SERVICE MANUAL

ProLyte®

Electrolyte Analyzer

Na^+ / K^+ / Cl^- / Li^+

DIAMOND

Smart Lab Solutions

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The Diamond Diagnostics PROLYTE analyzer is for In Vitro Diagnostic use.

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If the system is used in a manner differently than specified by Diamond Diagnostics Inc., the protection provided by the equipment may be impaired. See warning and hazard statements.

Service Guide Contents

Table of Symbols

▲ **NOTES** *Helpful information or references to other related sections of the manual.*

KEY INFORMATION *Could take PROLYTE analyzer out of operation.*

Chapter 1 - Product Description

1.a System Overview (For SN 130202315 or higher)

The PROLYTE analyzer performs direct measurements of Sodium (Na), Potassium (K), Chloride (CI), and Lithium (Li) in whole blood, serum, or plasma. Urine is diluted prior to measurement. Measurements are made using ion-selective electrode (ISE) technology

The analyzer uses "YES" or "NO" buttons to step through the program which allows the operator to perform sample analysis, diagnostic steps and maintenance. Newer PROLYTES with SN higher than 130202315 have mini-keyboards

The PROLYTE analyzer performs analysis on approximately one hundred micro-liters of whole blood, serum or plasma in about one minute. Urine analysis requires four hundred micro-liters of diluted urine.

The analyzer can be set up to automatically calibrate at a specific time each day so that the instrument can be available when the operator needs to perform tests. Test results are displayed on the LCD screen and can also be documented on paper using the printer or stored electronically using an interface to a computer.

The PROLYTE analyzer is designed to make service and repair quick and easy. Modular construction is used throughout the design. The basic operating system consists of a motor which drives the peristaltic pump. The peristaltic pump draws the desired fluid through the system. The peristaltic pump works in conjunction with a second motor that drives the sample probe through the solutions valve to aspirate the appropriate fluid or air. The fluids include samples, standards, and conditioner (Flush solution). The sample detector in the fluid path determines if there is air or liquid in the fluid path.

In order to warranty the quality and precision of the measurement, the PROLYTE instrument is equipped with an electronic chip identifier, which allows consistent communication between the instrument and the fluid pack to protect it from low quality fluid packs not manufactured by Diamond Diagnostics.

Please note that mechanical and electrical assemblies can be replaced. Follow the instructions in the ***TROUBLESHOOTING SECTION*** to determine if assembly replacement is necessary. Refer to the *Replacement List* in the section which lists replaceable assemblies, components and appropriate part numbers.

1.b Front and Rear Assembly Components

This section describes the main assemblies of the PROLYTE front and rear assemblies. Refer to Figures **P1, P2, and P3** for the location of each component.

Front Housing front case of the analyzer

Power Supply powers the analyzer
- **Power Entry Module -** contains ON OFF switch, connection for the power cable
- **Fuse Bay** holds 2 fuses
- **Power Supply Cable** connects the power supply to the CPU assembly (Figure P2)

CPU Board contains the CPU board with digital components and analog sensor inputs:
- **USB Connectors** for Mini-Keyboard and Barcode Scanner
- **Serial Port -** a port for RS-232 for serial device (Figure P2)

Display Assembly (graphics) shows PROLYTE prompts/results on LCD screen
- **Display Screen** has a 2 line graphic display
- **Display Cable** connects the display to the CPU assembly (Figure P2)

Sample Detector Assembly (graphics) detects Air and Liquid in Fluid Path
- **Sample Detector PCB** to bridge the sample detector and the CPU board
- **Sample Detector Cable** connects the sample detector to the CPU assembly (Figure P3)

YES/NO Touch Pad Assembly (graphics) detects Air and Liquid in Fluid Path
- **Touch Pad** has YES/NO buttons.
- **Touch Pad Cable** connects the Touch Pad to the CPU assembly (Figure P1)

Mini-Keyboard

FUNCTION KEY	DESCRIPTION
F1	ANALYZE
F2	RESULTS
F3	QC/STD
F4	MAINTENANCE
F5	OPERATOR SETTINGS
F6	INSTRUMENT SETTINGS
F7	DIAGNOSTICS
F8	PERFORM CALIBRATION
F9	STANDBY
F10	SERVICE LOGIN
RIGHT ARROW	NEXT
LEFT ARROW	PREVIOUS
DOWN	YES

Peristaltic Pump Assembly peristaltic pump moves fluids through the analyzer
Peristaltic Pump Motor powers pump
Peristaltic Pump Head Assembly contains pump rotor and rollers
Peristaltic Pump Connection connects the pump to the CPU assembly
(Figure P3)

Probe Arm Assembly moves the probe arm
Linear Actuator powers lead screw
Probe Motor Support holds probe motor assembly in place
Probe Arm holds and moves the probe to aspirate samples and calibrants
(Figure P3)

Sample Probe Position Locator indicates the home position for the sample probe arm
(Figure P2)

Optical Switch senses the location of the probe arm using the position locator
Slotted Optical Switch that interacts with Sample Probe Position Locator
Cable and Connector connects the Switch to the CPU assembly
(Figure P3)

Printer prints a hard copy of analysis, diagnostics or maintenance results
Printer Bracket holds the printer mechanism and printer driver board
Printer Cable connects the printer driver board to the CPU assembly
(Page 28)

Electrode Jack(s) connects electrodes to the CPU assembly
(Figure P3)

Rear Housing rear case of the analyzer
(Page 27)

Mini-Keyboard connects to USB port on back of analyzer
(Seen below)

Barcode Reader (optional) connects to USB port on back of analyzer
(Seen below)

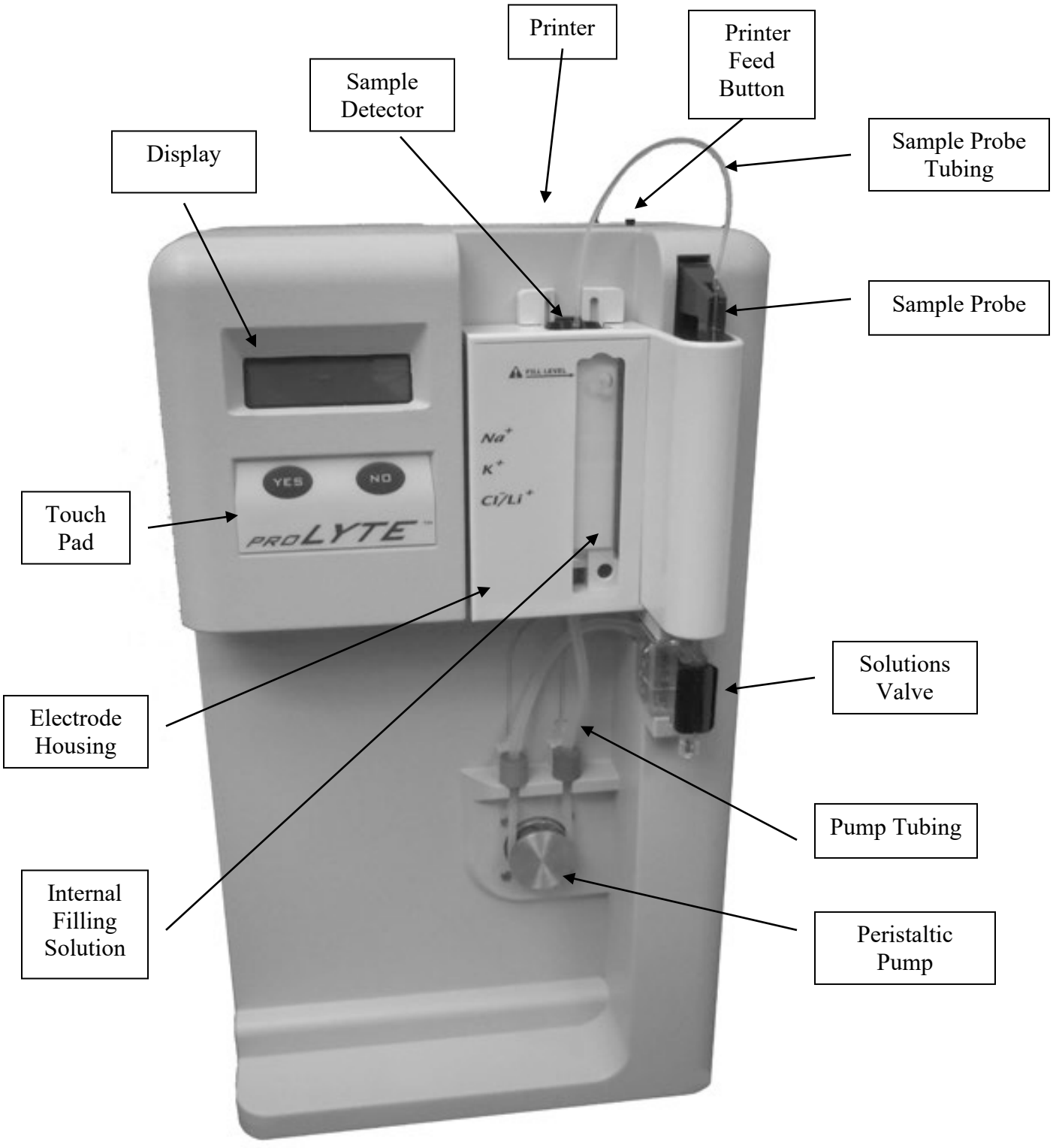


Figure P1 - Front Assembly

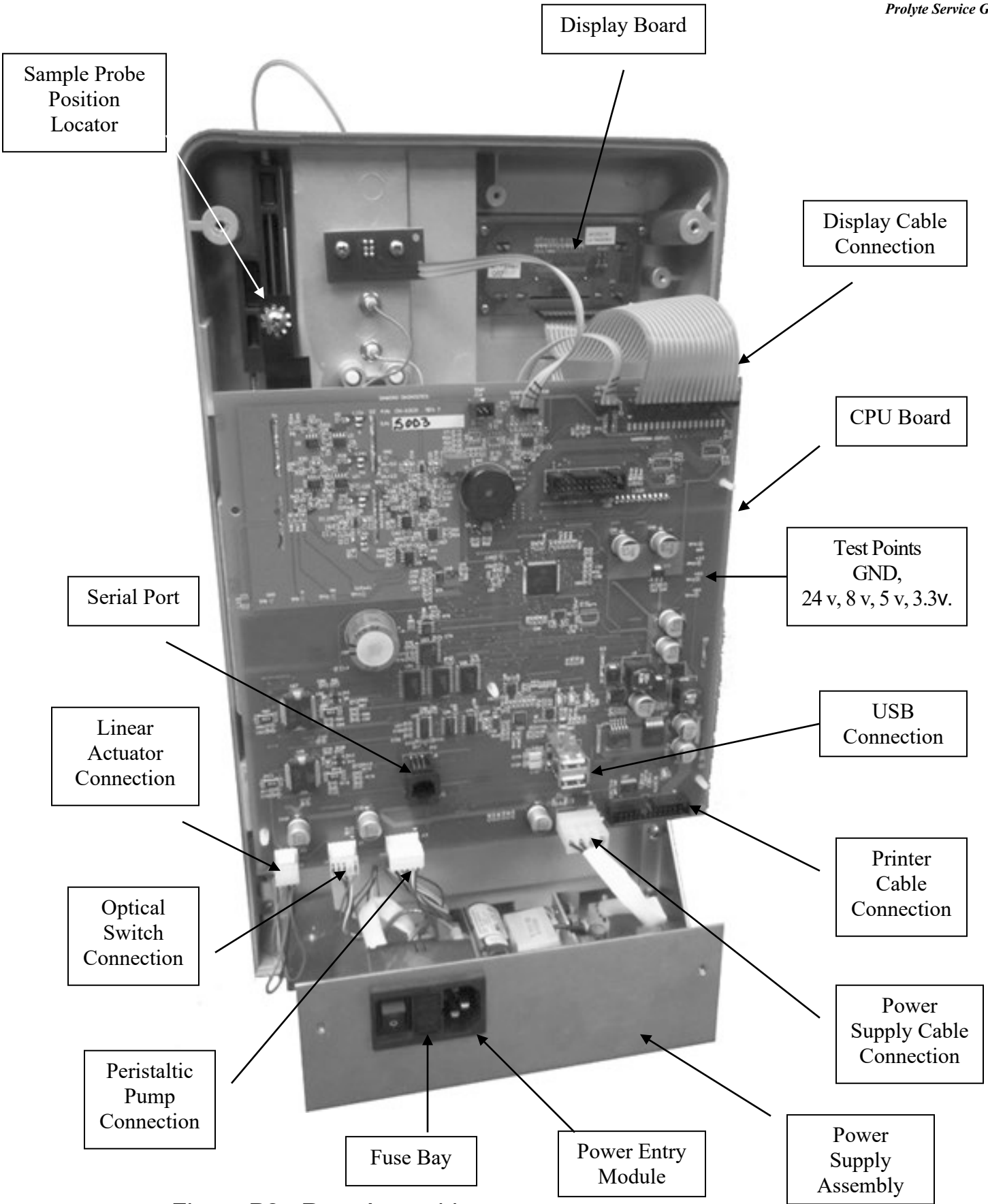


Figure P2 - Rear Assembly

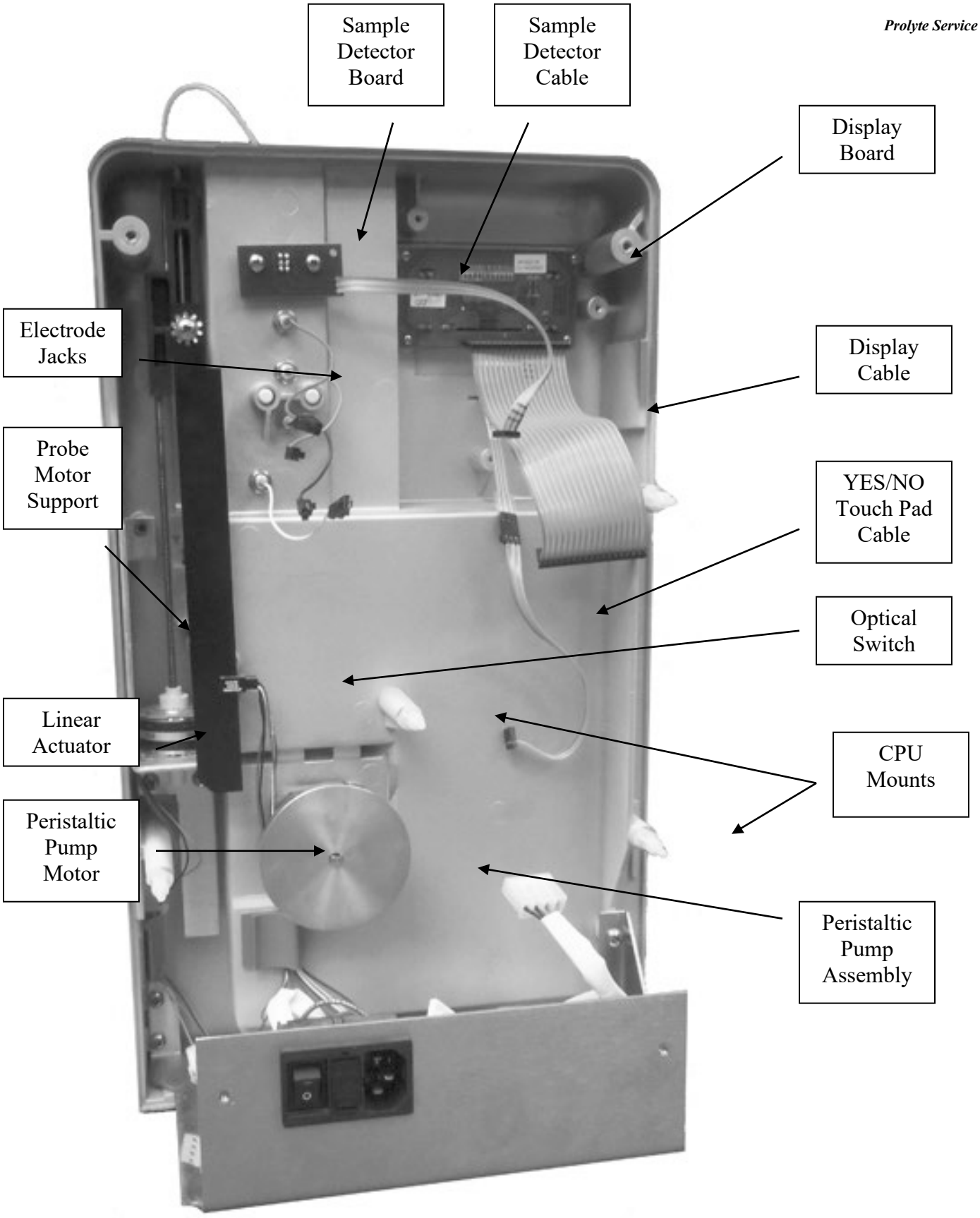


Figure P3 - Rear Assembly

1.c Electrode Housing Assembly Components

This section describes the components of the PROLYTE electrode assembly. Refer to Figure P4 for the location of each component.

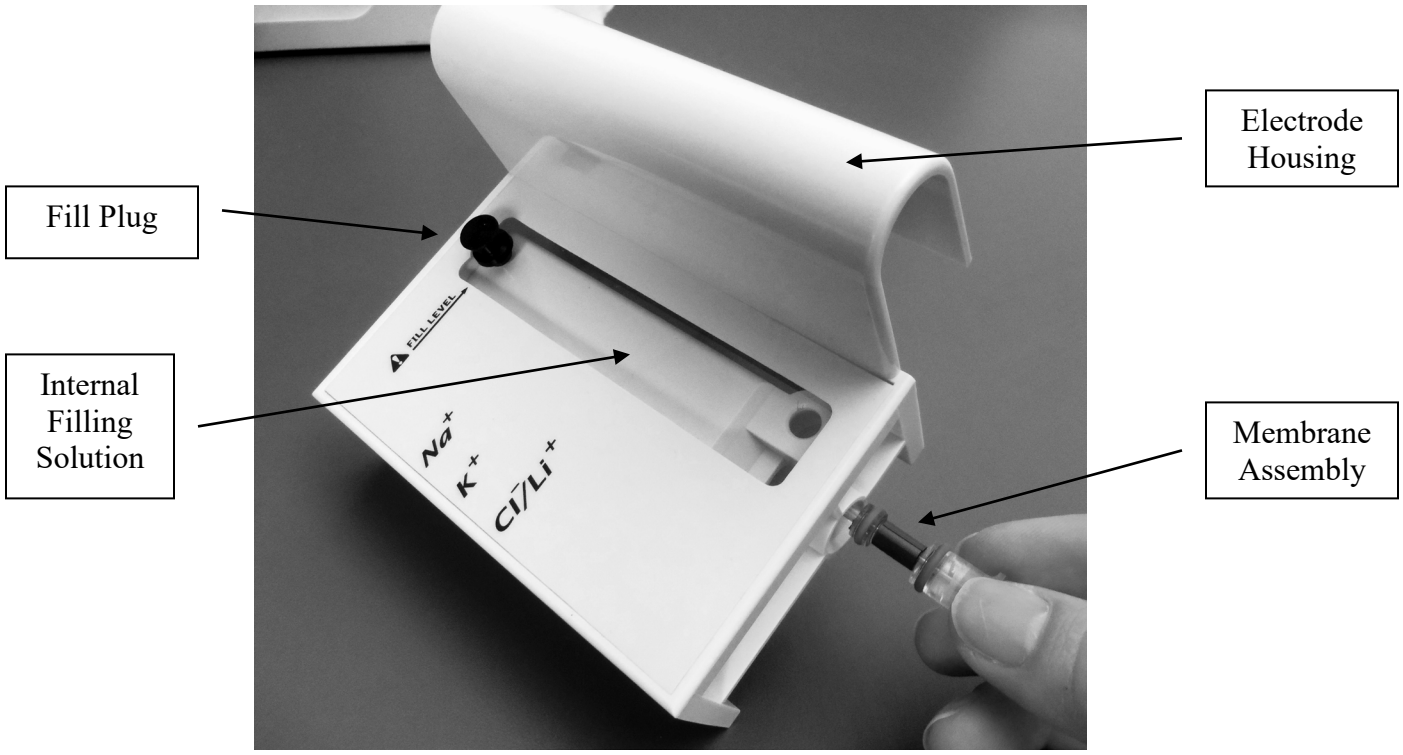
Electrodes are sodium, potassium, chloride, lithium, and reference.

Sample Detector detects presence of air/liquid, sets sample position inside electrodes

Internal Filling Solution, 2 molar KCL solution, acts as a “salt bridge” for the reference electrode

Fill Plug prevents the internal filling solution evaporation

Membrane Assembly creates the connection between the reference electrode and the other electrodes



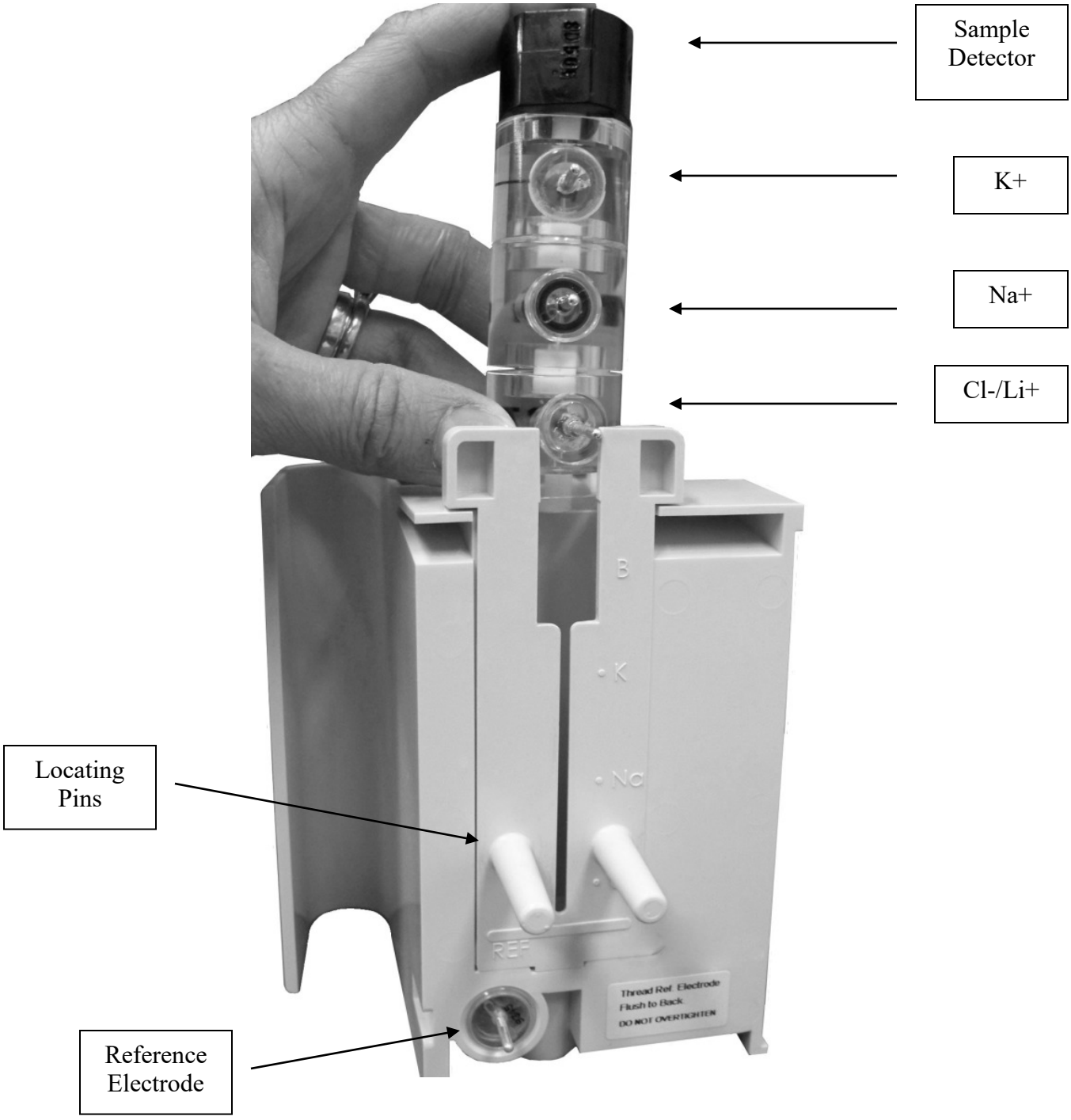


Figure P4- Electrode Housing Assembly

1.d Replacement Parts

Description	Part No.	SW Version
CPU Board	CN-A3030	
CPU Board	CN-A3031	≥ 700
Display Cable	CN-3147	
Display, Graphic	CN-3145	
Electrode Housing	CN-A3005	
Electrode Jack, Cl	CN-A3019	
Electrode Jack, K	CN-A3017	
Electrode Jack, Na	CN-A3018	
Electrode Jack, Reference	CN-A3011	
Fuses (each)	CN-4146	
Power Supply	CN-A3027	
Printer Assembly	CN-A3032	
Printer Cable	CN-3136	
Probe Arm	CN-3010	
Probe Arm Linear Actuator	CN-3018	
Probe Arm Motor Assembly	CN-A3006	
Pump	CN-A3004	
RFID Board	CN-A4054	≥ 700
Sample Detector Board Assembly	CN-A3033	
Sample Probe Position Locator 7	CN-3017	
Sample Probe Position Sensor	CN-A3009	
Touch Pad	CN-3053	
Touch Pad Cable	CN-A3034	

1.e Consumables List

Description	Part No.
Fluid Pack	IL-2121D
K^+ Electrode	ME-2101D
Na^+ Electrode	ME-2102D
Reference Electrode	ME-2103D
Tubing Kit	ME-2104D
Li^+ Electrode	ME-2106D
Sample Probe	ME-2107D
Solutions Valve	ME-2108D
Cl^- Electrode	ME-2113D
Sample Detector	ME-2257D
Membrane Assembly	ME-2258D
Probe Wiper	ME-2323D
Internal Filling Solution	ME-2492D
Printer Paper	ME-2541D

Chapter 2 - Troubleshooting

2.a Troubleshooting Overview

This section describes troubleshooting of the mechanical and electrical functions of the PROLYTE analyzer. This section is based on the principle of replacing suspected faulty assemblies with new assemblies. **Diamond Diagnostics** recommends keeping an inventory of functioning test assemblies for troubleshooting the PROLYTE**.** Refer to the Troubleshooting Guide in this section to determine the cause and corrective action that must be taken to properly service the PROLYTE analyzer.

2.b Service Functions

The table below shows the service functions that can be accessed in the PROLYTE.

ON	OFF	FUNCTION
APM	MPA	Data is saved when printer runs out of printer paper
BIN		Burn-in test to stress mechanical parts
CPC		Enables uploading of new SW to the PROLYTE from a computer.
ECS		Allows calibration intervals to be changed from 1 to 4 hour intervals.
HRS	SRH	Number of decimal places reported for Lithium increases by one.
LCE	LCD	Turns on the lease counter.
LCR		Lease counter report is printed.
LCR		Prints a lease counter report.
LIS	SIL	Turns on LIS communication.
MVE	MVD	The millivolt result for each measurement is printed.
PIE	PID	Patient ID Number can be entered for each sample analyzed.
PMI		PROLYTE information printed.
PNE	PND	Patient Name can be entered for each sample analyzed.
RST		This function deletes all saved data as well as any operator entered parameters such as QC ranges, First AUTOCAL, Blood and Urine limits.
SDC		Start sample detector troubleshooting in real-time. Checks & Displays values for air and fluid. (Only for software revision 706 or higher)

2.c Troubleshooting Guide

Refer to the chart below to help determine the problem and corrective action needed.

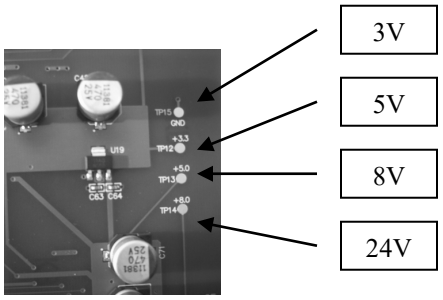
Problem Description	**Problem Source**	**Diagnostic & Correction Steps**
Blank Display	Power Malfunction or Defective Display	AC Power Verification DC Power Verification Display Verification
No Response to YES/NO Buttons	Power Malfunction or Defective Display Connection	Display Assembly Verification DC Power Verification
No Response to NO Button, but Responds to YES Button.	Cable connection	Invert cable connection
Blank Display, Beeping	Power Malfunction	DC Power Verification
"SPR" Errors	Probe Motor Malfunction	Probe Motor Verification
"PMP" Errors or No Pump Movement	Pump Motor Malfunction	Perform PUMP CAL test In DIAGNOSTICS? Menu Pump Motor Verification
Printer Does Not Print	Printer Malfunction	Printer Verification
Sample Detector Test Failure Result 255 or 000	Sample Detector / Circuit Malfunction	Sample Detector Verification
Bad Electrode Voltages	Electrodes or Signal Input Malfunction	Check Electrode Installation and Performance Signal Input Verification
Serial Transmission Failure	Serial Cable or Transmission Protocol	Serial Communication Verification

2.d AC Power Verification

1. Power instrument off.
2. Remove the two fuses from the fuse bay as depicted in Figure P2.
3. If either of the fuses is blown, replace with a CN-4146 fuse.
4. If none of the fuses are blown, contact Diamond Diagnostics.

2.e DC Power Verification

1. Power instrument on.
2. Verify the voltage between **GND** and **24 V, 8 V, 5 V, 3. V** in test points. (See below)
3. If any of the voltage values in STEP 2 are not within specification of +/- 0.5 V, replace the CPU board.



2.f Display Verification

1. Disconnect the display cable from the CPU board. See Display Assembly Removal in the **REPAIR SECTION** for details.
2. Connect a known good display assembly to the CPU board and connect the main power cord. Verify that the test display is operative. Based on the test results, take the appropriate corrective action.

-Display blank and/or **YES/NO** buttons DO NOT operate:
Remove the test display cable. Perform DC power verification. If the DC power tests are successful, replace the CPU board with a new CPU board, and return to normal operation. See CPU Board Removal in the **REPAIR SECTION** for details.

-Display On and **YES/NO** buttons function:
Remove the original display assembly and replace with a new display assembly. See Display Assembly in the REPAIR SECTION for details.

2.g Display Position Verification

1. Turn the instrument off. Remove the rear housing as detailed in **REPAIR SECTION.**

2. Loosen the four screws holding the display to the front housing. Shift the display towards the probe arm assembly and tighten the four screws.

3. Reinstall the rear housing as detailed in **REPAIR SECTION** and turn the instrument on. If the error appears again, please contact Diamond Diagnostics.

2.h Header Verification

1. Go to Instrument Settings, Printer Settings, click "**YES**" at Header Text?

2. Clear any unwanted/random characters by replacing them with " ". This can be accomplished by typing the text using the mini-keyboard. Alternatively, text can be entered using the "**NO**" button to cycle through available characters and using "**Yes**" to confirm selection.

2.i RTC Verification

1. Set the date to 31st Dec 2012 and time to 23:58 hrs. Put the instrument in standby. Wait for 2-3 minutes and the date/time should advance to 01 Jan 2013 00:00hrs. If not, there is an RTC error.

2. Set the date to 28th Feb 2012 and time to 23:58 hrs. Put the instrument in standby. Wait for 2-3 minutes and the date/time should advance to 01 Mar 2013 00:00hrs. If not, there is an RTC error.

If the instrument passes both tests, RTC is working properly.

2.j Probe Motor Verification

1. Turn off the instrument, wait ten seconds, then turn the instrument back on. The probe arm should move down and back up until it reaches home position. If there are no error messages, resume normal operation. If a "SPR" error occurs, proceed to STEP 2.

2. Remove the sample probe from the probe arm. For details refer to PROLYTE Operator's Manual. Turn the machine off, then on. The probe arm should move down and back up. If there are no error messages, the "SPR" error was due to one of the following**; sample probe, solutions valve, and/or probe wiper**. If a "SPR" error occurs, proceed to STEP 3.

3. If the probe arm does not move at all, perform the following operations.

   A. Visually inspect that the lead screw has not broken away from the probe arm. If the lead screw is still attached and motor fails to operate refer to Probe Motor Installation in the REPAIR SECTION for details.

   B. Check that the probe motor wires are completely seated inside the 4-pin connector as follows:
      - Remove the probe motor connector from the bottom left of the CPU Board.
      - Compress the strain-relief cap against the probe motor connector to firmly seat the wires.
      - Reinstall the probe motor connector into the CPU Board.

   C. Check that the sample probe position locator is pushed against the sample probe position sensor. If this is not the case, refer to the *Probe Motor Assembly Installation* in the **REPAIR SECTION** for details.

   D. Repeat STEP 1. If no errors occur, resume normal operation.

   (If arm still does not move, replace/test with test motor – if works replace motor)

4. If the probe arm moves and stops anywhere except the top position, or if the probe arm vibrates against the top of the PROLYTE housing, replace the **probe position sensor**. To replace the sensor: open the back cover, first remove the CPU Board and the probe position locator. Refer to Probe Motor Assembly Removal in the REPAIR SECTION for details.

2.k Printer Verification

1. Press the printer paper advance button. If the printer platen moves proceed to STEP 2. If the printer platen does not move, proceed to STEP 3.

2. Verify that the printer is on. Turn the printer on by pressing "**NO**" to the **PRINTER OFF?** in the Instrument Settings, **Printer Settings** section.

3. If the printer is still not working, turn off the analyzer and wait for ten seconds, and then turn back on. The paper should advance forward printing "PROLYTE".

4. If the printer is still not working, check for any paper obstruction in the printer head area. Remove any obstructions if possible, without damaging the printer assembly. If an obstruction is present and cannot be removed, replace the Printer Assembly. Refer to Printer Removal and Installation in the REPAIR SECTION for details.

5. If there are no obstructions, but the printer does not work, perform the following steps.

   a. Remove the rear housing as detailed in the REPAIR SECTION.
   b. Remove the printer cable at the bottom right of the CPU board.
   c. Reinstall the printer cable into the CPU Board.

6. If the printer still does not print, connect a test printer assembly to the CPU Board. If the test printer works, install a new printer assembly. If the test printer does not work, replace the CPU board. Refer to CPU Board Installation in the REPAIR SECTION for details.

2.l Flash Verification

1. When instrument displays FLASH ERROR, CALL ENGINEER, press "**NO**".
2. Turn the instrument off, wait 10 seconds, then turn the instrument on.
3. If the error appears again, please contact Diamond Diagnostics.

2.m Sample Detector Verification

1. Remove the electrode housing from the analyzer. See the PROLYTE Operator's Manual for further details.
2. Remove the sample detector from the front housing.
3. Install the sample detector into the sample detector receptacle.

▲ Do not install the electrode housing or pump tubing at this time.

4. Look at the left side of the sample detector. A red light must shine from the LED hole. If there is no red light, install a known good sample detector. If there is still no red light, replace the Display Cable Assembly. Refer to the REPAIR SECTION for information.
5. If the known good sample detector red light is on, check the four connecting pins on the original sample detector. The pins must face straight out forming a rectangle. If the pins are bent against the black plastic body, straighten the pins using a small flat head screwdriver.
6. Reinstall the original sample detector.

   -If the red light comes ON: Reassemble the PROLYTE and perform a **SOLUTIONS PRIME** and a **SAMPLE DET. TEST**. Resume normal operation.

   -If the red light remains OFF: Install a new sample detector.

2.n Serial Communication Verification

1. Connect the PROLYTE analyzer to a device with a known working serial port. Use a known good PROLYTE serial cable, part no. CN-3104. Make cross connections as required (e.g. 2 to 3; 4 to 5).

2. Refer to the following serial interface specifications.

Serial Interface Specifications

Serial Cable Settings	
Connector	Registered Jack (RJ12)
Pin Type	6 pole, 6 connected (6P6C)
Pin Assignments	
Pin 1	GND Ground
Pin 2	R x D Receive data
Pin 3	R x D Receive data
Pin 4	T x D Transmit Data
Pin 5	T x D Transmit Data
Pin 6	GND Ground
RS-232 Protocols	
Transmission Rate	38400
Bit Configuration	8 data bits, 1 stop
Bit Parity	None
Control Codes	None
All lines end with Carriage return line feed (CRLF)	
All transmission is ASCII string	

3. When correctly linked the PROLYTE will transmit to the external device all of the data that is printed by the PROLYTE printer, in the same format.

2.0 *Serial LIS Protocol*

A serial cable with straight through configuration is required for this process.
*To turn on communication, enter LIS service code in [**SERVICE LOGIN?**].*

Serial communication protocol

Result Format

PARAMETER	NO OF CHARACTERS	EXAMPLE
START	1	(02 H)
CODE1	1	'S' SAMPLE
CODE2 CODE3 DATA LENGTH	3 3 5	ANA ANALYSIS 000 RESERVED FOR FUTHER USE 00037
DATE TIME	6 4	ddmmyy hhmm
RACK NOS	4	0000
TUBE NOS	4	0000
TEST NOS ID NAME	5 16 16	00010 PATIENT ID PATIENT NAME
PATIENT TYPE SAMPLE TYPE	2 1	Human, Control, Animal B Blood
RESULT 1	33	Electrode Result (see break up)
RESULT 2 RESULT 3 RESULT N	33 33 33	Electrode Result (see break up) Electrode Result (see break up) Electrode Result (see break up)
Temperature	8	Temperature
STOP	1	(03 H)

Rows Highlighted in Green are only valid for Sample Analysis. During calibration, these are not passed in the LIS data packet.

Start Code
Hexadecimal value [02] marks the start of data packet

Analysis Code

Description	**Code1**	**Code3**	**Code3**
Sample Analysis	S	ANA	000
Calibration	C	ION	000

Data Length
Determines the data length that follows after this block

Date
Represents date in DD-MM-YY format

Time
Represents time in HHMM format

Rack Number
Represent the rack number. Not used here. Reserved for future use!

Tube Number
Represent the sample tube number. Not used here. Reserved for future use!

Test Number
Default internal sample test number give to each sample.

Patient Id
Operator assigned 16 characters long Patient Id. Default Patient Id is 16 white spaces.

Patient Name
Operator assigned 16 characters long Patient Name. Default Patient name is 16 white spaces.

Patient Type

Patient Type	Patient Type Code
Control Sample	01
Standard Sample	02
Human Sample	03
Dog Sample	04
Cat Sample	05
Cow Sample	06
Horse Sample	07
Pig Sample	08
Sheep Sample	09
Other Animal	10

Sample Type

Sample Type	Sample Type Code
Serum	1
Blood	2
Urine	3
Standard	4
QC1	5
QC2	6
QC3	7
Bicarbonate	8
Acetate	9

Sample Result [X]

Ion result is sent out in 33 characters. Table below shows the result format:

PARAMETER	NO OF CHARACTERS	EXAMPLE
ION CODE	2	01
Unit Code Value Sign Value	1 1 7	M + Positive number 0100000 1000 times Conc result
Correlation Flag	1	D Default
Error Flag Sample milli-volt sign	1 1	L Low + Positive number
Sample milli-volt	7	0343400 1000 times Sample mV
Sample try Count Standard milli-volt sign	2 1	01 Number of tries for successful result + Positive number
Standard milli-volt	7	0343400 1000 times Sample mV
Standard try Count	2	01 Number of tries for successful result

Ion Code List

Ion Code Parameter	**Code**
Na	01
K	02
Cl	03
Ca	04
Li	05
Na (Std C)	06
K (Std C)	07
Cl (Std C)	08
Ca (Std C)	09
Li (Std C)	10

Unit Code List

Unit Code	Unit Code
mmol/dL	M
mg/dL	G

Value Sign

This character represents if value is positive or negative. “+” represents positive and “-” negative numbers

Value

Ion concentration value is sent out in 7 Digits. This number is 1000 times the concentration determined in the analysis. For example, 01234560 represent value of 1234.56

Correlation Flag

Correlation Type	Flag Code
Default	D
User Correlation	U
MGL Correlation (for Ca)	M
Flame Correlation	F

Error Flag

Correlation Type	Flag Code
MV Range Error	V
Noise Error	N
Drift Error	D
Range Low	L
Range High	H
Too Low	<
Too High	>
Not Calibrated	X
Not Consistent	!
Cannot Measure	@
Li Cannot Measure	M

Reading 1 mV Sign

This character represents if value is positive or negative. "+" represents positive and "-" negative numbers. During calibration, this represents STD-A. During sample analysis, it represents Sample mV.

Reading 1 mV Value

Ion concentration value is sent out in 7 Digits. This number is 1000 times the concentration determined in the analysis. For example, 01234560 represent value of 1234.56. During calibration, this represents STD-A. During sample analysis, it represents Sample mV.

Reading 1 mV Try Count

The number represents number of tries instrument ran the standard fluid before producing stable results. During calibration, this represents STD-A.

Reading 2 mV Sign

This character represents if value is positive or negative. "+" represents positive and "-" negative numbers. During calibration, this represents STD-B. During sample analysis, it represents Standard Fluid mV.

Reading 2 mV Value

Ion concentration value is sent out in 7 Digits. This number is 1000 times the concentration determined in the analysis. For example, 01234560 represent value of 1234.56. During calibration, this represents STD-B. During sample analysis, it represents Standard Fluid mV.

Reading 2 mV Try Count

The number represents number of tries instrument ran the standard fluid before producing stable results. During calibration, this represents STD-B.

Temperature

PARAMETER	NO OF CHARACTERS	EXAMPLE
Constant	1	T
Unit Code	1	C Celsius
Value	7	0100000 100 times Actual temperature
Error Flag	1	L Low

Temperature Unit Code

Units	Unit Code
Celsius	C
Kelvin	K

Temperature Value

100 times recorded temperature value is give these 5 characters.

Temperature Flag

Flag Name	Code
Low	L
High	H

Stop Code

Hexadecimal value [03] marks end of data packet

2.p *Fail safe software upload mode*

(Only for software revision 706 or higher)

In situations where instrument doesn't initialize completely due to wrong software upload or peripheral issues, bootloader mode can be entered directly by following these steps –

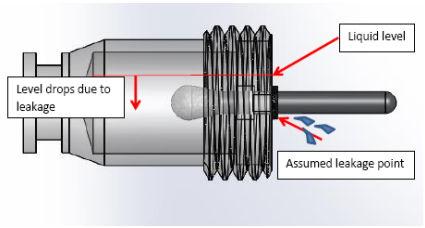
1. Turn instrument off.
2. Press YES button.
3. While pressing the YES button, turn on the instrument.
4. Wait for 30 seconds.
5. Instrument is now in programming mode.
6. New software can be uploaded using provided steps.

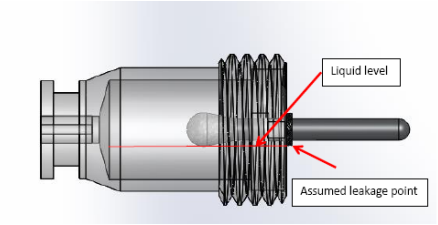
2.q *Reference Area Verification*

Identifying the source of salt creep in the reference area of a ProLyte instrument is critical in order to properly resolve the issue. If the Reference Electrode is not properly seated into the housing the required seal will not form, causing a large leak. Pressing the electrode housing too far into the instrument may loosen the electrode pin and create a leak around the pin area which then spreads onto the cap around the pin of the electrode.

How to determine if the source of leak is the Reference Electrode or the Electrode Housing?

Reference Electrode



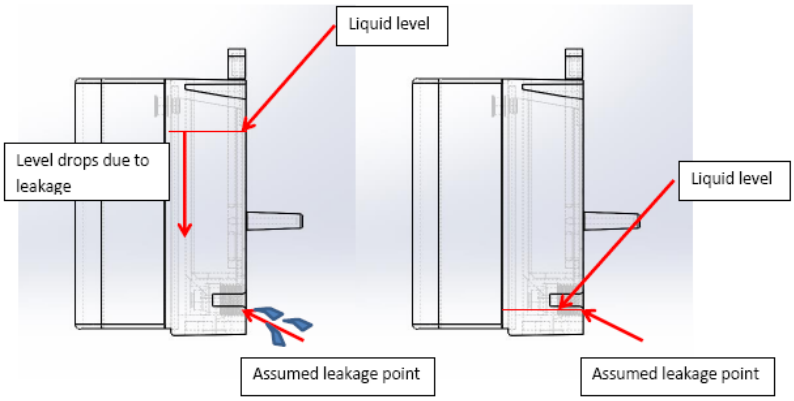


Fluid above the pin line

Fluid level below the pin line

The pictures above show how the reference electrode hydrostatics works. If the seal between the pin & the cap is damaged and the liquid level is above the pin line, then the leak will happen. Leaking will continue until the internal fluid level falls below the pin line. In this scenario, the leaked liquid will be minimal given the amount of liquid inside the electrode. The electrode needs to be replaced.

Electrode Housing



If the reference electrode is not threaded properly to reference housing, then there will be leak around the housing and reference body junction. The leakage and salt buildup will be significantly higher in this case as the reference housing holds comparatively larger fluid volume. Leak will stop only when the housing fluid is drained below the leakage point as shown in above picture. Reference electrode internal fluid volume will be unchanged in this case. Properly sealing the reference electrode with housing or replacing the housing will resolve this issue.

Chapter 3 - Repair

3.a Repair Overview

Always consult the TROUBLESHOOTING SECTION first to determine the problem before attempting to repair the analyzer.

Always remove the solutions pack and the electrode housing from the analyzer before beginning any repair work. Refer to the PROLYTE Operator's Manual for detailed instructions.

Follow the assembly and removal instructions in the order outlined in this section unless otherwise noted. Always unplug the power cord from the analyzer before beginning any repair work.

Note that only complete mechanical and electronic assemblies can be replaced. Refer to the Replacement List in the PRODUCT DESCRIPTION SECTION which lists replaceable assemblies. Consult the list to determine the appropriate replacement item and part number.

3.b Recommended Tools

The following is a list of the tools required to perform repairs on the PROLYTE analyzer. Please refer to this list to determine the appropriate tool and size needed.

Phillips Screw Driver, Small
Phillips Screw Driver, Large
Scissors
Needle Nose Pliers
Volt Meter

3.c Rear Housing Removal

1. Disconnect the power cord from the power entry module, the Mini-keyboard (and Barcode Reader if used) from USB connectors. See figure below.

2. Remove the four screws from the rear housing using a Phillips head screw driver, as shown below.

3. Disconnect the printer cable from the CPU board.

4. Separate the front and back housing. See Figure P5.

3.d Rear Housing Installation

1. Align and attach the front and back housing. See figure below. Verify that all cable connectors are attached properly. Refer to figures in the PRODUCT DESCRIPTION SECTION for detail. Verify that all wires/cables are inside the instrument and are not being pinched by anything before proceeding.

2. Perform steps 1 and 2 from Rear Housing Removal in reverse.

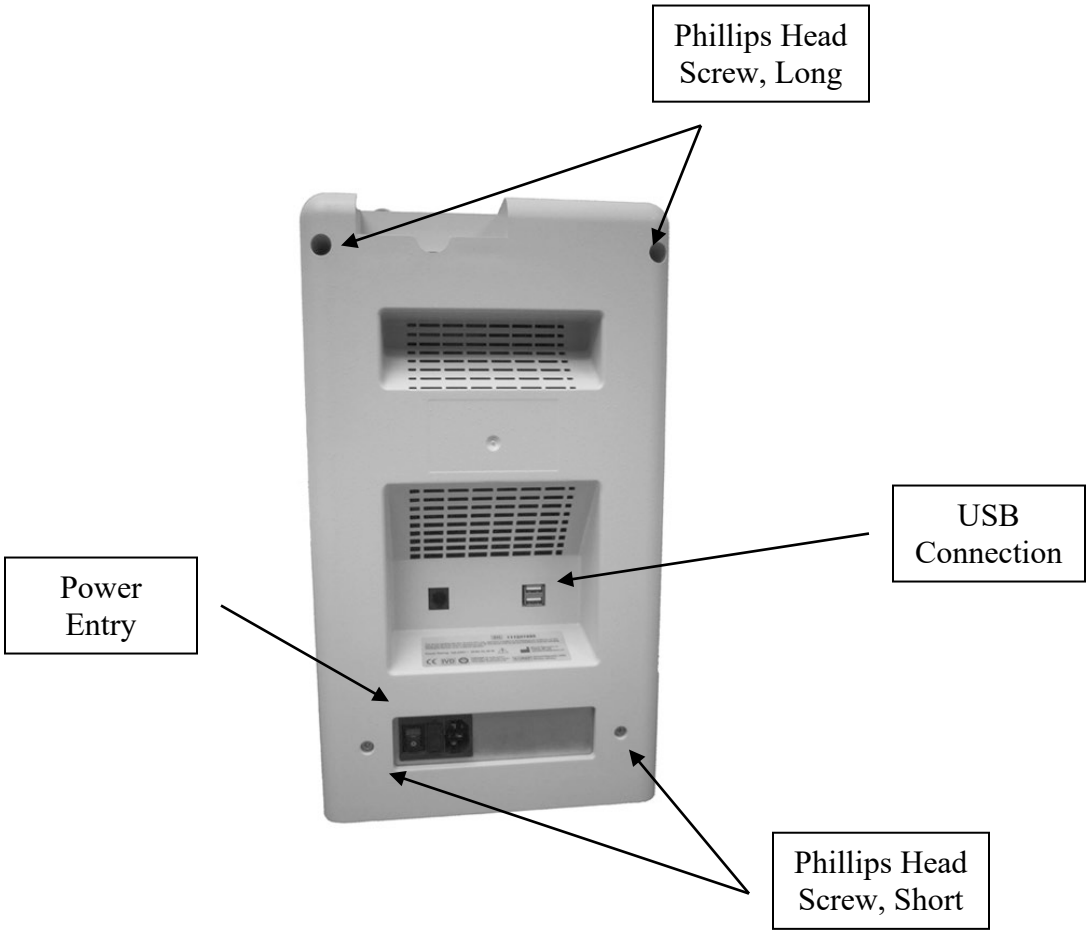


Figure P5 - Rear Housing Removal (Cont)

3.e Power Supply Removal

1. Refer to section 3.c to open analyzer.
2. Disconnect the power supply cable from the CPU board, see Figure P6.
3. Remove the four screws holding the power supply.
4. Slide power supply out of front case.

▲ Support analyzer when power supply is removed to avoid tipping.

3.f Power Supply Installation

1. Slide the power supply assembly into the front case, as shown in figure below. Align mounting holes on the bottom of the front housing.
2. Perform steps 2 and 3 from Power Supply Removal in reverse.

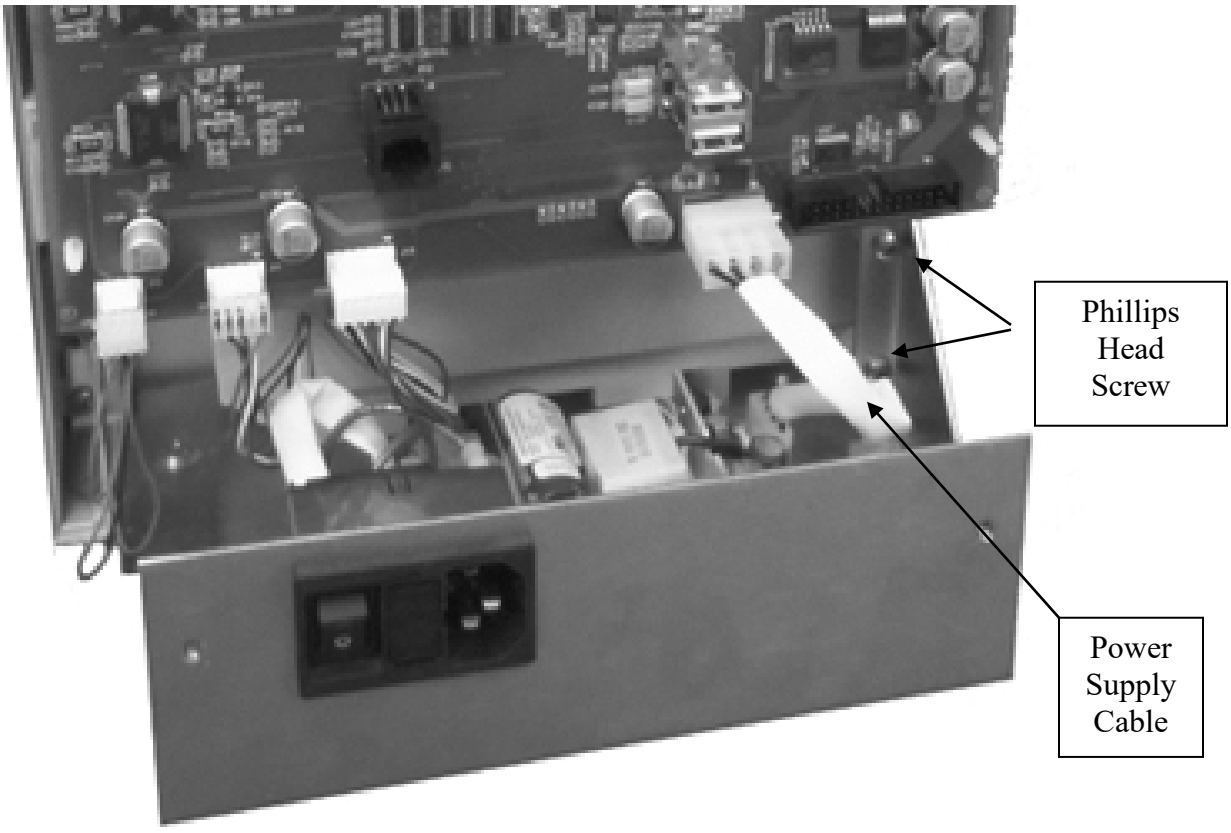


Figure P6 - Power Supply Removal / Installation

3.g Printer Removal

1. Remove the paper roll from the printer bay.
2. Remove the rear housing of the analyzer, refer to Section 3.c for details.
3. Detach the printer cable from the retaining clamps located along the inside face of the rear housing. See Figure P7.
4. Using needle nose pliers, remove the terminal plugs from the printer button as shown in Figure P7.
5. Remove the long Phillips Head screw near the printer button using small screw driver.
6. Remove the other two screws that hold the printer bracket into the back case as shown in Figure P7.

3.h Printer Installation

1. Perform steps 2 through 6 (mentioned above) in reverse.
2. Power on the analyzer.
3. Using scissors cut the beginning of the paper roll. Insert the paper into the feeder slot inside the printer bay, and press the paper feed button until the paper is pulled through the printer.
4. Place the printer roll in the printer bay, as shown in Figure P8.

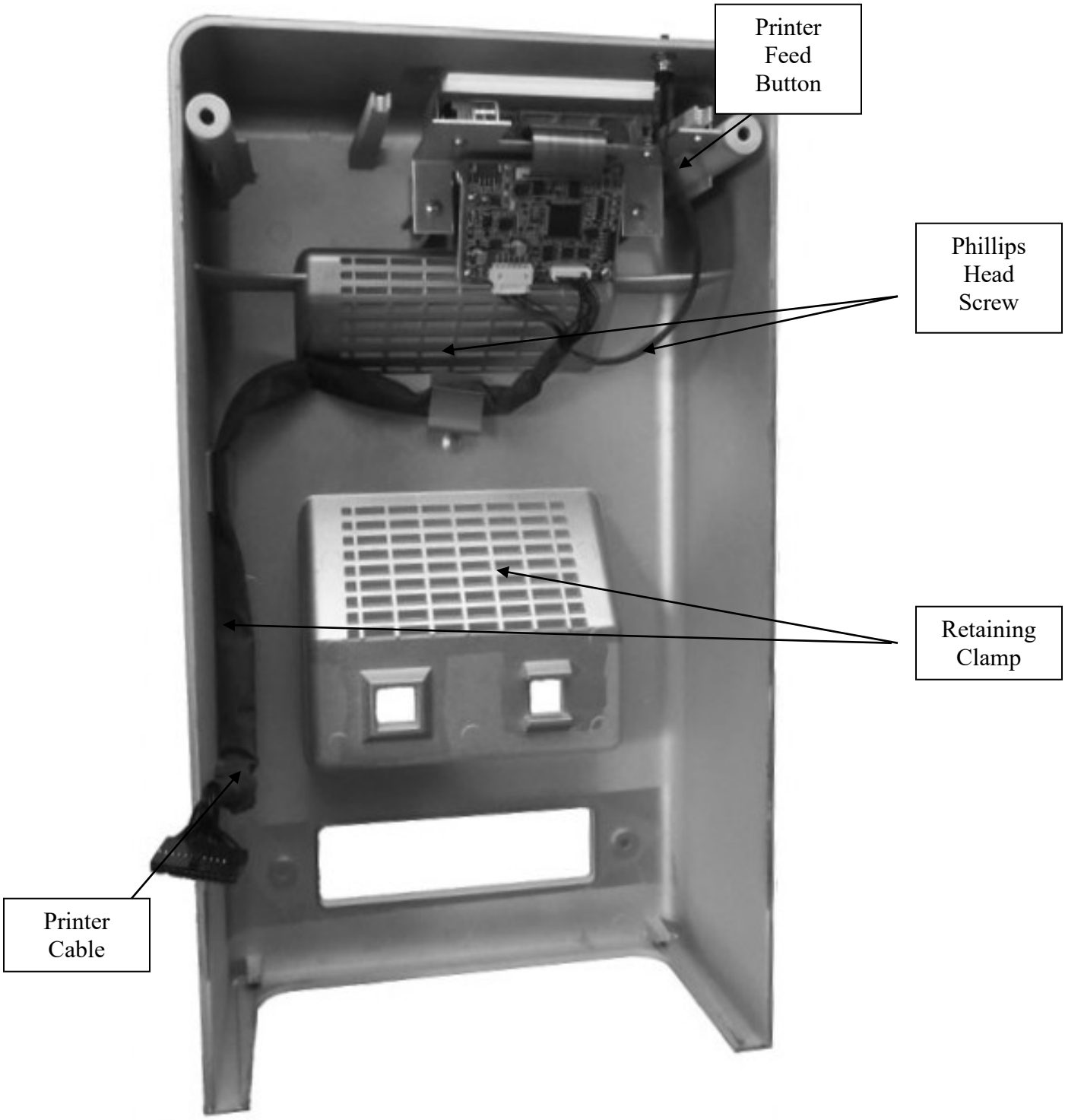


Figure P7 - Printer

Removal / Installation

Figure P8 - Printer Removal/Installation

3.i CPU Board Removal

1. Remove the rear housing of the analyzer; refer to section 3.c for details.

2. Remove the display cable from the top of the CPU board shown in Figure P9.

3. Disconnect the electrode jack connectors from behind the CPU board. See figure below for the location of the electrode jacks.

4. Disconnect the linear actuator, optical switch, peristaltic pump, power supply and printer cables.

5. Disengage the CPU board from the four plastic mounting posts as shown.

6. Slide the CPU board off the mounting posts. See Figure P9.

3.j CPU Board Installation

1. Align the CPU board with the plastic mounting posts. Snap into place.

2. Connect the electrode jacks to the back of the CPU board. To connect, gently push the electrode jack connectors straight into the CPU connectors until you hear a click. See Figure P9 to determine the proper connector pin position on the CPU board and the recommended installation order.

3. Attach the display cable to the CPU board.

4. Connect the probe motor, sensor, pump motor, power supply and printer cables to the CPU board, See Figure P9.

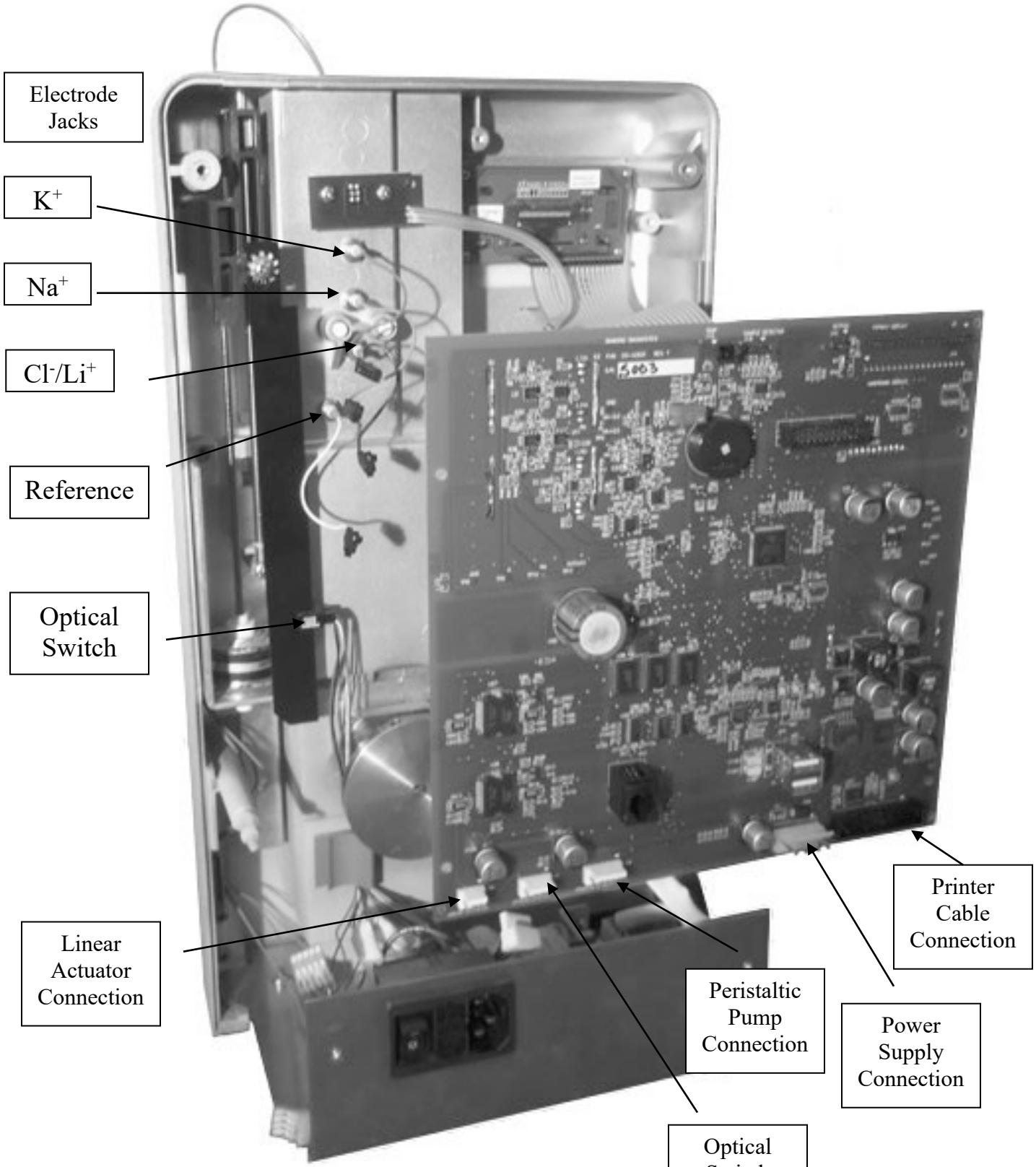


Figure P9 - CPU Board Removal/Installation

3.k Display Removal

1. Remove the rear housing of the analyzer, refer to Section 3.c for details.
2. Carefully remove the display cable from the Display Board. See Figure P10.
3. Disconnect display cable from Touch Pad Connector.
4. Remove the four screws from the display assembly using a Phillips head screw driver. See Figure P10.

3.l Display Installation

1. Position the front housing so that the front of the analyzer is facing down.
2. Align mounting holes with front case with Display cable connector facing down.
3. Hold the display in place and attach the four screws using a Phillips head Screw driver. See Figure P10.

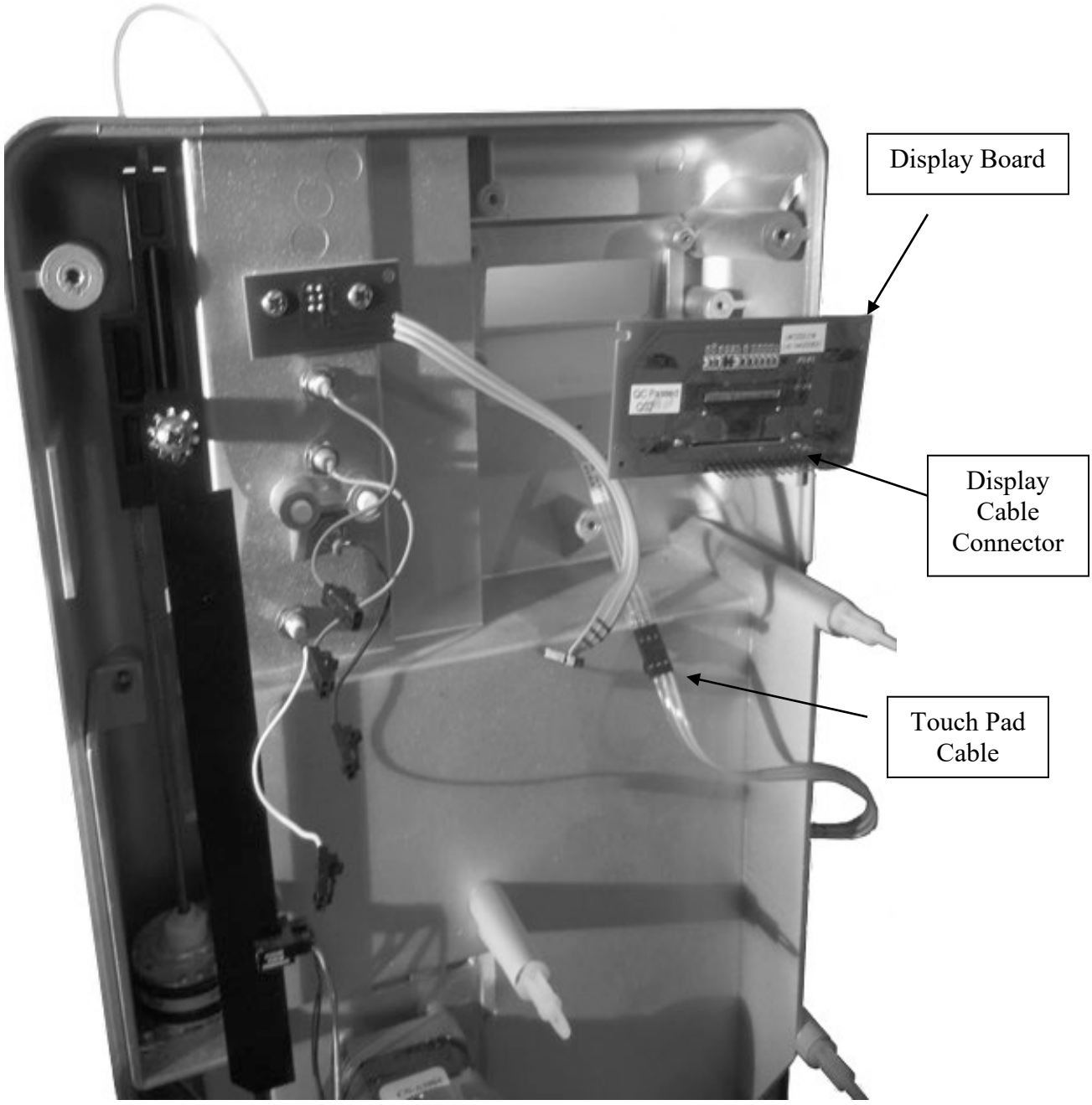


Figure P10 - Display Removal/Installation

3.m Pump Motor Removal

1. Remove the pump tubing from the front of the analyzer.
2. Remove back case of analyzer; refer to Section 3.c for details.
3. Remove CPU Board; refer to Section 3.i for details.
4. Remove the four screws from the front of the analyzer using a Phillips head screw driver. See Figure P11.
5. Remove the pump motor assembly, as shown in Figure P12.

3.n Pump Motor Installation

1. Install the pump motor assembly through the front housing, as shown in Figure P12. The pump motor wires are positioned below the pump when properly aligned.

2. Attach the four screws into the front of the analyzer, using a Phillips head screw driver. See Figure P12.

3. Secure the loose wires under the pump motor in the wire retainer.

4. Install the pump tubing.

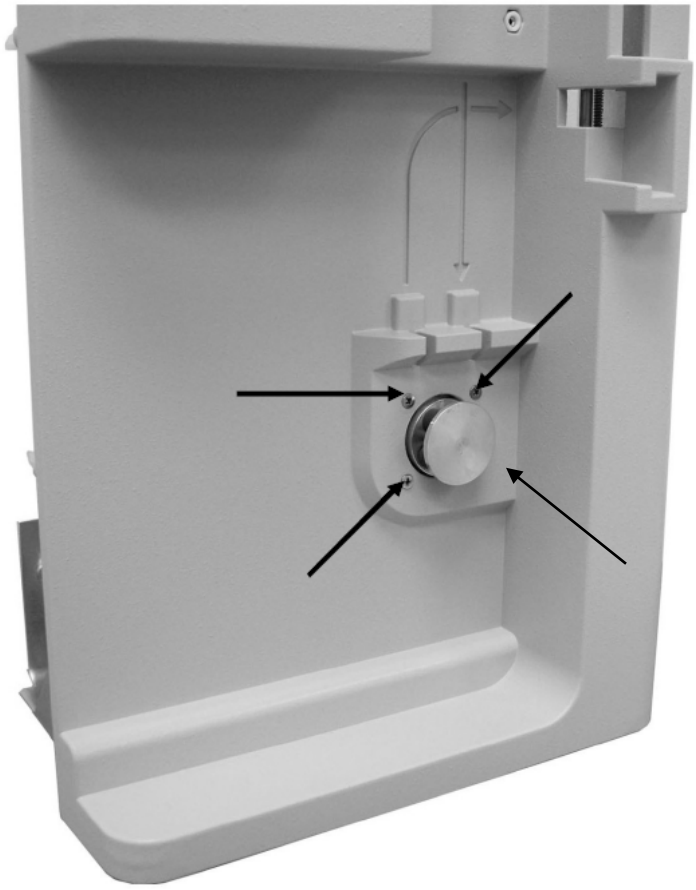


Figure P11 - Pump Motor Assembly Removal/ Installation

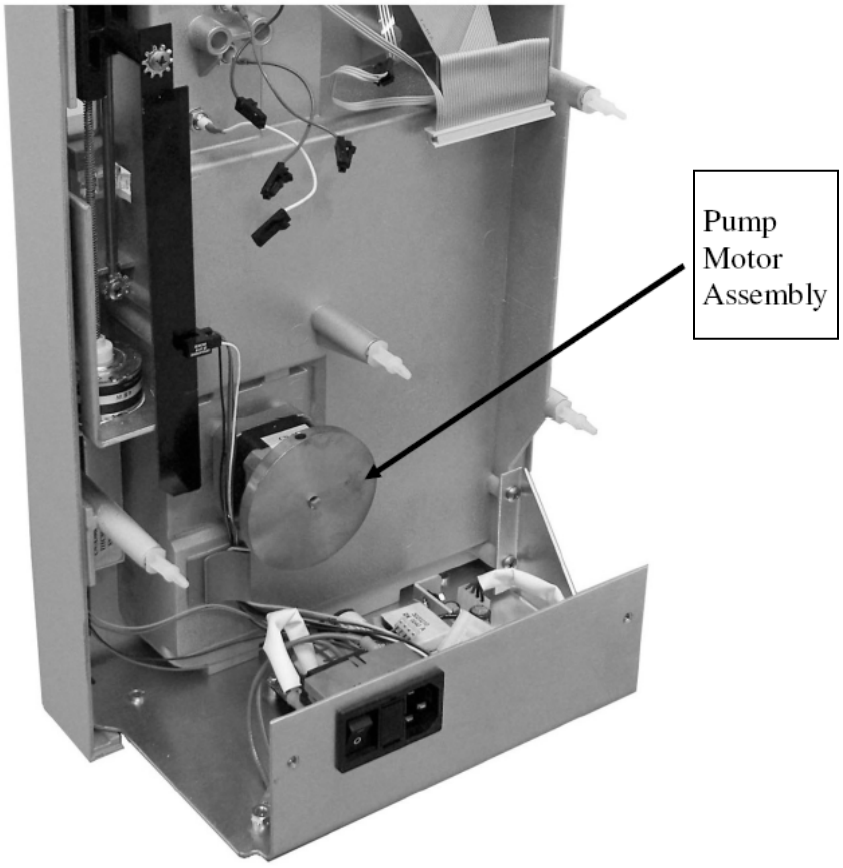


Figure P12 - Pump Motor Assembly Removal/Installation

3.o Probe Motor Assembly Removal

1. Remove back case; refer to Section 3.c for details.
2. Remove CPU Board; refer to Section 3.i for details.
3. Remove the screw at the top of the probe position locator, using a Phillips head screw driver, as shown in P13. Remove the washer.
4. Remove the probe position locator.
5. Remove the three screws from the probe motor bracket, using a Phillips head screw driver, as shown in Figure P13.
6. Remove the Guide Rod screw and washer with a Phillips head screw driver as seen in P13.
7. Remove the probe motor assembly and Guide Rod.

3.p Probe Motor Assembly Installation

1. Reinstall the probe motor assembly and the Guide Rod. Install Guide Rod screw with washer using a Phillips head screw driver. See Figure P13. Ensure the wires are routed behind the bracket.

2. Attach the three screws to the probe motor assembly bracket using a Phillips head screw driver.

3. Place the probe motor cable wires into the retaining clamp.

4. Install the solutions valve. Remove the black thumb grip from the solutions valve.

5. Install the sample probe. Refer to Figure P14 for details.

    A. With the probe hole facing to the left, toward the inside body of the PROLYTE, align the probe collar with the notch on the top of the probe arm. When aligned, snap the probe into the probe arm.
    B. Manually move the probe arm until the sample probe hole is aligned in the middle of top chamber of the solutions valve.

    ▲ *When the sample probe is aligned, DO NOT move the probe arm until the probe motor installation is complete.*

6. Place the position locator into position. The locator should be seated inside the optical switch.

7. Attach and slightly tighten the washer and screw at the top of the position locator. Do not fully tighten the screw.

8. Align the probe position locator slot within the center of the optical switch. Gently move the locator to the left and visually confirm the alignment. Refer to Figure P3 for correct alignment.

    ▲ *Confirm that the sample probe hole is aligned with the middle of the top chamber on the solutions valve before continuing.*

9. When alignment is complete, fully tighten the probe position locator screw into place using a Phillips head screw driver.

    ▲ *Apply small amount of white Lithium Grease to linear actuator worm gear if necessary. Refer to Figure P16 for grease details.*

Figure P16 – BEL-RAY Food-grade, NLGI#2, Silicone grease, PN: 62280

10. Reattach the black thumb grip on the solutions valve.

12. Reinstall CPU Board, refer to section 3.j. for details.

13. Power on analyzer and ensure probe stops in center of solutions valve top chamber.

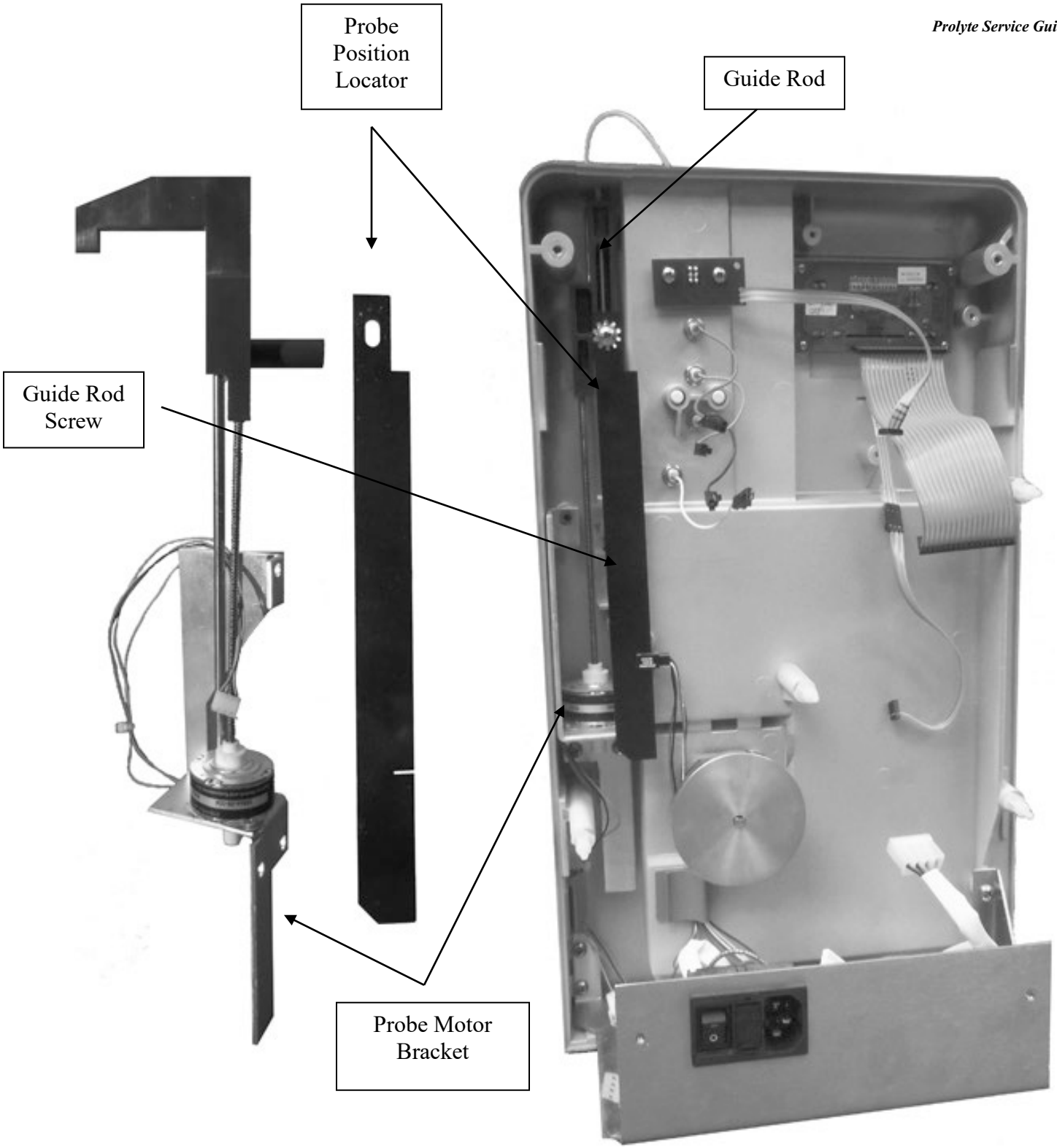


Figure P13 - Probe Motor Removal/Installation

Figure P14 - Solution Valve Removal/Installation

3.q Electrode Jack Removal

1. Remove back case of analyzer; refer to Section 3.c for details.
2. Remove CPU Board; refer to Section 3.i for details.
3. Remove the hex nuts on the electrode jack using needle nose pliers.
4. Pull the electrode jacks from the front housing of the analyzer, as shown in Figure P15.

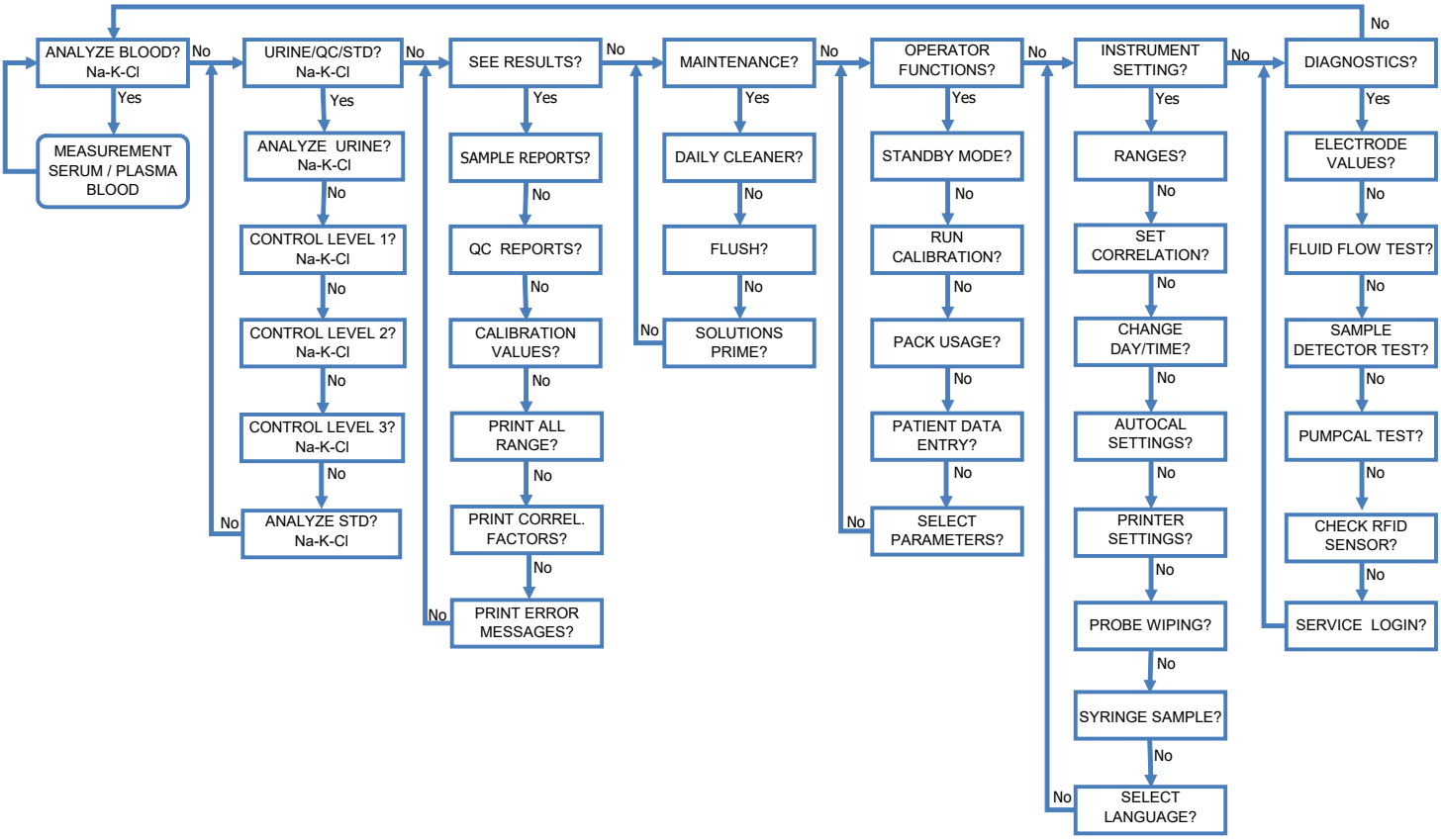
3.r Electrode Jack Installation

1. Push the electrode jacks through the holes in the front of the analyzer, see Figure P15.
2. Attach the hex nut to the electrode jack using needle nose pliers, and tighten.
3. Connect wires to CPU Board.

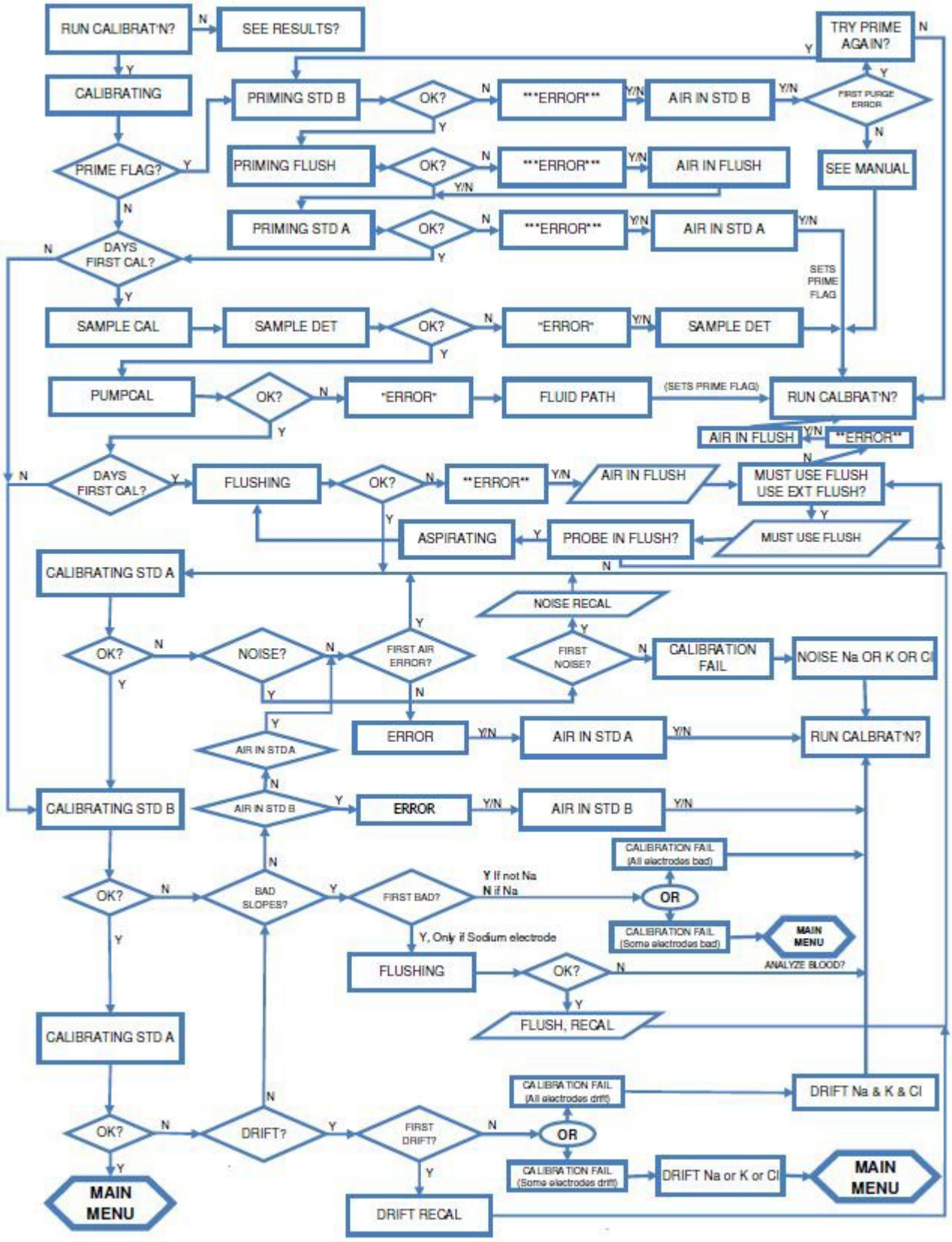
Figure P15 - Electrode Jack Removal/Installation

Chapter 4 - Software Flowcharts

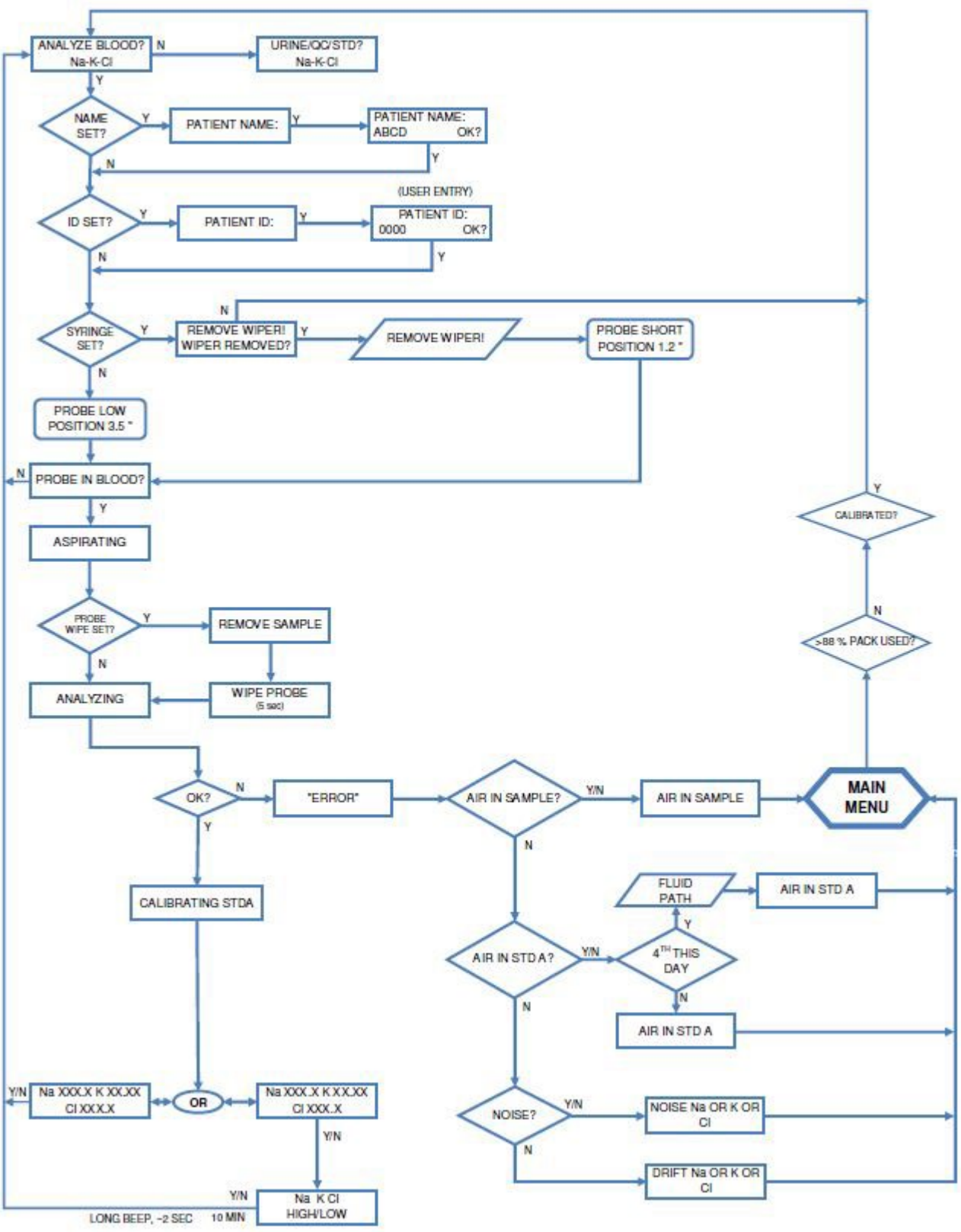
1. Overall Program Flow



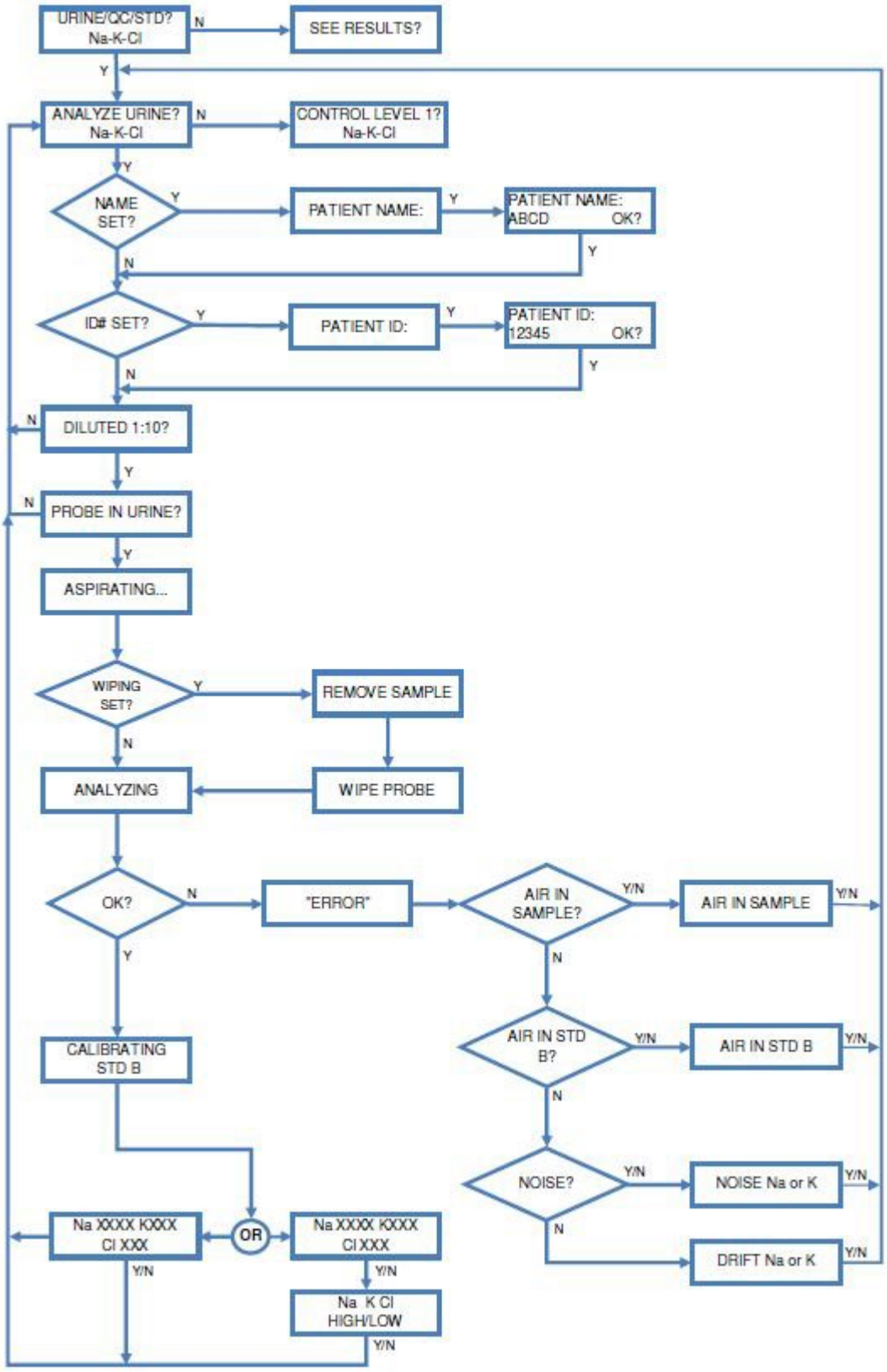
2. Calibration



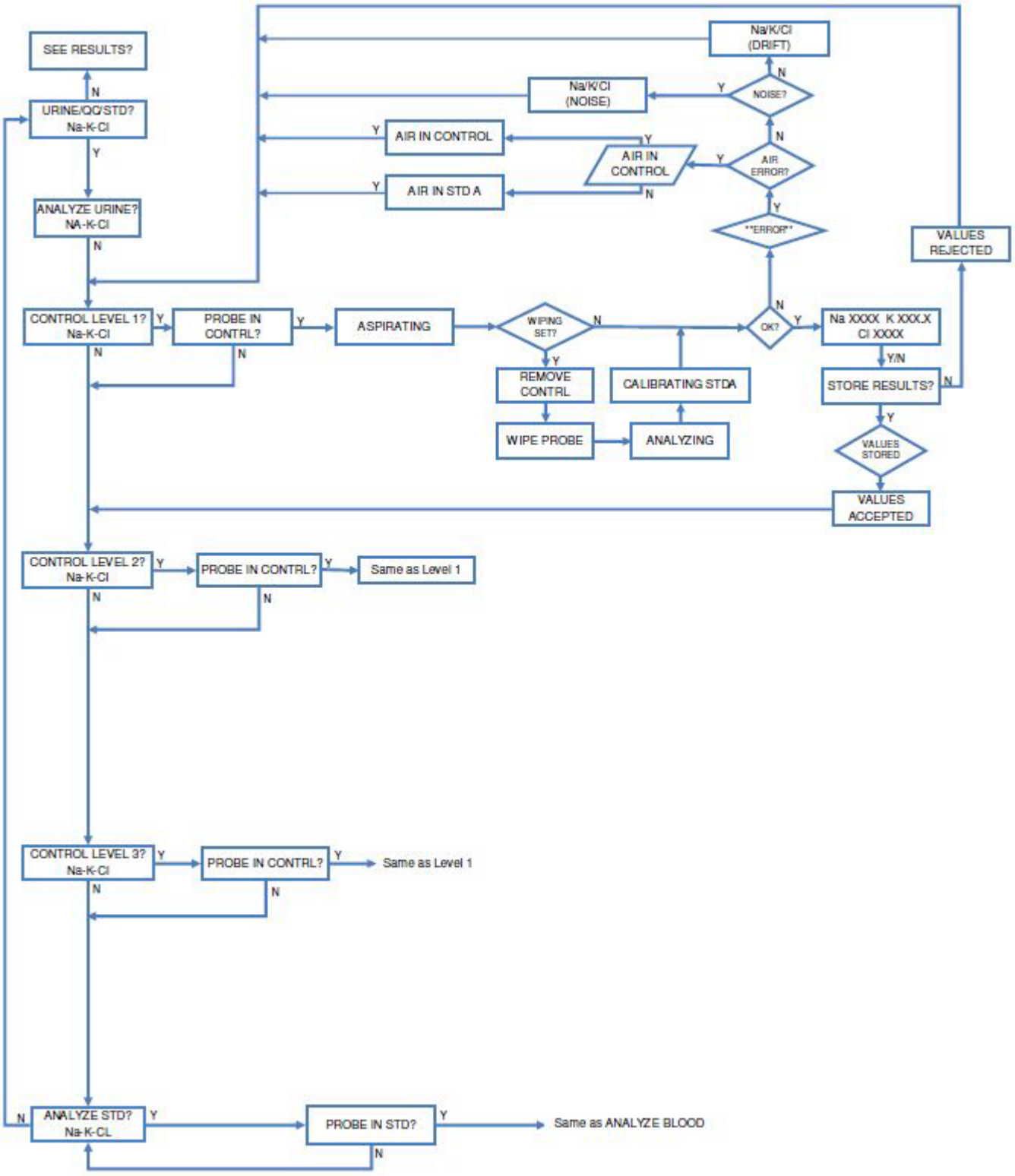
3. Analyze Blood



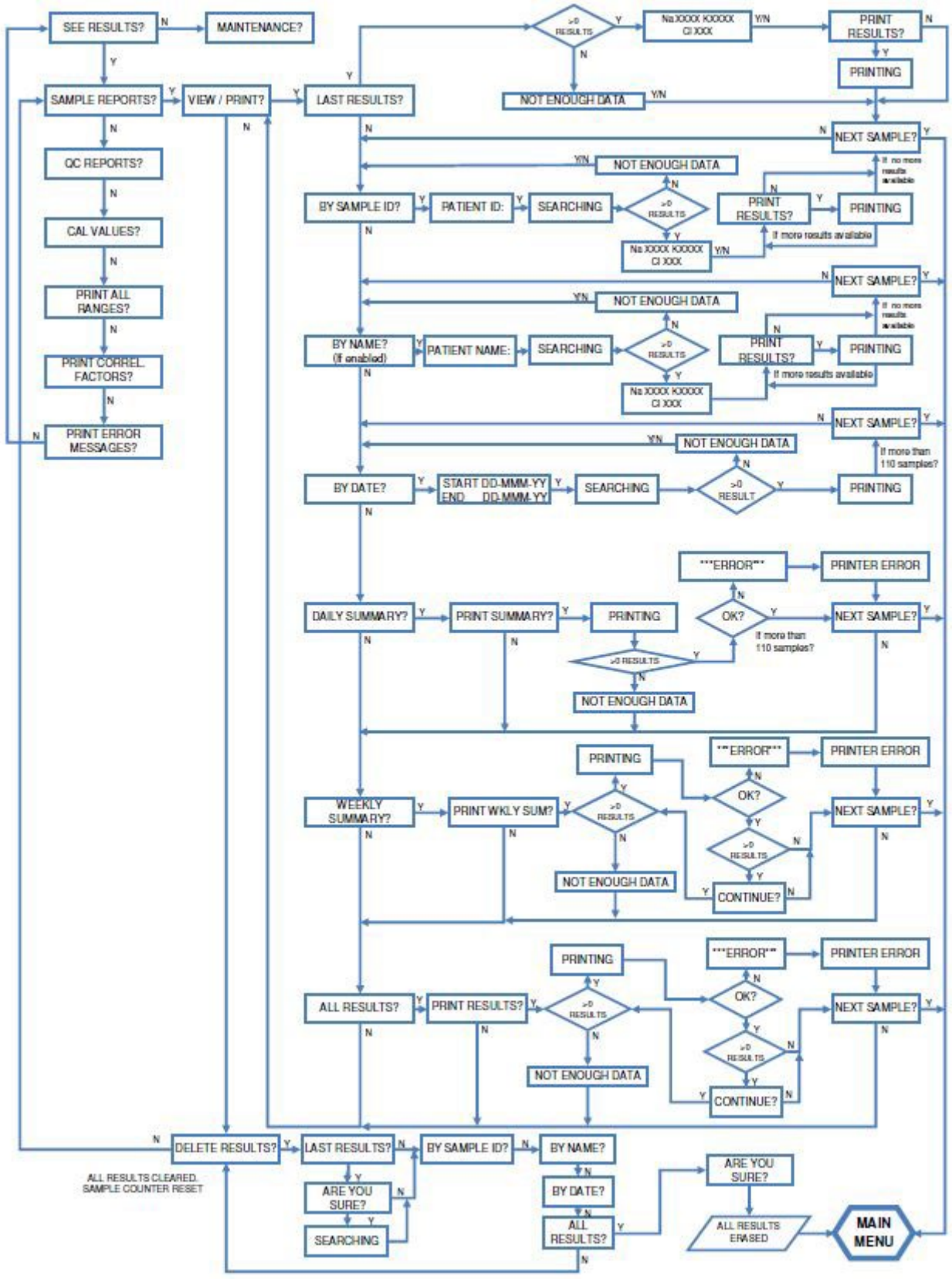
4.A Urine-QC-STD UR



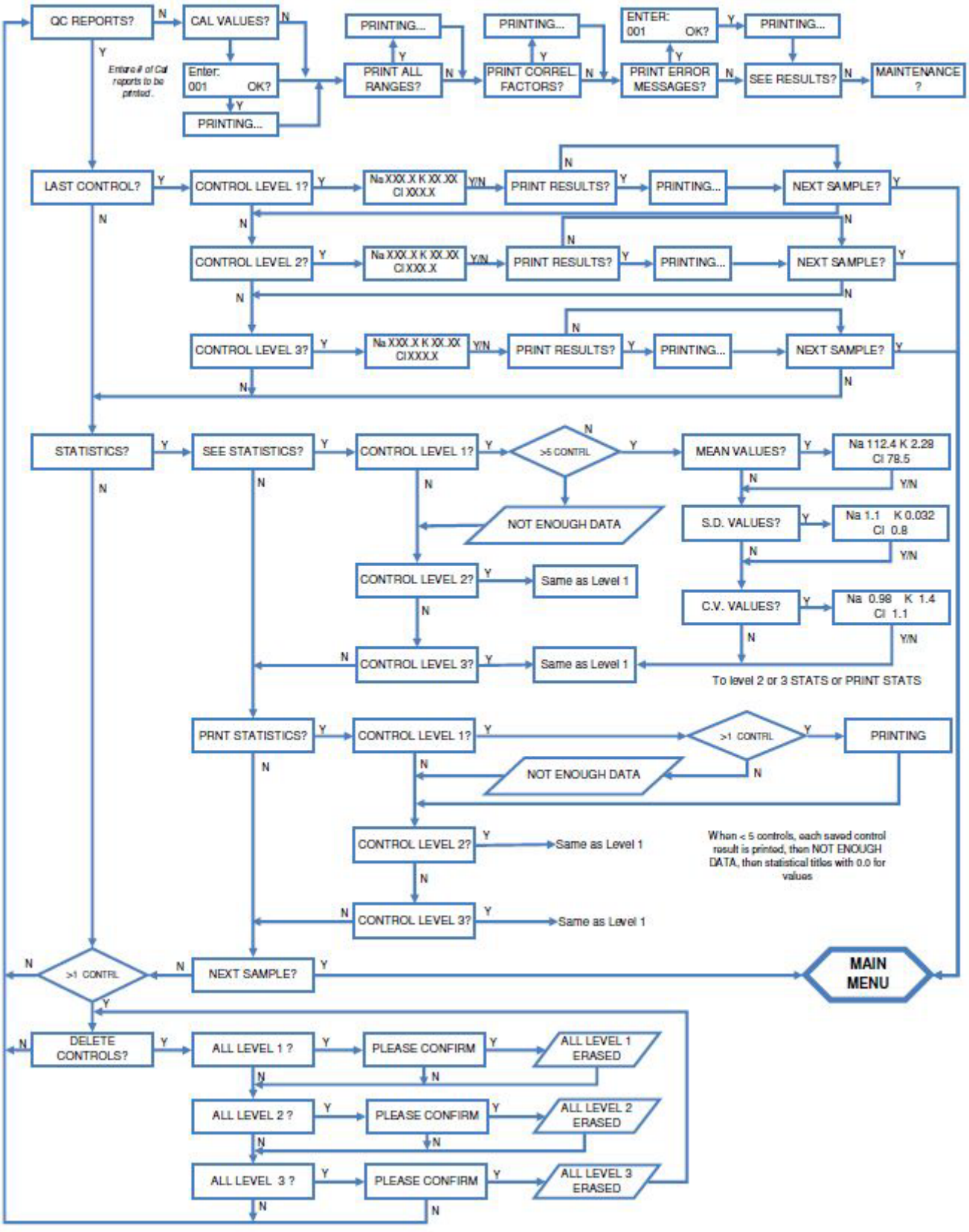
4.B Urine-QC-STD QC



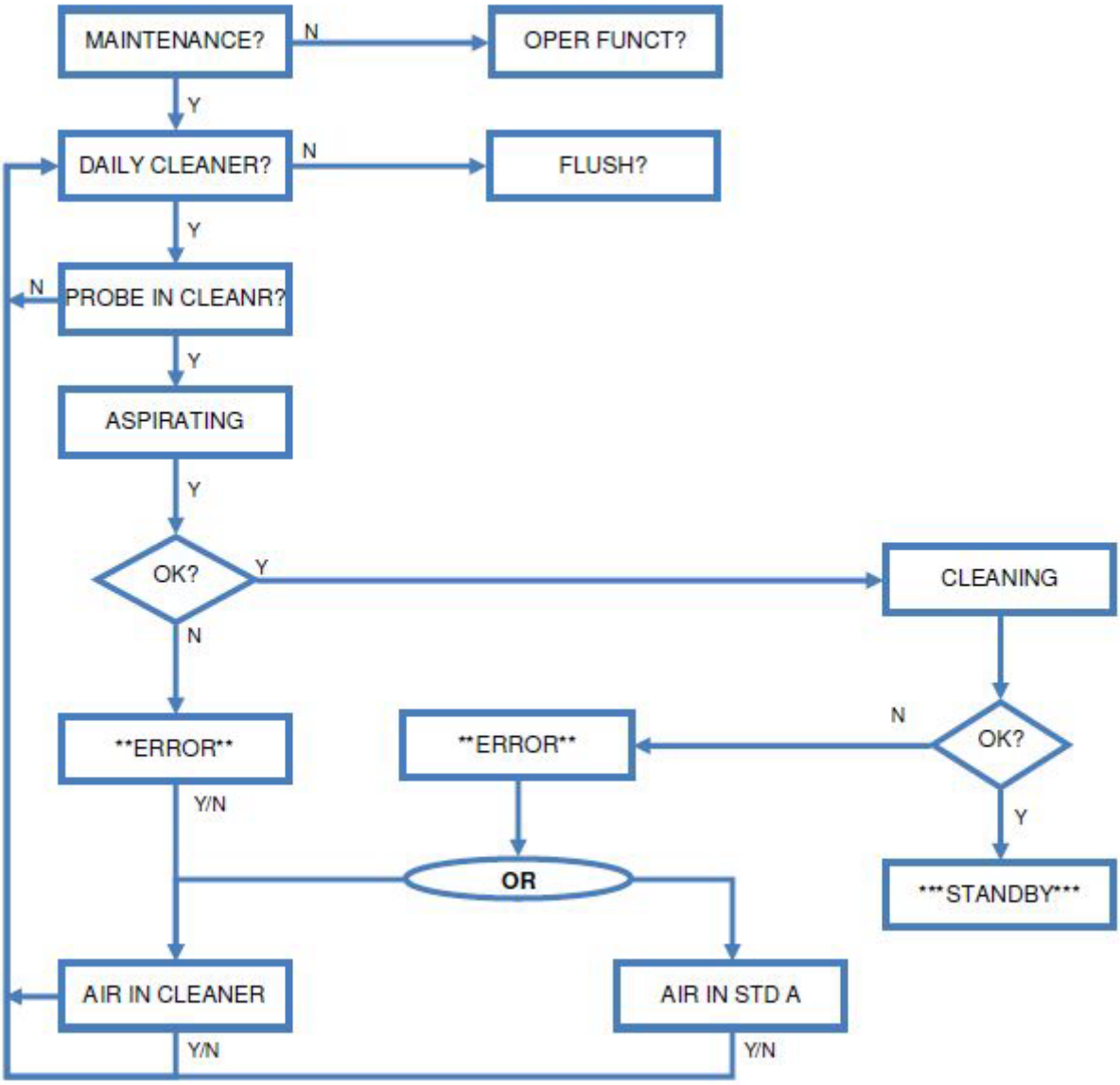
5.A See Results- Samples



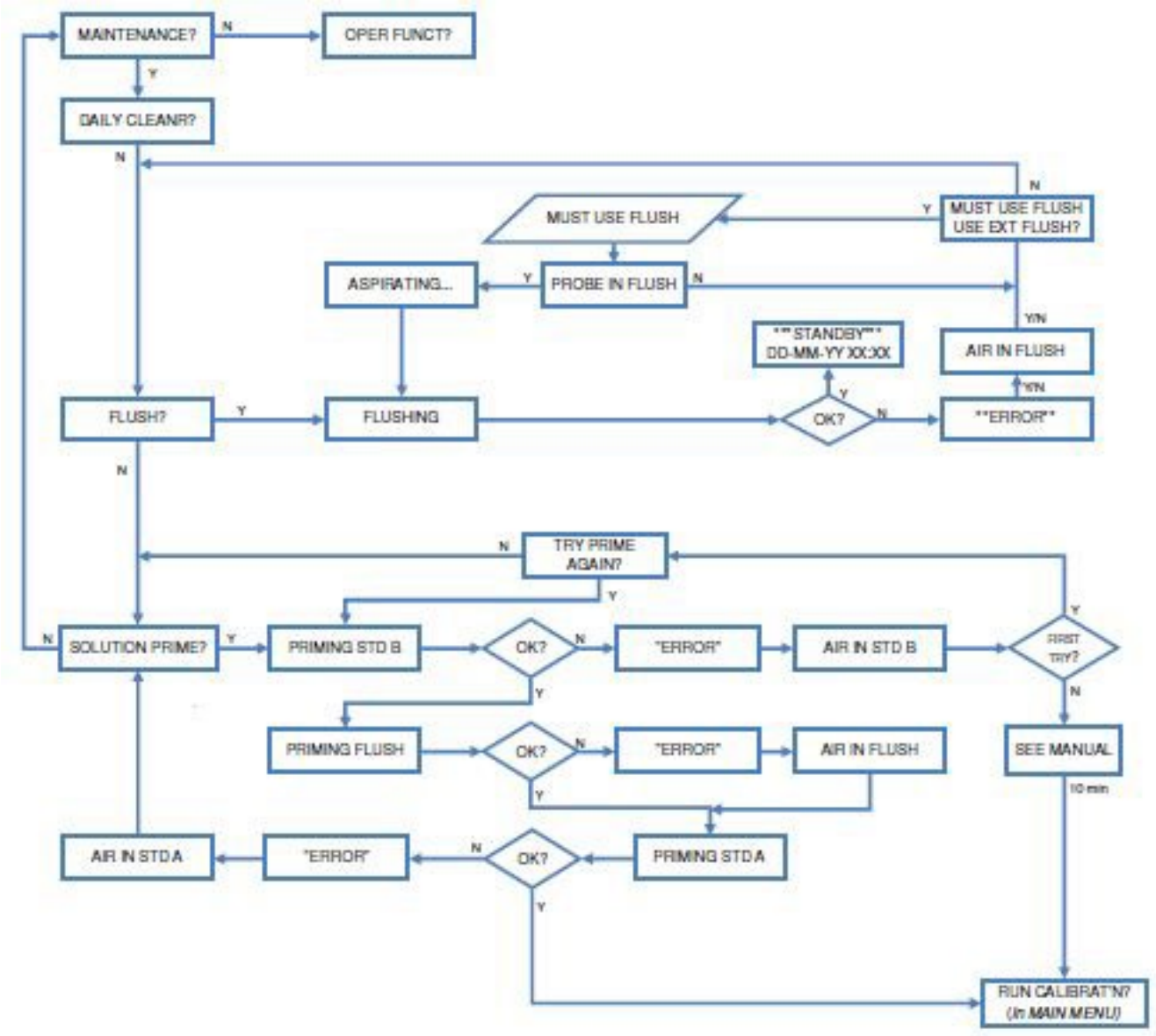
5.B See Results- QC Reports



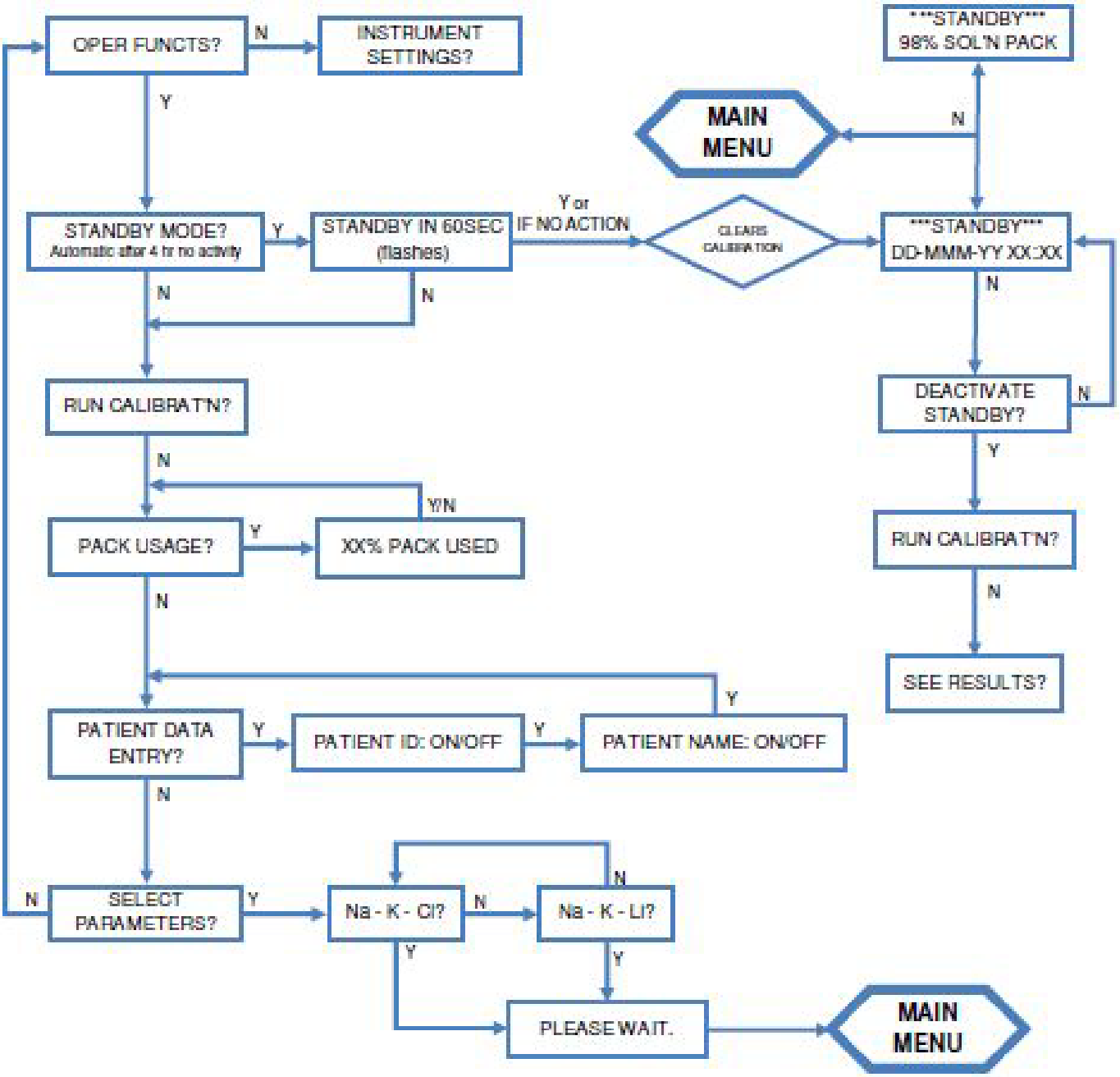
6.A Maintenance Daily Cleaner



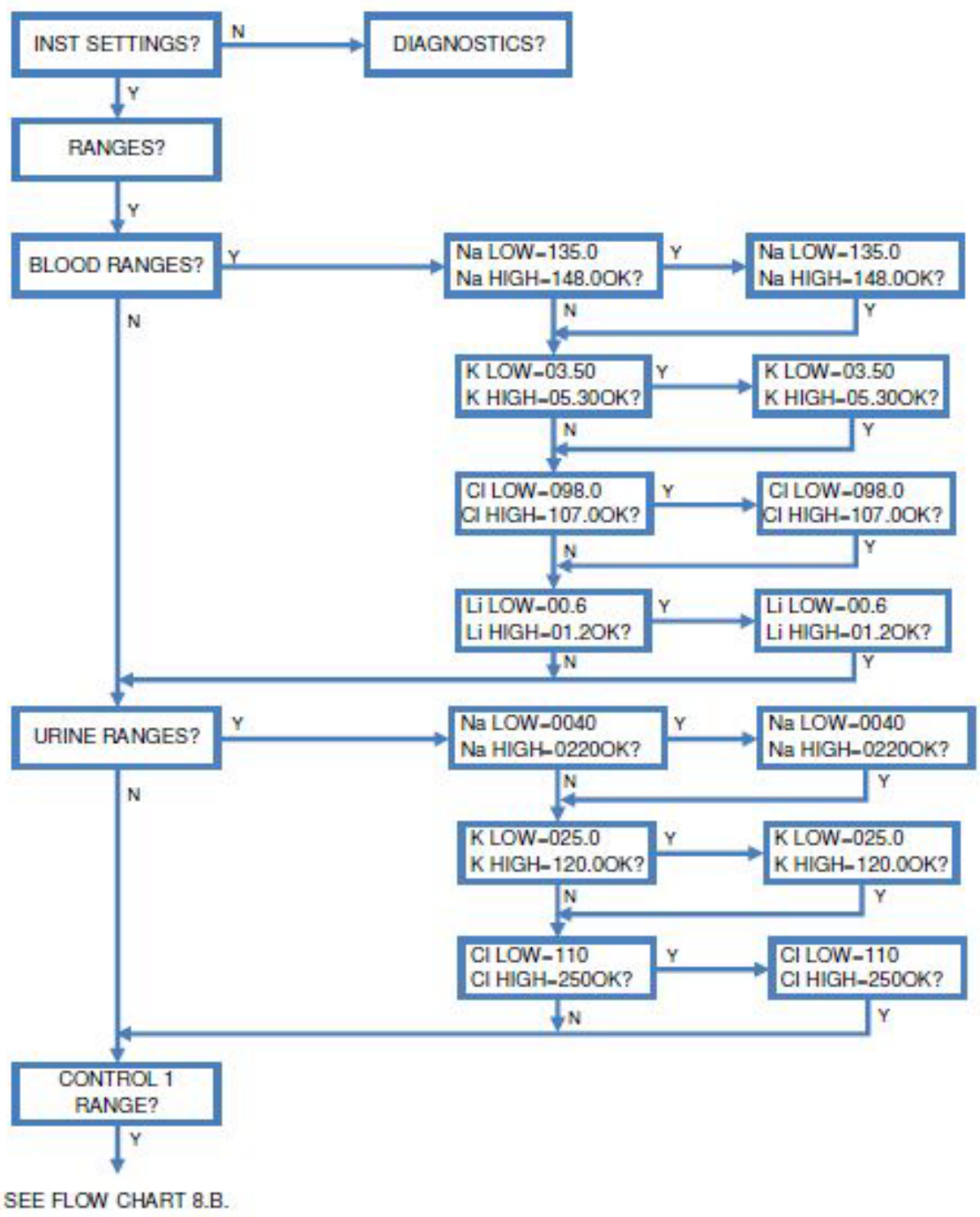
6.B Maintenance Flush Solution Prime



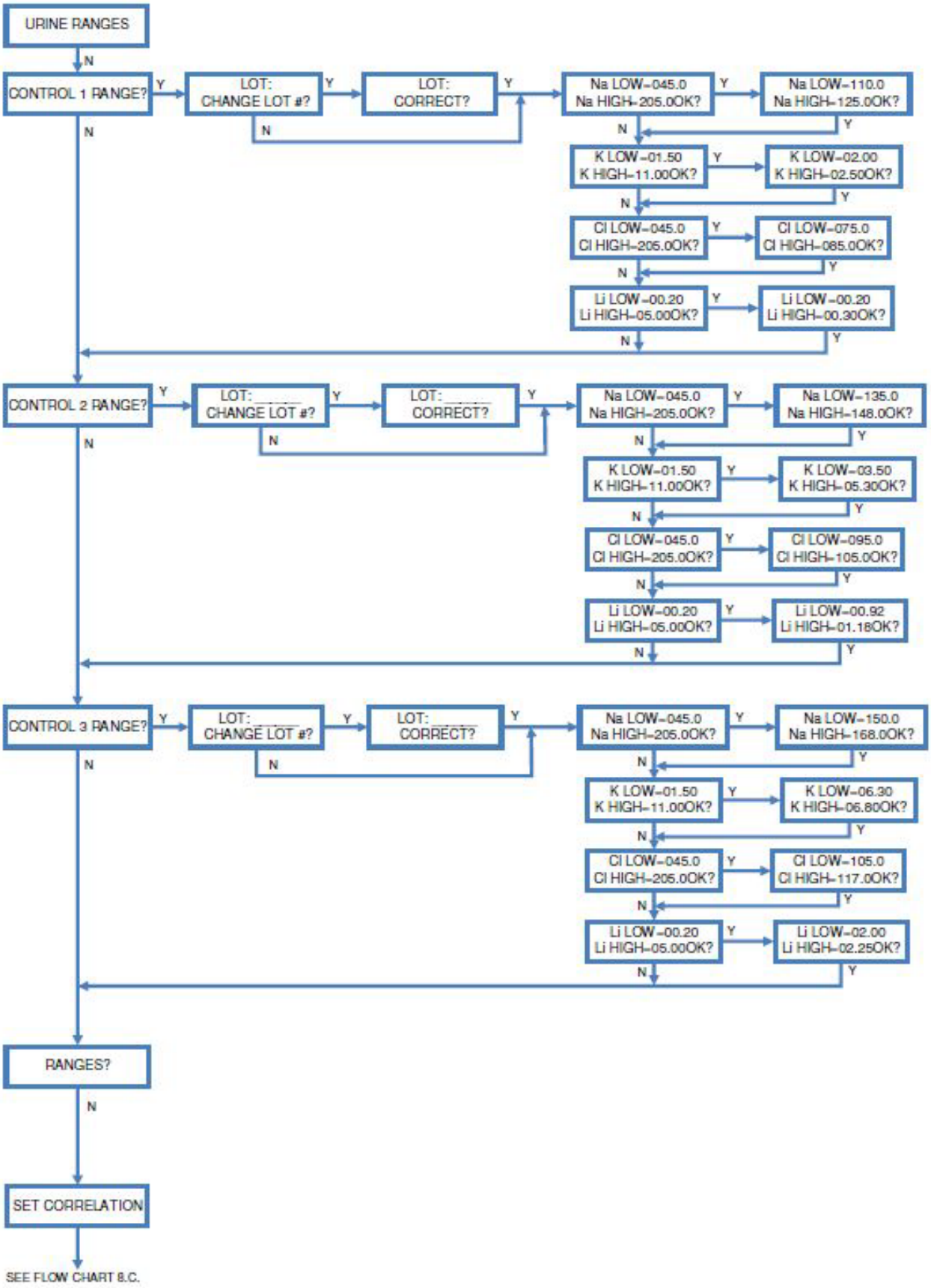
7. Operational Functions



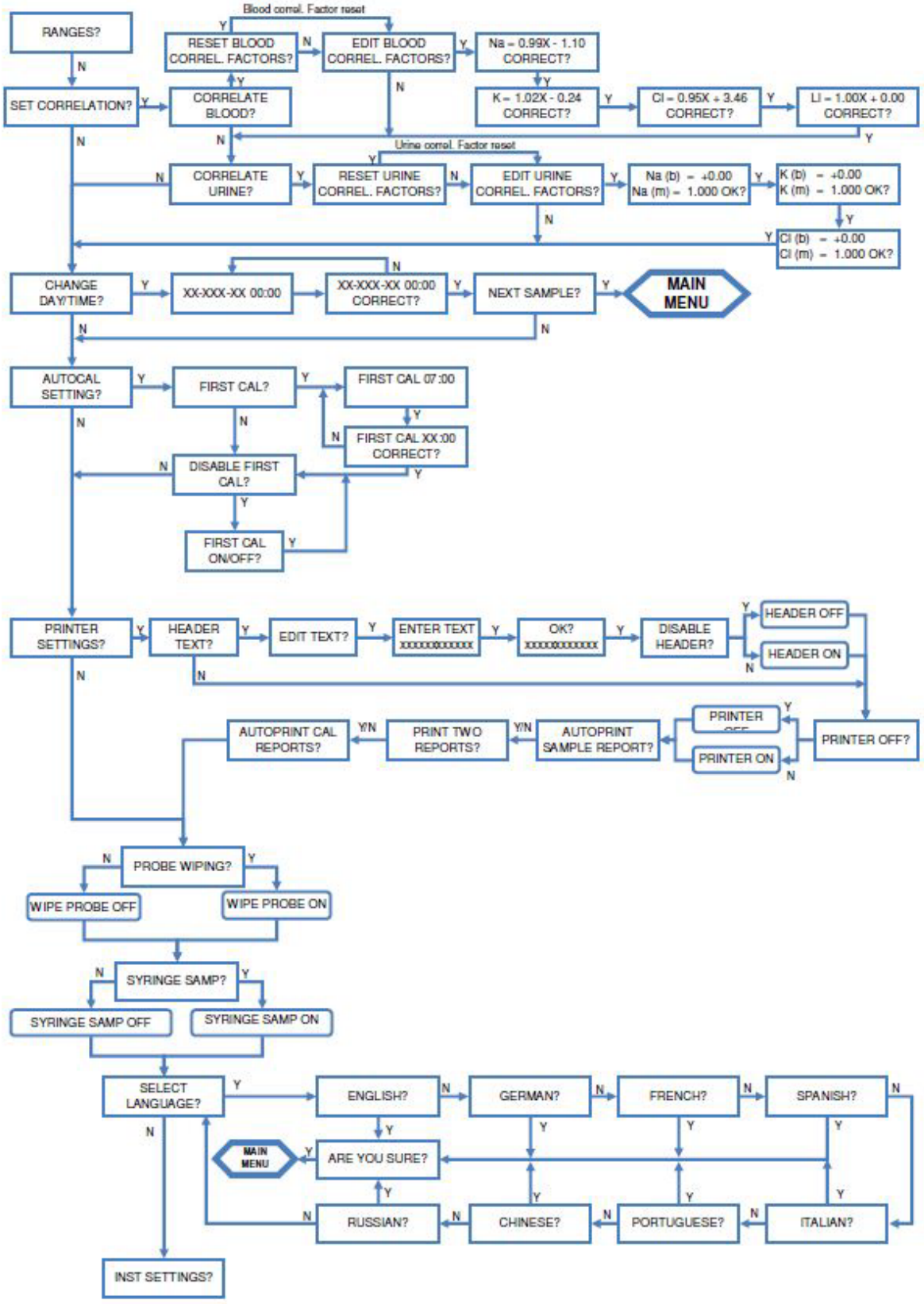
8.A Instrument Settings



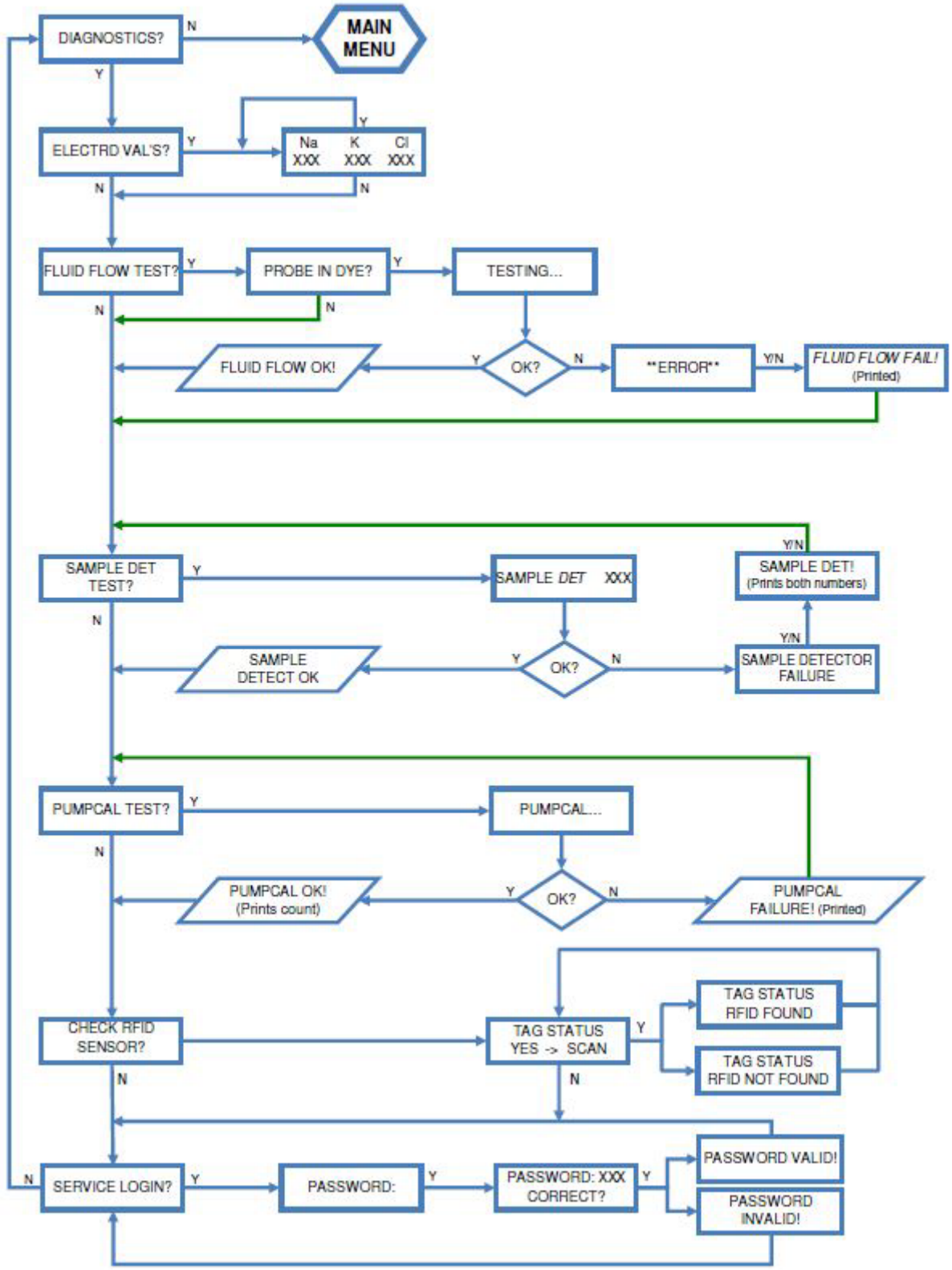
8.B Instrument Settings - QC



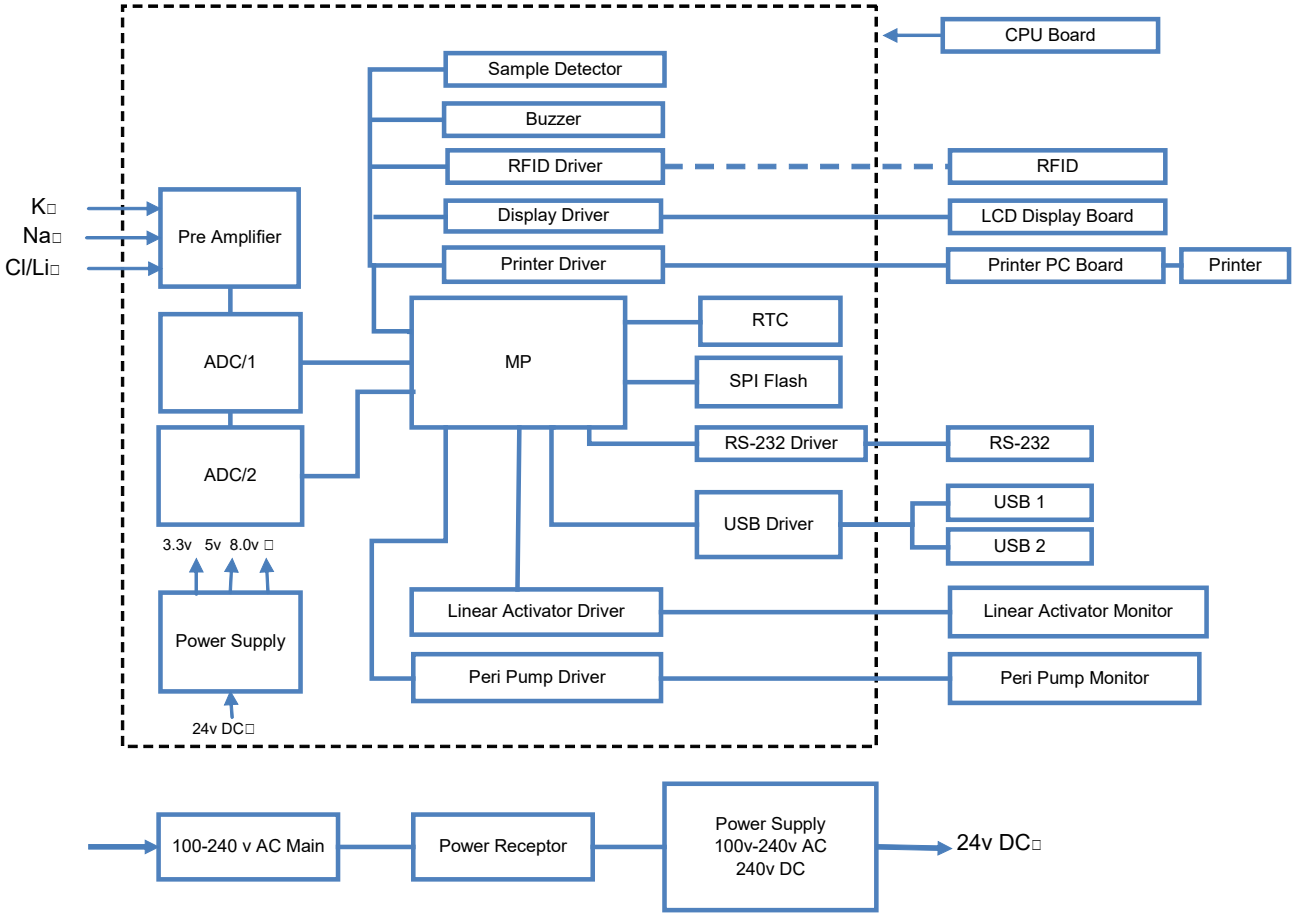
8.C Instrument Settings – Other



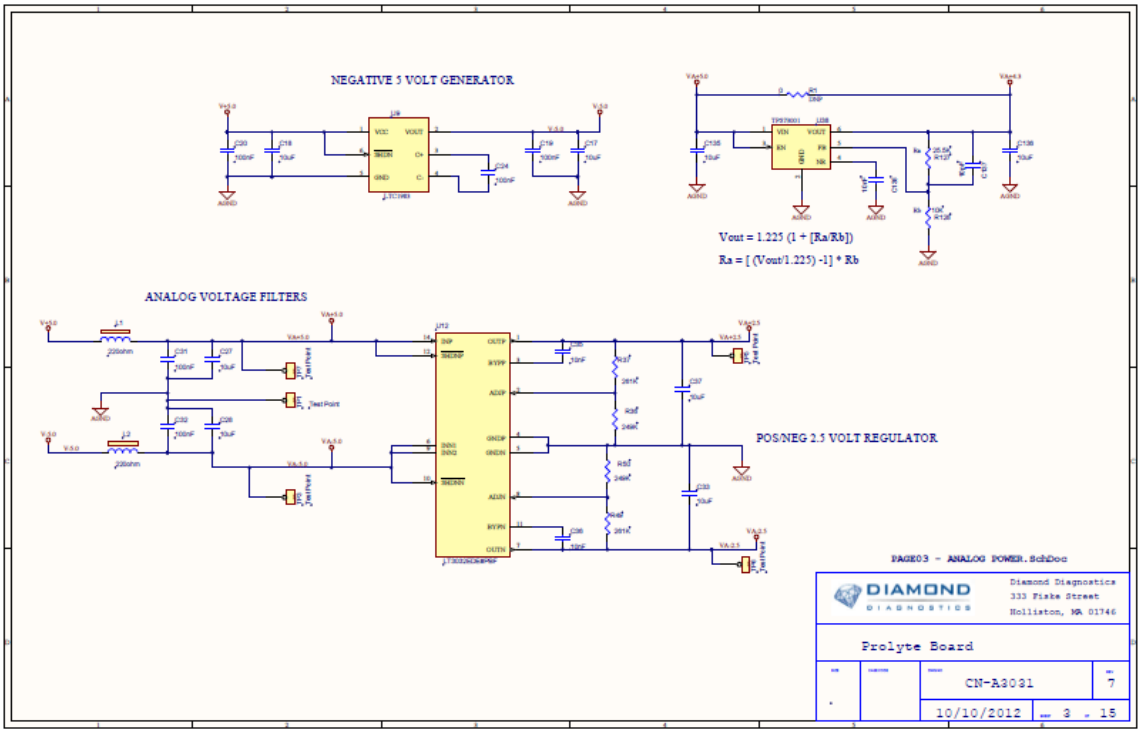
9. Diagnostics

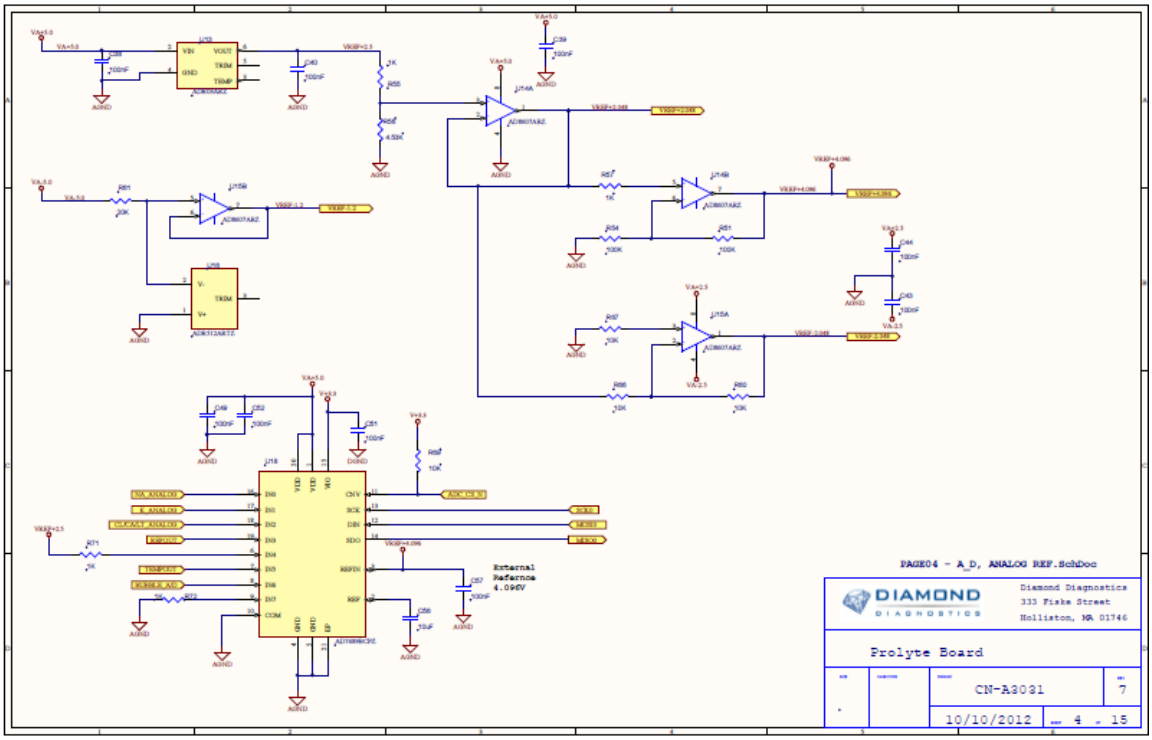


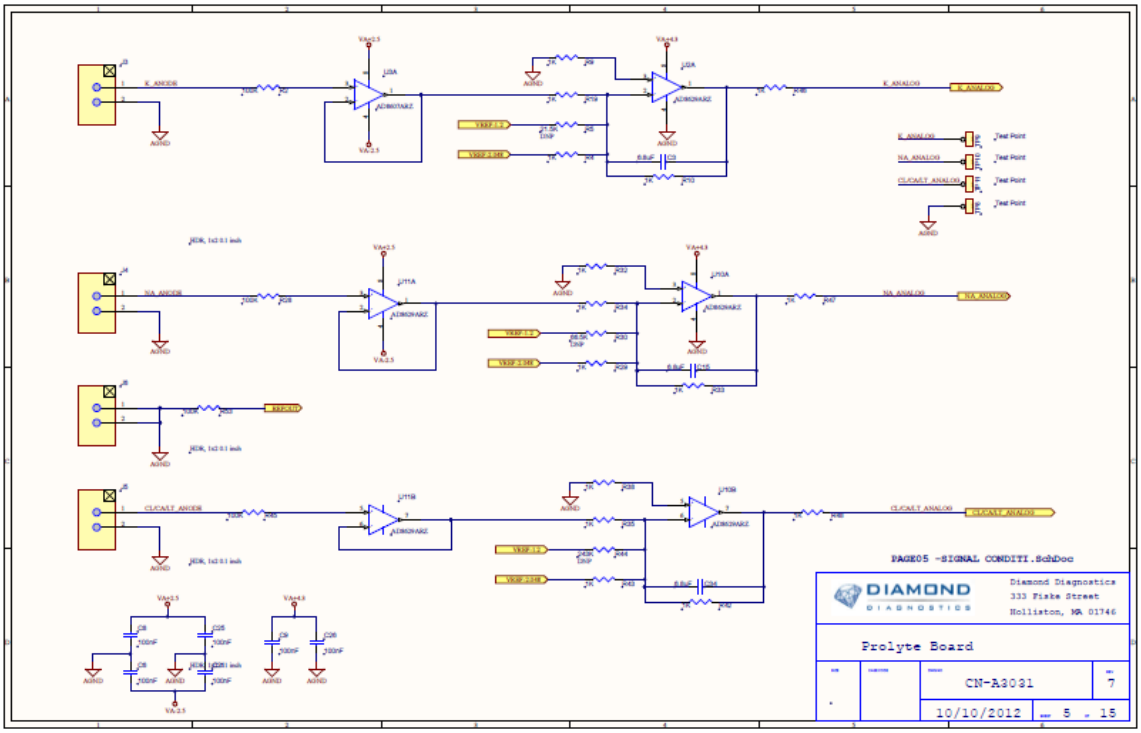
10. Electronics Block Diagram.



11. PROLYTE SCHEMATICS



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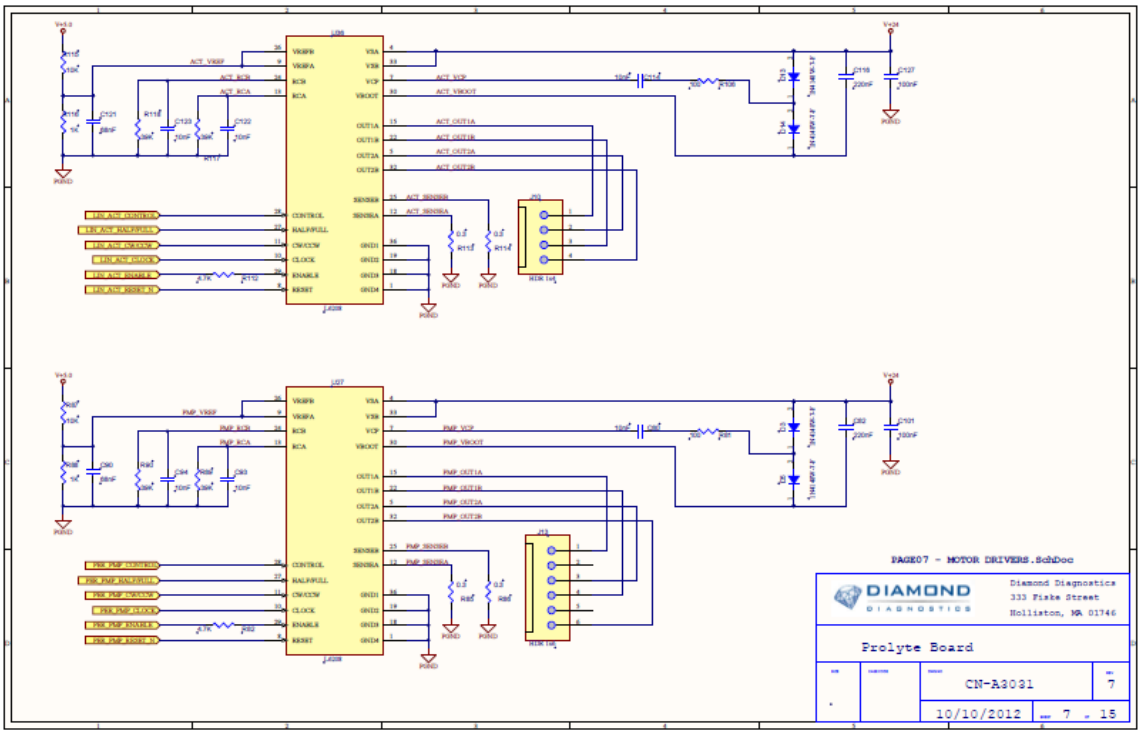
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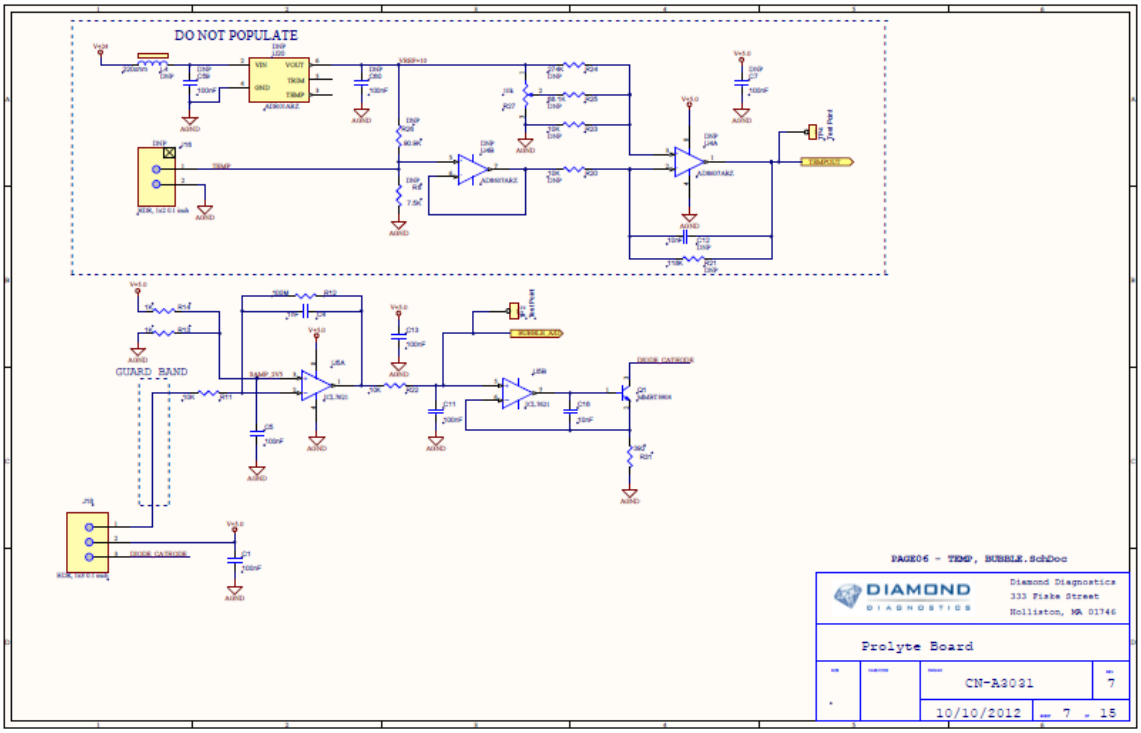
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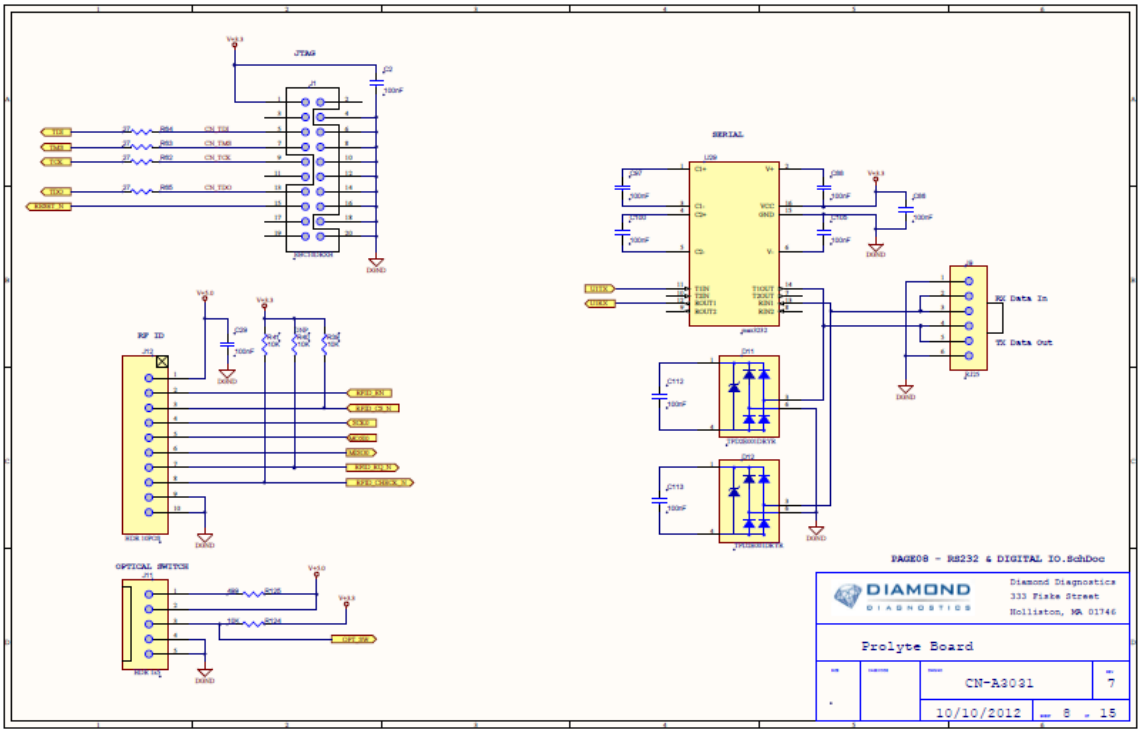
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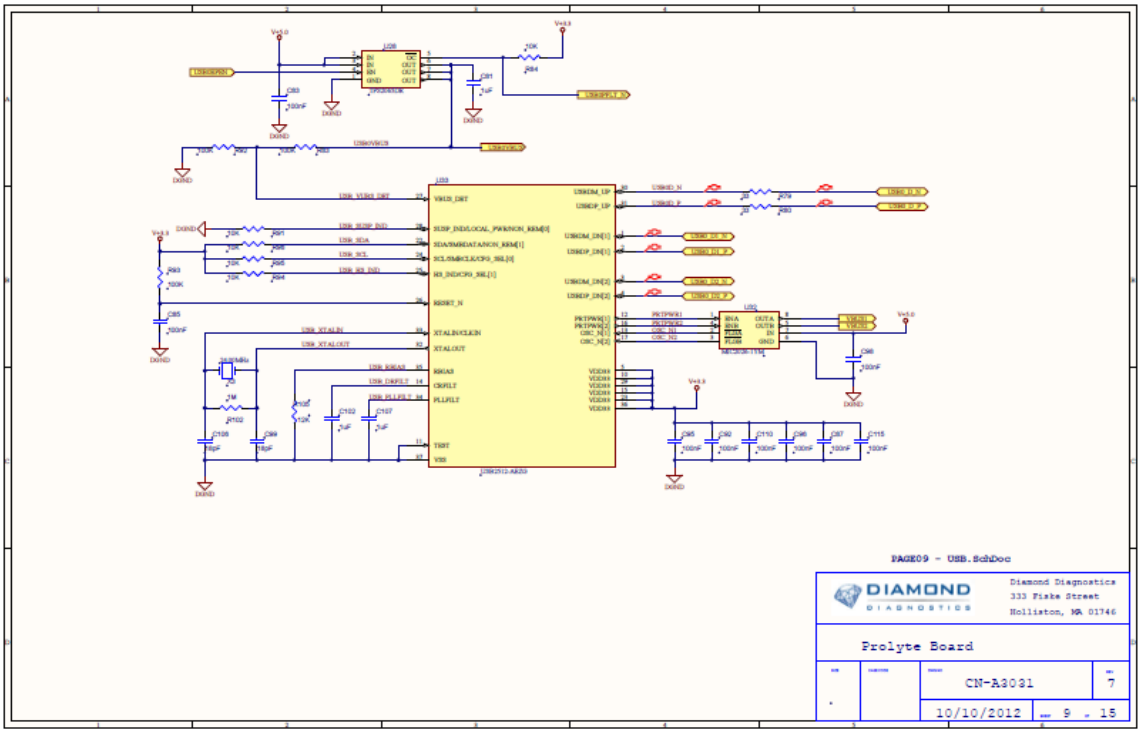
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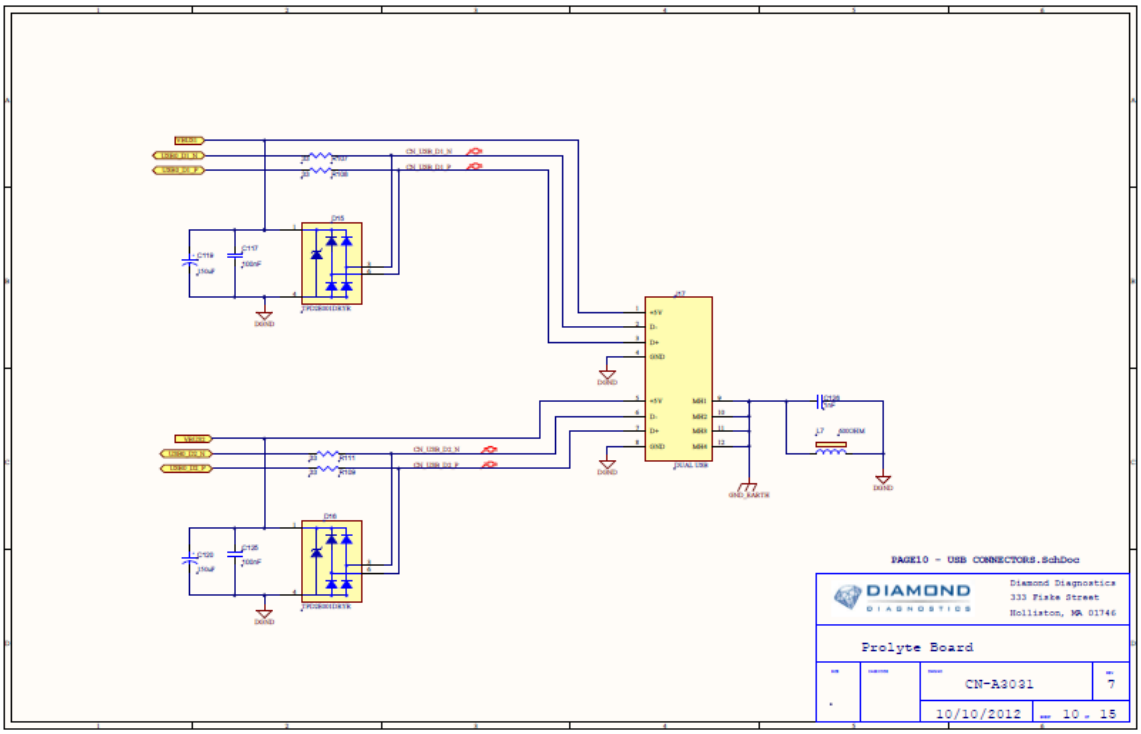
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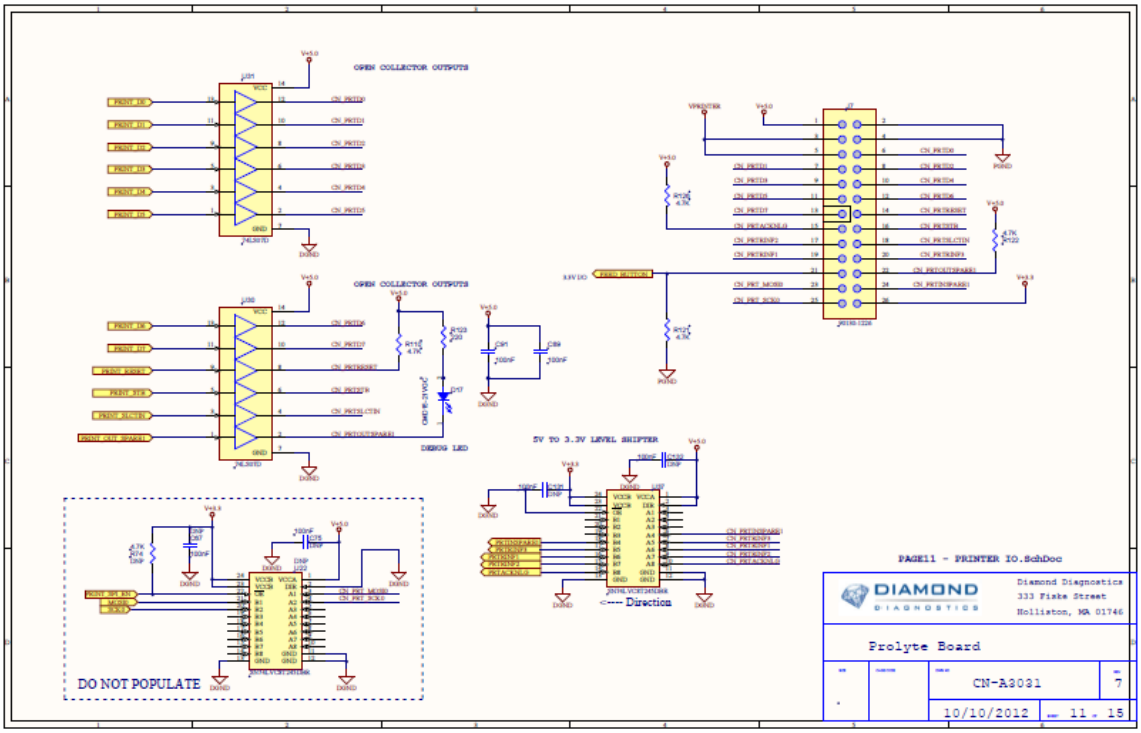
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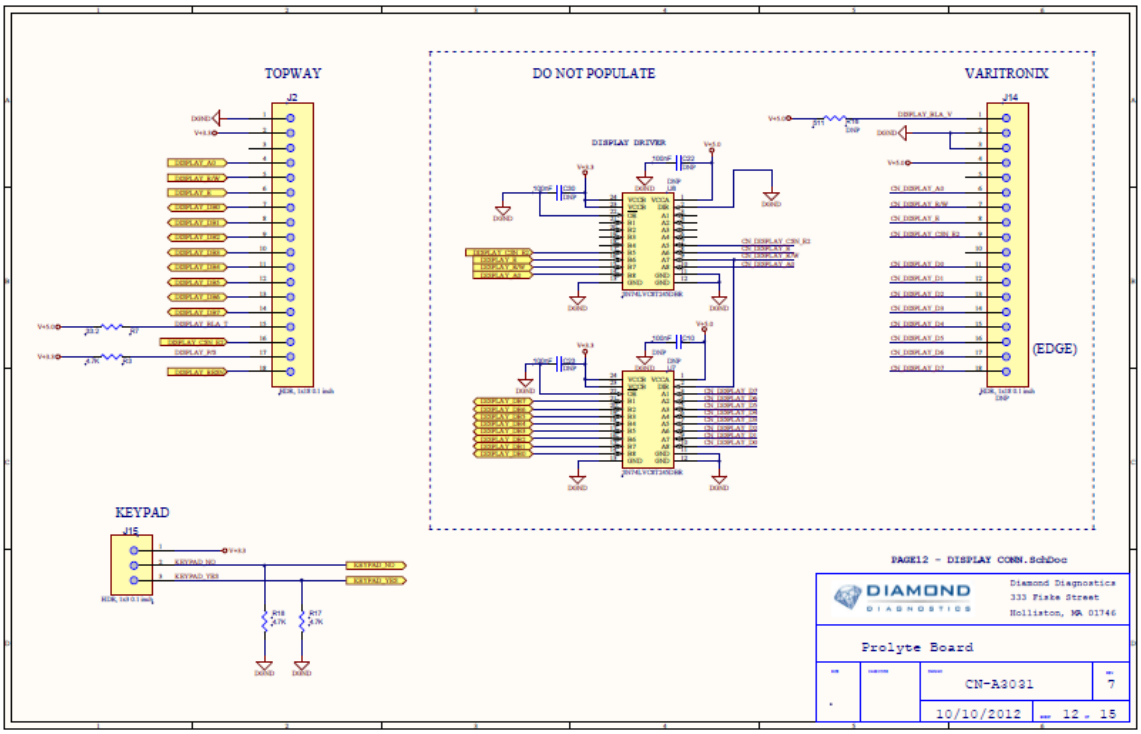
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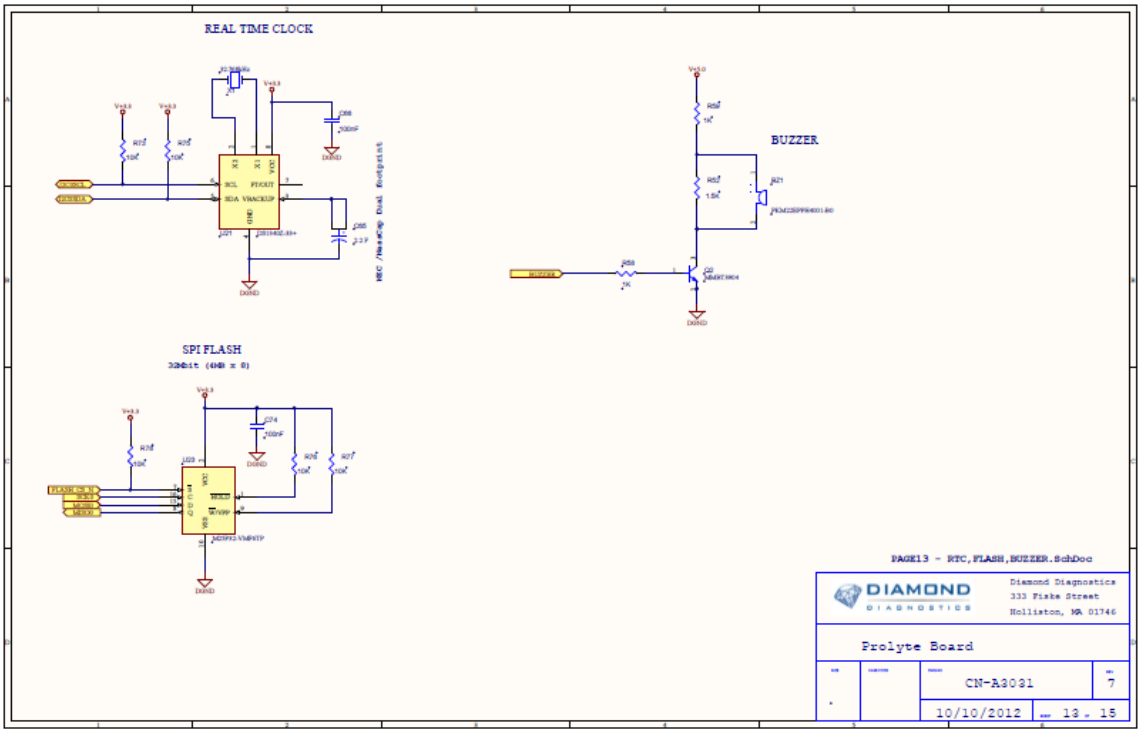
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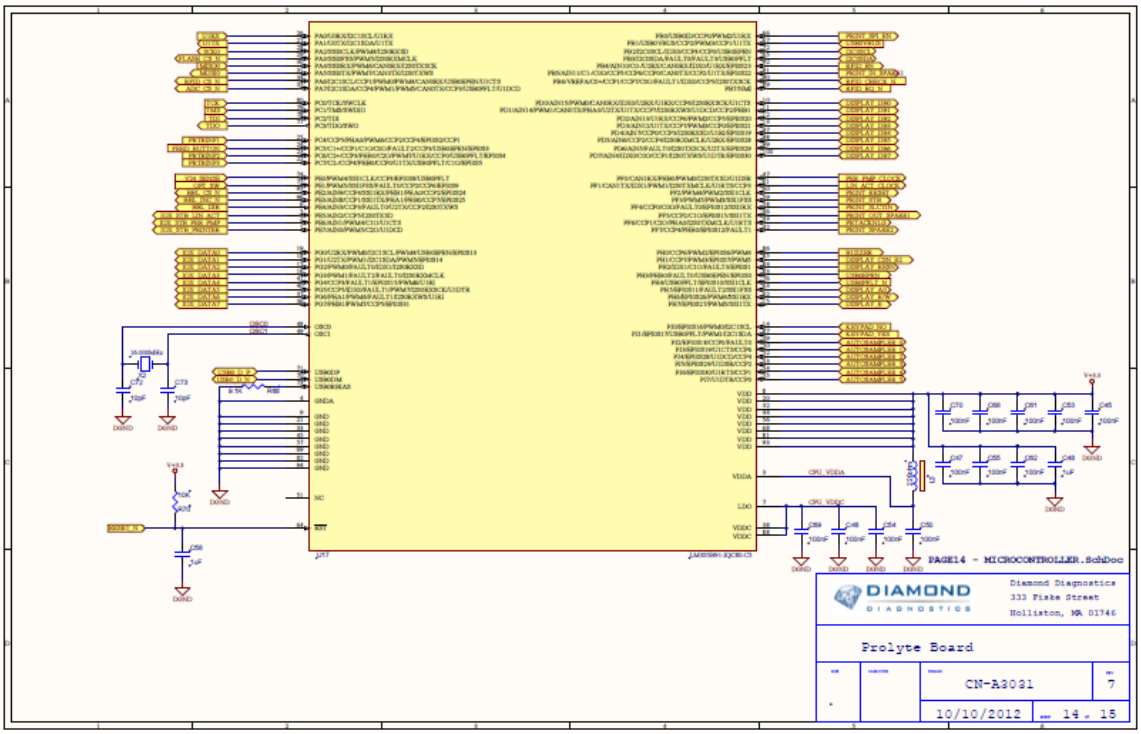
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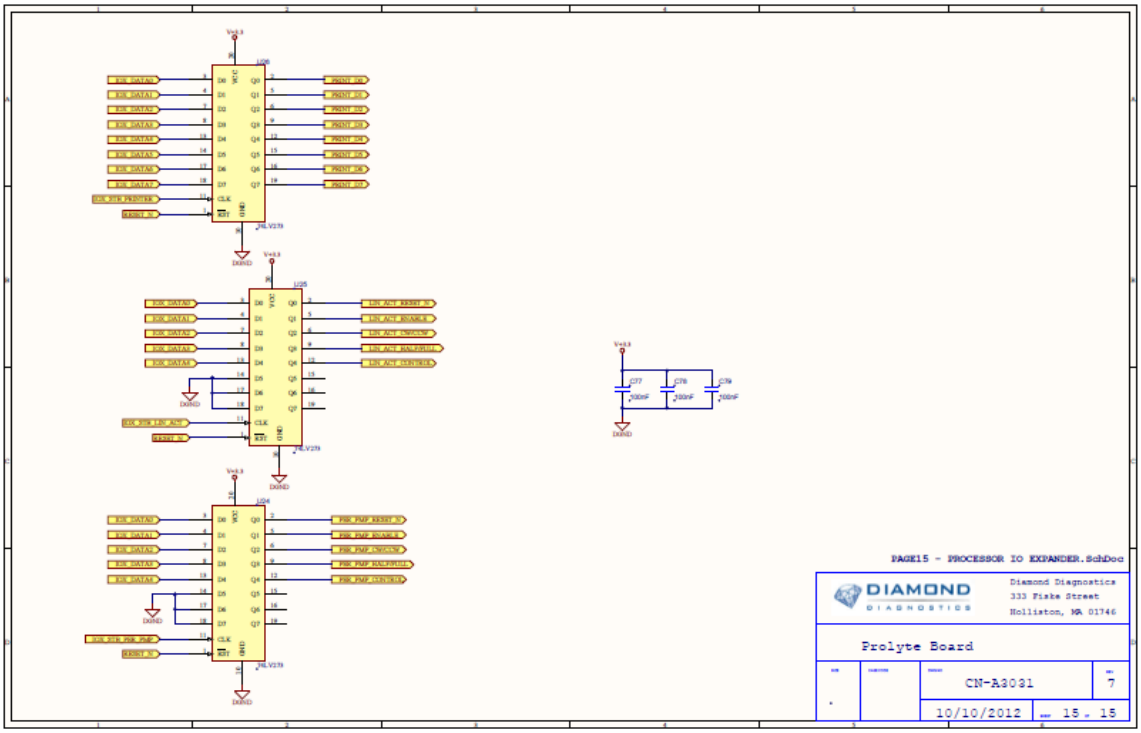
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