid from the base placing the lid upside down to the right of the base.

6. Connect the Flasher 5 to the main PCB using the 10-way ribbon connector. Plug one end into the socket marked '**Target**' on the Flasher 5. The other end should be connected to the connector marked '**Flash Prog**' on the MININEPHPLUS main PCB (see Fig 5 on page 10).

7. Connect the power supply to both the Flasher 5 and the MININEPHPLUS and switch both on. **CAUTION: The power supply to the analyser will now be live. Do not place hands into the base unit as this contains hazardous live parts which may cause death or severe injury.**

8. When the green light on the Flasher 5 is illuminated, press the white 'Start/Stop' button. The green light on the Flasher 5 should now flash for several seconds while the MININEPHPLUS is being programmed.

9. When the MININEPHPLUS has been successfully programmed the green light on the Flasher 5 will stop flashing and stay on. If programming has failed for any reason, the green light will go off and the red light will illuminate.

10. Disconnect the power to both the analyser and the Flasher 5 and remove the 10-way ribbon cable from the PCB.

11. Ensure that all internal MININEPHPLUS cables are secure and have not been disconnected before placing the lid back onto the base.

12. Carefully turn the instrument over and secure the lid to the base with the seven enclosure screws. Reconnect the power cable, pipette and if required the barcode reader and printer.

13. Replace the on-board buffer bottle, waste pot and waste pot holder.

14. Check the software version is correct as described in Appendix A. The version should match that printed on the software disc (see section 7.1).

15. Unless specified by the customer set Checksum On in the analyser set up as follows'.

    - With the "Enter Chemistry Number" prompt displayed press the Shift/Set Up button, followed by the UPC button to enter the "Set Up" mode.
    - Continue to press the Enter button until Checksum ON / Checksum OFF prompt is displayed.
    - Select required setting then press the Enter button twice more to exit the "Set Up" mode.

16. Test the calibration of the instrument as described in section 3.5.

8. Setup and Testing of Barcode reader

A barcode reader maybe connected to the serial port (3) on the rear of the MININEPHPLUS. This enables operators to input Sample ID by barcode rather than manually.

Updating the MININEPHPLUS software may result in the Barcode reader no longer functioning correctly. If this occurs the following procedures should be followed.

8.1 Datalogic Touch 65/90 barcode reader.

The following procedure should only be followed only if using a Touch 65/90 barcode reader manufactured by Datalogic Scanning Inc with a manufacturers part number 901201242 and the software version of the analyser is V3.0 (FW=041214) or higher.

- Connect barcode reader cable to the barcode reader and plug into the power supply.
- Turn on. The barcode reader will beep.
- Scan the configuration set up barcodes in the order below.

RESTORE DEFAULT

RS232 INTERFACE

Standard

Enter Configuration

FIFO

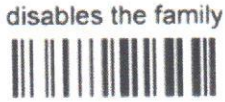
disable

AIM standard

Exit and Save Configuration

Enter Configuration

disables the family



Exit and Save Configuration

Enter Configuration

◆ Interleaved 2/5

no check digit control

0

1

9

9

Exit and Save Configuration

8.2 Honeywell Hyperion 1300g Barcode scanner

The following procedure should be followed only if using a Hyperion 1300g Barcode scanner manufactured by Honeywell and the software version of the analyser is V3.0 (FW=041214) or higher.

- Connect barcode reader interface cable to the barcode reader and plug into power supply.
- Plug the serial connector into the serial port (3) on the MININEPHPLUS.
- Turn on. The barcode reader will beep.
- Turn on the MININEPHPLUS.
- Scan the configuration set up barcodes below.

DEFALT.

Standard Product Default Settings

PAP232.

RS232 Interface

232BAD5.

9600

PREBK2.

Add Prefix

K9K.

9

9

5

C

8

1

Save

8.3. Testing the barcode reader.

- Connect the barcode reader interface cable to the barcode reader and plug into power supply.
- Plug the serial connector into the serial port (3) on the MININEPHPLUS.
- Turn on the Barcode reader and MININEPHPLUS.
- Start a UPC session, Blank 5s, Read 5s, T1.
- At the "Enter Sample ID" prompt scan a barcode then press the Enter button on the analyser.
- Complete a dummy assay.
- Repeat for each of the barcodes below.

Code 39

EAN8

EAN13

UPC A

UPCE

Interleaved 2 OF 5 (with invalid check digit)

CODE 128

Note: If Checksum ON is selected in "Set Up" the Interleaved 2 OF 5 barcode above will be displayed on the LCD upon reading. However, the ID will not be accepted when the Enter button is pressed.
Unless specified by the customer the analyser should be set to Checksum On.
To change the Checksum setting see section 7.2 step 15 above.

Appendix A Software version number

During manufacture the MININEPHPLUS is programmed with the current version of the driver software. This software is subject to periodic updates to correct known errors or add new functionality. To check the version of the software installed:

1. Switch off the analyser.

2. Switch on the analyser while holding down the Print button. The LCD will display the software version number (e.g. FW=041214).

3. To return to magnetic card mode press the ESC button.

Appendix B Spare Parts and Accessories

AD500.1: 800mA Fuses

AD230: MININEPH Scatter Standard

AD500.2: Barcode Reader

AD500.3: Waste Pot

AD500.4: Null Modem Serial Cable (9-pin Female to 9-pin Female)

AD500.5: Null Modem Serial Cable (9-pin Female to 25-pin Male)

AD500.6: Tubing Pack

AD500.7: Syringe Plunger

AD500.8: Buffer Bottle Caps

AD500.9: Right Angle Tubing Connector

AD500.10: Syringe Assembly

AD500.11: Valve Tubing Connectors

AD500.12: Chassis Tubing Connectors

AD500.13: MININEPHPLUS Pipette

AP1310DPKIT63: MININEPHPLUS Printer

A05856TPR1: Thermal Printer Paper (20 pack, for use with AP1310DPKIT63)

The following service packs are only available to Trained Service Engineers.

AD500.SP1: Swipe Card Reader

AD500.SP2: Printer/Barcode Reader Port

AD500.SP3: Pipette Port

AD500.SP4: 3 Way Valve

AD500.SP5: V3 Syringe Pump

AD500.SP6: Onboard Buffer Drawer Front

AD500.SP7: Optical Block Assembly

AD500.SP8: Stirrer Motor

AD500.SP9: Optical Block Heater Kit

AD500.SP10: Daughter PCB

AD500.SP11: Detector PCB

AD500.SP12: Power Supply PCB

AD500.SP13: IEC Power Switch

AD500.SP14: Fan

AD500.SP15: Software Disc

Flasher 5: Flash Programmer

Appendix C Tools and useful items

The following is a list of items that may be useful when performing procedures outlined in this manual.

Tools Required

7mm standard handle nut spinner

5.5mm standard handle nut spinner

5mm standard handle nut spinner

7mm spanner

8mm spanner

10mm spanner

4mm pozi drive screw driver

5x1mm Flat blade screw driver

3/32 Allen key (Imperial)

K type thermocouple thermometer and probe

Timer

Small clippers

ESD trimmer tool with a 0.37x2.03mm tip

Pipettes and tips to cover 10 to 1000µl

Other Useful Items

Small pliers

Lowmelt glue gun and glue sticks

Can of Dust Remover.

2.5mm Cable ties

Binding site kits and accessories required

MININEPH accessory kit (ZK500.R),

MININEPHPLUS on board buffer (SN107.4),

Minineph Scatter standard (AD230)

Suitable pipette tips for the MININEPHPLUS.

MININEPH Human CRP kit (ZK044.L.R)

MININEPHPLUS **Freelite** Human Kappa Free Kit (VK016)

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