Biolyzer® 200

analyticon

Service Manual

Analyticon Biotechnologies AG

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agile - affordable - accurate

REVISION RECORD

The latest edition supercedes any preceding ones. If you have old editions, discard them to avoid possible confusion.

REV	DATE	REVISION HIGHLIGHT
0	Oct 23/2001	Published as Technical Information.
0	Nov 9/2001	Corrected known errors, added Chapter 8, etc.
0	Nov 26/2001	Published as Service Manual SM-E58xx-0.
1	Jan 15/2002	- Added forwards, safety warnings, etc. - Chapters 2 and 3: Made changes for accuracy. - Chapter 6: Added cuvette check procedure. - Chapter 10: Made changes for readability and accuracy. - Appendix A: Made changes for accuracy. - Appendix D: Added wiring information for respective PC boards. - Appendix G: Added information on test points and LED's.
2	Sep 15/2002	-Chapter 4: Added procedure of the "D. Remove the cuvette cover".
3	Oct 20/2002	-Chapter 3: Added 25P3231 as IRU_DRV. -Chapter 5: Added procedure of cleaning of tubing system. -Chapter 6: Modified description in the "2. Preventative Maintenance". -Chapter 9: Modified description in the "3. Stirrer". -Chapter 10: Modified description in "Mounting stirrer" and "B. Replacing wipe tip". -Chapter 10: Added procedure of "F. Replacing IRU Heater". -Chapter 11: Added procedure of "8. DTA Board" and 25P3231 as IRU_DRV. -Chapter 12: Modified procedure in "4. Changing Offset Voltage". -Appendix A: Made changes of specifications (Item No.9-7, 11, 12 and 15) and EQUIPMENT LIST. -Appendix B: Modified special tool (jigs). -Appendix C: Attached code number in the parts list. -Appendix D: Added 25P3231 as IRU_DRV. -Appendix E: Revised diagrams. -Appendix G: Changed drawing direction of "Figure G-1". Added 25P3231 as IRU_DRV. -Appendix H: Added appendix H as BCR adjustment.
4	Jun 10/2003	Fully revised.
5	Aug 8/2003	Modified for Windows XP version.
6	Dec 5/2003	-Appendix C: Type of Modular jack is corrected to "25AP-X-3710".
7	Aug 30/2006	-Chapter 8: Updated error message
8	Aug 30/2007	-Modified for Control Unit and some maintenance parts
9	July 11, 2008	-Chapter 8: Modified and added some error messages. -Appendix C, D, E, G in which some drawings are modified or added.

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FOREWORDS

This clinical chemistry analyzer consists of main analyzer including software and software on operational PC. And the analyzer is used with operational PC and printer and can interact with the host computer.

By adopting sample bar code reader (option) to the ASP unit, all of the reagents and samples for measurement including samples obtained from patients are fully controlled by bar codes and thus enables the analyzer to perform the entire process of the analysis automatically.

Manufacturer of the Analyzer

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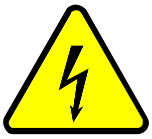
SAFETY WARNINGS AND NOTICES

■ Meanings of warning symbols

WARNING ABOUT:

Biohazard



Electric shock

High temperature

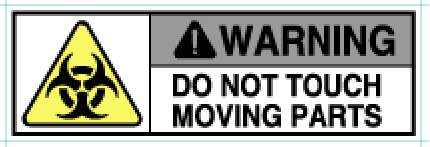
Injury

Action to be taken as directed by the "OPERATOR'S MANUAL"

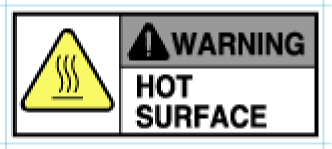
■WARNING LABELS

The following warning labels are affixed on the places that are the potentially hazardous.

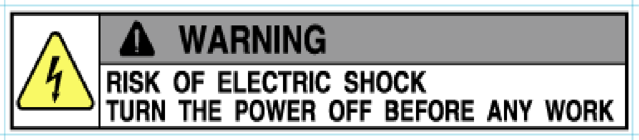
WARNING ABOUT:	PLACES:
RISK OF ELECTRIC SHOCK	Power supply inlet, power supply portion



WARNING ABOUT:	PLACES:
DO NOT TOUCH MOVING PARTS	Covers of SPT, RPT, MIX1 and MIX2

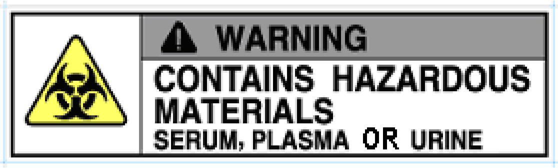


WARNING ABOUT:	PLACES:
HOT SURFACE	DTR

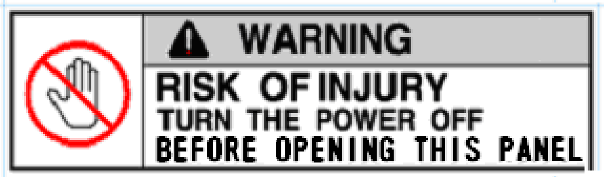


WARNING ABOUT:	PLACES:
RISK OF ELECTRIC SHOCK TURN THE POWER OFF BEFORE ANY WORK	Front frame

WARNING ABOUT:	PLACES:
THE TANK CONTAINS HAZARDOUS MATERIAL	Waste tanks (2 tanks)



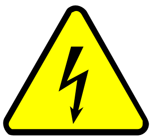
WARNING ABOUT:	PLACES:
CONTAINS HAZARDOUS MATERIALS SERUM, PLASMA AND URINE	Mosaic 2, right side cover on SWU panel



WARNING ABOUT:	PLACES:
RISK OF INJURY TURN THE POWER OFF BEFORE THE PANEL OPEN	Lid for replacing halogen lamp, lid of ISE tank, lid for replacing ISE electrode

WARNING ABOUT:	PLACES:
Action to be taken as directed by the “OPERATOR’S MANUAL”	IRU heat insulation plate, fans on rear frame (2 fans), right frame, left frame

WARNING FOR SAFE USE

	During operation, do not touch auto sampler unit, reagent container unit, nozzles and any other moving mechanical parts in the analyzer. During operation, shut cover all the time.
	Never touch patients' samples with bare hands to prevent operator from possible infection. Handle SPT nozzle, RPT nozzle, reaction cells, wash nozzles, waste nozzles and MIX paddle in the same way. Wear medical rubber gloves to keep skin from direct contact with patients' samples.
	Give special consideration to keep skin and mucous membrane from contact with reagents to prevent operator from possible infection. Wear medical rubber gloves, goggles, etc. to keep skin and mucous membrane from contact with reagents.
	Read the statements of virtues that came with reagents prior to their use.
	The contact with the wastes such as used reaction cells and solutions may cause infection. Handle them with gloved hands without exception. Follow the national or local laws and rules when they are thrown out. There are two kinds of liquid wastes drained from this analyzer, i.e. high- and low-concentrated wastes.
	The access to the conductive parts within the analyzer may cause serious electric shock. When removing parts, make sure to shut off the power supply. Leave any maintenance and repair of electrical parts inside the equipment to a qualified service personnel.
	Never leave reagent bottles on the working table (upper surface inside the analyzer). Careless handling of reagent bottles may cause tumble and leak.
	Do not make a modification to the analyzer.
	Exchange the halogen lamp for a new one after a lapse of 30 minutes since the power switch of the analyzer is turned off to avoid danger of burns.

NOTICES FOR USE

(SAFETY AND PREVENTION AGAINST DANGER)

The user is requested to read this instruction before he uses the analyzer for the first time and becomes acquainted with how to operate the analyzer.

1. Only qualified personnel should use the analyzer.

2. The following precautions should be taken when the analyzer is installed:

   1 Keep the analyzer out of the rain and any other water splash.

   2 Avoid areas that are adversely affected by atmospheric pressure, temperature, humidity, ventilation, sunlight, dust, air containing salt or sulfur, etc.

   3 Pay attention to inclination, vibration, shock (including shock during transportation), etc.

   4 When the analyzer is lifted, do it in a team of four or more. Lift carefully the analyzer by grabbing grips embedded in four bottom corners of the analyzer by one each hand and supporting the other places of the bottom by another each hand.

   5 Do not install the analyzer at the place adjacent to the storage room of chemicals or the place where any gas is likely to be generated.

   6 Pay attention to frequency, voltage and permissible current (or power consumption).

   7 Make sure that the analyzer is correctly and well grounded.

8 When the analyzer is used in the U.S.A. together with accessories including PC, visual display and printer, use UL-certified accessories.

9 When the analyzer is used in Europe together with accessories including PC, visual display and printer, use CE-certified accessories.

10 Connect the analyzer to the operational PC using accompanying LAN cable. When the other cable is used, this may cause the analyzer to suffer from disturbing noise, exert an adverse effect on its surroundings or get incorrect measurement results.

3. The following cautions should be exercised before the analyzer is operated:

   - Check the power supply frequency, voltage and current capacity (power consumption).
   - Make sure that the analyzer is correctly and well grounded.
   - Make sure that all the necessary electrical cables are correctly connected.
   - Check that the contact conditions of switches and indicators are appropriate and that the analyzer is ready to be activated correctly.
   - Extreme care must be taken not to result in misdiagnosis or pose any danger to the analyzer or human body when the analyzer in conjunction with other equipment.
   - Wipe the nozzle tips of SPT and RPT several times with cloth or alikeness impregnated with rubbing alcohol before the analyzer is used. At this time, do not forget to put medical rubber gloves or alikeness on. Pay also attention to prevent bare skins of hands or arms from being touched by or pricked with the nozzle tip.

4. The following cautions should be exercised when exchanging the halogen lamp.

   - Exchange the halogen lamp for a new one after a lapse of 30 minutes since the power switch of the analyzer is turned off to avoid danger of burns. Keep hands away from glass part of new halogen lamp. Make sure that there is no crack or breakage in the glass part.

5. The following cautions should be exercised during operation.

   - Pay attention not to exceed time and volume necessary for diagnosis.
   - Keep monitoring the behavior of whole system in order to detect any malfunction.
   - Take immediate corrective measures including shutdown of operation when any malfunction is detected in the analyzer.
   - Avoid possibilities of any direct access by patients.

6. The following cautions should be exercised after the use of the analyzer.

   - Turn off the power after every operational switch and control is restored to its pre-use state as directed.

   - Do not remove the line cord plugs from receptacles by cords not to give undue stress to cords.

   - Wipe the nozzle tips of SPT and RPT several times with cloth moistened with rubbing alcohol after the use of the analyzer. Also wipe the mosaic plates with cloth moistened with neutral detergent. At this time, do not forget to wear medical rubber gloves or alikeness. Also pay attention to prevent bare skins of hands or arms from being touched by or pricked with the nozzle tip.

   - Pay attention to the storage area:

     a) Keep the analyzer out of the rain and any other water splash.

     b) Avoid areas that are adversely affected by atmospheric pressure, temperature, humidity, ventilation, sunlight, dust and air containing salt, sulfur, etc.

     c) Pay attention to inclination, vibration, shock (including shock during transportation), etc.

     d) Avoid areas adjacent to the storage room of chemicals or areas that are likely to generate gasses. Avoid areas that are likely to be subject to inclination, vibration and shock.

   - Organize and store parts and cords associated with the analyzer after they have been cleaned.

   - Keep the analyzer clean not to cause any inconvenience to the next use.

7. In the event of trouble, do not play with the analyzer and leave any repair work to an authorized expert.

8. Maintenance and checks

   - It is importance for the analyzer and its associated parts to be periodically checked.

   - Make sure without fail that the analyzer operates normally and correctly, when it is reused after being kept unused for some time.

TECHNICAL SPECIFICATIONS

See APPENDIX A.

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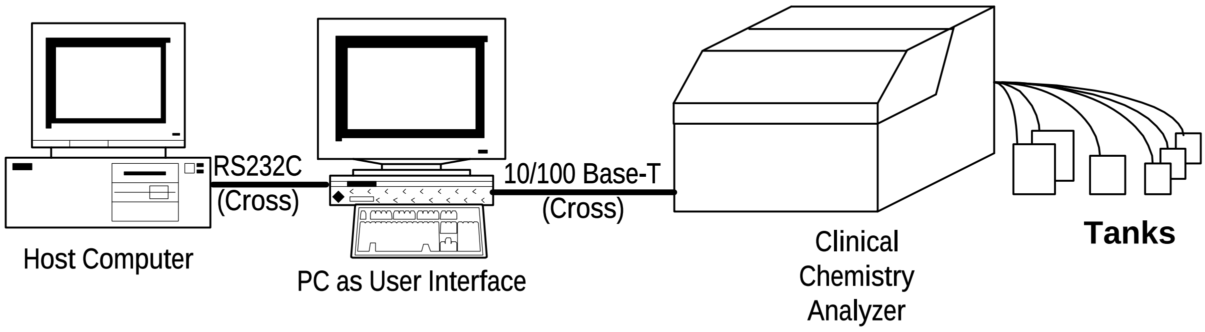
Chapter 1
Overview

1. General

The Clinical Chemistry Analyzer is a fully automatic biochemical analysis system. It has a human-oriented design in both software and hardware to carry out reliable and safe operations.

All necessary actions such as the following ones are controlled and time-optimized by computer:
- Pipetting
- Sampling
- Stirring
- Rinsing
- Photometric measurement
- Making calibration curve.

The clinical chemistry analyzer is connected to PC (Windows XP) through Ethernet (10/100 Base-T, cross cable). The PC is used as a user interface, and all the necessary operations can be conducted from it. This PC may be connected to hospital's host computer through RS232C (cross cable) to exchange various data such as analysis orders, analysis results, etc.

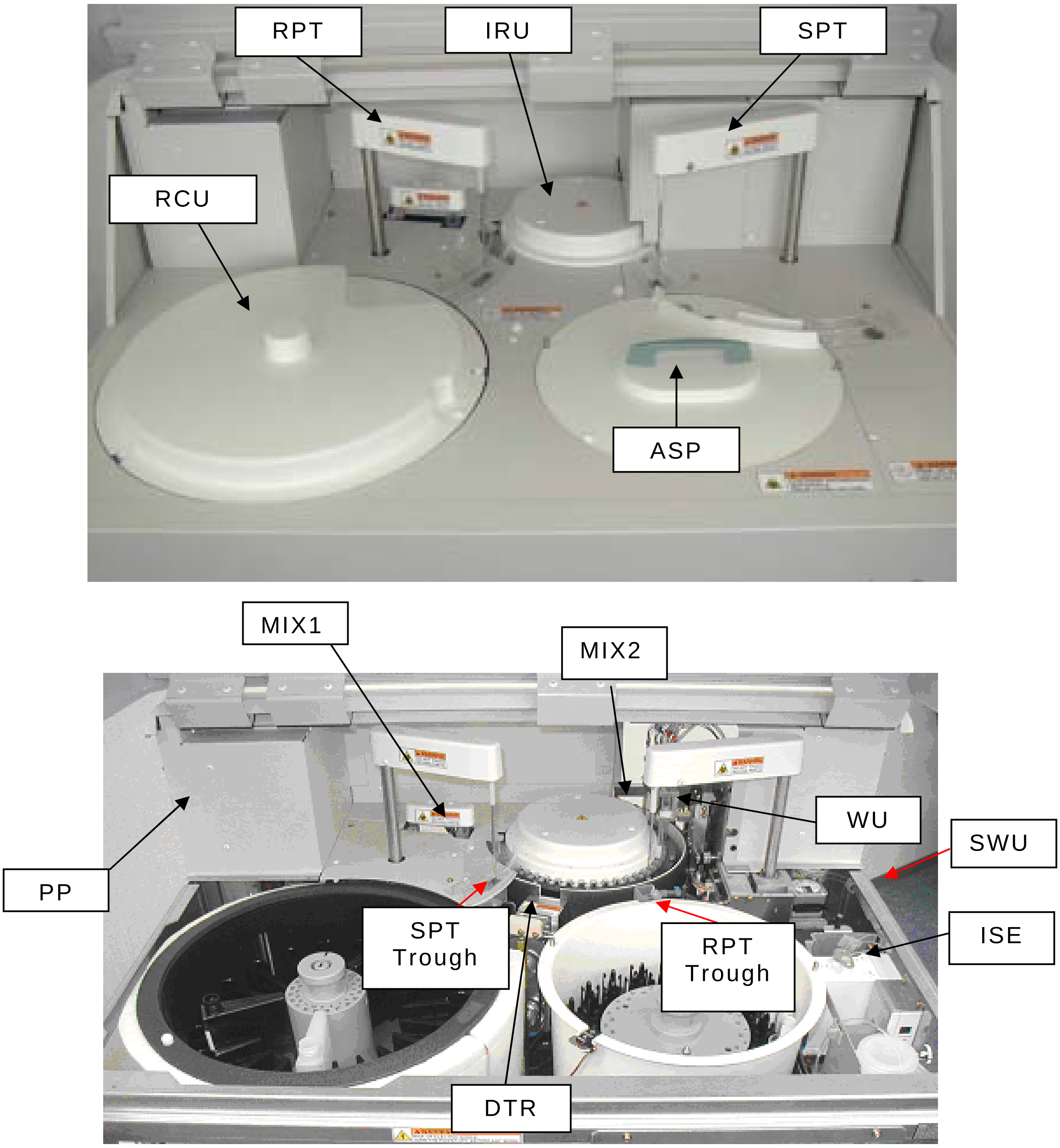


For the appearance of the Clinical Chemistry Analyzer, refer to the succeeding page.

APPEARANCE OF CLINICAL CHEMISTRY ANALYZER
Figure 1-1

2. Built-in Units

The Clinical Chemistry Analyzer comprises various built-in units as shown below:



UNITS LOCATION
Figure 1-2

The Clinical Chemistry Analyzer performs analysis by driving its built-in units. The unit-driving sequence varies according to the software, and the following one shows a typical analysis sequence:

1 Preparation such as initializations of various units, rinsing pipettes, etc.

2 A desired reagent bottle (RCU) is positioned to the RPT-pipetting spot, then the RPT pipettes it.

3 A desired cuvette (IRU) is positioned to the RPT-dispensing spot, and then the RPT dispenses the reagent there. The RPT is then washed in the RPT trough.

4 A desired sample tube (ASP) is positioned to the SPT-pipetting spot, then the SPT pipettes it.

5 The cuvette (IRU) is positioned to the SPT-dispensing spot, and then the SPT dispenses the sample there. The SPT is then washed in the SPT trough.

6 The stirrer (MIX) mixes the reagent/sample within the cuvette, then leaves the cuvette for a given incubation (reaction) time.

7 If necessary, steps 2, 3 and 6 are repeated with different reagent.

8 The DTR detects the light that is passed through the cuvette in which the sample and the reagent reacted. The light detected indicates the reaction result.

9 The WU drains/washes/wipes the cuvette.

10 Analysis result is calculated from the data obtained in step 8.

The following table summarizes functions for each unit. It should be noted that the description is considerably simplified for comprehensibility. Accurate and detailed descriptions are left to Chapter 2.

MAJOR FUNCTIONS OF EACH UNIT

UNIT	MAJOR FUNCTIONS
IRU	Incubation Reaction Unit Its cuvette turntable holds 45 cuvettes, and turns to the position where desired sample (reagent) can be dispensed by SPT (RPT).
RCU	Reagent Container Unit Its reagent turntable holds up to 40 bottles, and turns to the position where desired reagent can be pipetted by the reagent pipette (RPT).
RPT	Reagent Pipette Unit Pipettes the reagent by using RPP, then dispenses it into the cuvette that is pre-positioned by IRU.

(CONT'D)

UNIT	MAJOR FUNCTIONS
RPP	Reagent Pump Unit Used when pipetting or dispensing reagent or wash solution. RPP section within PP unit is regarded as an independent unit throughout this manual for comprehensibility.
ASP	Auto Sampler Unit Its sample turntable holds up to 40 tubes of samples. Turns to the position where a desired sample tube can be pipetted by the sample pipette (SPT).
SPT	Sample Pipette Unit Pipettes the sample by using SPP, then dispenses it into the cuvette that is pre-positioned by IRU.
SPP	Sample Pump Unit Used when pipetting or dispensing sample or wash solution. SPP section within PP unit is regarded as an independent unit throughout this manual for comprehensibility.
MIX	Mixing Stirrer Unit After sample and reagent are dispensed into a cuvette, the paddle-type stirrer comes down into the cuvette and stirs them. For efficient mixing two stages of Mixers (MIX1 and MIX2) are provided. MIX 1 stirs R1 reagent, and MIX2 stirs R2 reagent.
DTR	Detector Unit After the mixing and incubation process, measures the change in luminous intensity that indicates incubation (reaction) process in a cuvette.
WU	Wash Unit Comprises a series of supply and drain nozzles. After incubation (reaction) liquid is drained out of the cuvette at the end of measurement, WU dispenses wash solution or purified water into the cuvette by using WPP, and washes its inside. A wipe tip is provided to remove water drops from the inside the cuvette completely.
WPP	Wash Pump Unit Used by WU when dispensing wash solution or purified water into the cuvette. WPP section within PP unit is regarded as an independent unit throughout this documentation for comprehensibility.
SWU	Supply Water Unit Contains the following pumps: - Pumps for WU to drain waste liquid - Pumps to supply purified water and/or wash solution to the troughs for SPT, RPT, MIX1 and MIX2.
ISE	Ion Selective Electrode Measures the concentration of electrolyte (sodium, potassium, chloride) contained in blood serum, blood plasma or urine. Before measurement, SPT dispenses sample into ISE.

NOTE: SPP, RPP and WPP are part of PP.

Chapter 2
Unit Descriptions

1. General

This chapter explains the theory of operation for each unit forming the Clinical Chemistry Analyzer.

Some units are similar to each other. This will half your pain when reading this chapter:
- ASP and RCU
- SPT and RPT
- SPP and RPP.

SPP, RPP and WPP are physically installed together within PP (pump unit), but they are regarded as different units because they operate independently.

It should be noted that the figures given in this chapter are considerably simplified for comprehensibility.

SEE ALSO:

Appendix D "Wiring Diagrams"	Electrical connections of PC boards, sensors, motors, etc.
Appendix E "Fluidic System Diagram"	Fluidic connections of tubes, pumps, valves, etc.
Appendix F "Sensor List"	Lists up sensors.

2. ASP (Auto Sampler Unit)

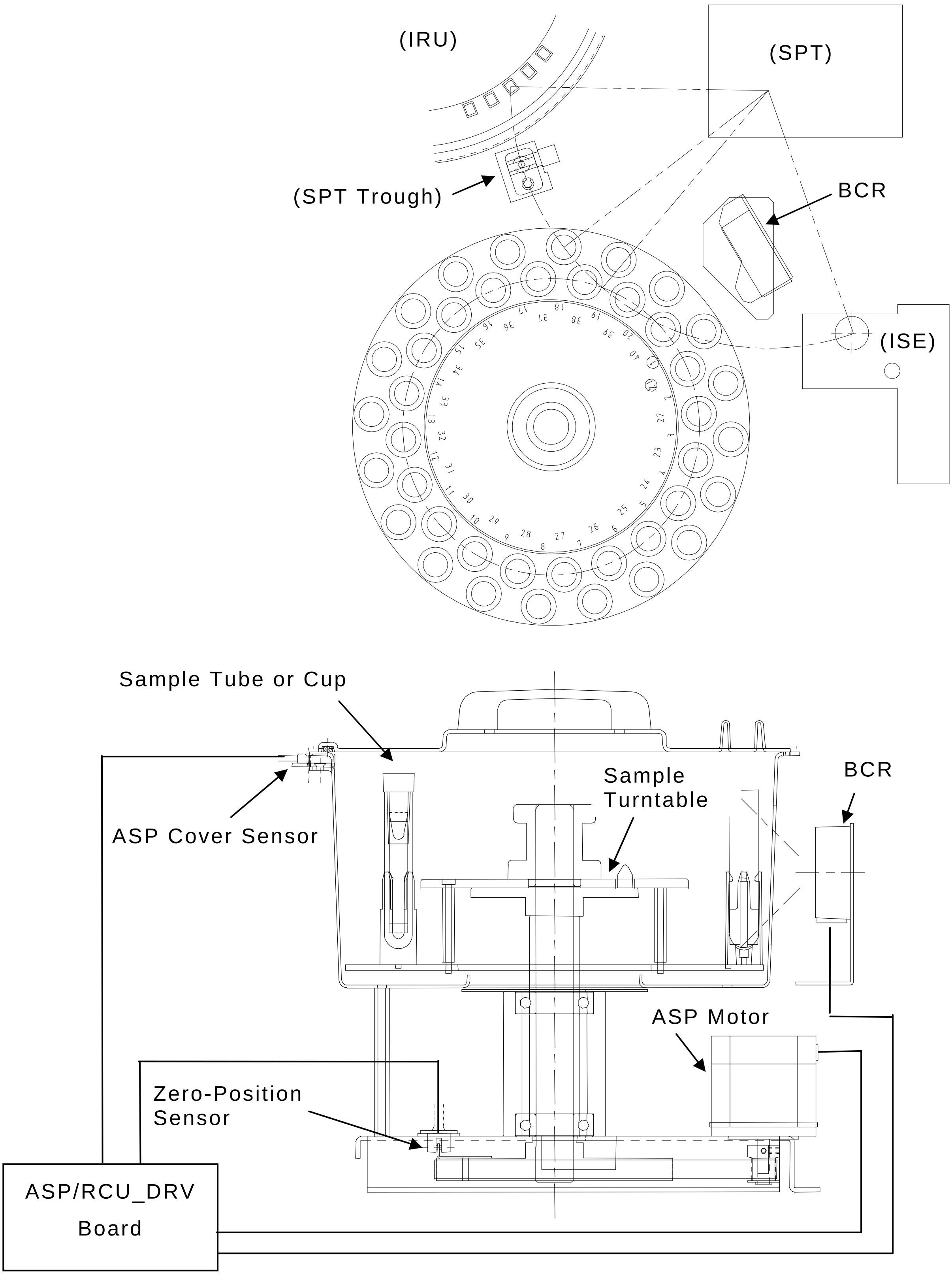
A. Functions

The ASP holds up to 40 tubes of samples on its sample turntable, and rotates the turntable to bring any requested sample to the SPT-pipetting spot.

- The sample position numbers are marked on the sample turntable.
- A barcode label is stuck on each sample tube. However, it is required only when the optional bar code reader (BCR) is added to ASP.
- The ASP rotates the sample turntable position by position while reading a barcode on each sample tube. After a wanted sample is identified, the ASP rotates the sample turntable further until the wanted sample comes to the SPT-pipetting spot (when ASP is used with BCR).
  When it is not used with BCR, ASP rotates the turntable to the position where the SPT can pipette the sample from the tube of selected slot number.

B. Components of ASP

COMPONENT	FUNCTION AND OPERATION
Sample Container	Mainly consists of an ASP case, sample turntable and ASP cover (lid). The ASP cover sensor detects if the cover is set properly.
Sample Turntable	Holds up to 40 tubes of samples i.e. 20 tubes on the inner circumference plus 20 tubes on the outer circumference. The sample tubes must be placed on the sample turntable with their barcode labels faced outwards so that the BCR may read them (when ASP is used with BCR).
ASP Motor	Stepping motor. Rotates the sample turntable, and brings a requested sample tube to the SPT-pipetting spot.
BCR (Barcode Reader) (Option)	Identifies a sample by reading a barcode label on each sample tube. The data read by the BCR is sent to the control unit (through the ASP/RCU_DRV board) over the RS232C transmission line.
Zero-position Sensor	Photo interrupter. Detects the zero position of the sample turntable. When position No. 18 comes to the SPT-pipetting spot the sensor output goes ON. Under this condition, No. 1 position faces the BCR. The rotation angle is tracked by counting the pulses fed to the ASP motor after detecting the zero position.



ASP (AUTO SAMPLER)
Figure 2-1

3. SPT (Sample Pipette Unit)

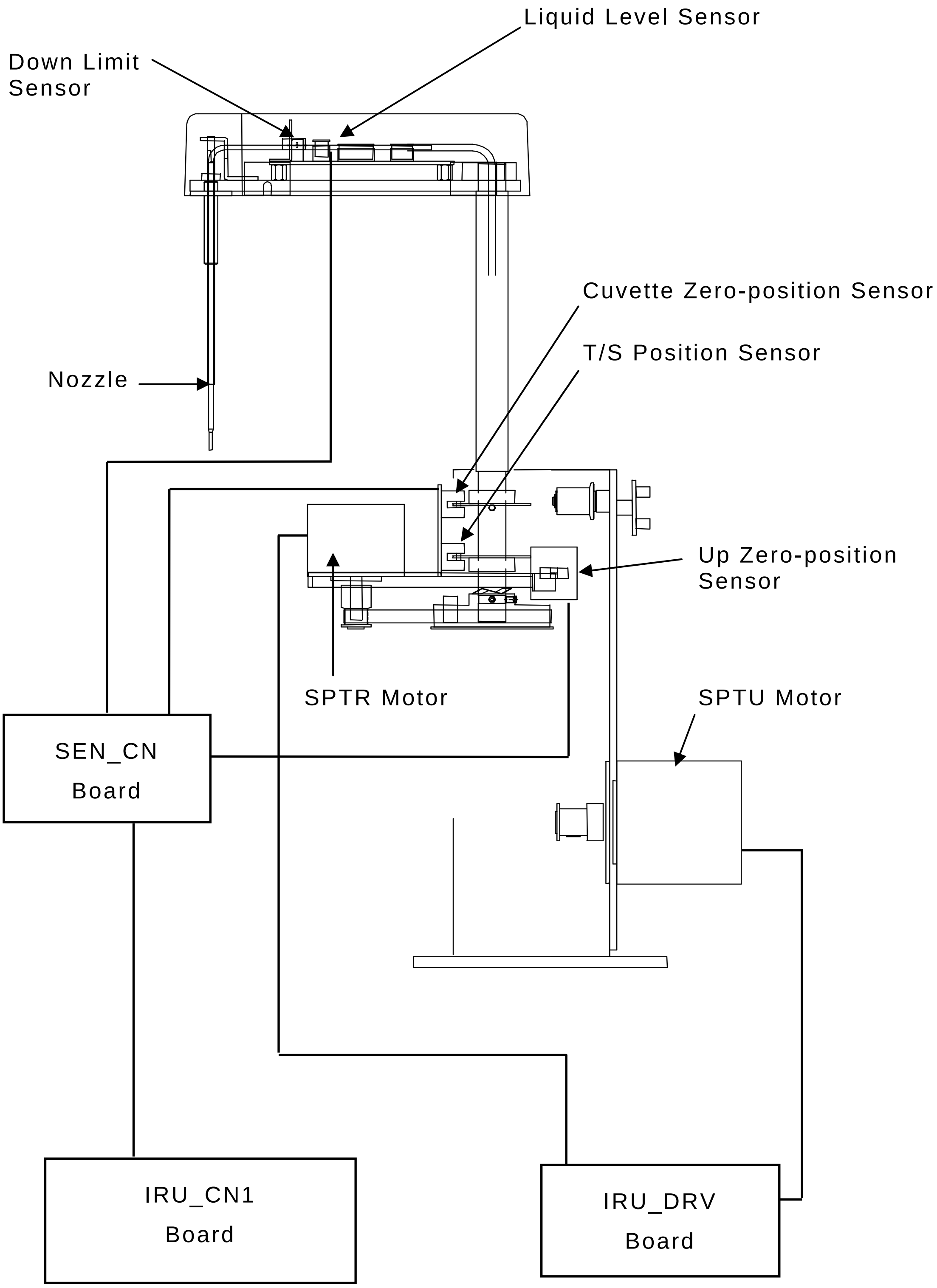
A. Functions

In the initialization, the nozzle is positioned on the SPT trough.

The SPT pipettes a sample tube (ASP) and the tip of nozzle is washed at SPT trough. And then SPT dispenses its contents into a cuvette (IRU) by using the SPP. After dispensing, the nozzle is washed in the SPT trough.

B. Components of SPT

COMPONENT	FUNCTION AND OPERATION
SPTU Motor	Stepping motor. Gives up-and-down movement to the nozzle.
SPTR Motor	Stepping motor. Gives rotary movement to the nozzle.
Nozzle	The movement of nozzle is given by the SPTU and SPTR motors. Pipetting/dispensing is performed by using the SPP.
Cuvette Zero-position Sensor	Photo interrupter. Detects the zero position for the rotary movement for cuvette dispensing. The cuvette zero-position is identical to the SPT-dispensing spot. The rotary position is tracked by counting the pulses fed to the SPTR motor after detecting the cuvette zero position.
T/S Position Sensor	Photo interrupter. Detects the SPT trough spot, the pipetting (e.g. sampling) spot, IRU trough spot and ISE-dispensing spot on the sample turntable (ASP) by sensing the slits on the disk.
Up Zero-position Sensor	Photo interrupter. Detects the upward zero position of the nozzle. The vertical position is tracked by counting the pulses fed to the SPTU motor after detecting the up zero position.
Liquid Level Sensor	The nozzle itself functions as a sensor. It detects that the nozzle tip has reached sample liquid. When the sensor output becomes active, the SPTU motor stops. Touch to the sample liquid is detected by sensing a sudden change of capacitance.
Down Limit Sensor	Photo interrupter. Normally the nozzle neck rests in the photo interrupter, i.e. the photo interrupter is OFF. When the nozzle tip reaches the bottom of a sample tube, the nozzle neck is lifted up, resulting that the photo interrupter goes ON. This sensor is used for protection of the nozzle. When the sensor output becomes ON, the SPTU motor stops.



SPT (SAMPLE PIPETTE)
Figure 2-2

4. RPT (Reagent Pipette Unit)

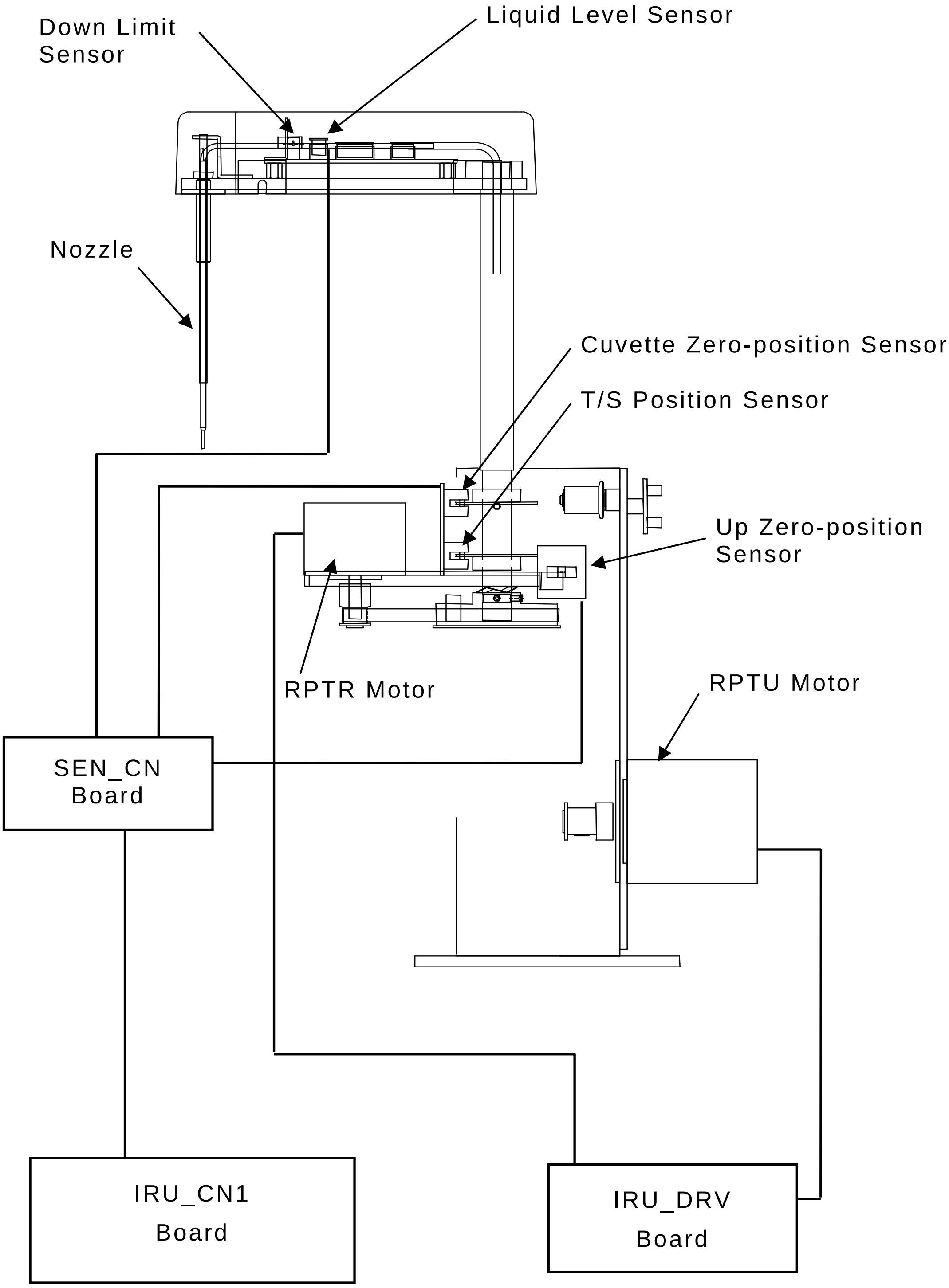
A. Functions

In the initialization, the nozzle is positioned on the RPT trough.

The RPT pipettes a reagent bottle (RCU) then dispenses it into a cuvette (IRU) by using the RPP. After dispensing, the nozzle is washed in the RPT trough.

B. Components of RPT

COMPONENT	FUNCTION AND OPERATION
RPTU Motor	Stepping motor. Gives up-and-down movement to the nozzle.
RPTR Motor	Stepping motor. Gives rotary movement to the nozzle.
Nozzle	The movement of nozzle is given by the RPTU and RPTR motors. Pipetting/dispensing is performed by using the RPP.
Cuvette Zero-position Sensor	Photo interrupter. Detects the zero position for the rotary movement of the nozzle. The cuvette zero-position is identical to the RPT-dispensing spot. The rotary position is tracked by counting the pulses fed to the RPTR motor after detecting the cuvette zero position.
T/S Position Sensor	Photo interrupter. Detects the RPT trough spot, the pipetting spot on the reagent turntable (RCU) and IRU cuvette spot by sensing the slits on the disk.
Up Zero-position Sensor	Photo interrupter. Detects the upward zero position of the nozzle. The vertical position is tracked by counting the pulses fed to the RPTU motor after detecting the up-zero position.
Liquid Level Sensor	The nozzle itself functions as a sensor. It detects that the nozzle tip has reached reagent liquid. When the sensor output becomes active, the RPTU motor stops. Touch to the reagent liquid is detected by sensing a sudden change of capacitance.
Down Limit Sensor	Photo interrupter. Normally the nozzle neck rests in the photo interrupter, i.e. the photo interrupter is OFF. When the nozzle tip reaches the bottom of a reagent bottle, the nozzle neck is lifted up, resulting that the photo interrupter goes ON. This sensor is used for protection of the nozzle. When the sensor output becomes ON, the RPTU motor stops.



RPT (REAGENT PIPETTE)
Figure 2-3

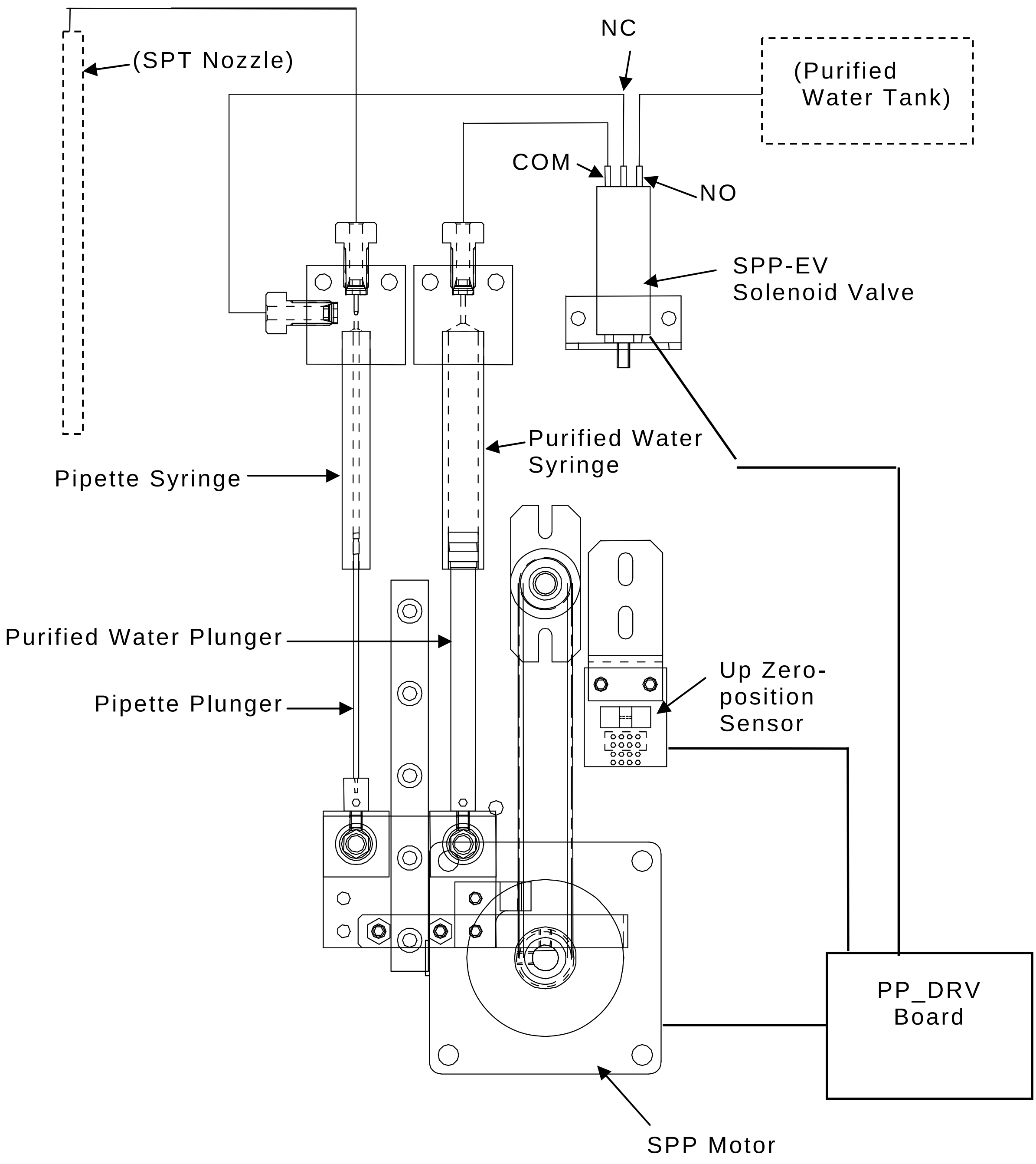
5. SPP (Sample Pump)

A. Functions

The SPP serves the SPT to pipette sample, purified water, wash solution, etc.

B. Components of SPP

COMPONENT	FUNCTION AND OPERATION
Plungers (Pipette Plunger and Purified Water Plunger)	Two plungers are provided; one is for pipetting syringe, and the other for purified-water syringe. They are coupled mechanically and move together.
SPP Motor	Stepping motor. Gives up-and-down movement to the plungers.
Up Zero-position Sensor	Photo interrupter. Detects the upward zero-position of the plungers. Pumping-in starts by lowering the plungers from this position. The plunger position is tracked by counting the pulses fed to the SPP motor after detecting the up zero position.
Syringes (Pipette Syringe and Purified Water Syringe)	Two syringes are provided; one is for pipetting and the other for purified water. The pipetting syringe is coupled to the SPT nozzle directly. Through the SPT nozzle, this syringe pumps sample, air, purified water or wash solution depending where the nozzle tip exists. The purified-water syringe is coupled to both the purified-water tank and the SPT nozzle through the solenoid valve. This syringe pumps purified water only.
SPP-EV Solenoid Valve	When the solenoid is OFF, the purified water syringe is coupled to the purified-water tank. If the plungers are lowered under this condition, the purified-water syringe is filled with water. When the solenoid is ON (energized), the purified-water syringe is coupled to the SPT nozzle. If the plunges are raised under this condition, the water in the purified-water syringe is dispensed through the SPT nozzle.



SPP (SAMPLE PUMP)
Figure 2-4

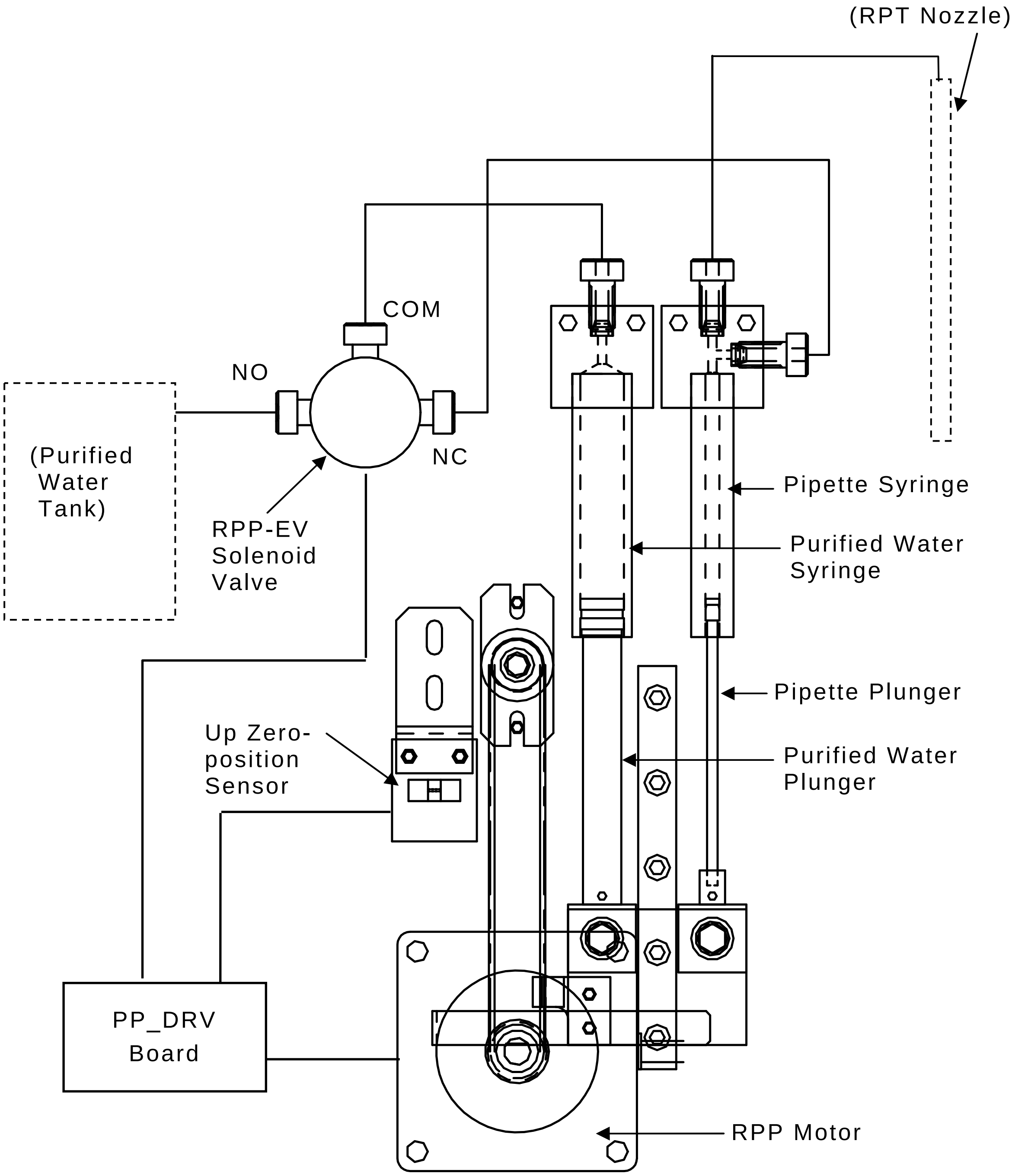
6. RPP (Reagent Pump Unit)

A. Functions

The RPP serves the RPT to pipette reagent, purified water, wash solution, etc.

B. Components of RPP

COMPONENT	FUNCTION AND OPERATION
Plungers (Pipette Plunger and Purified Water Plunger)	Two plungers are provided; one is for the pipetting syringe and the other for purified-water syringe. They are coupled mechanically and move together.
RPP Motor	Stepping motor. Gives up-and-down movement to the plungers.
Up Zero-position Sensor	Photo interrupter. Detects the upward zero-position of the plungers. Pumping-in starts by lowering the plungers from this position. The plunger position is tracked by counting the pulses fed to the RPP motor after detecting the up zero position.
Syringes (Pipette Syringe and Purified Water Syringe)	Two syringes are provided; one is for pipetting and the other for purified water. The pipetting syringe is coupled to the RPT nozzle directly. Through the RPT nozzle, this syringe pumps reagent, air, purified water or wash solution depending on where the nozzle tip stays. The purified-water syringe is coupled to both the purified-water tank and the RPT nozzle through the RPP-EV solenoid valve. This syringe pumps purified water only.
RPP-EV Solenoid Valve	When the solenoid is OFF, the purified-water syringe is coupled to the purified-water tank. If the plungers are lowered under this condition, the purified-water syringe is filled with water. When the solenoid is ON (energized), the purified-water syringe is coupled to the RPT nozzle. If the plunges are raised under this condition, the water in the purified-water syringe is dispensed through the RPT nozzle.



RPP (REAGENT PUMP)
Figure 2-5

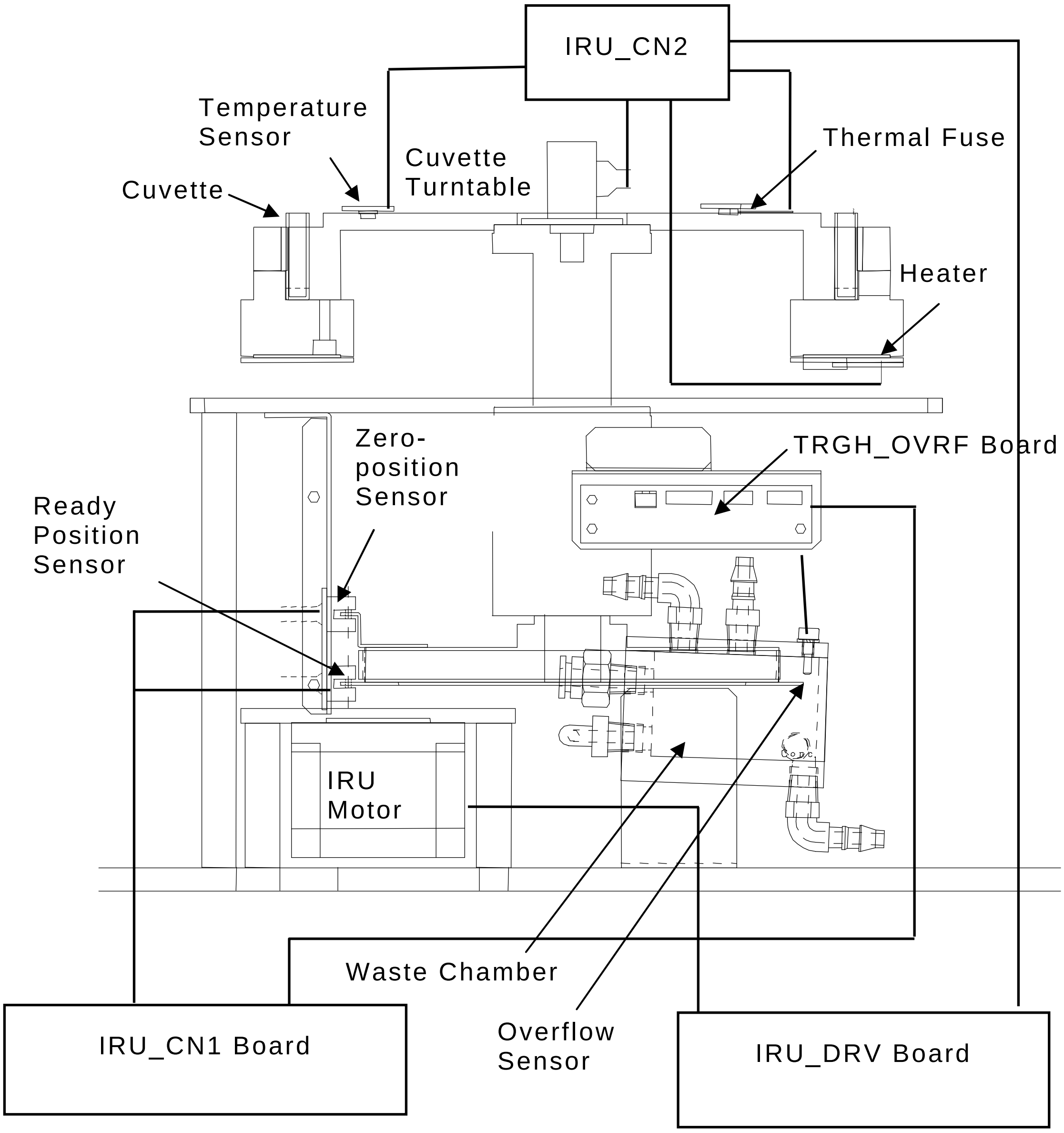
7. IRU (Incubation Reaction Unit)

A. Functions

The IRU holds 45 cuvettes on its cuvette turntable. The SPT and RPT dispense sample and reagent in a cuvette, respectively. To speed up the incubation (reaction between sample and reagent), the cuvette turntable is heated.

B. Components of IRU

COMPONENT	FUNCTION AND OPERATION
Cuvette Turntable	Holds 45 cuvettes. The incubation (reaction) liquid in the cuvettes is kept at 37 ± 0.3°C by heating the cuvette turntable directly. In the initialization, the cuvette turntable is driven to bring cuvette No. 1 in the RPT-dispensing spot.
Cuvettes	The cuvettes are made of special material (PYREX) so that the light from the halogen lamp (DTR) may pass them.
IRU Motor	Stepping motor. Gives rotary movement to the cuvette turntable.
Zero-position Sensor	Photo interrupter. Detects the zero position of the cuvette turntable. The sensor output goes ON at the moment when cuvette No. 1 comes to the RPT-dispensing spot. The rotation angle is tracked by counting the pulses fed to the IRU motor after detecting the zero position.
Ready Position Sensor	A disk is coaxially fixed to the turntable pulley. Along the disk edge 45 slits are arranged. These slits indicate 45 cuvette positions, respectively. After a desired cuvette is positioned to the SPT or RPT-dispensing spot, the ready position sensor output is checked. If the sensor output is ON, then the SPT or RPT nozzle is descended into the cuvette safely.
Heaters	Heaters 1 thru 3 warm the cuvette turntable.
Temperature Sensors	The temperature sensors TS1 thru TS3 mounted on the cuvette turntable monitor the turntable temperature. The heaters are driven based on this temperature measurement. Thanks to this arrangement, the incubation (reaction) liquid in the cuvettes is maintained at 37 ± 0.3°C.
Thermal Fuse	Prevents the IRU from overheat. The fuse blows out and then electric power to the heater stops when the temperature exceeds 76°C.
Overflow Sensor	Detects overflow of the IRU-divider that collects waste liquid from: - RCU - SPT trough - RPT trough - MIX1 trough - MIX2 trough. A pair of electrodes is placed within the waste chamber (IRU divider). Overflow is detected by sensing the conduction between the electrodes.



IRU (INCUBATION REACTION UNIT)
Figure 2-6

8. DTR (Detector Unit)

A. Functions

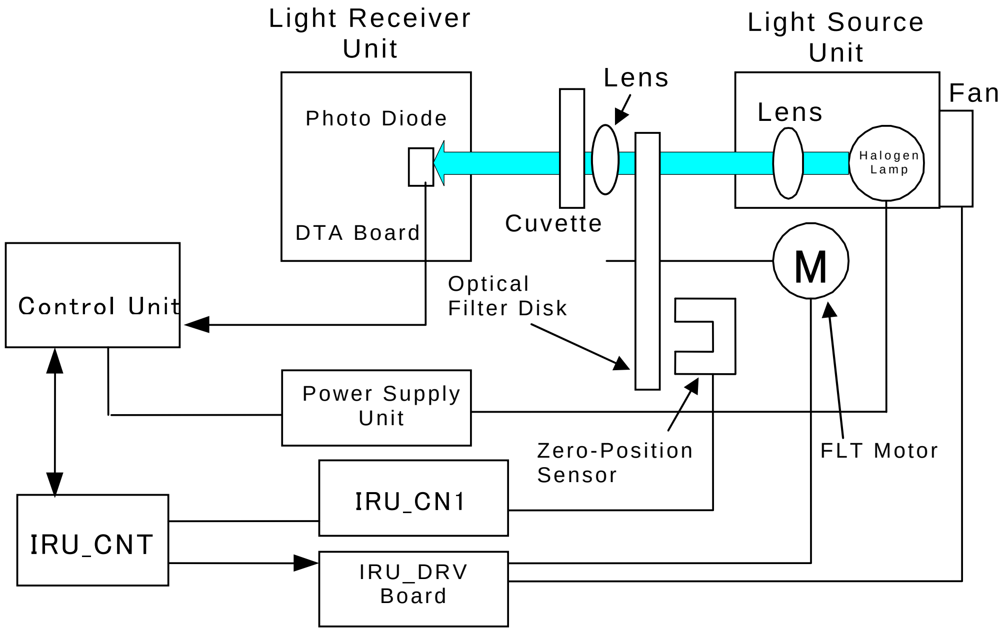
As the reaction progresses (between sample and reagent) within a cuvette (IRU), the liquid color changes. The DTR emits light to the cuvette, and measures the luminous intensity that passes through the cuvette.

The light is emitted from a halogen lamp, and is passed through an optical filter to obtain a desired wavelength. Eight filters are mounted on a optical-filter disk, and any one may be used.

The light from the optical filter passes through the cuvette, then is received by a photo diode. The resultant electrical signal is amplified in the DTA board then fed to the control unit for analog-to-digital conversion.

B. Components of DTR

COMPONENT	FUNCTION AND OPERATION
Halogen Lamp	The white light from the halogen lamp is condensed by a pair of lenses and is emitted to the cuvette through the optical filter. The halogen lamp is cooled by a fan.
Optical-filter Disk	Eight optical filters are mounted on this disk, and any one filter may be selected. The white light from the halogen lamp is passed through the selected optical filter to obtain one of the eight wavelengths.
DTA Board	The light passed through a cuvette is received by the photo diode for conversion to electrical signal, amplified by the gain-calibrated amplifier in the DTA board, then fed to the control unit for analog-to-digital conversion.
IRU_DRV Board	This board drives the motors of FLT, IRU, DTR, SPT, RPT and MIX1/2, and powers the cooling fan for the halogen lamp.
FLT Motor	Stepping motor. Rotates the optical-filter disk.
Zero-position Sensor.	Photo interrupter. Detects the zero position of the optical-filter disk. The filter position is tracked by counting the pulses fed to the FLT motor after detecting the zero position.



DTR (DETECTOR UNIT)
Figure2-7

9. RCU (Reagent Container Unit)

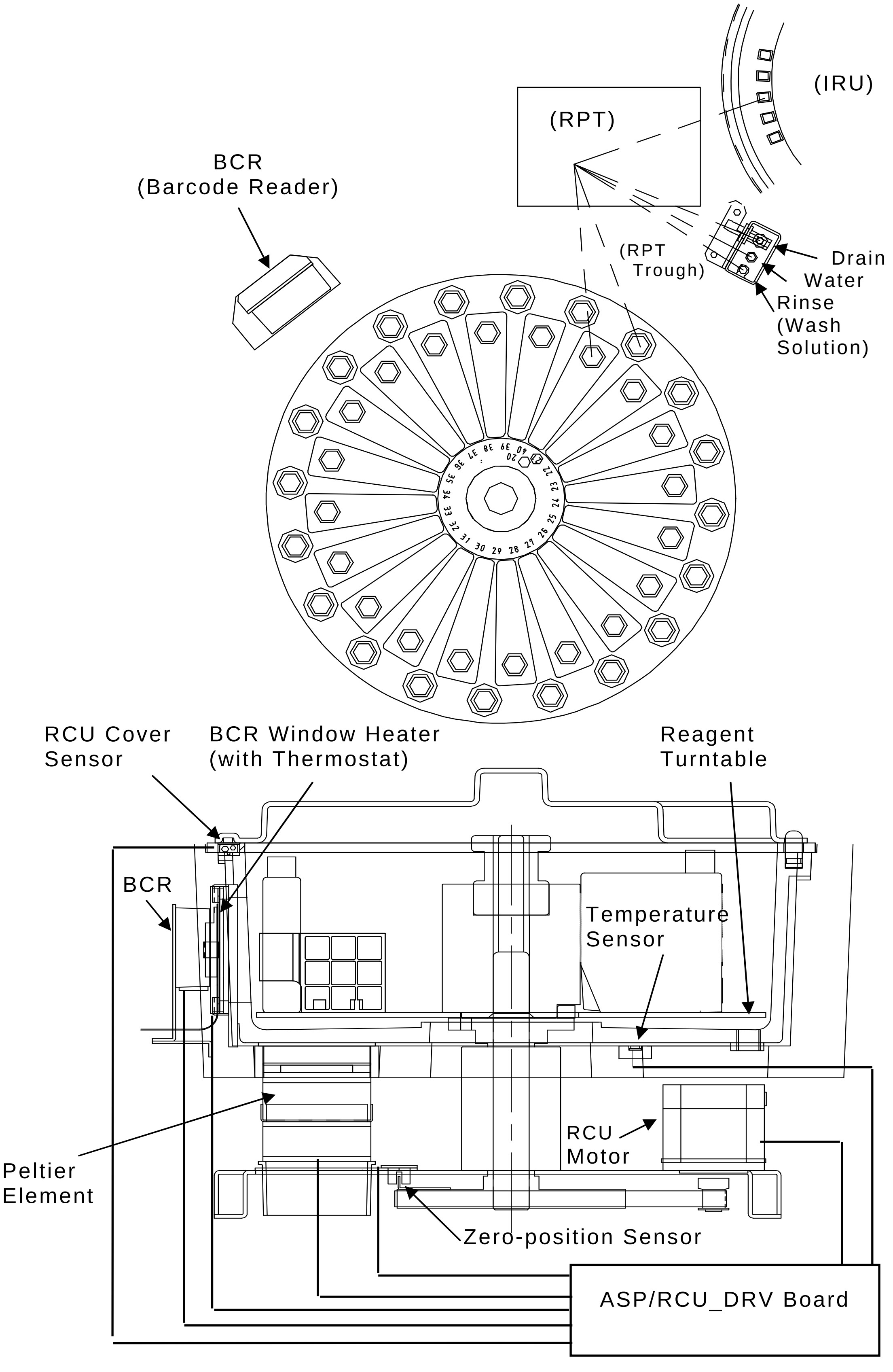
A. Functions

The RCU holds up to 40 bottles of reagents on its reagent turntable, and rotates the turntable to bring any requested reagent to the RPT-pipetting spot.

- The reagent position numbers are marked on the reagent turntable.
- A barcode is stuck on each reagent bottle.
- Before measurement, the RCU rotates the reagent turntable by 360 degrees, and reads a barcode on each reagent bottle. And the RCU memorizes the positions and the kinds of reagent bottles beforehand. During measurement, the RCU rotates the turntable to bring requested reagent to the RPT-pipetting spot.
- The inside of the reagent container is cooled by Peltier elements (PE1 to PE4).

B. Components of RCU

COMPONENT	FUNCTION AND OPERATION
Reagent Container	Mainly consists of a reagent turntable and RCU cover (lid). The exterior surface of the container is covered with thermal-insulating material. The RCU cover sensor detects if the cover is set properly.
Reagent Turntable	Holds up to 40 reagents (20 bottles of 100 ml reagents on the inner circumference plus 20 bottles of 20 ml reagents on the outer circumference). Using the optional reagent bottle adapter, the reagent bottle of 20mL or 50mL is storable on the inner circumference. The reagent bottles must be placed on the reagent turntable with their barcode labels faced outwards so that the BCR may read them.
RCU Motor	Rotates the reagent turntable, and brings any requested reagent bottle to the RPT-pipetting spot.
Zero-position Sensor	Photo interrupter. Detects the zero position of the reagent turntable. The sensor output goes ON at the moment when position No. 1 comes to the RPT-pipetting spot. In the initialization, the reagent turntable is returned to the zero position. The rotation angle is tracked by counting the pulses fed to the RCU motor after detecting the zero position.
BCR (Barcode Reader)	Identifies a reagent by reading a barcode label on each reagent bottle. The data read by the BCR is sent to the control unit (through the ASP/RCU_DRV board) over the RS232C transmission line.
Peltier Elements	Peltier elements (PE1 to PE4) cool the reagent container. Fans cool the elements themselves.
Temperature Sensor	Monitors the temperature in the reagent container. The Peltier elements are driven based on this temperature measurement. Thanks to this sensor, the reagents are maintained from 8 to 15°C.
Barcode Reading Window Defrosting Heater	It is a heater for defrosting barcode reading window.
Thermostat	Prevents the above defrosting heater from overheat. It stops power supply to the heater when the temperature reaches 75°C.



RCU (REAGENT CONTAINER UNIT)

Figure 2-8

10. MIX1/MIX2 (Mixing Stirrer Unit 1 and 2)

A. Functions

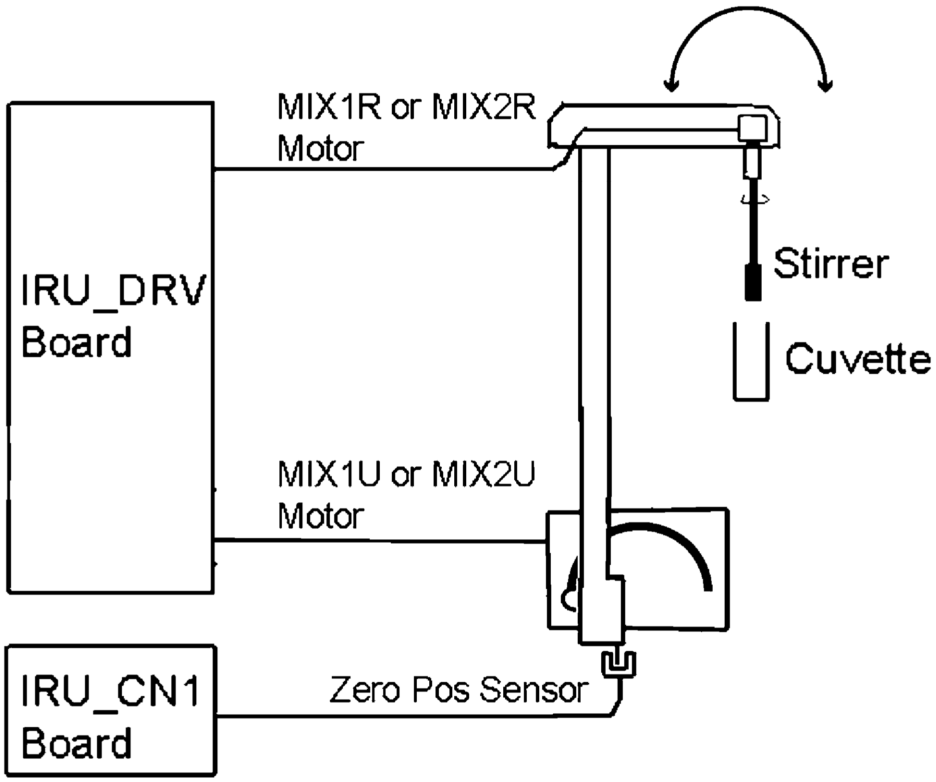
After sample and reagent are dispensed into a cuvette (IRU), a paddle-type stirrer comes down into a cuvette and mixes them so that incubation (reaction) may progress evenly. For mixing the 1st reagent and 2nd reagent separately, two mixers are provided e.g. MIX1 and MIX2.

After the mixing operation, the stirrer is washed.

In the initialization, the stirrer is positioned on the mixer trough (MIX1 trough or MIX2 trough).

B. Components of MIX1/MIX2

COMPONENT	FUNCTION AND OPERATION
Stirrer	This paddle-type stirrer comes down into a cuvette, rotates with the stepping motor and mixes sample/reagent so that incubation (reaction) may progress evenly. After mixing, the stirrer is washed in the MIX1 or MIX2 trough.
MIX1U or MIX2U Motor	Stepping motor. Gives up-and-down movement to the stirrer.
Zero-position Sensor	Photo interrupter. Detects the zero position of the stirrer. The position of the stirrer is tracked by counting the pulses fed to the MIX motor after detecting the zero position.
MIX1R or MIX2R Motor	Stepping motor. Turns the stirrer for mixing. The rotation speed of the stirrer can be selected from three stages of H/M/L.



MIX (MIXER)
Figure 2-9

11. WU (Wash Unit)

A. Functions

Cuvettes are cleaned up through 9 steps of operations comprising 8-step washing plus one step of null operations. For these operations, 8 washing stages (WU1 thru WU8) and one null stage are provided, respectively. These stages are aligned to accommodate consecutive 9 cuvettes. The WU cleans cuvettes while turning the cuvette turntable stage by stage. Cleaning of a given cuvette completes when it has traveled all the 9 stages from WU1 to WU8 (including one null stage between WU6 and WU7).

The null stage placed between WU6 and WU7 is used for immersion. During this period of step, the cuvette is left with purified water filled.

NOTE: Do not take that the cuvette turntable stays still during the null operation. The cuvette under the null step is served to "blank water measurement" i.e. the DTR measures the light passed through the clean cuvette filled with purified water. For this purpose, the nozzles are lifted up, the cuvette under the null step is move from the null stage to the DTR-measuring spot temporarily. As soon as the measurement completes, the cuvette is returned to the stages WU7 and WU8.

Each WU stage comprises supply/drain nozzle pair. Exceptionally WU7 and WU8 comprise drain nozzles only. WU8 is provided with a wipe tip at the tip of its drain nozzle to wipe water drops off in the last step of cleaning.

As shown in "13. WPP (Wash Pump Unit)", the supply nozzles dispense the below-listed liquid:

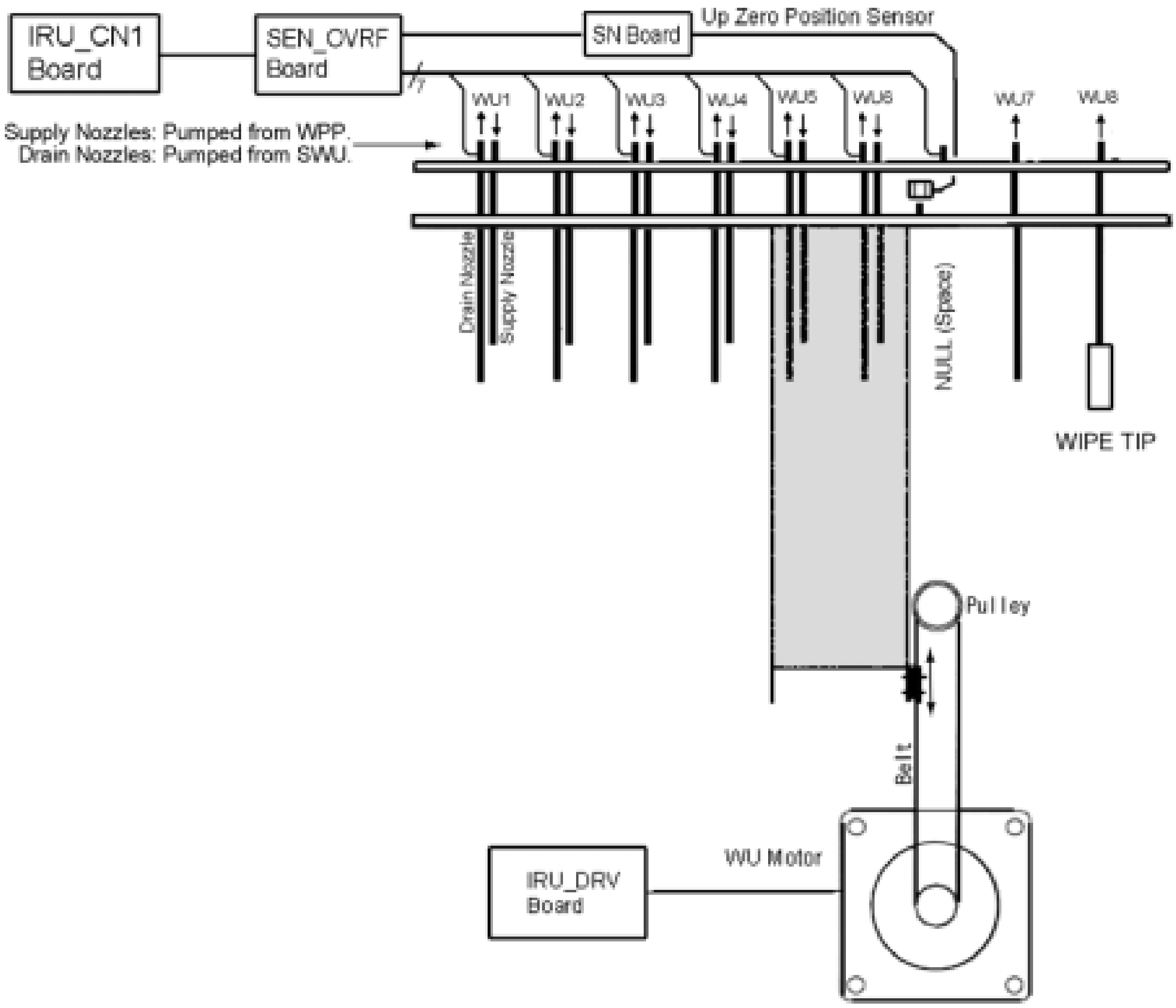
STAGE	SUPPLY NOZZLE DISPENSES:
WU1	Purified Water Wash Solution 2
WU2	Purified Water
WU3	Purified Water Wash Solution 1
WU4	Purified Water
WU5	Purified Water
WU6	Purified Water
Null	N/A
WU7	N/A
WU8	N/A

As shown in "12. SWU (Supply Water Unit)", the drain nozzles are connected to the pumps in SWU.

All nozzles are fixed each other, and move up and down together.

B. Components of WU

COMPONENT	FUNCTION AND OPERATION
Supply Nozzles	Supply wash solution or purified water into the cuvettes for cleaning. (Pumped from WPP.)
Drain Nozzles	Drain incubation (reaction) liquid, waste water or waste wash solution from the cuvettes. (Pumped from SWU.)
Wipe Tip	Wipes the cuvettes in the last step.
WU Motor	Stepping motor. Gives up-and-down movement to the nozzles.
Up Zero-position Sensor	Photo interrupter. Detects the upward zero position of the nozzles. The position of the nozzles is tracked by counting the pulses fed to the WU motor after detecting the zero position.
Overflow Sensor (Each pair of drain and supply nozzles of WU1 to WU6.)	Detects overflow from cuvettes. Each pair of drain and supply nozzles (WU1 to WU6) forms an electrode pair. After draining the cuvettes, conduction between paired electrodes is checked. If conduction is detected (due to liquid in a cuvette) on either electrode pair, it is recognized as overflow.



WU (WASH UNIT)
Figure 2-10

12. SWU (Supply Water Unit)

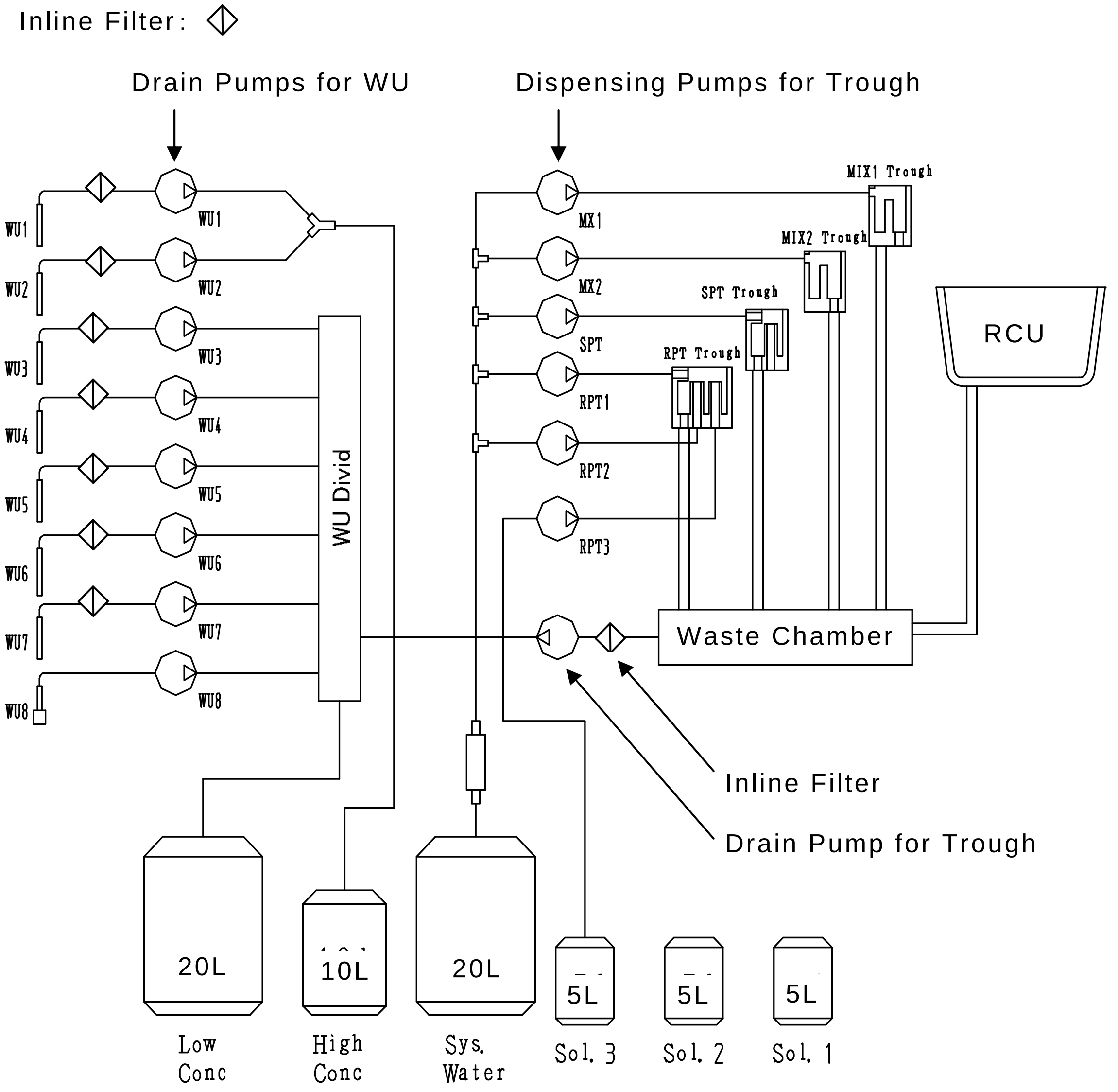
A. Functions

Drainage in the Wash Unit:
- WU1 and WU2 drain high concentration waste liquid.
- WU3 through WU8 drain low concentration waste liquid.

Suppliance of the purified water to the troughs (SPT, RPT, MIX1 and MIX2).
Suppliance of the wash solution to the RPT troughs.
Drainage in the waste chamber (IRU divider).
Interface to the external tank sensors (option).

B. Components of SWU

COMPONENT	FUNCTION AND OPERATION
Drain Pumps for WU	These pumps (WU1 to WU8) drain waste liquid from eight cuvettes, respectively.
Dispensing Pumps for Troughs	Dispense purified water to the SPT, RPT, MIX1 and MIX2 troughs. For the RPT trough, wash solution is dispensed additionally.
Drain Pump for Troughs	It drains waste liquid of SPT trough, RPT trough, MIX1 trough and MIX2 trough.
Inline Filters	For protection to the WU1 to WU7 and Drain pump for troughs.



SWU (SUPPLY WATER UNIT)
Figure 2-11

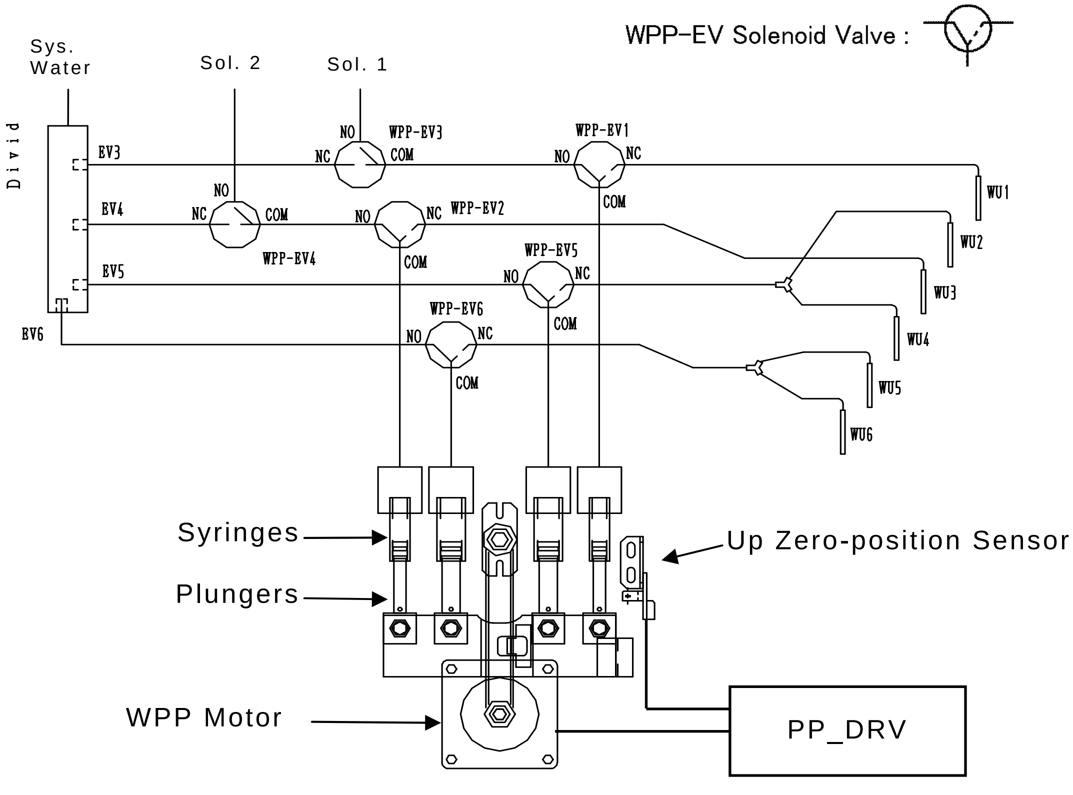
13. WPP (Wash Pump Unit)

A. Functions

The WPP contains the pumps to dispense purified water or wash solution to the WU.

B. Components of WPP

COMPONENT	FUNCTION AND OPERATION
Plungers	Four plungers are coupled mechanically and move together.
WPP Motor	Stepping motor. Gives up-and-down movement to the plungers.
Up Zero-position Sensor	Photo interrupter. Detects the upward zero-position of the plungers. Pumping-in starts by lowering the plungers from this position. The plunger position is tracked by counting the pulses fed to the WPP motor after detecting the up zero position.
Syringes	Four syringes are provided: SYRINGE / PUMPS: / DISPENSES TO: WU1 / Water or Wash Solution1 / WU1 Supply Nozzle WU3 / Water or Wash Solution2 / WU3 Supply Nozzle WU2/4 / Water / WU2/4 Supply Nozzles WU5/6 / Water / WU5/6 Supply Nozzles
WPP-EV Solenoid Valves	If the plungers are lowered with solenoid valves WPP-EV1, 2, 5 and 6 inactivated, the syringes are filled with purified water or wash solution. Solenoid valves WPP-EV3 and 4 select purified water or wash solution for the WU 1 and 3 syringes, respectively. If solenoid valves WPP-EV3 and 4 are inactivated (activated), wash solution (purified water) is pumped in. If the plungers are raised with solenoid valves WPP-EV1, 2, 5, and 6 activated, liquid in the syringes are dispensed through the WU supply nozzles.



WPP (WASH PUMP)
Figure 2-12

14. ISE (Ion Selective Electrode) (Option)

A. Functions

First, the SPT dispenses sample (blood serum, blood plasma or urine) into ISE's sample port, then the sample is fed to the ion-electrode chain. Upon receiving a command from the control unit over the RS232C transmission line, the ISE starts measuring concentrations of electrolytes (sodium Na+, potassium K+, chloride Cl-) contained in the sample. Last, the ISE transmits the measurements back to the control unit.

B. Components of ISE

COMPONENT	FUNCTION AND OPERATION
Ion Electrodes	Mainly comprises Na+, K+ and Cl- electrodes and a reference electrode. The three ion-electrodes are aligned (chained) serially. First, the SPT dispenses sample into the sample port of the ISE. The sample is then fed to the front end of the electrode chain. The SPT also dispenses calibrant B in the same manner. Unlike calibrant B, calibrant A is supplied internally by using the calibrant A pump. The ISE measures the concentrations of electrolytes (Na+, K+, Cl-) while passing the sample/calibrant through the ion-electrode chain. For washing, the SPT dispenses wash solution (e.g. cleaning solution) or purified water in the same manner.
Calibrant A Bottle	Contains calibrant A.
Calibrant A Pump	Tubular pump. Driven by ISE's internal motor to dispense calibrant A solution to the ion-electrode chain.
Waste Pump	Tubular pump. Driven by ISE's internal motor to drain waste liquid from the final end of the ion-electrode chain.
ISE Module (Processing and I/O Board)	Amplifies the signals from the ion electrodes and performs analysis. This board communicates with the control unit over the RS232C line.

15. External Tanks

A. Functions

They are the tanks for purified water, wash solutions and waste liquid.

B. Components of External Tanks

COMPONENT	FUNCTION
Purified Water Tank (20L)	Supply tank for purified water used as system water.
Wash Solution 1 Tank (5L)	Supply tank for wash solution for WU1 cuvette.
Wash Solution 2 Tank (5L)	Supply tank for wash solution for WU3 cuvette.
Wash Solution 3 Tank (5L)	Supply tank for wash solution for washing nozzle at RPT trough.
High Concentration Waste Liquid Tank (10L)	Storage tank for high concentration waste liquid (from WU1 and WU2).
Low Concentration Waste Liquid Tank (20 L)	Storage tank for low concentration waste liquid (from WU3 to WU8 and waste liquid chamber).

16. Liquid Level Sensors (Option)

A. Functions

Liquid level sensors monitor the liquid level of purified water tank, wash solution tanks and high and low concentration waste liquid tanks. The liquid level data is sent to the analyzer and is used as the data for an alarm.

B. Components of Liquid Level Sensors

COMPONENT	FUNCTION
Tank Rack	Rack for wash solution 1, 2 and 3 tanks. Equipped with liquid level sensors for respective tanks. It also provides connectors for interface cables from the analyzer and connectors for liquid level sensors of purified water tank and waste liquid tanks (High and low Concentration) which are installed outside the tank rack.
Wash Solution Liquid Level Sensors	They are part of a tank rack. They are used by setting at the bottom of the tanks, and monitor the remaining amount. - Type: transmissive type photo sensor, - ON: at fluid volume 300mL or more, - OFF: at fluid volume 300mL or less (the quantity for about 600 tests).
Purified Water Liquid Level Sensor	It is inserted in the purified water tank, and it monitors the remaining amount. - Type: float sensor, - ON: at fluid volume 4L or more, - OFF: at fluid volume 4L or less (the quantity for about 100 tests).
Waste Liquid Level Sensors	They are inserted in the waste liquid tanks, and monitor the remaining amount. There are two types of sensors for the high concentration waste liquid tank and the low concentration waste liquid tank. - Type: float sensor, - ON: at fluid volume 9L or more for the high concentration waste liquid tank, at fluid volume 18L or more for the low concentration waste liquid tank, - OFF: at fluid volume 9L or less for the high concentration waste liquid tank, at fluid volume 18L or less for the low concentration waste liquid tank.

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Chapter 3
PC Board Descriptions

1. General

This chapter explains the functions of every PC board used in the Clinical Chemistry Analyzer.

SEE ALSO:

Appendix D "Wiring Diagrams"	Electrical connections of PC boards, sensors, motors, etc.
Appendix F "Sensor List"	Summarizes the function of each sensor.

2. Functions of PC Boards

The following table lists PC boards in alphabetic order, and summarizes their functions, referring to Appendix D "Wiring Diagrams".

The term "driver" used in the table refers to an input circuit (sensor amplifier for example) as well as an output circuit (power transistor for example).

Locations for the PC boards with numbers (#) are shown in Figure 3-2.

FUNCTIONS OF EACH PC BOARD

PCB	IMPLEMENTED FUNCTIONS/DEVICES	Fig
AC_FLT 25P3230	AC line filter.	
ASP/RCU_DRV 25P3222	Drivers for RCU. Drivers for ASP.	#3
CNT-IBM 25P3521	This is a CPU board to control mechanical drives of the analyzer by PC command.	#2
CNT-CN1 25P3237	This board connects control signals from CONT-IBM board to units to be controlled.	#2
POWER-CN 25P3238	This board connects DC power supply to CNT-IBM, CNT-CN1 and AD PCB. And this board generates an analog power supply for AD PCB. Also this board connects control signals to Power Supply Unit & ISE Unit.	#2
AD PCB 25P3706	This PCB performs detection & A/D convert receiving signals from DTA board.	#1
DTA 25P3219	Photo diode for DTR and gain-calibrated amplifier.	#4

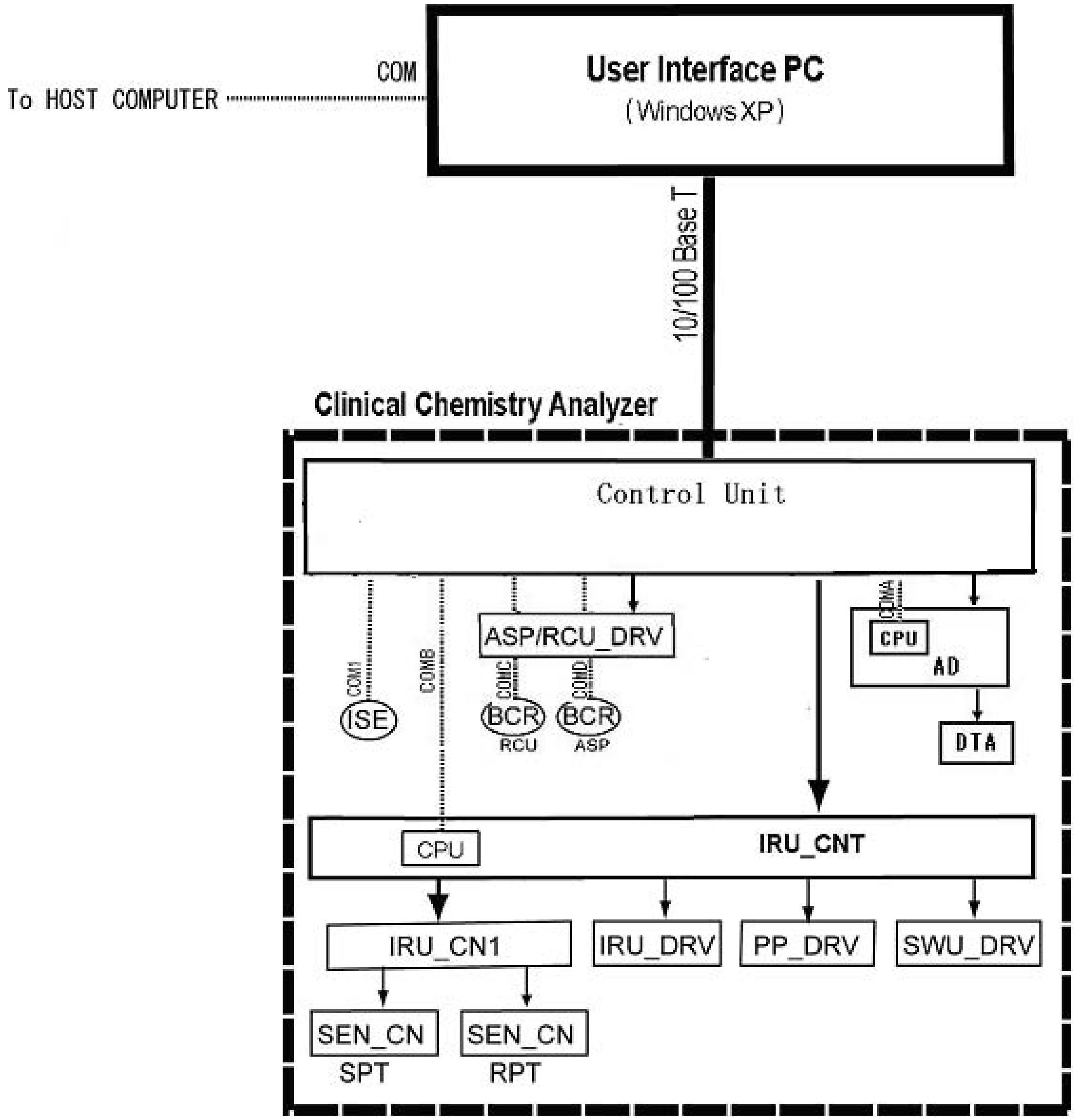
(CONT'D)

PCB	IMPLEMENTED FUNCTIONS/DEVICES	Fig
TRGH_OVRF 25P3233	Driver for the waste chamber over flow sensor.	
IRU_CN1 25P3217	Connections to MIX1's, MIX2's and DTR's zero position sensors. Connection to IRU's ready and zero position sensors. Connections to SEN_CN boards (RPT/SPT) and TRGH_OVRF boards (WU/Trough).	#7
IRU_CN2 25P3218	Connections to the heaters 1, 2 and 3. Connections to the three thermal fuses. Connections to the temperature sensors TS1, TS2 and TS3.	
IRU_CNT 25P3215	This board connects the signal of the control unit to the IRU_DRV, IRU_CN1, SWU_DRV and PP_DRV boards. A CPU resides on this board. The control unit communicates with this CPU over COMB. In accordance with the commands from the control unit, the CPU drives the liquid level sensor in RPT or SPT through the SEN_CN and SEN_LL/DL boards. Drivers for the cooling fans FAN1, FAN2 and FAN3 (on the chassis and power supply unit) are also implemented on this board.	#5
IRU_DRV 25P3216 or 25P3231	Drivers for the motors of RPT, SPT, IRU, MIX1, MIX2, WU and DTR. Driver for DTR’s cooling fan.	#8
PP_DRV 25P3220	Drivers for RPP. Drivers for SPP. Drivers for WPP	#6
SEN_CN 25P3223	Connections for SPT or RPT sensors.	
SEN_LL/DL 25P3234	Drivers liquid-level and down-limit sensors for SPT or RPT.	
SEN_OVRF 25P3229	Driver for WU overflow sensor.	
SN (SENSA) 25P3207	Single photo-interrupter. Used in many places where single photo-interrupter is needed.	
C_LIMIT 25P3236	The voltage of halogen lamp is controlled.	

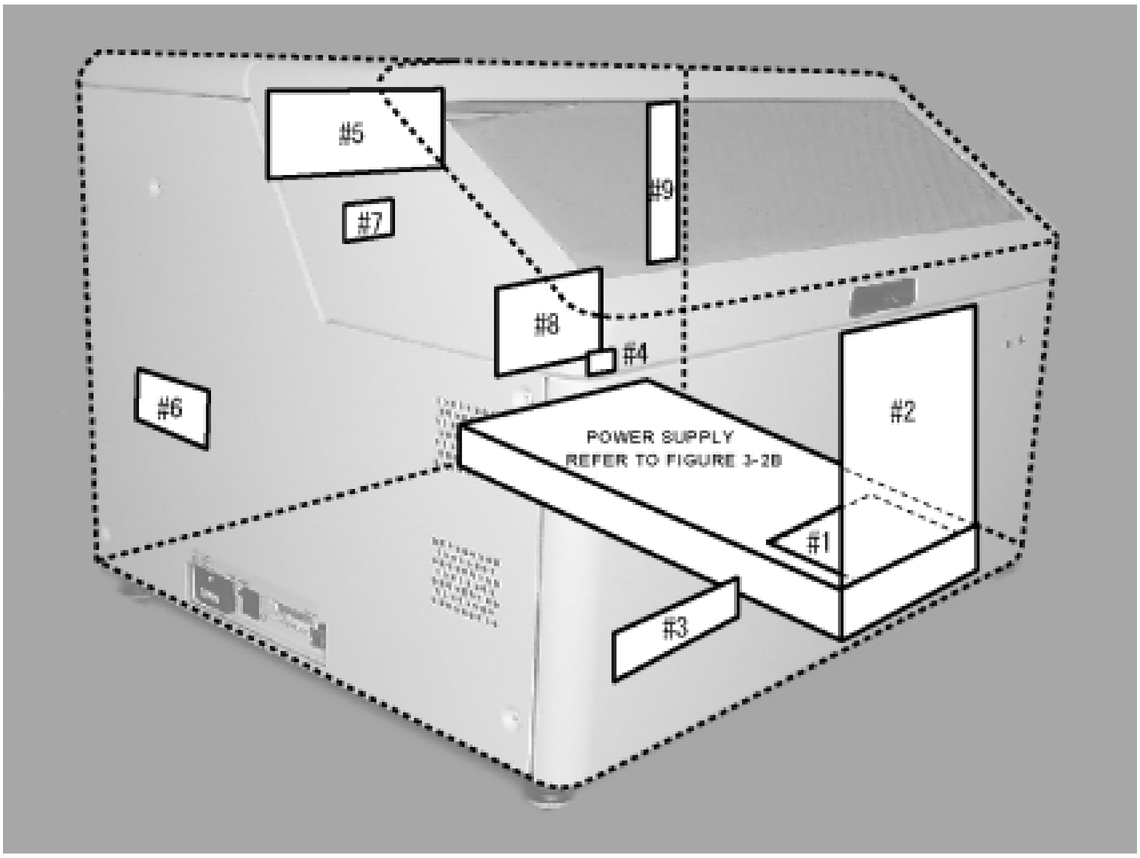
(CONT'D)

PCB	IMPLEMENTED FUNCTIONS/DEVICES	Fig
SN2 (SEN2) 25P3225	Two photo-interrupters. Used in the following units: - IRU (as ready-position and zero-position sensors) - SPT (as T/S-position and cuvette zero-position sensors) - RPT (as T/S-position and cuvette zero-position sensors)	
SWU_DRV 25P3221	Drivers for the pumps in SWU. Drivers for the sensors for external tanks for waste liquid, wash solution and purified water.	#9
TS (TSP) 25P2015	Temperature sensor. Used in RCU and in IRU (as TS1, TS2 and TS3).	

The following diagram shows the hierarchy of major circuit boards.

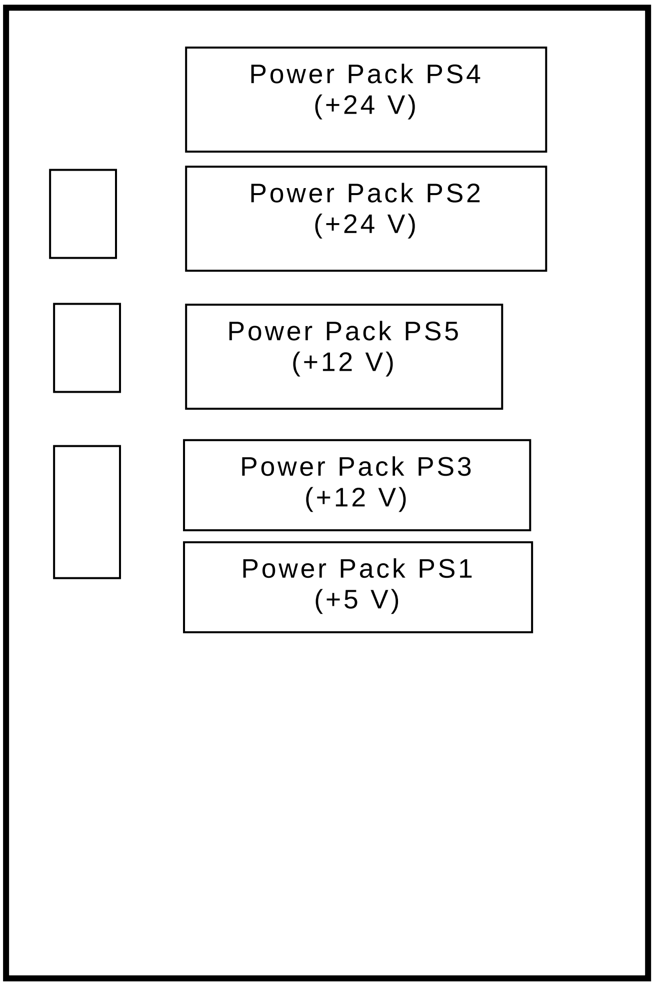


HIERARCHY OF MAJOR PC BOARDS
Figure 3-1



LOCATION OF MAJOR PC BOARDS
Figure 3-2A

POWER SUPPLY



LOCATION OF MAJOR PC BOARDS
Figure 3-2B

Chapter 4
Installation

1. Installation Site

A. Required Space

Dimensions of the analyzer:	770mm (w) x 620mm (d) x 550mm (h) The height of the adjustment bolts, which are located at the bottom of the analyzer, is not included.
Mass:	135 kg (Max)

On the right side of the analyzer there will be external tanks placed and on the left side there will be PC placed for user interface. The required space next to the analyzer is 30 cm on the right and 60 cm on the left. In case of installing a printer on the left side of the analyzer, extra 40 cm will be required.

Keep the backside of the analyzer more than 10 cm for air circulation. (See Figure 4-12.)

B. Environmental Condition

- Ambient temperature range should be within 15 to 30 degrees Celsius and humidity within 45 to 85% without condensing.
- Do not expose to direct sun light or water splash.
- Install where there is no dust or vibration.
- Do not expose to direct heat or cool air from air conditioners.
- Avoid areas that are adversely affected by atmospheric pressure, temperature, humidity, ventilation, sunlight, dust, air containing salt or sulfur, etc.
- Do not install the analyzer at the place adjacent to the storage room of chemicals or the place where any gas is likely to be generated.

C. Power Supply

- AC 100 to 120V 50/60Hz, 5.5A(Max.) or
  AC 200 to 240V 50/60Hz, 2.8A(Max.)

D. User Interface PC with Printer (To be prepared locally)

- Supply Voltage: Refer to the manual for your PC.
- Power Consumption: Refer to the manual for your PC.

2. Unpacking and Installation

A. Unpacking

(1) Cut the plastic bands.

Figure 4-1

(2) Lift the top lid of the package.

Figure 4-2

(3) Lift and remove the top cushions.

Figure 4-3

(4) Lift and remove the sidewall. Also remove the vinyl cover from the unit.

Figure 4-4

B. Installation

Four or more persons are required to lift and carry the analyzer from a palette and place it in an installation place. Make sure that each person should hold one of the four handles located at the four corners of the analyzer's bottom by one hand and support the other bottom portion of the analyzer by the other hand, then lift the analyzer carefully. Since the analyzer weighs 135kg, place it on the solid bench.

C. Detaching Unit Protection Plates

The SPT, RPT, Mix-1, Mix-2 and WU units are fixed with protection plates to avoid damage during transportation. Follow the procedure below to remove them before operating the analyzer.

(1) Detach SPT holding plate.

Remove the SPT holding plate by removing the two screws (M3). Tighten colored screws (accessories) instead of the screws removed above.

Figure 4-5

(2) Remove the RPT holding plate by removing the two screws (M3).
Tighten colored screws (accessories) instead of the screws removed above.
Remove the MIX1 holding plate by removing the one screw (M3).
Tighten colored screw (accessory) instead of the screw removed above.

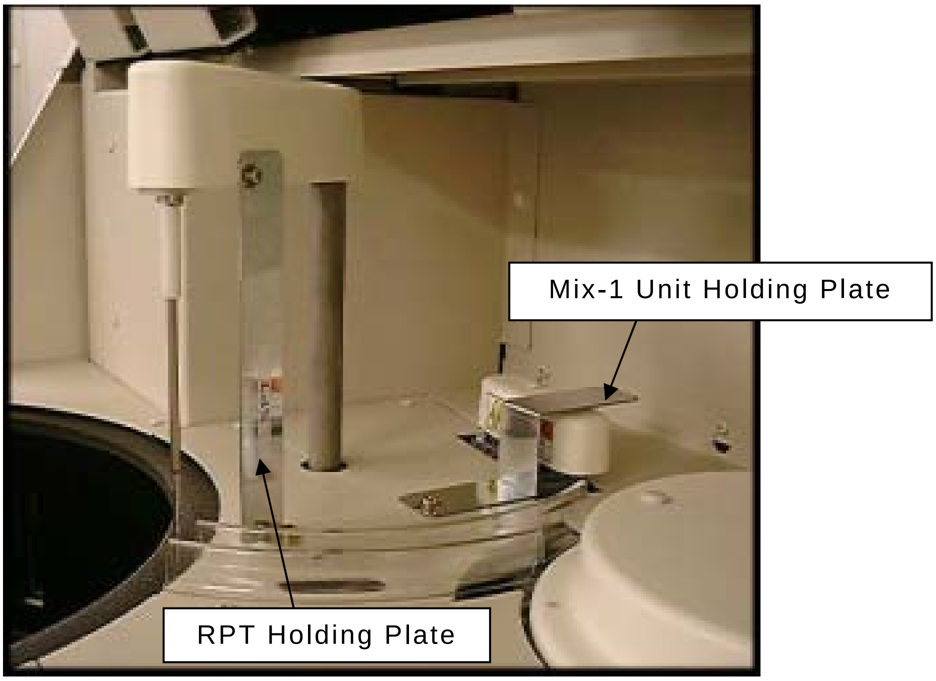


Figure 4-6

(3) Detach SWU cover.

Remove the SWU cover by removing the one screw (M3) and two plastic clips.

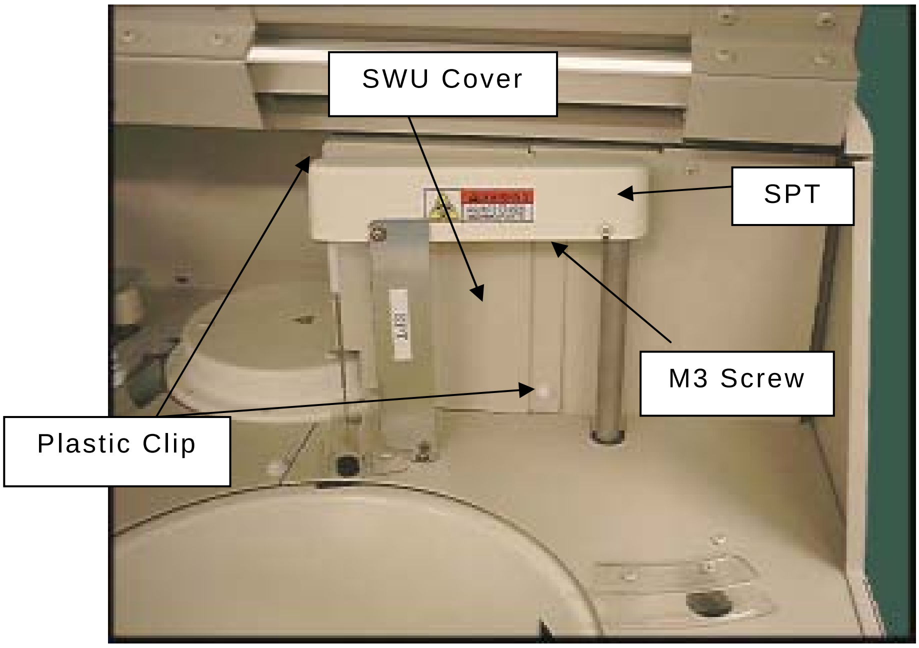


Figure 4-7

(4) Wash unit holding plate holds MIX2 unit as well.

The WU holding plate also supports the MIX2 unit located behind. Remove the WU holding plate-fixing screw. Lifting the WU holding plate upward, pull it to remove. After removing, tighten to install the WU holding plate-fixing screw in its original place. Lower the WU nozzle plate so that the end of WU nozzle is located a little up from the cuvette mouth. Attach the SWU cover to the original position.

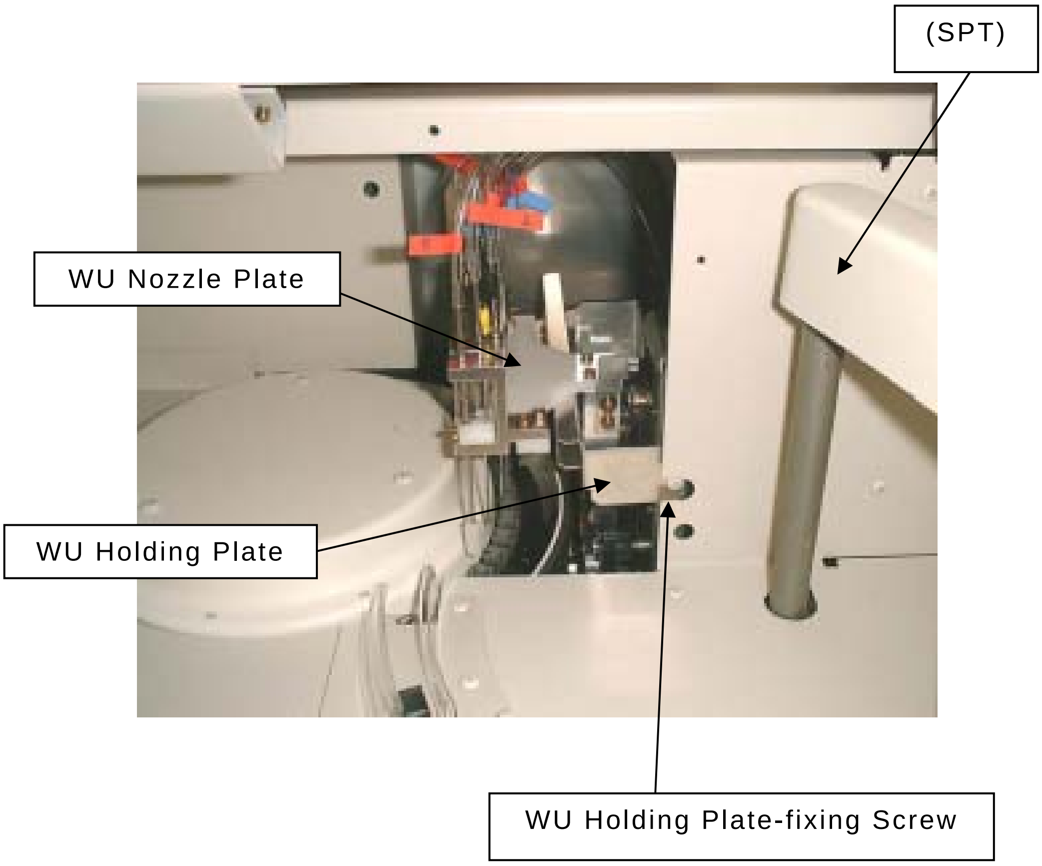


Figure 4-8

(5) Unit Protection Plates

The removed unit protection plates are shown in Figure 4-9.

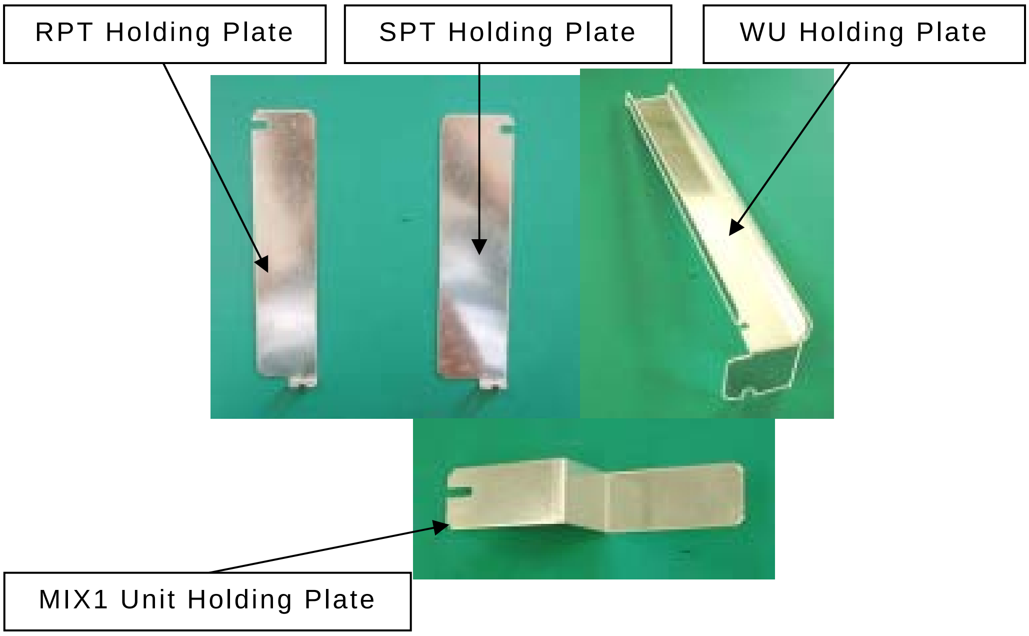


Figure 4-9

D. Remove Cuvette Cover

During transportation, the cuvettes in the IRU are covered with a cuvette cover (vinyl plate) to prevent dust from entering the unit. When the analyzer is installed, it is necessary to remove the cuvette cover from the IRU.

Remove the mosaic plate 9 (cover of the DTR) by loosening the one screw (M3) and removing the two plastic clips. Remove the green tape (several places) and cuvette cover. Attach the mosaic plate 9 to its original position.

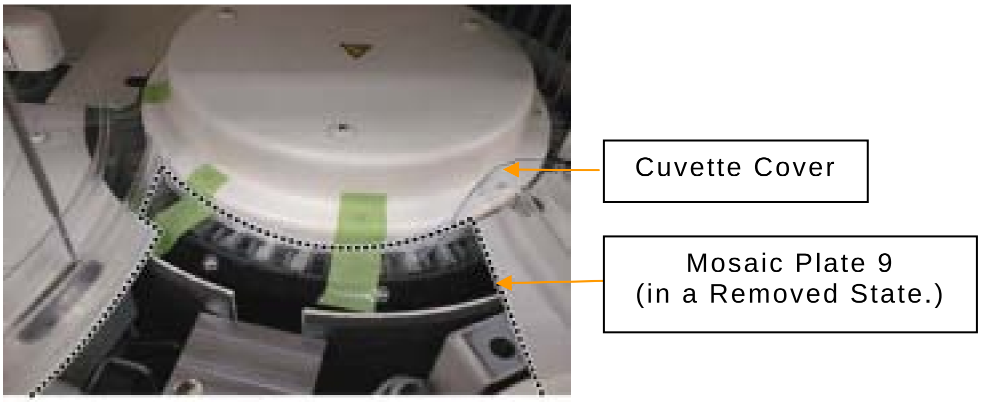


Figure 4-10

E. Level

The analyzer must be installed on the level. Place a level sensor on the halogen-lamp case (DTR) and adjust the level with the four height adjustment bolts.

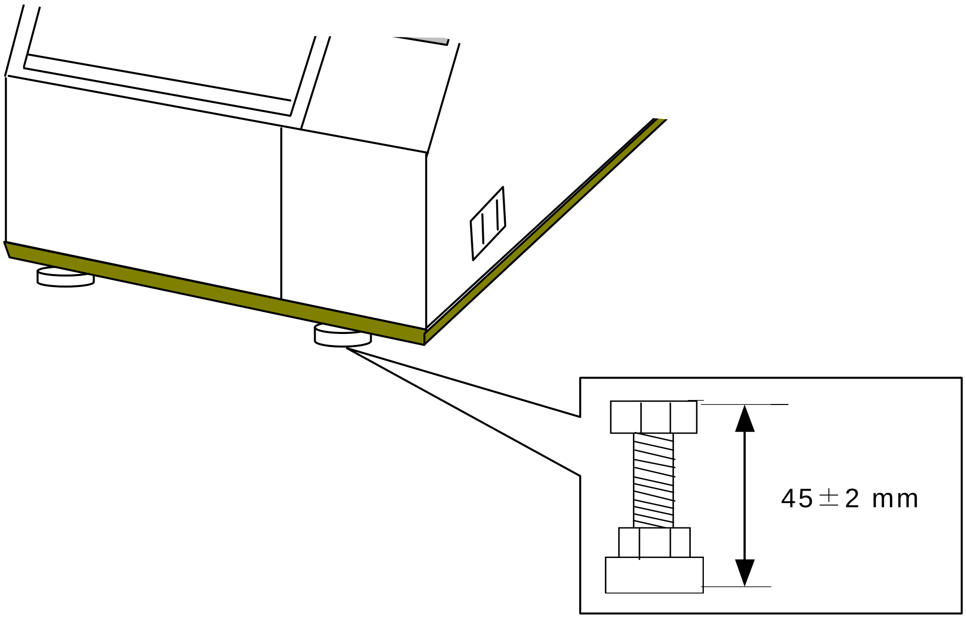


Figure 4-11

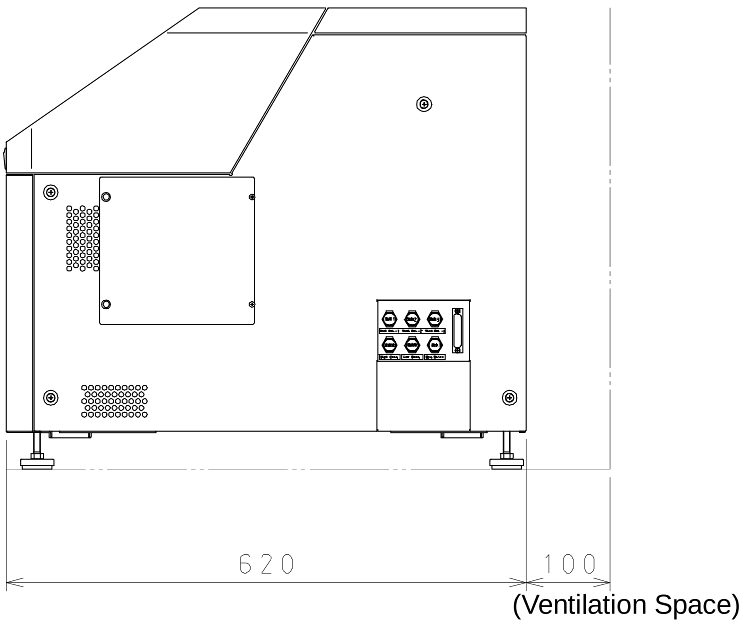


Figure 4-12

NOTE: For ventilation, 100 mm or more space is required.

F. Signal Cable Connection

At completion of analyzer installation, connect the analyzer to PC and connect tubes to external tanks.

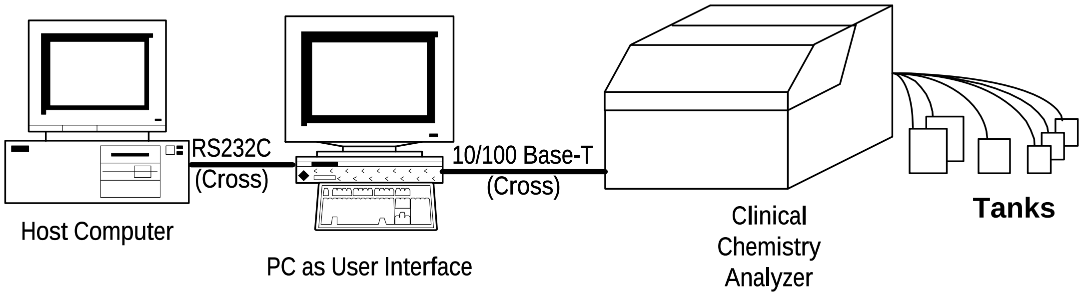


Figure 4-13

- Analyzer (Left side)

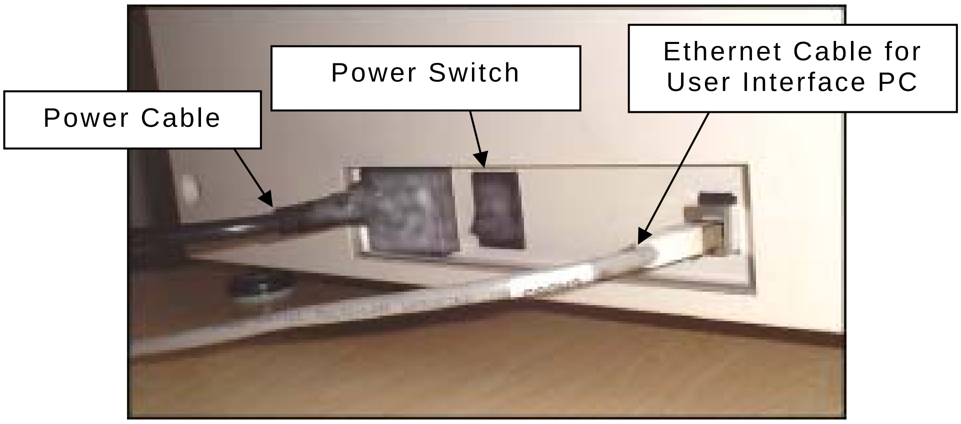


Figure 4-14

- Analyzer (Right side)

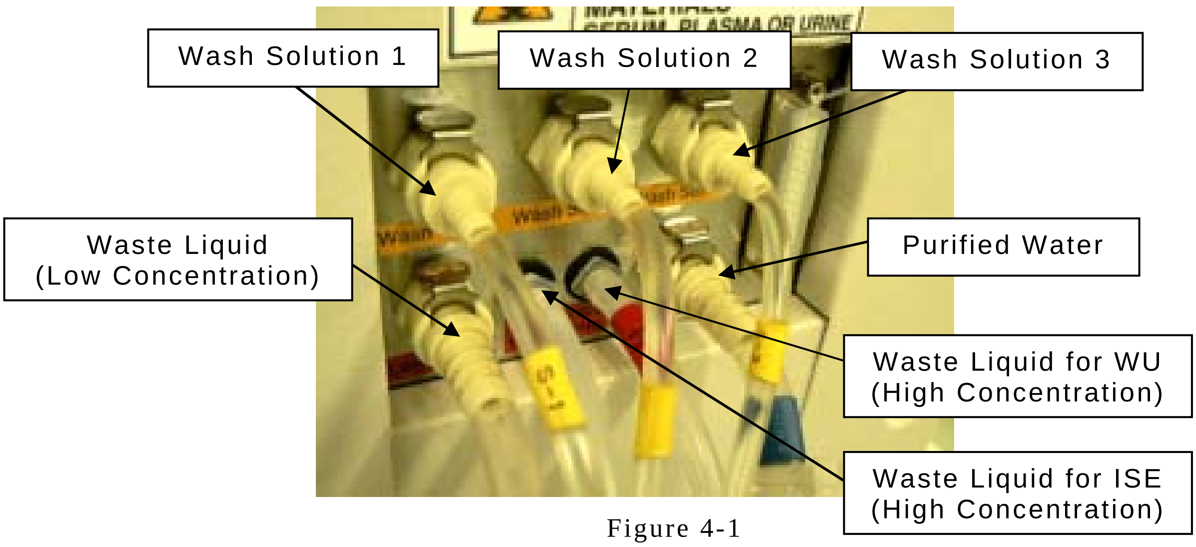
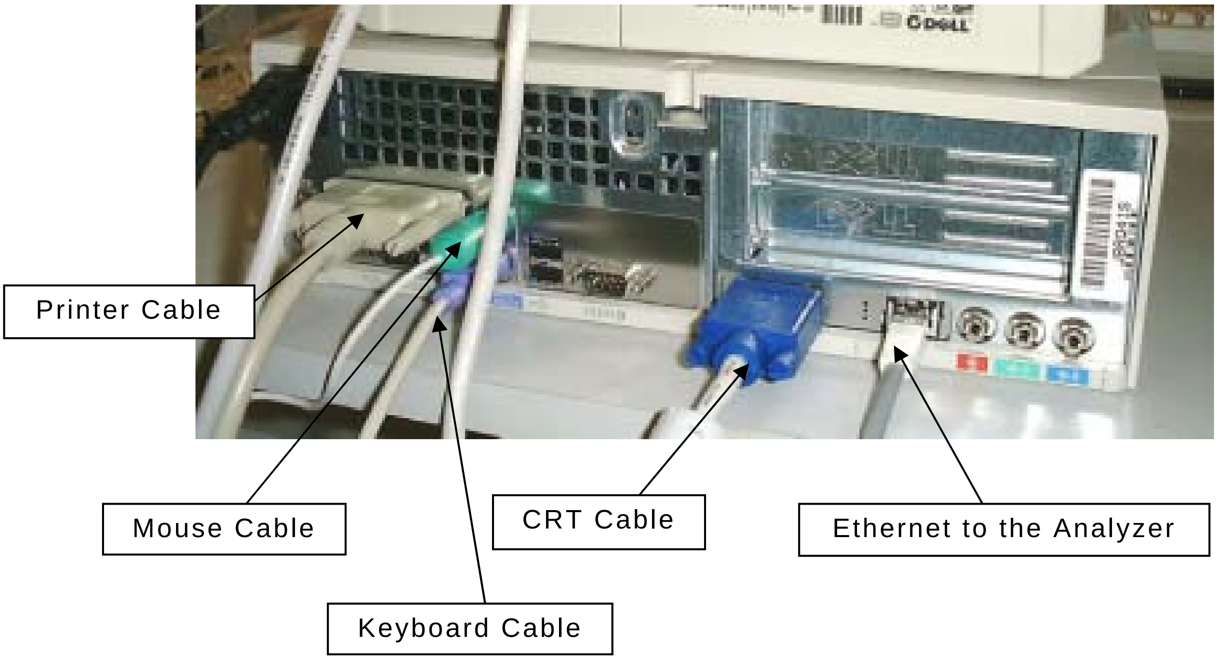


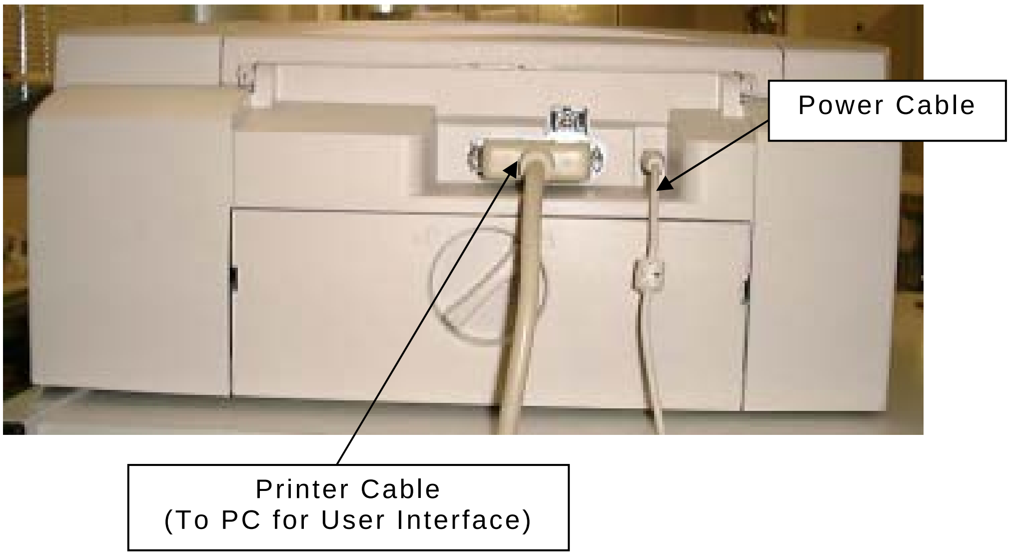
Figure 4-1

- PC (To be prepared locally. The following figure is for reference only.)



EXAMPLE OF CABLE CONNECTIONS
Figure 4-16

- Printer (To be prepared locally. The following figure is for reference only.)



EXAMPLE OF CABLE CONNECTIONS
Figure 4-17

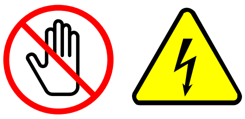
G. Power Cable Connection

Use power cable supplied and check power capacity before turning on the analyzer, PC and printer. Secure ground connection for safety.

Chapter 5
Cleaning

This chapter gives cleaning instructions for respective units.

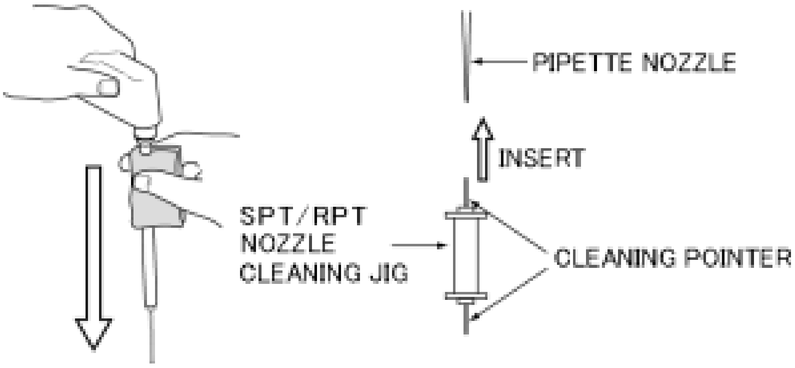
1. Pipettes (RPT/SPT)



WARNING: BEFORE STARTING THE FOLLOWING STEPS, MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.
WEAR MEDICAL RUBBER GLOVES WHEN HANDLING RPT/SPT TO PREVENT DIRECT CONTACT WITH NOZZLES OR LIQUID.

(1) Moisten gauze with ethanol.
(2) Lift up the nozzle assembly by hand.
(3) Wipe the entire length of the pipette as shown in Figure 5-1, starting from the top with the moistened gauze.

WARNING: DO NOT APPLY EXTRA FORCE TO THE NOZZLE ASSEMBLY. PROPER ALIGNMENT OF NOZZLE ASSEMBLY IS VITALLY IMPORTANT FOR PROPER PIPETTING OPERATION. UNPROPER ALIGNMENT CAN RESULT IN DAMAGES TO THE PIPETTE AND/OR INCORRECT ANALYSIS RESULT.



CLEANING PIPETTE
Figure 5-1

(4) Insert the cleaning pointer of the SPT/RPT nozzle cleaning jig into the nozzle. Using the jig clean the inside of the nozzle. See Figure 5-1.
Note that the cleaning pointer for SPT is thinner than the one for RPT.
(5) Finally, clean the nozzle with purified water using [Maintenance] menu.
- Select [Maintenance] menu.
- Select the function menu button [Wash (F10) Page:1/2].
- Press the "Start" button of "R.P.T." or "S.P.T." to start cleaning.

2. <u>Stirrers</u> (MIX1/MIX2)

**<u>WARNING</u>: BEFORE STARTING THE FOLLOWING STEPS, MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.
WEAR MEDICAL RUBBER GLOVES WHEN HANDLING MIX1/MIX2 TO PREVENT DIRECT CONTACT WITH NOZZLES OR LIQUID.**

There are two stirrers: MIX1 is near the RPT, MIX2 is inside of the SWU cover located near the ASP. To clean the MIX2 stirrer, open the SWU cover first.

(1) Moisten gauze with ethanol.

(2) Lift up the stirrer assembly by holding its arm cover.

(3) Wipe the stirrer with the gauze moistened with ethanol. Be careful not to bend the paddle.

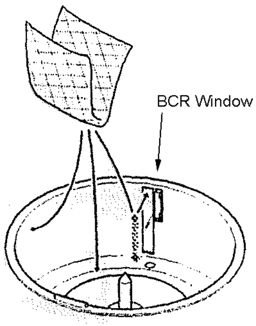
3. Sample Compartment (ASP)

WARNING: BEFORE STARTING THE FOLLOWING STEPS, MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.
WEAR MEDICAL RUBBER GLOVES WHEN HANDLING SAMPLE COMPARTMENT TO PREVENT DIRECT CONTACT WITH NOZZLES OR LIQUID.

(1) Make sure that the SPT nozzle assembly is off the sample compartment. If it is, rotate the nozzle assembly by hand.

(2) Take out the ASP tray.

(3) Wipe the barcode-reader (BCR) window (aperture) with gauze moistened with ethanol.



SAMPLE COMPARTMENT
Figure 5-2

(4) Clean the inner surface of the sample compartment with gauze or paper towel as illustrated above. Make sure that condensation and water drops are wiped off completely.

(5) Reinstall the ASP tray.

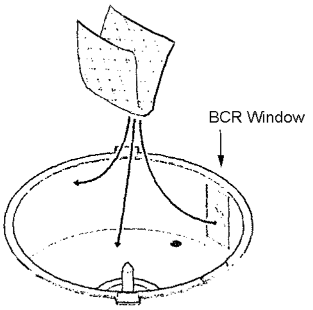
4. Reagent Compartment (RCU)

WARNING: BEFORE STARTING THE FOLLOWING STEPS, MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.
WEAR MEDICAL RUBBER GLOVES WHEN HANDLING REAGENT COMPARTMENT TO PREVENT DIRECT CONTACT WITH NOZZLES OR LIQUID.

(1) Make sure that the RPT nozzle assembly is off the reagent compartment. If it is, rotate the nozzle assembly by hand.

(2) Take out the RCU tray.

(3) Wipe the barcode-reader (BCR) window with gauze moistened with ethanol or with glass cleaner. Be careful not to scratch the window surface.



REAGENT COMPARTMENT
Figure 5-3

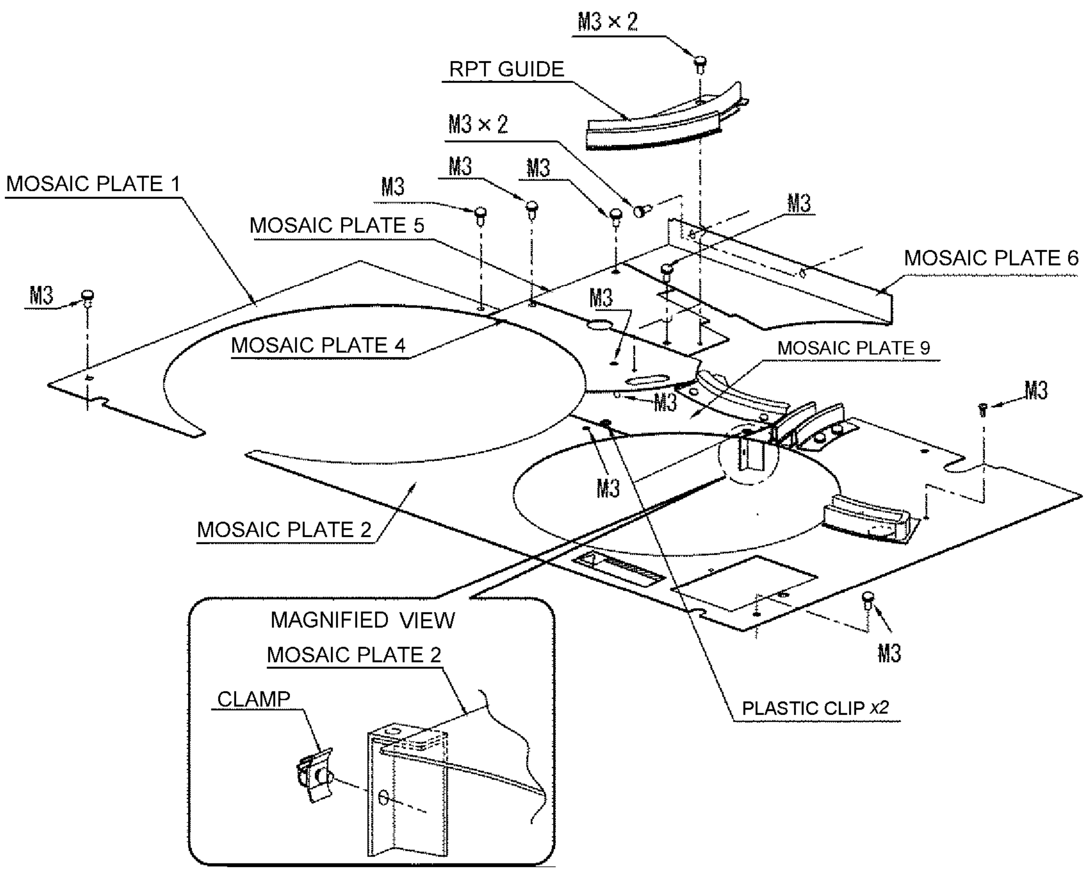
(4) Clean the inner surface of the reagent compartment with gauze or paper towel as illustrated above. Make sure that condensation and water drops are wiped off completely.

(5) Reinstall the RCU tray, and close the lid.

5. <u>Mosaic Plates</u>

<u>WARNING</u>: BEFORE STARTING THE FOLLOWING STEPS, MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.
WEAR MEDICAL RUBBER GLOVES WHEN HANDLING MOSAIC PLATES TO PREVENT DIRECT CONTACT WITH NOZZLES OR LIQUID.

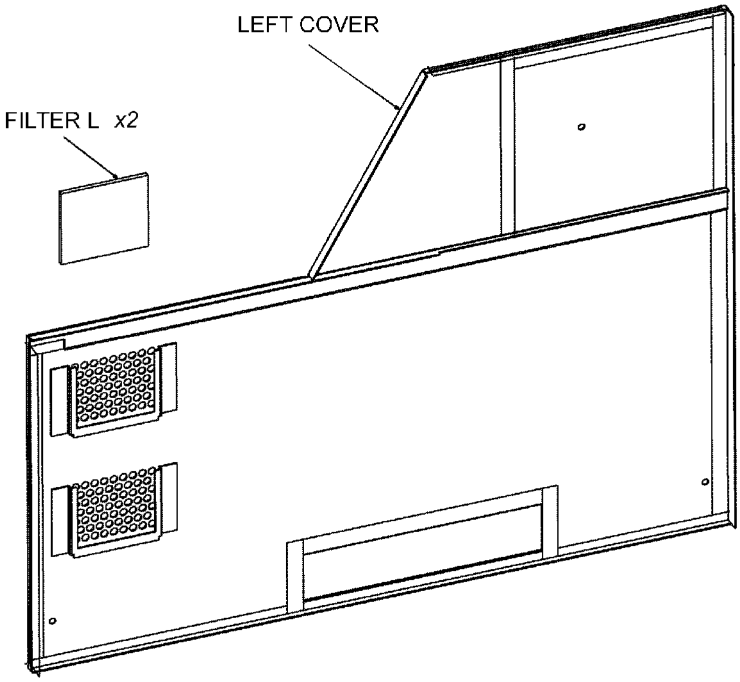
(1) Clean the surface of the mosaic plates with neutral detergent-moistened gauze or paper towel.



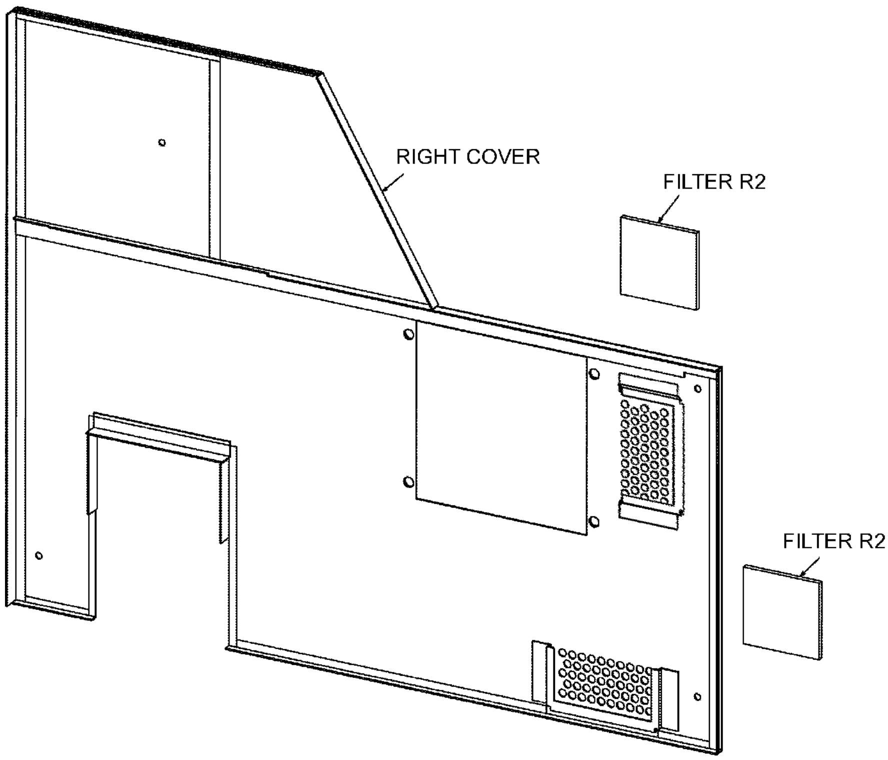
MOSAIC PLATES
Figure 5-4

6. <u>Dust Filter</u>

Two dust filters are provided on the inner surface of each left- and right-side cover. Clean the filters from time to time. If they are damaged or contaminated heavily, replace them.



DUST FILTER (LEFT SIDE)
Figure 5-5



DUST FILTER (RIGHT SIDE)
Figure 5-6

7. ISE (Ion Selective Electrode)

   (1) Remove the ISE cover and pull out the ISE unit.

   (2) Check if the area around the sample port is clean. If it is not clean, wipe the area using gauze moistened with ethanol. Make sure that ethanol will not enter inside the sample port.

   (3) Push back and install the ISE unit. Reinstall the ISE cover.

8. Nozzle Cover (SPT/RPT) and Arm Cover (MIX1/MIX2)

   Wipe the nozzle cover (or arm cover) using gauze or paper towel moistened with ethanol.

9. Trough (SPT/RPT/MIX1/MIX2)

   Wipe the trough using gauze or paper towel moistened with ethanol.

10. WU Nozzle

   (1) Remove the SWU cover.

   (2) Wipe the nozzles (six supply nozzles and seven drain nozzles) using gauze moistened with ethanol. Make sure not to bend nozzles.

   (3) Reinstall the SWU cover.

11. Tubing System (Decontamination Procedure)

Make sure that wash solution used in the cleaning procedure below should not be mixed with other wash solutions.

A. Cleaning procedure

(1) Flow

(Approx. time required)

<1>	Preparation	• Preparation: Tank filled with purified water. Relocate tubes (3 tubes from Sol.1,2 and 3 → Tank filled with purified water).	15 min.
		• Clean tubes from Sol.1,2 and 3 with purified water ("Prime": 2 cycles).	
		• Preparation: Tank filled with diluted wash solution. • Relocate tubes (4 tubes → Tank filled with diluted wash solution）.	
<2>	Cleaning	• Clean the inside of the tubes with diluted wash solution ("Prime": 2 cycles). • Clean cuvettes ("Cuvette Wash": one cycle).	27 min.
<3>	Post-Cleaning (Rinse)	• Relocate tubes (4 tubes → Tank filled with purified water).	
		• Clean the inside of the tubes with purified water ("Prime": 4 cycles). • Clean cuvettes ("Cuvette Wash": one cycle).	42 min.
		• Preparation for measurement 1 (Return the tubes to tanks for measurement.)	(84 min.)
		• Preparation for measurement 2 ("Prime": one cycle) ("Cuvette Wash": one cycle)	20 min. <Following day>
		Total	104 min.

These steps can be automated by setting Sleep Mode. Refer to "(2) Description of cleaning procedure" below.

CAUTION :

If you perform cleaning with purified water as the Post-Cleaning in Sleep Mode, set the time and day of the week so that the cleaning will start immediately. Do not leave the cuvettes or tubes for a long period of time with wash solution (C1) filled in, or this may shorten the life of cuvettes or tubes.

(2) Description of cleaning procedure

<1> Preparation

1 Cleaning of tubes from Sol.1, 2 and 3 with purified water:
If the wash solution used in the cleaning procedure is mixed with acid detergent, gaseous chlorine may be generated due to chemical reaction. To avoid this danger, completely wash away the inside of the tubes before going to step <2>. The procedure is as follows:
Fill a tank (other than a tank of system water) with purified water (approx. 4 to 5 L).
Put the tubes from Sol.1, 2 and 3 into this tank.
Perform the "Prime" operation to wash away the remaining materials out of the tubes completely. "Prime" operation is: On the [Maintenance] screen, select the function menu button [Sequence (F9)] (or press the **F9** key). Press the [Start] button of the "Prime Sequence" to start cleaning.
(Perform this procedure twice.)

2 Making diluted wash solution:
Add purified water (ion exchanged water) to the Wash Solution (C1) to make diluted wash solution (Wash Solution (C1) - 1%).
Fill a tank with the diluted wash solution. Approx. 500 mL of diluted wash solution is required for one round of cleaning (2 cycles of "prime" operation) per analyzer. Therefore, at least 1 L of diluted wash solution is necessary to be made.

3 Preparation for cleaning:
Place the four tubes (the tube from system water and tubes from Sol.1, 2 and 3) into the tank filled with the diluted wash solution (prepared in step 2). Leave the drain tubes connected to the waste liquid tank at this stage.

<2> Cleaning

To clean the inside of the nozzles, tubes and cuvettes with diluted Wash Solution (C1), follow the procedures described below. （For frequency, refer to "B".)

1 Routine cleaning of the inside of the tubes or nozzles:
On the [Maintenance] screen, select the function menu button [Sequence (F9)] (or press the **F9** key). Press the [Start] button of the "Prime Sequence" to start cleaning. (2 cycles)

2 Routine cleaning of the inside of the cuvettes:
On the [Maintenance] screen, select the function menu button [Sequence (F9)] (or press the **F9** key). Press the [Start] button of the "Cuvette Wash" to start cleaning. (One cycle)

<3> Post-Cleaning (Rinse)

Completely wash away wash solution used in step <2> with purified water, or remaining wash solution may cause incorrect measurement results by the analyzer.

1 Remove the four tubes (tubes from system water, Sol.1, 2 and 3) from the diluted wash solution tank and put them in a tank filled with purified water.
2 On the [Maintenance] screen, select the function menu button [Sequence (F9)] (or press the **F9** key). Press the [Start] button of the "Prime Sequence" to start cleaning. (4 cycles)
3 On the [Maintenance] screen, select the function menu button [Sequence (F9)] (or press the **F9** key). Press the [Start] button of the "Cuvette Wash" to start cleaning. (One cycle)
4 Return all these tubes to the regular measurement tanks respectively.
5 On the [Maintenance] screen, select the function menu button [Sequence (F9)] (or press the **F9** key). Press the [Start] button of the "Prime Sequence" to start cleaning. (One cycle)
6 On the [Maintenance] screen, select the function menu button [Sequence (F9)] (or press the **F9** key). Press the [Start] button of the "Cuvette Wash" to start cleaning. (One cycle)
(When step 6 is complete, measurement operation is available.)

How to set up Sleep Mode
Refer to Operator's Manual "4.7.8 Automatic start-up [Auto Start (F12)]" for details.

1 On the [Maintenance] screen, select [Auto Start (F12)]. On the [Auto Start] menu screen, enter the number of times of "Prime" and "Cuvette Wash" operations in "Prep1" or "Prep2". (For example, you can set "Prep1" for sleep mode and "Prep2" for routine cleaning.)

2 Input the start-up time (day of the week and the time), then select "Prep1" or "Prep2".
(If you want to start cleaning shortly after making setting, set the start-up time to a few minutes after the current time.)
NOTE: Make sure to push Save button after setting above.

3 Click on the "Shut Down" on upper right corner of the screen to display the "shut down" menu screen. Then click on the "Sleep".
(Make sure that the "Sleep" indication pops up.)

B. Frequency

Perform cleaning with Wash Solution (C1) every two weeks in average frequency of use (approx. 500 tests a day). To prevent bacterial growth in the tubing system, perform cleaning at least once a month even though your analyzer's work load (frequency in use) is lower or your analyzer looks comparatively clean.

CAUTION: Usually cleaning cycle is every two week. To prevent bacterial growth in the tubing system of the analyzer, perform cleaning from time to time. The bacteria growth may cause plugging of filters resulting in short life of the filters.

C. Storage of Wash Solution (C1)

The storage life of concentrate wash solution is 24 months. Concentrate wash solution can be stored for 24 months if the cap is closed tightly even after opening the cap. Since diluted wash solution is not preservable, make fresh diluted wash solution for each use.

D. Precautions

Following are precautions for cleaning of the analyzer. For other general precautions, obey the instructions given on the label of Wash Solution (C1).

(1) Use Wash Solution after diluting in accordance with the above mentioned instructions.
(2) Make sure to use purified water (ion exchanged water) to dilute Wash Solution. Do not dilute it with tap water. If you dilute it with tap water and leave the diluted wash solution for several days, brown particles (corroded iron) or white particles (calcium chloride) might be generated.
(3) After the storage life of Wash Solution (24 months) is expired, sodium hypochlorite contained in the solution is decomposed and available chlorine is reduced. Therefore, dispose of Wash Solution in an appropriate manner. (Before disposing of Wash Solution, neutralize it and dilute it with volumes of water.)
(4) Be careful not to mix Wash Solution with acid things.
(5) Be careful not to contact Wash Solution with metals, such as iron, ferric oxide, copper, copper alloy, etc. or zinc plating, which may result in metal corrosion.
(6) If you put Wash Solution into another tank, make sure that the tank is completely clean. After cleaning away the tank, rinsing it with purified water and drying it, pour Wash Solution into it.

Chapter 6
Maintenance

1. Daily Check

This subsection explains the checks, which are required before day's work.

A. Purified Water and Waste Liquid Tanks

Make sure the following points:
- Purified water tank is full.
- The tube tip of the purified water tank is in contact with the bottom.
- The waste liquid tank is empty.
- The tube tip of the waste liquid tank is well above the waste liquid level.

NOTE: When using Clinical Chemistry Analyzer, take care of the following points from time to time:
- The purified water tank is not empty.
- The tube tip of the waste liquid tank is well above the waste liquid level. (If the tube tip is in the waste liquid, waste liquid can not flow normally, resulting in trouble.)

B. Wash Solution Tank (Sol-1, 2 and 3)

Make sure the following points:
- Sufficient amount of wash solution is in each wash solution tank.
- The tube tip of the wash solution tube is in contact with the bottom of each tank.

C. ISE and Its Related Portion (Option)

Make sure the following points:
- The remaining amount of Calibrant-A is enough.
- Check the expiration date of Calibrant-B when executing the ISE calibration.
- Check the expiration date of ISE cleaning solution when executing the ISE cleaning.

D. Others

Make sure the following points:
- The print paper is set.
- Check the remaining amount and the expiration date of reagents in the reagent container.
- Check the operating time of the consumable parts on [Wash (F10) Page:1/2] of the "Maintenance" screen.
- Check that the listed results of cuvette check on [Wash (F10) Page:2/2] of the "Maintenance" screen are normal at every wavelength.

2. <u>Preventative Maintenance</u>

This subsection describes the check items which a serviceman performs every four months. In the eight months check, the four months and eight months check items are performed. And in the twelve months check, the four months, eight months and twelve months check items are performed.

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
ASP	Operating condition of whole mechanism	X			The alarm must not occur in normal measurement.
	Function of photo couplers	X and O			The alarm must not occur in normal measurement.
	Contamination of light receiving portion of the barcode reader	X and O			There must not be contamination at visual check. Clean the light receiving portion with compressed air.
	Function of barcode reader	X and A			The alarm must not occur in normal measurement.
	Contamination of sample tray	X and O			See "Chapter 5 Cleaning".
	Contamination of auto sampler unit	X and O			See "Chapter 5 Cleaning".
	Function of ASP cover (lid)	X			Select [Sequence (F9)] on the "Maintenance" screen, and check "ASP_COVER2". "ASP_COVER2" is displayed in yellow color when the lid is closed.
	Tension and condition of timing belt (Timing belt must be exchanged every 3 years.)	X and A			There must not be damage at visual check. See "Chapter 10 Unit/Parts Replacement" for tension adjustment.
	Contamination of mechanical parts	X and O			There must not be contamination at visual check.
SPT & RPT	Damage and contamination of nozzles	X and O		R	There must not be contamination at visual check. See "Chapter 5 Cleaning".
	Function of photo couplers	X and O			The alarm must not occur in normal measurement.

(CONT'D)

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
SPT & RPT	Function of liquid level sensor	X			The alarm must not occur in normal measurement.
	Function of the spring and down limit sensor	X			Select [Sequence (F9)] on the "Maintenance" screen. Check that "SPTU_DL (RPTU_DL)" is displayed in yellow color when the nozzle is pushed up by hand, and is displayed in black color when the hand is removed from the nozzle.
	Tension and condition of timing belt (Timing belt must be exchanged every 3 years.)	X and A			There must not be damage at visual check. See "Chapter 10 Unit/Parts Replacement" for tension adjustment.
	Damage and contamination of tubing	X and O			There must not be damage at visual check. See "Chapter 5 Cleaning".
	Operating condition of whole mechanism	X			The alarm must not occur in normal measurement.
SPP, RPP & WPP	Exchange of plunger tips (1.46/3.26/7.29/10.3)	R			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and check "Working Hour Counter".
	Operation of solenoid valve	X	R (WPP)	R (WPP)	Select [Sequence (F9)] on the "Maintenance" screen, and perform "Prime Sequence". At the time, purified water must be dispensed from the nozzles of SPT, RPT and WU. Also the alarm must not occur while performing.
	Contamination of syringes	X and O			There must not be contamination at visual check. Perform "11. Tubing System" in "Chapter 5 Cleaning" when there is contamination.
	Damage and contamination of tubing (Tubing must be exchanged every 2 years.)	X and O			

(CONT'D)

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
SPP, RPP & WPP	Function of photo couplers	X and O			The alarm must not occur in normal measurement.
	Tension and condition of timing belts (Timing belt must be exchanged every 3 years.)	X and A			There must not be damage at visual check. See "Chapter 10 Unit/Parts Replacement" for tension adjustment.
	Contamination of mechanical parts	X and O			There must not be contamination at visual check.
IRU & DTR	Contamination of mechanical parts	X and O			There must not be contamination at visual check.
	Tension and condition of timing belts (Timing belt must be exchanged every 3 years.)	X and A			There must not be damage at visual check. See "Chapter 10 Unit/Parts Replacement" for tension adjustment.
	Operating condition of whole mechanism	X			The alarm must not occur in normal measurement.
	Function of photo couplers	X and O			Select [Sequence (F9)] on the "Maintenance" screen. Execute "ALL" of the sensor test, and check it.
	Contamination of optical light path (filters and lenses)	X and O			Clean the filters and lenses with compressed air.
	Halogen lamp (It must be exchanged every 1,000 hours.)	X and R			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and check "Working Hour Counter".
	Incubator temperature (37±0.3 °C)	X			The alarm must not occur in normal measurement.
	Function of fan motor	X and O			Check the operation of fan motor visually.
	Life of the spring	150,000 times (About 3.3 years.)			

(CONT'D)

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
IRU & DTR	Cuvettes	X and R			See "3. A Cuvette Check Procedure" in "Chapter 6 Maintenance".
RCU	Operating condition of whole mechanism	X			The alarm must not occur in normal measurement.
	Contamination of mechanical parts	X and O			There must not be contamination at visual check.
	Contamination of light receiving portion of the barcode reader	X and O			Clean the light receiving portion with compressed air. The bar code must be read correctly when performing the reagent scan.
	Function and adjustment of the barcode reader	X and A			The bar code must be read correctly when performing the reagent scan.
	Function of BCR-window heater	X			
	Contamination of reagent container unit	X and O			See "4. Reagent Compartment" in "Chapter 5 Cleaning".
	Contamination of barcode reader window	X and O			
	Function of cooling function (Peltier elements) and temperature sensor	X			Select [Performance (F11)] on the "Maintenance" screen and check that the RCU temperature is in 8 °C to 15 °C.
	Function of RCU cover (lid) sensor	X			Select [Sequence (F9)] on the "Maintenance" screen, and check "RCU_COVER1". "RCU_COVER1" is displayed in yellow color when the lid is closed.
	Function of chassis fan motor (Fan motor must be exchanged every 4 or 5 years.)	X and O			

(CONT'D)

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
RCU	Function of photo couplers	X and O			The alarm must not occur in normal measurement.
	Tension and condition of timing belts (Timing belt must be exchanged every 3 years.)	X and A			There must not be damage at visual check. See "Chapter 10 Unit/Parts Replacement" for tension adjustment.
	Damage and contamination of tubing (Tubing must be exchanged every 2 years.)	X and O			There must not be damage at visual check.
SWU	Damage and contamination of tubing (Tubing must be exchanged every 2 years.)	X and O			There must not be contamination at visual check. Perform "11. Tubing System" in "Chapter 5 Cleaning" when there is contamination.
	Function of pumps (Pumps must be exchanged every 1,000 hours.)	X			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and check "Working Hour Counter".
	Contamination of external tanks	X and O			There must not be contamination at visual check.
	Water supply for the MIX1 and MIX2 troughs	X			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and perform "S.P.T" cleaning. At the time, purified water must flow out from MIX1 and MIX2 troughs.
	Water supply for the SPT trough	X			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and perform "S.P.T" cleaning. At the time, purified water must flow out from SPT trough.

(CONT'D)

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
SWU	Water supply for the RPT trough	X			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and perform "R.P.T (W)" cleaning. At the time, purified water must flow out from RPT trough.
	Water supply for the RPT C-trough	X			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and perform "R.P.T (R)" cleaning. At the time, the wash solution must flow out from RPT C-trough.
	Contamination of inline filters (Inline filters must be exchanged every 6 months.)	X (and R)			Change the inline filters for WU1 to WU7 and waste chamber.
	Contamination of mechanical parts	X and O			There must not be contamination at visual check.
WU	Damage and contamination of nozzles (Nozzles must be exchanged once a year.)	X and O			There must not be damage and contamination at visual check.
	Function of photo couplers	X and O			The alarm must not occur in normal measurement.
	Function of over flow sensors	X			The alarm must not occur in normal measurement.
	Function of spring	X			Remove the WU cover, push up the WU1 to WU8 nozzles by hand, and remove the hand from nozzles. At the time, the nozzles must return to original position.
	Tension and condition of timing belts (Timing belt must be exchanged every 3 years.)	X and A			There must not be damage at visual check. See "Chapter 10 Unit/Parts Replacement" for tension adjustment.

(CONT'D)

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
WU	Operating condition of whole mechanism	X			The alarm must not occur in normal measurement.
	Contamination of mechanical parts	X and O			There must not be contamination at visual check.
MIX1/ MIX2	Damage and contamination of stirrers	X and O			There must not be contamination at visual check. See "2. Stirrers" in "Chapter 5 Cleaning" for cleaning.
	Function of photo couplers	X and O			The alarm must not occur in normal measurement.
	Lubrication for bearings and slide plates	X			Lubricate the silicone grease.
	Operating condition of whole mechanism	X			The alarm must not occur in normal measurement.
	Contamination of mechanical parts	X and O			There must not be contamination at visual check.
ISE	Cleaning for ISE unit	X			There must not be contamination at visual check. See "7. ISE" in "Chapter 5 Cleaning" for cleaning.
	Verification of calibrants (Calibrant-A/Calibrant-B)	X (and R)			Check the remaining amount and the expiration date of Calibrant-A. The tube in the bottle must not come out of the liquid surface. Perform ISE Prime 10 times when the tube comes out from the liquid surface. Check the expiration date of the Calibrant-B for calibration.
	Verification of diluted solution and wash solution	X (and R)			Check the expiration date of the diluted solution for diluting the urine sample and the ISE wash solution.

(CONT'D)

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
ISE	Verification of pump (Pumps must be exchanged every 180 days.)	X (and R)			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and check "Working Hour Counter".
	Verification of electrode (The expiration date is 1,000 tests or 6 months.)	X (and R)			Select [Wash (F10) Page:1/2] on the "Maintenance" screen, and check "Working Hour Counter".
	ISE cleaning	X			Select [Sequence (F9)] on the "Maintenance" screen, and perform "ISE Cleaning".
Tubes	Contamination and condition of water inlet (Piping must be exchanged every 2 years.)	X and O			There must not be damage and contamination at visual check. Perform "11. Tubing System" in "Chapter 5 Cleaning" when there is contamination.
	Contamination and condition of waste tubing (Piping must be exchanged every 2 years.)	X and O			Perform "11. Tubing System" in "Chapter 5 Cleaning" when there is contamination.
Power Supply	DC voltage check : 24/12.6/12/5 VDC	X and A			
Electr-onics Parts	Circuit board connectors and fixing of all PCB's			X and O	Check the connection of the circuit board and the connectors visually. There must not be fallen contact pins from the connectors.
Others	Contamination of the dust filter at both side covers of chassis	X and O			There must not be contamination at visual check.
	Function of fan motors in the chassis	X			The fan must operate at the visual check.
	Contamination of entire instrument	X and O			Check the contamination at the visual check, and wipe the dirt with soft cloth or a paper towel.

(CONT'D)

X=Check, O=Clean, R=Replace, A=Adjust

UNIT/ PARTS	CHECK ITEM	CHECK INTERVAL (MONTHS)			REMARKS
		4	8	12	
Others	Check customer's emergency spare parts.				
	Open/Close operation of chassis cover				See "3. Check Procedures, B. Chassis Cover Check Procedures" in "Chapter 6 Maintenance" for check and adjustment.
	Final check of instrument performance (Check the reproducibility by standard sample and control sample.)	X			Check the reproducibility by control sample.

3. Check Procedures

A. Cuvette Check Procedure

The condition of the cuvettes is vitally important to obtain correct analysis results. The clinical chemistry analyzer is provided with a utility to check the cuvette condition. Perform the following procedure at least once a week.

(1) Start the analyzer program on the user-interface PC if not started yet. ([Start] -> "Program (P)" -> "analyzer" -> "analyzer")

(2) Click on the [Maintenance] tab.

(3) Click on the [Sequence (F9)] button (located at the lower edge of the dialog box).

(4) Start the "Cuvette Check" by clicking on its [Start] button. Conduct checking by responding to the message boxes displayed.

(5) When the check completes, click on the [Wash (F10)] button.

(6) Click on the [Page: 1/2] button (located at the lower-right corner) to display "Page 2/2".

(7) Select any one "Wave Length".

(8) Enter "5000" as the "Judgment Value", then click on the [Judgment] button. Wait until check results for the 45 cuvettes are displayed.

The check results are indicated by color:

COLOR	MEANING
White	Good. You may continue to use the cuvette as it is.
Yellow	The result is inferior to the above "white", however you may continue to use the cuvette. It shows that the result is over the [Judgment] value in the wavelength which was not selected at (7).
Red	No good. The cuvette may be contaminated and/or damaged (scratch etc.).

(9) Check if test result of any cuvette is displayed in red color. Write the cuvette number(s) in question down on paper.

(10) Repeat steps (7) through (9) while changing wavelength one after another in step (7).

(11) If check result has never been displayed in red color, the 45 cuvettes are all right. Check is complete, and terminate the analyzer program.

If check result has been displayed in red color for any cuvette(s) with any wavelength(s) selected, those cuvette(s) may be either contaminated or damaged. In this case proceed to step (12) to wash then recheck the cuvettes.

(12) Click on the [Sequence (F9)] button (located at the lower edge of the dialog box).

(13) Start the "Cuvette Wash" by clicking on its [Start] button. Conduct washing by responding to the message boxes displayed.

(14) Perform steps (4) through (10) again.

(15) If check result has never been displayed in red color, the 45 cuvettes are all right. When the result of "Cuvette Check" is displayed in red color again, wash the cuvette in the following procedures.

a. Dilute Wash Solution (No.10-2) with purified water.
Wash Solution (No.10-2): 0.5%.
Use a hand pipette to pipette 600 microL (per cuvette) of this 0.5% diluted wash solution and discharge it to the cuvette whose check result is displayed in red color.
b. Leave it for about 5 to 6 hours.
c. Perform "Cuvette Wash" twice. (Select [Sequence (F9)] on the "Maintenance" screen, and execute "Cuvette Wash".)
d. Perform the procedures (4) through (10) and check the condition of the cuvette.

(16) If the result is displayed in red color after the above-mentioned cleaning procedures, extract the cuvette from the IRU and dip the whole cuvette in diluted wash solution (Wash Solution (No.10-2): 0.5%) for several hours (2 to 3 hours). Then, wipe both inside and outside of the cuvette carefully with a soft paper towel. Return the cleaned cuvette to the IRU, perform procedures (1) through (10), and check the condition of the cuvette. If the result of the Cuvette check is still displayed in red color, the cuvette needs to be exchanged.

See "11. IRU (Incubation Reaction Unit)" in Chapter 10 for the means of removing cuvettes from the unit.

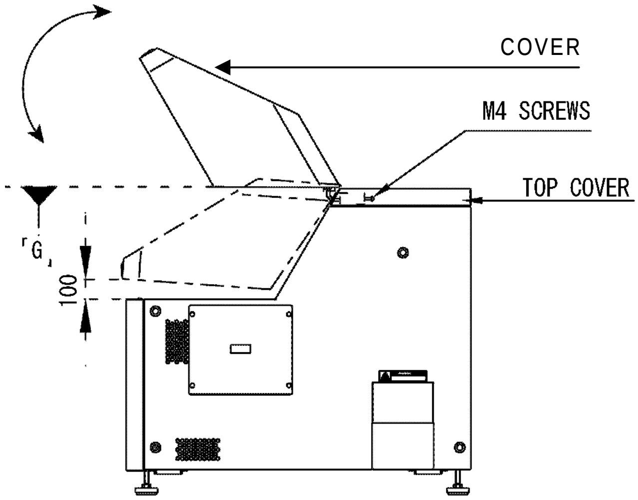
(17) Now the check is complete. Terminate the analyzer program.

B. Chassis Cover Check Procedures

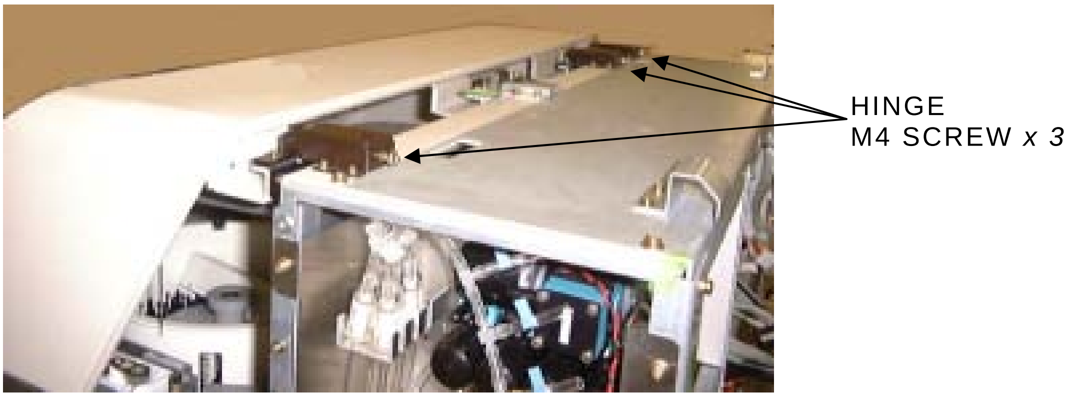
If the cover does not open or close smoothly, it is necessary to adjust its hinges. Procedures to check and adjust the cover are described below.

(1) Remove the top cover.

(2) Open the cover up to the position where the surface "G" becomes horizontal. Under this condition, make sure that the cover stays still without swinging up and down.



(3) When the cover does not stay still but swing up and/or down, adjust by tightening the M4 screws to attach the hinges (three places).



(4) Make sure that the cover will close down by itself, if it is opened up by 100 mm then released. In this case, the cover should close smoothly without large noise.

Chapter 7
Checker Programs

This chapter gives instructions to use the checker programs, which are run from the user-interface PC. These checker programs ensure the performance of some components used in the clinical chemistry analyzer.

Explanations of some items within the checker programs are omitted since they are intended for use in the factory and are not necessary for field services.

1. Motor Checker Program (chk_mot)

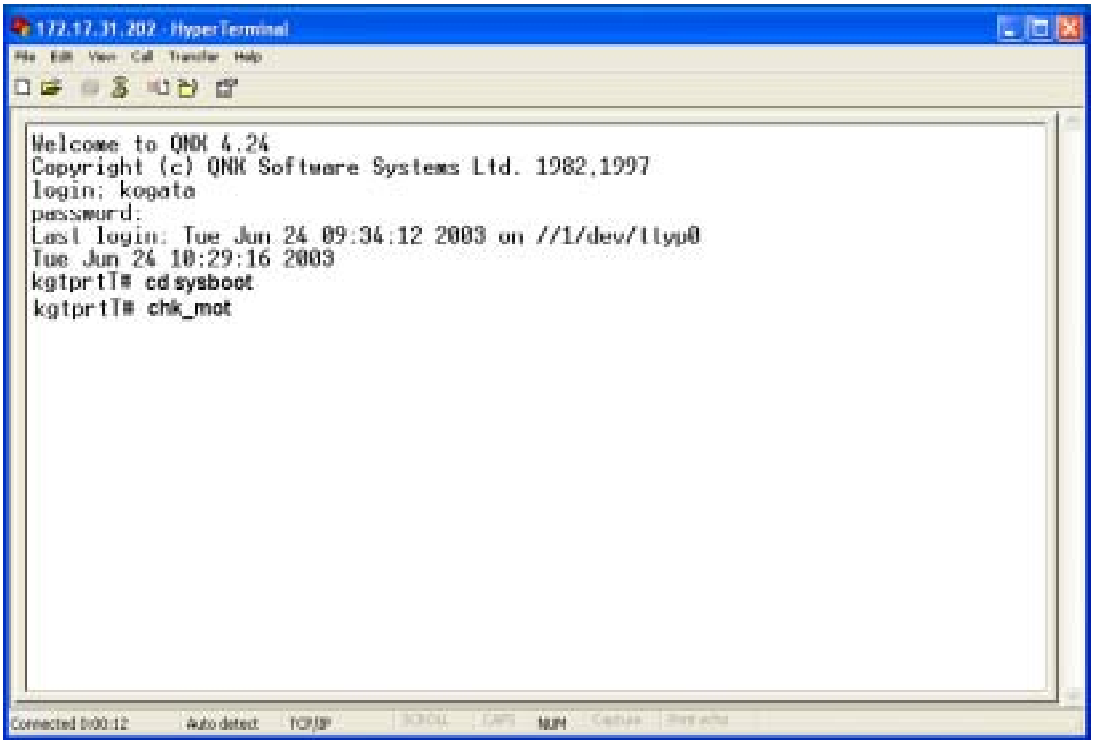
   A. Starting the checker program

      (1) After turning the power switch on, double-click on the Hyper Terminal icon to start it. At the login prompts, respond as follows:

      login: kogata
      Password: qnx

      (2) Log into the program directory "sysboot", then start the program:

      kgtprtT#: cd sysboot
      kgtprtT#: chk_mot



STARTING CHK_MOT
Figure 7-1

B. Operations within the checker program

When the checker program starts, "Motor Checker Menu" is displayed:

```
boot  : MachineType=TARGET(0)

*** Motor Checker > Start!!
motsvr: PosiMap Not Found (mt_MX1R)
motsvr: PosiMap Not Found (mt_MX2R)


// == Motor Checker Menu
 1. Information
 2. Back Home
 3. Zero Near
 4. Zero Search
 5. Mcio Move
 6. Pulse Move
 7. Map  Move
 8. Sensor
 9. Kousoku Search
 10.Posi Map
 11.Kateisoku Move
 12.Gensoku Stop
 13.Get Pulse Para
 14.Set Pulse Para
 15.Tank Check

Select No[ 1-15 or "end" ] -->
```

MOTOR CHECKER MENU
Figure 7-2

The following table summarizes the function of each menu item.

Motor Checker Menu

MENU ITEM	FUNCTION
1. Information	(DO NOT SELECT THIS ITEM.)
2. Back Home	Moves all motor to their respective zero positions. (No further operation is required. When the Back Home operation completes, the Motor Checker Menu redisplays automatically.)
3. Zero Near	(DO NOT SELECT THIS ITEM.)
4. Zero Search	Moves a desired motor to its zero position.
5. Mcio Move	Moves a desired motor by desired number of pulses.
6. Pulse Move	(DO NOT SELECT THIS ITEM.)
7. Map Move	Moves a desired motor to a desired position pre-defined within the position map.
8. Sensor	Displays status of all sensors. (No further operation is required. Soon the Motor Checker Menu redisplays automatically.)
9. Kousoku Search	(DO NOT SELECT THIS ITEM.)
10. Posi Map	As you select a motor, displays number of pulses, which are required to go to each position pre-defined within the position map.
11. Kateisoku Move	(DO NOT SELECT THIS ITEM.)
12. Gensoku Stop	(DO NOT SELECT THIS ITEM.)
13. Get Pulse Para	(DO NOT SELECT THIS ITEM.)
14. Set Pulse Para	(DO NOT SELECT THIS ITEM.)
15. Tank Check	(DO NOT SELECT THIS ITEM.)

CAUTION: DO NOT SELECT THE MENU ITEMS IN THE SHADED AREA ABOVE.

After typing a menu item number, press the [Enter] key. Operations in respective menu items are explained on the succeeding pages.

NOTE: If an invalid item number is entered, "[Select No #ERR]" is displayed.

If you want to terminate the checker program, type "end" then press the [Enter] key.

WARNING: **THE CHK_MOT PROGRAM DRIVES THE MOTORS IN "NON-SAFETY MODE" IN THAT IT DRIVES THE MOTORS FAITHFULLY AS YOU COMMAND, DISREGARDING SAFETY. FOR EXAMPLE, THE IRU MOTOR WILL ROTATE (IF COMMANDED SO) EVEN WHEN THE SPT NOZZLE STAYS IN THE IRU CUVETTE, RESULTING IN BROKEN SPT NOZZLE OR CUVETTE. FOR THIS REASON, YOU MUST BE CAREFUL WHEN DRIVING THE MOTORS. TYPICALLY TAKE CARE OF THE FOLLOWING CASES:**

- **BEFORE OPERATING IRU, RETURN ALL SPT, RPT, MIX1, MIX2 AND WU TO THEIR RESPECTIVE VERTICAL ZERO POSITIONS.**
- **BEFORE ROTATING SPT (OR RPT), RETURN IT TO ITS VERTICAL ZERO POSITION.**
- **BEFORE ROTATING ASP (OR RCU), RETURN SPT (OR RPT) TO ITS VERTICAL ZERO POSITION.**
- **DO NOT MOVE SPP, RPP OR WPP BEYOND ITS ZERO POSITION.**

(1) "4. Zero Search"

Moves a desired motor to its zero position.

```
// == Motor Checker Menu
 1. Information
 2. Back Home
 3. Zero Near
 4. Zero Search
 5. Mcio Move
 6. Pulse Move
 7. Map  Move
 8. Sensor
 9. Kousoku Search
 10.Posi Map
 11.Kateisoku Move
 12.Gensoku Stop
 13.Get Pulse Para
 14.Set Pulse Para
 15.Tank Check

Select No[ 1-15 or "end" ] --> 4

// == Zero Search
00:mt_FLT    01:mt_WU     02:mt_MX2U   03:mt_MX2R
04:mt_MX1U   05:mt_MX1R   06:mt_RPTR   07:mt_RPTU
08:mt_SPTR   09:mt_SPTU   10:mt_IRU    11:mt_ASP
12:mt_RCU    13:mt_SPP    14:mt_RPP    15:mt_WPP

Motor  Index  ==> 8
Search Mode   ==> 0
```

ZERO SEARCH
Figure 7-3

At respective prompts, enter the following parameters:

PROMPT	PARAMETR TO ENTER
Motor Index	Motor number: See Figure 7-4.
Search Mode	Origin search range mode: 0: Maximum range search (Searches up to the "Max" value defined in "4. Position Maps") 1: Near range search (Searches up to double of the "Near" value defined in "4. Position Maps")

0: FLT	1: WU	2: MIX2U	3: MIX2R
4: MIX1U	5: MIX1R	6: RPTR	7: RPTU
8: SPTR	9: SPTU	10: IRU	11: ASP
12: RCU	13: SPP	14: RPP	15: WPP

MOTOR NUMBER LIST
Figure 7-4

(2) "5. Mcio Move"

Moves a desired motor by desired number of pulses.

```
// == Motor Checker Menu
 1. Information
 2. Back Home
 3. Zero Near
 4. Zero Search
 5. Mcio Move
 6. Pulse Move
 7. Map  Move
 8. Sensor
 9. Kousoku Search
 10.Posi Map
 11.Kateisoku Move
 12.Gensoku Stop
 13.Get Pulse Para
 14.Set Pulse Para
 15.Tank Check

Select No[ 1-15 or "end" ] --> 5

// == Mcio Move
00:mt_FLT    01:mt_WU     02:mt_MX2U   03:mt_MX2R
04:mt_MX1U   05:mt_MX1R   06:mt_RPTR   07:mt_RPTU
08:mt_SPTR   09:mt_SPTU   10:mt_IRU    11:mt_ASP
12:mt_RCU    13:mt_SPP    14:mt_RPP    15:mt_WPP

Motor  Index        ==> 8
Move   Dir( 0:+,1:- )==> 0
Move   Pulse        ==> 500
PmPara Index(0-1:Teisoku,2-4:Kagen ==> 0
```

MCIO MOVE
Figure 7-5

At respective prompts, enter the following parameters:

PROMPT	PARAMETER TO ENTER
Motor Index	Motor number: See Figure 7-4.
Move Dir (0: +, 1: –)	Direction of motor rotation: 0: Gets away from the zero position. 1: Gets near to the zero position.
Move Pulse	Number of pulses: See "4. Position Maps". Do not enter the values below "Min" or above "Max" values defined in "4. Position Maps".
PmPara Index (0-1:Teisoku,2-4:Kagen	Driving Mode 0: Constant speed 1 1: Constant speed 2 2: Trapezoidal (slew-up/const/down) drive 1 3: Trapezoidal (slew-up/const/down) drive 2 4: Trapezoidal (slew-up/const/down) drive 3

(3) "7. Map Move "

Moves a desired motor to a desired position pre-defined within the position map.

```
// == Motor Checker Menu
 1. Information
 2. Back Home
 3. Zero Near
 4. Zero Search
 5. Mcio Move
 6. Pulse Move
 7. Map  Move
 8. Sensor
 9. Kousoku Search
 10.Posi Map
 11.Kateisoku Move
 12.Gensoku Stop
 13.Get Pulse Para
 14.Set Pulse Para
 15.Tank Check

Select No[ 1-15 or "end" ] --> 7

// == Mcio Move
00:mt_FLT    01:mt_WU     02:mt_MX2U   03:mt_MX2R
04:mt_MX1U   05:mt_MX1R   06:mt_RPTR   07:mt_RPTU
08:mt_SPTR   09:mt_SPTU   10:mt_IRU    11:mt_ASP
12:mt_RCU    13:mt_SPP    14:mt_RPP    15:mt_WPP

Motor  Index        ==> 8
PosMap PosName==> SPTRTRD
PosMap Offset(+) ==>0
PmPara Index(0-1:Teisoku,2-4:Kagen ==> 0
```

MAP MOVE
Figure 7-6

At respective prompts, enter the following parameters:

PROMPT	PARAMETER TO ENTER
Motor Index	Motor number: See Figure 7-4.
PosMap PosName	Position name: See "4. Position Maps". (Use uppercase letters only.)
PosMap Offset (+)	Position name offset: Always enter 0.
PmPara Index (0-1:Teisoku,2-4:Kagen	Driving Mode 0: Constant speed 1 1: Constant speed 2 2: Trapezoidal (slew-up/const/down) drive 1 3: Trapezoidal (slew-up/const/down) drive 2 4: Trapezoidal (slew-up/const/down) drive 3

(4) "8. Sensor "

Displays status of all sensors:

```
// == Motor Checker Menu
 1. Information
 2. Back Home
 3. Zero Near
 4. Zero Search
 5. Mcio Move
 6. Pulse Move
 7. Map  Move
 8. Sensor
 9. Kousoku Search
 10.Posi Map
 11.Kateisoku Move
 12.Gensoku Stop
 13.Get Pulse Para
 14.Set Pulse Para
 15.Tank Check

Select No[ 1-15 or "end" ] --> 8

// == Sensor

// MC-I/O(1)
00:IRU_ZERO    =1  01:IRU_READY  =1  02:FLT_ZERO    =0  03:WU_ZERO     =1
04:WU_OVER     =0  05:MIX1U_ZERO  =0  06:MIX2U_ZERO  =0  07:SPTR_ZERO  =1
08:SPTR_TS     =1  09:SPTU_ZERO  =1  10:SPTU_DL     =0  11:SPTU_LL     =0
12:SPT_LOW     =0  13:RPTR_ZERO  =0  14:RPTR_TS     =1  15:RPTU_ZERO  =0
16:RPTU_DL     =0  17:RPTU_LL    =0  18:RPT_LOW     =0  19:TRF_OVER    =0
20:IRU_24VM    =1  21:PP_24VM    =1  22:SWU_24VM    =1  23:BOT6_EMP    =0
24:WPP_ZERO    =0  25:SPP_ZERO   =1  26:RPP_ZERO    =0  27:BOT1_EMP    =0
28:BOT2_EMP    =0  29:BOT3_EMP   =0  30:BOT4_FULL   =0  31:BOT5_FULL   =0
32:ASP_ZERO    =1  33:RCU_ZERO   =1  34:ASPRCU_24VM =1  35:ASPRCU_24V1 =1
36:ASPRCU_24V2 =1  37:CNT_YOBI1  =1  38:CNT_YOBI2   =1  39:CNT_YOBI3   =1
40:CNT_YOBI4   =0  41:CNT_YOBI5  =0  42:RCU_COVER1  =1
43:RCU_COVER2  =1
```

SENSOR
Figure 7-7

Sensor status is coded as follows:
0= Sensor OFF
1= Sensor ON.

The following table shows sensor names for each sensor number:

00:	Zero Pos (IRU)	01:	Ready Pos (IRU)	02:	Zero Pos (DTR)	03:	Up Zero Pos (WU)
04:	Overflow (WU)	05:	Zero Pos (MIX1)	06:	Zero Pos (MIX2)	07:	Cuvette Zero Pos (SPT)
08:	T/S Pos (SPT)	09:	Up Zero Pos (SPT)	10:	Down Limit (SPT)	11:	Liquid Level (SPT)
12:	Not used	13:	Cuvette Zero Pos (RPT)	14:	T/S Pos (RPT)	15:	Up Zero Pos (RPT)
16:	Down Limit (RPT)	17:	Liquid Level (RPT)	18:	Not used	19:	Overflow (Waste Chamber)
20:	IRU 24 V	21:	PP 24 V	22:	SWU 24 V	23:	Wash solution 3 empty
24:	Up Zero Pos (WPP)	25:	Up Zero Pos (SPP)	26:	Up Zero Pos (RPP)	27:	Purified water empty
28:	Wash solution 1 empty	29:	Wash solution 2 empty	30:	Waste liquid 1 full	31:	Waste liquid 2 full
32:	Zero Pos (ASP)	33:	Zero Pos (RCU)	34:	ASP/RCU 24	35:	RCU 24V (1) (Peltier Element)
36:	RCU 24 V (2) (Peltier Element)	37:	CNT aux. (Not implemented)	38:	CNT aux. (Not implemented)	39:	CNT aux. (Not implemented)
40:	CNT aux. (Not implemented)	41:	CNT aux. (Not implemented)	42:	RCU Cover (Lid)	43:	ASP Cover (Lid)

NOTE: For sensor details, see "Appendix F Sensor List".

(5) "10. Posi Map"

At the "Motor Index ==> " prompt, enter a motor number given in Figure 7-4. Then the check program displays number of pulses required to go to each pre-defined position within the position map. See the following example.

For pre-defined positions, see "4. Position Maps".

```
// == Motor Checker Menu
 1. Information
 2. Back Home
 3. Zero Near
 4. Zero Search
 5. Mcio Move
 6. Pulse Move
 7. Map  Move
 8. Sensor
 9. Kousoku Search
 10.Posi Map
 11.Kateisoku Move
 12.Gensoku Stop
 13.Get Pulse Para
 14.Set Pulse Para
 15.Tank Check

Select No[ 1-15 or "end" ] --> 10

// == Posi Map
00:mt_FLT    01:mt_WU     02:mt_MX2U   03:mt_MX2R
04:mt_MX1U   05:mt_MX1R   06:mt_RPTR   07:mt_RPTU
08:mt_SPTR   09:mt_SPTU   10:mt_IRU    11:mt_ASP
12:mt_RCU    13:mt_SPP    14:mt_RPP    15:mt_WPP

Motor Index     ==> 8

// mt_SPTR
00: ZERO           0
01: SPTRTRD        98
02: SPTRTRR        123
03: SPTRASPOUT     213
04: SPTRASPIN      283
05: SPTRISE        612
06: MAX            665
```

POSI MAP
Figure 7-8

(6) "2. Back Home"

Moves all units to respective zero positions, but exceptionally the units where the sensor status is ON do not move.

2. D-I/O Checker Program (chk_dio)

This program allows you to control various devices in the internal units by switching internal (D-I/O) signal outputs between logical ONE and ZERO manually.

A. Starting the checker program

(1) After turning the power switch on, double-click on the Hyper Terminal icon to start it. At the login prompts, respond as follows:

login: kogata
Password: qnx

(2) Log into the program directory "sysboot", then start the program:

kgtprtT#: cd sysboot
kgtprtT#: chk_dio

Soon the D-I/O Checker Menu" displays:

```
Copyright (c) QNX Software Systems Ltd. 1982,1997
login: kogata
password:
Last login: Mon Nov 26 19:53:59 2001 on //1/dev/ttyp0
Mon Nov 26 20:02:49 2001
kgtprtT# cd sysboot
kgtprtT# chk_dio

Starting....  Kogata Bunseki(Off-Line)

boot   : MachineType=TARGET(0)
motsvr: PosiMap Not Found (mt_MX1R)
motsvr: PosiMap Not Found (mt_MX2R)

*** D-I/O Checker > Start!!


diosvr:PioClear()
// == D-I/O Checker Menu
1. Port Out
2. HeaterOn
3. Temp Read
4. RcuPer On

Select No[ 1-4 or "end" ] -->
```

D-I/O CHECKER MENU
Figure 7-9

B. Operation within the checker program

The following table summarizes the function of each menu item.

D-I/O Checker Menu

MENU ITEM	FUNCTION
1. Port Out	Sets a desired D-I/O output port to ON/OFF.
2. HeaterOn	(DO NOT SELECT THIS ITEM.)
3. Temp Read	(DO NOT SELECT THIS ITEM.)
4. RcuPer On	(DO NOT SELECT THIS ITEM.)

CAUTION: DO NOT SELECT THE MENU ITEMS IN THE SHADED AREA ABOVE.

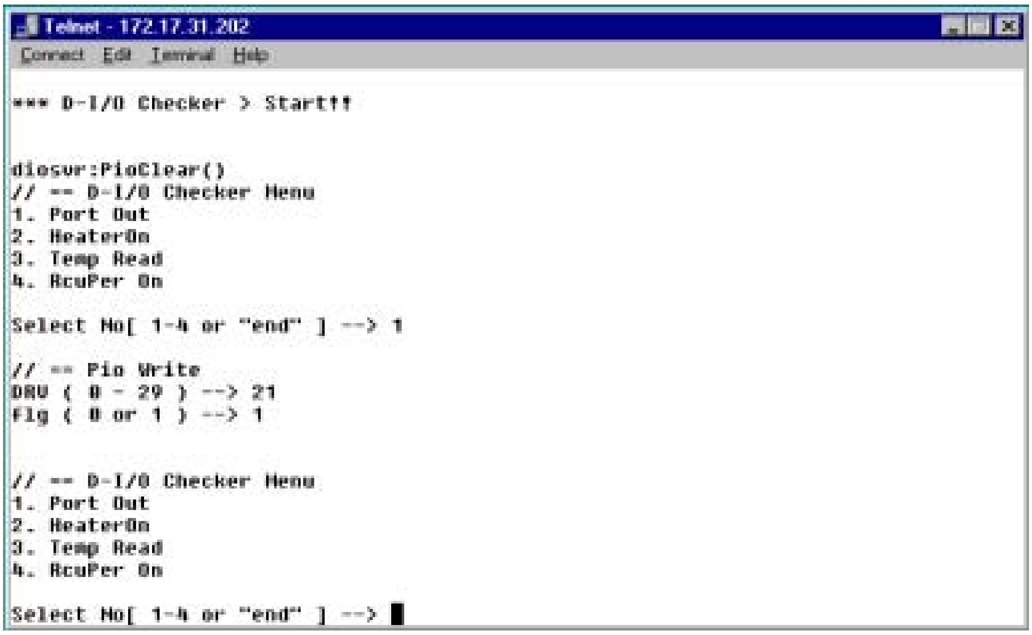
Type a menu item number and press the [Enter] key. Operations in respective menu items are explained on the succeeding pages.

NOTE: If an invalid item number is entered, "[Select No #ERR]" is displayed.

If you want to terminate the checker program, type "end" then press the [Enter] key.

(1) "1. Port Out"

Sets a desired D-I/O output port to ON/OFF.



PORT OUT
Figure 7-10

At respective prompts, enter the following parameters:

PROMPT	PARAMETER TO ENTER
DRV (0 – 29)	Port number: 0 Solenoid valve WPP-EV1 (for WU1 nozzle) 1 Solenoid valve WPP-EV2 (for WU3 nozzle) 2 Solenoid valve WPP-EV3 (for WU1 nozzle) 3 Solenoid valve WPP-EV4 (for WU3 nozzle) 4 Solenoid valve WPP-EV5 (for WU2 and WU4 nozzles) 5 Solenoid valve WPP-EV6 (for WU5 and WU6 nozzles) <u>6 Purified-water supply pump for SPT trough</u> 7 Spare 6 (IRU) 8 Drain pump for WU1 9 Drain pump for WU2 10 Drain pump for WU3 11 Drain pump for WU4 12 Drain pump for WU5 13 Drain pump for WU6 14 Drain pump for WU7 <u>15 Purified-water supply pump for RPT trough "D"</u> (For the water inlet on the side of the drain outlet within the RPT trough) <u>16 Purified-water supply pump for RPT trough "R"</u> (For the water inlet on the RPT trough bottom) 17 Drain pump for WU8 <u>18 Wash-solution supply pump for RPT trough "C"</u> (For the wash-solution inlet on the RPT trough bottom) <u>19 Water supply pump for MIX1 trough</u> <u>20 Water supply pump for MIX2 trough</u> <u>21 Drain pump for Waste Chamber</u> 22 Solenoid valve SPP-EV 23 Solenoid valve RPP-EV 24 Not used 25 Not used 26 Not used 27 Not used 28 Not used 29 Demist heater for BCR window (RCU)
flg (0 or 1)	Output level 1: ON (Energize) 0: OFF.

<u>CAUTION</u>:DRIVE A PUMP (OR PUMPS) OF PORT NUMBERS 6, 15, 16, 18, 19 AND/OR 20 (UNDERLINED PART) AFTER STARTING TO DRIVE THE DRAIN PUMP FOR WASTE CHAMBER OF PORT NUMBER 21.

3. Absorbance Checker Program (chk_abs)

A. General

This program allows you to adjust the offset voltage or check the DTR function.

B. Starting the checker program

(1) After turning the power switch on, double-click on the Hyper Terminal icon to start it. At the login prompts, respond as follows:

```
login:     kogata
Password: qnx
```

(2) Log into the program directory "sysboot", then start the program:

```
kgtprtT#:  cd sysboot
kgtprtT#:  chk_dio
```

When the checker program starts, "Absorbance Checker Menu" is displayed:

```
Starting....Kogata Bunseki (Off-Line)

boot:          MachineType=TARGET(0)
motsvr:        PosiMap Not Found (mt_MX1R)
motsvr:        PosiMap Not Found (mt_MX2R)

//== Absorbance Checker
0. SubCPU Check
1. FLT BackHome              ; Back to the home position
2. FLT AutoMove              ; Turning the FLT
3. FLT Stop                  ; Stopping the FLT
4. Gain Set
5. Gain Set (All)
6. Lamp Set                  ;ON and OFF for Halogen lamp
7. Measure                   ;Photometric measurement

Select No[1-8 or "end"] →_
```

STARTING CHK_ABS
Figure 7-11

4. Position Maps

A. General

This subsection lists position-map files stored in the “\home\kogata\sysboot\pmap” folder within the Clinical Chemistry Analyzer.

NOTE: If you want, you may copy (down-load) all the position-map files from the analyzer to PC as explained in "5. B. Changing Position Map" (Chapter 12). Because the map-position files are plain text files, you may read them by using Notepad, etc. Never modify the position-map files stored in the Clinical Chemistry Analyzer unless instructed to do so by us.

For each position-map file, the following information is given:
- "GENERAL INFORMATION"
- "DUMP LIST OF MAP FILE".

GENERAL INFORMATION includes the following items.

GENERAL INFORMATION

ITEM	WHAT THIS ITEM INDICATES
Trip Rate (or Rotation Rate)	This value indicates how much (mm or degree) the up-down (or rotary) mechanism moves when a single pulse is fed to the stepping motor.
Add Pulses	In the initialization the motor is driven as follows: 1 Motor is driven until the zero position is detected. Motor driving stops as soon as the zero position is detected. 2 Next, the number of pulses indicated by “Add Pulses” is additionally fed to the motor so that the motor may enter the zero position sufficiently.

A dump list looks like this, and explanations on respective items follow.

DUMP LIST OF: mt_WU.txt

```
Min     0
Max     808
Near    80
Size    4
1 [WUUP2]      240    // 22 mm above the cuvette bottom
2 [WUUSP1]     340    // 17 mm above the cuvette bottom
3 [WUUSP2]     620    // 3 mm above the cuvette bottom
4 [WUUDL]      700    // 1 mm below the cuvette bottom
```

ITEM	WHAT THIS ITEM INDICATES
Min	Minimum pulse number. Do not give a pulse number less than this value.
Max	Maximum pulse number. Do not give a pulse number greater than this value.
Near	Number of pulses to leave zero position in initialization
Size	This number merely tells how many position names (see below) are available.
[Position Name]	A position name is enclosed within brackets [ ]. "[" or "]" is not a part of position name. The value that follows the position name is a number of pulses required for the motor to go from its zero position to the named position. The text line led by "//" is a comment explaining the position. The comment is not contained in the file but added for this publishing only. <u>NOTE</u>: Position names are not always available. Some position map files do not have position names.

B. ASP Motor

GENERAL INFORMATION

Rotation Rate:	0.045 deg/pulse
Add Pulses:	8 pulses

DUMP LIST OF: mt_ASP.txt

Min	0
Max	8143
Near	108
Size	0

C. FLT Motor

GENERAL INFORMATION

Rotation Rate:	0.90 deg/pulse
Add Pulses:	2 pulses

DUMP LIST OF: mt_FLT.txt

Min	0
Max	4156
Near	15
Size	0

D. IRU Motor

GENERAL INFORMATION

Rotation Rate:	0.064 deg/pulse
Add Pulses:	8 pulses

DUMP LIST OF: mt_IRU.txt

Min	0
Max	5781
Near	110
Size	0

E. MIX1 Motor

GENERAL INFORMATION

Rotation Rate:	0.45 deg/pulse
Add Pulses:	1 pulse

DUMP LIST OF: mt_MX1U.txt

```
Min     0
Max     596
Near    20
Size    7
1 [MIX1TR0]       34   // The middle level for washing in the MIX1 trough
                       // ( 10.0 mm above the trough bottom )
2 [MIX1TR1]       85   // The top level for washing in the MIX1 trough
                       // ( 22.5 mm above the trough bottom )
3 [MIX1TR]        85   // The top level for washing in the MIX1 trough
                       // ( 22.5 mm above the trough bottom )
4 [MIX1HALF]     186   // The level at the half-way position between MIX1 trough
                       and cuvette
5 [MIX1CELL]     425   // The cuvette-mouth level in IRU
6 [MIX1PULL]     551   // 11.5 mm above the cuvette bottom in IRU
7 [MIX1IRU]      594   // 0.5 mm above the cuvette bottom in IRU
```

F. MIX2 Motor

GENERAL INFORMATION

Rotation Rate:	0.45 deg/pulse
Add Pulses:	1 pulse

DUMP LIST OF: mt_MX2U.txt

```
Min     0
Max     596
Near    20
Size    7
1 [MIX2TR0]       34   // The middle level for washing in the MIX2 trough
                       // ( 10.0 mm above the trough bottom )
2 [MIX2TR1]       85   // The top level for washing in the MIX2 trough
                       // ( 22.5 mm above the trough bottom )
3 [MIX2TR]        85   // The top level for washing in the MIX2 trough
                       // ( 22.5 mm above the trough bottom )
4 [MIX2HALF]     186   // The level at the half-way position between MIX2 trough
                       and cuvette
5 [MIX2CELL]     425   // Cuvette-mouth level in IRU
6 [MIX2PULL]     551   // 11.5 mm above the cuvette bottom in IRU
7 [MIX2IRU]      594   // 0.5 mm above the cuvette bottom in IRU
```

G. RCU Motor

GENERAL INFORMATION

Rotation Rate:	0.045 deg/pulse
Add Pulses:	8 pulses

DUMP LIST OF: mt_RCU.txt

Min	0
Max	8143
Near	108
Size	0

H. RPP Motor

GENERAL INFORMATION

Trip Rate:	0.05 mm/pulse
Add Pulses:	4 pulses

DUMP LIST OF: mt_RPP.txt

Min	0
Max	1060
Near	60
Size	0

I. RPTR Motor

GENERAL INFORMATION

Rotation Rate:	0.18 deg/pulse
Add Pulses:	8 pulses

DUMP LIST OF: mt_RPTR.txt

```
Min     0
Max     684
Near    38
Size    5
1 [RPTRTRD]       240    // RPT (drain) trough
2 [RPTRTRR]       270    // RPT (water) trough
3 [RPTRTRC]       295    // RPT (rinse) trough
4 [RPTRRCUOUT]    504    // Pipetting spot for outer bottles in RCU
5 [RPTRRCUIN]     582    // Pipetting spot for inner bottles in RCU
```

J. RPTU Motor

GENERAL INFORMATION

Trip Rate:	0.025 mm/pulse
Add Pulses:	8 pulses

DUMP LIST OF: mt_RPTU.txt

Min	0		
Max	4600		
Near	160		
Size	5		
1 [RPTUDMYU]		520	// The level to dispense reagent dummy in the RPT (drain) trough
2 [RPTUTRDU]		720	// The level to dispense wash solution in the RPT (drain) trough
3 [RPTUTRRU]		400	// The level to pipette wash solution in the RPT (rinse) trough
4 [RPTUIRUD]		1520	// Cuvette-bottom level in IRU
5 [RPTURCUD]		4570	// Bottle-bottom level in RCU

K. SPP Motor

GENERAL INFORMATION

Trip Rate:	0.05 mm/pulse
Add Pulses:	4 pulses

DUMP LIST OF: mt_SPP.txt

Min	0
Max	980
Near	60
Size	0

L. SPTR Motor

GENERAL INFORMATION

Rotation Rate:	0.18 deg/pulse
Add Pulses:	8 pulses

DUMP LIST OF: mt_SPTR.txt

```
Min     0
Max     665
Near    38
Size    5
1 [SPTRTRD]        98   // Drain outlet within SPT trough
2 [SPTRTRR]       123   // Water inlet within SPT trough
3 [SPTRASPOUT]    213   // Pipetting spot for outer tubes in ASP
4 [SPTRASPIN]     283   // Pipetting spot for inner tubes in ASP
5 [SPTRISE]       612   // Dispensing spot in ISE
```

M. SPTU Motor

GENERAL INFORMATION

Trip Rate:	0.025 mm/pulse
Add Pulses:	8 pulses

DUMP LIST OF: mt_SPTU.txt

```
Min     0
Max     4600
Near    160
Size    6
1 [SPTUTRD2]     680   // The level to wash nozzle in SPT (drain) trough
2 [SPTUTRDU]     780   // The level to dispense sample dummy in the SPT (drain)
                          trough
3 [SPTUTRD1]    1100   // The level to dispense ISE sample dummy in the SPT
                          (drain) trough
4 [SPTUISEU]    1120   // The level to dispense sample in ISE
5 [SPTUIRUD]    1600   // Cuvette-bottom level in IRU
6 [SPTUASPD]    4500   // Tube-bottom level in ASP
```

N. WPP Motor

GENERAL INFORMATION

Trip Rate:	0.05 mm/pulse
Add Pulses:	4 pulses

DUMP LIST OF: mt_WPP.txt

Min	0	
Max	460	
Near	40	
Size	8	
1 [WUPRESID]	5	// Plungers are lowered down to this point to absorb air after dispensing purified water or wash solution.
2 [WUPWASH1]	98	// Plungers are lowered down to this point to absorb 190 µl of wash solution. (First)
3 [WUPTEI1]	391	// Plungers are lowered down to this point to absorb 600 µl of wash solution for volume examination.
4 [WUPWASH2]	298	// Plungers are lowered down to this point to absorb 410 µl of purified water or wash solution. (Second)
5 [WUPTEI2]	440	// Plungers are lowered down to this point to absorb 700 µl of purified water for volume examination.
6 [WUPPRIM]	347	// Plungers are lowered down to this point for absorption in prime operation
7 [WUPWASH]	391	// Not used
8 [WUPPURE]	440	// Plungers are lowered down to this point to absorb 290 µl of purified water.

O. WU Motor

GENERAL INFORMATION

Trip Rate:	0.05 mm/pulse
Add Pulses:	8 pulses

DUMP LIST OF: mt_WU.txt

Min	0	
Max	808	
Near	80	
Size	4	
1 [WUUP2]	240	// 22 mm above the cuvette bottom
2 [WUUSP1]	340	// 17 mm above the cuvette bottom
3 [WUUSP2]	620	// 3 mm above the cuvette bottom
4 [WUUDL]	700	// 1 mm below the cuvette bottom

+

Chapter 8
Troubleshooting

1. Troubleshooting by Error Messages

This subsection lists all ERROR MESSAGEs that the Clinical Chemistry Analyzer displays, and the "SUSPECT:" column indicates possible faulty sections for respective errors. First take the actions given in the "CHECK:" column. Unless this solves your problem, then replace the parts raised in the same column (CHECK).

Block: RPTR (RPT Rotary Block)

E0102
to E0104

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0102	RPT rotation from origin; RPTR origin sensor (RPTR_ZERO) is on after rotation. Note; It means that RPT cannot return to its rotational origin.	Emergency Stop	Initialization	The nozzle position is out of its movable range on the IRU side.	Manually move the nozzle into its movable range, then perform the initialization again.
				Rotary driving section.	Check the RPTR motor for slackness of belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
E0103	RPT rotation to origin; RPTR origin sensor (RPTR_ZERO) is on before rotation. Note; There is no guarantee that RPT can return to its rotational origin.	Emergency Stop	Analysis Maintenance	The nozzle position is out of its movable range on the IRU side.	Manually move the nozzle into its movable range, then perform the initialization again.
				Rotary driving section.	Check the RPTR motor for slackness of belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
E0104	RPT rotation to origin; RPTR origin sensor (RPTR_ZERO) is off after rotation. Note; It means that RPT cannot return to its rotational origin.	Emergency Stop	Initialization	The nozzle position is out of its movable range on the RCU side.	Manually move the nozzle into its movable range, then perform the initialization again.
				Rotary driving section.	Check the RPTR motor for slackness of belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
				RPTR origin sensor.	Check the followings for poor contact of connector, etc: - RPTR origin sensor - SEN_CN board - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: RPTR (RPT Rotary Block)

E0106
to E0156

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0106	RPT rotation from origin; RPTU origin sensor (RPTU_ZERO) is off before rotation. Note; It means that, when RPT rotates from IRU, the RPT nozzle is in the cuvette (lowered position). (RPT is not at its vertical origin.)	Emergency Stop	Analysis Maintenance	The nozzle position is out of its lower limit.	Manually move the nozzle to the correct position, then perform the initialization again.
				The nozzle is not able to return to its zero position due to external force.	Check the cause of blocking movement for RPT nozzle. Manually move the nozzle to the correct position, then perform the initialization again.
				Up-down driving mechanism.	Check the RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: -IRU_DRV board -IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor - SEN_CN - IRU_CN1 board - IRU_CNT board.
E0156	RPT rotation from origin: RPTU origin sensor (RPTU_ZERO) must be on before rotation but not. Note; It means that, when RPT rotates from trough or RCU, the RPT nozzle is in its lowered position. (RPT is not at its vertical origin.)	Sampling stop	Analysis (At RPT trough or RCU)	Nozzle is not able to return to its zero position due to external force.	Check the cause of blocking movement for RPT nozzle. Manually move the nozzle to the correct position, then perform the initialization again.
				Up-down driving mechanism.	Check the RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: -IRU_DRV board -IRU_CNT board.
				Up zero-position sensor. (RPTU_ZERO)	Check the followings for poor contact of connector, etc: - RPTU_ZERO sensor - SEN_CN - IRU_CN1 board - IRU_CNT board.

Block: RPTU (RPT Up-down Block)

E0201
to E0203

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0201	RPT descend from origin; RPTU origin sensor (RPTU_ZERO) is off before descend. Note; In normal operation, the origin sensor must be on.	Emergency Stop	Analysis	Up-down driving section.	Check the RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up-zero position sensor (RPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0202	RPT descend from origin; RPTU origin sensor (RPTU_ZERO) is on after descend. Note; In normal operation, the origin sensor must be off.	Emergency Stop	Initialization	The nozzle position is out of its upper limit.	Manually move the nozzle into its movable range, then perform the initialization again.
				Up-down driving section.	Check the RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc. - Up zero-position sensor (RPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0203	RPT ascend to origin; RPTU origin sensor (RPTU_ZERO) is on before ascend. Note; In normal operation, the origin sensor must be off.	Emergency Stop	Analysis Maintenance	The nozzle position is out of its upper limit.	Manually move the nozzle into its movable range, then perform the initialization again.
				Up-down driving section.	Check the RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (RPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: RPTU (RPT Up-down Block)

E0204
to E0206

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0204	RPT ascend to origin; RPTU origin sensor (RPTU_ZERO) is off after ascend.	Emergency Stop	Initialization	The nozzle position is out of its lower limit.	Perform the initialization again.
				The nozzle is not able to return to its zero position due to external force.	Check that the RPT is correctly moved to the upper position by hand, then perform the initialization again.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (RPTU_ZERO) is - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0205	RPT ascend/descend at off-origin; RPTU origin sensor (RPTU_ZERO) is on before ascend/descend.	Emergency Stop	Analysis Maintenance	The nozzle position is out of its upper limit.	Manually move the nozzle into its movable range, then perform the initialization again.
				Up-down driving section.	Check the RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (RPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0206	RPT descend at IRU; IRU safety sensor (IRU_READY) is off. Note; In the normal case, IRU safety sensor must be on.	Emergency Stop	Analysis Maintenance	Positional relation of IRU and RPT.	Check the RPT position whether RPT nozzle is correctly moved up/down at IRU.
				IRU driving section.	Check the IRU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
				IRU ready-position sensor.	Check the followings for poor contact of connector, etc: - IRU Ready-position sensor (IRU_READY) - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: RPTU (RPT Up-down Block)

E0207
to E0255

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0207	RPT ascend/descend; RPT safety sensor (RPTR_TS) is off.	Sampling stop	Analysis Maintenance	RPT nozzle state at RCU or RPT trough.	Check the RPT position whether RPT nozzle is correctly moved up/down at bottle position of RCU and RPT trough.
				RPTU driving section.	Check the RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
				RPT ready-position sensor.	Check the followings for poor contact of connector, etc: - RPT Ready-position sensor (RPTR_TS) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0251	RPTU descend from origin; RPTU origin sensor (RPTU_ZERO) is off. Note; In the normal case, RPTU origin sensor must be on.	Sampling stop	Analysis (At RPT trough or RCU)	RPTU driving section.	Check RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc.
E0253	RPTU ascend from origin; RPTU origin sensor (RPTU_ZERO) is on before ascend. (Trough or RCU position) Note; In the normal case, RPTU origin sensor must be off.	Sampling stop	Analysis (At RPT trough or RCU)	RPTU driving section.	Check RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc.
E0255	RPT ascend/descend at off-origin; RPTU origin sensor (RPTU_ZERO) must be off before ascend/descend but not. (Trough or RCU position)	Sampling stop	Analysis (At RPT trough or RCU)	RPTU driving section.	Check RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc.

(CONT'D)

Block: RPTU (RPT Up-down Block)

E0257
to E0276

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0257	RPT ascend/descend; RPT safety sensor (RPTR_TS) is off. (RCU position)	Sampling stop	Analysis Maintenance	RPT nozzle state at RCU or RPT trough.	Check the RPT position whether RPT nozzle is correctly moved up/down at bottle position of RCU and RPT trough.
				RPTU driving section.	Check the RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: IRU_DRV board IRU_CNT board.
				RPT ready-position sensor.	Check the followings for poor contact of connector, etc: - RPT Ready-position sensor (RPTR_TS) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0275	RPT liquid level detection at RCU; Down sensor (RPTU_DL) is on after descend.	Operation continued. (Only warning)	Analysis	Reagent is shorted.	Supply reagent.
				Down limit sensor.	Check the followings for poor contact of connector, etc: - Down limit sensor (RPTU_DL) - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.
				RCU driving section.	Check the RCU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - ASP/RCU_DRV board - Control Unit.
				RPTU driving section.	Check RPTU motor for slackness of its belt/pulleys or poor contact of connector, etc.
E0276	RPT liquid level detection at RCU; Liquid level not detected. Note; The nozzle descended to the bottom of reagent bottle (the maximum descent amount for liquid level detection) without detecting the liquid level.	Operation continued. (Only warning)	Analysis	Reagent is shorted.	Supply reagent.
				Liquid level sensor.	Check the followings for poor contact of connector, etc: - Liquid level sensor - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.
				RCU driving section.	Check the RCU motor for slackness of its belt/pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - ASP/RCU_DRV board - Control Unit.

(CONT'D)

Block: RPTU (RPT Up-down Block)

E0278
to E0280

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0278	RPT liquid level detection at RCU; Liquid hardware abnormal. Note; The RPT nozzle stopped without arriving at the bottom of reagent bottle. However, the liquid level is not detected.	Operation continued. (Only warning)	Analysis	Reagent bottle.	Check that reagent inside of bottle has not bubble.
				Liquid level sensor.	Check the followings for poor contact of connector, etc: - Liquid level sensor - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0279	RPT liquid level not detected at verification. Note; After RPT detected the liquid level and performed Pipetting, it has not detected the liquid level.	Operation continued.	Analysis	Reagent bottle.	Check that reagent inside of bottle has not bubble.
				ıid level sensor.	Check the followings for poor contact of connector, etc: - Liquid level sensor - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0280	Not enough wash solution for RPT special wash.	Continued operation. (Only warning)	Maintenance	Detergent short	Check residual quantity of the detergent which is registered to use for maintenance.

Block: RPP

E0301
to E0302

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0302	RPP aspiration from origin; RPP origin sensor (RPP_ZERO) is on after aspiration.	Emergency Stop	Initialization	RPP driving section.	Check the RPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				RPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPP up zero-position sensor (RPP_ZERO) - PP_DRV board - IRU_CNT board.
				Light-interrupting plate for the up zero-position sensor (photo-interruptor) is fixed too high.	Lower the fixing position, then perform the initialization again.
E0303	RPP dispensation to origin; RPP origin sensor (RPP_ZERO) is on before dispensation.		Analysis Maintenance	RPP driving section.	Check the RPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				RPP fluidics system	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPP up zero-position sensor (RPP_ZERO) - PP_DRV board - IRU_CNT board.

(CONT'D)

Block: RPP

E0303
to E0304

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0304	RPP dispensation to origin; RPP origin sensor (RPP_ZERO) is off after dispensation.	Emergency Stop	Initialization	RPP driving section.	Check the RPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				RPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPP up zero-position sensor (RPP_ZERO) - PP_DRV board - IRU_CNT board.
E0305	RPP dispensation/aspiration at off-origin; RPP origin sensor (RPP_ZERO) is on before movement		Analysis Maintenance	RPP driving section.	Check the RPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				RPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPP up zero-position sensor (RPP_ZERO) - PP_DRV board - IRU_CNT board.

(CONT'D)

Block: RPP

E0351
to E0353

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0351	RPP aspiration from origin; RPP origin sensor (RPP_ZERO) is off before aspiration. Note; Since it occurred in the trough or RCU, sampling stops.	Sampling stop	Analysis (At RPT trough or RCU)	RPP driving section.	Check the RPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				RPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPP up zero-position sensor (RPP_ZERO) - PP_DRV board - IRU_CNT board.
E0353	RPP dispensation to origin; RPP origin sensor (RPP_ZERO) is on before dispensation. Note; Since it occurred in the trough or RCU, sampling stops.	Sampling stop	Analysis (At RPT trough or RCU)	RPP driving section.	Check the RPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				RPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPP up zero-position sensor (RPP_ZERO) - PP_DRV board - IRU_CNT board.

(CONT'D)

Block: RPP

E0355

E0355	RPP dispensation/aspiration at off-origin; RPP origin sensor (RPP_ZERO) is on before movement.	Emergency Stop	Analysis Maintenance	RPP driving section.	Check the RPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				RPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPP up zero-position sensor (RPP_ZERO) - PP_DRV board - IRU_CNT board.

Block: SPTR (SPT Rotary Block)

E0402
to E0404

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0402	SPT rotation from origin; SPTR origin sensor (SPTR_ZERO) is on after rotation. Note; SPTR zero position sensor must be off.	Emergency Stop	Initialization	The nozzle position is out of its movable range on the IRU side.	Manually move the nozzle into its movable range, then perform the initialization again.
				SPTR driving section.	Check the SPTR motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
E0403	SPT rotation to origin; SPTR origin sensor (SPTR_ZERO) is on before rotation. Note; SPTR zero position sensor must be off.	Emergency Stop	Analysis Maintenance	The nozzle position is out of its movable range on the IRU side.	Manually move the nozzle into its movable range, then perform the initialization again.
				SPTR driving section.	Check the SPTR motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
E0404	SPT rotation to origin; SPTR origin sensor (SPTR_ZERO) is off after rotation. Note; SPTR zero position sensor must be on.	Emergency Stop	Initialization	The nozzle position is out of its movable range on the RCU side.	Manually move the nozzle into its movable range, then perform the initialization again.
				SPTR driving section.	Check the SPTR motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				SPTR zero-position sensor.	Check the followings for poor contact of connector, etc: - SPTR-zero position sensor (SPTR_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: SPTR (SPT Rotary Block)

E0406
to E0456

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0406	SPT rotation; SPTU origin sensor (SPTU_ZERO) is off before rotation. Note; The sensor of SPT vertical driving section must be on. It means that, when SPT rotates, the SPT nozzle is lowered.	Emergency Stop	Analysis Maintenance	The nozzle position is out of its lower limit.	Perform the initialization again.
				The nozzle can not return to its zero position due to external force.	Perform the initialization again.
				SPTR driving section.	Check the SPTR motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				SPTU zero-position sensor.	Check the followings for poor contact of connector, etc: - SPTU zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0456	SPT rotation; SPTU origin sensor (SPTU_ZERO) should be on before SPTR rotation but not. (Trough or ASP position) Note; The sensor of SPT vertical driving section must be on. It means that, when SPT starts rotation, the SPT nozzle is lowered. Since the nozzle is in the trough or ASP, sampling stops.	Sampling stop	Analysis (At SPT trough or ASP)	SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.

Block: SPTU (SPT Up-down Block)

E0501
to E0503

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0501	SPT descend from origin; SPTU origin sensor (SPTU_ZERO) is off before descend. Note; The sensor of SPT vertical driving section must be on. It means that, when SPT starts rotation, the SPT nozzle is lowered.	Emergency Stop	Analysis Maintenance	SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0502	SPT descend from origin; SPTU origin sensor (SPTU_ZERO) is on after descend. Note; The sensor of SPT vertical driving section must be turned off.	Emergency Stop	Initialization	The nozzle position is out of its upper limit.	Manually move the nozzle into its movable range, then perform the initialization again.
				SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0503	SPT ascend to origin; SPTU origin sensor (SPTU_ZERO) is on before ascend. Note; The sensor of SPT vertical driving section must be off.	Emergency Stop	Analysis Maintenance	The nozzle position is out of its upper limit.	Manually move the nozzle into its movable range, then perform the initialization again.
				SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor - SEN_CN board - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: SPTU (SPT Up-down Block)

E0504
to E0507

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0504	SPT ascend to origin; SPTU origin sensor (SPTU_ZERO) is off after ascend. Note; It means that SPT has not returned to its upper origin.	Emergency Stop	Initialization	The nozzle position is out of its upper limit.	Perform the initialization again.
				The nozzle is not able to return to its zero position due to external force.	Check the factor which has resisted the motion of the nozzle, then perform the initialization again.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0505	SPT ascend/descend at off-origin; SPT sensor (SPTU_ZERO) must be off but not. Note; It means that SPT is not correctly moved up/down.	Emergency Stop	Analysis	The nozzle position is out of its upper limit.	Manually move the nozzle into its movable range, then perform the initialization again.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0506	SPT descend at IRU; IRU safety sensor (IRU_READY) is off. Note; It means that IRU is not in the position.	Emergency Stop	Analysis Maintenance	IRU driving section.	Check the IRU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				IRU ready-position sensor.	Check the followings for poor contact of connector, etc: - Ready-position sensor - IRU_CN1 board - IRU_CNT board.
E0507	SPT ascend/descend; SPT safety sensor (SPTR_TS) is off.	Sampling stop	Analysis Maintenance	The nozzle position is out of its valid movement range.	Manually move the nozzle into its movable range, then perform the initialization.
				SPT position sensor.	Check the followings for poor contact of connector, etc: - SPT position sensor (SPTR_TS) - SEN_CN board - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: SPTU (SPT Up-down Block)

E0551
to E0555

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0551	SPT descend from origin; SPTU origin sensor (SPTU_ZERO) is off before descend. (Trough or ASP position) Note; It means that SPT is not correctly moved up/down. Since the nozzle is in the trough or ASP , sampling stops.	Sampling stop	Analysis (SPT trough or ASP)	SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0553	SPT ascend to origin; SPTU origin sensor (SPTU_ZERO) is on before ascend. (Trough or ASP position) Note; It means that SPT is not correctly moved up/down. Since the nozzle is in the trough or ASP, sampling stops.	Sampling stop	Analysis (SPT trough or ASP)	SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0555	SPT ascend/descend at off-origin; SPT sensor (SPTR_TS) must be off but not. (Trough or ASP position) Note; It means that SPT is not correctly moved up/down. Since nozzle is in the trough or ASP, sampling stops.	Sampling stop	Analysis (SPT trough or ASP)	SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: SPTU (SPT Up-down Block)

E0557
to E0576

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0557	SPT ascend/descend; SPT safety sensor (SPTR_TS) is off.	Sampling stop	Analysis Maintenance	The nozzle position is out of its valid movement range.	Manually move the nozzle into its movable range, then perform the initialization.
				T/S position sensor.	Check the followings for poor contact of connector, etc: - T/S position sensor (SPTR_TS) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0575	SPT liquid level detection at ASP; Down sensor (SPTU_DL) is on after descend. Note; It means that there is no pipetting sample in the cup of ASP or the tube.	Operation continued.	Analysis (At ASP position)	Sample is shorted.	Supply sample.
				Down limit sensor.	Check the followings for poor contact of connector, etc: - Down limit sensor (SPTU_DL) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
				ASP driving section.	Check the ASP motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - ASP/RCU_DRV board - Control Unit.
				SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
E0576	SPT liquid level detection at ASP; Liquid level abnormal. Note; Although SPT descended to the maximum downward range, liquid level was not detected and the down limit sensor did not turn on. First, check that a tube is in an ASP slot. It means that there is no sample when this error occurs in the tube. In the case of the cup, E0576 error occurs when there is no sample.	Operation continued.	Analysis (At ASP position)	Sample is shorted. Not being sample tube.	Supply sample. Place sample tube to ASP slot.
				Liquid level sensor.	Check the followings for poor contact of connector, etc: - Liquid level sensor - SEN_CN board - IRU_CN1 board - IRU_CNT board.
				ASP driving section.	Check the ASP motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - ASP/RCU_DRV board - Control Unit.

(CONT'D)

Block: SPTU (SPT Up-down Block)

E0578
to E0583

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0578	SPT liquid level detection at IRU; Down sensor (SPTU_DL) is on after descend.	Operation continued.	Analysis (At IRU position)	Cuvette does not exist correctly in IRU.	If cuvette is broken, poor cuvette is exchanged to new one.
				Reagent is not dispensed.	RPP may be faulty.
				Down limit sensor.	Check the followings for poor contact of connector, etc: - Down limit sensor - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0579	SPT liquid level detection at IRU; Liquid level abnormal. Note; Although SPT descended to the maximum downward range, liquid level was not detected and the down limit sensor did not turn on.	Operation continued.	Analysis (At IRU position)	Cuvette does not exist correctly in IRU.	If cuvette is broken, poor cuvette is exchanged to new one.
				Reagent is not dispensed	RPP may be faulty.
				Liquid level sensor.	Check the followings for poor contact of connector, etc: - Liquid level sensor - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0581	SPT liquid level detection at ASP; Liquid level hardware abnormal. Note; A SPTU motor stops without operation corresponding to the input pulse, and moreover, it is not detecting liquid level.	Operation continued.	Analysis (At ASP position)	SPTU driving section.	Check whether the step out occurs.
				Liquid level sensor.	Check the followings for poor contact of connector, etc: - Liquid level sensor - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0582	SPT liquid level detection at IRU; Liquid level hardware abnormal. Note; A SPTU motor stops without operation corresponding to the input pulse, and moreover, it is not detecting liquid level.	Operation continued.	Analysis (At IRU position)	Liquid level sensor.	Check the followings for poor contact of connector, etc: - Liquid level sensor - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E0583	Liquid level not detected at verification.	Operation continued.	Analysis (At ASP position)	Liquid level sensor.	Check whether bubbles are produced in the sample. IF the bubbles are in the sample, take out them.
					Check the followings for poor contact of connector, etc: - Liquid level sensor - SEN_LL/DL board - SEN_CN board - IRU_CN1 board - IRU_CNT board.

Block: SPP

E0601
to E0602

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0601	SPP aspiration; SPP origin sensor (SPP_ZERO) is off before aspiration.	Emergency Stop	Analysis Maintenance	SPP driving section.	Check the SPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				SPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPP_ZERO) - PP_DRV board - IRU_CNT board.
E0602	SPP aspiration; SPP origin sensor (SPP_ZERO) is on after aspiration.	Emergency Stop	Initialization	SPP driving section.	Check the SPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				SPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPP_ZERO) - PP_DRV board - IRU_CNT board.
				Light-interrupting plate for the up-zero position sensor (photo-interruptor) is fixed too high.	Lower the fixing position, then perform the initialization again.

(CONT'D)

Block: SPP

E0603
to E0604

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0603	SPP dispensation; SPP origin sensor (SPP_ZERO) is on before dispensation.	Emergency Stop	Analysis Maintenance	SPP driving section.	Check the SPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				SPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor - PP_DRV board - IRU_CNT board.
E0604	SPP dispensation; SPP origin sensor (SPP_ZERO) is off after dispensation.	Emergency Stop	Initialization	SPP driving section.	Check the SPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				SPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPP_ZERO) - PP_DRV board - IRU_CNT board.

(CONT'D)

Block: SPP

E0605
to E0651

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0605	SPP aspiration/disaspiration at off-origin; SPP origin sensor (SPP_ZERO) is on before aspiration.	Emergency Stop	Analysis Maintenance	SPP driving section.	Check the SPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				SPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPP_ZERO) - PP_DRV board - IRU_CNT board.
E0651	SPP aspiration; SPP origin sensor (SPP_ZERO) is off before aspiration. Note; Although SPP is in its original position, the origin sensor is off.	Sampling stop	Analysis (SPT trough or ASP position)	SPP driving section.	Check the SPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				SPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPP_ZERO) - PP_DRV board - IRU_CNT board.

(CONT'D)

Block: SPP

E0653

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0653	SPP dispensation; SPP origin sensor (SPP_ZERO) is on before dispensation. Note; Although SPP is not in its original position, the origin sensor is on.	Sampling stop	Analysis (SPT trough or ASP position)	SPP driving section.	Check the SPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Make sure that the syringe is in parallel with the plunger. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (SPP_ZERO) - PP_DRV board - IRU_CNT board.

Block: MIX1R (MIX1 Rotary Block)

E0706

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0706	Mixer1 mix; MIX1U origin sensor (MIX1_ZERO) is on before rotation. Since MIX1U has already moved close to the cuvette at the time of the mixing start, the origin sensor (MIX1_ZERO) must be off.	Emergency Stop	Analysis Maintenance	MIX1 driving section.	Check the MIX1 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.

Block: MIX1U (MIX1 Up-down Block)

E0801
to E0804

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0801	Mixer1 descend from origin; MIX1U origin sensor (MIX1_ZERO) is off before descend.	Emergency Stop	Analysis Maintenance	MIX1 driving section.	Check the MIX1 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX1_ZERO) - IRU_CN1 board - IRU_CNT board.
E0802	Mixer1 descend from origin; MIX1U origin sensor (MIX1_ZERO) is on after descend.	Emergency Stop	Initialization		Manually move the mixer into its movable range, then perform the initialization again.
				MIX1 driving section.	Check the MIX1 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX1_ZERO) - IRU_CN1 board - IRU_CNT board.
E0803	Mixer1 ascend to origin; MIX1U origin sensor (MIX1_ZERO) is on before ascend.	Emergency Stop	Analysis Maintenance		Manually move the mixer into its movable range, then perform the initialization again.
				MIX1 driving section.	Check the MIX1 motor or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX1_ZERO) - IRU_CN1 board - IRU_CNT board.
E0804	Mixer1 ascend to origin; MIX1U origin sensor (MIX1_ZERO) is not on after ascend.	Emergency Stop	Initialization	The mixer1 is not able to return to its zero position due to external force.	Manually move the mixer into its movable range, then perform the initialization again.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX1_ZERO) - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: MIX1U (MIX1 Up-down Block)

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0805	Mixer1 ascend/descend at off-origin; MIX1U origin sensor (MIX1_ZERO) must be off before action but not.	Emergency Stop	Analysis Maintenance	The mixer is not able to return to its zero position due to external force.	Manually move the mixer into its movable range, then perform the initialization again.
				MIX1 driving section.	Check the MIX1 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX1_ZERO) - IRU_CN1 board - IRU_CNT board.
E0806	Mixer1 descend at IRU; IRU safety sensor (IRU_READY) is off.	Emergency Stop	Analysis Maintenance	IRU driving section.	Check the IRU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				IRU ready-position sensor.	Check the followings for poor contact of connector, etc: - Ready-position sensor (IRU_READY) - IRU_CN1 board - IRU_CNT board.

Block: MIX2R (MIX2 Rotary Block)

E0906

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E0906	Mixer2 mix; MIX2U origin sensor (MIX2_ZERO) is on before rotation. Note; Although MIX2U is not in its original position, the origin sensor (MIX2_ZERO) is on.	Emergency Stop	Analysis Maintenance	MIX2 driving section.	Check the MIX2 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX2_ZERO) - IRU_CN1 board - IRU_CNT board.

Block: MIX2U (MIX2 Up-down Block)

E1001
to E1004

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1001	Mixer2 descend from origin; MIX2U origin sensor (MIX2_ZERO) is off before descend.	Emergency Stop	Analysis Maintenance	MIX2 driving section.	Check the MIX2 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX2_ZERO) - IRU_CN1 board - IRU_CNT board.
E1002	Mixer2 descend from origin; MIX2U origin sensor (MIX2_ZERO) is on after descend.	Emergency Stop	Initialization	The mixer is not able to move from origin due to external force.	Manually move the mixer into its movable range, then perform the initialization again.
				MIX2 driving section.	Check the MIX2 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board (MIX2_ZERO) - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX2_ZERO) - IRU_CN1 board - IRU_CNT board.
E1003	Mixer2 ascend to origin; MIX2U origin sensor (MIX2_ZERO) is on before ascend.	Emergency Stop	Analysis Maintenance	The mixer is not able to return to origin due to external force.	Manually move the mixer into its movable range, then perform the initialization again.
				MIX2 driving section.	Check the MIX2 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX2_ZERO) - IRU_CN1 board - IRU_CNT board.
E1004	Mixer2 ascend to origin; MIX2U origin sensor (MIX2_ZERO) is not on after ascend.	Emergency Stop	Initialization	The mixer is not able to return to its zero position due to external force.	Perform the initialization again.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX2_ZERO) - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: MIX2U (MIX2 Up-down Block)

E1005
to E1006

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1005	Mixer2 ascend/descend at off-origin; MIX2U origin sensor (MIX2_ZERO) must be off before action but not.	Emergency Stop	Analysis Maintenance	The mixer is not able to return to its zero position due to external force.	Manually move the mixer into its movable range, then perform the initialization again.
				MIX2 driving section.	Check the MIX2 motor for slackness of vertical driving section or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero-position sensor (MIX2_ZERO) - IRU_CN1 board - IRU_CNT board.
E1006	Mixer2 descend at IRU; IRU safety sensor (IRU_READY) is off.	Emergency Stop	Analysis Maintenance	IRU driving section.	Check the IRU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				IRU ready-position sensor.	Check the followings for poor contact of connector, etc: - Ready-position sensor - IRU_CN1 board.

Block: WUU (WU Up-down Block)

E1101
to E1104

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1101	WU descend; WU origin sensor (WU_ZERO) is off before descend. Note; When the WU starts a downward movement from upper limit to middle of cuvette, the origin sensor is off.	Emergency Stop	Analysis Maintenance	WUU driving section.	Check the WU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (WU_ZERO) - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.
E1102	WU descend; WU origin sensor (WU_ZERO) is on after descend.	Emergency Stop	Initialization	WU position is out of its upper limit.	Manually move WU into its movable range, then perform the initialization again.
				WUU driving section.	Check the WU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (WU_ZERO) - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.
E1103	WU ascend; WU origin sensor (WU_ZERO) is on before ascend.	Emergency Stop	Analysis Maintenance	WU position is out of its upper limit.	Manually move WU into its movable range, then perform the initialization again.
				WUU driving section.	Check the WU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (WU_ZERO) - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.
E1104	WU ascend; WU origin sensor (WU_ZERO) is off after ascend.	Emergency Stop	Initialization	WU position is out of its IRU-side limit.	Perform the initialization again.
				WU is not able to return to its zero position due to external force.	Perform the initialization again.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (WU_ZERO) - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: WUU (WU Up-down Block)

E1105
to E1106

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1105	WU ascend/descend at off-origin; WU origin sensor (WU_ZERO) must not be off before action but not. Note; When the WU starts a downward movement from middle of cuvette to bottom, the origin sensor (WU_ZERO) is on.	Emergency Stop	Analysis Maintenance	WU position is out of its upper limit.	Manually move WU into its movable range, then perform the initialization again.
				WUU driving section.	Check the WU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (WU_ZERO) - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.
E1106	WU descend; IRU safety sensor (IRU_READY) is off. Note; When the WU starts a downward movement from middle of cuvette to bottom, the IRU safety sensor (IRU_READY) is off. The position of IRU is not correct.	Emergency Stop	Analysis Maintenance	IRU driving section.	Check the IRU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				IRU ready-position sensor.	Check the followings for poor contact of connector, etc: - IRU ready-position sensor (IRU_READY) - IRU_CN1 board - IRU_CNT board.

Block: WPP

E1201
to E1202

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1202	WPP aspiration; WPP origin sensor (WPP_ZERO) is on after aspiration.	Emergency Stop	Initialization	WPP driving section.	Check the WPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				WPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (WPP_ZERO) - PP_DRV board - IRU_CNT board.
				Light-interrupting plate for the up zero-position sensor (photo-interruptor) is fixed too high.	Lower the fixing position, then perform the initialization again.
E1203	WPP dispensation; WPP origin sensor (WPP_ZERO) is on before dispensation	Emergency Stop	Analysis Maintenance	WPP driving section.	Check the WPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				WPP fluidics system	Check the tubes for damage, leakage, stoppage, etc
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (WPP_ZERO) - PP_DRV board - IRU_CNT board.

(CONT'D)

Block: WPP

E1204
to E1205

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1204	WPP dispensation; WPP origin sensor (WPP_ZERO) is off after dispensation. Note; The check whether this origin sensor is turned on is omitted during operation. The check is done only at the initialization.	Emergency Stop	Initialization	WPP driving section.	Check the WPP motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				WPP fluidics system.	Check the tubes for damage, leakage, stoppage, etc.
				Solenoid valve.	Check the solenoid valve for sticking odd object, etc. Check the followings for poor contact of connector, etc: - PP_DRV board - IRU_CNT board.
				Syringe tip.	Check the syringe tip for excessive friction resistance, etc.
				Up zero-position sensor.	Check the followings for poor contact of connector, etc: - Up zero-position sensor (WPP_ZERO) - PP_DRV board - IRU_CNT board.
E1206	WU overflow (WU_OVER=1) (During Prime)	Emergency Stop	Analysis	WU/SWU fluidics system connected to WU drain nozzles.	Check the tubes for stoppage, damage, etc.
				In-line filters placed on the inlet side of waste-liquid pumps WU1 through WU7 in SWU.	Check the filters for contamination, etc.
				Waste-liquid pumps WU1 through WU8 in SWU.	Check if the pumps are functioning.
				Paired nozzles (supply and drain) for WU1 through WU6 are shorted electrically by water, etc.	Wipe the nozzles cleanly.
				WU over-flow sensor.	Check the followings for poor contact of connector, etc: - WU over-flow sensor - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.

(CONT'D)

Block: WPP

E1266

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1256	WU overflow (WU_OVER=1) (During Run)	Sampling Stop	Analysis	WU/SWU fluidics system connected to WU drain nozzles.	Check the tubes for stoppage, damage, etc.
				In-line filters placed on the inlet side of waste-liquid pumps WU1 through WU7 in SWU.	Check the filters for contamination, etc.
				Waste-liquid pumps WU1 through WU8 in SWU.	Check if the pumps are functioning.
				Paired nozzles (supply and drain) for WU1 through WU6 are shorted electrically by water, etc.	Wipe the nozzles cleanly.
				WU over-flow sensor.	Check the followings for poor contact of connector, etc: - WU over-flow sensor - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.

Block: IRU (IRU Rotary Block)

E1302
to E1307

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1302	IRU rotation from origin; IRU origin sensor (IRU_ZERO) is on after rotation.	Emergency Stop	Initialization Maintenance	Ready position sensor.	Check the followings for poor contact of connector, etc: - Ready position-sensor - IRU_CN1 board - IRU_CNT board.
				IRU driving section.	Check the IRU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
E1304	IRU rotation to origin; IRU origin sensor (IRU_ZERO) is off after rotation.	Emergency Stop	Initialization	Ready-position sensor.	Check the followings for poor contact of connector, etc: - Ready-position sensor - IRU_CN1 board - IRU_CNT board.
				IRU driving section.	Check the IRU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
E1306	IRU rotation; SPTR origin sensor (SPTR_ZERO) is on. Note; When the IRU starts the rotation, SPT is located on IRU.	Emergency Stop	Analysis Maintenance	SPT zero-position sensor.	Check the followings for poor contact of connector, etc: - SPT zero-position sensor (SPTR_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
				SPTR driving section.	Check the SPTR motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
E1307	IRU rotation; RPTR origin sensor (RPTR_ZERO) is on. Note; When the IRU starts the rotation, RPT is located on IRU.	Emergency Stop	Analysis Maintenance	RPT zero-position sensor.	Check the followings for poor contact of connector, etc: - RPT zero-position sensor (RPTR_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
				RPTR driving section.	Check the RPTR motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.

(CONT'D)

Block: IRU (IRU Rotary Block)

E1308
to E1310

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1308	IRU rotation; WU origin sensor (WU_ZERO) is off.	Emergency Stop	Analysis Maintenance	WU driving section.	Check the WU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				WU zero-position sensor.	Check the followings for poor contact of connector, etc: - WU zero-position sensor (WU_ZERO) - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.
E1309	At cuvette water placement and filter rinsing; SPTU origin sensor is off.	Emergency Stop	Maintenance	SPTU driving section.	Check the SPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				SPT up zero-position sensor.	Check the followings for poor contact of connector, etc: - SPT up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E1310	At cuvette water placement and filter rinsing; RPTU origin sensor is off.	Emergency Stop	Maintenance	RPTU driving section.	Check the RPTU motor for slackness of belt, pulleys or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				RPT up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPT up zero-position sensor (RPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.

Block: RCU (RCU Rotary Block)

E1402
to E1454

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1402	RCU rotation from origin; RCU origin sensor (RCU_ZERO) is on after rotation.	Emergency Stop	Initialization	Proceed to RCU ROTARY-BLOCK CHECK PROCEDURE.	
E1404	RCU rotation to origin; RCU origin sensor (RCU_ZERO) is off after rotation.	Emergency Stop	Initialization Analysis	Proceed to RCU ROTARY-BLOCK CHECK PROCEDURE.	
				The RPT nozzle is not able to return to its zero position due to external force.	Perform the initialization again.
				RPT up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPT up zero-position sensor - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E1406	RCU rotation from origin; RPTU origin sensor (RPTU_ZERO) is off.	Emergency Stop	Initialization	Proceed to RCU ROTARY-BLOCK CHECK PROCEDURE.	
				The RPT nozzle is not able to return to its zero position due to external force.	Perform the initialization again.
				RPT up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPT up zero-position sensor - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E1454	RCU rotation to origin; Origin sensor (RCU_ZERO) is not on after rotation.	Emergency Stop	Initialization	Proceed to RCU ROTARY-BLOCK CHECK PROCEDURE.	
				The RPT nozzle is not able to return to its zero position due to external force.	Perform the initialization again.
				RPT up zero-position sensor.	Check the followings for poor contact of connector, etc: - RPT up zero-position sensor - SEN_CN board - IRU_CN1 board - IRU_CNT board.

RCU ROTARY-BLOCK CHECK PROCEDURE

STEP	CHECK	JUDGEMENT	SUSPECT:	CHECK:
1	First, manually rotate the RCU tray clockwise by 180 degrees from its zero position. Next, by using the sensor check in the maintenance mode, check the status (ON-OFF) of the RCU zero-position sensor.	The RCU zero-position sensor is ON.	RCU zero-position sensor.	Check the followings for poor contact of connector, etc: - RCU zero-position sensor - ASP/RCU_DRV board - Control Unit.
		The RCU zero-position sensor is OFF.	Go to STEP 2 below.	
2	Perform the initialization under the condition of STEP 1.	The RCU tray does not rotate, resulting in error.	RCU motor.	Replace the RCU motor.
		The RCU tray does not rotate to its zero position, resulting in error.	Go to STEP 3 below.	
3	Remove the RCU, and check the RCU motor for slackness of its belt/pulleys, etc.	Slackness is found.		Fix it up.
		Slackness is not found.	Go to STEP 4 below.	
4	Measure the belt tension.	The belt tension is too low.		The belt is deteriorated. Replace it.
		The belt tension is normal.		Call for repair.

Block: DTR

E1502
to E1508

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1502	Filter wheel rotation from origin; Origin sensor (FLT_ZERO) is on after rotation.	Emergency Stop	Initialization	DTR driving section.	Check the FLT motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
E1504	Filter wheel rotation to origin; Origin sensor (FLT_ZERO) is off after rotation.	Emergency Stop	Initialization	DTR driving section.	Check the FLT motor for slackness of belt, pulleys, plunger or poor contact of connector, etc. Check the followings for poor contact of connector, etc: - IRU_DRV board - IRU_CNT board.
				Zero-position sensor.	Check the followings for poor contact of connector, etc: - Zero position sensor (FLT_ZERO) - IRU_CN1 board - IRU_CNT board.
E1508	Absorbance reading has negative value.	Emergency Stop	Analysis	Halogen lamp. (Poor illumination)	Replace the halogen lamp.
				Optical filter. (Contamination)	Clean the optical filter.

Block: ASP (ASP Rotary Block)

E1602
to E1654

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1602	ASP rotation from origin; Origin sensor (ASP_ZERO) is on after rotation.	Emergency Stop	Initialization	Proceed to ASP ROTARY-BLOCK CHECK PROCEDURE.	
E1604	ASP rotation to origin; Origin sensor (ASP_ZERO) is off after rotation.	Emergency Stop	Initialization Analysis Maintenance	Proceed to ASP ROTARY-BLOCK CHECK PROCEDURE.	
E1606	ASP rotation from origin; SPTU origin sensor (SPTU_ZERO) is off.	Emergency Stop	Initialization	The SPT nozzle position is out of its lower limit.	Perform the initialization again.
				The SPT nozzle can not return to its zero position due to external force.	Perform the initialization again.
				SPT up zero-position sensor.	Check the followings for poor contact of connector, etc: - SPT up zero-position sensor (SPTU_ZERO) - SEN_CN board - IRU_CN1 board - IRU_CNT board.
E1654	ASP rotation to origin; Origin sensor (ASP_ZERO) is not on after rotation.	Sampling stop	Analysis	Proceed to ASP ROTARY-BLOCK CHECK PROCEDURE.	

ASP ROTARY-BLOCK CHECK PROCEDURE

STEP	CHECK	JUDGEMENT	SUSPECT:	CHECK:
1	First, manually rotate the ASP tray clockwise by 180 degrees from its zero position. Next, by using the sensor check in the maintenance mode, check status (ON-OFF) of the ASP zero-position sensor.	The ASP zero-position sensor is ON.	ASP zero-position sensor.	Check the followings for poor contact of connector, etc: - ASP zero-position sensor - ASP/RCU_DRV board - Control Unit.
		The ASP zero-position sensor is OFF.	Go to STEP 2 below.	
2	Perform the initialization under the condition of STEP 1.	The ASP tray does not rotate, resulting in error.	ASP motor.	Replace the ASP motor.
		The ASP tray does not rotate to its zero position, resulting in error.	Go to STEP 3 below.	
3	Remove the ASP, and check the ASP motor for slackness of its belt/pulleys, etc.	Slackness is found.		Fix it up.
		Slackness is not found.	Go to STEP 4 below.	
4	Measure the belt tension of the ASP motor.	The belt tension is too low.		The belt is deteriorated. Replace it.
		The belt tension is normal.		Call for repair.

Block: ISE

E1775
to E1782

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E1775	There is an anomaly in response to Serum Sample inquiry.	Alarm	Analysis	Communication with the ISE unit.	Check the followings for poor contact of connector, etc: - ASP_DRV board - RCU_DRV board.
E1776	There is an anomaly in response to Urine Sample inquiry.	Alarm	Analysis	Communication with the ISE unit.	Same as E1775.
E1777	ISE result measurement data is not available.	Alarm	Analysis	Communication with the ISE unit.	Same as E1775.
E1780	There is an anomaly in response to ISE electrode exchange inquiry <MANT>.	Alarm	Maintenance	Communication with the ISE unit	Same as E1775.
E1781	There is an anomaly in response to ISE prime inquiry < PURG >.	Alarm	Maintenance	Communication with the ISE unit	Same as E1775.
E1782	There is an anomaly in response to ISE cleaning inquiry <CLEAN>.	Alarm	Maintenance	Communication with the ISE unit	Same as E1775.

Block: External Tanks

E2605
to E2680

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E2605	Low Wash solution-3 (BOT6_EMP=0)	Emergency Stop	Prime Operation	Wash solution 3 is shorted.	Supply wash solution 3.
				Sensor.	Check the sensor for poor contact of connector, etc.
E2606	Low purified water (BOT1_EMP=0)	Emergency Stop	Prime Operation	Purified water is shorted.	Supply purified water.
				Sensor.	Check the sensor for poor contact of connector, etc.
E2607	Low Wash solution-1 (BOT2_EMP=0)	Emergency Stop	Prime Operation	Wash solution 1 is shorted.	Supply wash solution 1.
				Sensor.	Check the sensor for poor contact of connector, etc.
E2608	Low Wash solution-2 (BOT3_EMP=0)	Emergency Stop	Prime Operation	Wash solution 2 is shorted.	Supply wash solution 2.
				Sensor.	Check the sensor for poor contact of connector, etc.
E2609	Full waste tank-1 (BOT4_FULL=0)	Emergency Stop	Prime Operation	Low concentration waste tank is full.	Empty low concentration waste tank.
				Sensor.	Check the sensor for poor contact of connector, etc.
E2610	Full waste tank-2 (BOT5_FULL=0)	Emergency Stop	Prime Operation	High concentration waste tank is full.	Empty high concentration waste tank.
				Sensor.	Check the sensor for poor contact of connector, etc.
E2675	Low Wash solution-3 (BOT6_EMP=0)	Operation continued.	Analysis	Wash solution 3 is shorted.	Supply wash solution 3.
			Maintenance	Sensor.	Check the sensor for poor contact of connector, etc.
E2676	Low purified water (BOT1_EMP=0)	Operation continued.	Analysis	Purified water is shorted.	Supply purified water.
			Maintenance	Sensor.	Check the sensor for poor contact of connector, etc.
E2677	Low Wash solution-1 (BOT2_EMP=0)	Operation continued.	Analysis	Wash solution 1 is shorted.	Supply wash solution 1.
			Maintenance	Sensor.	Check the sensor for poor contact of connector, etc.
E2678	Low Wash solution-2 (BOT3_EMP=0)	Operation continued.	Analysis	Wash solution 2 is shorted.	Supply wash solution 2.
			Maintenance	Sensor.	Check the sensor for poor contact of connector, etc.
E2679	Full waste tank-1 (BOT4_FULL=0)	Operation continued.	Analysis	Low concentration waste tank is full.	Empty low concentration waste tank.
			Maintenance	Sensor.	Check the sensor for poor contact of connector, etc.
E2680	Full waste tank-2 (BOT5_FULL=0)	Operation continued.	Analysis	High concentration waste tank is full.	Empty high concentration waste tank.
			Maintenance	Sensor.	Check the sensor for poor contact of connector, etc.

Block: Miscellaneous

E2701
to E2875

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E2701	Lid for ASP is open	Emergency Stop	Analysis	ASP cover is not placed in position.	Place the ASP cover in position.
			Maintenance	ASP cover sensor.	Check the followings for poor contact of connector, etc: - ASP cover sensor - ASP/RCU_DRV board - Control Unit.
E2702	Lid for RCU is open.	Emergency Stop	Analysis	RCU cover is not placed in position.	Place the RCU cover in position.
			Maintenance	RCU cover sensor.	Check the followings for poor contact of connector, etc: - RCU cover sensor - ASP/RCU_DRV board - Control Unit.
E2703	Waste chamber over flow	Emergency Stop	Maintenance	Fluidics system connected to the troughs.	Check the tubes for damage, leakage, stoppage, etc.
				In-line filter placed on the inlet side of waste-liquid pump for the IRU divider. (The filter/pump are placed in SWU.)	Check the filter for contamination, etc.
				Waste-liquid pump for the IRU divider in SWU.	Check if the pump is functioning.
				Trough over-flow sensor.	Check the followings for poor contact of connector, etc: - Trough over-flow sensor - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.
E2753	Waste chamber over flow	Sampling Stop	Analysis	Fluidics system connected to the troughs.	Check the tubes for damage, leakage, stoppage, etc.
				In-line filter placed on the inlet side of waste-liquid pump for the IRU divider. (The filter/pump are placed in SWU.)	Check the filter for contamination, etc.
				Waste-liquid pump for the IRU divider in SWU.	Check if the pump is functioning.
				Trough over-flow sensor.	Check the followings for poor contact of connector, etc: - Trough over-flow sensor - SEN_OVRF board - IRU_CN1 board - IRU_CNT board.
E2875	Sample short; Ordered test not completed.	Sampling Stop	Analysis	Sample runs out.	Check the remaining amount of the sample.

Block: IRU Thermal Sensor

E3051
to E3053

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E3051	IRU temperature lower than 37-2 degrees.	Sampling stops.	Analysis Maintenance	IRU heater 1.	Check for poor contact of connector, etc.
				IRU slip ring.	Check for poor contact of connector, etc.
				Control Unit.	Check for poor contact of connector, etc.
				Thermal fuse for IRU heater 1.	Check if the fuse is blown off.
				Fuse F1 on IRU_DRV board.	Check if the fuse is blown off.
E3052	IRU temperature higher than 37+2 degrees.	Sampling stops.	Analysis Maintenance	IRU Slip ring.	Check for poor contact of connector, etc.
				Control Unit.	Check for poor contact of connector, etc.
E3053	RCU temperature higher than 15 degrees.	Sampling stops.	Analysis Maintenance	IRU heater 2.	Check for poor contact of connector, etc.
				IRU slip ring.	Check for poor contact of connector, etc.
				Control Unit.	Check for poor contact of connector, etc.
				Thermal fuse for IRU heater 2.	Check if the fuse is blown off.
				Fuse F1 on IRU_DRV board.	Check if the fuse is blown off.

Block: BCR

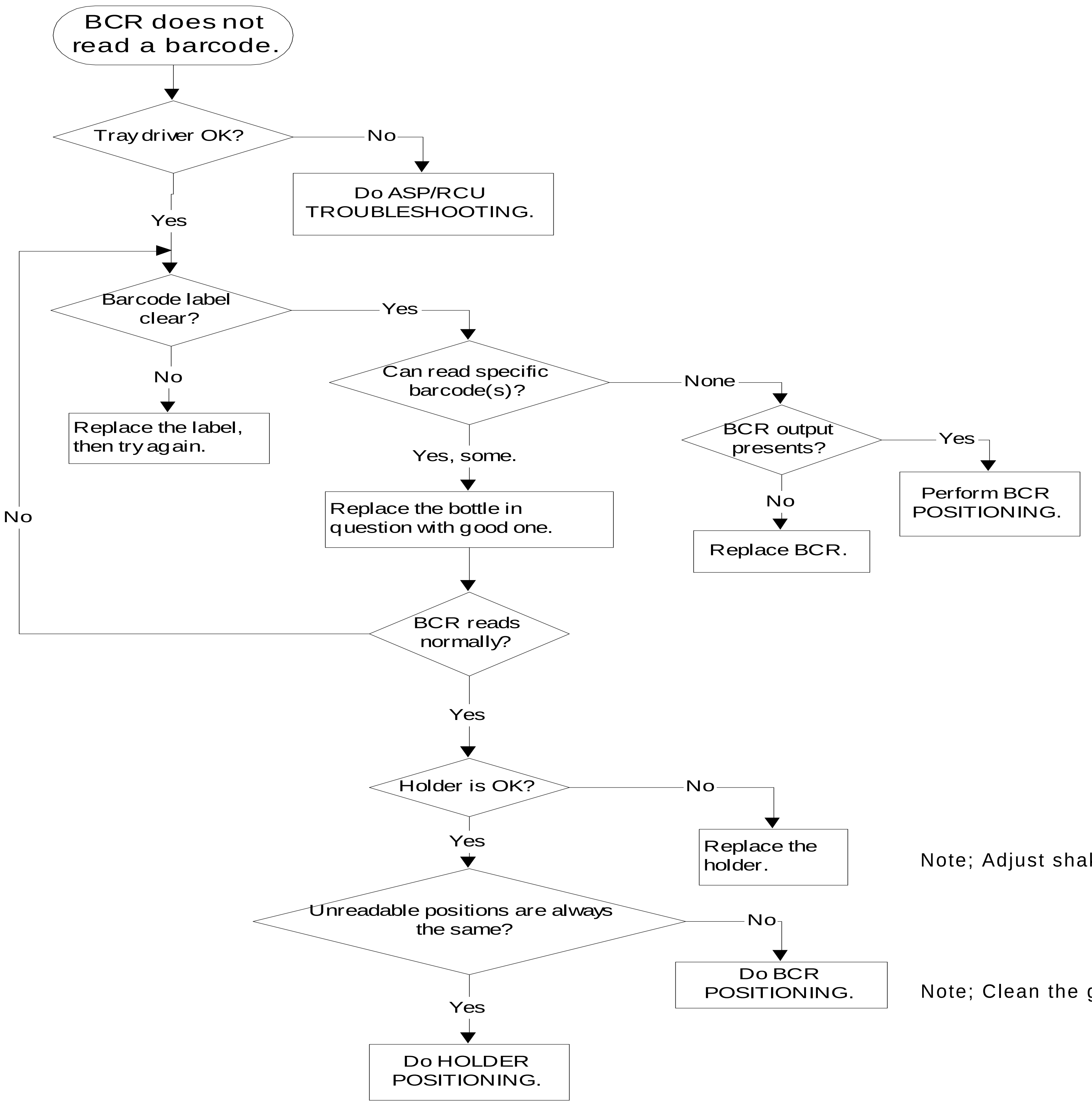
E5001
to E5075

ERROR CODE	ERROR MESSAGE	RESULT	OPERATIONAL MODE	SUSPECT:	CHECK:
E5001	Reagent barcode reader; Initialization error.	Emergency Stop	Initialization	Connection.	Check the followings for poor contact of connector, etc: - RCU_DRV
				BCR.	Replace the BCR, then check it works correctly.
E5002	Sample barcode reader; Initialization error.	Emergency Stop	Initialization	Connection.	Check the followings for poor contact of connector, etc: - ASP_DRV - RCU_DRV
				BCR.	Replace the BCR, then check it works correctly.
E5075	Sample barcode could not be read due to character out of specification.	Alarm	Analysis	Non-standardized character error	Check label on sample cup/tube if there is non-standardized character.

2. Troubleshooting by Symptoms

This subsection shows case-studies of various troubles.

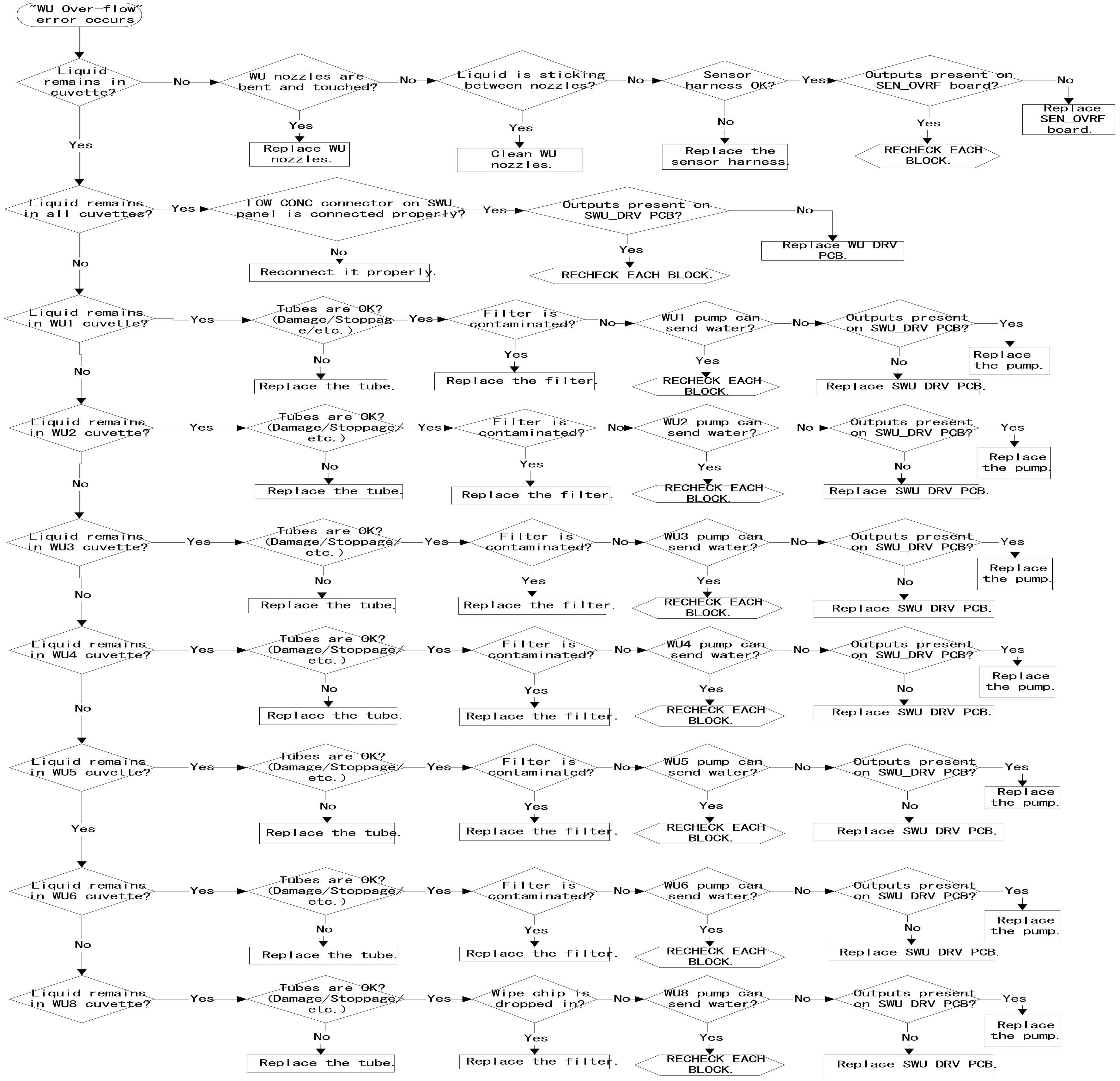
A. BCR does not read a barcode.



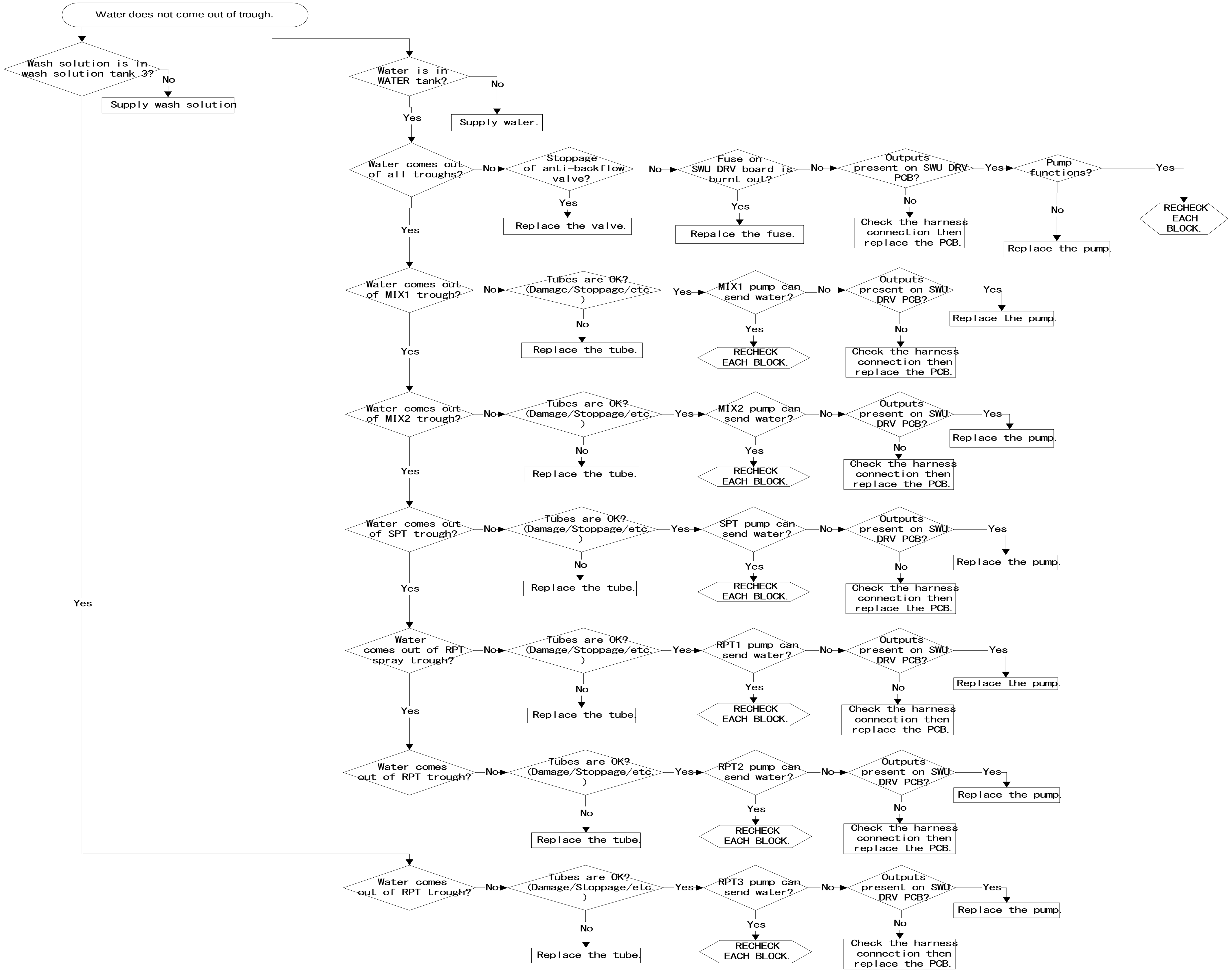
Note; Adjust shakiness of the tray when the tray is too shaky.

Note; Clean the glass window of BCR, when dirt is in the glass window.

B. "WU Overflow" error occurs.



C. Water does not come out of trough.



Chapter 9
Parts Replacement by Operator

This chapter explains parts replacement procedures conducted by operators.

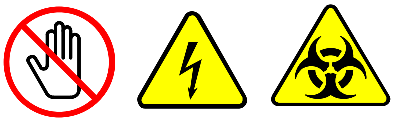
To carry out the replacement, the following items are required:

SPECIAL TOOLS AND MATERIALS

ITEM	DESCRIPTIONS
Hex. Wrenches	Diagonal: 0.9 and 6 mm
Jigs	1. Plunger tip insertion die (25-012-4101-1) 2. PT nozzle height adjustment jig (25-012-9045-0) (used for RPT and SPT)
Silicone oil	Shin-Etsu Silicones, KF-96H-50,000cs

1. <u>Syringe Plunger Tips</u>

The syringe plunger tips should be replaced every 150 hours of operation. If the analyzer works 8 hours per day and 5 days per week for example, they should be replaced every 4 months. If your analyzer works longer, replacement is required more frequently.

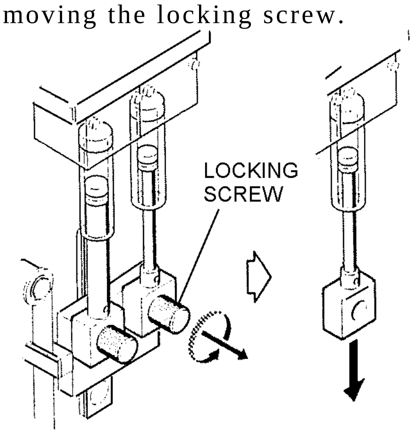


<u>WARNING</u>

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER (ANALYZER) MUST BE TURNED OFF.**
- **DO NOT CRIMP (BEND) PIPETTE TUBING.**
- **WEAR MEDICAL RUBBER GLOVES WHEN HANDLING SYRINGE COMPONENTS AND TUBING TO PREVENT THE PENETRATION OF CONTAMINANTS.**

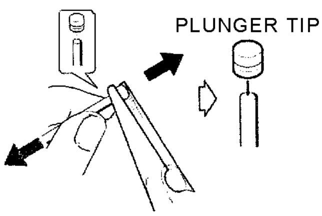
<u>Replacing Procedure</u>

(1) Loosen the locking screw by turning it counterclockwise with hex. wrench (6mm). Remove the plunger by removing the locking screw.



PREPARATION FOR SYRINGE PLUNGER TIP REMOVAL
Figure 9-1

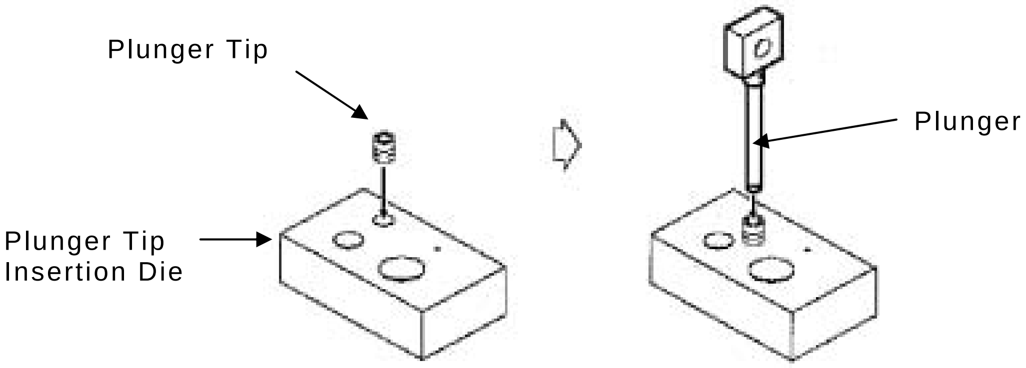
(2) Remove the plunger tip with pliers as shown below.



PLUNGER TIP REMOVAL
Figure 9-2

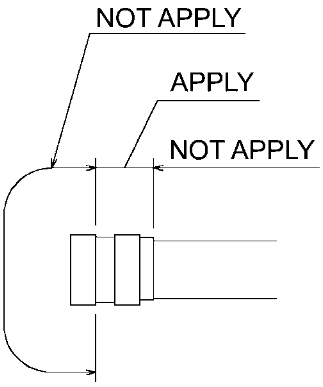
(3) Put a new plunger tip into the hole of the plunger tip insertion die.

(4) Hold the plunger vertically by hand and insert it into the hole of the plunger tip.



PLUNGER TIP INSERTION
Figure 9-3

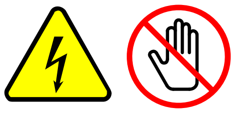
(5) Apply Silicone oil (Shin-Etsu Silicones, KF-96H-50,000cs) to the plunger with the plunger tip attached. Insert it into the syringe and push it up.



APPLY SILICONE OIL
Figure 9-4

(6) Tighten the locking screw removed in the step (1).

2. Halogen Lamp



WARNING

- **BEFORE STARTING THE FOLLOWING STEPS, MAKE SURE THAT THE ANALYZER IS TURNED OFF.**
- **AFTER THE POWER-OFF, LEAVE THE HALOGEN LAMP FOR COOLING FOR 30 MINUTES.**
- **DO NOT TOUCH GLASS PART OF THE HALOGEN LAMP.**
- **TAKE CARE NOT TO GIVE MECHANICAL STRESS TO THE LAMP-END OF THE LEAD WIRE.**

Replacing procedure

(1) Remove the mosaic plate 9. Refer to "2. B. Removing Mosaic Plates" in Chapter 10.

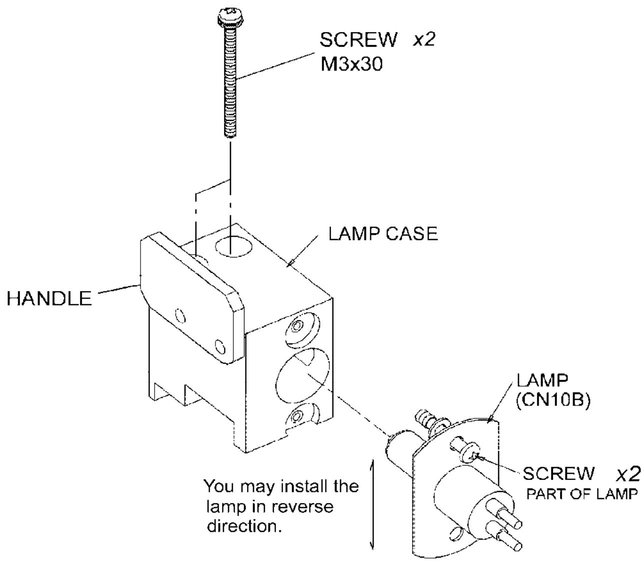
(2) Disconnect the plug connector CN10B of the halogen lamp.

(3) Remove the two screws (M3x30) (Fig 9-5) from the lamp case.

WARNING: **THE LAMP CASE MIGHT BE HOT. WHEN PULLING OUT THE HALOGEN LAMP, HOLD THE PLASTIC HANDLE OF THE LAMP CASE.**

(4) Hold the plastic handle (Fig 9-5) of the lamp case, and lift it up.

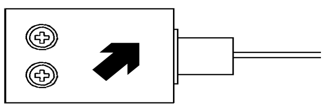
(5) Loosen the two screws (part of the halogen lamp) and pull out the halogen lamp as shown below.



HALOGEN LAMP REMOVAL
Figure 9-5

(6) Install a new halogen lamp into the lamp case by securing the two screws.

(7) Install the lamp case by tightening the two screws (M3x30).

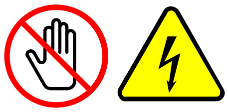


NOTE:When tightening the screws (M3x30), push the lamp case in the arrow direction.

HALOGEN LAMP INSTALLATION
Figure 9-6

3. <u>Pipette</u> (RPT/SPT)

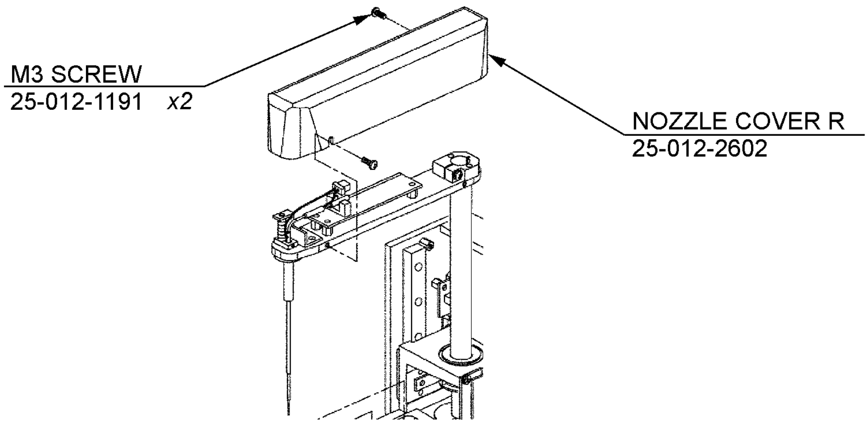
<u>WARNING</u>



- **BEFORE STARTING THE FOLLOWING STEPS,MAKE SURE THAT THE ANALYZER MUST BE TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

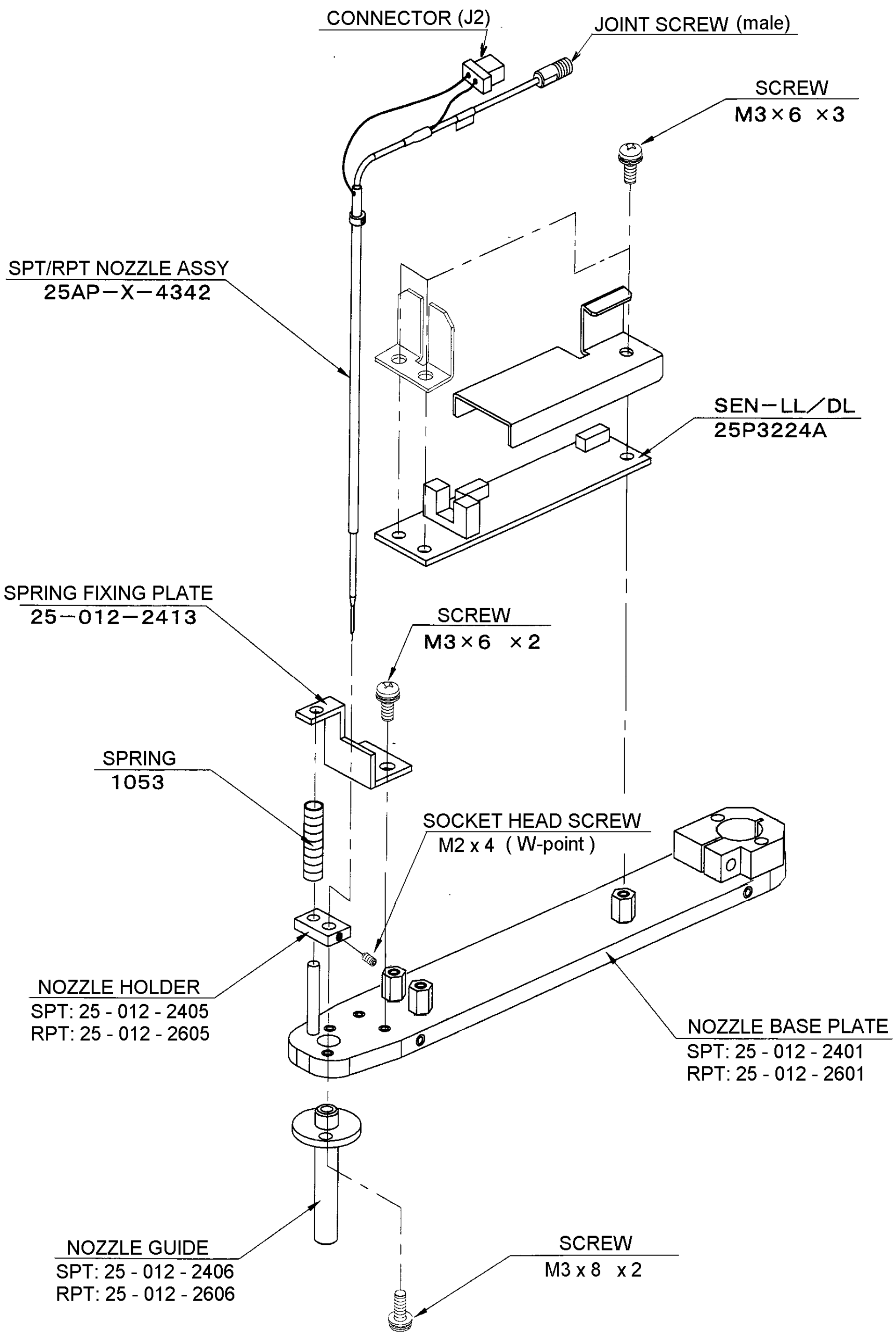
<u>Replacing procedure</u>

(1) Lift and rotate the pipette by hand to move it to any position convenient for replacement.
(2) Open the nozzle cover by loosening the two screws.



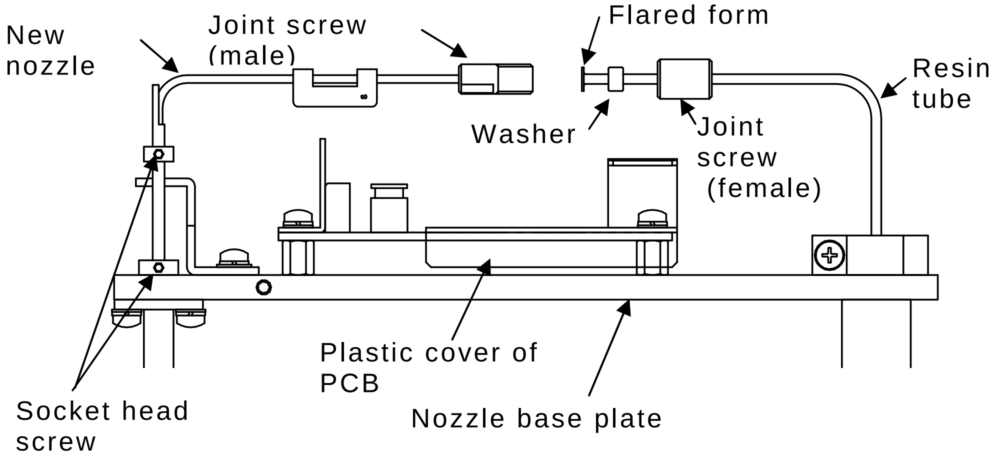
OPENING PIPETTE NOZZLE COVER
Figure 9-7

(3) Unplug the connector (J2) on the pipette arm. Refer to "6.B.Dismounting RPT Nozzle Assembly" in Chapter 10.
(4) Unfasten the tube joint screw and separate nozzle assay and resin tube.
(5) Loosen the socket head screw (W-point, M2x4) of the nozzle holder.
(6) Remove the pipette nozzle from the nozzle base plate while the nozzle is lifted up.

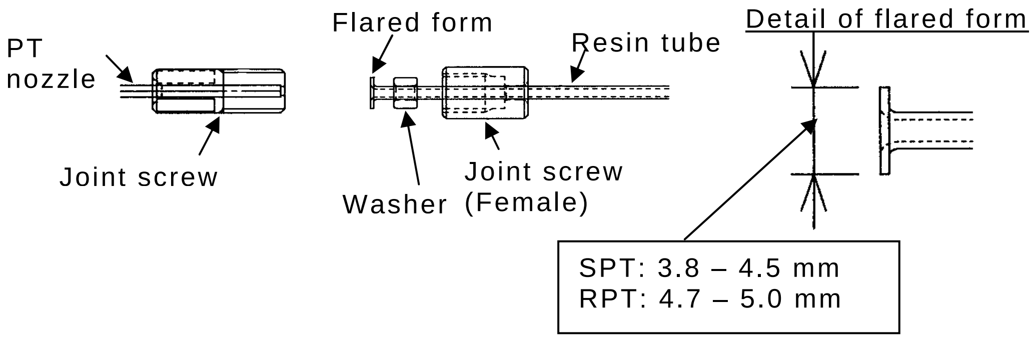


NOZZLE BASE PLATE & NOZZLE
Figure 9-8

(7) Set the new pipette nozzle with joint screw (male) to the nozzle base plate.

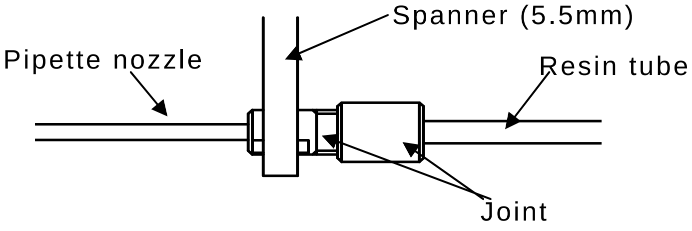


NOZZLE BASE PLATE, NOZZLE & RESIN TUBE
Figure 9-9



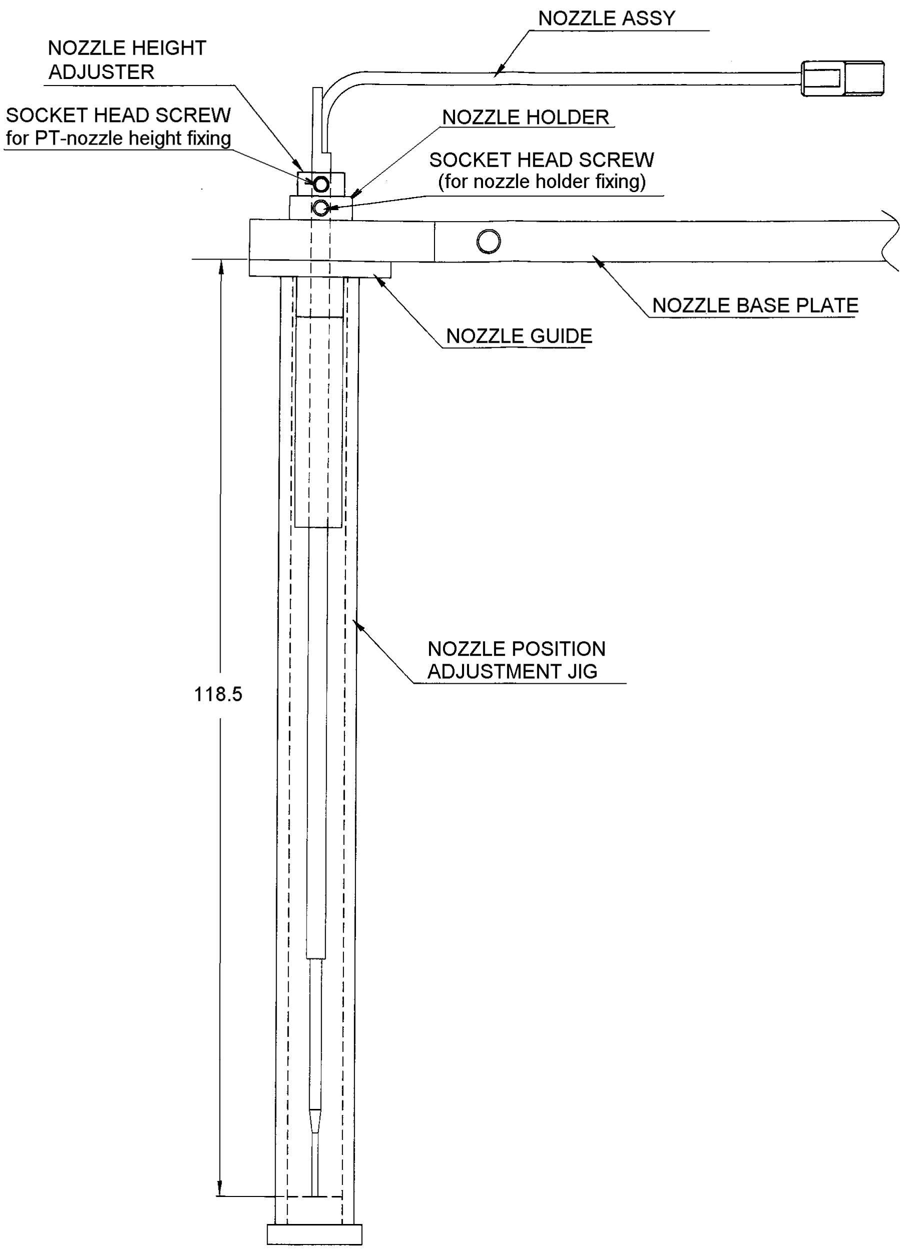
FLARED FORM
Figure 9-10

(8) Connect the male joint screw (nozzle) and female joint screw (resin tube) firmly by using spanner (5.5 mm). Since the pipette nozzle may be twisted by screwing joint, the spanner should be used for prevention such problem.



JOINT CONNECTION
Figure 9-11

(9) Adjust nozzle height using the PT nozzle height adjustment jig and fix the PT nozzle height position by PT-nozzle height fixing screw.

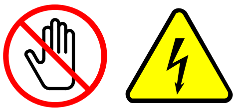


NOZZLE HIGHT ADJUST
Figure 9-12

(10) Connect the connector (J2) to PCB on the nozzle base plate.
(11) Confirm that PT nozzle can move up and down smoothly.
(12) Put the nozzle cover to pipette unit (SPT/RPT).

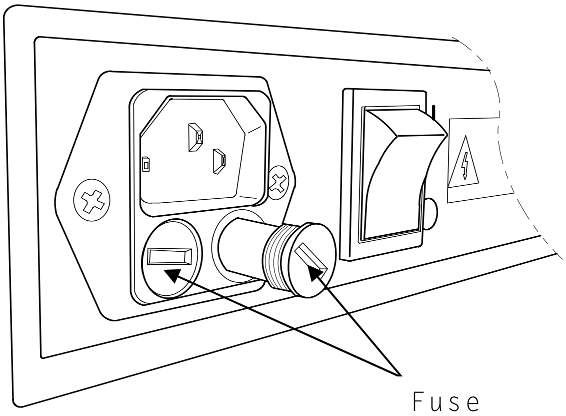
4. Primary Fuse

WARNING
BEFORE STARTING THE FOLLOWING STEPS, MAKE SURE THAT THE ANALYZER IS TURNED OFF.



Replacing Procedure

(1) Take out the fuse holder by means of a screwdriver (minus type) and replace it with new one.



REPLACING PRIMARY FUSE
Figure 9-13

5. Electrodes (ISE)

Refer to "4. ISE " in Chapter 10 for replacing electrodes.

6. Calibrant A (ISE)

Refer to "4. ISE " in Chapter 10 for replacing Calibrant A bottle.

7. ISE Pump Cassette

Refer to "4. ISE " in Chapter 10 for replacing ISE pump cassette.

Chapter 10
Unit/Parts Replacement

1. General

This chapter explains:
- Replacement procedure for each unit
- Replacement procedure for major parts within each unit
- Adjustment required after the parts replacement.

The parts discussed here include some electric parts such as solenoid valves but excludes power supply and PC boards. Replacement procedures of the PC boards are explained in Chapter 11.

As parts replacement procedures, only dismounting procedures are explained. Mounting procedures are omitted because they are simply the reverse of the dismounting procedures. Exceptionally, mounting procedures (or remarks) are given in the cases where adjustment or special care is required.

To carry out dismounting/mounting procedures explained in this chapter, the following items are required:

SPECIAL TOOLS AND MATERIALS

ITEM	DESCRIPTIONS
Belt Tension Meter	Required for replacement of some motors with timing belts. After motor/belt replacement, the tension of the belt needs to be adjusted. To measure belt tension, always use a tension meter "DOCTOR TENSION TYPE-I" that is available from the manufacturer of the timing belts. Call us for the tension meter.
Screw Driver	Phillips (cross) type, with the tip magnetized. Long shaft (30 cm will do). Size No.2.
Silicone Compound (HSC-50)	Required for replacement of Peltier element assemblies and IRU heater.
Liquid Gasket (1212)	Required for replacement of Peltier element assemblies.
Hex. Wrenches	Diagonal: 0.9 and 6 mm
Jigs	1. Plunger tip insertion die (25-012-4101-1) 2. PT nozzle height adjustment jig (25-012-9045-0) (used for RPT and SPT) 3. MIX height adjustment jig (25-012-9083-1) 4. MIX position adjustment jig (25-012-9111-0) 5. WU1 jig (25-012-9108-0) 6. WU7 jig (25-012-9107-0)

SEE ALSO:

Appendix C "Maintenance Parts List"	Lists the parts available for maintenance.
Appendix D "Wiring Diagrams"	Electrical connections of PC boards, sensors, motors, etc.
Appendix E "Fluidic System Diagram"	Fluidic connections of tubes, pumps, valves, etc.
Appendix G "Test Points and LED's"	Shows the connector locations.

2. Covers and Mosaic Plates

WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER (ANALYZER) IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

A. Removing Covers

See Figure 10-1.

(1) Remove the rear cover by removing the six screws (M4).

(2) Remove the top cover by removing the two screws (M4).

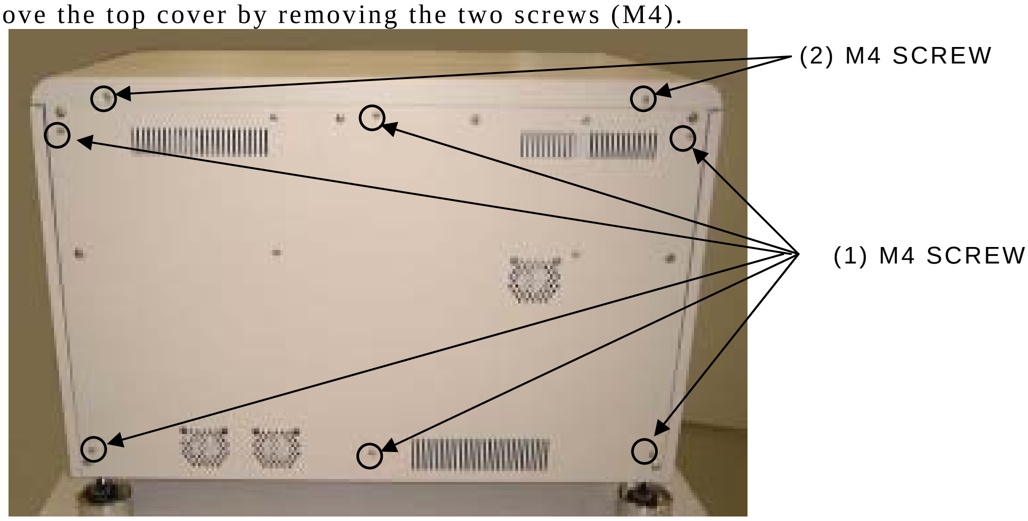


Figure 10-1A

(3) Remove the tube cover by loosening the two screws (M3x8) which are located inside the upper frame. The WU tubes are unfastened.

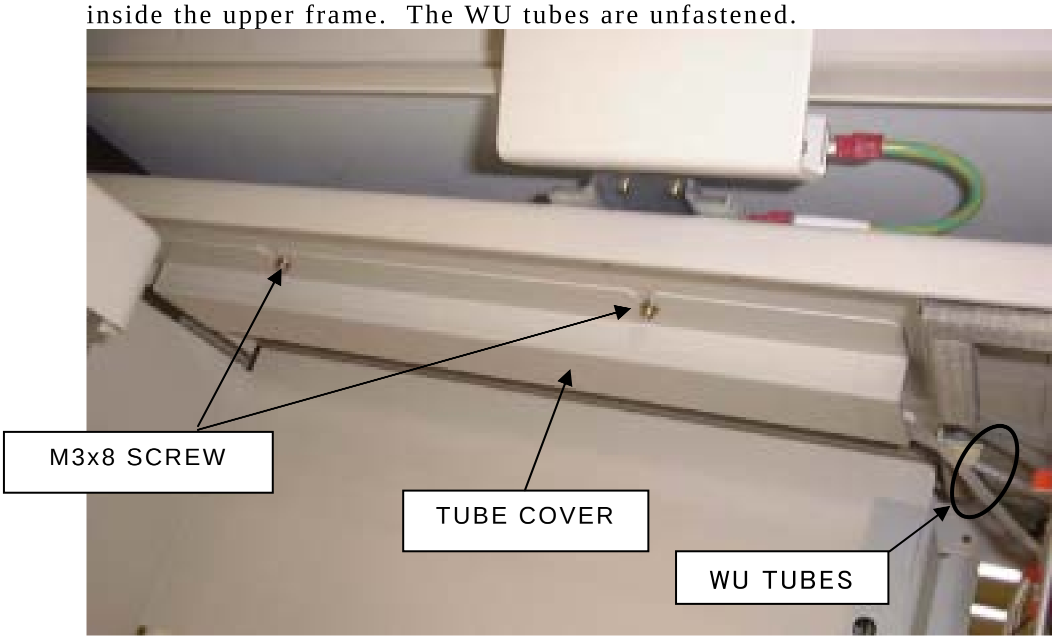


Figure 10-1B

(4) Remove the six screws (M4x8) which are located outside the upper frame.

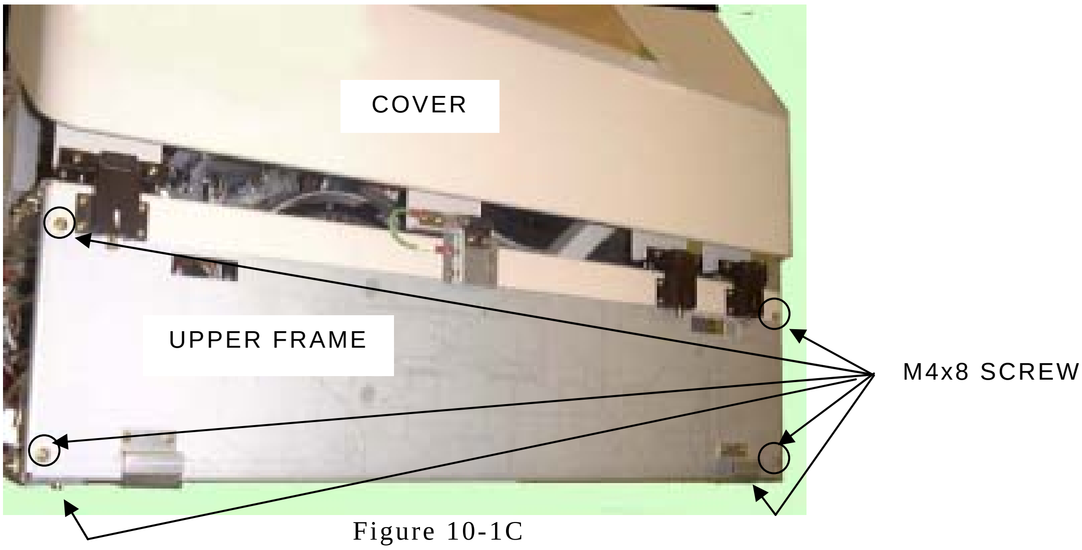


Figure 10-1C

(5) Remove the upper frame with the cover by removing the two screws (M3x8) and the two screws (M4x8).

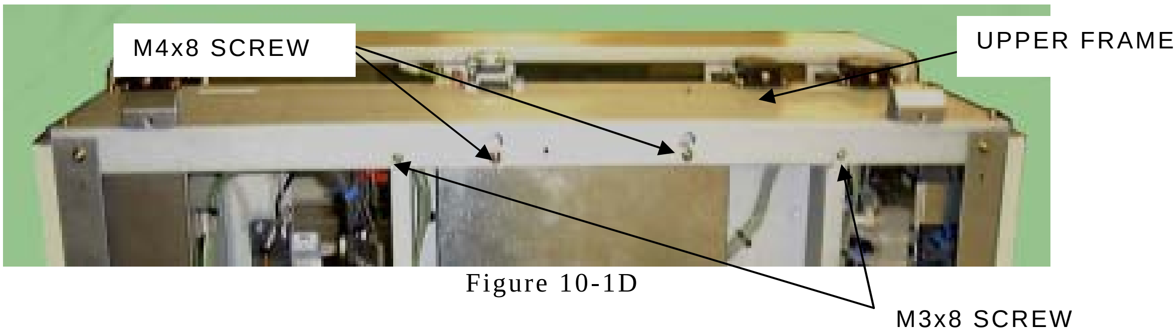
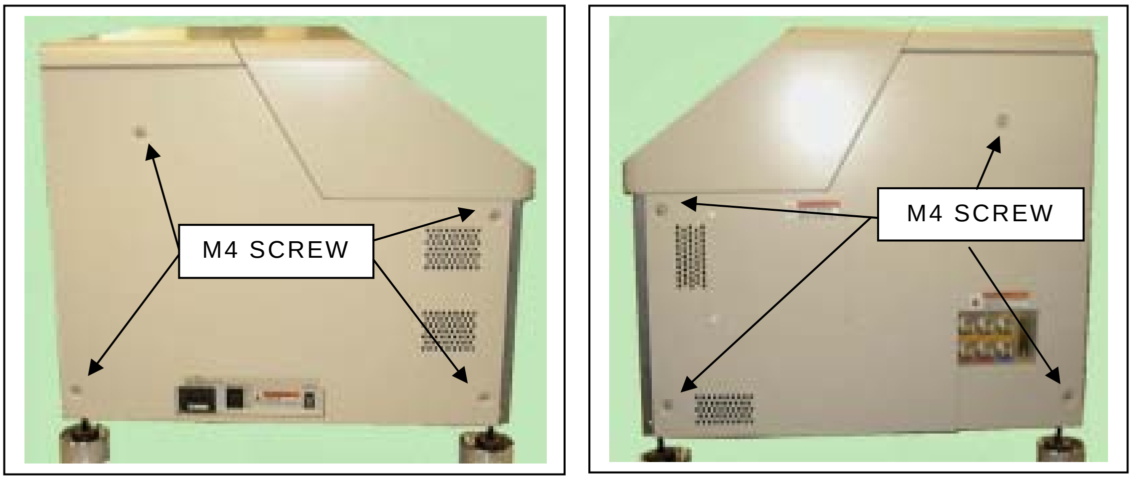


Figure 10-1D

(6) Remove the left cover by removing the four screws (M4).
(7) Remove the right cover by removing the four screws (M4).



LEFT COVER RIGHT COVER

Figure 10-1E

(8) Remove the front cover by removing the two screws (M3).

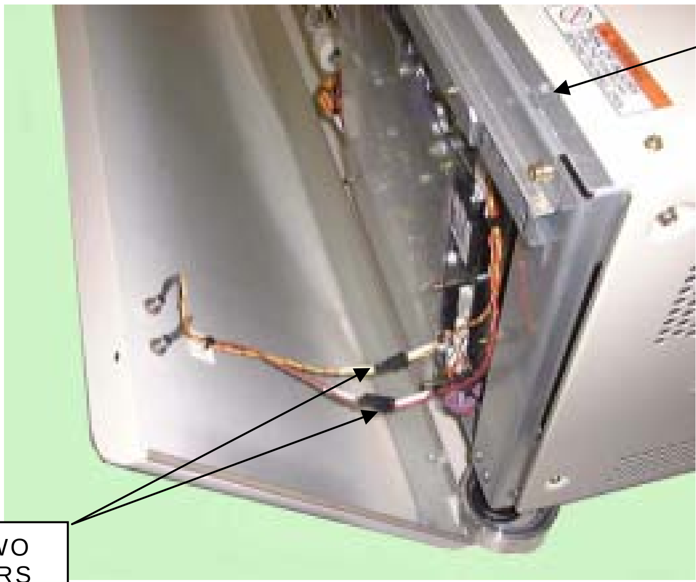


Figure 10-1F

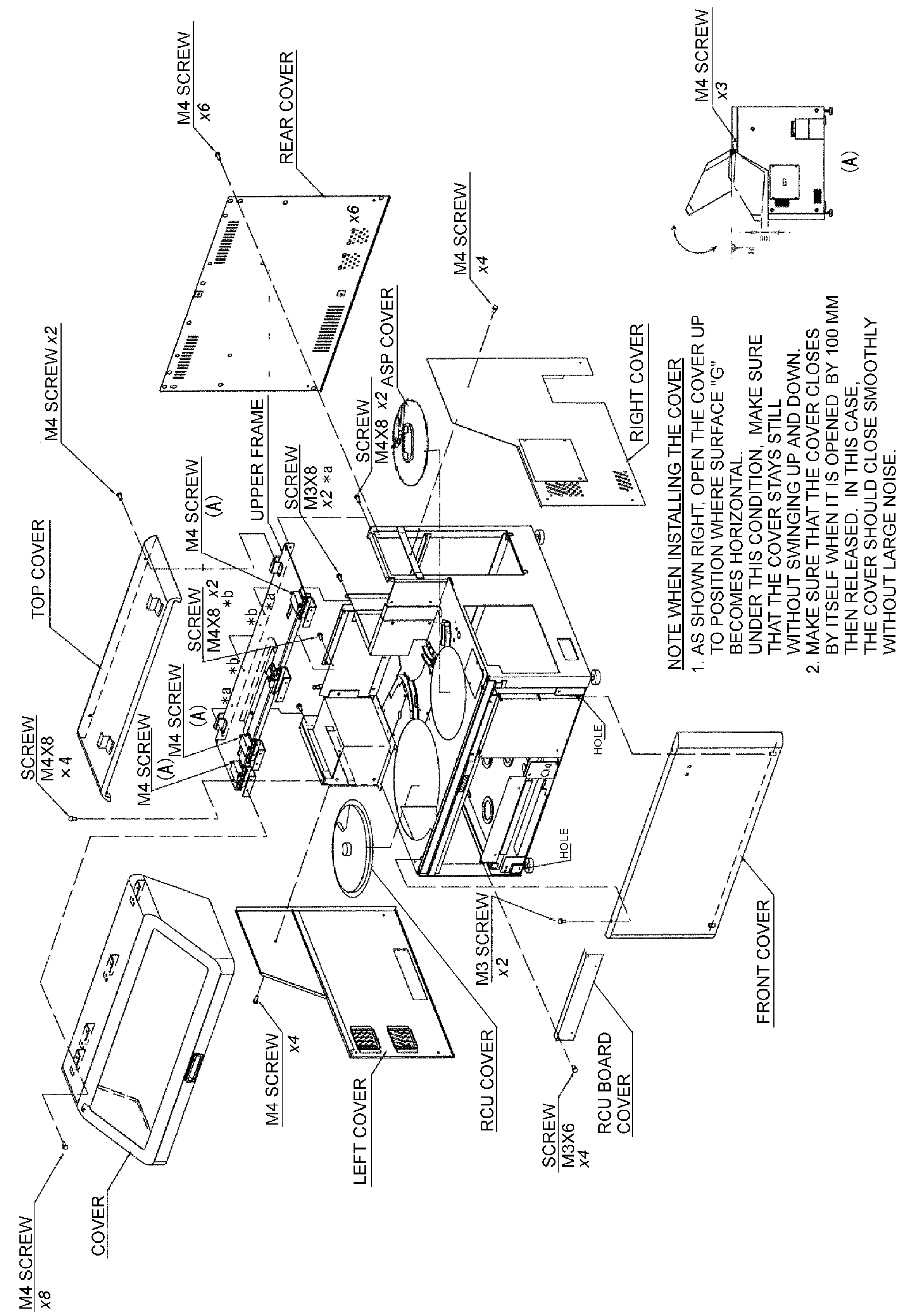

M4 SCREW x6
REAR COVER
M4 SCREW x2
TOP COVER
SCREW M4X8 x 4
M4 SCREW (A)
M4 SCREW (A)
SCREW M4X8 x2 *b
M4 SCREW (A)
UPPER FRAME
SCREW M3X8 x2 *a
SCREW M4X8 x2
ASP COVER
M4 SCREW x4
RIGHT COVER
M4 SCREW x3
(A)
NOTE WHEN INSTALLING THE COVER
1. AS SHOWN RIGHT, OPEN THE COVER UP TO POSITION WHERE SURFACE "G" BECOMES HORIZONTAL.
UNDER THIS CONDITION, MAKE SURE THAT THE COVER STAYS STILL WITHOUT SWINGING UP AND DOWN.
2. MAKE SURE THAT THE COVER CLOSES BY ITSELF WHEN IT IS OPENED BY 100 MM THEN RELEASED. IN THIS CASE, THE COVER SHOULD CLOSE SMOOTHLY WITHOUT LARGE NOISE.
HOLE
HOLE
M4 SCREW x8
COVER
M4 SCREW x4
LEFT COVER
RCU COVER
M3 SCREW x2
SCREW M3X6 x4
RCU BOARD COVER
FRONT COVER

Figure 10-1G

B. Removing Mosaic Plates

See Figure 10-2.

(1) Remove the mosaic plate 1 by removing the two screws (M3).

(2) Remove the RPT guide by loosening the two screws (M3).

(3) Remove the mosaic plate 4 by removing the two screws (M3).

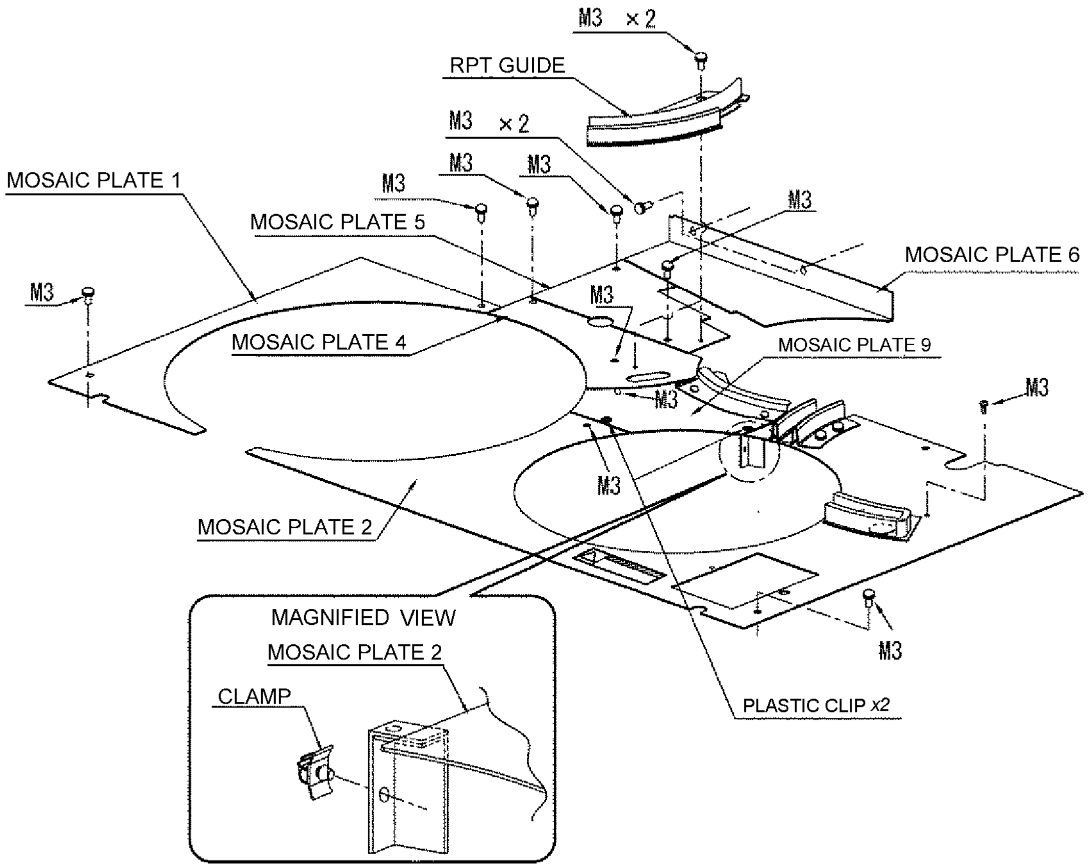
(4) Remove the mosaic plate 5 by removing the two screws (M3).

(5) Remove the mosaic plate 6 by loosening the two screws (M3).

(6) Remove the mosaic plate 9 by loosening the one screw (M3) and removing the two plastic clips.

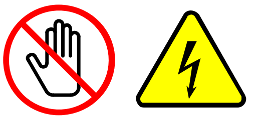
(7) Disengage the cable of the halogen lamp (of DTR) from the clamp on the mosaic plate 2.

(8) Remove the mosaic plate 2 by removing the two screws (M3).



MOSAIC PLATES
Figure 10-2

3. ASP (Auto Sampler Unit)



WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

A. Dismounting ASP

(1) Open the cover. See Figure 10-1G.

(2) Remove the front cover by removing the two screws (M3). Disconnect the two LED connectors. See Figure 10-1F.

(3) Remove the RCU board cover by removing the four screws (M3x6). See Figure 10-1G.

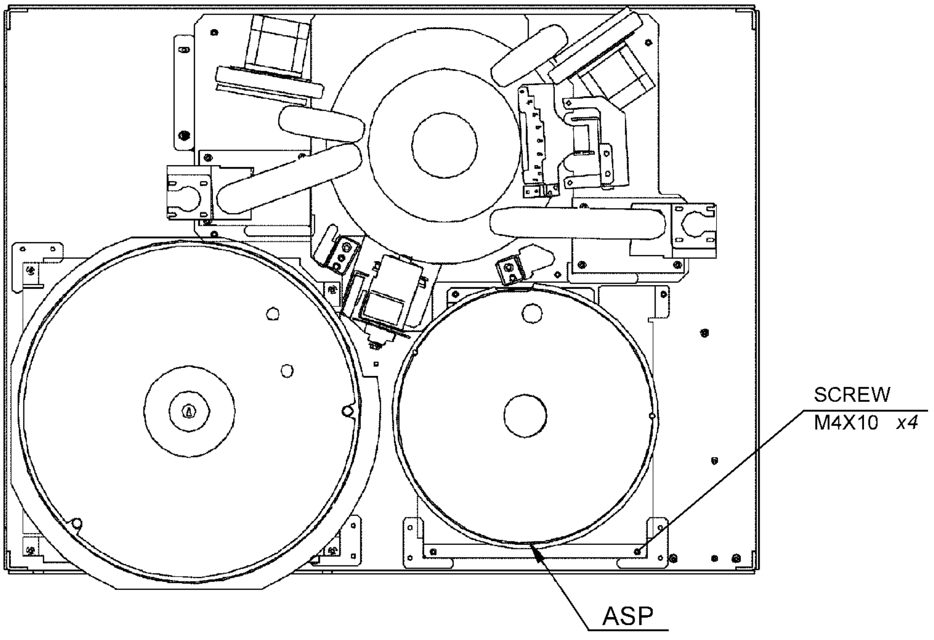
(4) Remove the ASP cover (lid). See Figure 10-1G.

(5) Remove the mosaic plate 9 by loosening the one screw (M3) and removing the two plastic clips. See Figure 10-2.

(6) Disengage the cable of the halogen lamp (of DTR) from the clamp on the mosaic plate 2. Remove the mosaic plate 2 by removing the two screws (M3).

(7) Disengage the connector cables from the clamps. Unplug the four connectors (CN201, CN202, CN203 and CN205) from the ASP/RCU_DRV board.

(8) Remove the four screws (M4x10) from the bottom plate. See Figure 10-3.



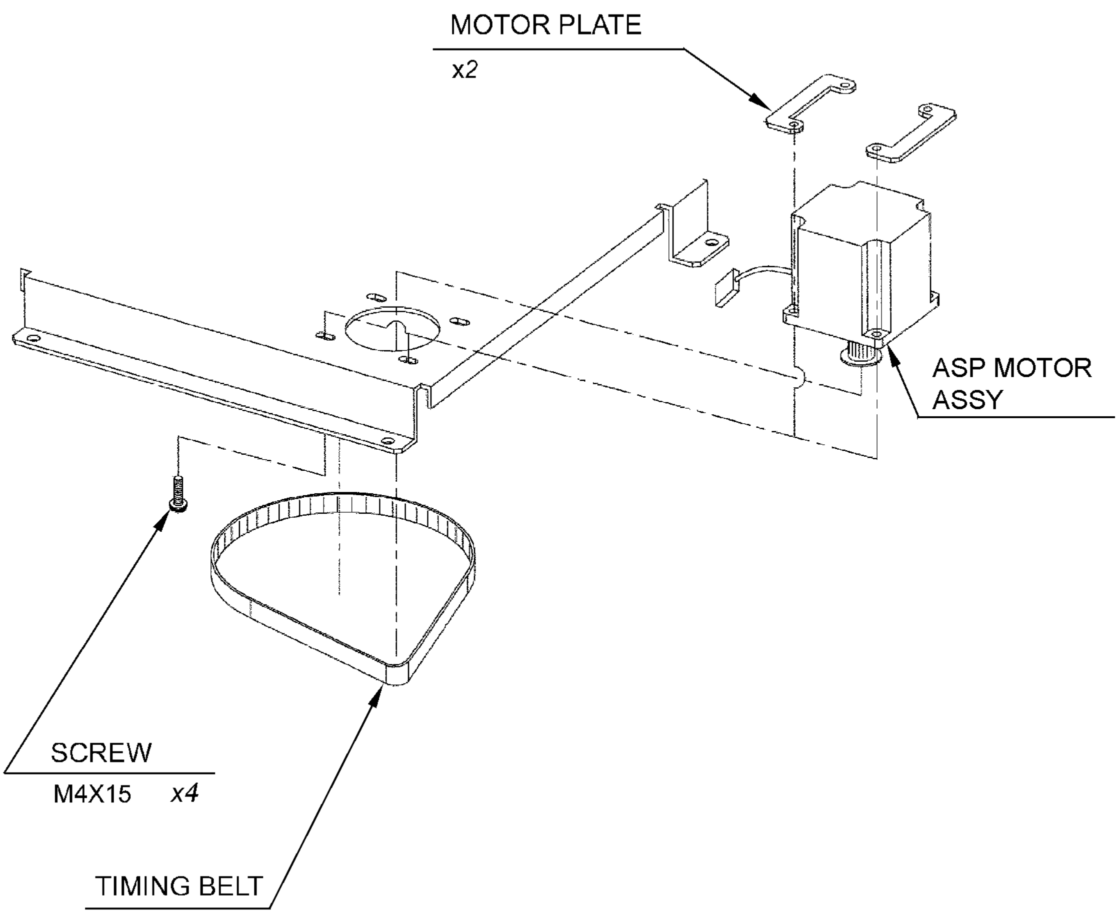
REMOVING M4X10 SCREWS
Figure 10-3

(9) Lift up the ASP to remove.

B. Dismounting ASP Motor

(1) Put the ASP upside down.

(2) Remove the ASP motor assembly by removing the four screws (M4x15) and two motor plates. At this stage the timing belt is also removable.

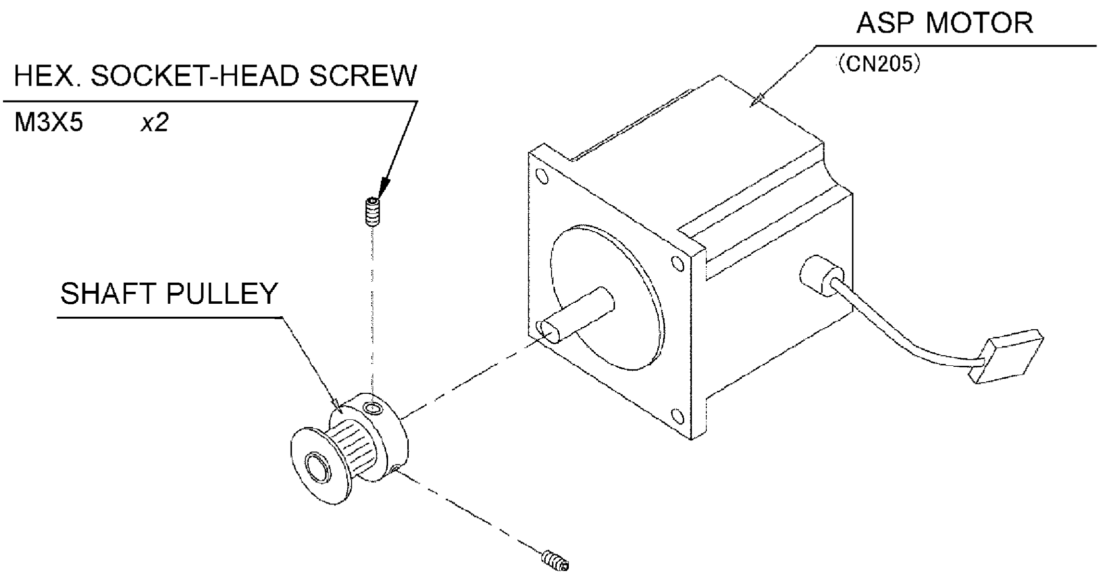


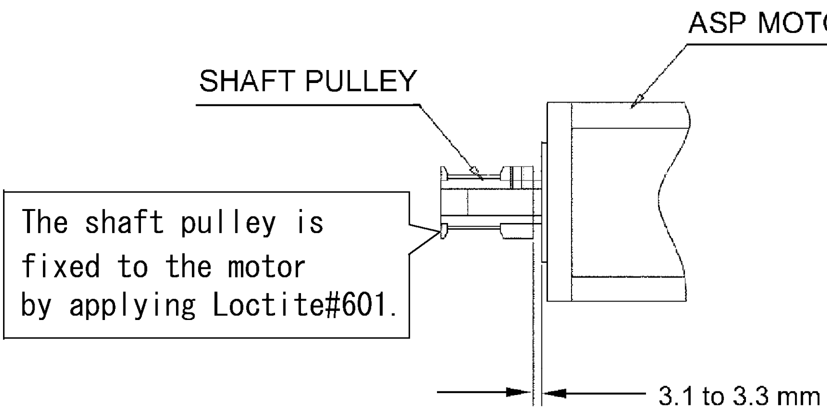
REMOVING ASP MOTOR ASSEMBLY AND TIMING BELT
Figure 10-4

Mounting ASP Motor

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the ASP motor.
The shaft pulley is built into the ASP motor as shown below.





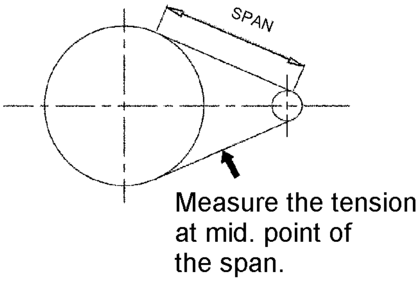
ASP MOTOR
Figure 10-5

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	10 mm
Belt Weight	0.013 kg/m
Belt Span	97 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screwdriver etc.



MEASURING BELT TENSION
Figure 10-6

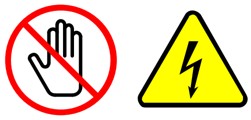
The belt tension must be 16.7 to 22.6 N.

(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

4. ISE (Ion Selectable Electrode)



WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES, GOGGLES, ETC TO PREVENT THE PENETRATION OF CONTAMINANTS.**

After removing the ASP as mentioned in “3.A.Dismounting ASP”, take the following steps.

A. Dismounting ISE

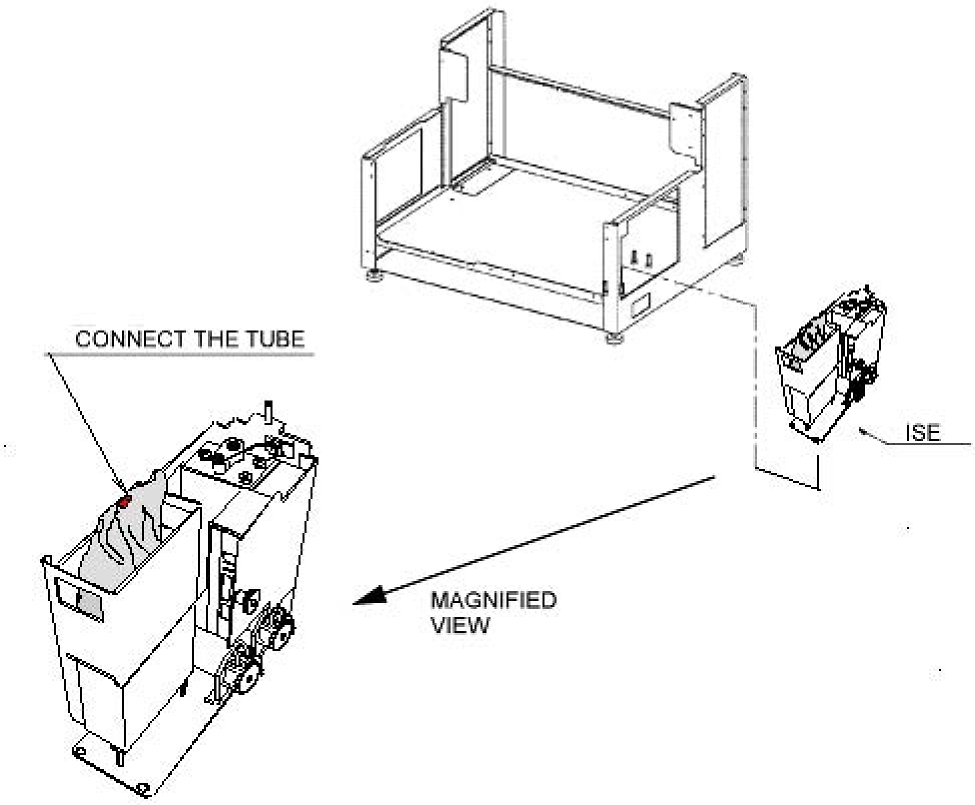
(1) Remove the right cover by removing the four screws (M4). See Figure 10-1E.

(2) Remove the four screws (M4x8) from the bottom plate as shown in Figure 10-7.

(3) Pull and disconnect the tube. See the magnified view in Figure 10-7.

(4) Unplug the connector (CN106) from the POWER-CN board.

(5) Lift up the ISE to remove.



ISE
Figure 10-7

B. Replacing Electrodes

<u>NOTE</u>: To replace electrodes, it is not necessary to remove the entire ISE from the Clinical Chemistry Analyzer.

(1) Preparation for electrode replacement

(a) Select "Job Menu", "Maintenance Program", then "Wash (F10)", and the following display will appear. Click on the "Start" button.

Figure 10-8

(b) Click on the "Start" button as instructed in step (a), and the following message will pop up.

Figure 10-9

(c) Click on the "OK" button, and the following message will pop up. At this point, the Clinical Chemistry Analyzer begins preparation for electrode exchange.

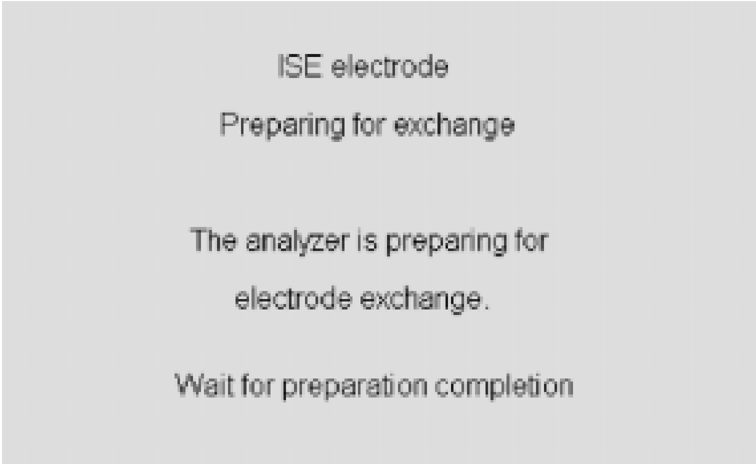


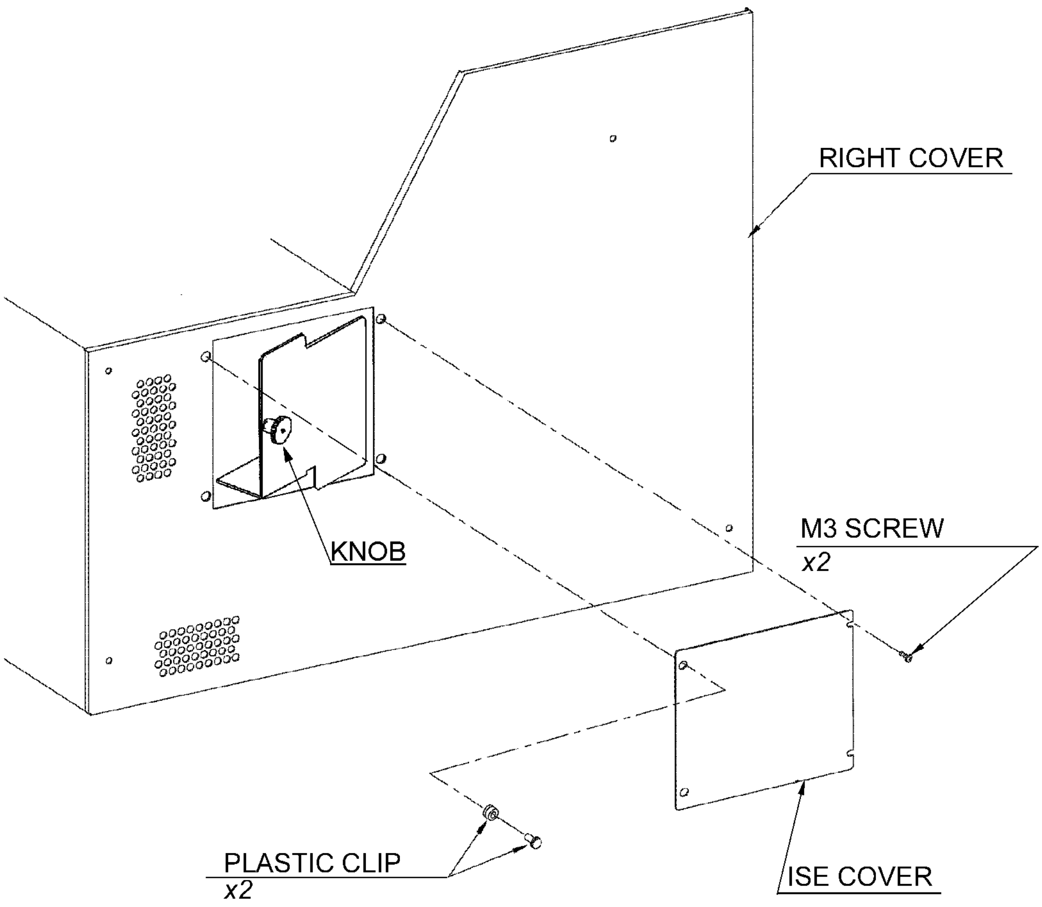
Figure 10-10

(d) When the Clinical Chemistry Analyzer completes the preparation, the following message will pop up. Click on the "Shut down" button, and the Clinical Chemistry Analyzer will begin its power off procedure.

Figure 10-11

(e) When power off procedure of the user interface PC completes, turn off the Power Switch of the Clinical Chemistry Analyzer.
At this stage, preparation for electrode exchange is completed.

(2) Remove the ISE cover by loosening the two screws (M3) and removing the two plastic clips.



REMOVING ISE COVER
Figure 10-12

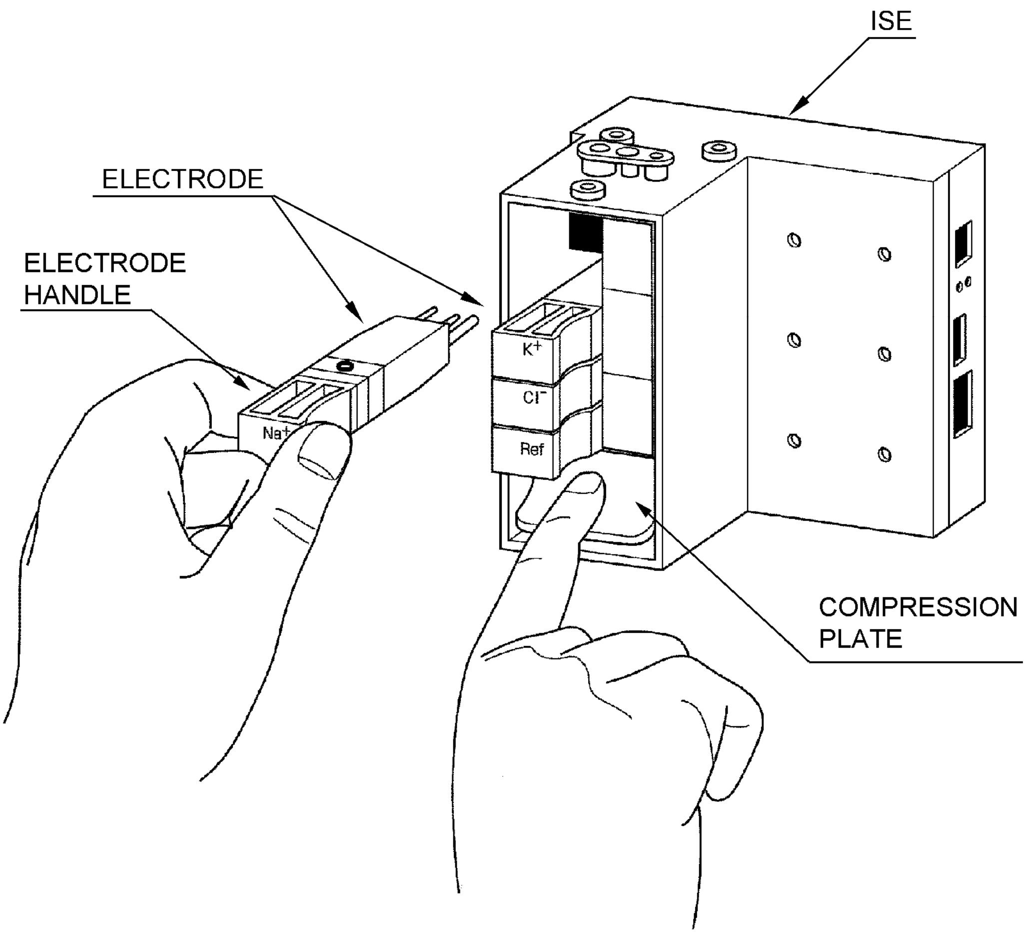
(3) Pull the knob to gain access to the electrodes.

(4) Depress the compression plate in order to release the compression on the electrodes. See Figure 10-13.

(5) Pull out the electrode while holding its handle. There are four electrodes (Na, K, Cl and Ref).

(6) Insert a new electrode in position while pressing the compression plate. Depressing the compression plate makes the insertion easier.

NOTE 1) Setting order of electrode: Ref, Cl, K and Na upward.
NOTE 2) Remove a brown tube stuck in Reference electrode hole just after opening a new electrode package.

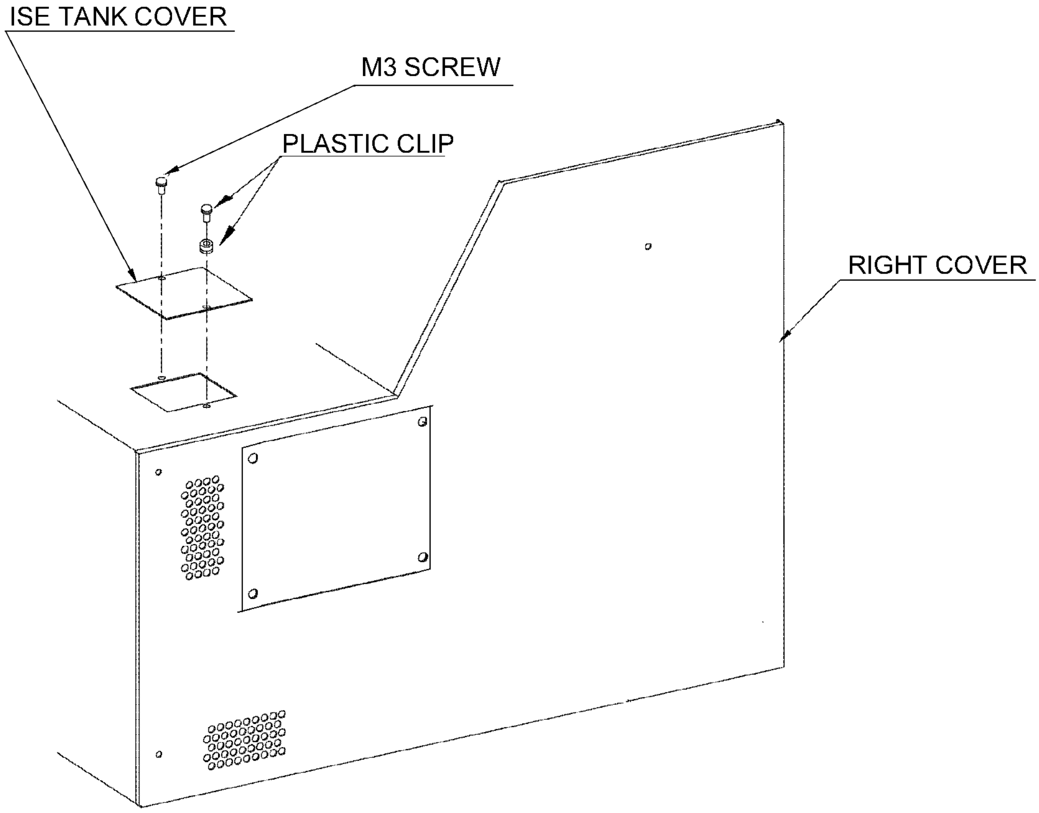


REPLACING ELECTRODE
Figure 10-13

C. Replacing Calibrant A Bag

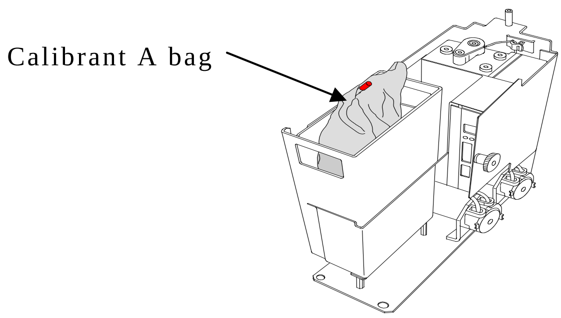
NOTE: To replace the calibrant A bag, it is not necessary to remove the entire ISE from the Clinical Chemistry Analyzer.

(1) Remove the ISE tank cover by loosening the one screw (M3) and removing the one plastic clip. See Figure 10-14.



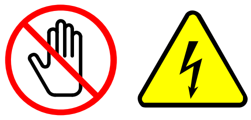
REMOVING ISE TANK COVER
Figure 10-14A

(2) Replace the calibrant A bag with a new one. Execute "ISE Prime" more than 10 times.



CALIBRANT A BAG
Figure 10-14B

D. Replacing Pump Cassette (2 places)



WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES, GOGGLES, ETC TO PREVENT THE PENETRATION OF CONTAMINANTS.**

For proper operation of ISE, replacement of pump cassettes on a regular basis is required. You can check operating hours of ISE by the [Maintenance] menu screen - [Wash (F10)] - "Working Hour Counters".

(1) Pull out the liquid supply tube from the short thick tube that is added to the tip of bag and prime ISE more than 5 times to purge the liquid from the flow path.

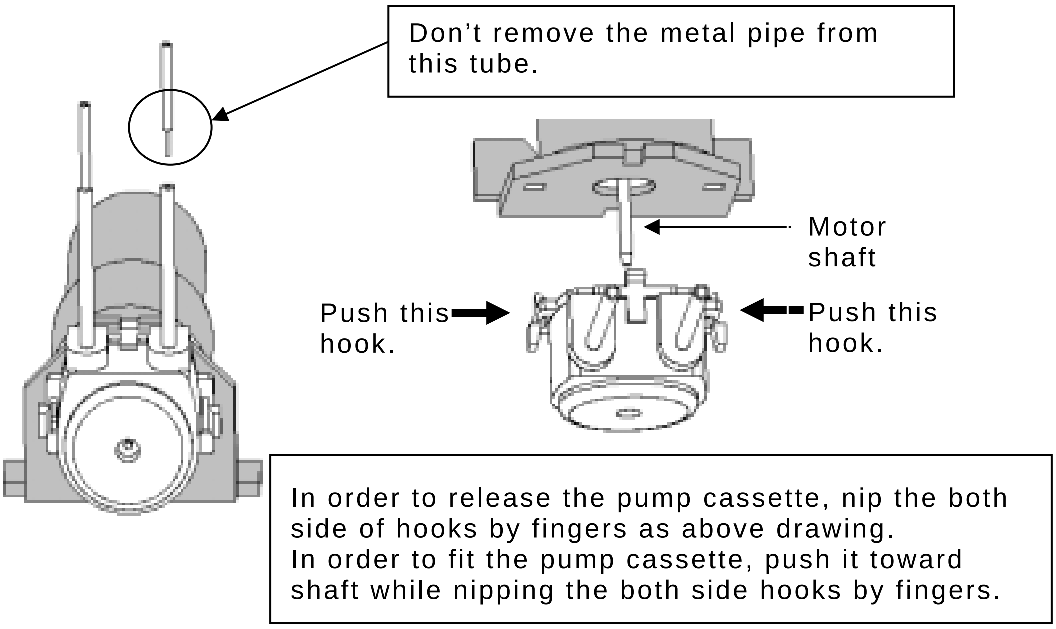
Figure 10-15A

(2) Click on “Shut down” to terminate the analyzers software on PC and then turn the power analyzer off.

(3) Remove the right side cover of analyzer and swing out ISE unit.

(4) Pull out two tubes of pump cassette from the connection parts.

(5) Release the pump cassette from the motor shaft by pressing two hooks at both side of pump cassette with fingers. (See the following drawings.)



(6) Replace the pump cassette.
When replacing, replace both cassettes at the same time.

Beware that there is no markings on the tubes for the cassette. Exchange the cassette carefully not to make wrong tube connection.

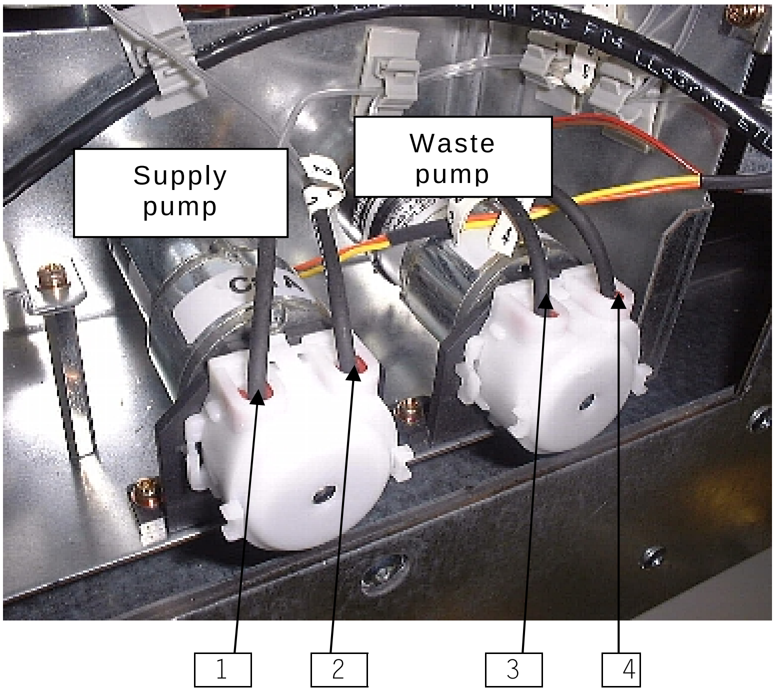


Figure 10-15B

Tube marker
1 : Output of the supply pump
(This line is connected to the sample port of ISE unit.)
2 : Input of the supply pump.
(This line is connected to the bag of Calibrant-A.)
3 : Output of the drain pump.
(This line is connected to the external drain tank.)
4 : Input of the drain pump.
(This line is connected to the termination port of ISE unit.)

(7) Attach the bottle cap for Calibrant-A bag and turn on the power for analyzer.
Then prime the ISE 99 times.
(During the ISE priming, check whether the fluid flows correctly into the each tube and the liquid leaking is not occurred at tube connection.)
After confirming that ISE is properly functioning, attach side covers.

(8) Reset the working hour of pump cassette at function menu [Wash (F10), Page:1/2] of the job menu [Maintenance].

5. RCU (Reagent Container Unit)

WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER (ANALYZER) IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

After removing the ASP as mentioned in "3.A.Dismounting ASP", take the following steps.

A. Dismounting RCU

(1) Remove the RCU cover (lid). See Figure 10-1G.

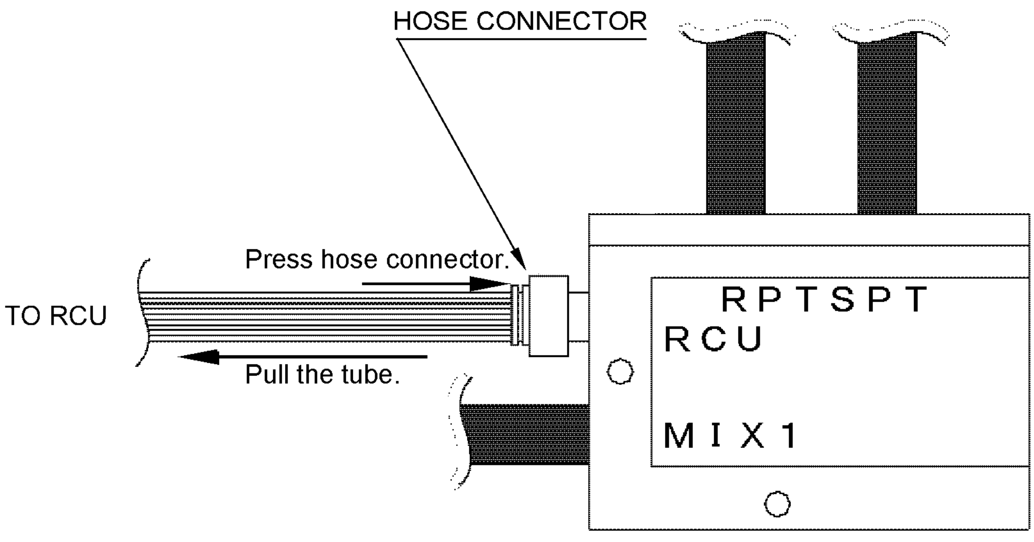
(2) Remove the mosaic plate 1 by removing the two screws (M3). See Figure 10-2.

(3) Remove the RPT guide by loosening the two screws (M3). See Figure 10-2.

(4) Remove the mosaic plate 4 by removing the two screws (M3). See Figure 10-2.

(5) Unplug the two connectors (CN101 and CN209) from the ASP/RCU_DRV board.

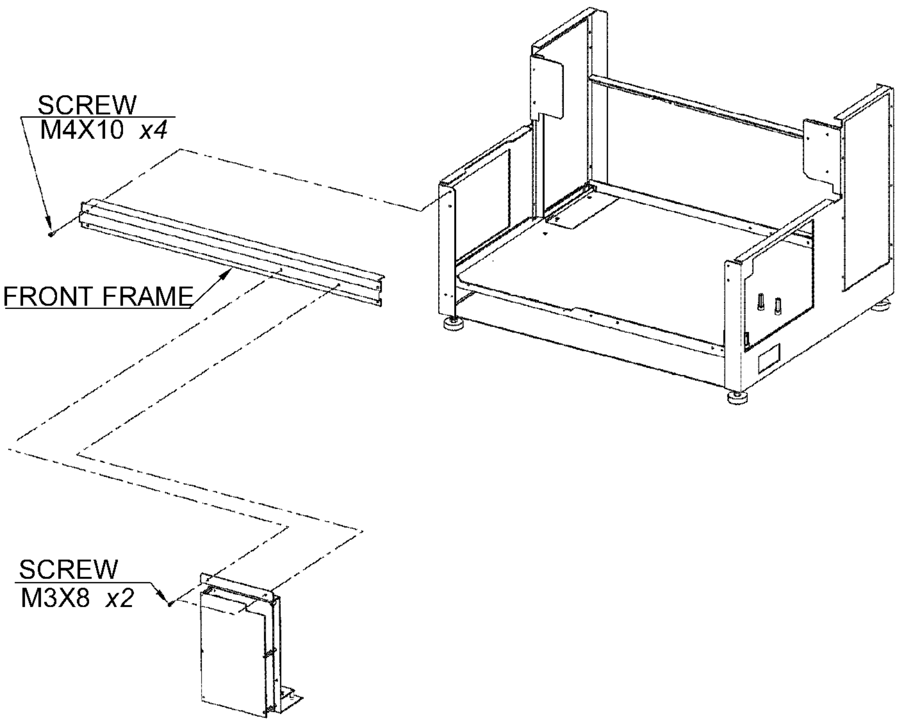
(6) Pull out the tube while pushing the hose connector as shown below.



DISCONNECTING TUBE
Figure 10-16

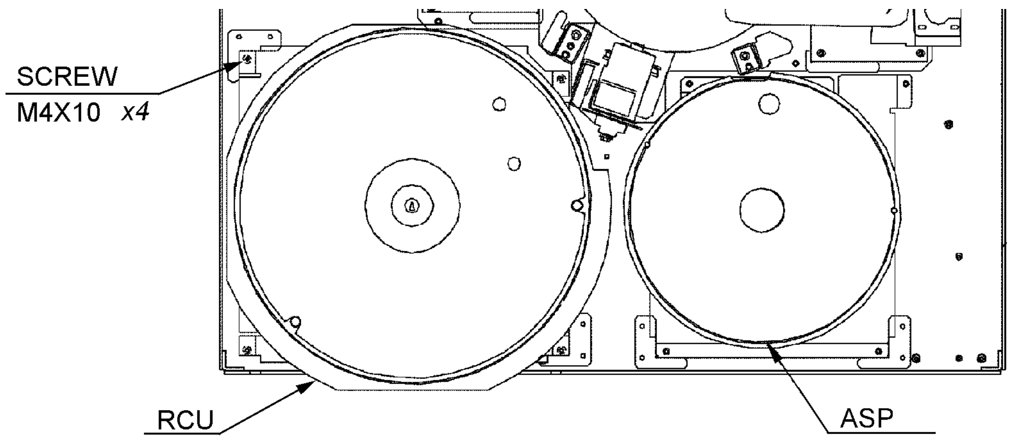
(7) Remove the two screws (M3x8) from the front frame. See Figure 10-17.

(8) Remove the front frame by removing the four screws (M4x10).



REMOVING FRONT FRAME
Figure 10-17

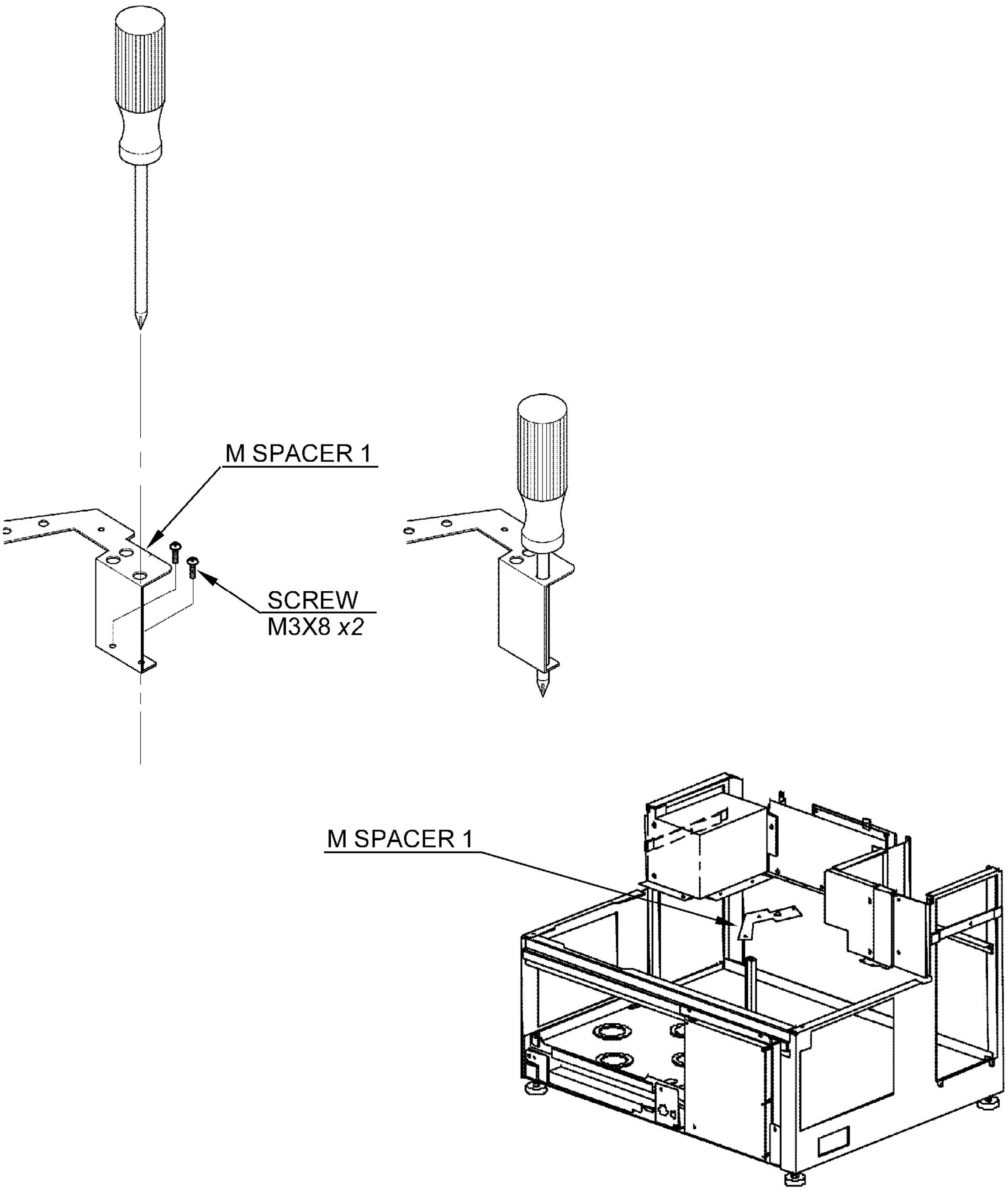
(9) Remove the four screws (M4x10) from the bottom plate.



REMOVING M4X10 SCREWS
Figure 10-18

(10) Remove the mosaic plate 5 by removing the two screws (M3). See Figure 10-2.

(11) Remove the M spacer 1 from the IRU by removing the two screws (M3x8) as shown below.



REMOVING M SPACER 1
Figure 10-19

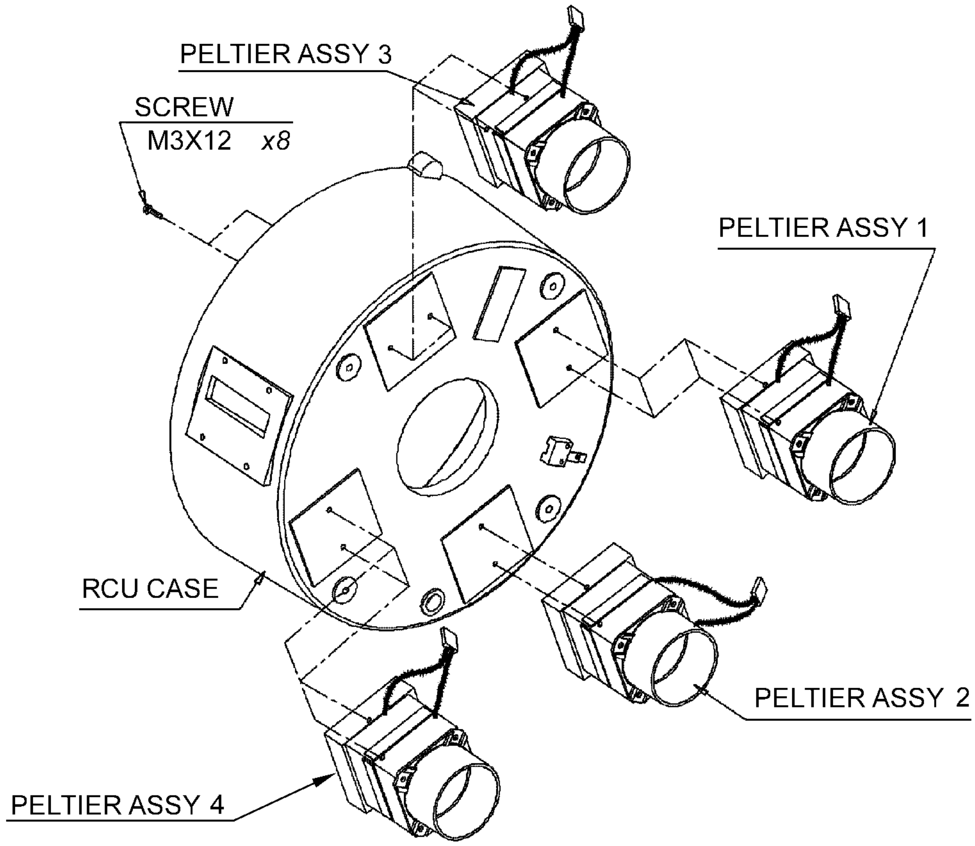
(12) Lift up the RCU to remove.

B. Dismounting Peltier Element Assemblies (1 through 4)

(1) Put the RCU upside down.

(2) Unplug the four connectors (CN210A, CN211A, CN212A and CN213A).

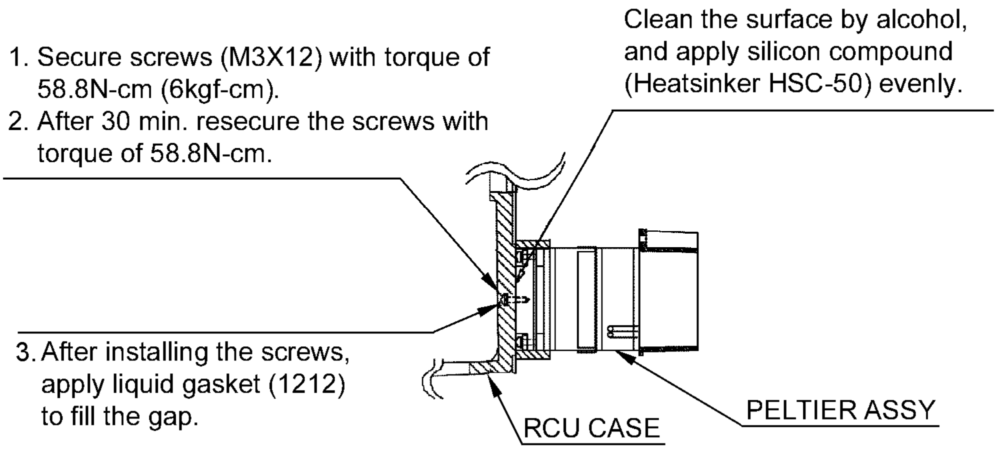
(3) Remove the four Peltier element assemblies (1 through 4) by removing the eight screws (M3x12).



REMOVING PELTIER ASSEMBLIES
Figure 10-20

Mounting Peltier assemblies

When mounting the Peltier assemblies, pay attention to the following points.

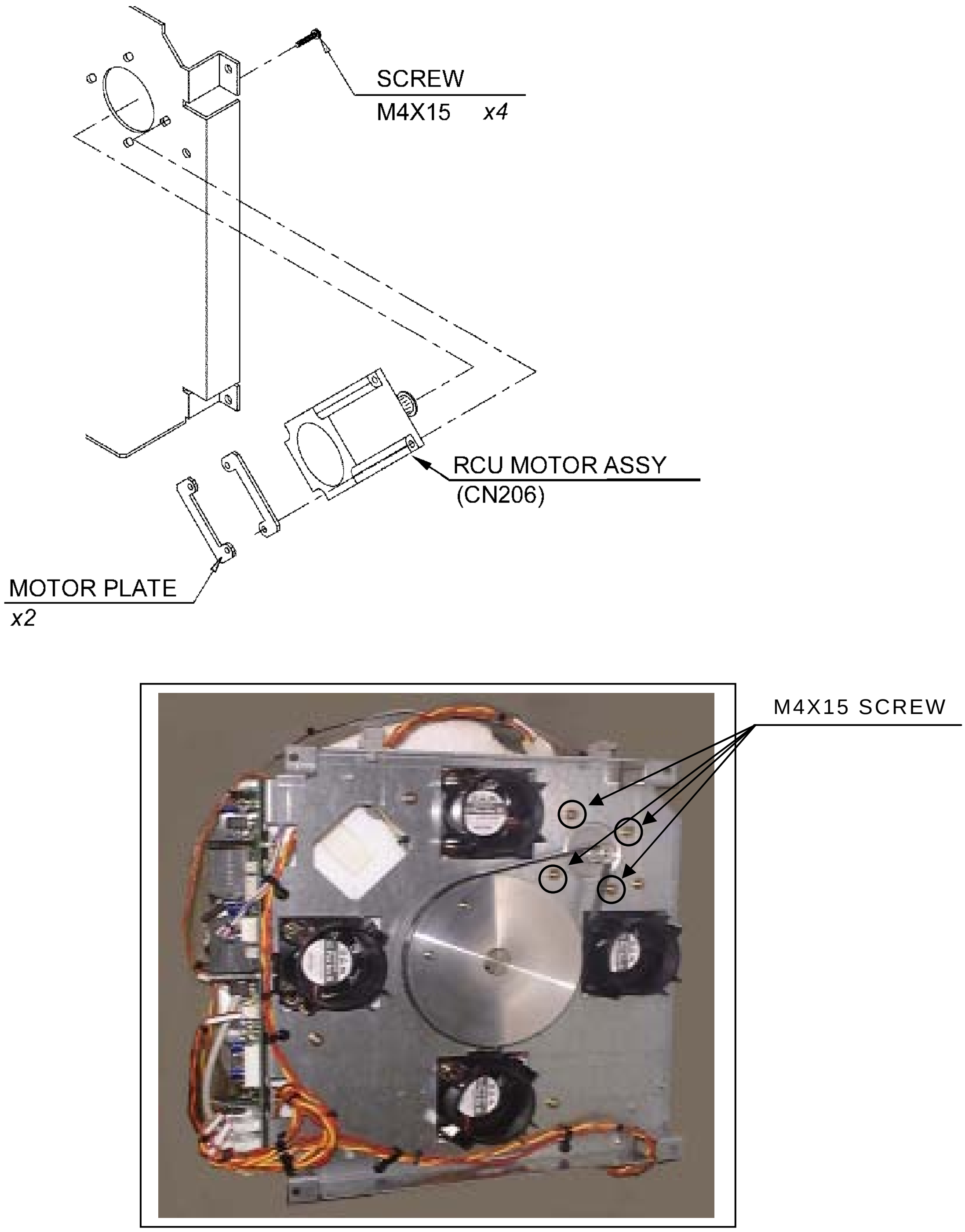


NOTES ON MOUNTING PELTIER ASSEMBLIES
Figure 10-21

C. Dismounting RCU Motor

(1) Put the RCU upside down.

(2) Remove the RCU motor assembly by removing the four screws (M4x15) and two motor plates. At this stage the timing belt is also removable.

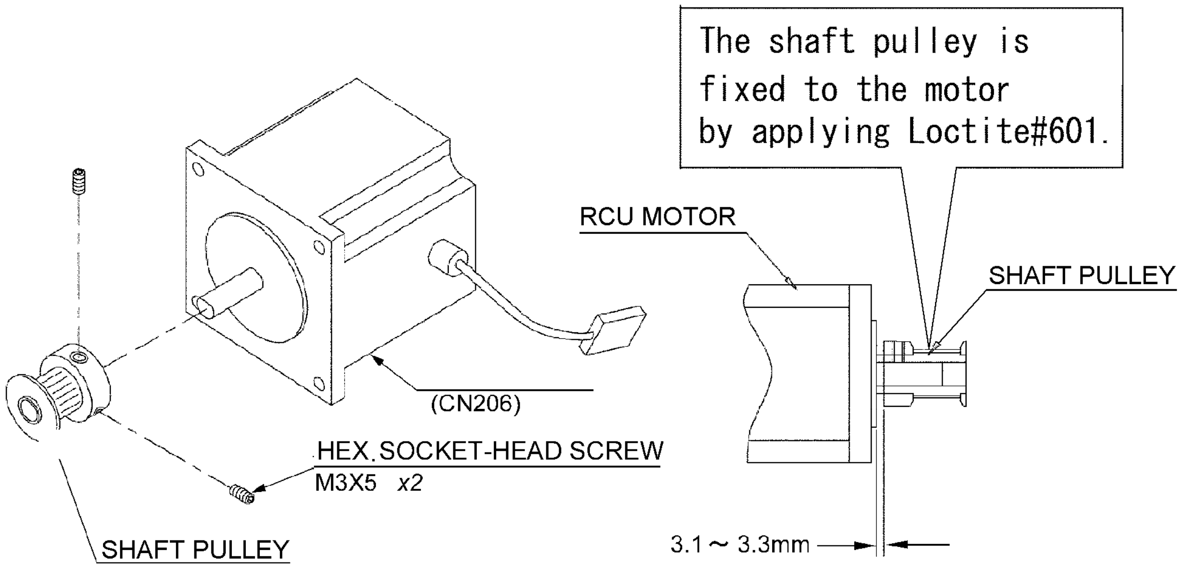


REMOVING RCU MOTOR ASSEMBLY
Figure 10-22

Mounting RCU Motor

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the RCU motor.
The shaft pulley is built into the RCU motor as shown below.



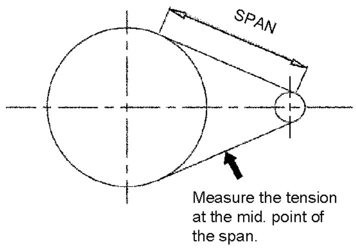
RCU MOTOR
Figure 10-23

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	10 mm
Belt Weight	0.013 kg/m
Belt Span	97 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screw driver etc.



MEASURING BELT TENSION
Figure 10-24

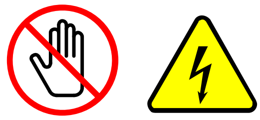
The belt tension must be 16.7 to 22.6 N.

(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

6. RPT (Reagent Pipette Unit)



WARNING

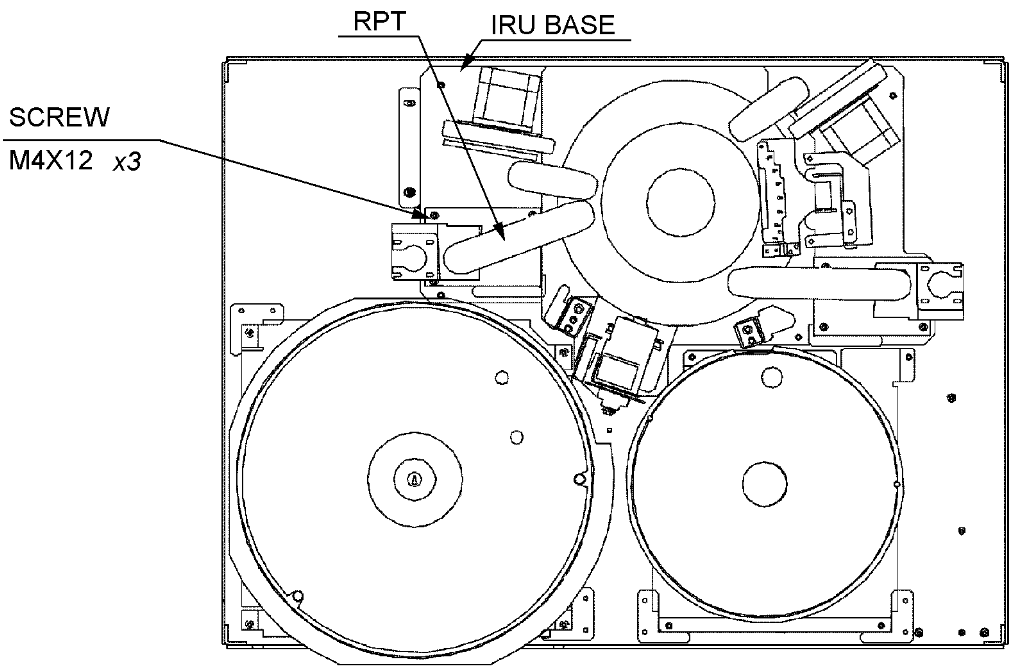
- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

After removing the RCU as mentioned in "5. A. Dismounting RCU", take the following steps.

A. Dismounting RPT

(1) Remove the mosaic plate 6 by removing the two screws (M3). See Figure 10-2.

(2) Remove the three screws (M4x12) from the IRU base.



REMOVING M4X12 SCREWS
Figure 10-25

(3) Remove the rear cover by removing the six screws (M4). See Figure 10-1A.

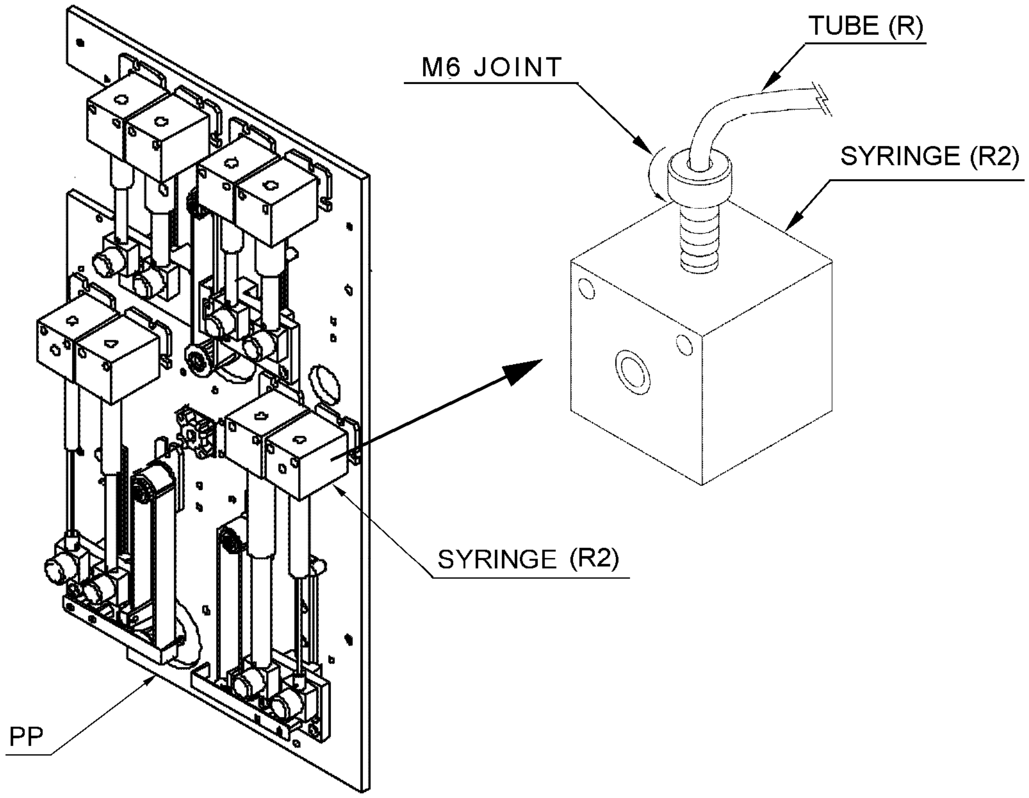
(4) Unplug the connector (CN324) from the IRU_CN1 board.

(5) Unplug the two connectors (CN333 and CN334) from the IRU_DRV board.

(6) Remove the left cover by removing the four screws (M4). See Figure 10-1E.

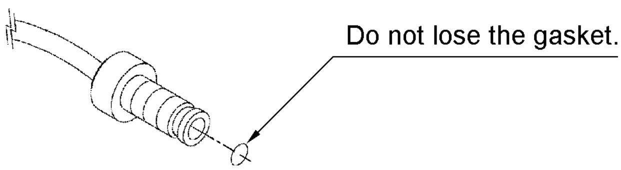
(7) Remove the M6 joint of the syringe (R2) as shown below.

NOTE: If the M6 joint is too tight to loosen, use long-nose pliers. When using long-nose pliers, cover the M6 joint with a cloth to prevent damage.



REMOVING M6 JOINT
Figure 10-26

(8) Pull and disconnect the tube (R) from the syringe (R2) of the PP.



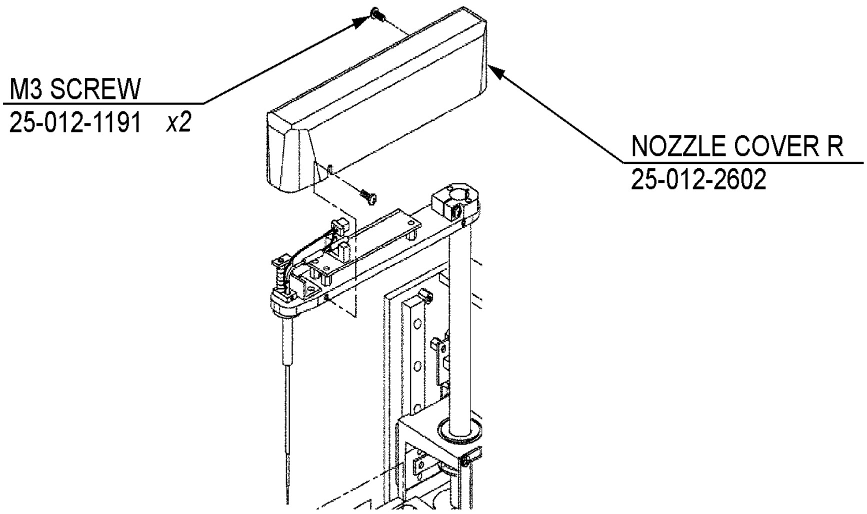
PULLING OUT TUBE (R)
Figure 10-27

At this stage the RPT is removable.

B. Dismounting RPT Nozzle Assembly

(1) Move the pipette to the position where the work can be carried easily.

(2) Loosen two M3 screws and remove the arm cover.

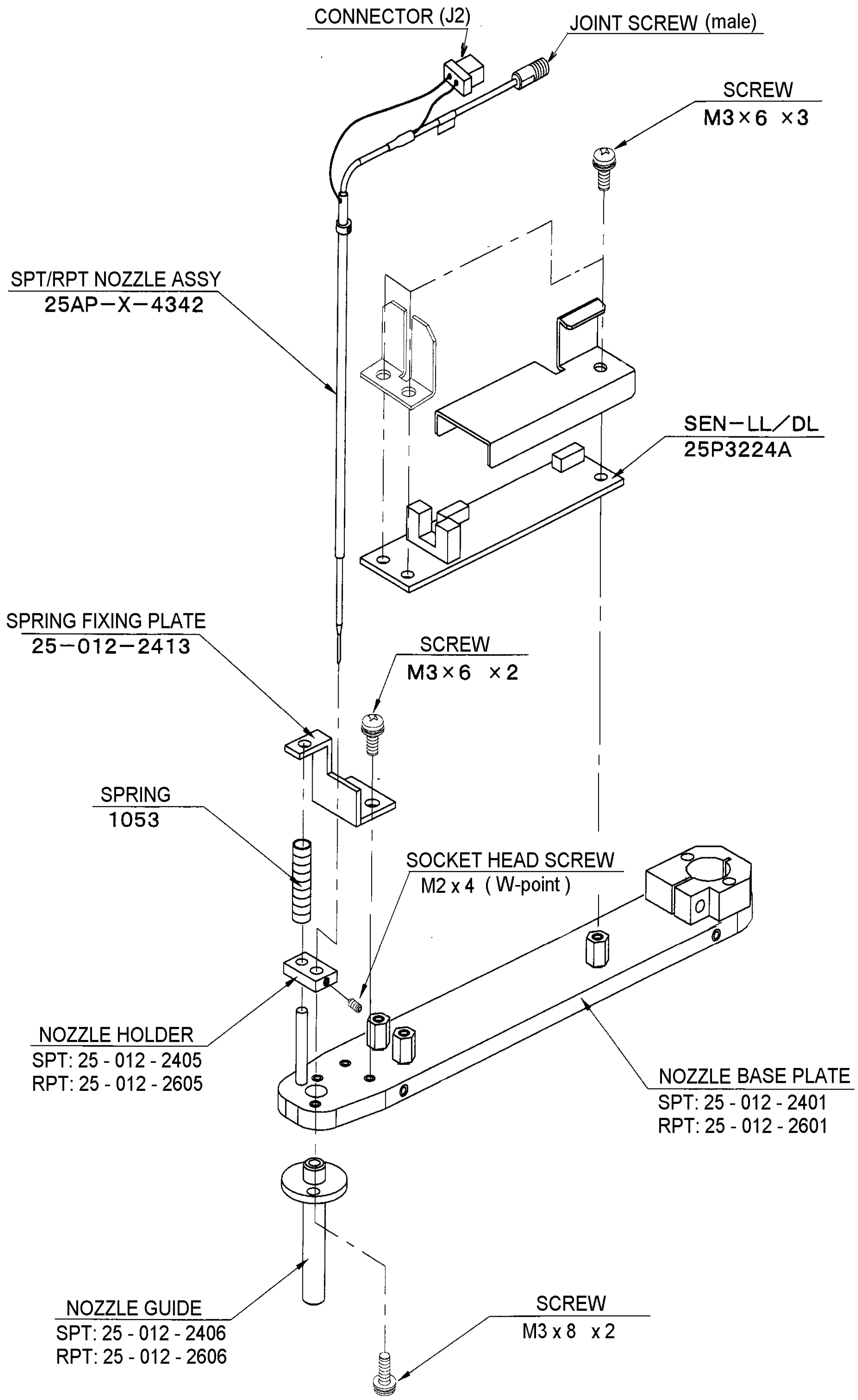


(3) Disconnect plugs (J2) from the PCB on the nozzle base plate.

(4) Unfasten the tube joint screw and separate nozzle assy and rsin tube.

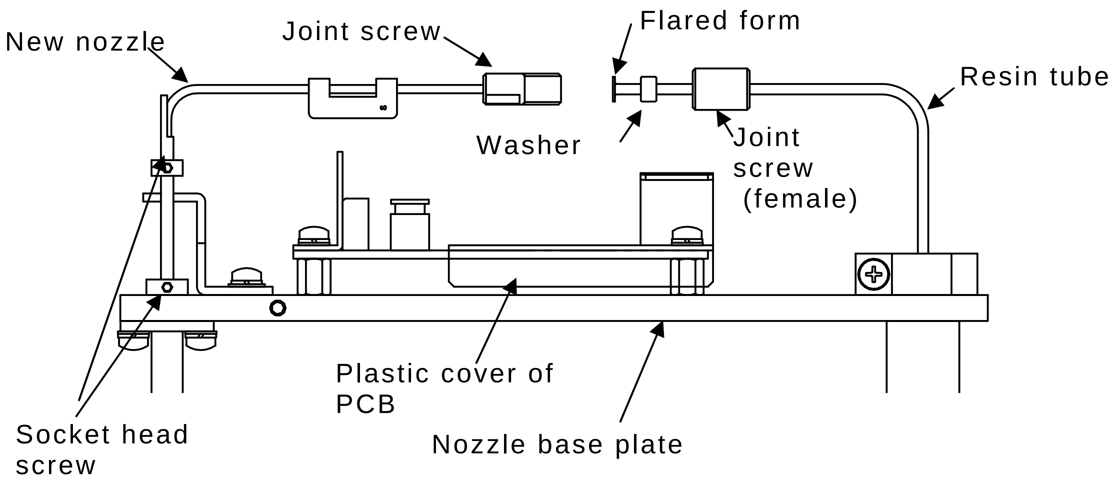
(5) Loosen the socket head screw (W-point, M2x4) of the nozzle holder.

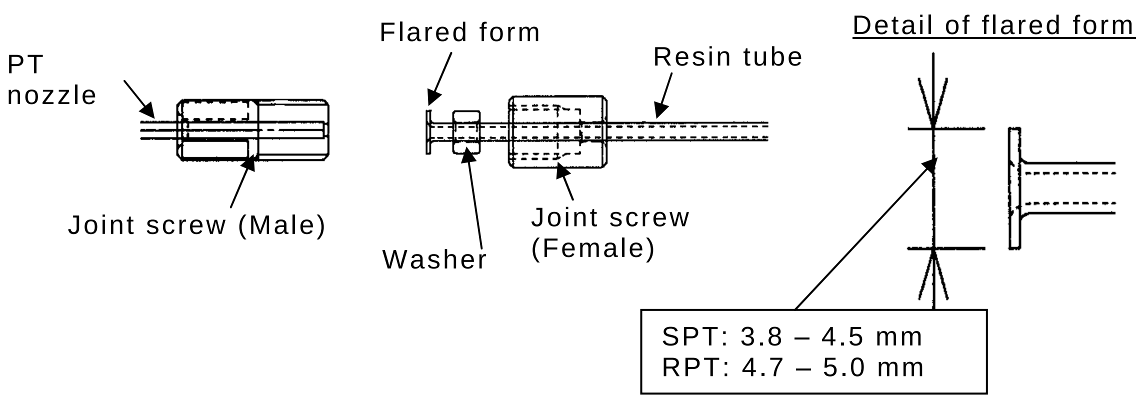
(6) Remove the pipette nozzle from the nozzle base plate while the nozzle is lifted up.



CONNECTOR (J2)
JOINT SCREW (male)
SCREW
M3×6 ×3
SPT/RPT NOZZLE ASSY
25AP−X−4342
SEN−LL/DL
25P3224A
SPRING FIXING PLATE
25−012−2413
SCREW
M3×6 ×2
SPRING
1053
SOCKET HEAD SCREW
M2 x 4 (W-point)
NOZZLE HOLDER
SPT: 25 - 012 - 2405
RPT: 25 - 012 - 2605
NOZZLE BASE PLATE
SPT: 25 - 012 - 2401
RPT: 25 - 012 - 2601
NOZZLE GUIDE
SPT: 25 - 012 - 2406
RPT: 25 - 012 - 2606
SCREW
M3 x 8 x 2

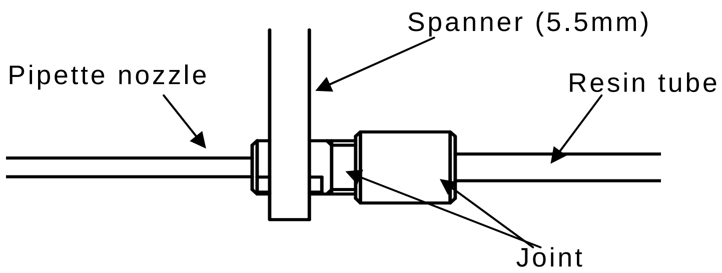
(7) Set the new pipette nozzle with joint screw (male) to the nozzle base plate.





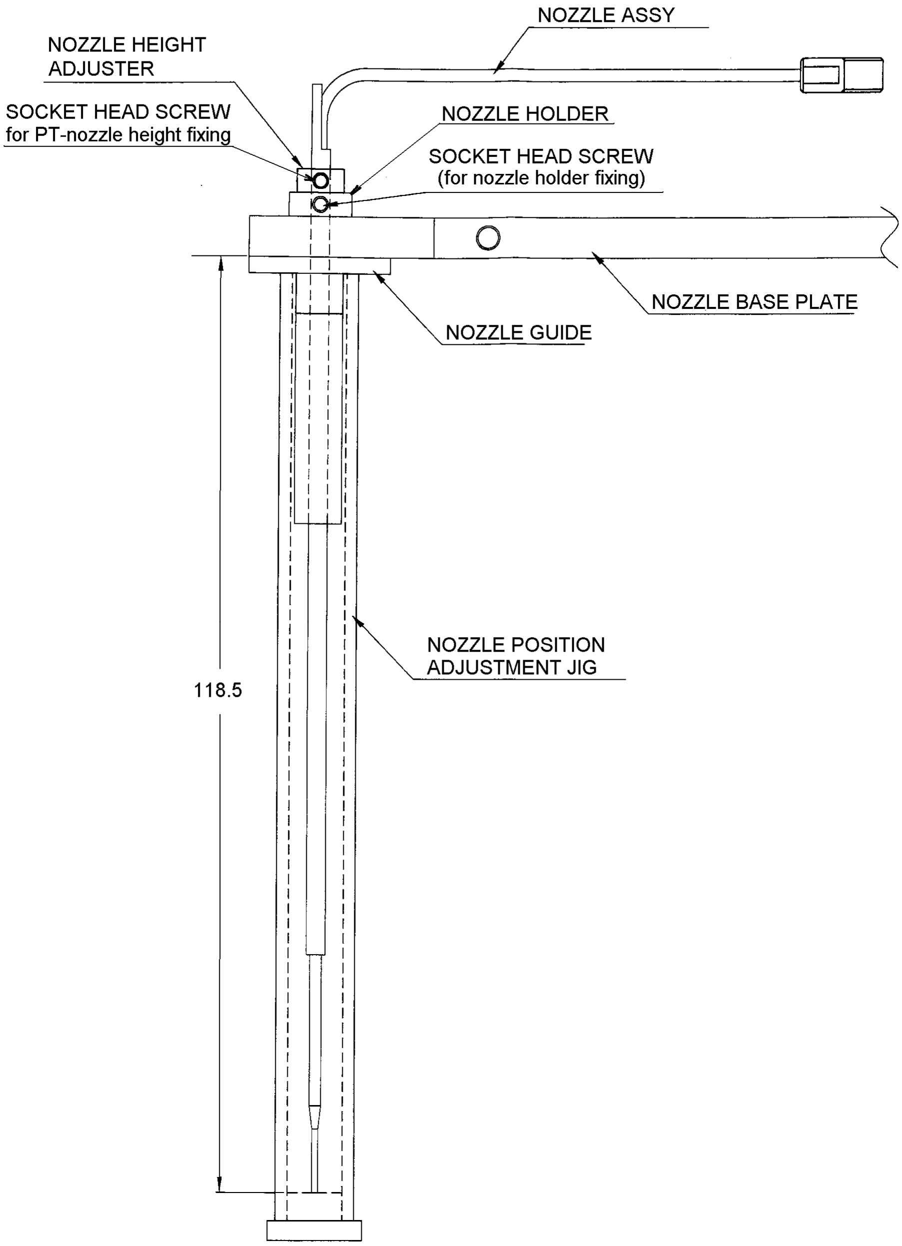
(8) Connect the male joint screw (nozzle) and female joint screw (resin tube) firmly by using spanner (5.5 mm).

Since the pipette nozzle may be twisted by screwing joint, the spanner should be used for prevention such problem.



(9) Adjust nozzle height using the PT nozzle height adjustment jig.

And fix the PT nozzle height position by PT-nozzle height fixing screw.



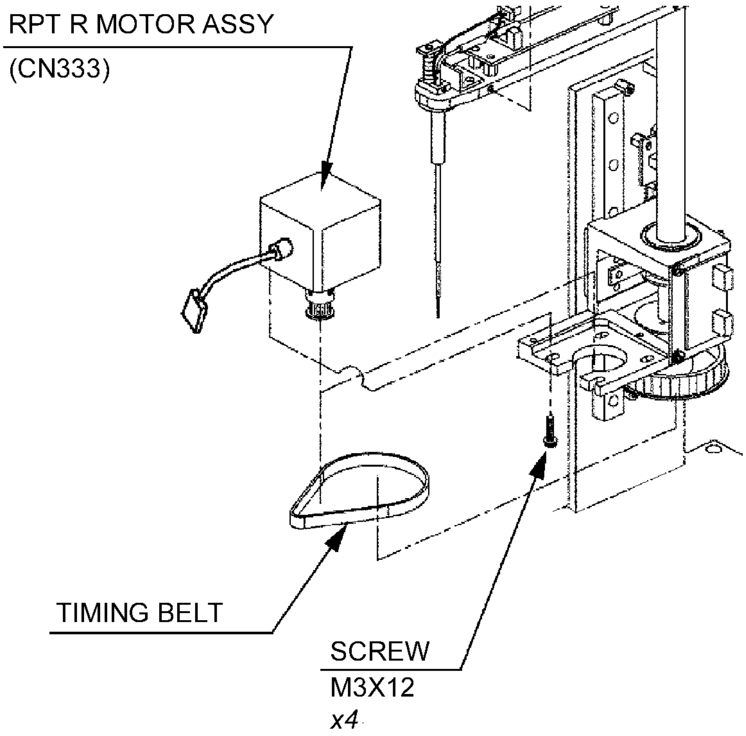
(10) Connect the connector (J2) to PCB on the nozzle base plate.

(11) Confirm that PT nozzle can move up and down smoothly.

(12) Put the nozzle cover to pipette unit (SPT/RPT).

C. Dismounting RPT R Motor

(1) Remove the RPT R motor assembly by removing the four screws (M3x12). At this stage the timing belt is also removable.

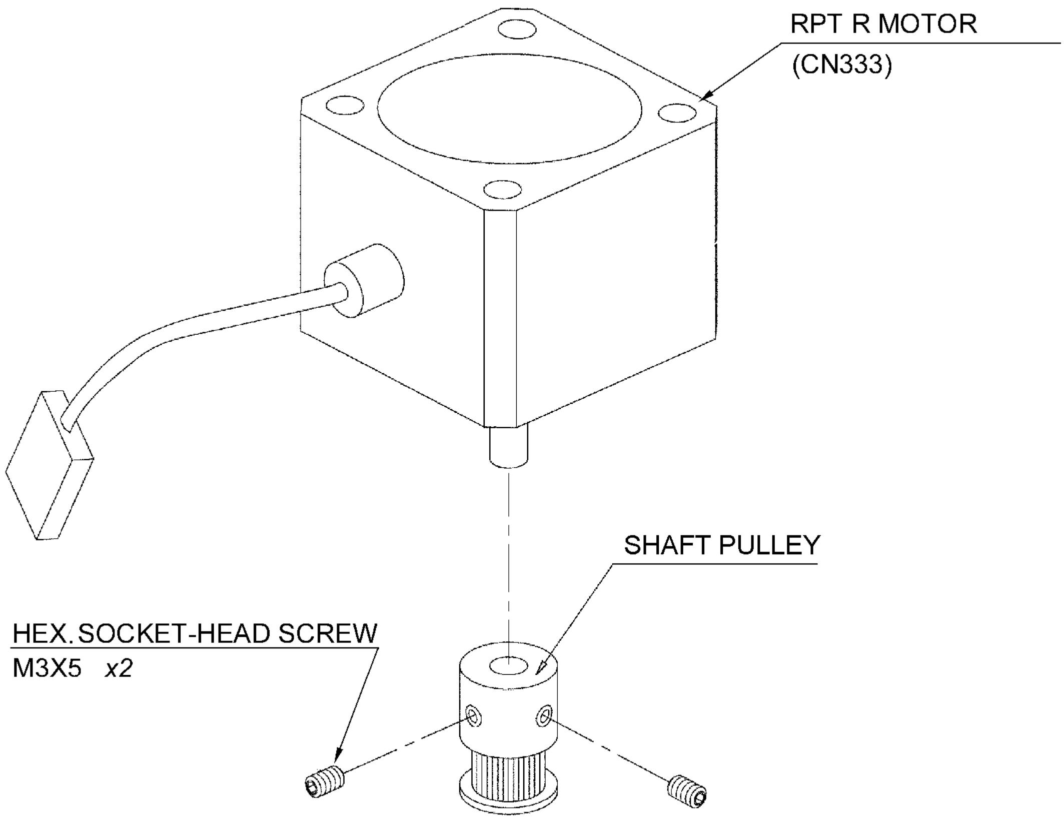


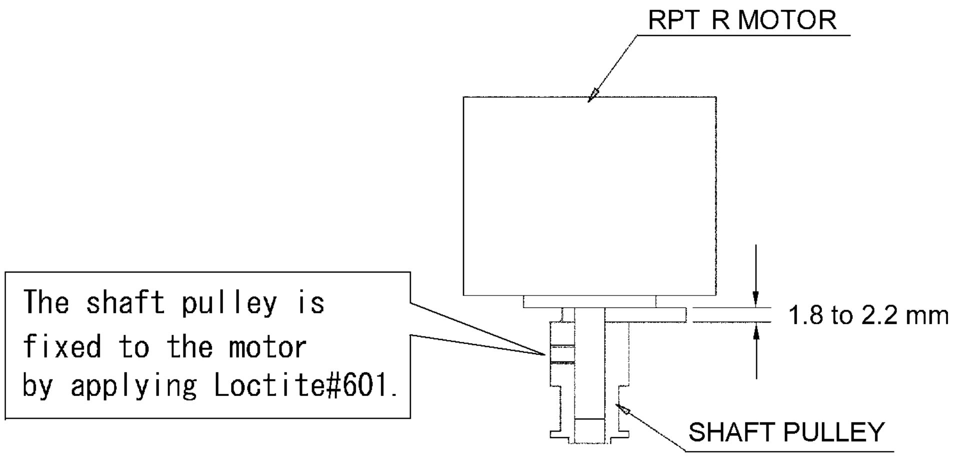
REMOVING RPT R MOTOR ASSEMBLY
Figure 10-33

Mounting RPT R Motor

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the RPT motor.
The shaft pulley is built into the RPT motor as shown below.





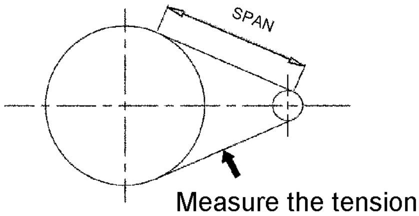
RPT R MOTOR
Figure 10-34

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	6 mm
Belt Weight	0.013 kg/m
Belt Span	40.1 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screw driver etc.



MEASURING BELT TENSION
Figure 10-35

The belt tension must be 9.8 to 12.7 N.

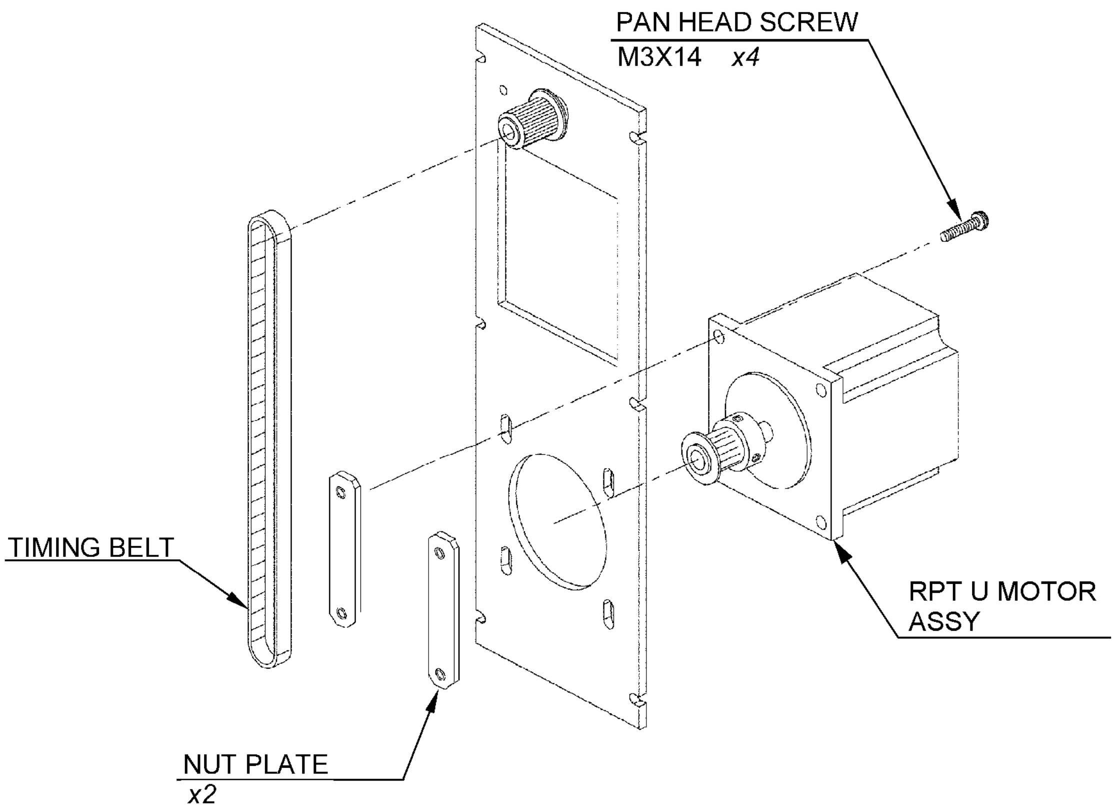
(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

D. Dismounting RPT U Motor

(1) Remove the RPT U motor assembly by removing the four screws (M3x14) and two nut plates. At this stage the timing belt is also removable.

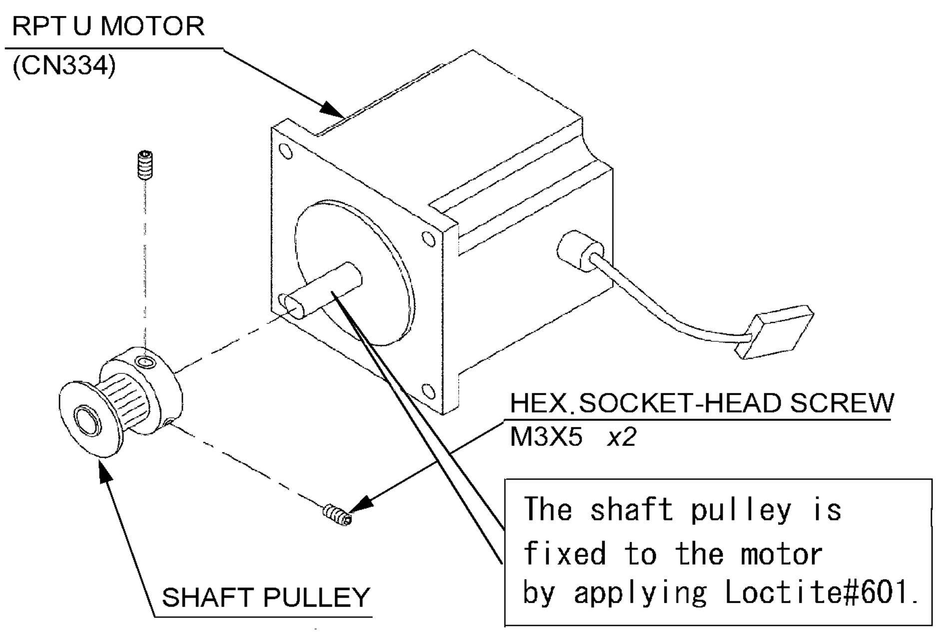


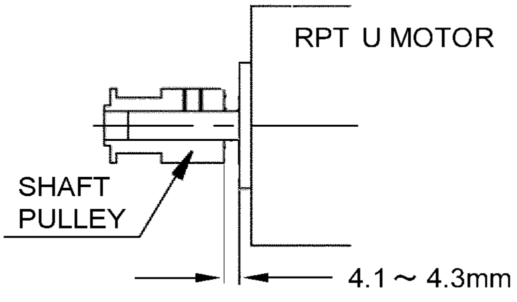
REMOVING RPT U MOTOR ASSEMBLY
Figure 10-36

Mounting RPT U Motor

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the RPT U motor.
The shaft pulley is built into the RPT U motor as shown below.





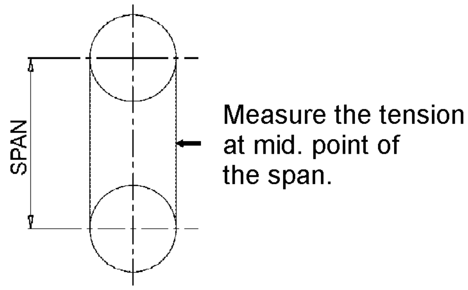
RPT U MOTOR
Figure 10-37

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	6 mm
Belt Weight	0.013 kg/m
Belt Span	147 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screw driver etc.



MEASURING BELT TENSION
Figure 10-38

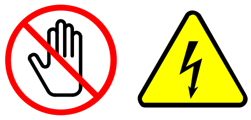
The belt tension must be 9.8 to 12.7 N.

(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

7. SPT (Sample Pipette Unit)



WARNING

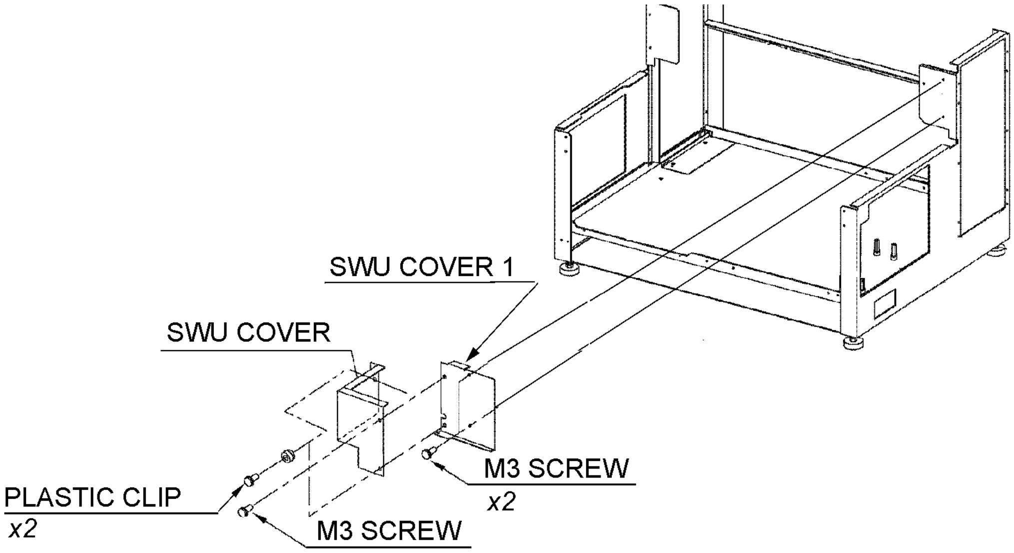
- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

After removing the ASP as mentioned in “3.A.Dismounting ASP”, take the following steps.

A. Dismounting SPT

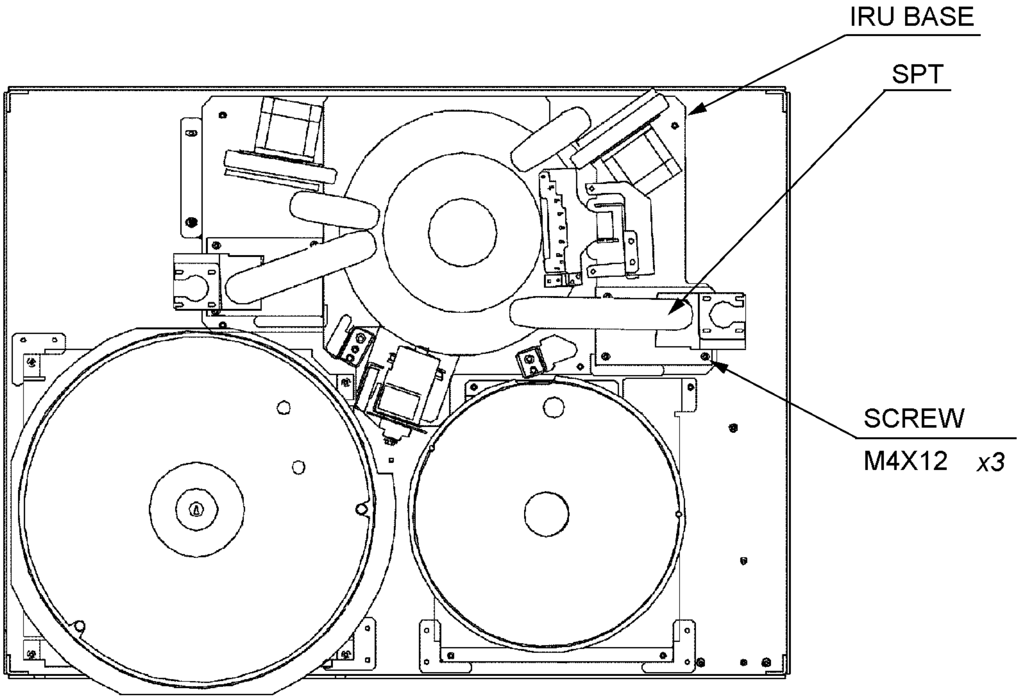
(1) Remove the SWU cover by removing the one screw (M3) and two plastic clips. See Figure 10-39.

(2) Remove the SWU cover 1 by removing the two screws (M3).



REMOVING SWU COVER AND SWU COVER 1
Figure 10-39

(3) Remove the three screws (M4x12) from the IRU base.



REMOVING M4X12 SCREWS
Figure 10-40

(4) Remove the rear cover by removing the six screws (M4). See Figure 10-1A.

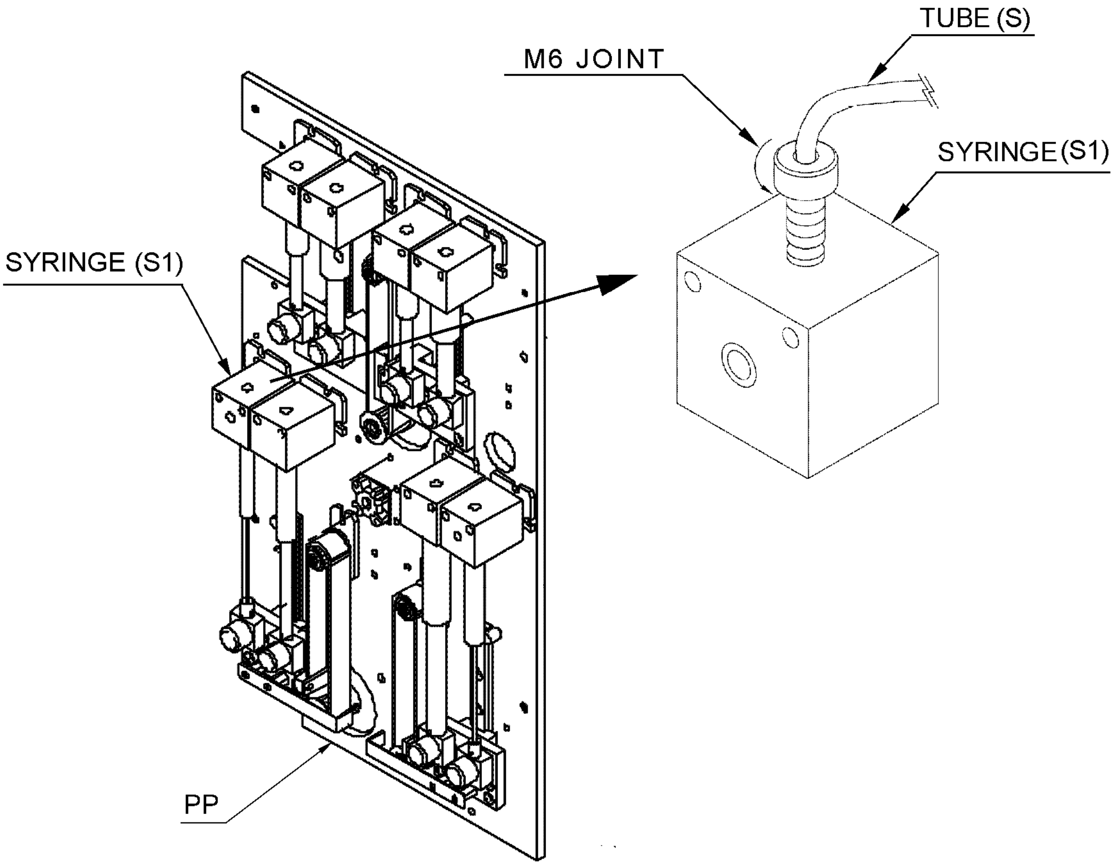
(5) Unplug the connector (CN322) from the IRU_CN1 board.

(6) Unplug the two connectors (CN338 and CN339) from the IRU_DRV board.

(7) Remove the left cover by removing the four screws (M4). See Figure 10-1E.

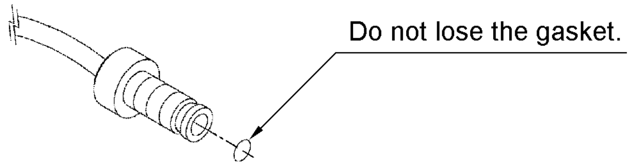
(8) Remove the M6 joint of the syringe (S1) as shown below.

NOTE: If the M6 joint is too tight to loosen, use long-nose pliers. When using long-nose pliers, cover the M6 joint with a cloth to prevent damage.



REMOVING M6 JOINT
Figure 10-41

(9) Pull and disconnect the tube (S) from the syringe (S1) of the PP.



PULLING OUT TUBE (S)
Figure 10-42

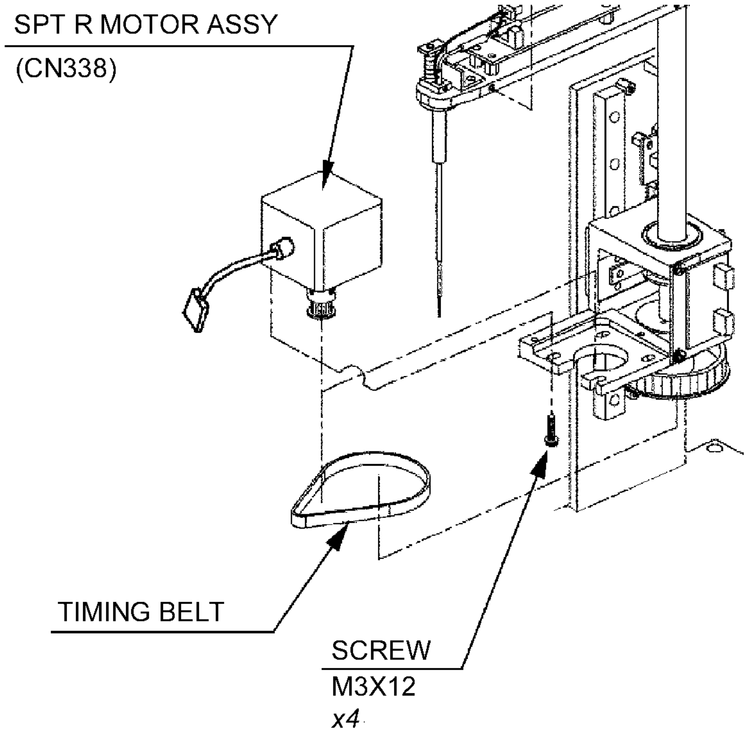
At this stage the SPT is removable.

B. Dismounting SPT Nozzle Assembly

Refer to “Dismounting RPT Nozzle Assembly”.

C. Dismounting SPT R Motor

(1) Remove the SPT R motor assembly by removing the four screws (M3x12). At this stage the timing belt is also removable.

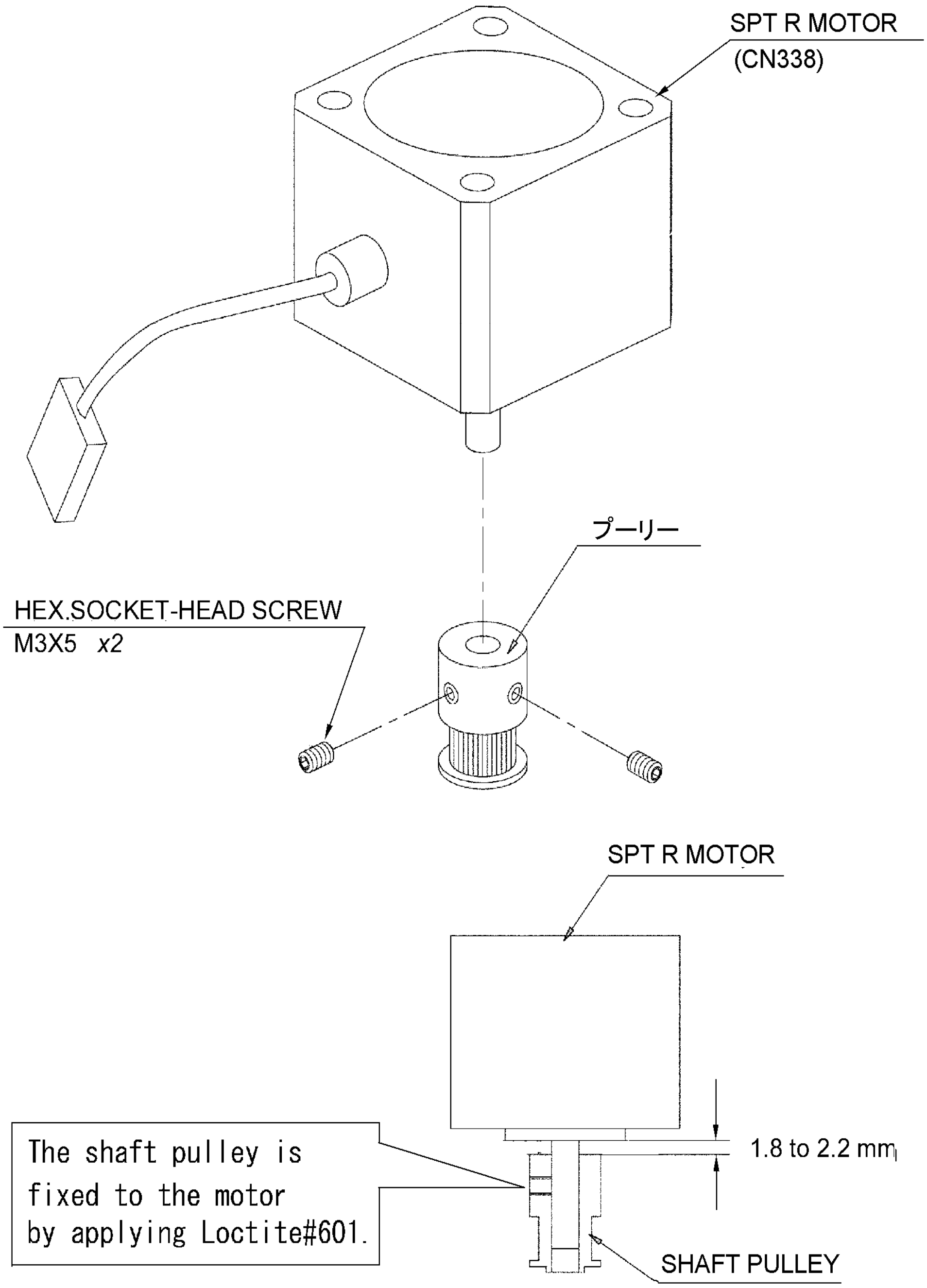


REMOVING SPT R MOTOR ASSEMBLY
Figure 10-48

Mounting SPT R Motor

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the SPT R motor.
The shaft pulley is built into the SPT R motor as shown below.



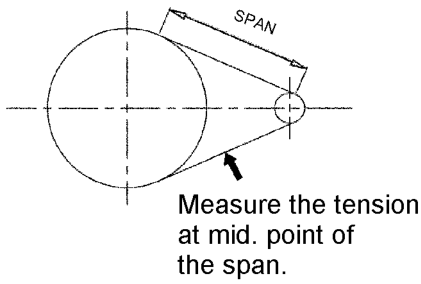
SPT R MOTOR
Figure 10-49

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	6 mm
Belt Weight	0.013 kg/m
Belt Span	40.1 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screw driver etc.



MEASURING BELT TENSION
Figure 10-50

The belt tension must be 9.8 to 12.7 N.

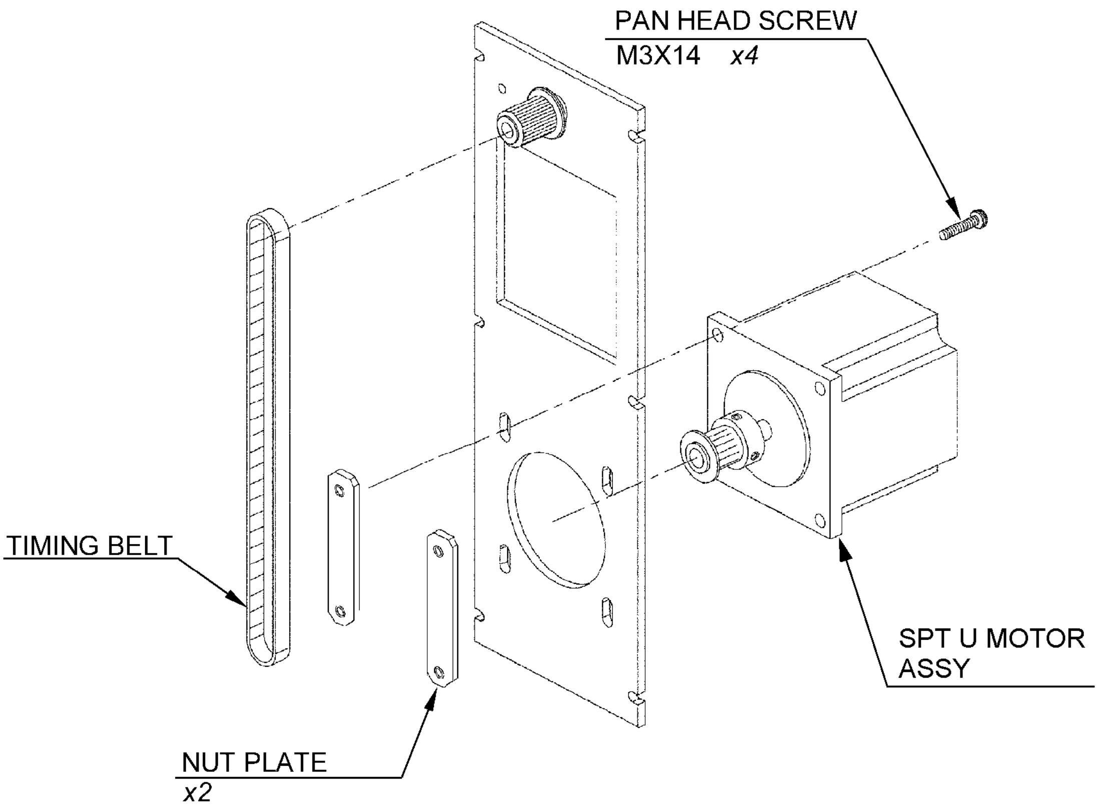
(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

D. Dismounting SPT U Motor

(1) Remove the SPT U motor assembly by removing the four screws (M3x14) and two nut plates. At this stage the timing belt is also removable.



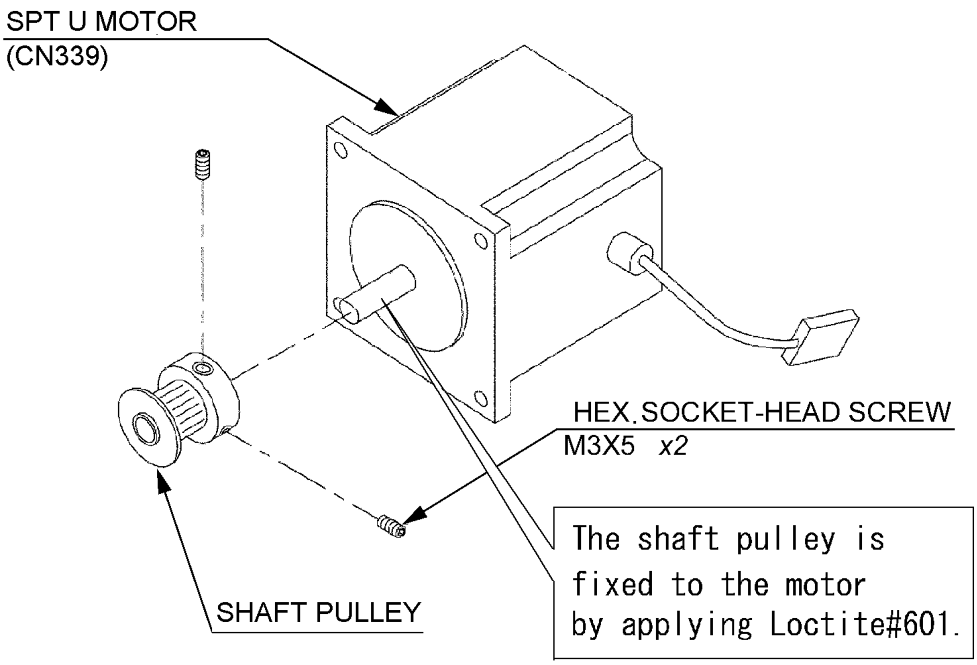
REMOVING SPT U MOTOR ASSEMBLY
Figure 10-51

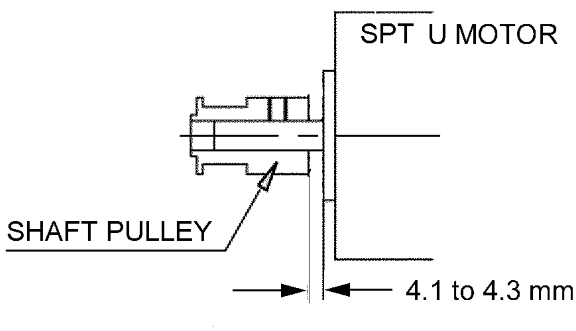
Mounting SPT U Motor

When mounting the SPT U motor, pay attention to the following points.

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the SPT U motor.
The shaft pulley is built into the SPT U motor as shown below.





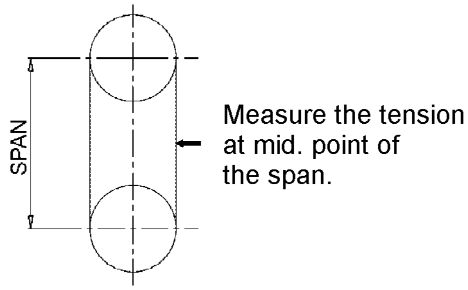
SPT U MOTOR
Figure 10-52

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	6 mm
Belt Weight	0.013 kg/m
Belt Span	147 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screw driver etc.



MEASURING BELT TENSION
Figure 10-53

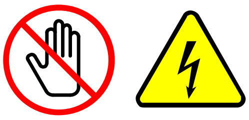
The belt tension must be 9.8 to 12.7 N.

(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

8. MIX1/MIX2 (Mixing Stirrer Unit 1/Mixing Stirrer Unit 2)



WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

Before removing the MIX1/MIX2, remove the followings:
- Top cover (Refer to “2. A. Removing Covers”.)
- Upper frame and cover as assembled (Refer to “2. A. Removing Covers”.)
- Rear cover (Refer to “2. A. Removing Covers”.)
- Mosaic plates 5 and 6 (Refer to Figure 10-2.)

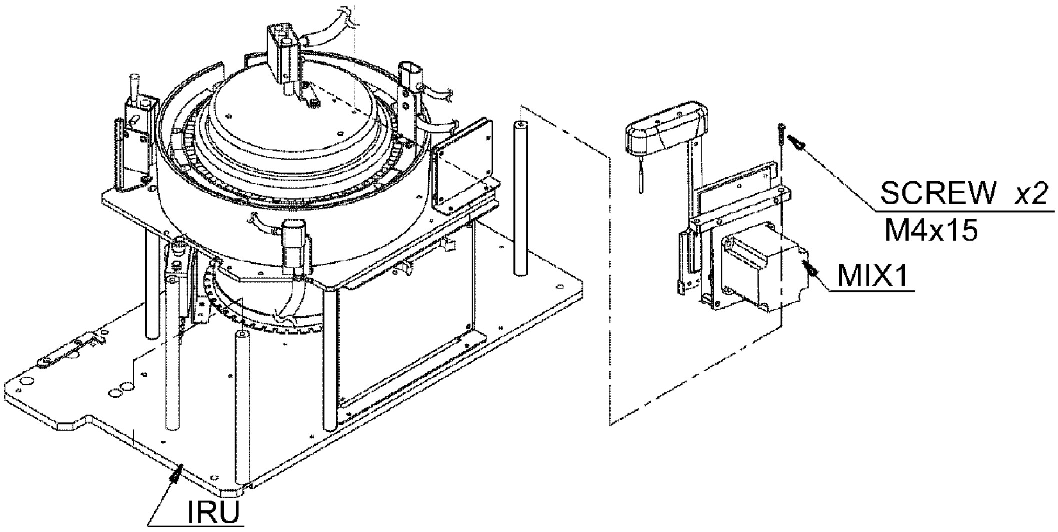
A. Dismounting MIX1

(1) Unplug the two connectors (CN336 and CN337) from the IRU-DRV board (25P3216/25P3231).

(2) Unplug the connector (CN323) from the IRU_CN1 board (25P3217).

(3) Remove the MIX1 from the IRU by removing the two screws (M4x15).

NOTE: When removing the MIX1, take care not to damage its stirrer.

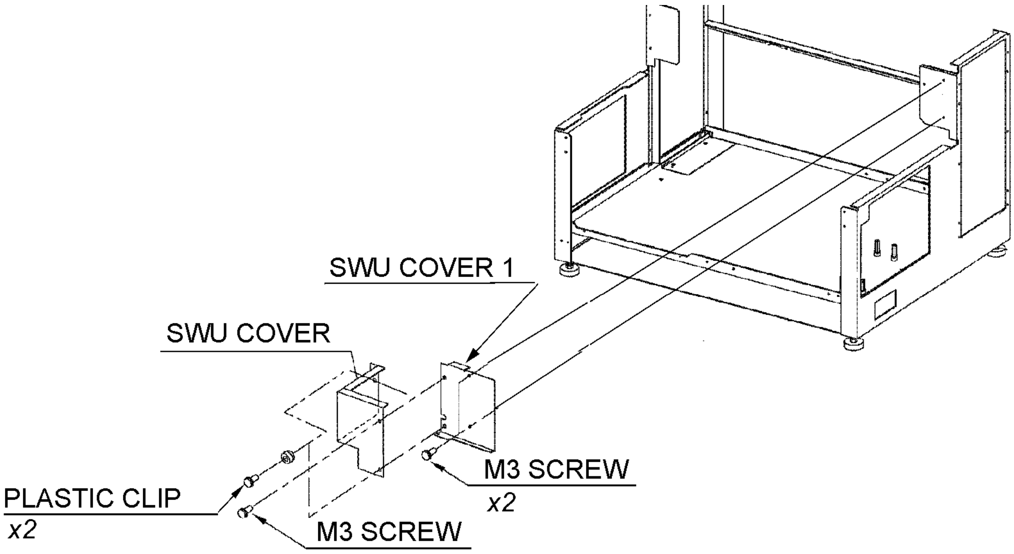


DISMOUNTING MIX1
Figure 10-54

B. Dismounting MIX2

(1) Remove the SWU cover (shown in Figure 10-55) by removing one screw (M3) and two plastic clips.

(2) Remove the SWU cover 1 by removing the two screws (M3).



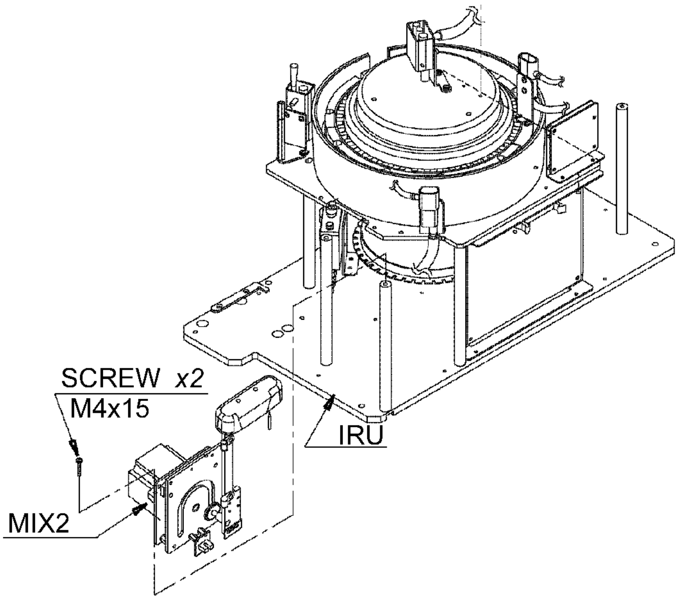
REMOVING SWU COVER
Figure 10-55

(3) Unplug the two connectors (CN341 and CN342) from the IRU_DRV board (25P3216/25P3231).

(4) Unplug the connector (CN320) from the IRU_CN1 board (25P3217).

(5) Remove the MIX2 from the IRU by removing the two screws (M4x15).

NOTE: When removing the MIX2, take care not to damage its stirrer.

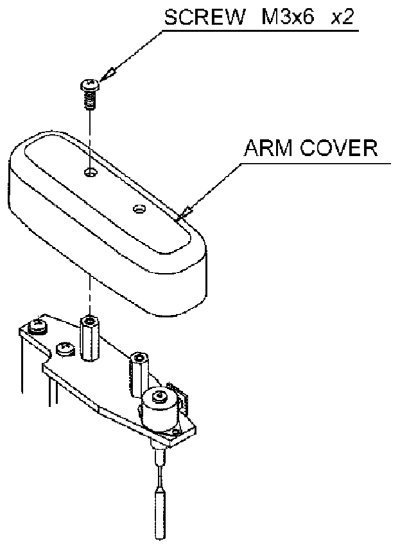


DISMOUNTING MIX2
Figure 10-56

C. Dismounting MIX1R/MIX2R Motor and Stirrer

Before removing the MIX2R motor, remove the SWU cover. See "B. (1)".

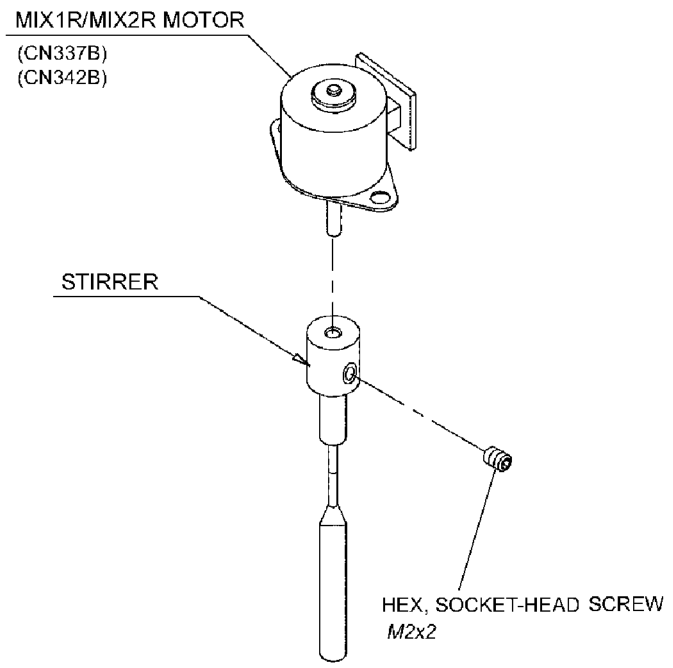
(1) Remove the arm cover by removing the two screws (M3x6).



REMOVING ARM COVER
Figure 10-57

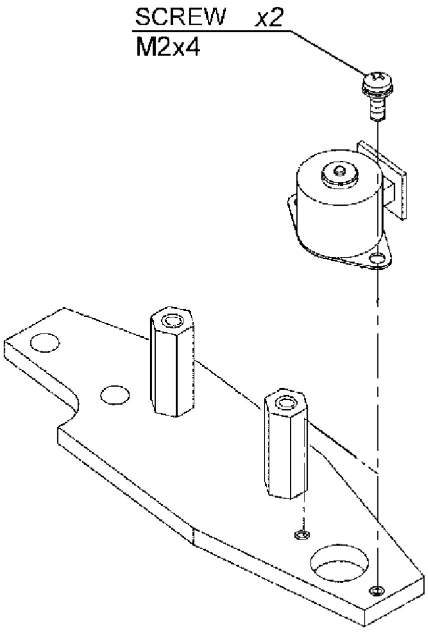
(2) Unplug the connector of the MIX1R or MIX2R motor.

(3) Remove the stirrer by loosening the hex. socket-head screw (M2x2).



REMOVING STIRRER
Figure 10-58

(4) Remove the MIX1R/MIX2R motor by removing the two screws (M2x4).

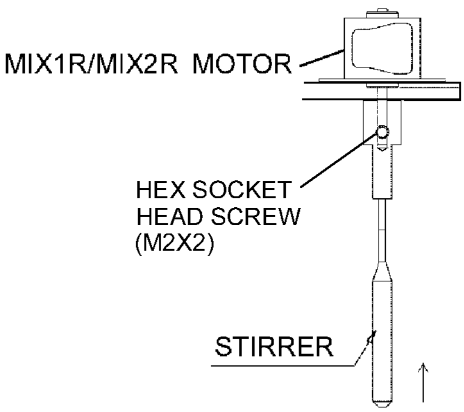


REMOVING MIX1R/MIX2R MOTOR
Figure 10-59

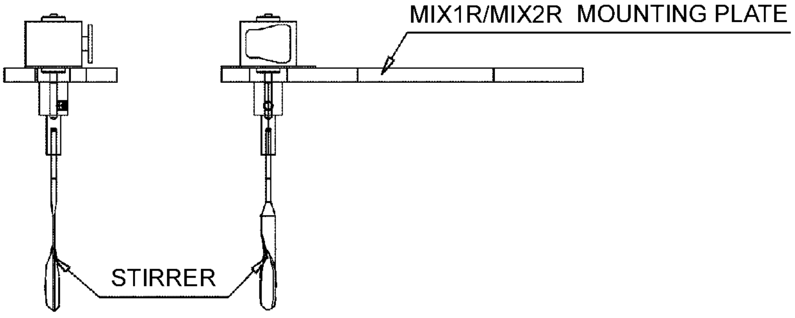
Mounting Stirrer

When mounting the stirrer, adjust the stirrer as follows:

(1) Install the MIX1R/MIX2R motor to the motor mounting plate. Loosely attach the stirrer to the motor drive shaft with the hex. socket-head screw (M2x2). For adjustment purpose at later stage, do not tighten the screw yet.



MOUNTING STIRRER
Figure 10-60A



STIRRER ANGLE
Figure 10-60B

(2) Height adjustment of MIX1(or MIX2) stirrer
Turn on the power of the Clinical Chemistry Analyzer and user interface PC.
- (a) Remove the cuvette holder plate near the cuvette No.44 (or No.29) by loosening two pieces of screws (M3x20). Refer to Figure 10-100.
- (b) Take out the cuvette from the IRU slot No.44 (or No.29) and keep it at a safe place.
- (c) Insert the MIX height adjustment jig to the IRU slot No.44 (or No.29).

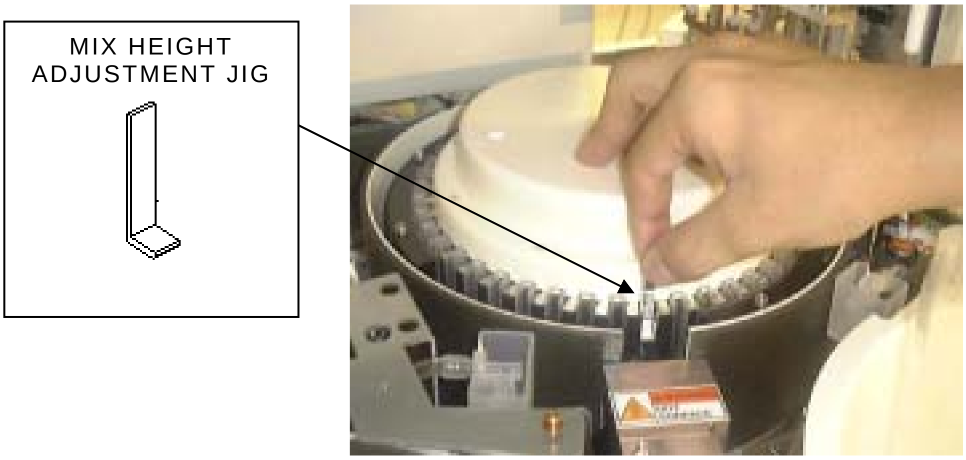


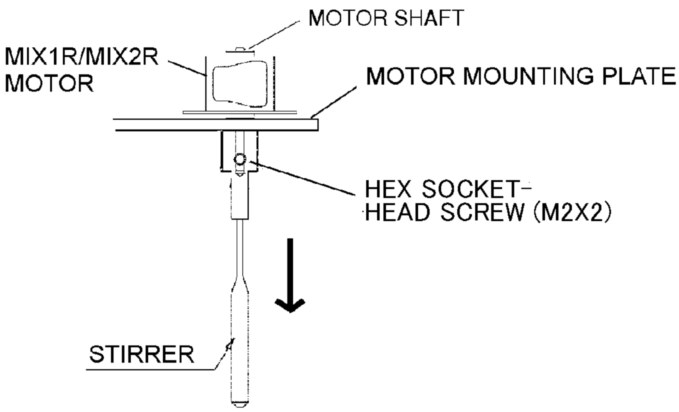
Figure 10-61A

- (d) Execute the checker program “chk_mot” after connecting “Hyper Terminal”.
- (e) Select “Select No.2 (Back Home)” for initialization.
- (f) Select “Select No.5 (Mcio Move)”. Refer to Figure 10-61B.

```
Select No[ 1-15 or “end” ] --> 5

// == Posi Map
00:mt_FLT     01:mt_WU      02:mt_MX2U     03:mt_MX2R
04:mt_MX1U  05:mt_MIXR   06:mt_RPTR     07:mt_RPTU
08:mt_SPTR  09:mt_SPTU   10:mt_IRU       11:mt_ASP
12:mt_RCU   13:mt_SPP     14:mt_RPP       15:mt_WPP

Motor Index          ==> 04 or 02
Move Dir (0:+, 1:-)==> 0
Move Pulse           ==> 593
PmPara index(0-1:Teisoku, 2-4:Kagen)==> 1
```

Figure 10-61B

At this stage, the stirrer is lowered down to the cuvette bottom in the IRU.



ADJUSTING STIRRER
Figure 10-61C

(g) Loosen the hex. socket-head screw (M2x2). Adjust the vertical position of the stirrer so that the end of the stirrer should touch the MIX height adjustment jig. Then fix the stirrer to the motor mounting plate by tightening the hex. socket-head screw (M2x2).

(h) Visually check that the stirrer is installed vertically.

In case that the stirrer is not installed vertically, check the followings:

1 Check whether the motor is installed correctly.
2 Check whether the motor shaft is not bent.
3 Check whether the stirrer is not bent.
4 Check whether the stirrer is fitted into the motor shaft (shakiness should be small enough) when the hex. socket-head screw (M2x2) is loosened.

(3) Position adjustment of MIX-1 (MIX-2) stirrer
After installing the stirrer, check whether the stirrer is correctly moved down to the center of the cuvette No.44 (or No.29) as follows.
(a) Remove the MIX height adjustment jig from the IRU slot No.44 (or 29).
(b) Insert the MIX position adjustment jig in the IRU slot No.44 (or 29).
(c) Execute the checker program "chk_mot" after connecting "Hyper Terminal".
(d) Select "Select No.2 (Back Home)" for initialization.
(e) Select "Select No.5 (MCI move)" and move the stirrer just above the cuvette No.44 (or No.29).

```
Select No[ 1-15 or "end" ] --> 5

// == Posi Map
00:mt_FLT    01:mt_WU     02:mt_MX2U    03:mt_MX2R
04:mt_MX1U   05:mt_MIXR   06:mt_RPTR    07:mt_RPTU
08:mt_SPTR   09:mt_SPTU   10:mt_IRU     11:mt_ASP
12:mt_RCU    13:mt_SPP    14:mt_RPP     15:mt_WPP

Motor Index          ==> 04 or 02
Move Dir (0:+, 1:-)==> 0
Move Pulse           ==> 450
PmPara index(0-1:Teisoku, 2-4:Kagen)==> 1
```

Figure 10-62A

(f) Check whether the tip of stirrer is at center of jig hole or not.
If it is necessary to adjust a stirrer position, take the following steps.
1 Loosen the two screws (M3x8) which attach the MIX motor mounting plate.
2 Move the MIX motor mounting plate to adjust stirrer position.
3 After adjustment, tighten the two screws (M3x8) to fix the MIX motor mounting plate.

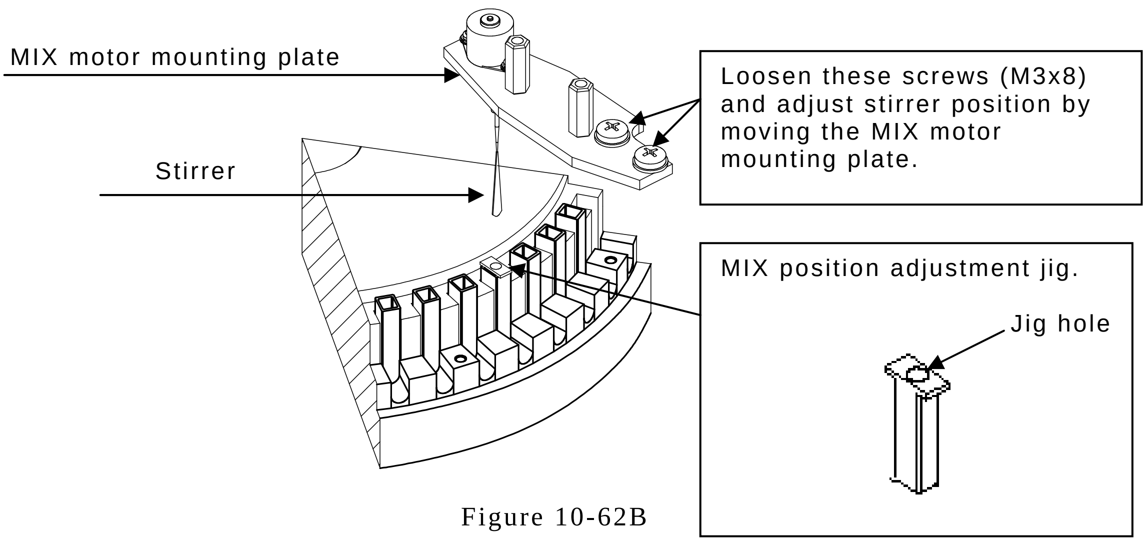


Figure 10-62B

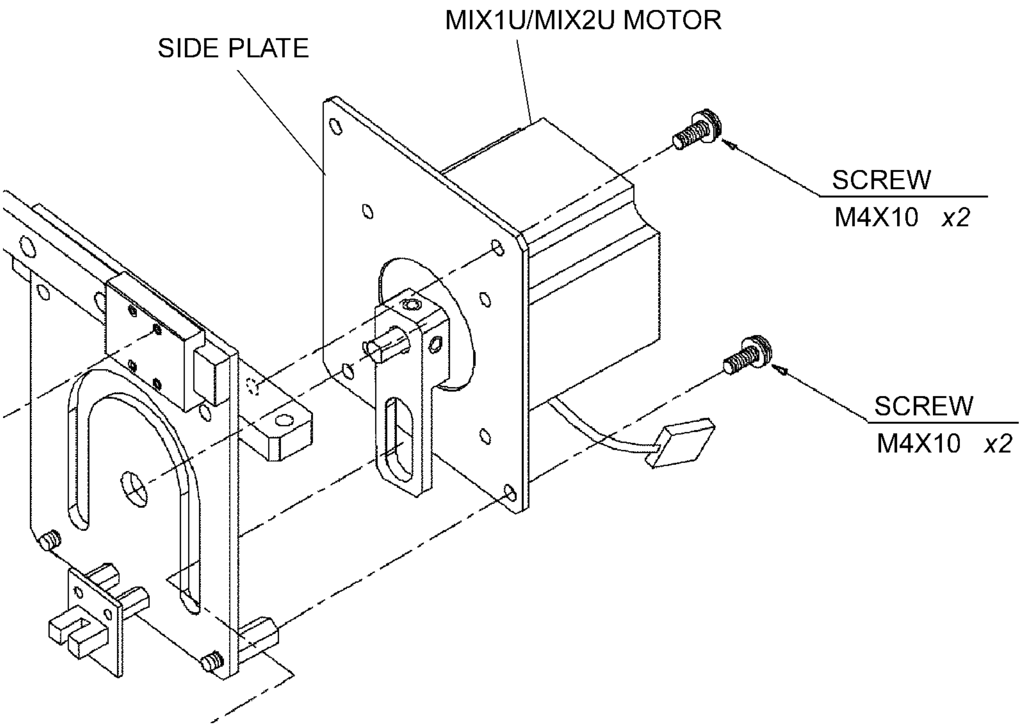
(g) Remove the jig from IRU slot No.44 (or 29), and insert back the cuvette to IRU slot No.44 (or 29).
(h) Install the cuvette holder plate. Refer to Figure 10-100.

D. Dismounting MIX1U/MIX2U Motor

First, remove the MIX1/MIX2 from the IRU. Refer to "A. Dismounting MIX1" or "B. Dismounting MIX2".

Next, take the following steps.

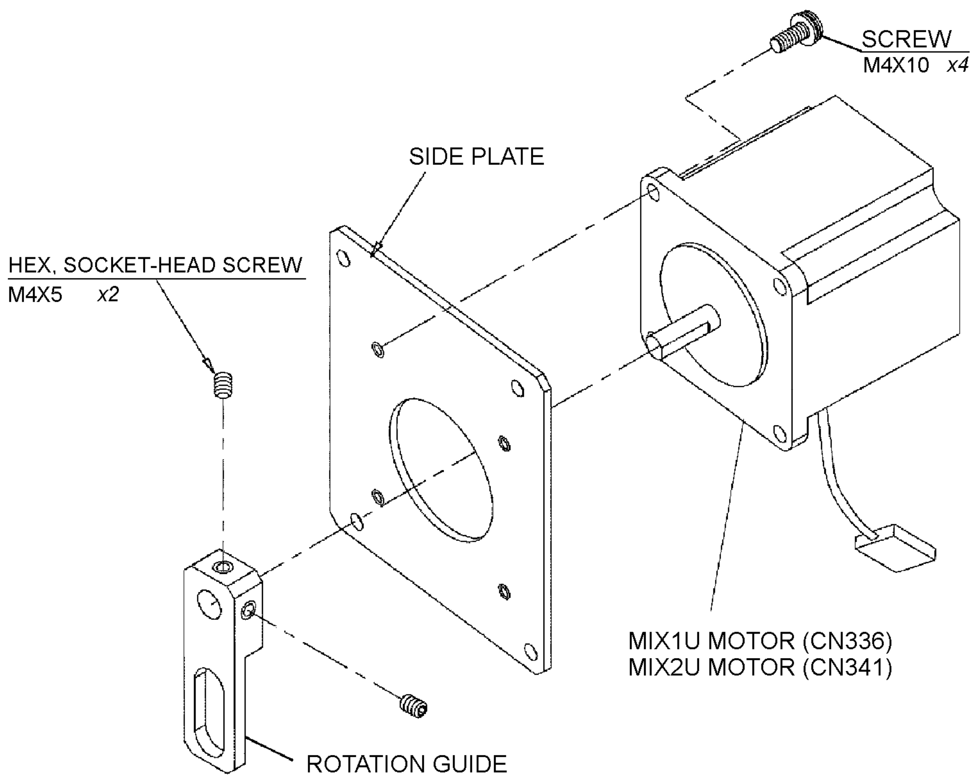
(1) Remove the MIX1U/MIX2U motor (with the side plate attached) by removing the four screws (M4x10).



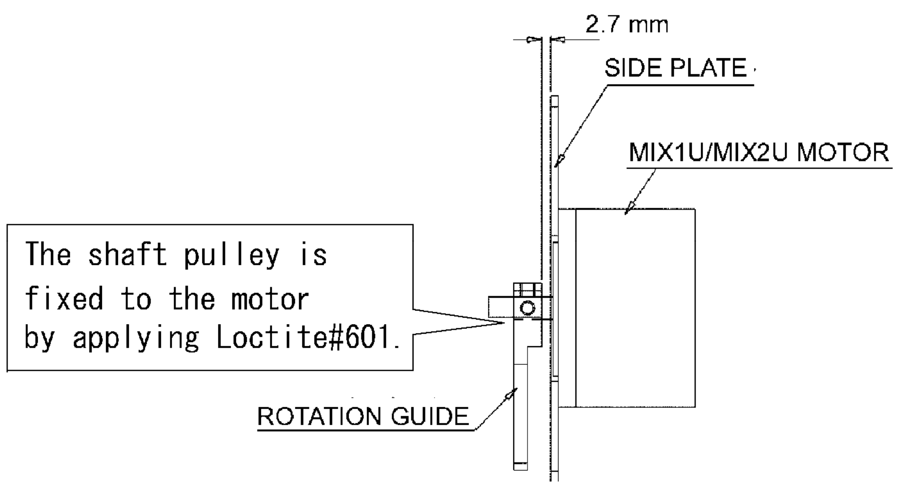
REMOVING M4X10 SCREWS
Figure 10-63

MIX1U/MIX2U Motor (Just for your reference)

The rotation guide is part of the MIX1U/MIX2U and built into the MIX1U/MIX2U motor as shown below.

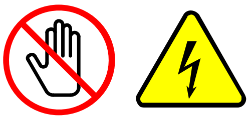


MIX1U/MIX2U MOTOR
Figure 10-64



MIX1U/MIX2U MOTOR
Figure 10-65

9. WU (Wash Unit)

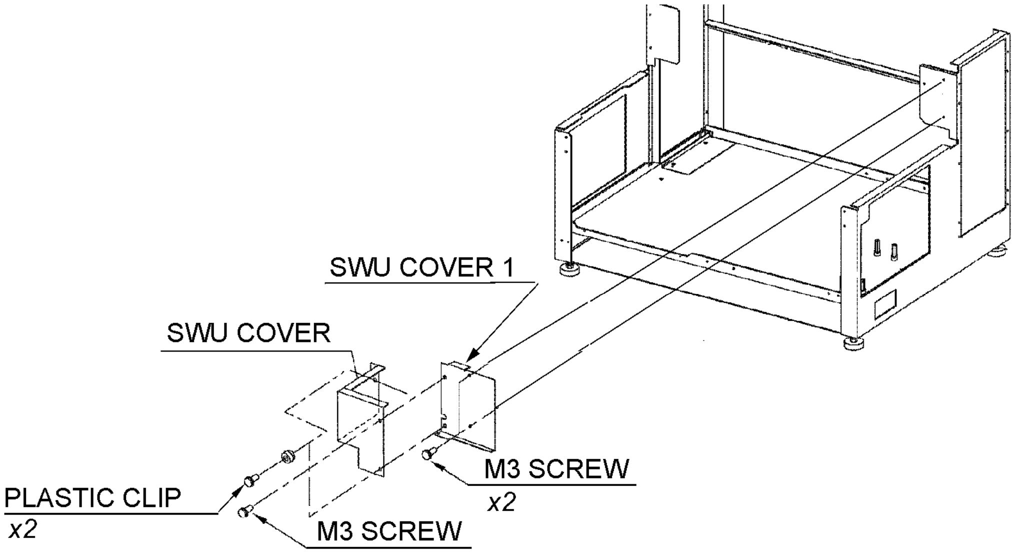


WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

Before removing the WU, remove the followings. Refer to “2. A. Removing Covers”.
- Top cover
- Upper frame and cover as assembled
- Rear cover.

Remove the SWU cover by removing one screw (M3) and two plastic clips as shown below.



REMOVING SWU COVER
Figure 10-66

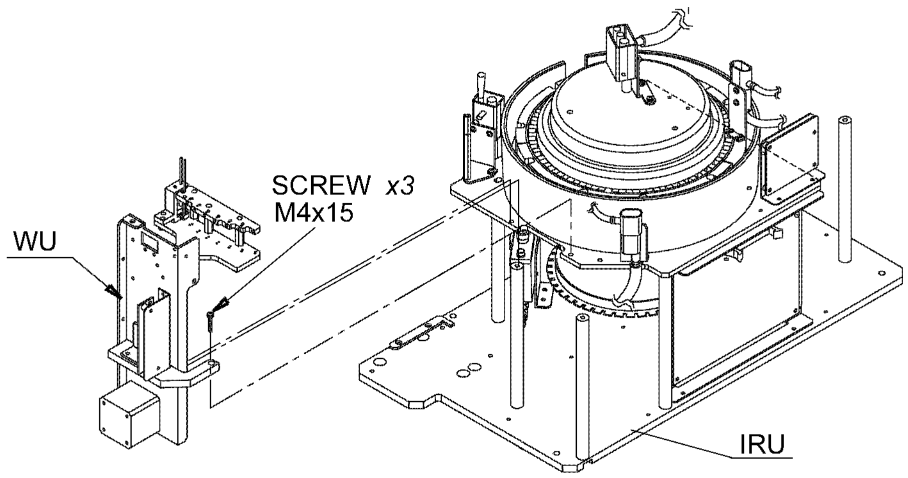
A. Dismounting WU

(1) Unplug the connector (CN340) from the IRU-DRV board (25P3216/25P3231).

(2) Unplug the connector (CN326) from the IRU_CN1 board (25P3217).

(3) Pull and disconnect all tubes from the nozzles.

(4) Remove the WU from the IRU by removing the three screws (M4x15).



REMOVING WU
Figure 10-67

NOTE: When connecting tubes, refer to "Appendix E. Fluidics System Diagram" for tube connection.

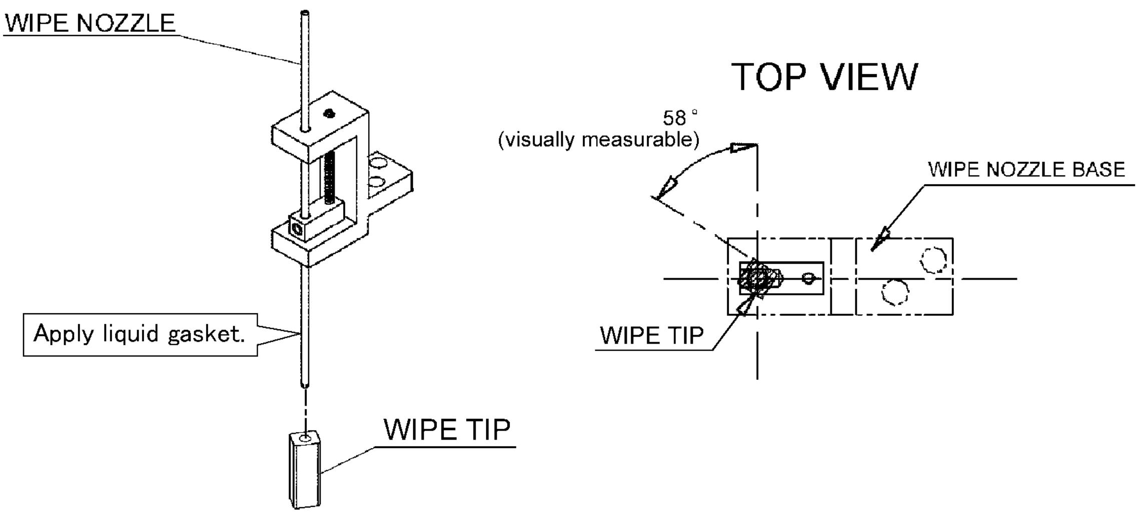
B. Replacing Wipe Tip

First remove the SWU cover. See Figure 10-66.
Remove the wipe tip as follows.

(1) Hold the wipe nozzle with fingers so that the wipe nozzle will not move. Pull down the wipe tip from the wipe nozzle.

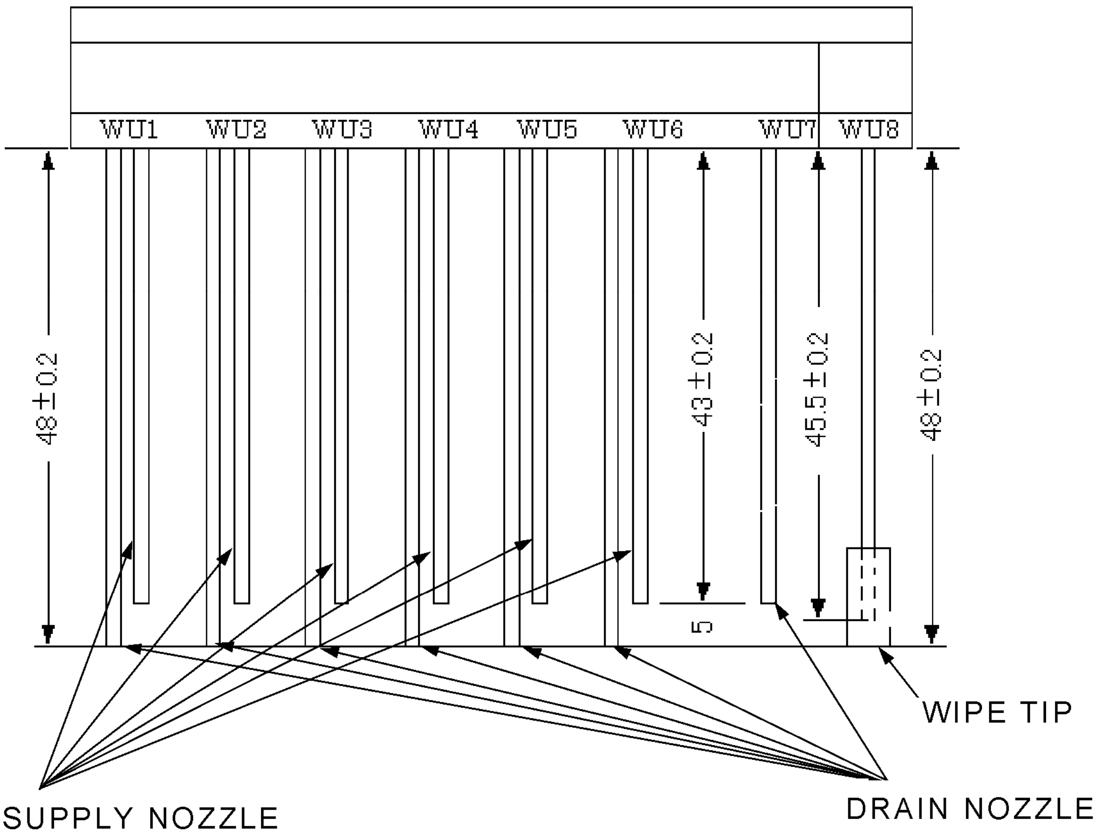
(2) Insert a new wipe tip into the wipe nozzle. Make sure that the wipe tip is located at the center of the cuvette, when the wipe nozzle is lowered down inside the cuvette.

NOTE: Lower the WU nozzle base to the cuvette-mouth position. Make sure that the wipe tip is at the center of the cuvette.



INSTALLING WIPE TIP
Figure 10-68

NOTE: Adjust the vertical position of the wipe tip so that the tip of the wipe tip is 5mm below from the tip (lowest) of the WU7 drain nozzle as shown below.



WU NOZZLE VERTICAL POSITION ADJUSTMENT
Figure 10-69

C. Replacing Nozzles

Remove the WU beforehand.

Removing Drain Nozzle (seven nozzles WU1 through WU7 with red label)

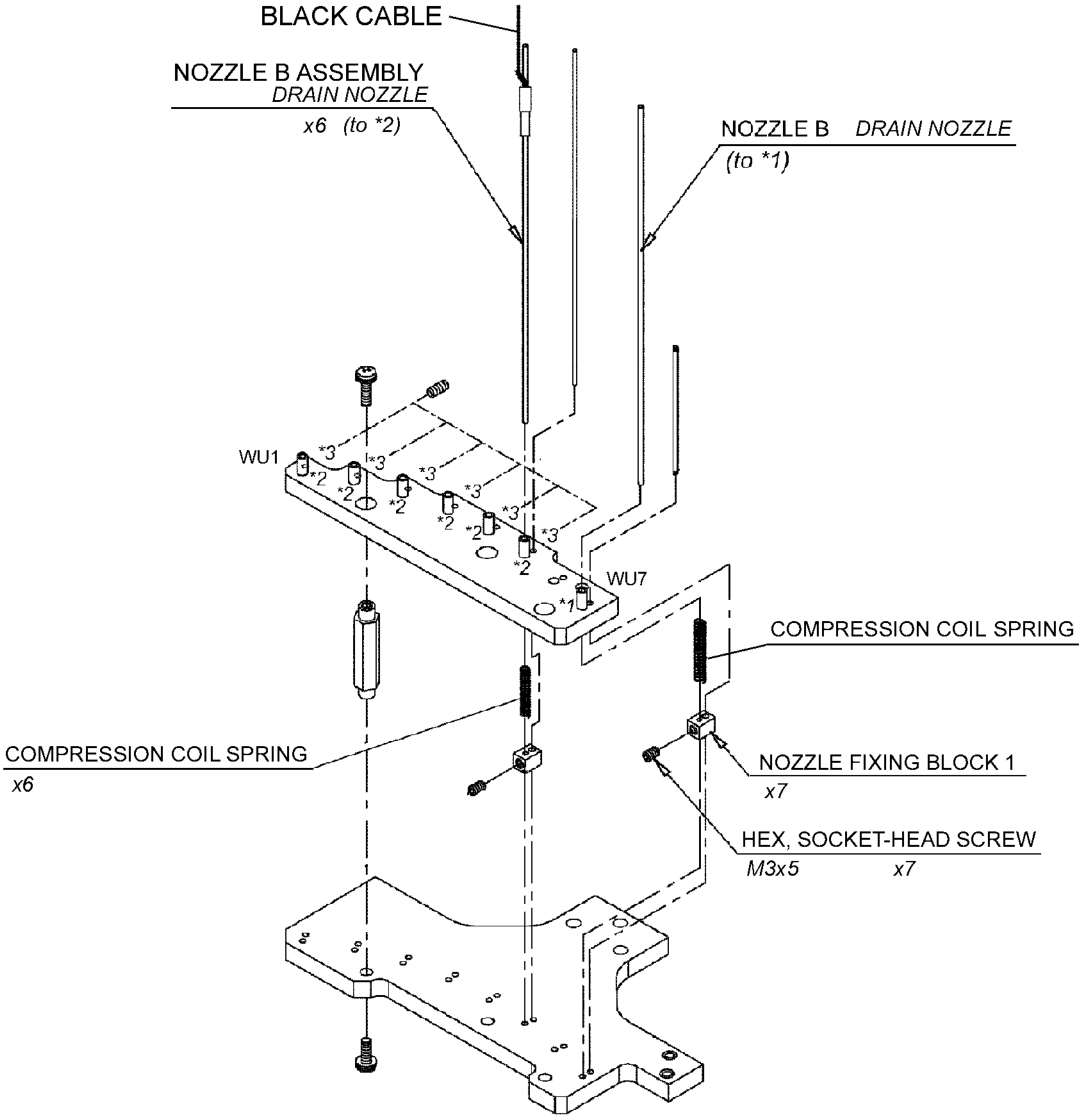
Take the following steps for each of the seven drain nozzles. Refer to Figure 10-70.

(1) For WU1 -WU6 drain nozzles, unsolder the black cable from each nozzle.

(2) Loosen the nozzle-fixing hex. screw (M3x5) located on the nozzle-fixing block.

(3) Lift up the nozzle to remove. As the compression coil spring is also removed at this stage, be careful not to lose it.

(4) Pull and disconnect the tube.



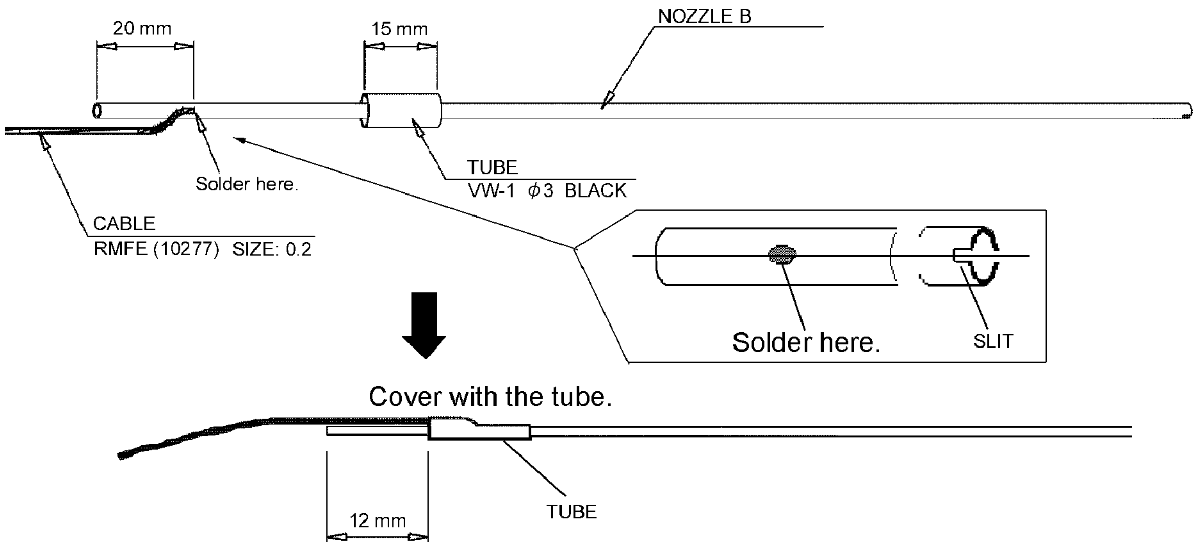
REMOVING DRAIN NOZZLES
Figure 10-70

Installing Drain Nozzle (seven nozzles WU1 through WU7 with red label)

When installing nozzles, pay attention to the following points.

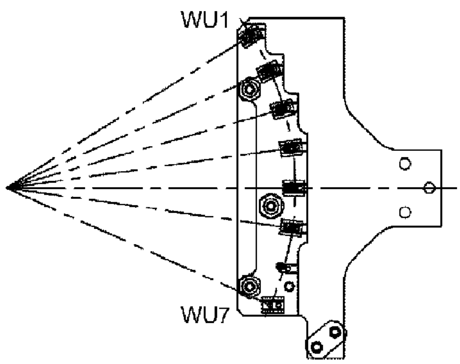
(1) Solder the black cable to the nozzle (WU1 through WU6), and cover the soldering point with the tube as shown below.

NOTE: Use stainless soldering and flux for stainless soldering.



SOLDERING CABLE
Figure 10-71

(2) Orient the slits of the nozzles to the center of the fan-shaped sector as shown below. (Visually measurable.)



ORIENTING NOZZLE SLITS
Figure 10-72

(3) Adjust the vertical position of the nozzles. Refer to Figure 10-69.
WU1 through WU6: 48±0.2mm
WU7: 43±0.2mm

NOTE: During the adjustment, make sure not to tighten too hard the screws fixing the nozzles, or the nozzle may be damaged.

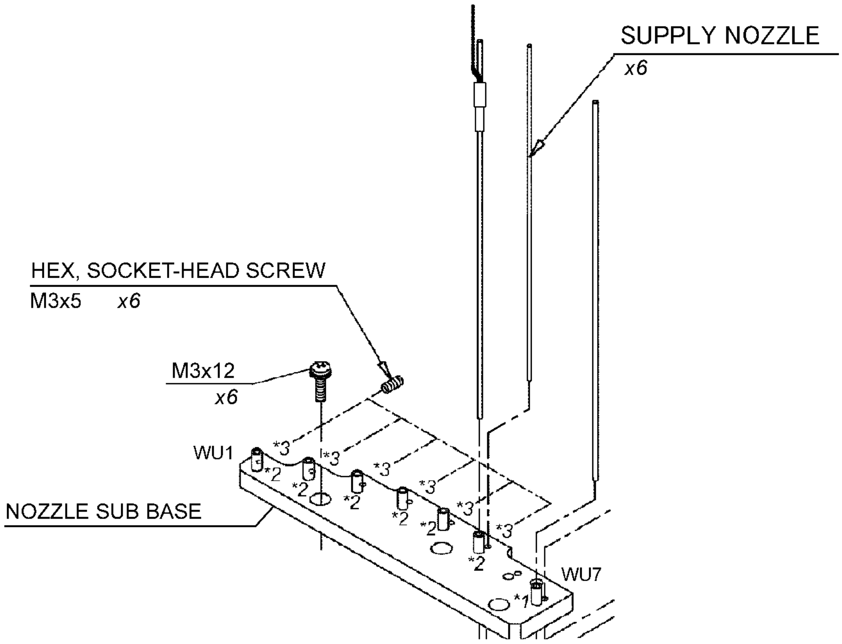
Removing Supply Nozzle (six nozzles WU1 through WU6 with blue label)

See Figure 10-73.

(1) Loosen the hex. socket-head screw (M3x5) located on the nozzle sub base.

(2) Lift up the nozzle to remove.

(3) Pull and disconnect the tube.



REMOVING SUPPLY NOZZLES
Figure 10-73

Installing Supply Nozzle (six nozzles WU1 - WU6 with blue label)

(1) Connect the tube to the nozzle.

(2) Install the nozzle into the nozzle sub base and secure the hex. socket-head screws (M3x5).

(3) Adjust the vertical position of the nozzle. Refer to Figure 10-69.
WU1 through WU6: 43±0.2mm

NOTE: During the adjustment, make sure not to tighten too hard the screws fixing the nozzles, or the nozzle may be damaged.

Removing Wipe Nozzle (one nozzle WU8 with red label)

Refer to Figure 10-74.

(1) Remove the wipe tip from the nozzle.

(2) Loosen the hex. socket-head screws (M3x5) on the nozzle-fixing block.

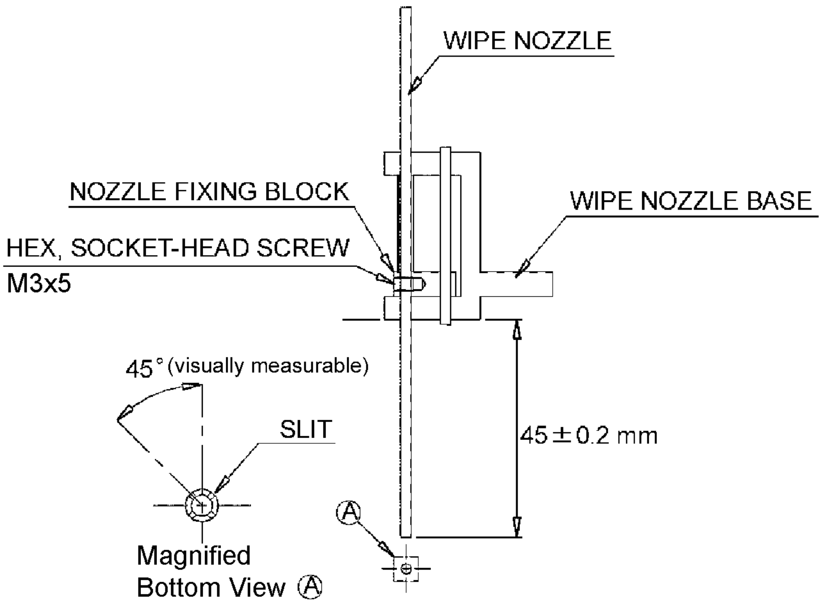
(3) Lift up the nozzle to remove. As the compression coil spring is also removed at this stage, be careful not to lose it.

(4) Pull and disconnect the tube.

Installing Wipe Nozzle (one nozzle WU8 with red label)

When installing the wipe nozzle, pay attention to the following points.

(1) Orient (45 degrees) the slits on the nozzle as shown below.



INSTALLING WIPE NOZZLE
Figure 10-74

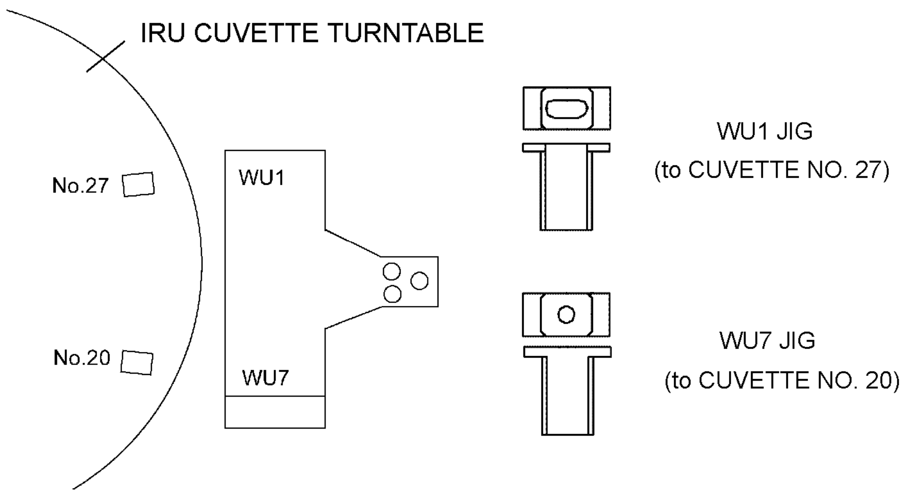
(2) Adjust the vertical position of the nozzle. Refer to Figure 10-69.
WU8: 45.5±0.2mm

NOTE: During the adjustment, make sure not to tighten too hard the screws fixing the nozzles, or the nozzle may be damaged.

Adjusting Horizontal Position of Nozzle

Loosely attach the WU unit with the three screws (M4x15). See Figure 10-67. For adjustment purpose at later stage, do not tighten these screws yet. Adjust horizontal position of nozzles as follows:

(1) Put the WU1 jig into the No. 27 cuvette. Put the WU7 jig into the No. 20 cuvette.

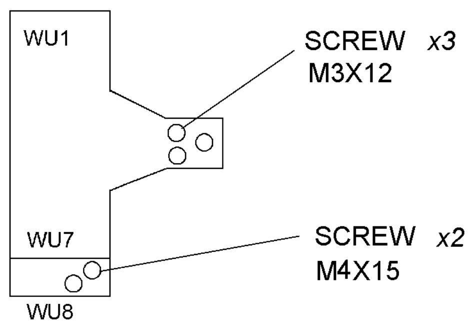


WU JIGS
Figure 10-75

(2) Move the IRU motor to its zero position using the checker program. Refer to Chapter 7 1. B. (1) "4. Zero Search".

(3) Put down the WU nozzle base just to the cuvette-mouth position by hand.

(4) Make sure that the WU1 and WU7 nozzles fit their respective jigs. If not, loosen the three screws (M4x15) fixing the WU base and three screws (M3x12) fixing the nozzle base to adjust their horizontal position. Then, tighten the screws.



NOZZLE BASE FIXING SCREWS
Figure 10-76

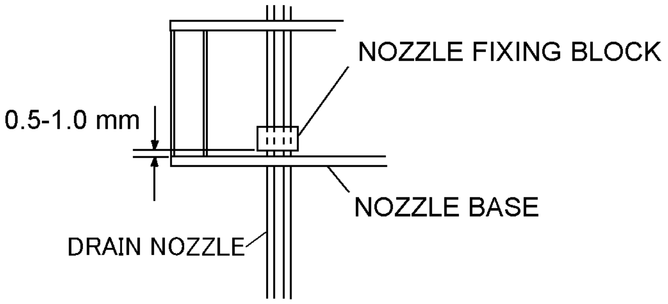
(5) Make sure that the wipe tip is exactly located at the center of the cuvette. If not, loosen the two screws (M3x15) fixing the wipe nozzle base to adjust its horizontal position (see Figure 10-76). Then, tighten the screws. Check the horizontal position by executing "Cuvette Wash".

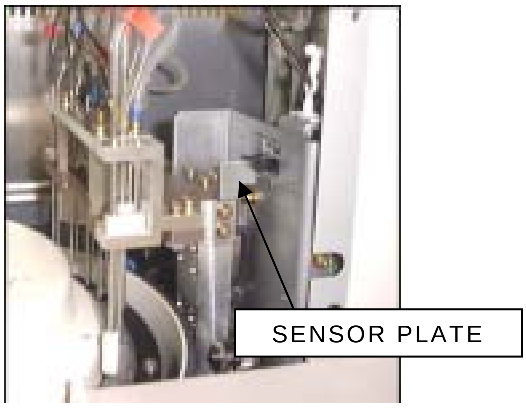
Adjusting Vertical Position of Nozzle

(1) Move the WU motor to its zero position using the checker program. Refer to Chapter 7 1. B. (1) "4. Zero Search" for the procedure.

(2) Move the WU motor to its lowermost position (WUUDL position: 1 mm below the cuvette bottom) using the checker program. Refer to Chapter 7 1. B. (3) "7. Map Move" for the procedure.

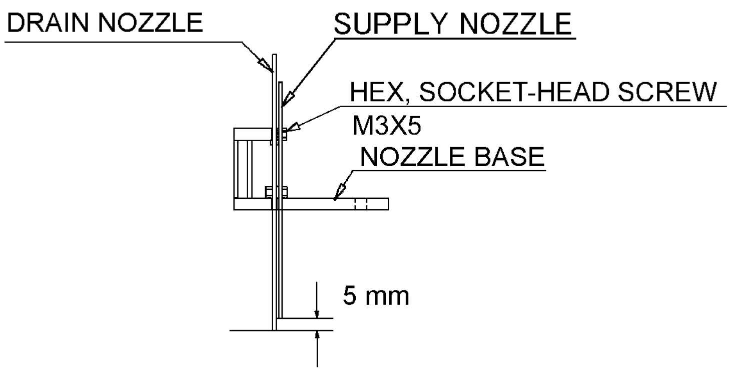
(3) Adjust the nozzle's vertical position using the sensor plate in order to make a gap (0.5 through 1.0mm) between the nozzle fixing block and white plastic nozzle base. Note that, if the sensor plate is raised, the gap gets larger and that if the sensor plate is lowered, the gap gets smaller. Make sure that the gap is made correctly using the checker program. Refer to Chapter 7 1. B. (3) "7. Map Move" "2.Back Home" for the procedure.





DRAIN NOZZLE/WIPE NOZZLE'S VERTICAL POSITION
Figure 10-77

(4) Adjust the vertical positions of the supply nozzles so that their tips are 5mm above the drain nozzle tips as shown below.



SUPPLY NOZZLE'S VERTICAL POSITION
Figure 10-78

D. Dismounting WU Motor

Before taking the following procedures, remove the WU.

(1) Remove the WU motor by removing the four hex. screws (M3x8) located on the timing belt side. At this stage, the timing belt is also removable.

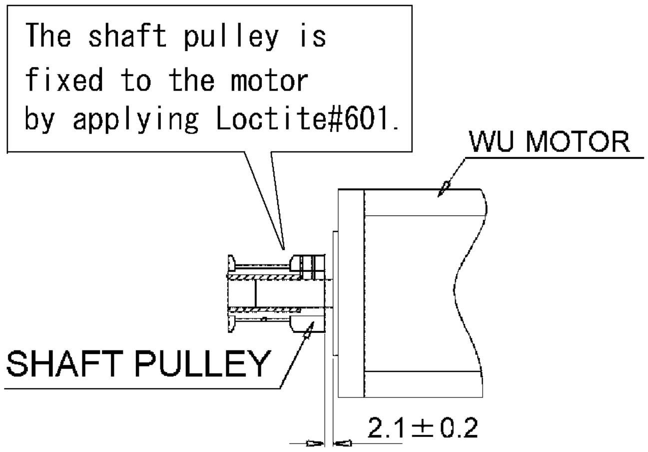
Mounting WU Motor

When mounting the WU motor, pay attention to the following points.

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the WU motor.
The shaft pulley is built into the WU motor as shown below.

When installing the shaft pulley, keep 2-mm gap as shown below.



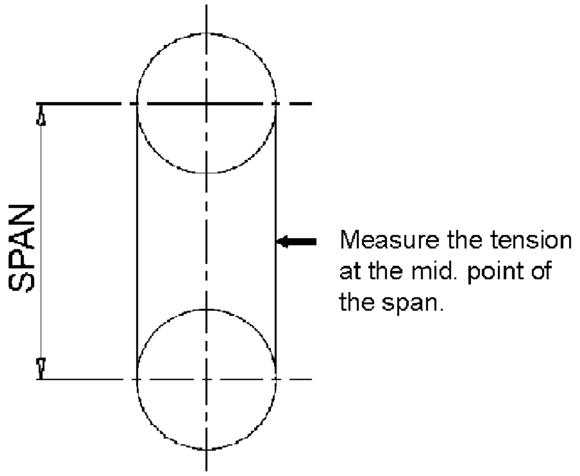
WU MOTOR
Figure 10-79

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	6 mm
Belt Weight	0.013 kg/m
Belt Span	105 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screwdriver etc.



MEASURING BELT TENSION
Figure 10-80

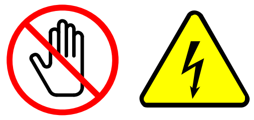
The belt tension must be 9.8 to 12.7 N.

(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

10. DTR (Detector Unit)



WARNING

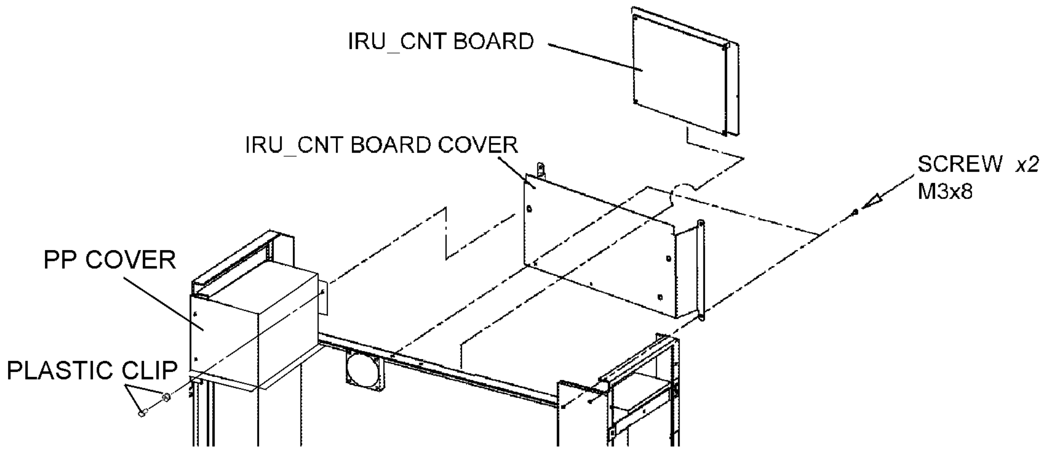
- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

Before removing the DTR, remove the followings:
- Top cover (See "2. A. Removing Covers")
- Upper frame and cover as assembled (See "2. A. Removing Covers")
- Rear cover (See "2. A. Removing Covers")
- Mosaic plates (See "2. B. Removing Mosaic Plates")
- WU (See "9. A. Dismounting WU")
- RCU (See "5. A. Dismounting RCU")

A. Dismounting DTR

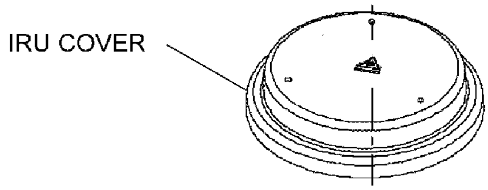
(1) Remove the two screws (M3x8) attaching the IRU_CNT board cover to the rear frame. See Figure 10-81.

(2) Remove the IRU_CNT board cover by removing the plastic clip located on the PP cover.



REMOVING IRU_CNT BOARD COVER
Figure 10-81

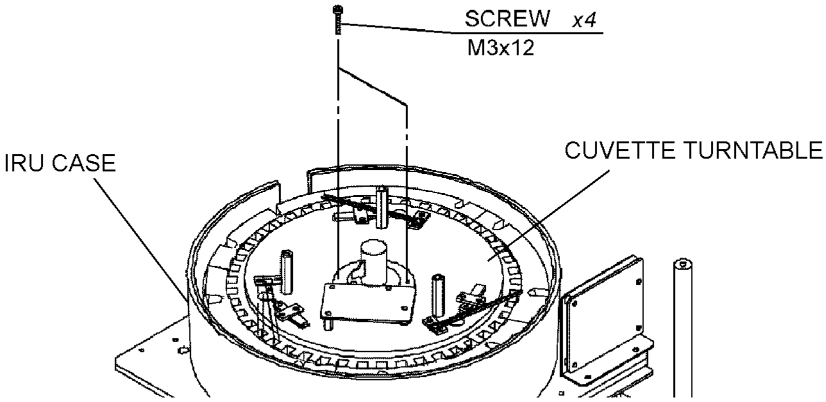
(3) Remove the IRU cover by removing the three screws (M4).



IRU COVER
Figure 10-82

(4) Unplug the connector (CN350) from the IRU_CN2 board (25P3218) located on the cuvette turntable.

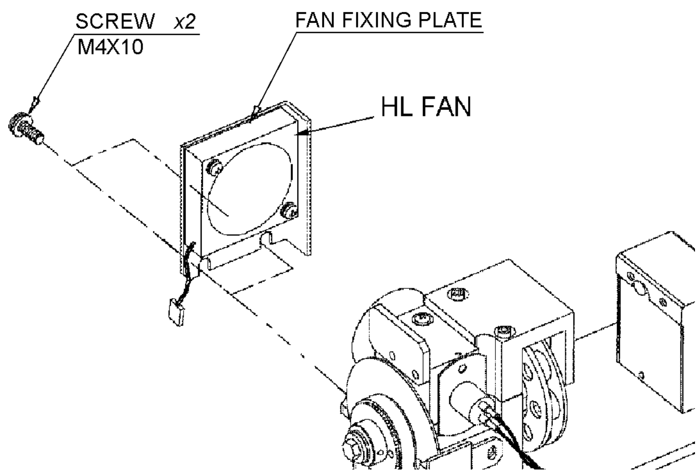
(5) Remove the four screws (M3x12) from the cuvette turntable. Lift the cuvette turntable to remove.



REMOVING CUVETTE TURNTABLE
Figure 10-83

(6) Remove the four screws (M3x8) from the IRU case (shown above). Lift the IRU case to remove.

(7) Remove the HL fan (part of DTR) and fan fixing plate as assembled by loosening the two screws (M4x10). Unplug fan's connector (CN344) from the IRU_DRV board (25P3216/25P3231).



REMOVING FAN (PART OF DTR)
Figure 10-84

(8) Unplug the connector of the halogen lamp (CN10B).

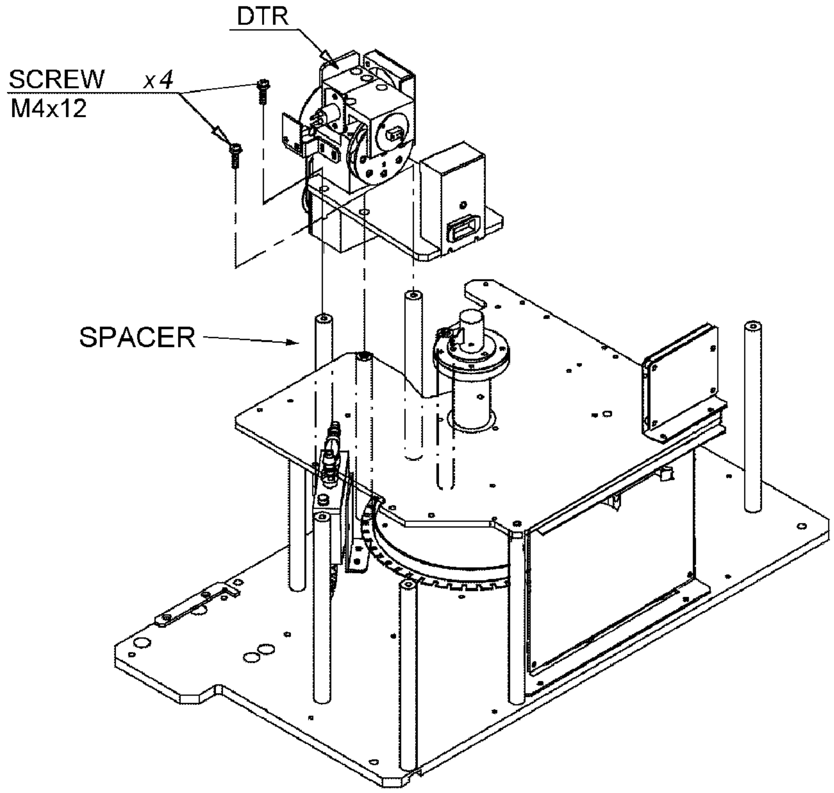
(9) Unplug the connector (CN332) from the IRU_DRV board (25P3216/25P3231).

(10) Unplug the connector (CN325) from the IRU_CN1 board (25P3217).

(11) Unplug the connector (CN100) from the AD board (25P3706).

(12) Remove the hex pole from the bottom plate using a spanner.

(13) Remove the DTR from the spacers by loosening the four screws (M4x12) as shown below.



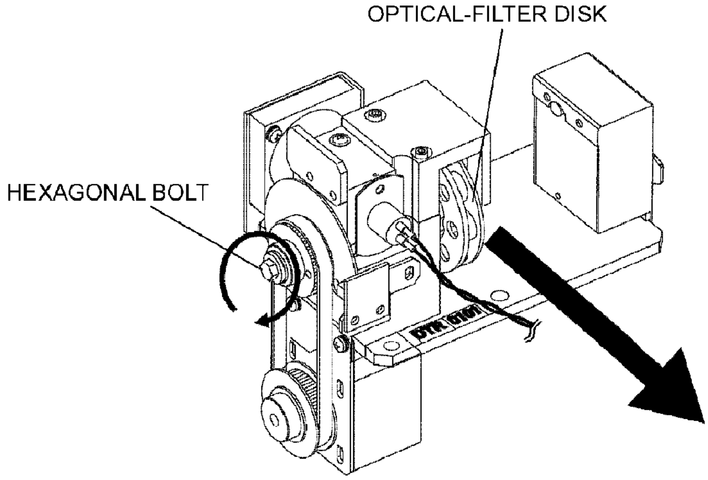
REMOVING DTR
Figure 10-85

B. Replacing Optical-Filter Disk

Before removing the optical-filter disk, remove the mosaic plates 2, 4 and 9 (Figure 10-2). Also, to make the removal procedure easier, remove the hex pole from the bottom plate.

(1) Using a spanner, loosen the hexagonal bolt fixing the optical-filter disk and the filter driving pulley together. See Figure 10-86.

(2) Remove the optical-filter disk by hand, taking care not to touch the glass surfaces of the filters.



REMOVING OPTICAL-FILTER DISK
Figure 10-86

Mounting Optical-Filter Disk

When mounting the optical-filter disk, make sure that the disk is engaged with the filter driving shaft properly.

C. Dismounting FLT Motor

First remove the RCU. See "5. A. Dismounting RCU".

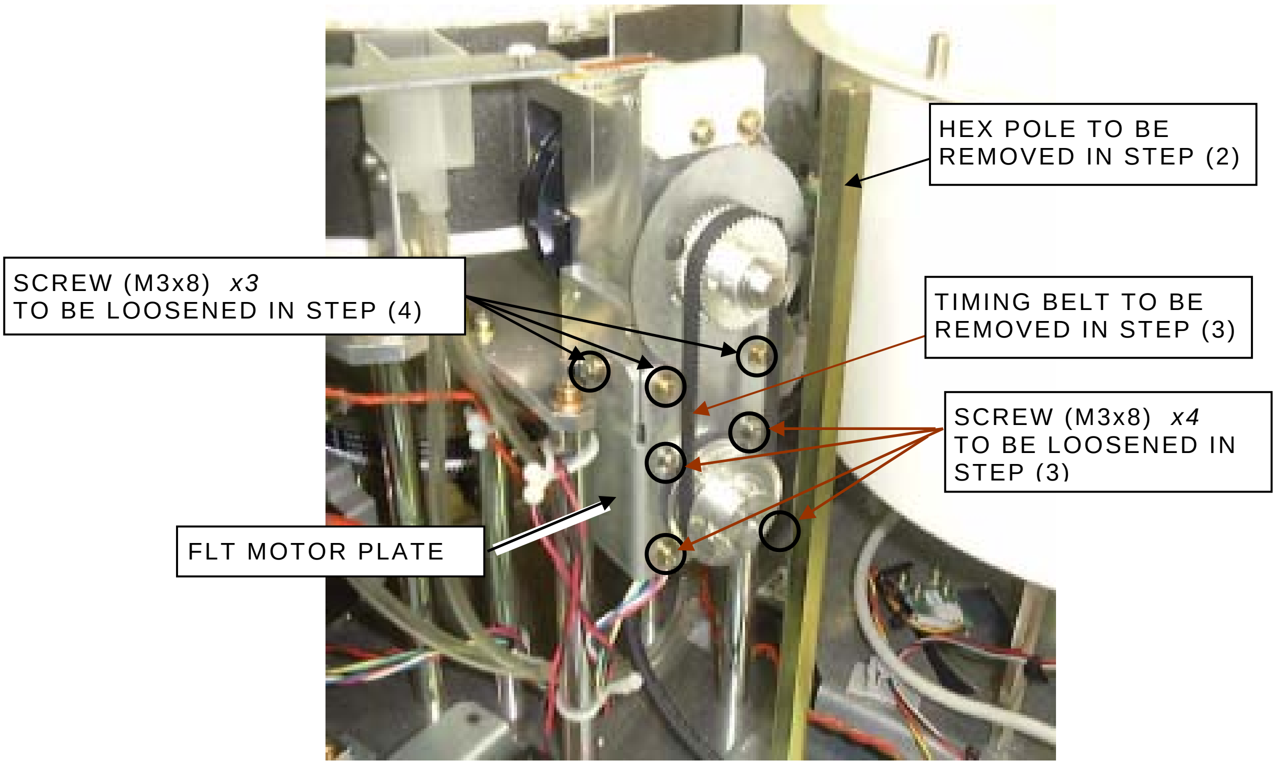
Next take the following steps. See Figure 10-87.

(1) Unplug the connector (CN332) from the IRU_DRV board (25P3216/25P3231).

(2) Using a spanner, remove the hex pole from the bottom plate.

(3) Loosen the FLT motor by loosening the four screws (M3x8). Remove the timing belt from the shafts.

(4) Remove the FLT motor with filter motor plate as assembled by removing the three screws (M3x8) which attach the filter motor plate to the DTR.



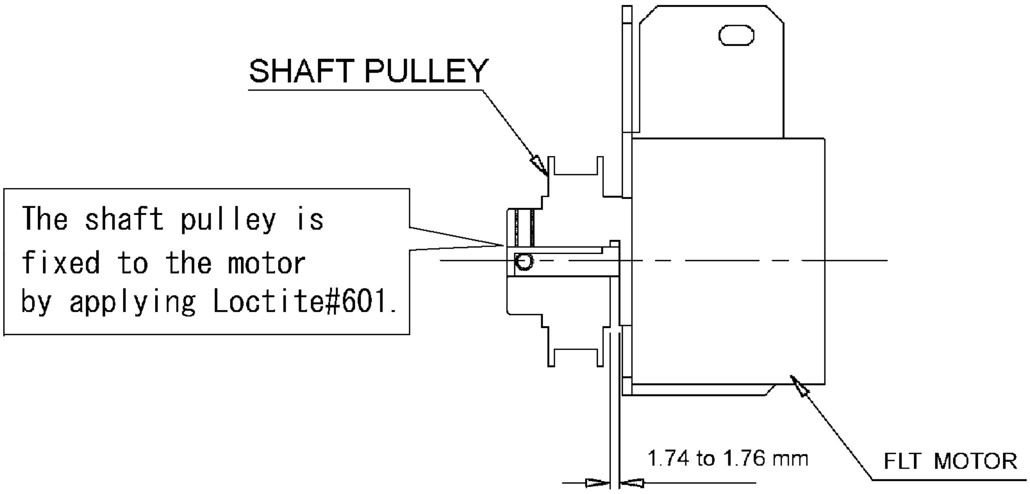
REMOVING FLT MOTOR
Figure 10-87

Mounting FLT Motor

When mounting the FLT motor, pay attention to the following points.

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the FLT motor.
The shaft pulley is built into the FLT motor as shown below.



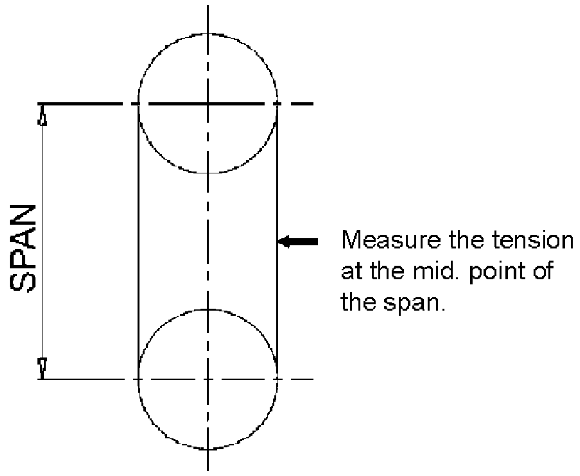
FLT MOTOR
Figure 10-88

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	6 mm
Belt Weight	0.013 kg/m
Belt Span	70.2 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screw driver etc.



MEASURING BELT TENSION
Figure 10-89

The belt tension must be 9.8 to 12.7 N.

(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

D. Replacing Halogen Lamp

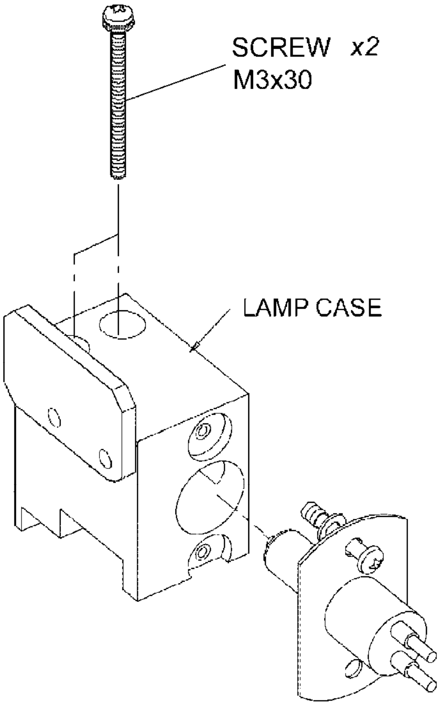
Remove the mosaic plates 4, 5 and 9 beforehand. See Figure 10-2.

Next, take the following steps.

WARNING: THE LAMP CASE MIGHT BE HOT. LEAVE THE HALOGEN LAMP FOR COOLING FOR 30 MINUTES AFTER THE POWER-OFF, THEN START THE FOLLOWING STEPS.

(1) Unplug the connector of the halogen lamp (CN10B). Disengage the halogen lamp cable from the clamp on the mosaic plate 2.

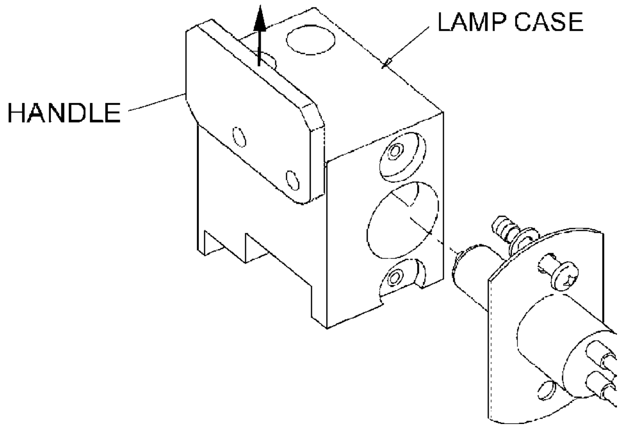
(2) Remove the two screws (M3x30) from the lamp case.



REMOVING M3X30 SCREWS
Figure 10-90

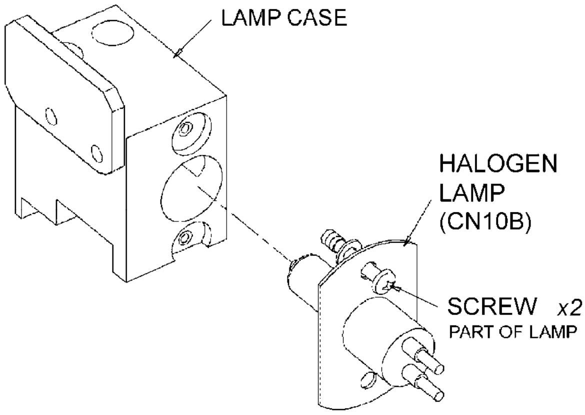
WARNING: THE LAMP CASE IS HOT. WHEN PULLING OUT THE HALOGEN LAMP IN STEPS (3) AND (4), HOLD THE PLASTIC HANDLE OF THE LAMP CASE.

(3) Remove the lamp case by holding its plastic handle.



REMOVING LAMP CASE
Figure 10-91

(4) Loosen the two screws (part of the halogen lamp) and pull out the halogen lamp from the lamp case.

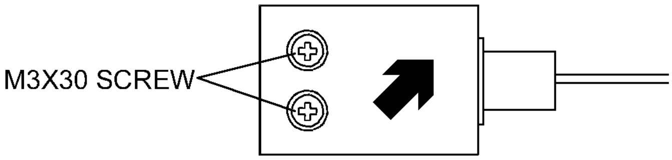


REMOVING HALOGEN LAMP
Figure 10-92

(5) Install a new lamp.

Installing Lamp Case

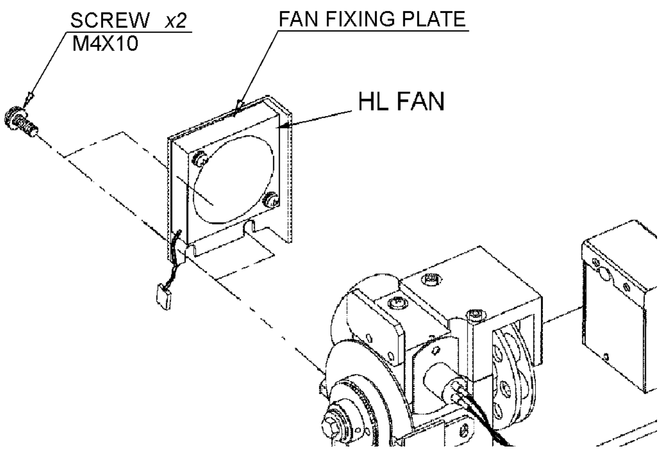
When installing the lamp case, give special consideration to tighten the two screws (M3x30) while pushing the lamp case in the arrow direction.



INSTALLING LAMP CASE
Figure 10-93

E. Dismounting HL Fan (Halogen Lamp Fan)

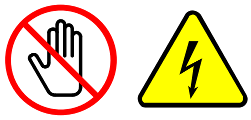
(1) Unplug the connector (CN344) from the IRU_DRV board (25P3216/25P3231).
(2) Loosen the two screws (M4x10) to remove the HL fan and fan fixing plate as assembled.



REMOVING HL FAN
Figure 10-94

(3) Remove the HL fan from the fan fixing plate by removing the two screws (M3x15).

11. IRU (Incubation Reaction Unit)



WARNING
- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

Before dismounting the IRU, remove the followings. Refer to "2. A. Removing Covers" for procedures:
- Top cover
- Upper frame and cover as assembled
- Rear cover

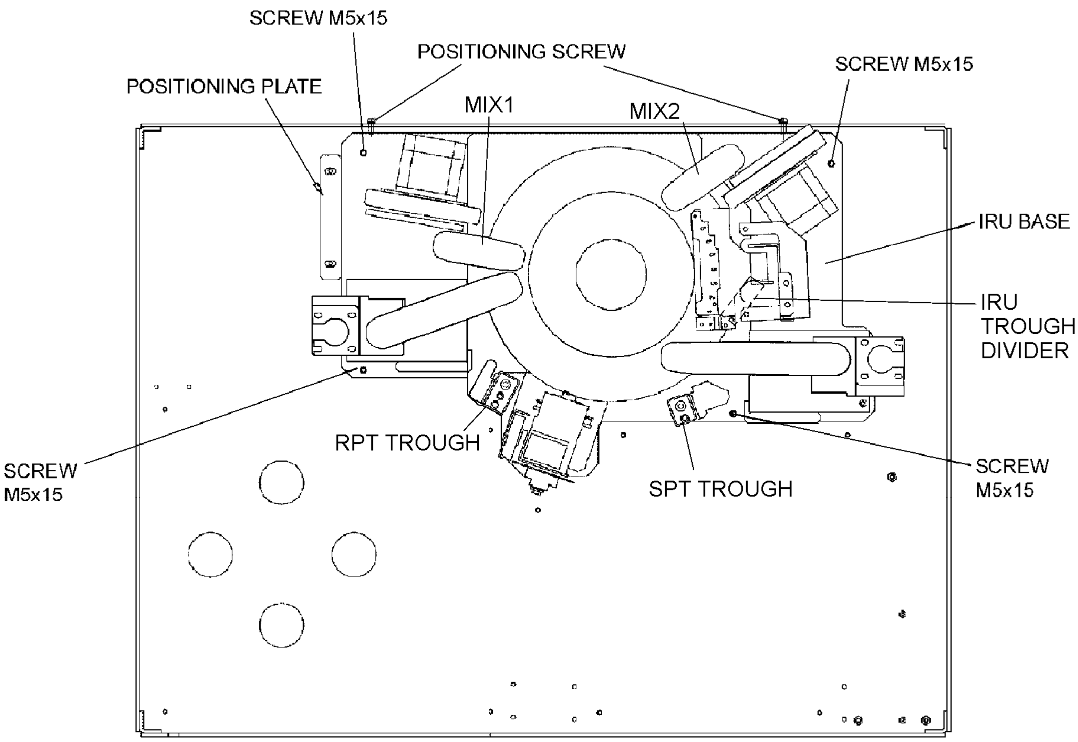
A. Dismounting IRU

(1) Unplug the connector (CN100) from the AD board. Unplug the two connectors (CN310 and CN331) from the IRU_DRV board. Unplug the connector (CN311) from the IRU_CN1 board.

(2) Pull and disconnect the seven tubes from the following troughs and divider.
NOTE: After disconnecting the tubes, close the end of each tube using a clip etc to prevent fluid leakage.

From	RPT trough:	2 tubes with blue label and 1 tube with green label,
	SPT trough:	1 tube with blue label,
	MIX1 trough:	1 tube with blue label,
	MIX2 trough:	1 tube with blue label,
	IRU trough divider:	1 tube with red label.

(3) Remove the IRU base from the bottom of the chassis by removing the four screws (M5x15).



REMOVING IRU BASE
Figure 10-95

CAUTION: DO NOT LOOSEN OR REMOVE THE POSITIONING PLATE FIXING SCREWS OR POSITIONING SCREWS.

<u>Mounting IRU Base</u>

When mounting the IRU base, pay attention to the following points.

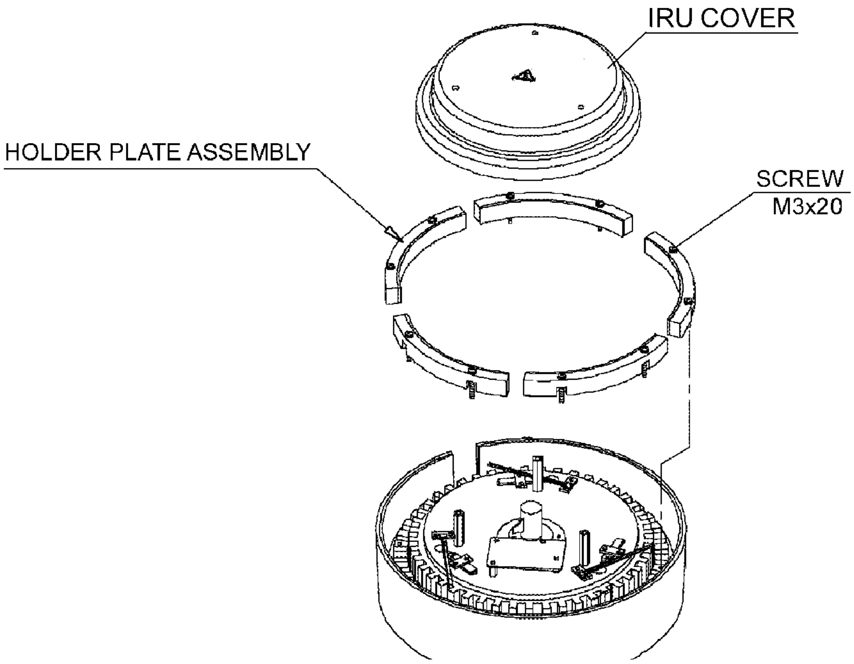
(1) When tightening the four screws (M5x15) to fix the IRU base, push the IRU base toward the positioning plate.

(2) When connecting the tubes, refer to "Appendix E. Fluidics System Diagram".

B. Replacing Cuvettes

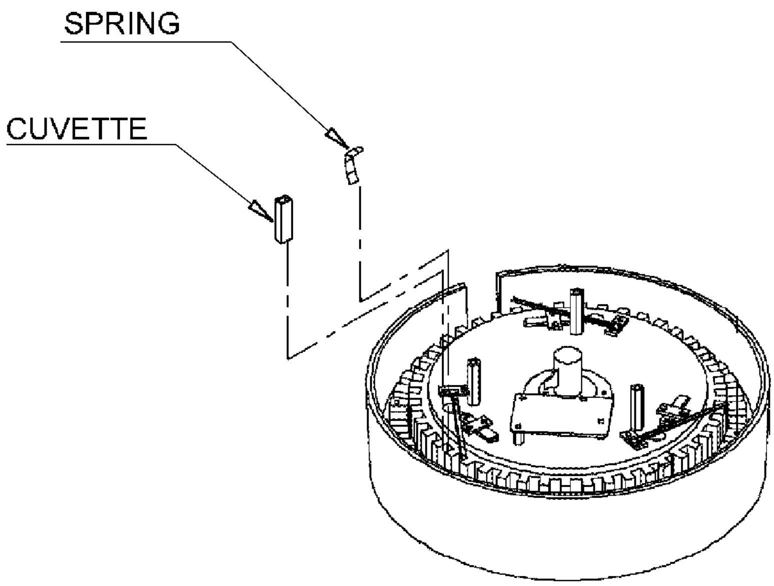
(1) Remove the holder plate assemblies by loosening two screws (M3x20) each.

<u>CAUTION</u>: TO AVOID LOSS OF THE WASHERS, DO NOT REMOVE THE SCREWS COMPLETELY BUT LOOSEN THEM A LITTLE.



REMOVING HOLDER PLATE ASSEMBLIES
Figure 10-97

(2) Remove the cuvettes. When removing the cuvettes, be careful not to disengage the springs.



REMOVING CUVETTES
Figure 10-98

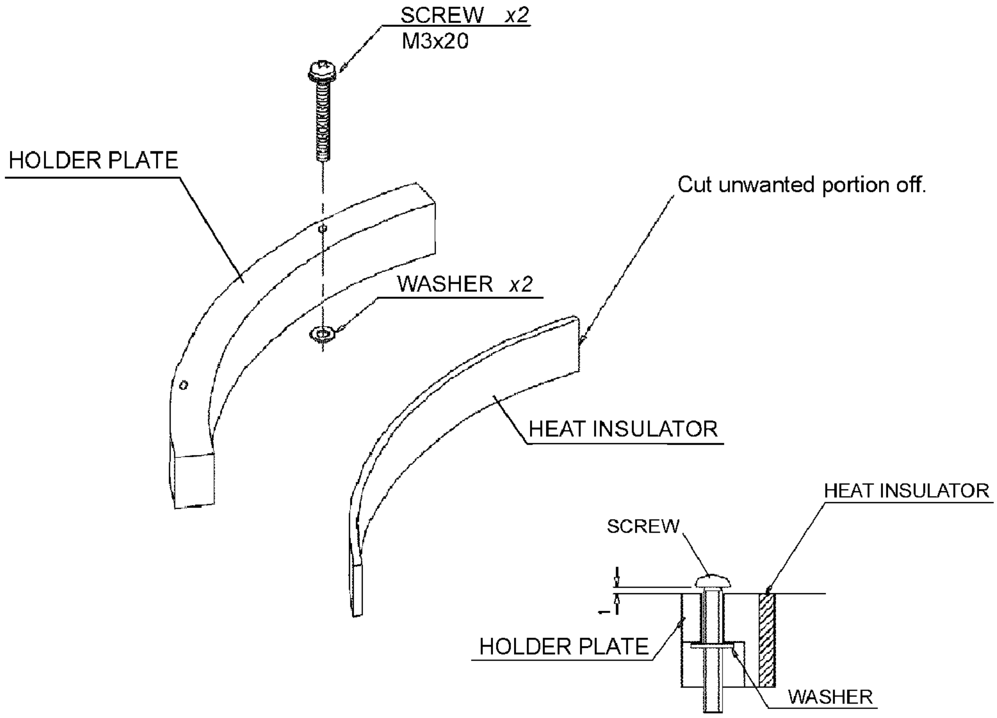
CAUTION: WHENEVER INSTALLING A NEW CUVETTE, REMOVE THE HOLDER PLATE ASSEMBLY BEFOREHAND. OTHERWISE, THE OUTER SURFACE OF THE NEW CUVETTE MAY RUB THE INNER SURFACE OF THE HOLDER PLATE ASSEMBLY, RESULTING IN STAIN OR SCRATCH.

(3) Install new cuvettes, and then, attach the five holder plate assemblies with screws (M3x20). Pay attention to the following points.

(a) When installing a new cuvette, set the spring as shown below.

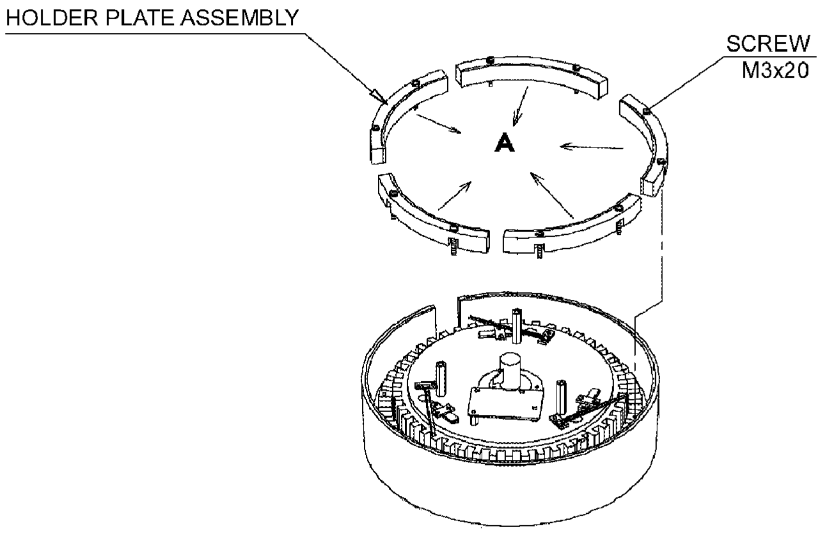
SETTING SPRING
Figure 10-99

(b) When you replace the holder plate assembly with a new one, attach a heat insulator to the new holder plate as shown below.



INSTALLING HEAT INSULATOR
Figure 10-100

(c) Install the holder plates assembly by tightening the screws (M3x20). When tightening the screws (M3x20), push the holder plate assembly in the A direction, as shown below.

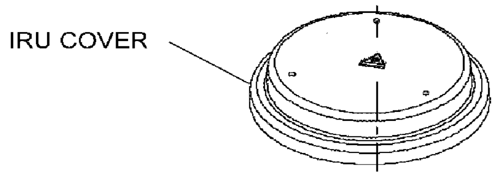


INSTALLING HOLDER PLATE ASSEMBLIES
Figure 10-101

C. Replacing Thermal Fuse (three places)

Remove the SWU cover and mosaic plate 6 beforehand.

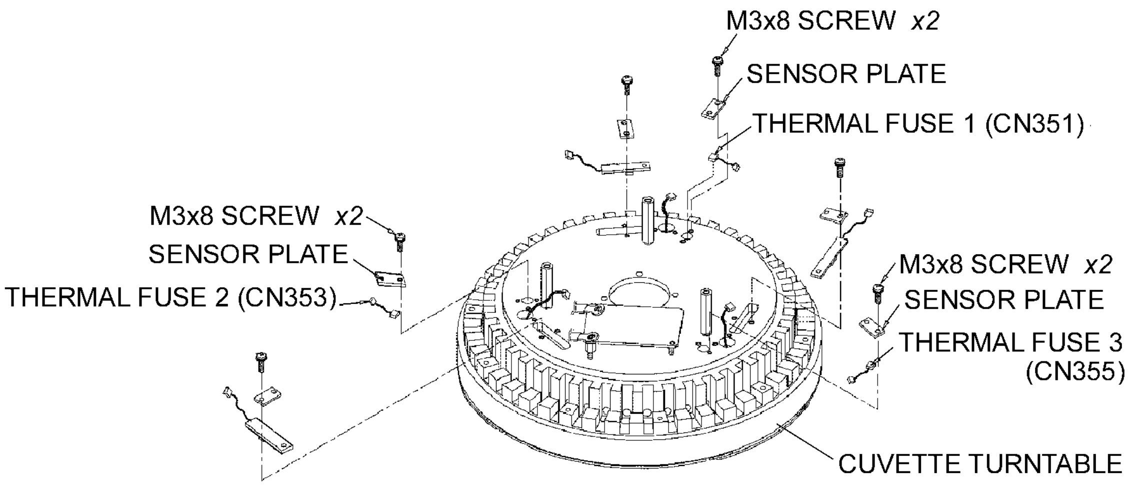
(1) Remove the IRU cover by removing the three screws (M4).



IRU COVER
Figure 10-102

(2) Unplug the connector from the IRU_CN2 board (25P3218) located on the cuvette turntable.

(3) Remove the sensor plates by removing two screws (M3x8) each. Thermal fuses also come off.

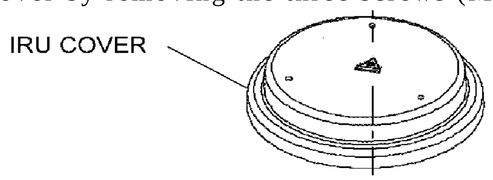


REMOVING THERMAL FUSES
Figure 10-103

D. Dismounting Slip Ring

Remove the SWU cover, mosaic plate 6 and rear cover beforehand.

(1) Remove the IRU cover by removing the three screws (M4).



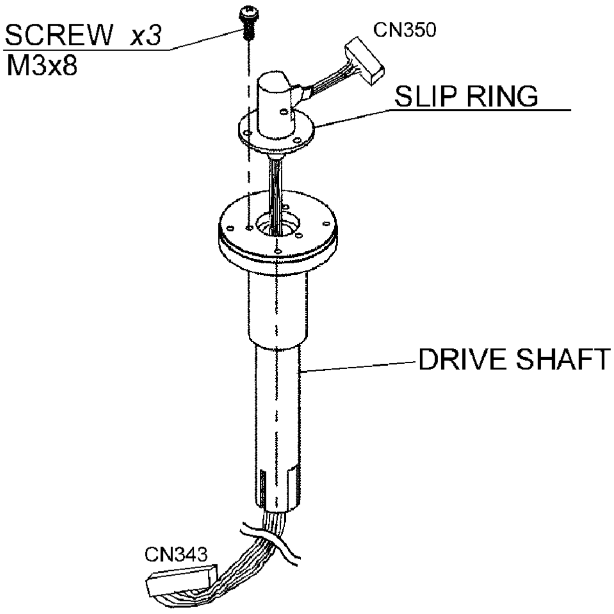
IRU COVER
Figure 10-104

(2) Unplug the connector (CN350) from the IRU_CN2 board (25P3218) located on the cuvette turntable.

(3) Unplug the connector (CN343) from the IRU_DRV board (25P3216/25P3231).

(4) Remove the three screws (M3x8) from the slip ring as shown in Figure 10-105.

(5) Lift the slip ring to draw out its cable from the drive shaft.



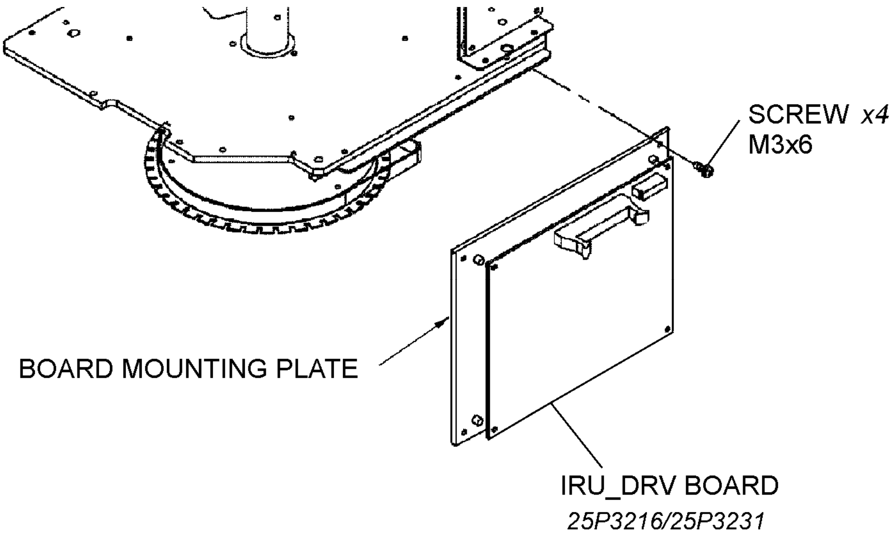
REMOVING SLIP RING
Figure 10-105

E. Dismounting IRU Motor

Remove the rear cover (Figure 10-1A) beforehand.

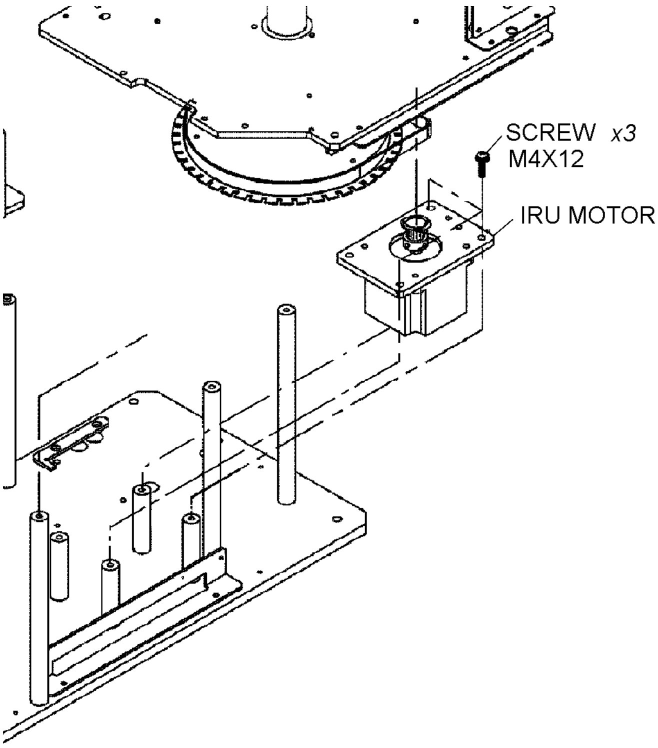
(1) Unplug all the connectors from the IRU_DRV board (25P3216/25P3231).

(2) Remove the IRU_DRV board mounting plate by removing the four screws (M3x6).



REMOVING BOARD MOUNTING PLATE
Figure 10-106

(3) Remove the IRU motor together with its mounting plate by removing the three hex. screws (M4x12). At this stage the timing belt is also removable.



REMOVING IRU MOTOR
Figure 10-107

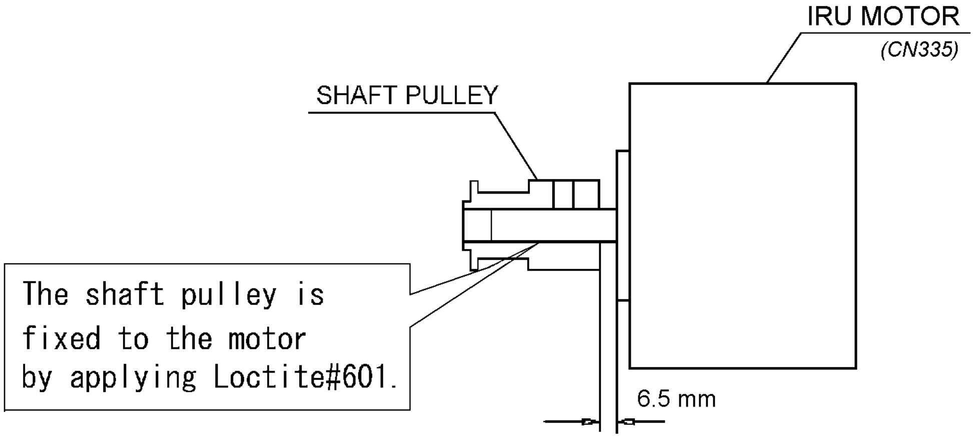
(4) Remove the IRU motor from the mounting plate by removing the four screws (M4x15).

Mounting IRU Motor

When mounting the IRU motor, pay attention to the following points.

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the IRU motor.
The shaft pulley is built into the IRU motor as shown below.



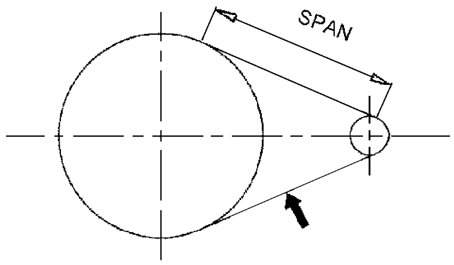
IRU MOTOR
Figure 10-108A

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	10 mm
Belt Weight	0.013 kg/m
Belt Span	66.7 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screwdriver etc.



MEASURING BELT TENSION
Figure 10-108B

The belt tension must be 16.7 to 22.6 N.

(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

F. IRU Heater

(1) Remove the mosaic plates 4, 5, 6 and 9, RPT guide and SWU cover.

(2) Remove the WU nozzle base by removing the three screws (M3x12). Put aside the WU nozzle base using tape etc.

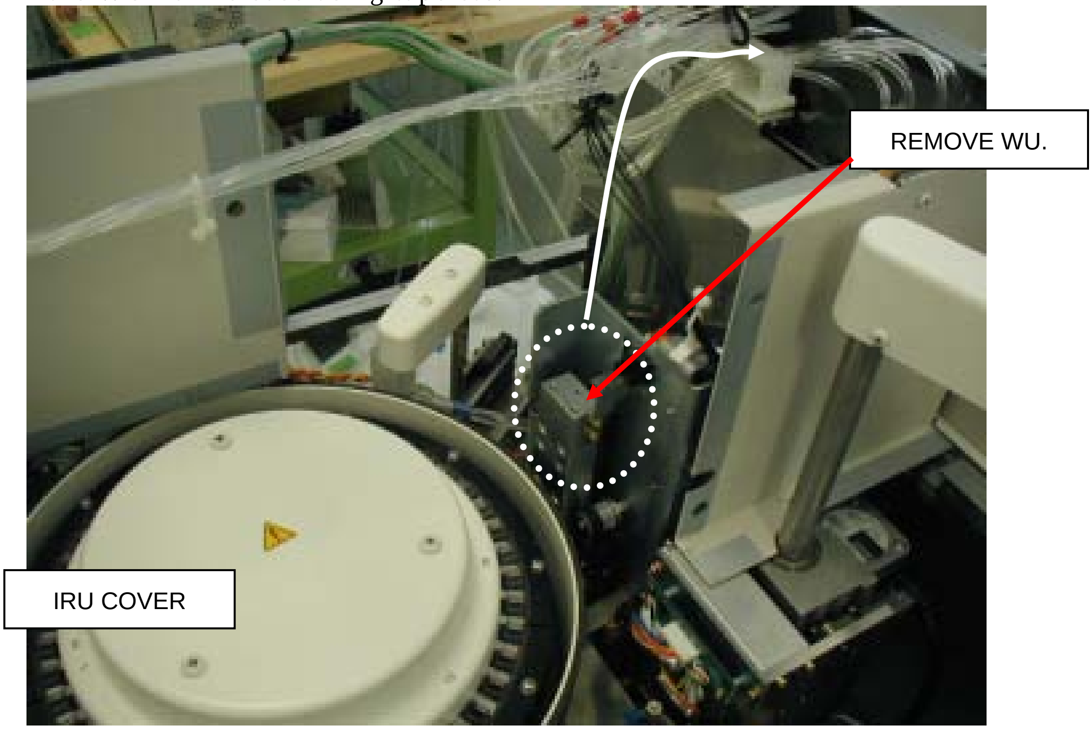


Figure 10-109A

(3) Removal of turntable

(a) Remove the IRU cover by removing the three screws (M4).

(b) Unplug the connector (CN350) from the IRU_CN2 board (25P3218) located on the turntable.

(c) Remove the four screws (M3x12) from the turntable. Lift up the turntable to remove.

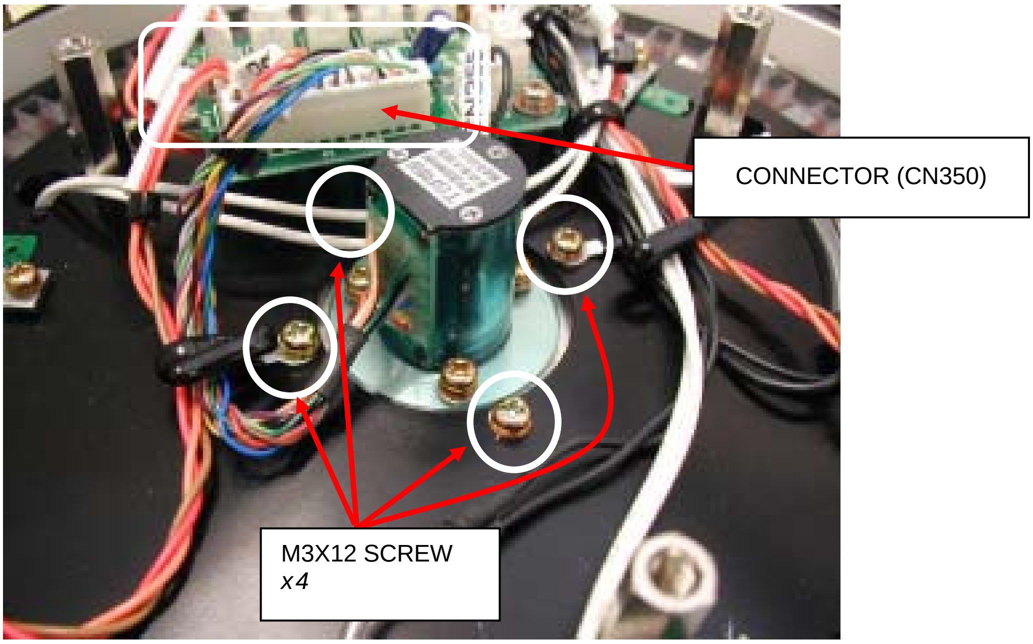


Figure 10-109B

(4) Replacement of heater

(a) Unplug the three connectors (CN352, CN354 and CN356) from the IRU_CN2 board (25P3218).

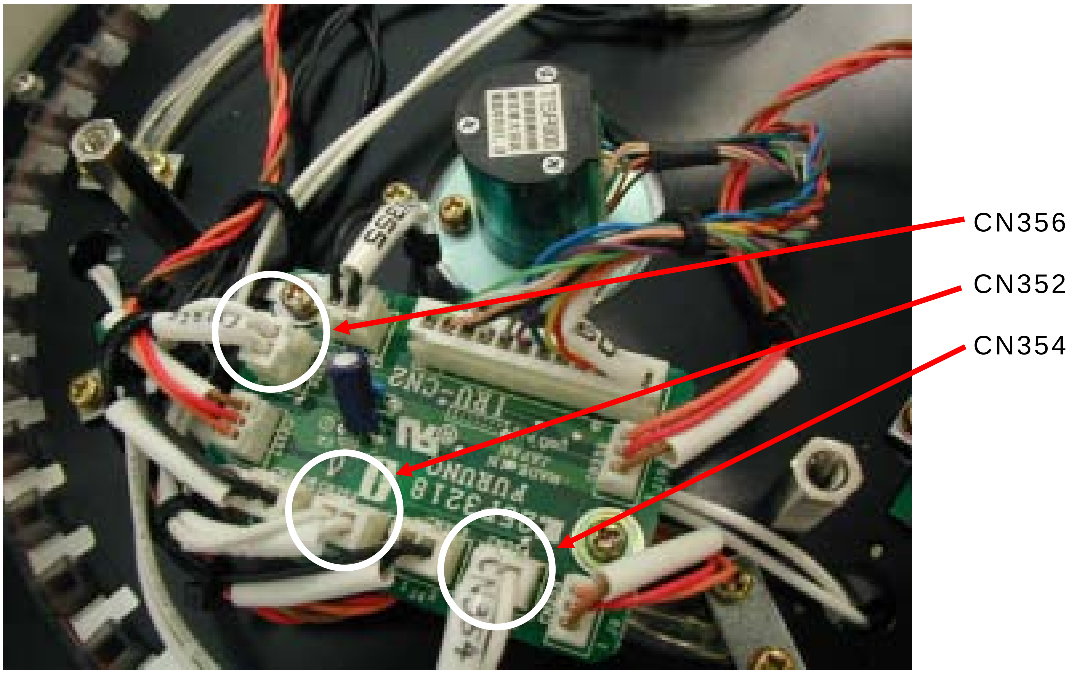


Figure 10-109C

(b) Put the turntable on a flat place and turn it over. (Heater side is up.)
(c) Remove the heater-fixing plates by removing the 12 screws (M2.5).
(d) Remove the three heater cable fixing plates by removing the two screws (M2) each.
(e) Remove the heater.

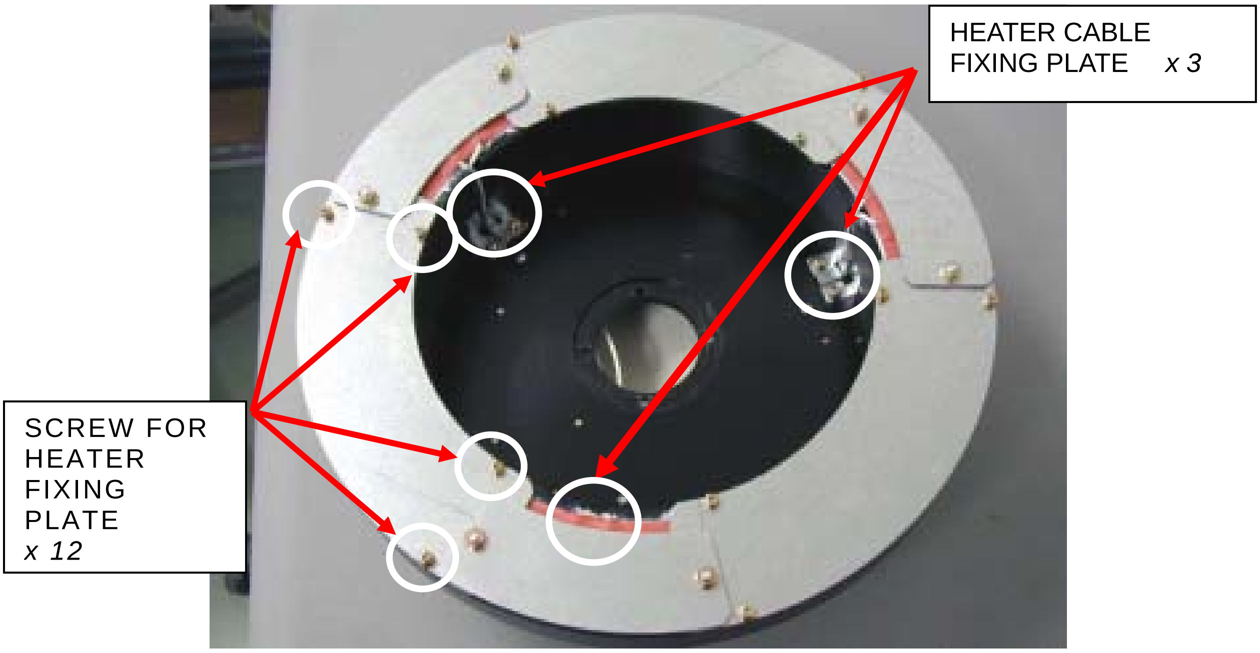


Figure 10-109D

Mounting IRU Heater

(1) Apply silicone compound (HSC-50) between a new heater and turntable.
(2) Carefully place the new heater in position.

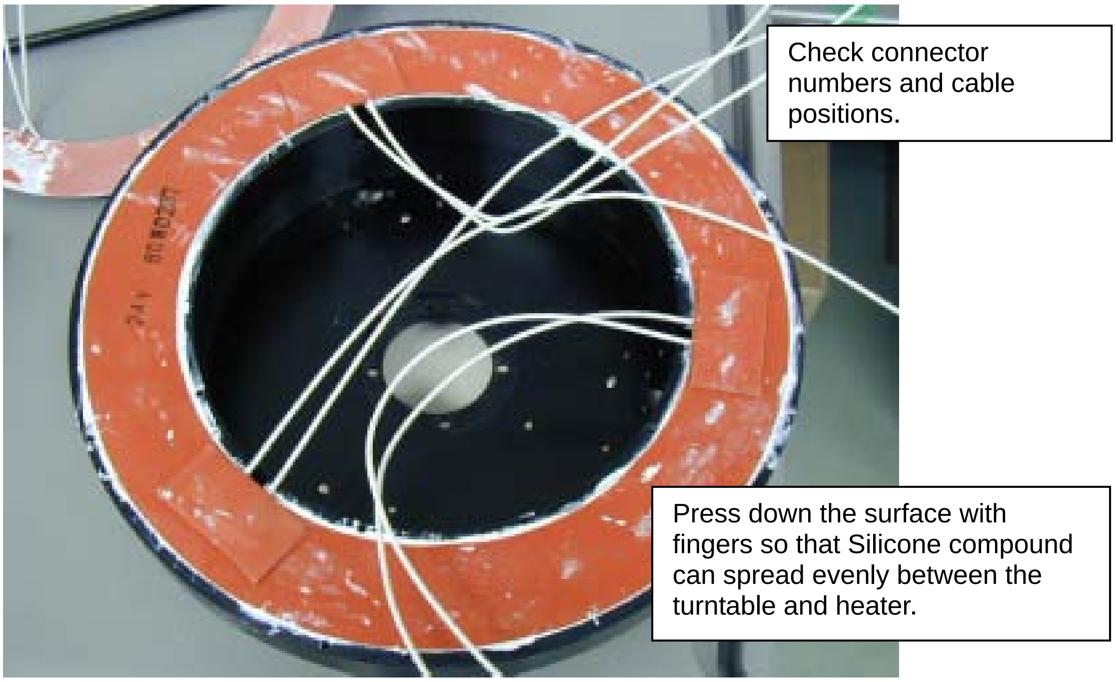


Figure 10-109E

(3) Install the heater fixing plates and heater cable fixing plates.
(4) Connect the connectors (CN352, CN354 and CN356) in position.

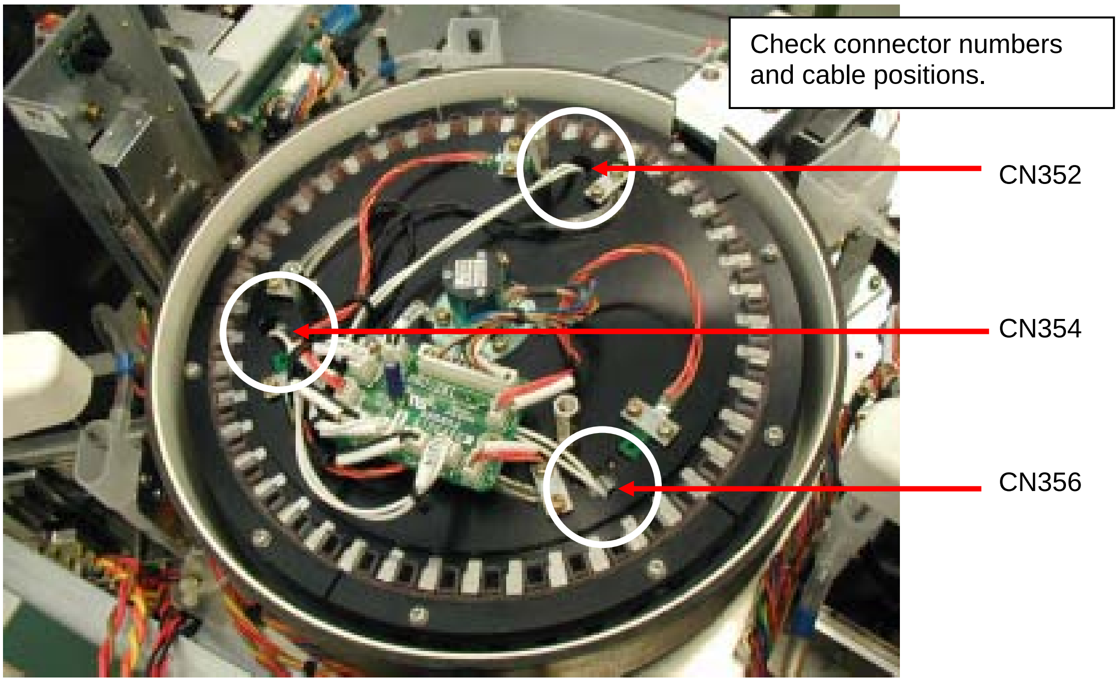


Figure 10-109F

(5) Loosely attach the turntable to the drive shaft with the four screws (M4x12). For position adjustment purpose at later stage, do not tighten the screws yet.
(6) Connect the connector (CN350) to the IRU_CN2 board.

Position Adjustment of Turntable

(1) Adjustment of light axis
  (a) Execute the checker program “chk_mot” after connecting “Hyper Terminal”.
  (b) Select “Select No.2 (Back Home)” to move all the units to their respective zero positions.
  (c) Using a light axis jig, adjusts the turntable position by hand so that the light axis is positioned in the center of the cuvette. After the position adjustment, tighten the four screws (M4x12). (Make sure that the light passes through the center of the cuvette.)
  (d) Measure light axis adjustment pulses by running the light axis adjustment soft ("offboot", Excel file) and apply the value to “system.txt” file.

(2) Position adjustment of WU
  (a) Install the WU nozzle unit.
  (b) Execute the checker program “chk_mot” and select “Select No.2 (Back Home)” to move the units to their zero positions.
  (c) Adjust position of the WU nozzles using the jigs. Accurately adjust the position of wipe nozzle (WU8). See Chapter 10 9. WU "Adjusting Horizontal Position of Nozzle" for the procedures.
  (d) Execute the checker program “chk_mot” to rotate the IRU by 176 degrees (2750 pulses) to verify that the wipe nozzle descends into the cuvette correctly. See Chapter 7 "1.Motor Checker Program".

(3) Other adjustments
  Execute the checker program “chk_mot”. Select "Map Move" to adjust a position of each unit.

> NOTE: Before adjustment, make sure to move the units back to their respective zero positions. In case of changing the position of a unit, loosen the positioning screws so that the positioning screws loosely attach positioning plates. After completing adjustment, tighten the positioning screws.

SPT

Move the SPT unit so that the pipette descends into the center of cuvettes.

[SPTRTRD]	Drain outlet of SPT trough. Verify and adjust that the nozzle tip is centrally located.
[SPTRTRR]	Water inlet of SPT trough. Verify and adjust that the nozzle tip is centrally located.
[SPTRASPOUT]	Pipetting spot of the outer tubes in ASP. Verify and adjust that the nozzle tip is centrally located.
[SPTRASPIN]	Pipetting spot of the inner tubes in ASP. Verify and adjust that the nozzle tip is centrally located. (Rotate the ASP by 238 pulses anti-clockwise.)
[SPTRISE]	Dispensing spot in ISE Verify and adjust that the nozzle tip is centrally located.

RPT

Move the SPT unit so that the pipette descends into the center of cuvettes.

[RPTRTRD]	Drain outlet of RPT trough D. Verify and adjust that the nozzle tip is centrally located.
[RPTRTRR]	Water inlet of RPT trough R. Verify and adjust that the nozzle tip is centrally located.
[RPTRTRC]	Rinse inlet of RPT trough C. Verify and adjust that the nozzle tip is centrally located.
[RPTRRCUOUT]	Pipetting spot of the outer bottles in RCU. Verify and adjust that the nozzle tip is centrally located. (Rotate the RCU by 16 pulses clockwise.)
[RPTRRCUIN]	Pipetting spot of the inner bottles in RCU. Verify and adjust that the nozzle tip is centrally located.

MIX1 & MIX2

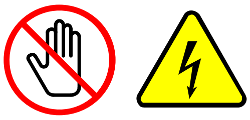
Position adjustment of MIX-1（Make sure that its stirrer does not touch the inside surface of the cuvettes.）

Position adjustment of MIX-2（Make sure that its stirrer does not touch the inside surface of the cuvettes.）

12. PP - SPP (Sample Pump) / RPP (Reagent Pump) / WPP (Wash Pump)

WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

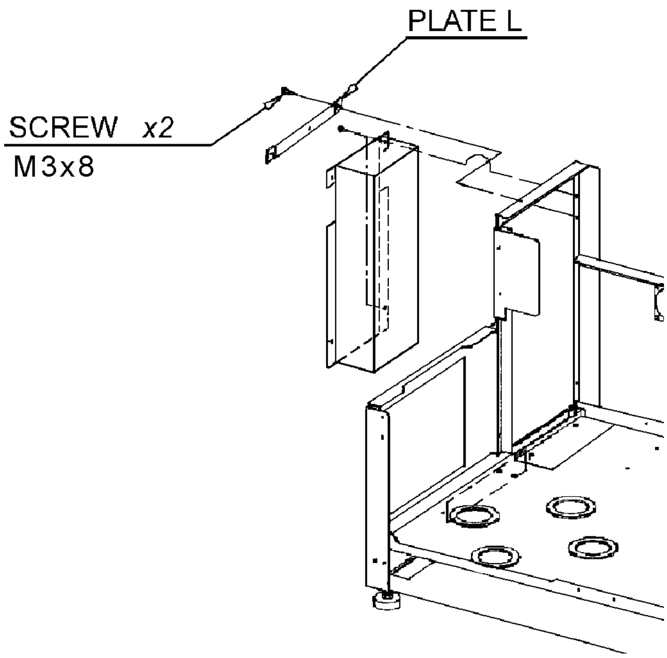


Before dismounting the PP, remove the followings.
- Rear cover (See Figure 10-1A.)
- Left cover. (See Figure 10-1E.)

A. Dismounting PP

(1) Unplug the two connectors (CN304 and CN403) from the IRU-CNT board (25P3215).

(2) Remove the plate L by removing the two screws (M3x8).

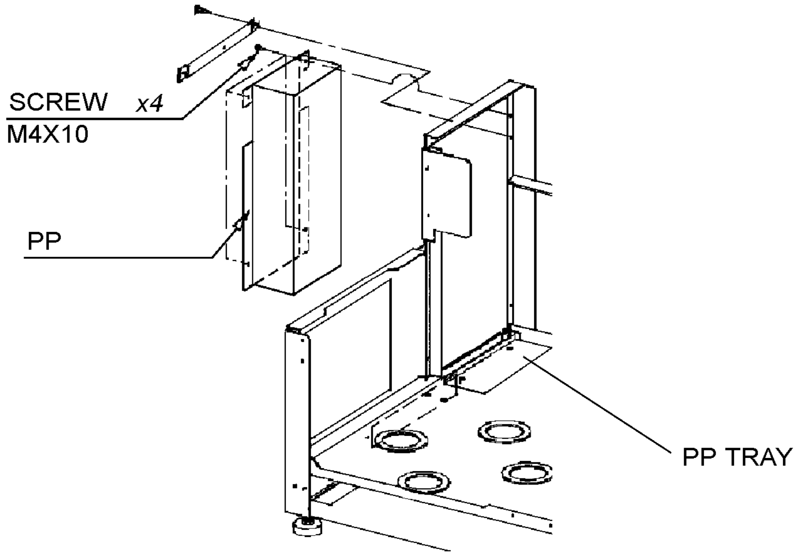


REMOVING PLATE L
Figure 10-110

(3) Remove the two lower PP fixing screws (M4x10). See Figure 10-111.

(4) Slightly loosen the two upper PP fixing screws (M4x10).

<u>NOTE</u>: Do not remove the screws completely.

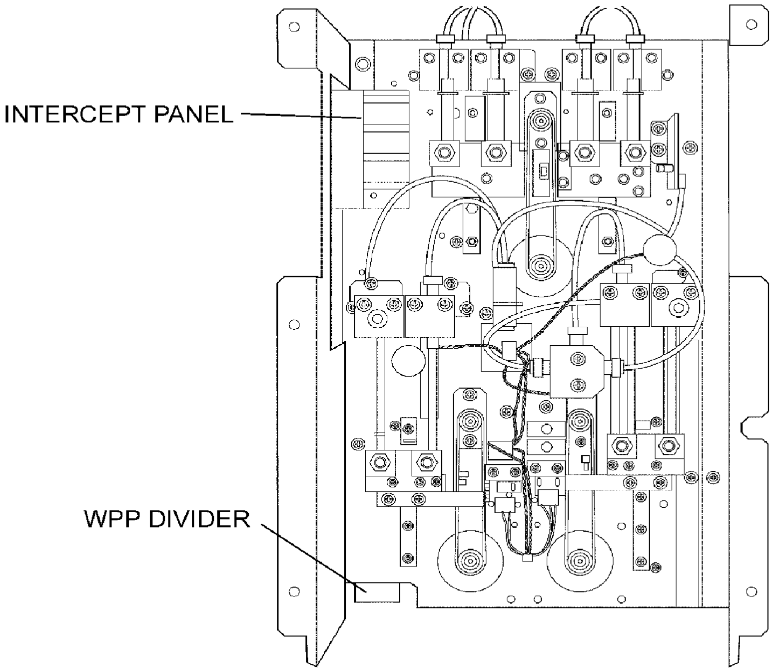


REMOVING M4X10 SCREWS
Figure 10-111

(5) Push the bottom part of the PP. Remove the PP tray from the bottom by removing the two plastic clips. See Figure 10-111.

(6) Pull out the tube (W) from the WPP divider located on lower left part of the PP. See Figure 10-112.

(7) Remove the eight tubes from the intercept panel.



INTERCEPT PANEL AND DIVIDER LOCATIONS
Figure 10-112

(8) Remove the M6 joint of the SPP/RPP syringes (two places). Pull out and remove the tube from each syringe. See Figures 10-26 and 10-41.

(9) Remove the upper two PP fixing screws (M4x10). See Figure 10-111.

(10) Remove the PP.

Mounting PP

When connecting tubes, refer to "Appendix E. Fluidics System Diagram".

B. Dismounting Solenoid Valves

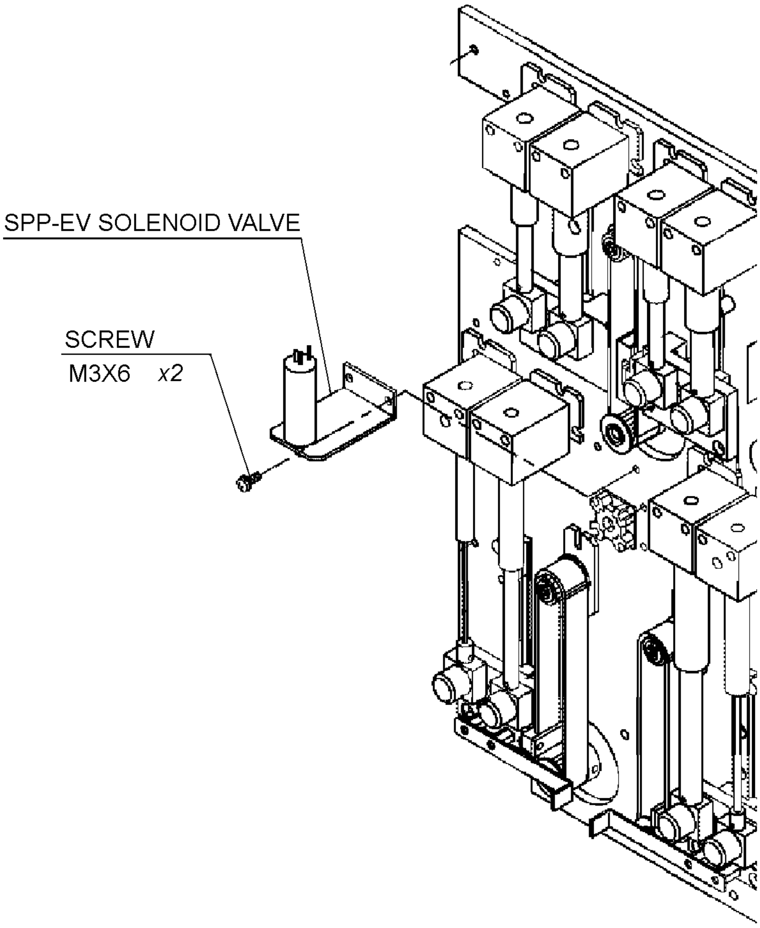
Dismounting SPP-EV Solenoid Valve

First remove the left cover and rear cover. See Figures 10-1A and 10-1E.

Next, take the following steps.

(1) Unplug the connector (CN420) from the PP_DRV board (25P3220).

(2) Dismount the SPP-EV solenoid valve with its mounting plate as assembled by removing the two screws (M3x6).



DISMOUNTING SPP-EV SOLENOID VALVE
Figure 10-113

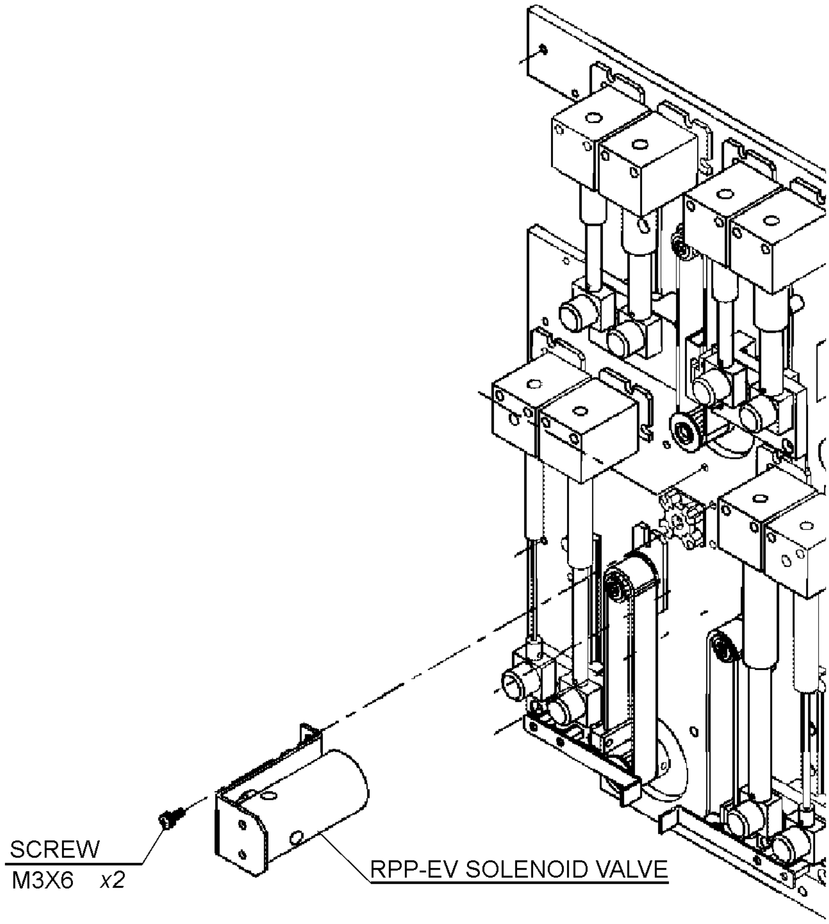
(3) Pull and disconnect the tubes from the solenoid valve.

NOTE FOR RECONNECTING TUBES:
Before inserting the tubes into the solenoid valve, apply liquid gasket (#1212) to the roots of the solenoid valve's pipes where the tubes are to be inserted.

Dismounting RPP-EV Solenoid Valve

(1) Unplug the connector (CN421) from the PP_DRV board (25P3220).

(2) Dismount the RPP-EV solenoid valve together with its mounting plate by removing the two screws (M3x6).



DISMOUNTING RPP-EV SOLENOID VALVE
Figure 10-114

(3) Pull and disconnect the tubes from the solenoid valve.

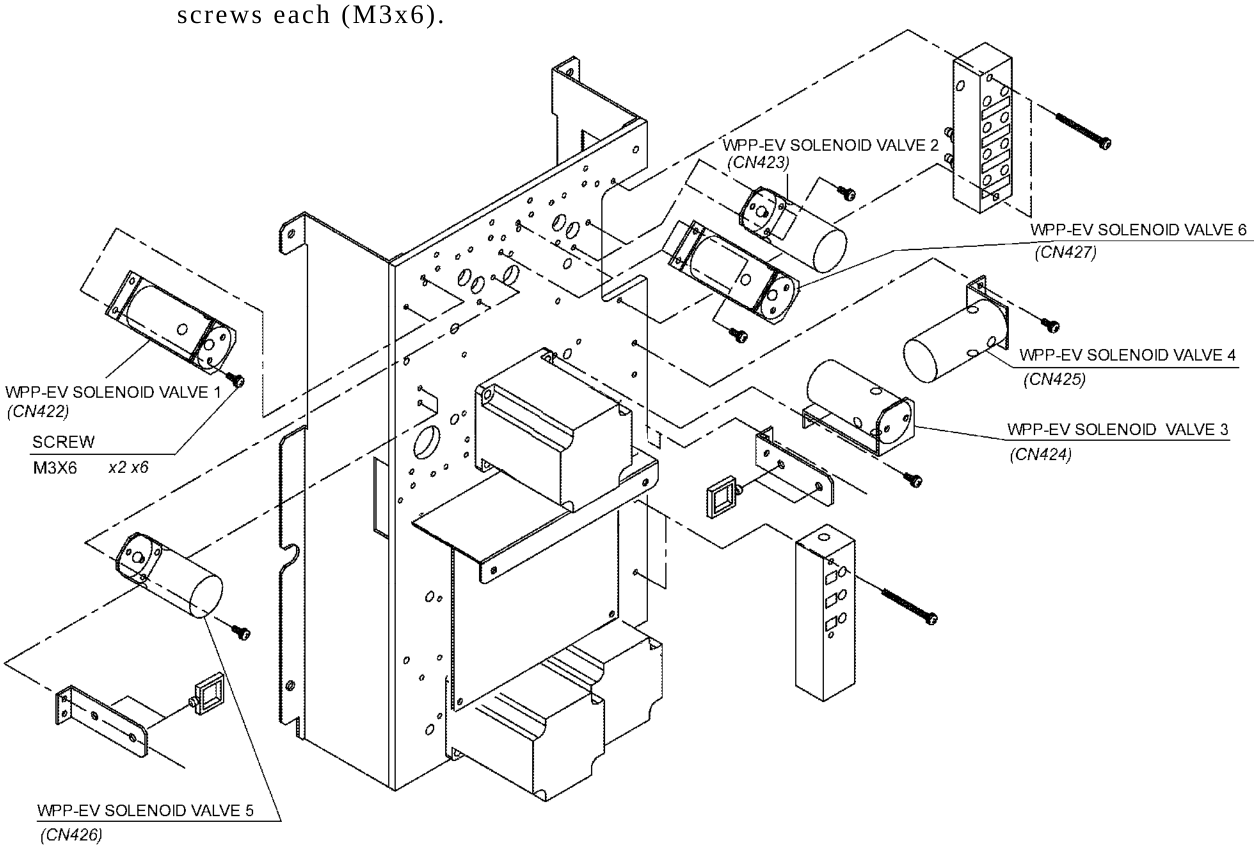
NOTE FOR RECONNECTING TUBES:
Before inserting the tubes into the solenoid valve, apply liquid gasket (#1212) to the roots of the solenoid valve's pipes where the tubes are to be inserted.

Dismounting WPP-EV Solenoid Valve (1 through 6)

(1) Remove the PP. See "A. Dismounting PP".

(2) Unplug the connectors (CN422-427) from the PP_DRV board (25P3220).

(3) Dismount the six WPP-EV solenoid valves (1 through 6) by removing the two screws each (M3x6).



DISMOUNTING WPP-EV SOLENOID VALVE
Figure 10-116

(4) Pull and disconnect the tubes from the solenoid valves.

NOTE FOR RECONNECTING TUBES:
Before inserting the tubes into the solenoid valves, apply liquid gasket (#1212) to the roots of the solenoid valves' pipes where the tubes are to be inserted.

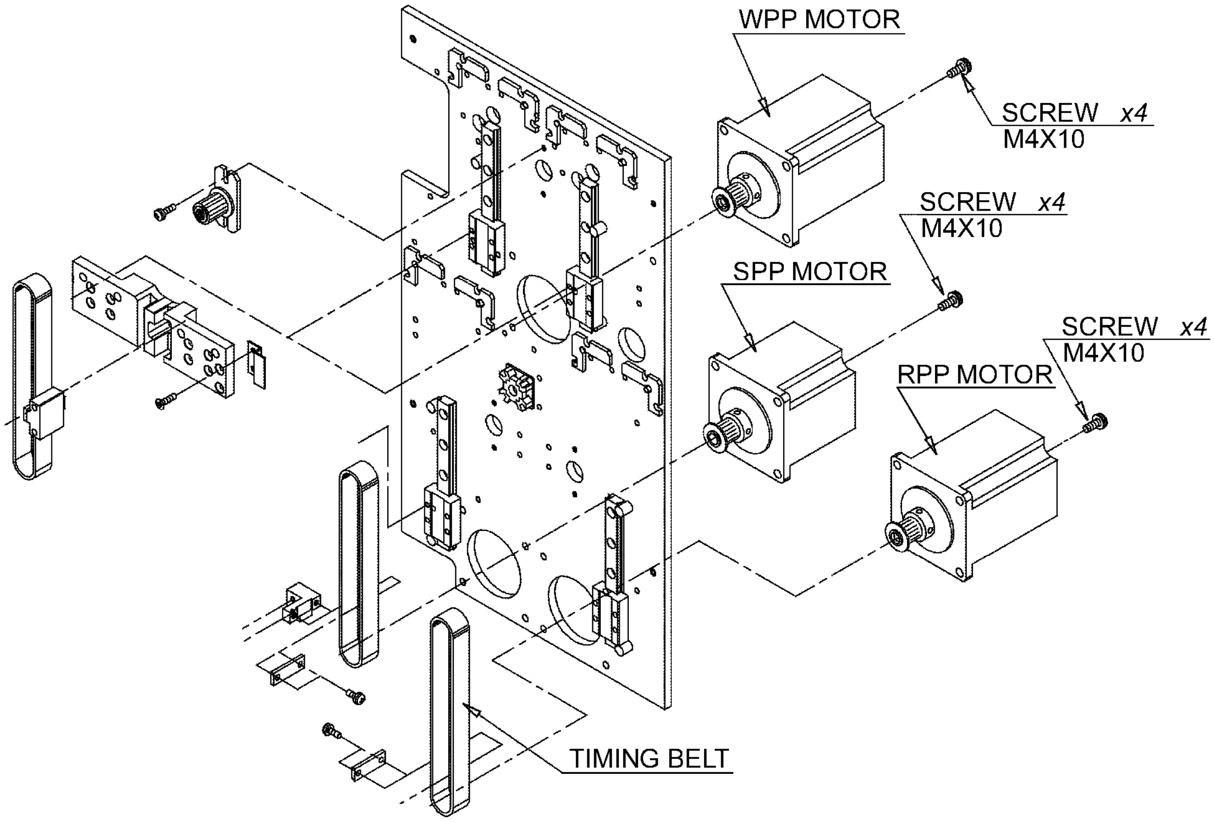
C. Dismounting SPP/RPP/WPP Motor

After removing the PP from the chassis as mentioned in "A. Dismounting PP", take the following steps. Refer to Figure 10-117.

(1) First, unplug the connector (CN414) from the PP_DRV board (25P3220). Next, dismount the SPP motor by removing the four screws (M4x10). At this stage the timing belt is also removable.

(2) First, unplug the connector (CN418) from the PP_DRV board (25P3220). Next, dismount the RPP motor by removing the four screws (M4x10). At this stage the timing belt is also removable.

(3) First, unplug the connector (CN416) from the PP_DRV board (25P3220). Next, dismount the WPP motor by removing the four screws (M4x10). At this stage the timing belt is also removable.



REMOVING SPP/RPP/WPP MOTOR
Figure 10-117

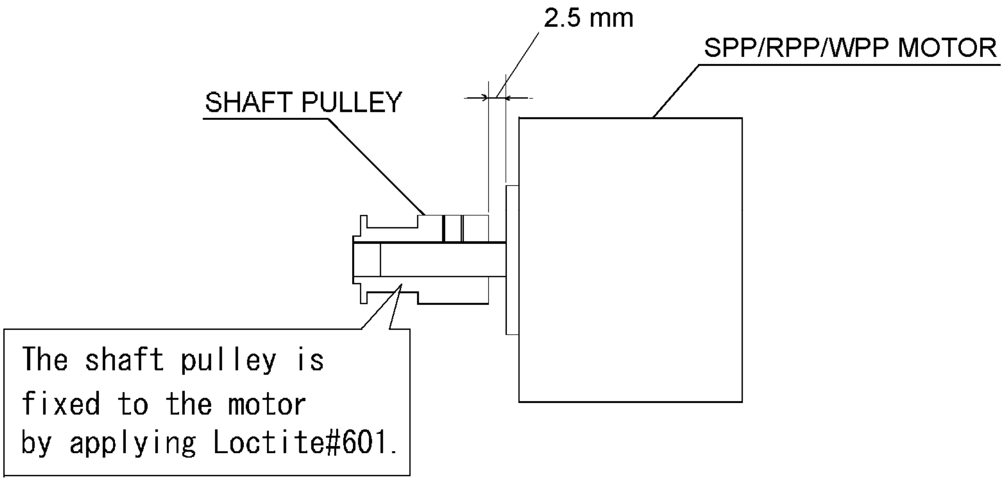
Mounting SPP/RPP/WPP Motor

When mounting the SPP/RPP/WPP motors, pay attention to the following points.

(1) Shaft Pulley (Just for your reference)

The shaft pulley is part of the motor.
The shaft pulley is built into the motor as shown below.

When installing the shaft pulley, keep 2.5-mm gap as shown below.



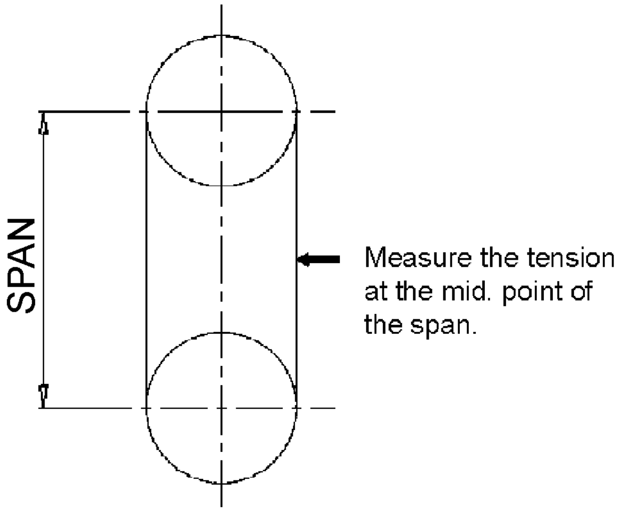
SPP/RPP/WPP MOTOR
Figure 10-118

(2) Timing Belt

(a) Set the tension meter for:

Belt Width	10 mm
Belt Weight	0.013 kg/m
Belt Span	91 mm

(b) Measure the belt tension at the midst of the span while gently hitting the belt with a screw driver etc.



MEASURING BELT TENSION
Figure 10-119

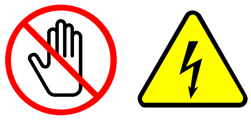
The belt tension must be 16.7 to 22.6 N.

(c) If the belt tension is out of the above-mentioned range:

1 Slightly loosen the motor-fixing screws.
2 Adjust (slide) the motor-fixing position.
3 Return to step (b).

Measure belt tension at three or four different spots on the belt by rotating the pulley because tension varies depending on the spot.

13. SWU (Supply Water Unit)



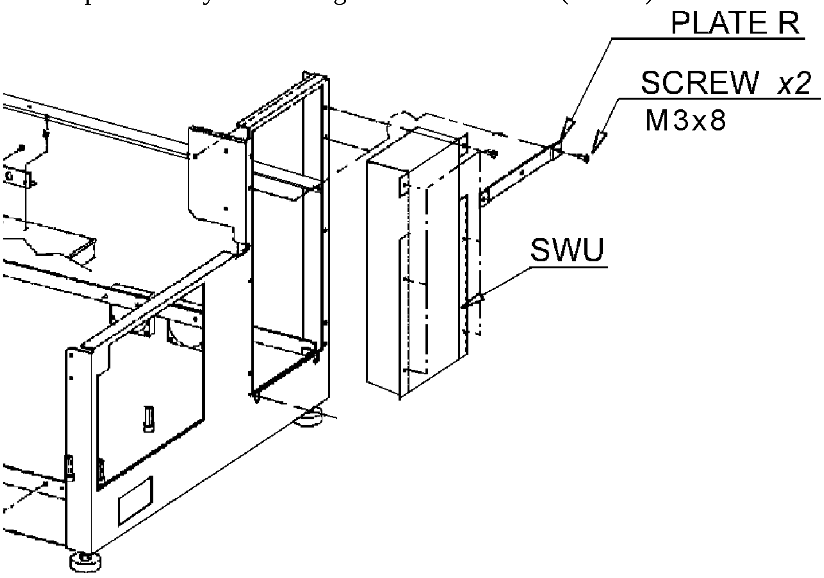
WARNING

- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

Before removing the SWU, remove the followings:
- Rear cover (Figure 10-1A)
- Right cover (Figure 10-1E)
- Tubes from external tanks
- If connected to the external-tank rack for the overflow detecting unit (option), disconnect the connector (D-SUB).

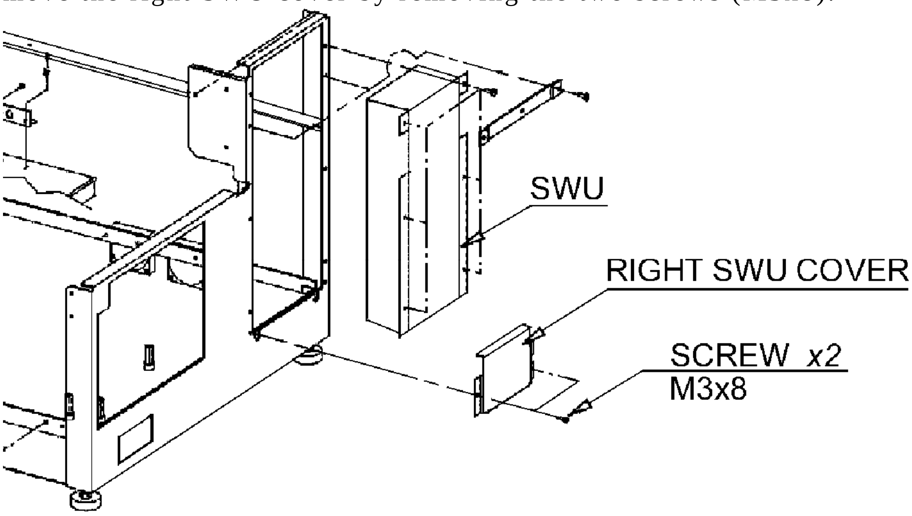
A. Dismounting SWU

(1) Remove the plate R by removing the two screws (M3x8).



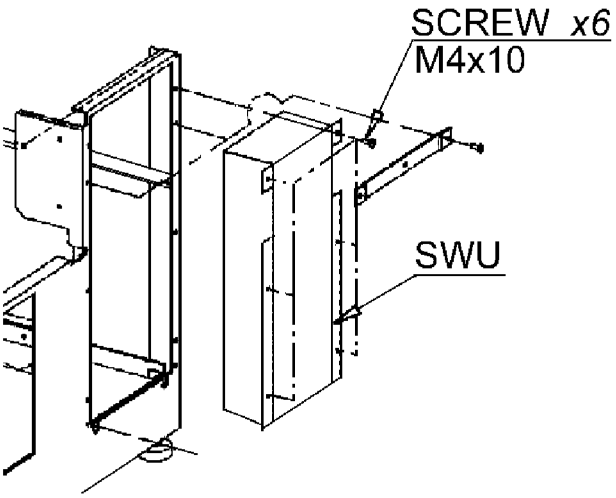
REMOVING PLATE R
Figure 10-121

(2) Remove the right SWU cover by removing the two screws (M3x8).



REMOVING M4X10 SCREWS
Figure 10-122

(3) Remove the six screws (M4x10) from the SWU.



REMOVING RIGHT SWU COVER
Figure 10-123

(4) Unplug the connectors (CN306 and CN603) from the SWU_DRV board (25P3221).

(5) Pull and disconnect all the tubes from all the pumps.

To make the removal easier, remove the trough pump (TR-Conc) and WU8 pump (shown in Figure 10-124) by removing the two screws (M3x6) each.

(6) Remove the SWU.

Mounting SWU

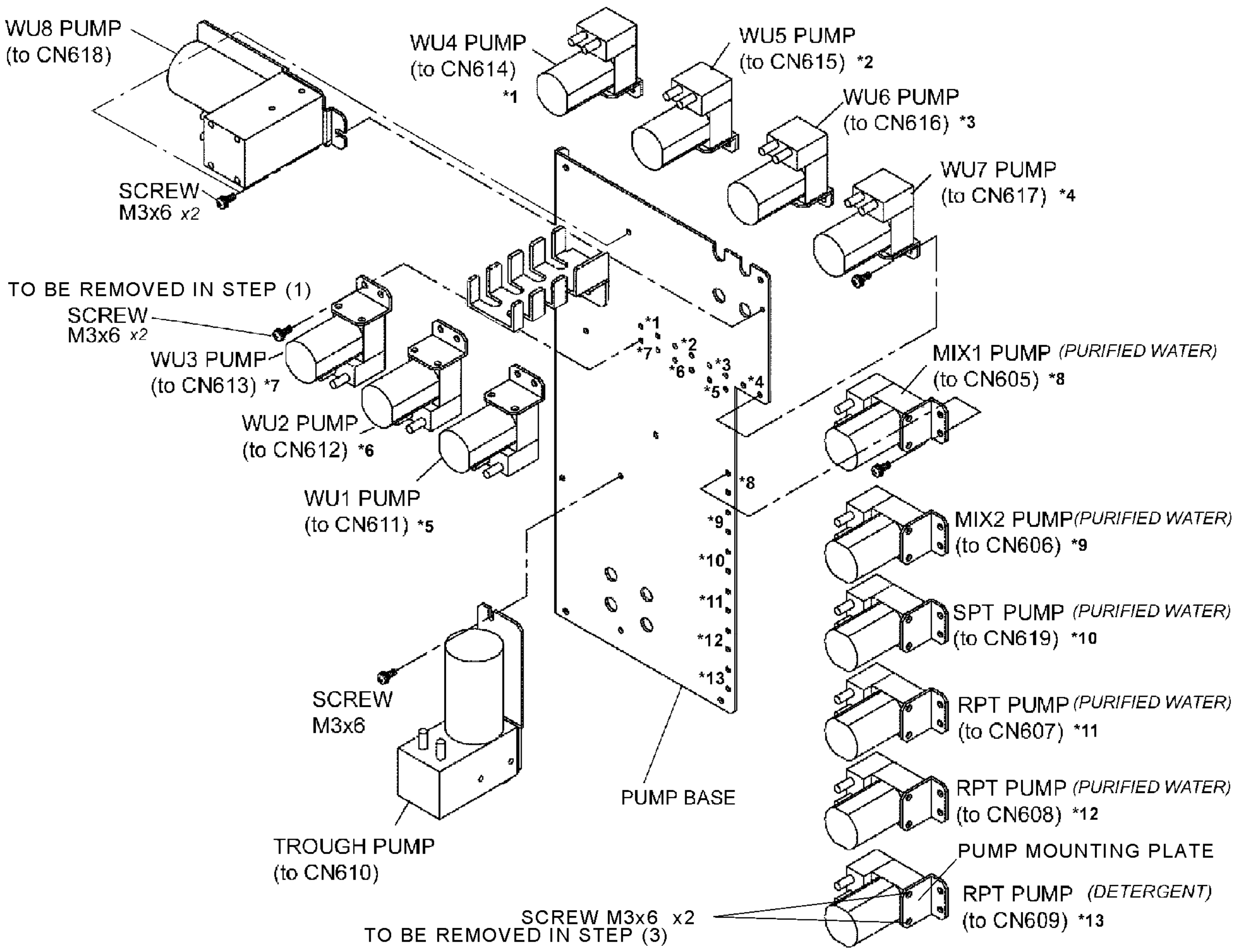
When connecting the tubes to the pumps, refer to "Appendix E. Fluidics System Diagram" for tube connection.

NOTE FOR CONNECTING TUBE:
Before reconnecting a tube, cut the edge of the tube by 10 mm.

B. Dismounting Pump

After removing the right cover (Figure 10-1E), take the following steps.

(1) Dismount each pump together with its pump mounting plate from the pump base by removing the two screws (M3x6).



DISMOUNTING PUMPS
Figure 10-124

(2) Pull and disconnect the tubes.

(3) Remove each pump from its pump mounting plate by removing the two screws (M3x6).

Mounting Pump

When connecting the tubes, refer to "Appendix E. Fluidics System Diagram" for tube connection.

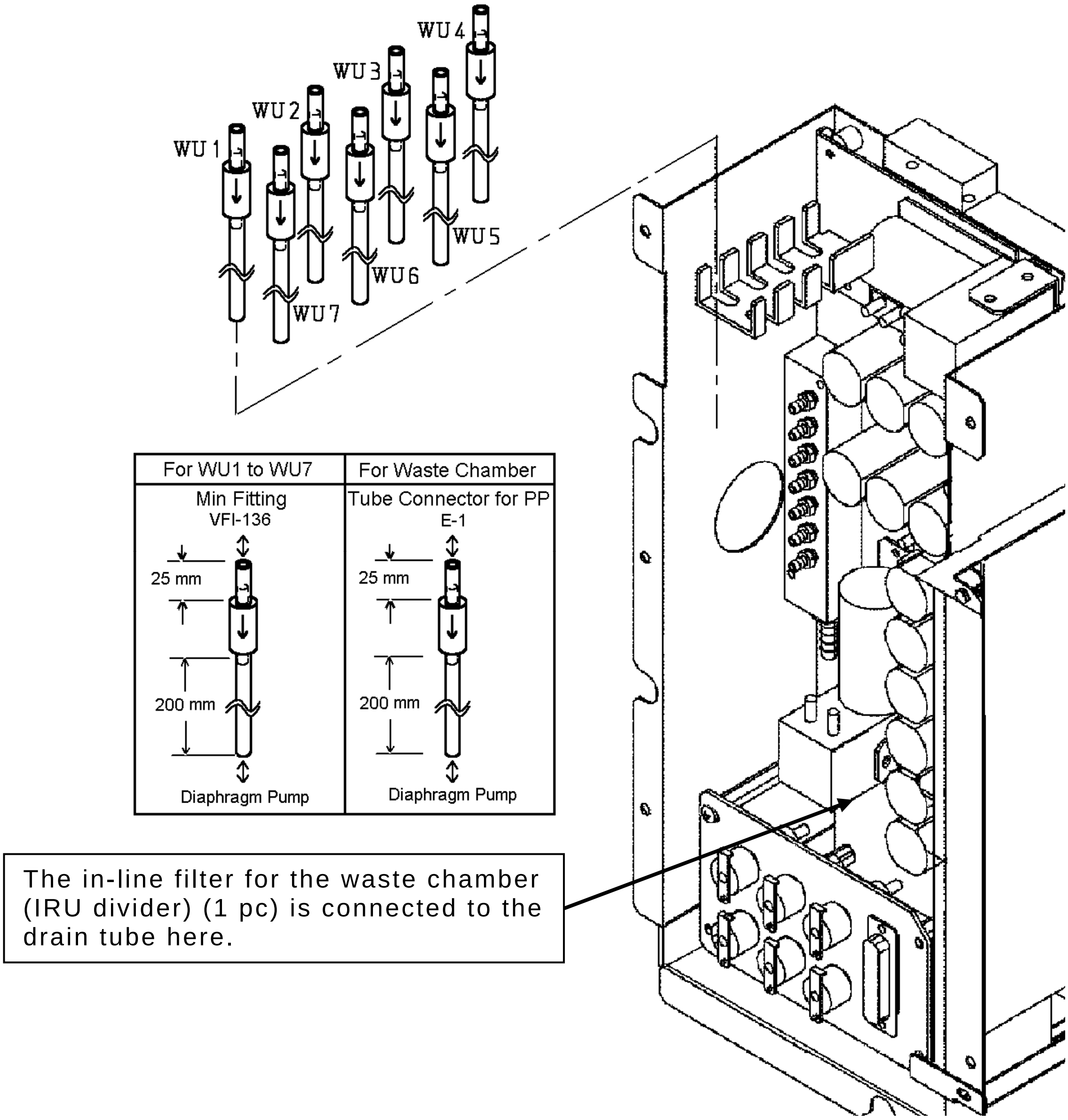
NOTE FOR CONNECTING TUBE:
Before reconnecting a tube, cut the edge of the tube by 10 mm.

C. Replacing In-Line Filter

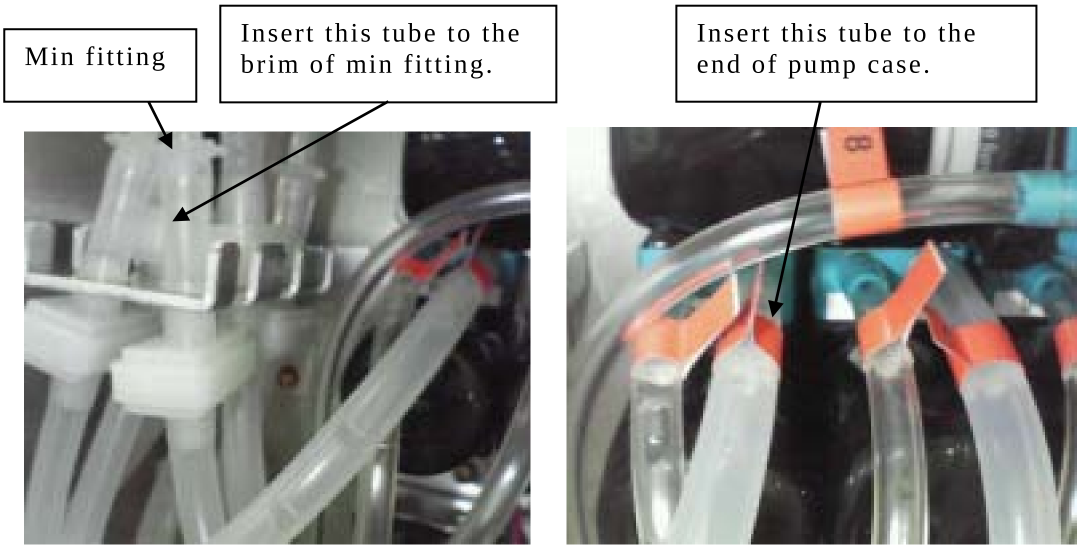
Remove the right cover (Figure 10-1E) beforehand.

(1) Pull out the tubes at both side of in-line filter (shown in Figure 10-125A) from the mini fitting (VFI-136) or tube connector (E-1) and diaphragm pump to remove. But don’t remove the tubes at both end of in-line filter.

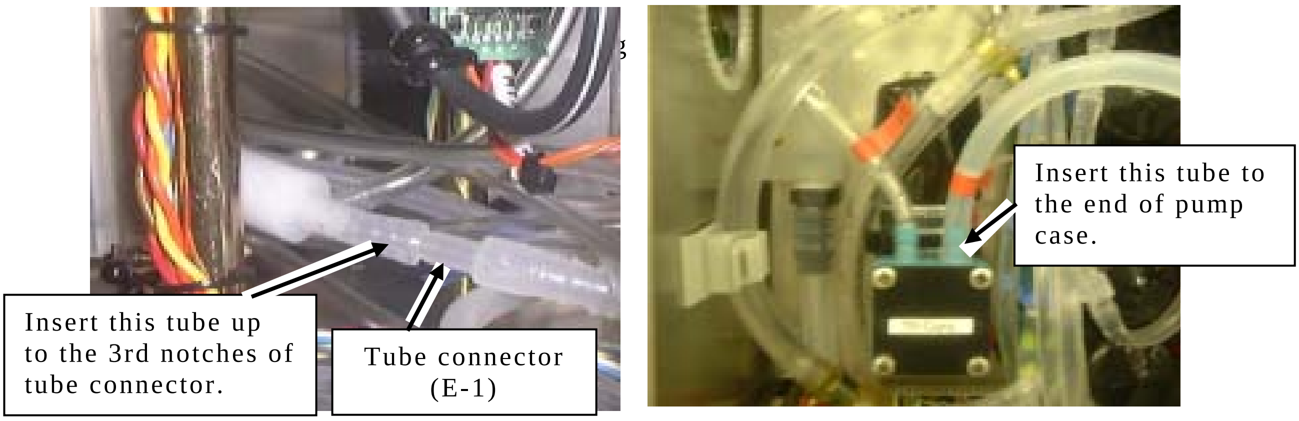
(2) Insert the tubes at both end of in-line filter to the min fitting (VFI-136) or tube connector (E-1) and diaphragm pump.



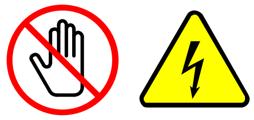
REPLACING IN-LINE FILTERS
Figure 10-125A



Fitting the in-line filter for WU1 to WU7
Fig 10-125B



14. Others



WARNING

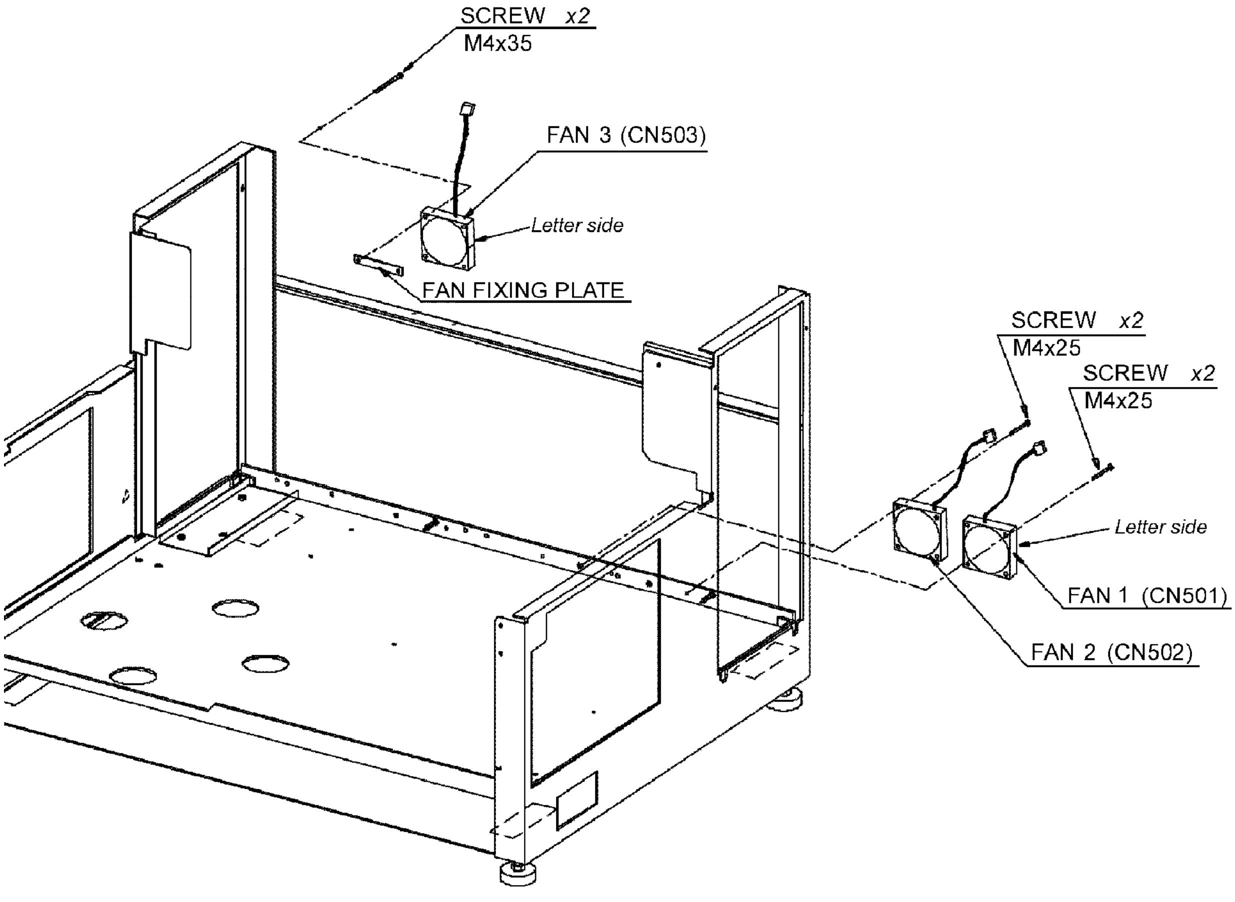
- **MAKE SURE THAT THE CLINICAL CHEMISTRY ANALYZER IS TURNED OFF.**
- **WEAR MEDICAL RUBBER GLOVES TO PREVENT THE PENETRATION OF CONTAMINANTS.**

A. Dismounting Fans (Fans 1 through 3)

(1) Remove the rear cover by removing the six screws (M4). See Figure 10-1A.

(2) Remove the two screws (M4x10). Pull the board mounting plate with the IRU_CNT board as assembled. Unplug the connector of each fan from the IRU_CNT board (25P3215). Refer to "6. A. Removal of IRU_CNT Board" in Chapter 11 for details.

(3) Remove the fans by removing the two screws each. When removing the fan 3, be careful not to drop its fan fixing plate.



DISMOUNTING FANS
Figure 10-126

Chapter 11
PC Board Replacement

This chapter explains the replacement procedures for:
- Power Supply
- Printed Circuit Boards.

This chapter mainly explains dismounting procedures. Mounting procedures are omitted because they are simply the reverse of the dismounting procedures. Mounting procedures are given in the cases where special skills or notes are required.

SEE ALSO:

Chapter 3 "PC Board Descriptions"	Location of PC boards
Appendix C "Maintenance Parts List"	Lists the parts available for maintenance.
Appendix D "Wiring Diagrams"	Electrical connections of PC boards, sensors, motors, etc.
Appendix G "Test Points and LED's"	Shows the connector locations.

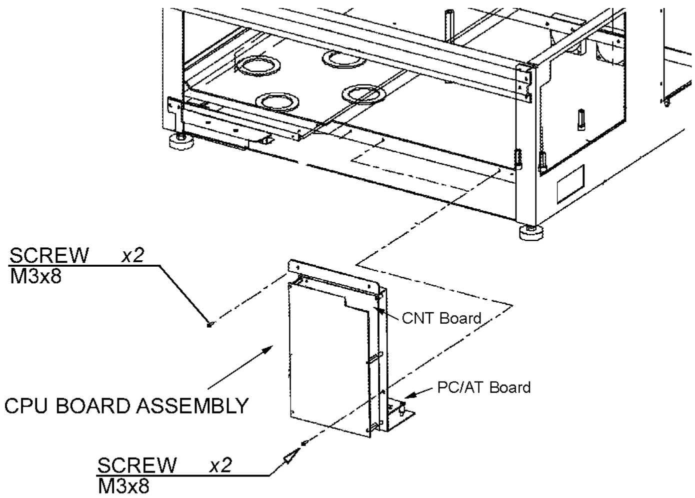
1. Control Unit (CNT-IBM, CNT-CN1, POWER-CN and AD Board)

A. Removal of CPU Board Assembly (Control Unit)

(1) Remove the front cover. See "2.A. Removing Covers" in Chapter 10.

(2) Unscrew four screws (M3x8) and take off a board cover.
Unplug J1 connector of the CNT-IBM board, CN101 & CN102 connectors of the CNT-CN1 board, CN103 & CN104 & CN105 & CN106 connectors of the POWER-CN board and CN100 connector of the AD board.

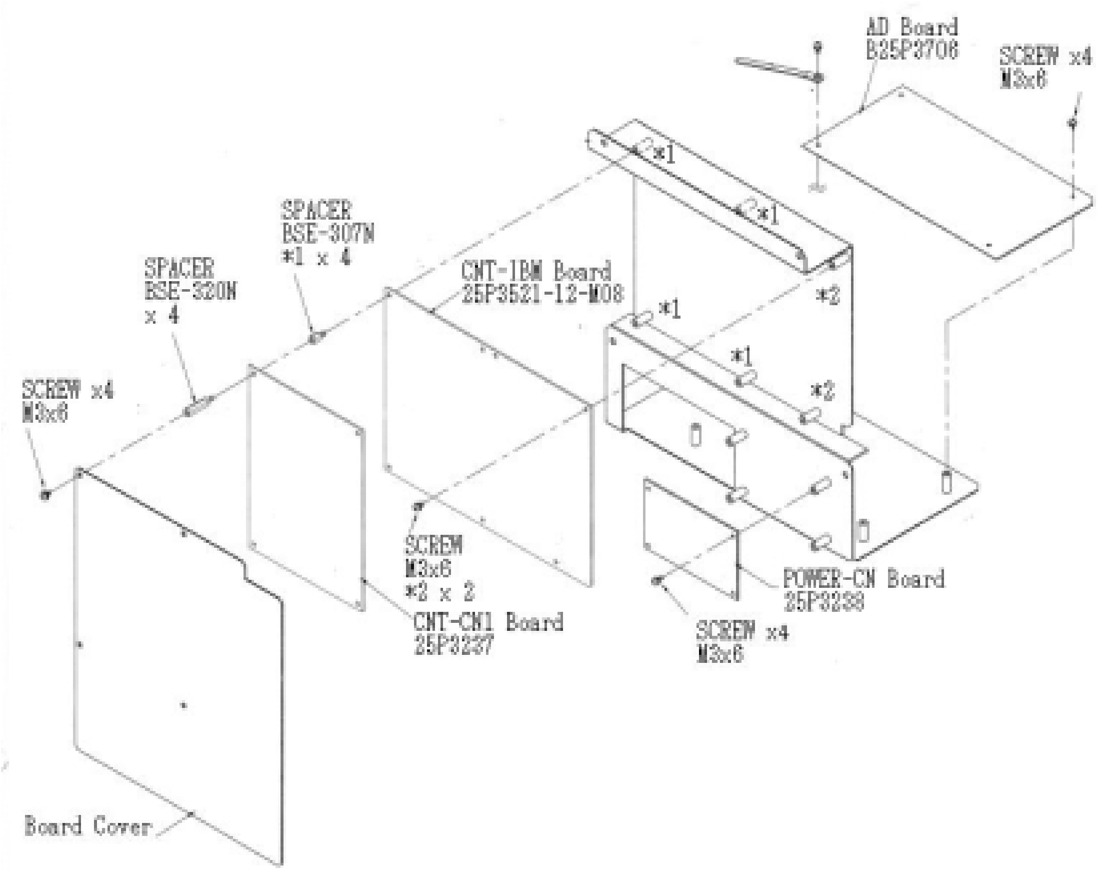
(3) Remove the four screws (M3x8), and pull out the CPU board assembly from the chassis as shown below.



DISMOUNTING CPU BOARD ASSEMBLY
Figure 11-1

(4) Proceed to Dismounting CNT-IBM, CNT-CN1, POWER-CN and AD Board.

See the following figure.



REMOVING boards of Control Unit
Figure 11-2

B. Dismounting CNT-IBM & CNT-CN1 Board

(1) Unplug all connectors from both boards.

(2) Take off four spacers and remove the CNT-CN1 board.

(3) Take off two screws (M3x6) and four spacers then remove the CNT-IBM board.

C. Dismounting POWER-CN Board

(1) Unplug all connectors from the board.

(2) Take off four screws (M3x6) and remove the board.

D. Dismounting AD BOARD

(1) Unplug all connectors from the board.

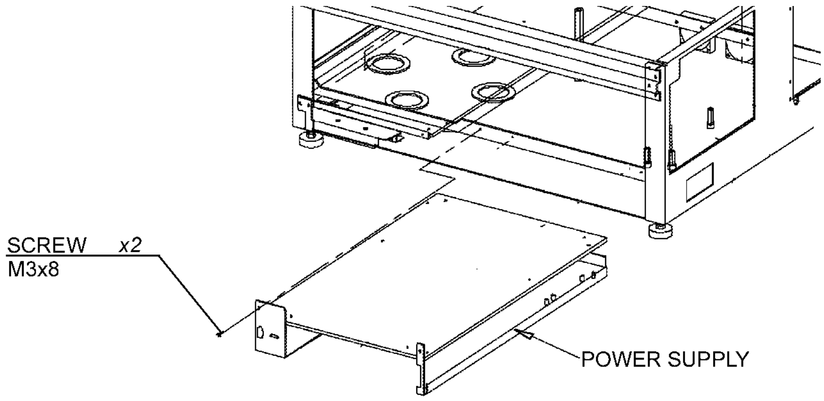
(2) Take off four screws (M3x6) and remove the board.

2. <u>Power Supply</u>

A. Removal of Power Supply

(1) Perform "A. Removal of CPU Board Assembly".

(2) Unplug the connectors (CN10A and CN500) and remove the two screws (M3x8) shown below.



DISMOUNTING POWER SUPPLY
Figure 11-3

(3) Pull out the power supply a little, and unplug the connector TB1-CN. Next, pull out the power supply from the chassis completely.

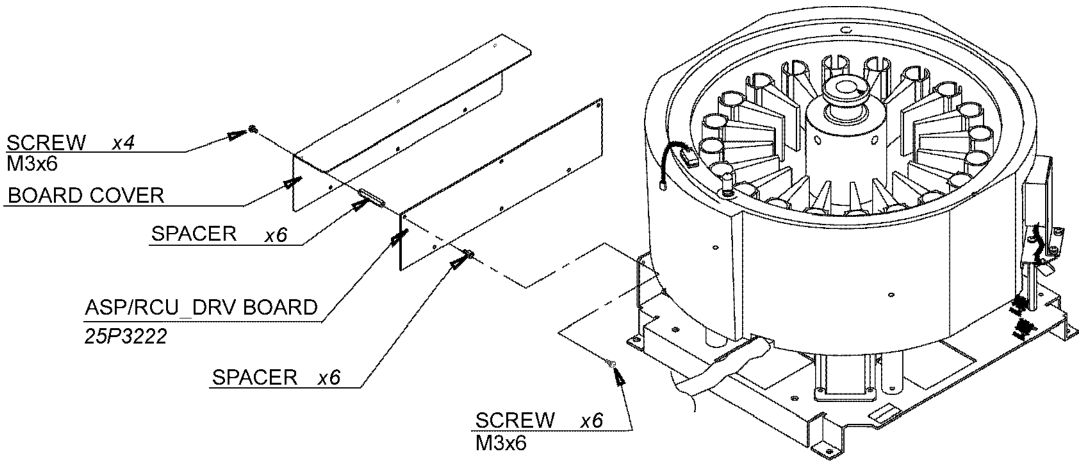
(4) Dismount the power supply cover by removing the four screws.

3. ASP/RCU_DRV Board

A. Removal of ASP/RCU_DRV Board

(1) Remove the front cover. See "2.A. Removing Covers" in Chapter 10.

(2) Remove the board cover by removing the four screws (M3x6) shown below.



REMOVING ASP/RCU_DRV BOARD
Figure 11-4

(3) Unplug all connectors from the ASP/RCU_DRV board.

(4) Remove the ASP/RCU_DRV board by removing the six spacers.

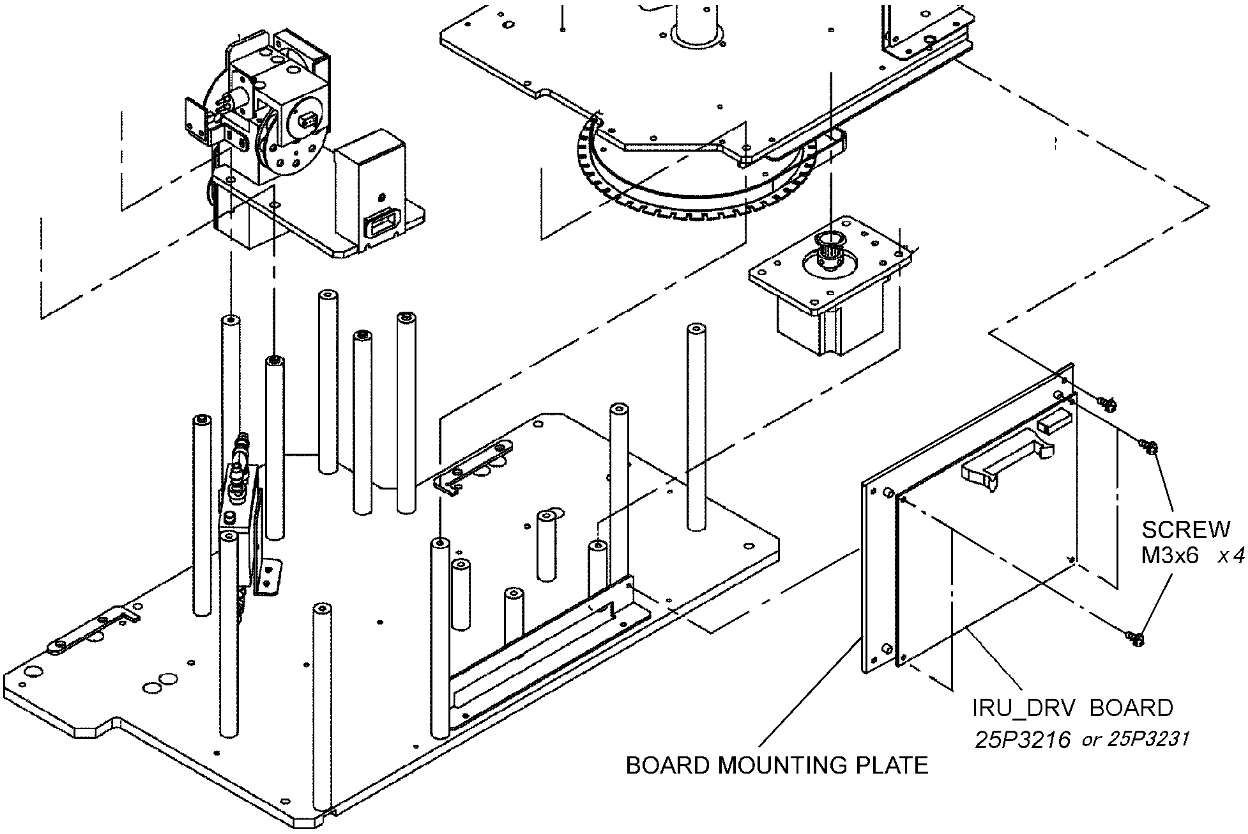
4. IRU_DRV Board

A. Removal of IRU_DRV Board

(1) Remove the rear cover. See "2.A. Removing Covers" in Chapter 10.

(2) Unplug all connectors from the IRU_DRV board.

(3) Remove the IRU_DRV board by removing the four screws (M3x6) shown below.



REMOVING IRU_DRV BOARD
Figure 11-5

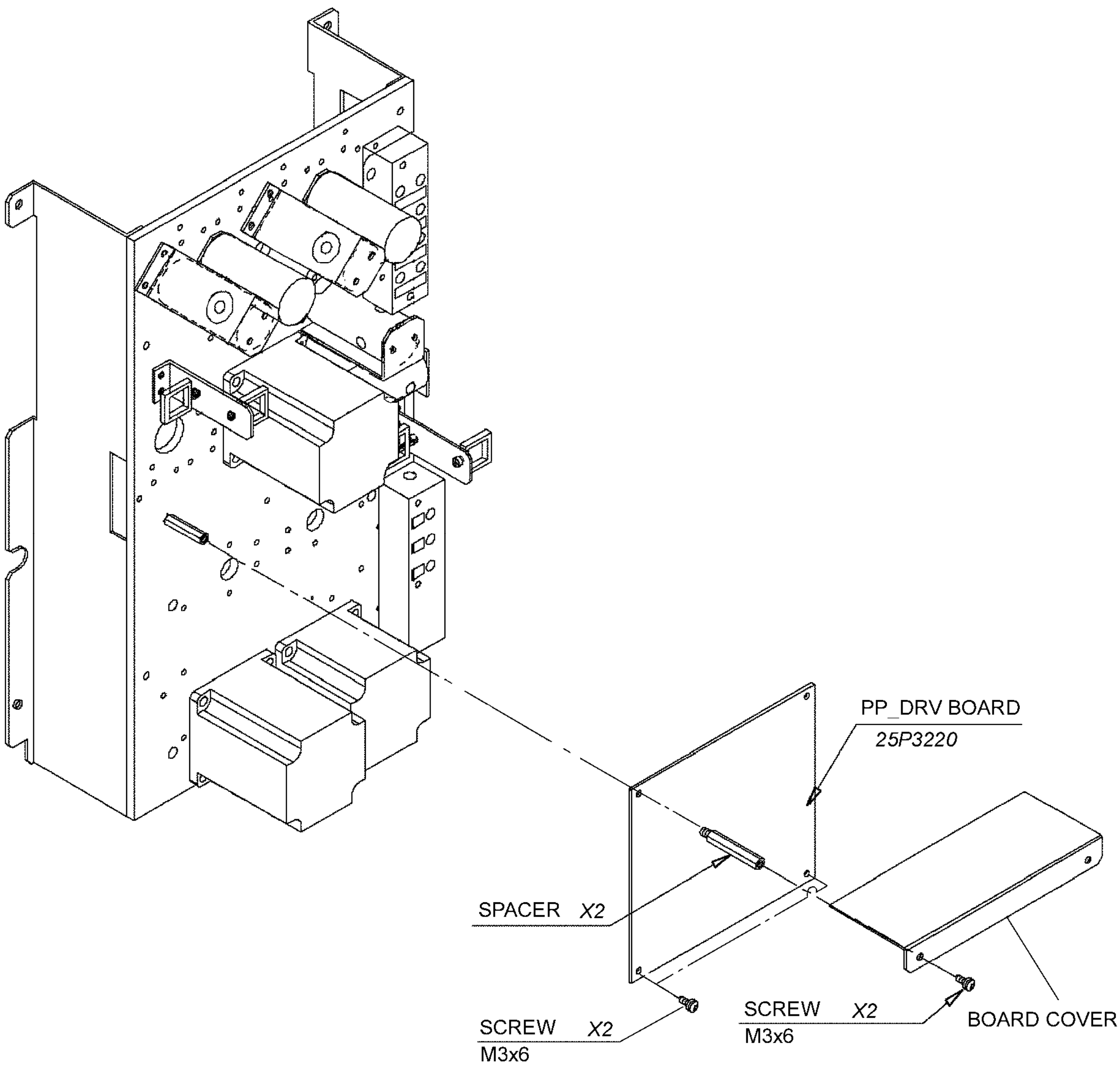
5. PP_DRV Board

A. Removal of PP_DRV Board

(1) Remove the left cover. See "2.A. Removing Covers" in Chapter 10.

(2) Remove all tubes connected to the PP intercept panel, SP syringe, RP syringe and WPP divider. See "12.A. Dismounting PP" in Chapter 10.

(3) Remove the board cover by removing the two screws (M3x6) shown below.



REMOVING PP_DRV BOARD
Figure 11-6

(4) Unplug all connectors from the PP_DRV board.

(5) Remove the PP_DRV board by removing the two screws (M3x6) and two spacers.

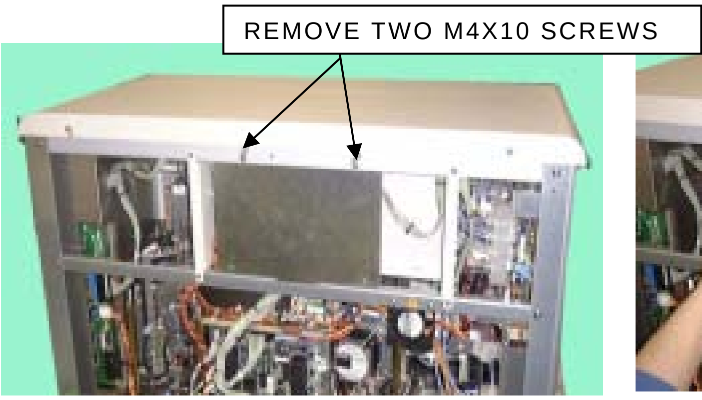
6. IRU_CNT Board

A. Removal of IRU_CNT Board

(1) Remove the rear cover. See "2.A. Removing Covers" in Chapter 10.

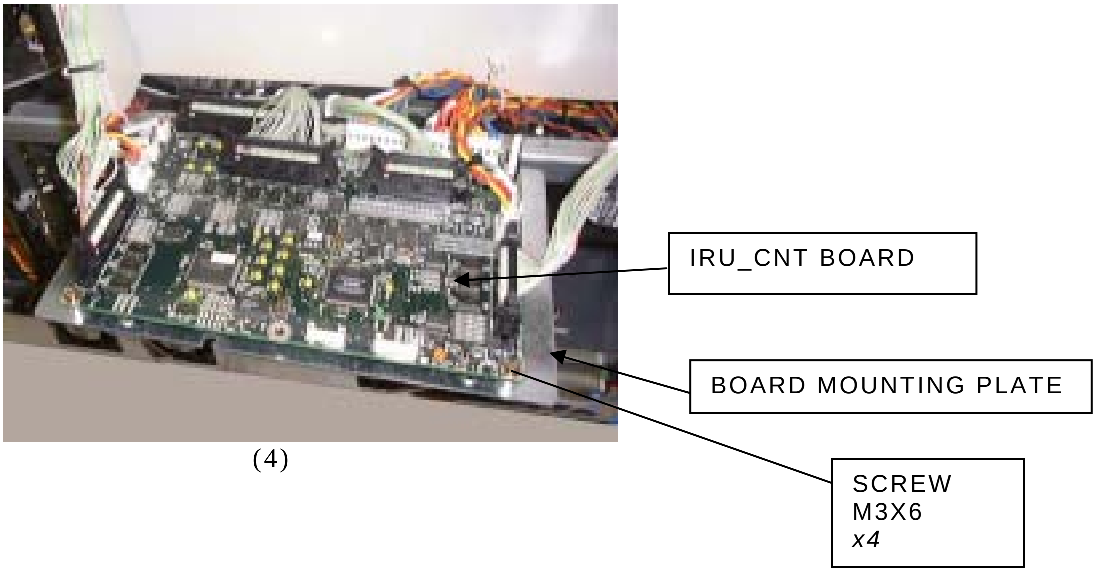
(2) Remove the two screws (M4x10) as shown below.

(3) Pull the board mounting plate as shown below.



(2)


(3)



(4)

REMOVING IRU_CNT BOARD
Figure 11-7

(4) Unplug all connectors from the IRU_CNT board.
Left: CN502, CN501, CN603, CN306
(Take care not to mistake CN501 for CN502 because they are same figure.)
Center: CN102, CN310, CN500, CN331, CN311
Right CN503, CN304, CN403

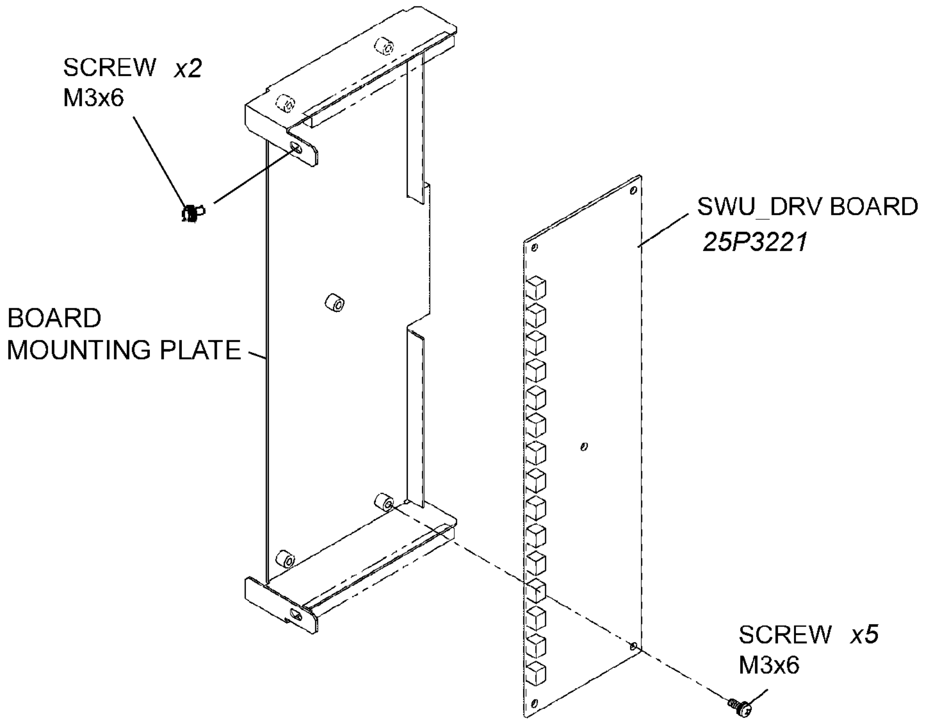
(5) Remove the IRU_CNT board from the board mounting plate by removing the four screws (M3x6).

7. SWU_DRV Board

(1) Remove the right cover. See "2.A. Removing Covers" in Chapter 10.

(2) Unplug all connectors from the SWU_DRV board.

(3) Remove the two screws (M3x6) and pull out the board mounting plate from the SWU as shown below.



REMOVING SWU_DRV BOARD
Figure 11-8

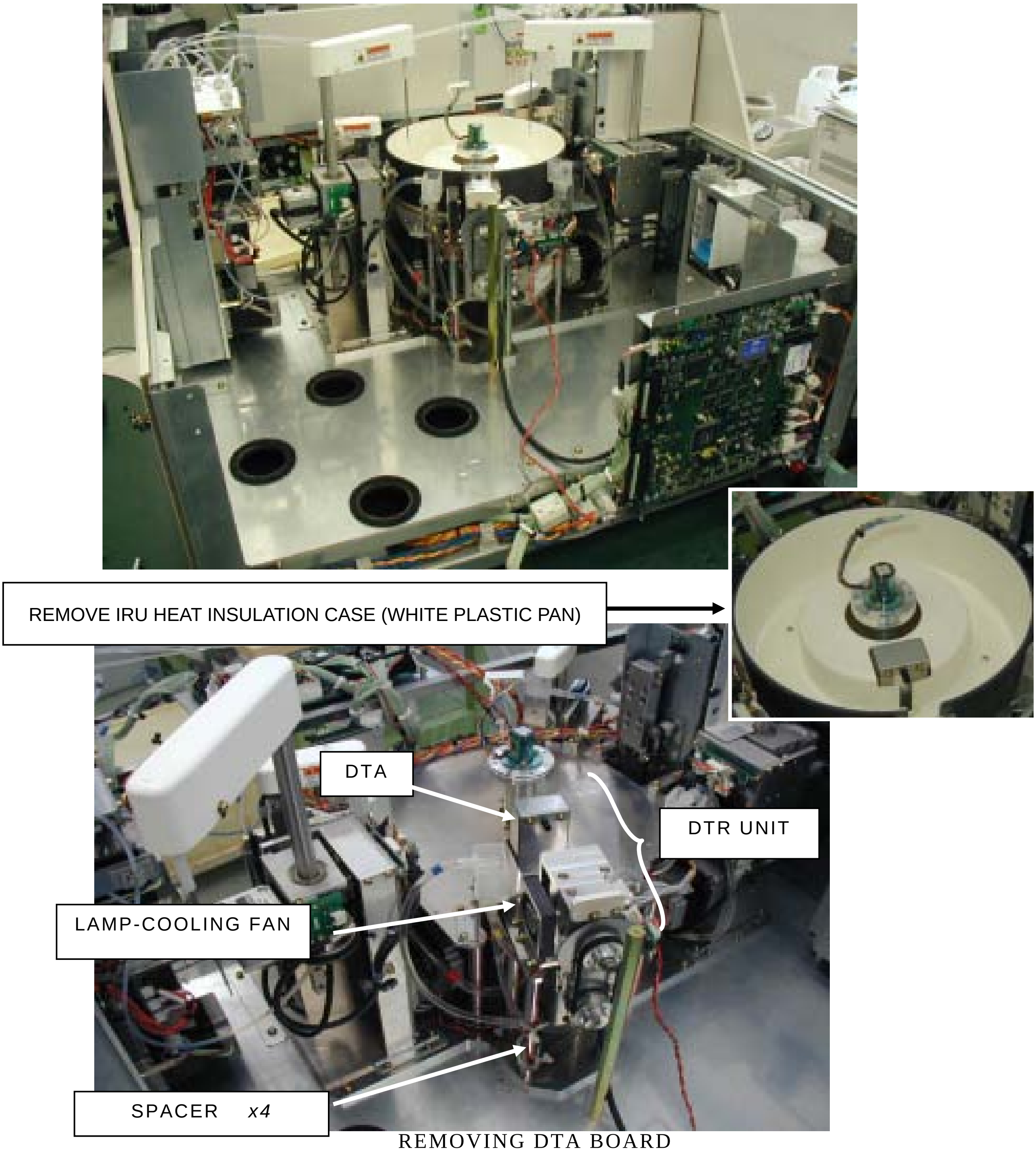
(4) Remove the SWU_DRV board by removing the five screws (M3x6).

8. <u>DTA Board</u>

A. Access to DTA board

(1) Remove the DTR. Refer to "10.A. Dismounting DTR" in Chapter 10.

(2) Remove the front frame, ASP unit and RCU unit.



REMOVING DTA BOARD
Figure 11-9B

B. Replacing DTA Board

(1) Remove the lamp-cooling fan (HL fan). See Figure 11-9B.

(2) Remove the DTR unit from the four spacers by removing the four screws. See Figure 10-85 in Chapter 10.

(3) Remove the DTA cover by removing the four screws (M3x6). Remove the DTA board by removing the three screws (M2.5x6) and replace with a new one. Install the new board with the three screws (M2.5x6). Install the DTA cover by the four screws (M3x6). Make sure not to separate the DTA case from the base plate.

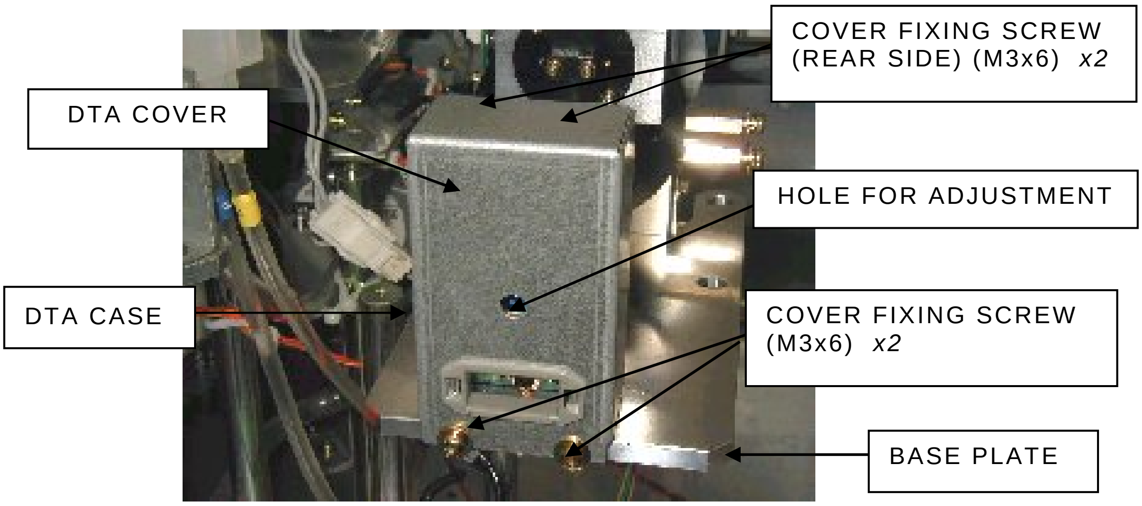


Figure 11-10

(4) Firmly install the DTR unit to the four spacers by tightening the four screws.

(5) Loosely attach the lamp-cooling fan. For adjustment purpose at later stage, do not tighten it yet.

(6) Measure and adjust the offset voltage. Refer to "C. DTA Offset Voltage Adjustment".

(7) Install the IRU heat insulation case (white plastic pan).

(8) Install the IRU turntable to the drive shaft with the four screws (M3x12). See Figure 10-109B. Make sure that each screw will be centrally located in the hole.

(9) Connect the connector (CN350) to the IRU_CN2 board. See Figure 10-109B.

(10) Adjust the turntable position.
  (a) Run “Hyper Terminal” to connect with the analyzer, then run the checker program "chk_mot". Select “2. BackHome” to move the unit to its origin position.
  (b) Adjust the turntable position by moving the DTR unit from side to side so that the light emitted from the DTR passes through the center of the cuvette.

(11) Install the RCU unit, ASP unit and front frame into the chassis. Connect the RCU drain tube to the waste chamber as shown in Figure 11-11.

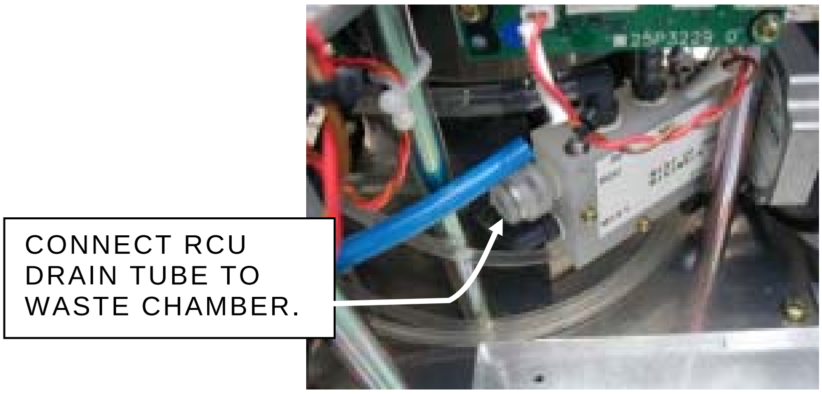


Figure 11-11

C. DTA Offset Voltage Adjustment

(1) Close the light receiving hole on the DTA to prevent the light from entering through the hole.
(2) Make sure that the ASP and RCU units are removed from the chassis. Turn on the power of this measurement instrument and PC.
(3) Double-click on the “Hyper Terminal” icon to start it. At the login prompts, respond as follows:

```
login:     kogata
Password:  qnx
```

(4) Log into the program directory "sysboot", then start the program:

```
kgtprtT>   cd sysboot
kgtprtT>   chk_abs
```

(5) The following menu is displayed.

```
##############################################################

            // == Absorbance Checker
            0. SubCPU Check
            1. FLT    BackHome
            2. FLT    AutoMove
            3. FLT    Stop
            4. Gain   Set
            5. Gain   Set(ALL)
            6. Lamp   Set
            7. Measure
            Select No[ 0-6 or "end" ] -->

##############################################################
```

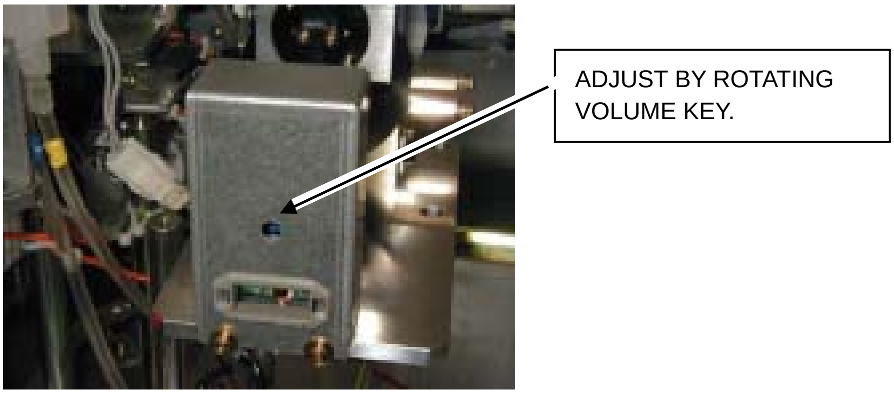
- Select "2. FLT AutoMove".
  Select No[0-6 or "end"] --> 2; Enter 2.
  // == FLT AutoMove
  PmPara Index(2-4)==> 2; Enter 2 and wait for 30 minutes until the temperature is stabilized.
- Select "3. FLT Stop".
  Select No[0-6 or "end"] --> 3; Enter 3.
- Select "1. FLT BackHome ".
  Select No[0-6 or "end"] --> 1; Enter 1.
- Select "5. Gain Set (All)".
  Select No[0-6 or "end"] --> 5; Enter 5.
  // == GainSet All
  Gain(1-127)--> 1   ; Enter 1.
  Mag (1-3) --> 3; Enter 3.
- Select "2. FLT AutoMove".
  Select No[0-6 or "end"] --> 2; Enter 2.
  // == FLT AutoMove
  PmPara Index(2-4)==> 2; Enter 2. Rotate filter.
- Select "7. Measure ".
  Select No[0-6 or "end"] --> 7; Enter 7.
  // == Measure
  LoopCount(1-30000)--> 100 ; Enter 100.

Voltage value will be displayed on “Hyper Terminal” as follows:

```
#################################################################

//Count= 1
meas  : GetVolt()> volt=
0.0942,0.0970,0.0955,0.0973,0.0958,0.0942,0.0958,0.0942
meas  : GetVolt()> voff=
0.0000,0.0000,0.0000,0.0000,0.0000,0.0000,0.0000,0.0000
volt> 0.0942 0.0970 0.0955 0.0973 0.0958 0.0942 0.0958 0.0942
mABS:000001: 337658 335538 336666 335315 336439 337658 336439
337658

//Count= 2
meas  : GetVolt()> volt=
0.0933,0.0976,0.0958,0.0942,0.0912,0.0952,0.0973,0.0946
meas  : GetVolt()> voff=
0.0000,0.0000,0.0000,0.0000,0.0000,0.0000,0.0000,0.0000
volt> 0.0933 0.0976 0.0958 0.0942 0.0912 0.0952 0.0973 0.0946
mABS:000002: 338353 335092 336439 337658 340001 336894 335315
337351

#################################################################
```

Adjust voltage value with Volume Key of DTA Unit so that its voltage become 80 +/- 40 mV.
Adjustment time can be set by Loop Count Value.

Caution:DTA filter is rotating during this adjustment!!



- Select "3. FLT Stop".
  Select No[0-6 or "end"] --> 3; Enter 3. Stop filter rotation.
- Select "end".
  Select No[0-6 or "end"] --> end; Enter end.

Note:Measurement of the offset voltage and setting for "System.txt" are not necessary.

Chapter 12
Software Setup

This chapter contains the following items:

ITEM	DESCRIPTIONS
1. Preparatory Setup	Complete this procedure once before proceeding to 2, 3, 4 or 5 below.
2. Analyzer Program Upgrade	Perform this procedure to upgrade the Analyzer Program within the Clinical Chemistry Analyzer unit.
3. User-interface Program Upgrade	Perform this procedure to upgrade the User-interface Program within PC.
4. Changing Correction Values	Perform this procedure only when instructed from us to do so. Do not abuse this procedure.

1. Preparatory Setup

Before proceeding to the software upgrading etc., complete the setup procedures given in this subsection. The setup you establish here is preserved after you shut down the power.

A. Setup for Network (between PC and the main unit of Analyzer)

(1) Terminate all programs on the PC.

For the User-interface Program, terminate it as follows:

1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

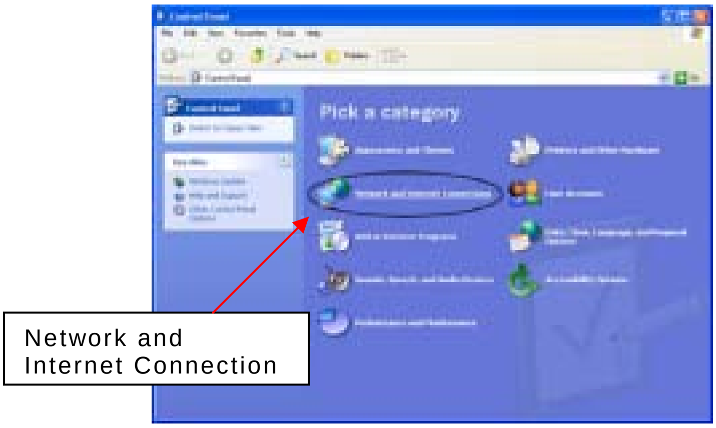
"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until the Windows desktop reappears.

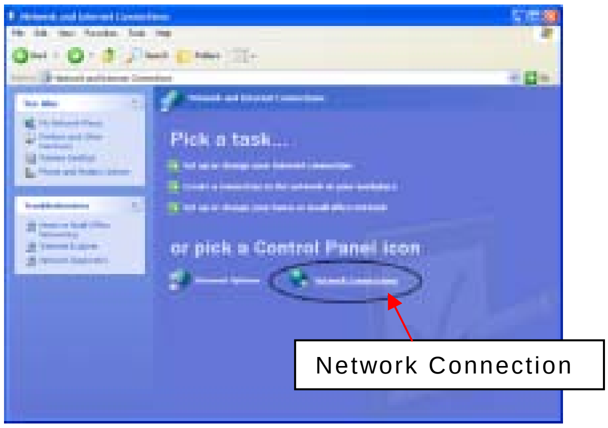
(2) By selecting [Start] and [Control Panel] in this order as below “Figure 12-1”, the “Control Panel” window is popped up.

“ CONTROL” window
Figure 12-1

(3) On the "Control Panel" window (Figure 12-2A), click on the [Network and Internet Connection] icon. Soon its window is popped up (Figure 12-2B). Then click on the [Network Connection] icon to make popping up the “Network Connection” window.

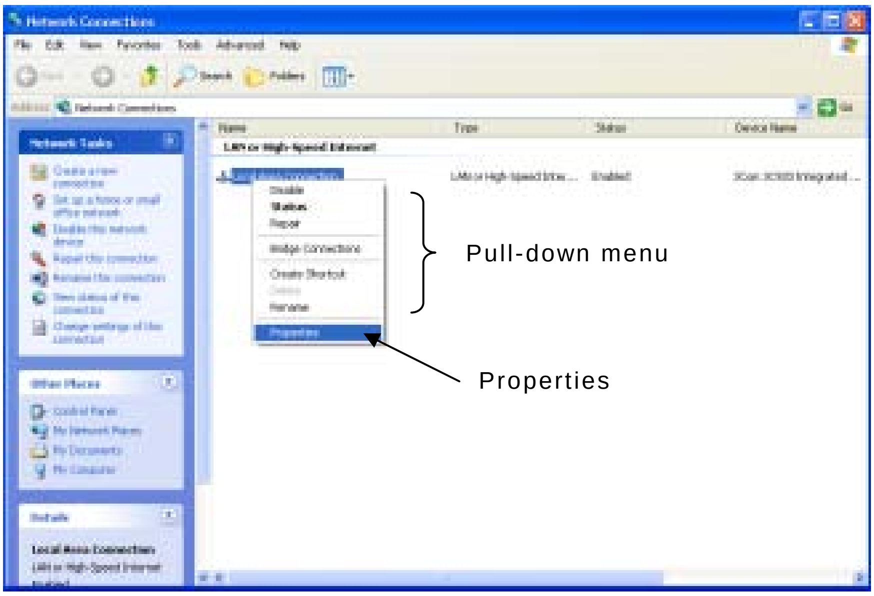


“Control Panel” window
Figure 12-2A



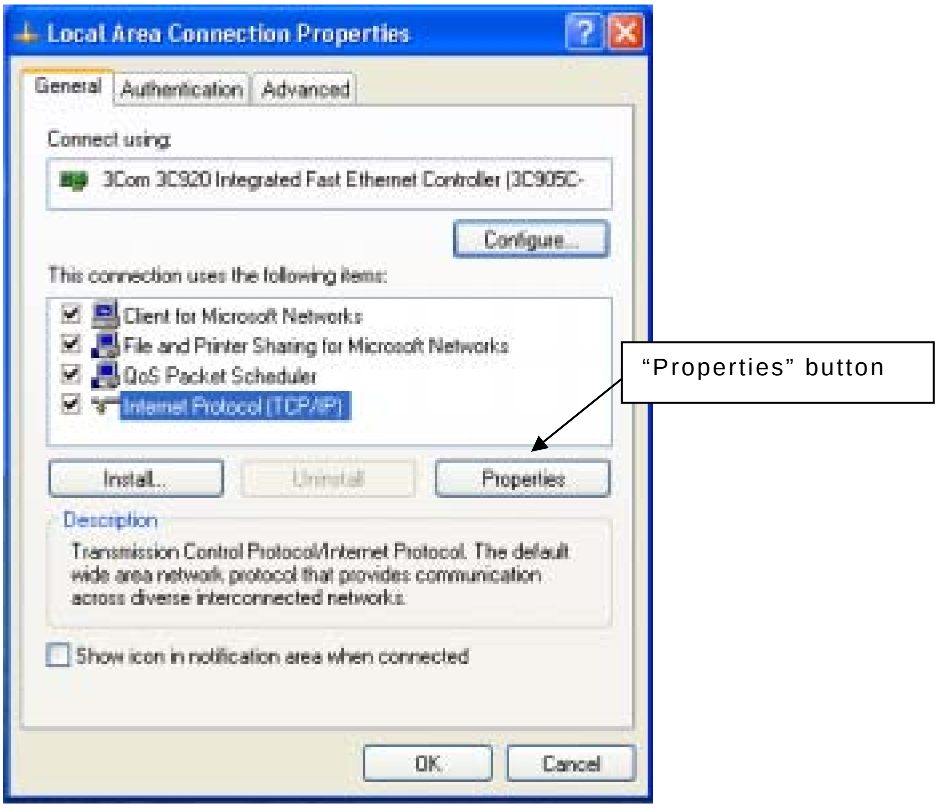
“Network and Internet Connection” window
Figure 12-2B

(4) On the “Network and Internet Connection” window, click the right button of the mouse on the [Local Area Connection] icon to draw out the pull-down menu. And select (click) the “Properties” from the pull-down menu as below picture. Then the “Local Area Connection Properties” window is popped up in the screen. (See Figure 12-4.)



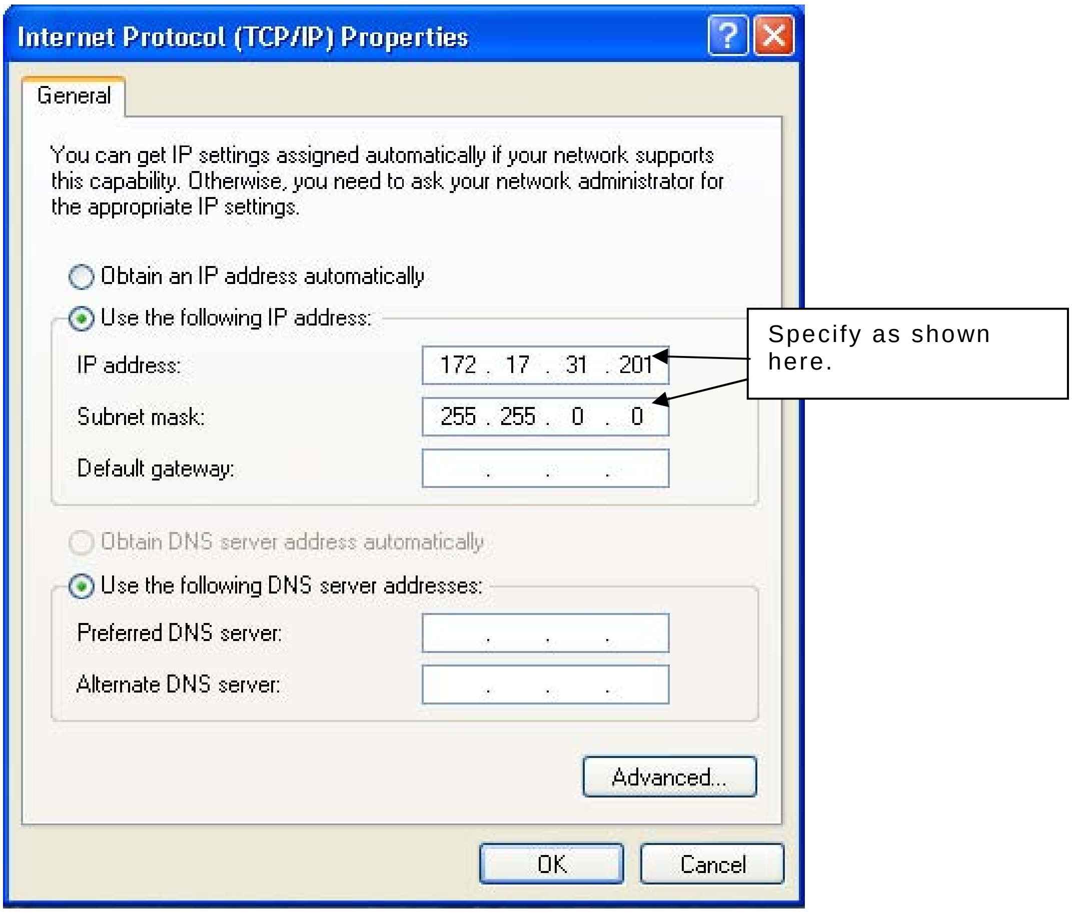
“Network Connection” window
Figure 12-3

(5) Select the "General" tab (upper-left side) and click on the [Internet Protocol (TCP/IP)] icon to select it.
Next click on the Properties button, soon "Internet Protocol (TCP/IP) Properties" dialog box is opened. (See Figure 12-5.)



"Local Area Connection Properties" window
Figure 12-4

(6) After clicking on the ball box at next of “Use the following IP address”, specify the "IP address" as shown below.



IP ADDRESS (TCP/IP PROPERTIES)
Figure 12-5

When everything is OK on the dialog box, click on the [OK] button.

(7) Now the procedure is complete. Terminate the CONTROL PANEL by clicking on the [X] button on its window.

B. Setup for Hyper Terminal

(1) Select [Hyper Terminal] from [Start] menu, [All Programs], [Accessories] and [Communications] as below figure 12-6.

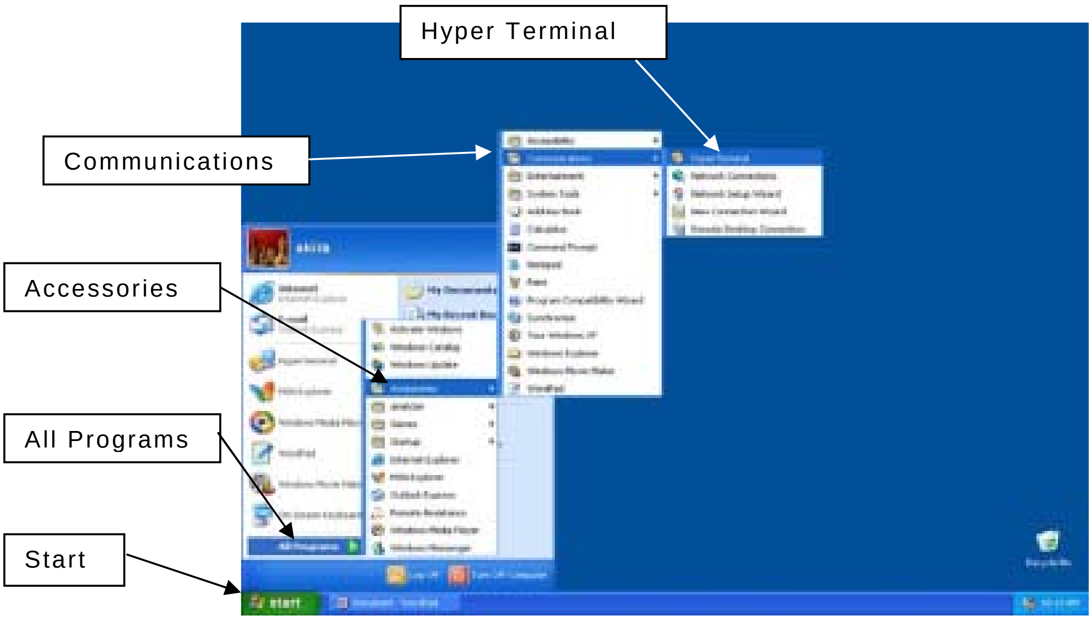


Figure 12-6

(2) Click on the [Yes] button at the following dialog. When this dialog box is not appeared and the dialog box is directly jumped to (5), you can progress the setup procedure from (5).

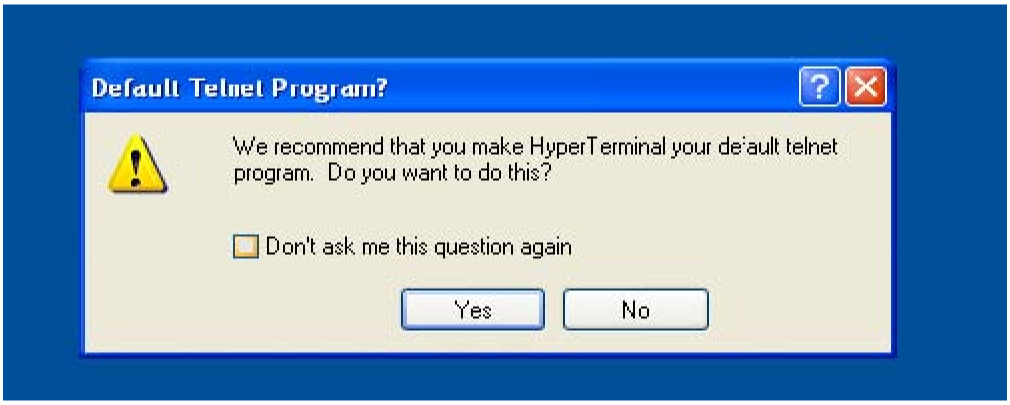


Figure 12-7

(3) Enter [1] as the followings and click on the [OK] button. Country and Region are not specified.

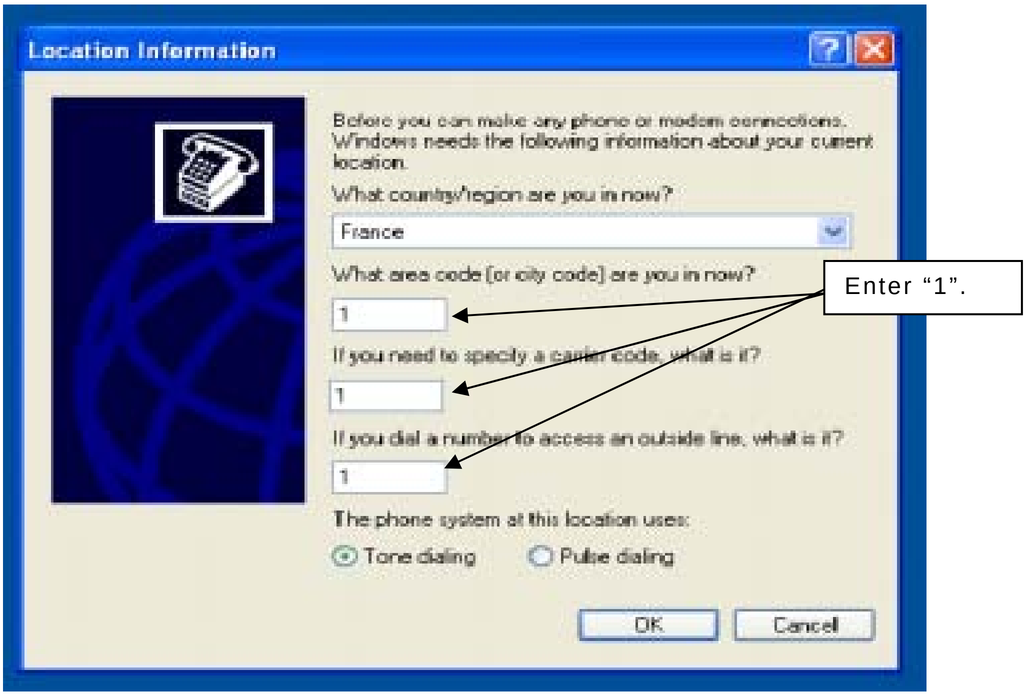


Figure 12-8

(4) Click on the [OK] button at [Phone and Modem Options].

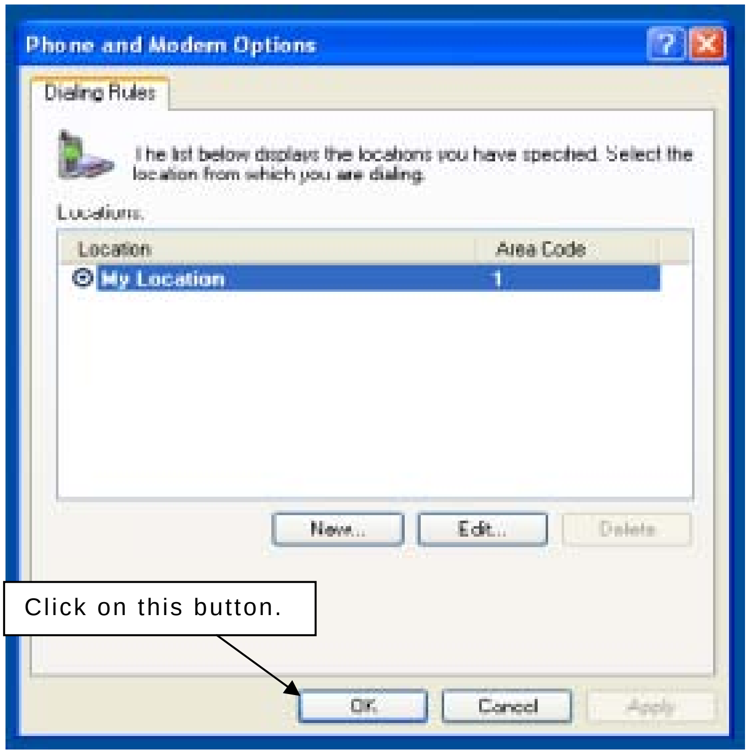


Figure 12-9

(5) Enter IP address [172.17.31.202] at the [Communication Descriptions] dialog and Click on the [OK] button.

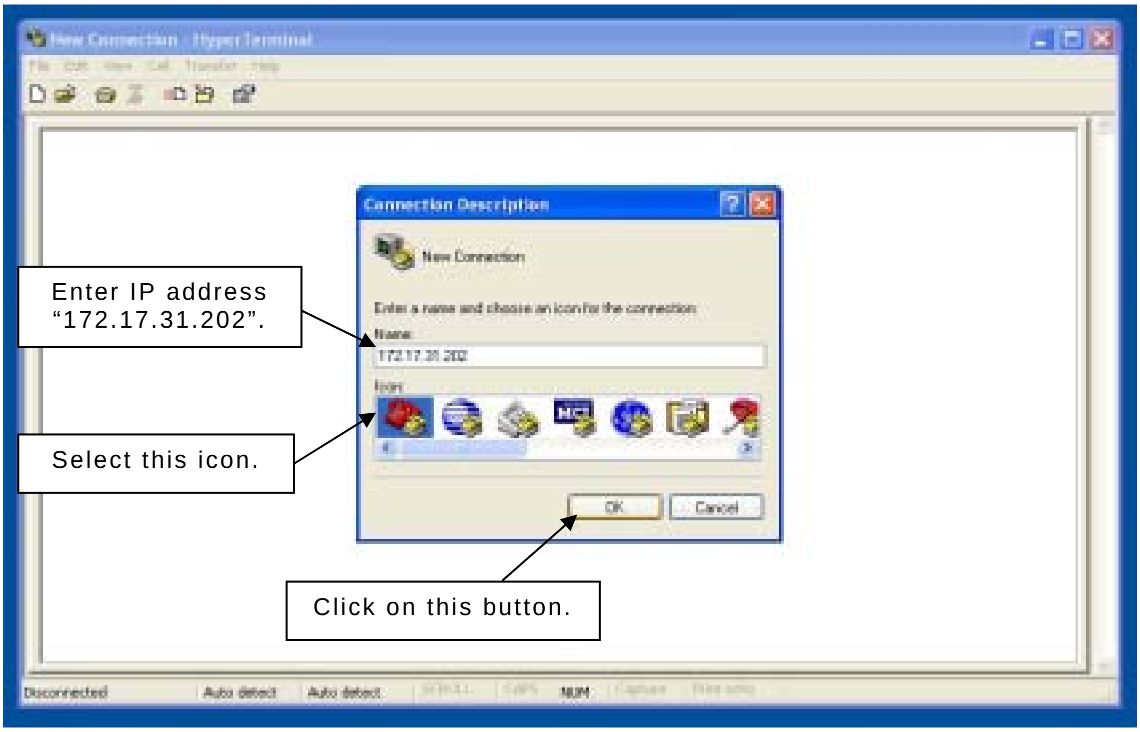


Figure 12-10

(6) Select [TCP/IP (Winsock)] at the [Connect To] dialog and click on the [OK] button.

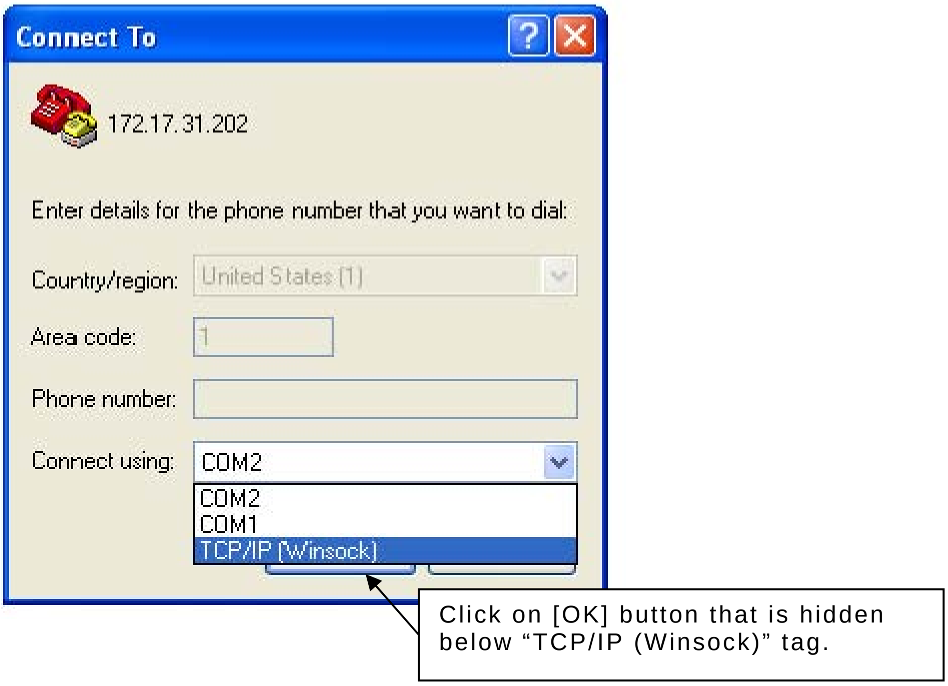


Figure 12-11

(7) Enter IP address [172.17.31.202] into the “Host address” field.

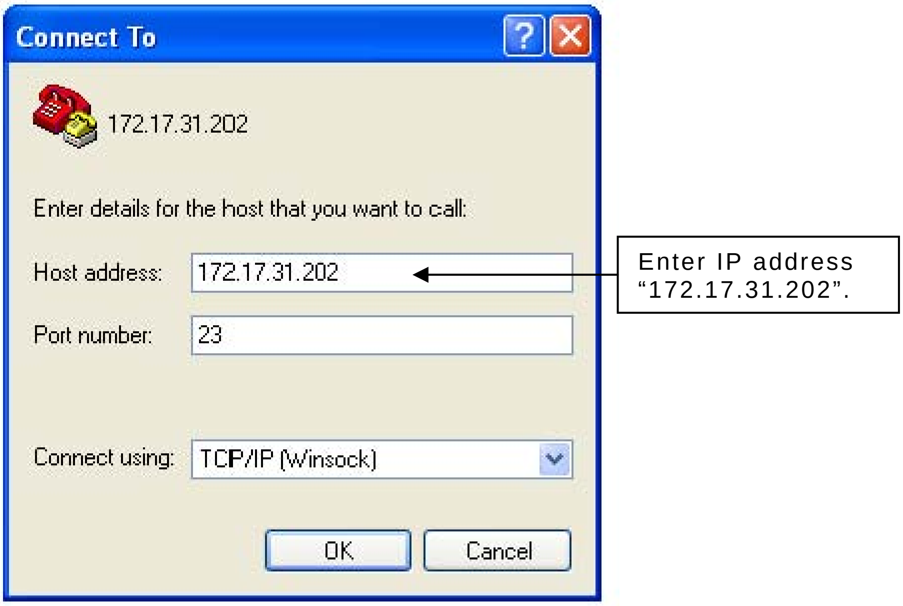


Figure 12-12

(8) After settings of the IP address is completed as shown Figure 12-12, the main unit of Analyzer’s communication line to PC by TCP/IP protocol is established.
At the “login: “prompt, enter “kogata”, and at the “password: “ prompt, enter “qnx”. Then, it is possible to operate the maintenance command.

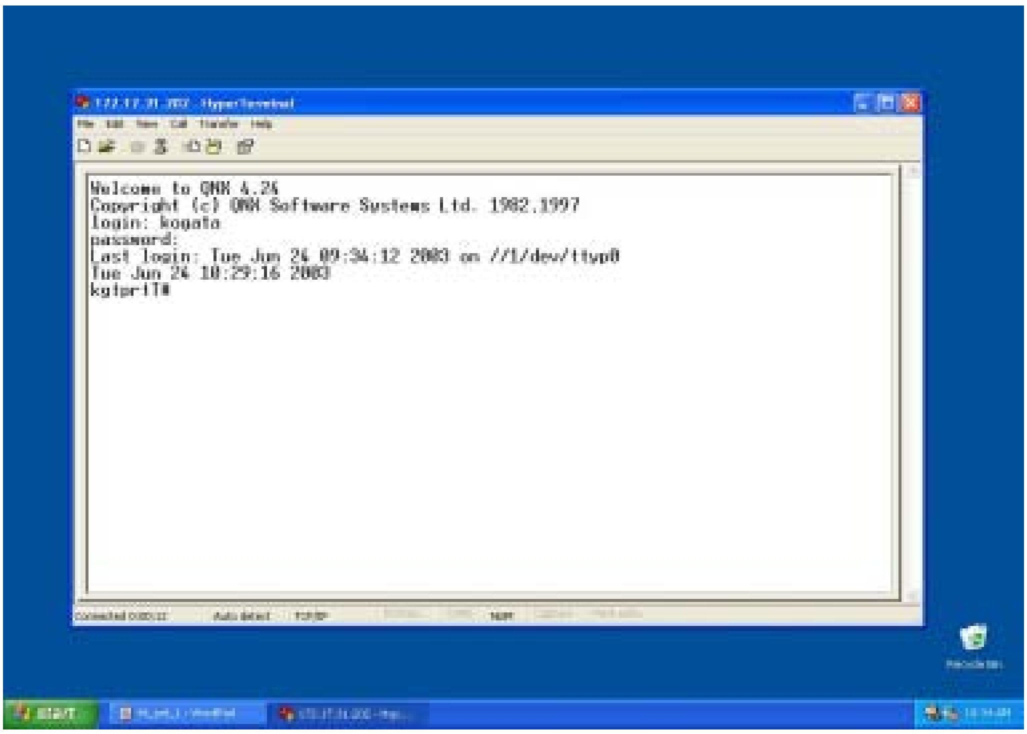


Figure 12-13

(9) When you want to terminate Hyper Terminal, click on the disconnect menu bar as shown below.

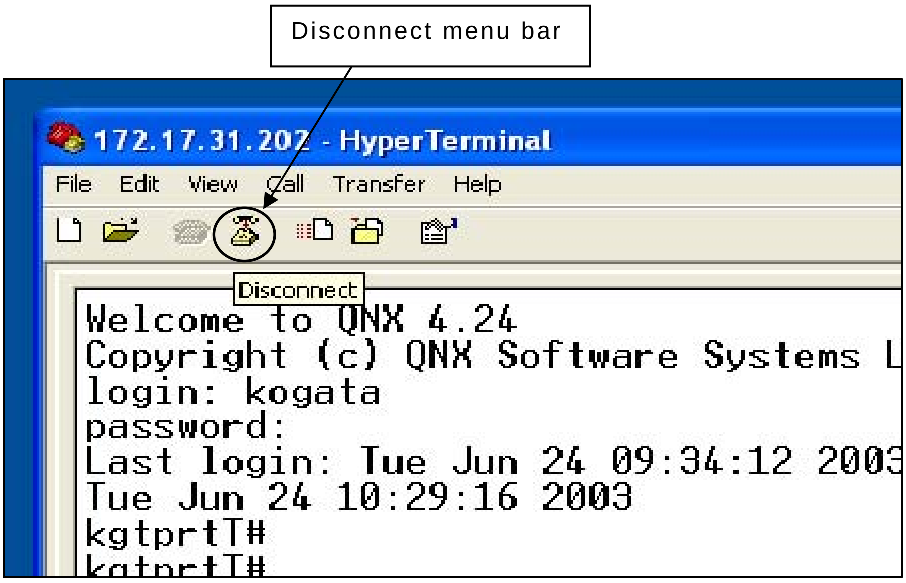


Figure 12-14

(10) Creation the shortcut icon of Hyper Terminal;

1) Select [Hyper Terminal] from [Start] menu, [All Programs], [Accessories], [Communications]. And select [kogata].

2) Click the right button for the mouse and create the shortcut icon. Transfer the shortcut icon on the desktop.

C. Setup for FFFTP

(1) Terminate all programs on the PC.

For the User-interface Program, terminate it as follows:

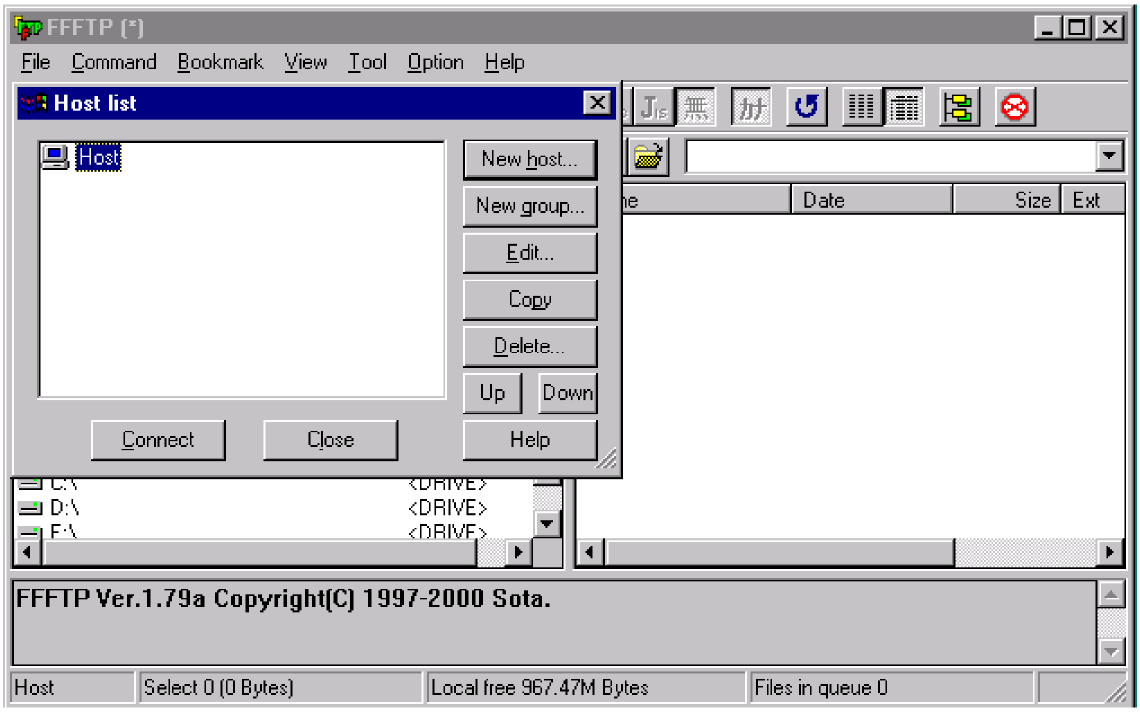
1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until the Windows desktop reappears.

(2) Start the FFFTP by clicking on the [FFFTP] icon found on the Windows desktop. Soon the "FFFTP" window opens, and the "Host list" dialog box is overlaid on it.

FFFTP ICON
Figure 12-15



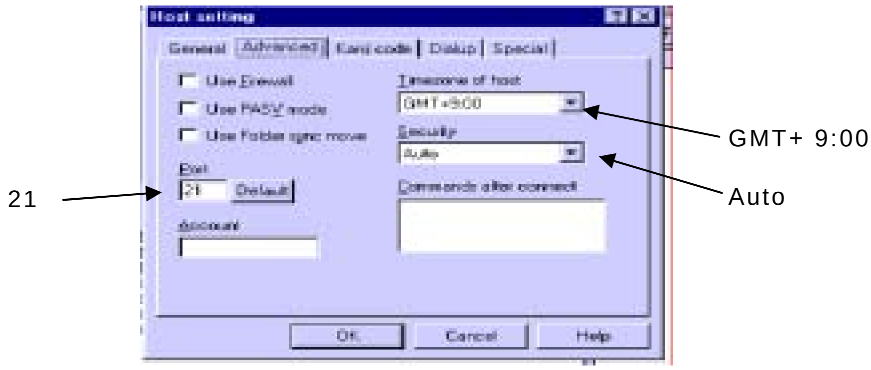
STARTING FFFTP
Figure 12-16

(3) First click on "CA-180" on the "Host list" dialog box to select it. Next click on the [Connect] button. As a result the "Host setting" dialog box pops up.

If "CA-180" is absent from the "Host list" dialog box, take the following measures:

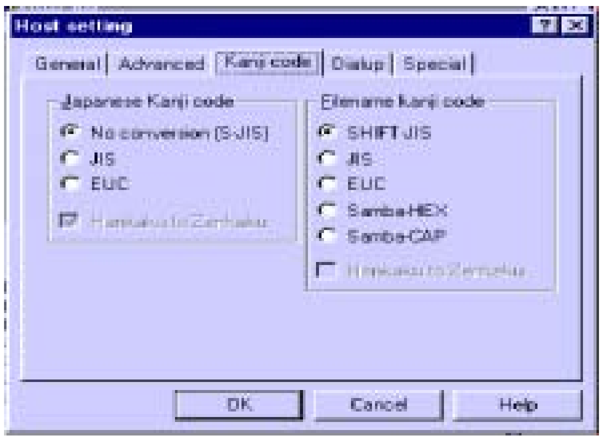
1 Click on the [Edit] button to display the "Host setting" dialog box.

2 After clicking on the [Advance] tab, fill out the blanks as shown below.



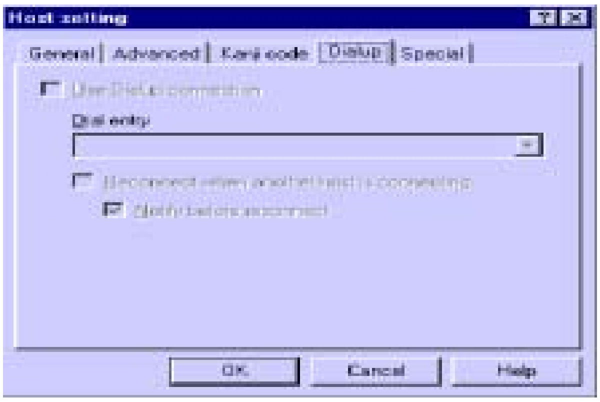
ADVANCED (HOST SETTING)
Figure 12-17

3 After clicking on the [Kanji code] tab, make settings as shown below.



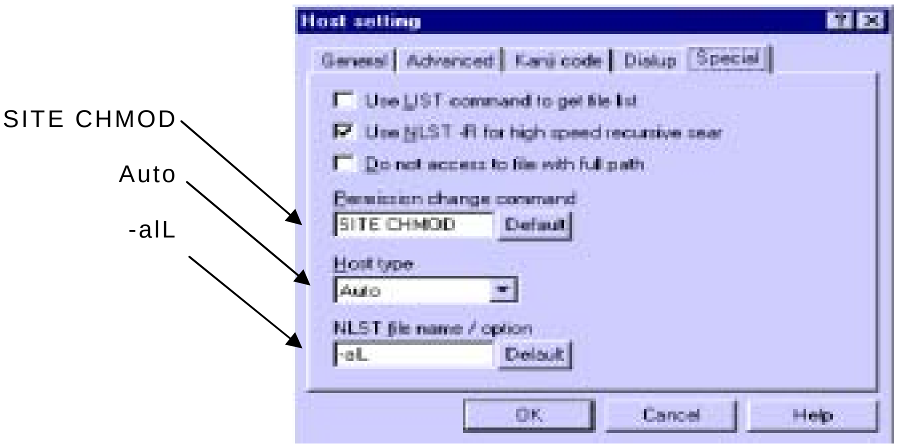
KANJI CODE (HOST SETTING)
Figure 12-18

4 After clicking on the [Dialup] tab, make settings as shown below.



DIALUP (HOST SETTING)
Figure 12-19

5 After clicking on the [Special] tab, make settings and fill out the blanks as shown below.

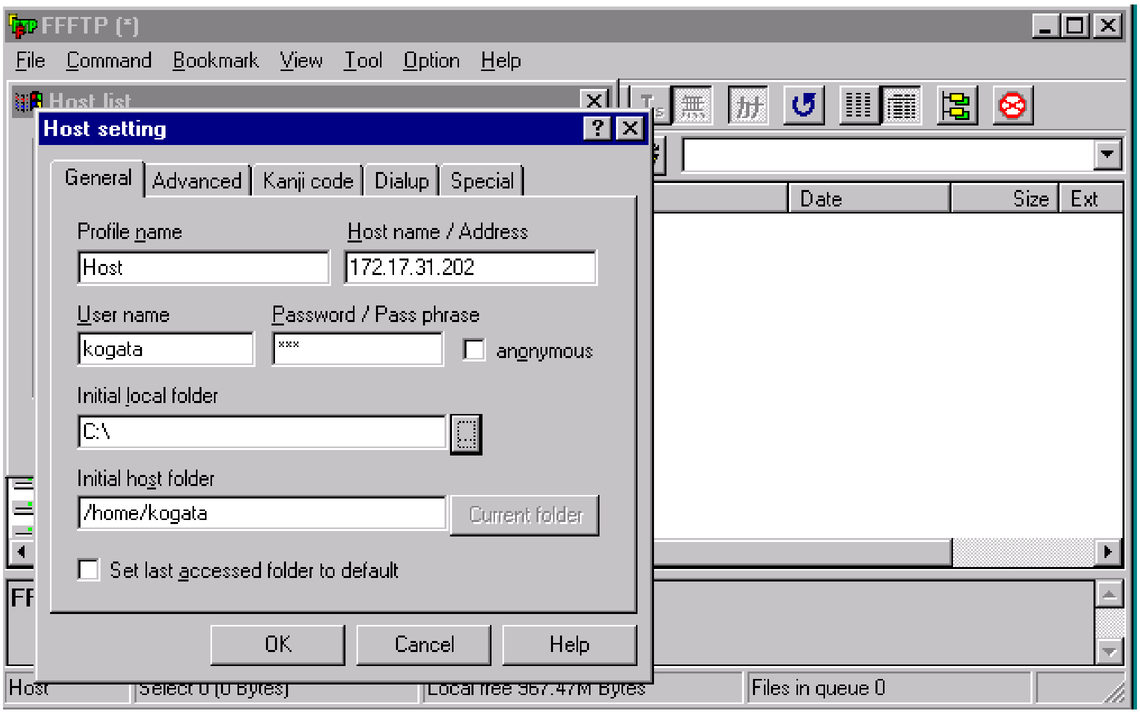


SPECIAL (HOST SETTING)
Figure 12-20

6 After clicking on the [General] tab, proceed to (4).

(4) On the "Host setting" dialog box, fill out the blanks as follows:

ITEM	ENTRY
Profile name:	Host
Host name/Address:	172.17.31.202
User name:	kogata
Password/Pass phrase:	qnx
Initial local folder:	C:\
Initial host folder:	/home/kogata



GENERAL (HOST SETTING)
Figure 12-21

When everything is OK on the dialog box, click on the [OK] button.

(5) Now the procedure is complete. Terminate the FFFTP by clicking the [X] button on its window.

2. Analyzer Software Upgrade

A. General

Software upgrading procedure for the Clinical Chemistry Analyzer unit is explained here. First complete "1. Preparatory Setup" if not done yet.

B. Procedure

(1) Terminate all programs on the PC.

For the User-interface Program, terminate it as follows:

1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until the Windows desktop reappears.

(2) Start the FFFTP by clicking on the [FFFTP] icon found on the Windows desktop. Soon the FFFTP starts up.

FFFTP ICON

(3) When "Host list" dialog box pops up, do as follows:
1 Click on (select) "CA-180"
2 Click on the [Connect] button.

Soon an explorer-flavored FFFTP window opens. The left- and right-half filers of the window list the directories/files in the PC and those in the Clinical Chemistry Analyzer, respectively.

(4) On the right-half filer, open the "/home/kogata/update" folder as follows:

1 Open the "home" folder by double-clicking it.
2 Open the "kogata" folder by double-clicking it.
3 Open the "update" folder by double-clicking it.

(5) Insert the CD disk into the drive.

(6) On the left-half filer, double-click on the CD drive to open it.

(7) On the tool bar, click on the [B] button (BINARY mode) to select it.

(8) On the left-half filer, click on the "sgata.tar.F" file to select it, then click on $\boxed{\uparrow}$. As a result the "sgata.tar.F" file is uploaded to the analyzer.

(9) Start the Hyper Terminal by selecting [Start], [Programs], [Accessories] and [Hyper Terminal] in this order on the Windows desktop.

NOTE: Alternatively, you may start the “Hyper Terminal” by double-clicking on the following icon that is found on the Windows desktop.

Hyper Terminal ICON

(10) At the "login:_" prompt, ender "kogata".

(11) At the "password:_" prompt, enter "qnx".

NOTE: The "qnx" entry is invisible.

(12) At the "kgtprtT>" prompt, enter "cd update".

(13) At the "kgtprtT>" prompt, enter "sgt_update" then wait until processing completes.

(14) At the "kgtprtT>" prompt, enter "logout" to terminate the Hyper Terminal.

(15) On the right-half filer, make sure that the "sgata.tar" files are displayed with new date/time stamps.

(16) Now the procedure is complete. Terminate the FFFTP by clicking the [X] button on its window.

3. User-interface Software Upgrade (on Windows)

CAUTION: In the procedure explained in this subsection, you will save the System Parameters and Database so that you may restore them after the User-interface Program Upgrade. However, the database cannot be restored when the data format is changed with software upgrade.

Software upgrading procedure for the User-interface Program is explained here. First complete "1. Preparatory Setup" if not done yet.

The following materials are required:

MATERIALS REQUIRED

ITEM	DESCRIPTIONS
New Software CD	Software No. 25501631XX where "XX" denotes 2-digit version number.
Floppy Disk	3.5-inch, 1.44 MB (HD), pre-formatted.

To upgrade the software, do the following procedures A thru H seamlessly.

A. Preparation

(1) Terminate all programs on the PC.

For the User-interface Program, terminate it as follows:

1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until the Windows desktop reappears.

(2) Create directory "C:\TEMP" if not available.

(3) Delete sub-directory "C:\TEMP\Db" if exists.

(4) Proceed to B (1) below.

B. Backup of System Parameters

(1) Start the old (existing) User-interface Program.
([Start] -> "Program (P)" -> "analyzer" -> "analyzer")

(2) Click on the [System Parameters] tab.

(3) Insert the pre-formatted floppy disk into the drive, then click on the [Backup (F10)] button.

(4) With the "Floppy Disk Operation" screen displayed, click on the [Save] button. The following message box pops up.

"Warring! Overwriting FD with system parameter. OK? [Yes] [No]"

(5) Click on the [Yes] button, and wait until "Backup in process" disappears.

(6) Click on the [Maintenance] tab.

(7) Click on the [Performance (F11)] button.

(8) Proceed to C (1) below.

C. Termination of User-interface Program

(1) Terminate the User-interface Program as follows:

1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until Windows desktop reappears.

D. Uninstallation of Old User-interface Program

(1) On the Windows desktop, start "ADD/REMOVE PROGRAMS" as follows:

1 Click on the [Start] button.
2 Select "Setting".
3 Click on "Control Panel".
4 Double-click on "Add/Remove Programs", and soon its window opens.

(2) Click on "Analyzer" on the selection box, then click on the [Add/Remove] button. In a while the installer/uninstaller "InstallShield Wizard" starts up.

(3) Click on the [Next>] button, and the "Program Maintenance" screen appears.

(4) Select the "Remove" radio button, then click on the [Next>] button. Soon, the "Remove the Program" screen appears.

(5) Click on the [Remove] button. After a bar-graph is displayed, "InstallShield Wizard Completed" is displayed.

(6) Click on the [Finish] button, and the Windows desktop reappears.

(7) Proceed to E (1) below.

E. Installation of New User-interface Program

(1) Insert the New Software CD into the drive, and soon the following message reads automatically:

"Welcome to the InstallShield Wizard ..."

(2) Click on the [Next>] button, and the "Customer Information" screen appears.

(3) Fill out the blanks as follows:

User Name: Analyzer

Organization: FEC

NOTE: Type "Analyzer" and "FEC" as shown above. Do not change the case of letters.

(4) Click on the [Next>] button, and "Destination Folder" appears.

(5) Click on the [Next>] button, and "Ready to Install the Program" appears.

(6) Click on the [Install] button, and a bar-graph is displayed. Wait until "InstallShield Wizard Completed" appears.

(7) Click on the [Finish] button, and the Windows desktop reappears.

(8) Proceed to F (1) below.

F. Restoration of System Parameters

For further information, read the CAUTION stated at the beginning of "3. User-interface Software Upgrade".

(1) Start the newly-installed User-interface Program.
([Start] -> "Programs" -> "analyzer" -> "analyzer")

(2) Click on the [System Parameters] tab, and the "System Parameters" screen appears.

(3) Insert the backup floppy disk (you made this in "B. Backup of System Parameters") into the drive.

(4) Click on the [Backup (F10)] button.

(5) Click on the [Load] button, and the following message appears:

Warning!
Reading system parameters from FD
- - - - - - - -

(6) Click on the [Yes] button, and a bar-graph is displayed.

(7) Terminate the User-interface Program as follows:

1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until the Windows desktop reappears.

(8) Proceed to G (1) below.

G. Final Check

(1) Perform the power shutdown procedure on the PC.

(2) Turn the Clinical Chemistry Analyzer ON.

(3) Turn the PC on again, and start the Windows.

(4) Usually, since it is set as automatic starting, new user-interface program starts. ([Start] -> "Programs" -> "analyzer" -> "analyzer")

(5) Click on the [System Parameters] tab, then click on the [System (F9)] button.

(6) Make sure that the new PC version number (printed on the CD label) is displayed on the upper-right portion of the screen as shown in the following example:

Program Version

Main: 25501641xx
Sub: 25501651xx
PC: 25501631xx

PC PROGRAM VERSION NUMBER PRESENTATION
Figure 12-24

NOTE: 2-digit number "xx" indicates a program version number.

(7) Click on the [Maintenance] tab.

(8) Click on the [Sequence (F9)] button, and the "Mechanical Maintenance" screen appears.

(9) Click on the [Start] button for "Initialization", and make sure that the operation is performed properly.

5. Changing Correction Values

A. Changing Temperature and Quantitative Parameters

(1) Terminate all programs on the PC.

For the User-interface Program, terminate it as follows:

1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until the Windows desktop reappears.

(2) Start the FFFTP by clicking on the [FFFTP] icon found on the Windows desktop. Soon the FFFTP starts up.

(3) When "Host list" dialog box pops up, do as follows:
1 Click on (select) "CA-180"
2 Click on the [Connect] button.

Soon the explorer-flavored FFFTP window opens. The left and right-half filers of the window list the directories/files in the PC and those in the Clinical Chemistry Analyzer, respectively.

(4) On the right-half filer, open the "\home\kogata\sysboot\offdata" folder and select the "system.txt" file as follows:

1 Open the "home" folder by double-clicking it.
2 Open the "kogata" folder by double-clicking it.
3 Open the "sysboot" folder by double-clicking it.
4 Open the "offdata" folder by double-clicking it.
5 Select the "system.txt" file by clicking it.

(5) On the left-half filer, open the "C:\TEMP" folder by double-clicking.

(6) On the tool bar, click on the B button (BINARY mode) to select it.

(7) Click on ↓ to download the "system.txt" file to the "C:\TEMP" folder.

(8) Change the parameters in the "C:\TEMP\system.txt" file with a text editor (NOTEPAD etc.). (Change accurately according to the descriptions from our company.)

(9) Upload the modified "system.txt" file as follows:

1 On the left-half filer of the "FFFTP" window, click on "system.txt" to select it.
2 On the right-half filer, reconfirm that the "\home\kogata\sysboot\offdata" folder is open.
3 Click on $\boxed{\uparrow}$ to upload the "C:\TEMP\system.txt" file to the analyzer.

(10) Now the procedure is complete. Terminate the FFFTP by clicking on the [X] button on its window.

B. Changing Position Map

(1) Terminate all programs on the PC.

For the User-interface Program, terminate it as follows:

1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until the Windows desktop reappears.

(2) Start the FFFTP by clicking on the [FFFTP] icon found on the Windows desktop. Soon the FFFTP starts up.

(3) When "Host list" dialog box pops up, do as follows:
1 Click on (select) "CA-180"
2 Click on the [Connect] button.

Soon the explorer-flavored FFFTP window opens. The left and right-half filers of the window list the directories/files in the PC and those in the Clinical Chemistry Analyzer, respectively.

(4) On the right-half filer, open the "\home\kogata\sysboot\pmap" folder and select the "*.txt" file as follows:

1 Open the "home" folder by double-clicking it.
2 Open the "kogata" folder by double-clicking it.
3 Open the "sysboot" folder by double-clicking it.
4 Open the " pmap" folder by double-clicking it.
5 Click (select) the position-map filename (*.txt) that you want to modify.

(5) On the left-half filer, open the "C:\TEMP" folder by double-clicking.

(6) Click on $\boxed{\downarrow}$ to download the "*.txt" file to the "C:\TEMP" folder.

(7) Change the parameters in the "C:\TEMP*.txt" file with a text editor (NOTEPAD etc.). (Change accurately according to the descriptions from our company.)

(8) Upload the modified "*.txt" file as follows:

1 On the left-half filer of the "FFFTP" window, click on "*.txt" to select it.
2 On the right-half filer, reconfirm that the "\home\kogata\sysboot\pmap" folder is open.
3 Click on $\boxed{\uparrow}$ to upload the "C:\TEMP*.txt" file to the analyzer.

(9) Now the procedure is complete. Terminate the FFFTP by clicking on the [X] button on its window.

C. Changing the setting parameters of optional unit.

(1) Terminate all programs on the PC.

For the User-interface Program, terminate it as follows:

1 While holding down the [Ctrl] key, press the [.](period) key. Soon the following buttons are displayed:

"Sleep
Power Off
Cancel"

2 Click on the [Power Off] button, and wait until the Windows XP desktop reappears.

(2) Start the FFFTP by clicking on the [FFFTP] icon found on the Windows XP desktop. Soon the FFFTP starts up.

(3) When "Host list" dialog box pops up, do as follows:
1 Click on (select) "CA-180"
2 Click on the [Connect] button.

Soon the explorer-flavored FFFTP window opens. The left and right-half filers of the window list the directories/files in the PC (Windows XP) and those in the Clinical Chemistry Analyzer, respectively.

(4) On the right-half filer, open the "\home\kogata\sysboot\kokyaku" folder and select the "*.txt" file as follows:

1 Open the "home" folder by double-clicking it.
2 Open the "kogata" folder by double-clicking it.
3 Open the "sysboot" folder by double-clicking it.
4 Open the " kokyaku" folder by double-clicking it.
5 Click (select) the option parts setting filename (*.txt) that you want to modify.

ayomu.txt for Barcode Reader of ASP
denkai.txt for ISE Unit
gaibu.txt for External Tanks
siyakuobiyomi.txt for Barcode Reader of RCU
The content of the text file is a one digit (1 or 0). When the unit is used, “1" is set.

(5) On the left-half filer, open the "C:\TEMP" folder by double-clicking.

(6) Click on $\boxed{\downarrow}$ to download the "*.txt" file to the "C:\TEMP" folder.

(7) Change the parameters in the "C:\TEMP*.txt" file with a text editor (NOTEPAD etc.).

(8) Upload the modified "*.txt" file as follows:

1 On the left-half filer of the "FFFTP" window, click on "*.txt" to select it.
2 On the right-half filer, reconfirm that the "\home\kogata\sysboot\kokyaku" folder is open.

3 Click on $\boxed{\uparrow}$ to upload the "C:\TEMP*.txt" file to the analyzer.

(9) Now the procedure is complete. Terminate the FFFTP by clicking on the [X] button on its window.

Appendix A
Specifications

1.	Kind of device	Clinical Chemistry Analyzer
2.	Usage	General chemistry as photometric assay Immunology as photometric assay (Latex reagent available)
3.	Assay type	1 point end, 2 point end, 1 point rate, 2 point rate
4.	Type of calibration	Factor, linear, Point to Point, Log Logit, Exponential, Spline
5.	Throughput	180 tests per hour
6.	Incubation time	One reagent assay: 10 minutes Two reagent assay: 5 minutes for R1 + 5 minutes for R2
7.	Sample type	Serum, Plasma and Urine
8.	Number of simultaneous measurement	40 items (Max.) + Electrolyte: 3 items
9.	Components	(1) Main Analyzer CHS (Chassis Unit) IRU (Incubation Reaction Unit) ASP (Auto Sampler Unit) RCU (Reagent Container Unit) RPT (Reagent Pipette Unit) SPT (Sample Pipette Unit) RPP (Reagent Pump Unit) SPP (Sample Pump Unit) WPP (Water Pump Unit) DTR (Detector Unit) MIX (Mixing Stirrer Unit) SWU (Supply Water Unit) WU (Wash Unit) POW (Power Unit) CNT (Control Unit) (2) External Tank Purified water tank: 1 Wash solution tank: 3 Waste fluid tank: 2 (3) Optional Accessories Personal Computer: 1 CRT Display: 1 Key-board: 1 Mouse: 1 Printer: 1 Cable: 1

(CONT'D)

(4) Optional Unit
Electrolyte measurement unit
Bar-code reader for sample tube
External-Tank Rack with Overflow detecting unit
(waste fluid tanks) and Fluid level detecting unit
(wash solutions / system water)

9-1 IRU (Incubation Reaction Unit)

Heating method:	Direct heat with silicon-rubber heater
Heating range:	37±0.3°C

9-2 Cuvette

Material:	PYREX
Size:	8mm(W) x 6.23mm(D) x 30mm(H)
Light length:	6mm
Quantity:	45
Minimum volume:	180µL
Maximum volume:	500µL

9-3 ASP (Auto Sampler Unit)

Valid tube:	Diameter 13 to 16mm, Length 53 to 100mm
Turn table:	Removable type
Number of tubes:	Maximum 40

9-4 SPT(Sample Pipette Unit)/SPP(Sampling Pump Unit)

Number of pipette:	1
Pump type:	Syringe pump
Liquid detection:	Conjugation of electric-capacitance detection
Sampling volume:	2 to 35µl (0.1µL/1 step)

9-5 RCU(Reagent Container Unit)

Turn table:	Removable type
Number of bottles:	Maximum 40 (20 bottles each for 100mL and 20mL type)
Cooling method:	Cooling with Pertier element
Cooling range:	8 to 15°C
Reagent inventory:	Count the dispensing volume of reagent

9-6 RPT (Reagent Pipette Unit)/RPP (Reagent Pump Unit)

Number of pipette:	1
Pump type:	Syringe pump
Liquid detection:	Conjugation of electric-capacitance detection
Sampling volume:	20 to 400µL (1µL/1 step)

(CONT'D)

9-7 DTR (Detector Unit)

Measurement:	Absorption of light (1 or 2 wavelength measurement)
Selectable wavelength:	8 wavelengths
Wavelength selection:	Change of Interference filter
Light source:	Halogen lamp
Cooling for light source:	Air-cooled by fan

9-8 MIX (Mixing Stirrer Unit)

Stirring mechanism:	Stirring-bar rotating by stepping motor

9-9 SWU (Supply Water Unit)

Liquid waste through nozzle of WU:	8 pieces of diaphragm pump
Liquid waste at trough:	1 piece of diaphragm pump
Supply water at trough:	5 pieces of diaphragm pump
Supply detergent at trough:	1 piece of diaphragm pump

9-10 WPP (Water Pump Unit)

Supply detergent for cuvette cleaning:	4 pieces of syringe pump

9-11 WU (General Wash Unit)

Cleaning mechanism:	8 steps cleaning 1st step: Waste of liquid and discharge of detergent 2nd step: Waste of liquid and discharge of purified water 3rd step: Waste of liquid and discharge of detergent 4th step: Waste of liquid and discharge of purified water 5th step: Waste of liquid and discharge of purified water 6th step: Waste of liquid and discharge of purified water 7th step: Waste of liquid 8th step: Waste of liquid with wipe tip

9-12 Power Unit

Source:	AC 100 to 120V(±10%), 5.5A(Max.)/AC 200 to 240V(±10%), 2.8A(Max.) 50/60Hz

10. Other functions: Auto start/shutoff, Emergency sample insertion, Automatic sample dilution, Water blank measurement, Reagent blank measurement, Test selection by profile, Host communication by RS232C with Operational PC.

(CONT'D)

11. Environment (without condensation and freezing)

Temperature:	Operation: 15 to 30°C, Storage/Transport: -10 to 50°C
Humidity:	Operation: 45 to 85%, Storage/Transport: 45 to 85%
Pressure:	Operation: 800 to 1060 hPa, Storage/Transport: 500 to 1060 hPa

12. Measurements

Figure (main unit):	770mm(W) x 620mm(D) x 505mm(H)
Weight (main unit):	135 Kg

13. Maximum sound level — 60dB
When the hatch is closed and the operator is distant 1m or more from the Main Analyzer.)

14. Definition of installation category in IEC60664 — Primary circuit: CAT II; Secondary circuit: CAT I

15. Pollution degree in IEC61010-1 — Pollution degree: 2

16. Connectors on main analyzer
   1) Electrical Connectors
      Appliance inlet
      RJ-45 modular jack (for connection between Main Analyzer and Operational PC)
      D-sub receptacle (for connection between Analyzer and optional External-Tank Rack)
   2) Piping Connectors (for connection between Analyzer and External-Tanks)
      System water
      High conc. Waste 1
      High conc. Waste 2
      Low conc. Waste
      Wash solution 1
      Wash solution 2
      Wash solution 3

17. The rating and the characteristics of fuses.

Type	Size (mm)	Rating	Characteristics	Location and Part No.
Glass tube fuse	5×20	1.6A/250V	Time lag- Acting, Slo-Blo	PCB:25P3222 (ASP/RCU_DRV)F1
Glass tube fuse	5×20	3.15A/250V	Time lag- Acting, Slo-Blo	PCB:25P3221 (SWU_DRV) F1
Glass tube fuse	5×20	5A/250V	Time lag- Acting, Slo-Blo	PCB:25P3220 (PP_DRV) F1 PCB:25P3222 (ASP/RCU_DRV) F2 & F3
Glass tube fuse	5×20	6A/125V	Medium-Acting, MITI	Appliance inlet F1 & F2 -FOR USE IN USA
Glass tube fuse	5×20	6.3A/250V	Time lag- Acting, Slo-Blo	Appliance inlet F1 & F2 -FOR USE OTHER COUNTRIES2
Glass tube fuse	5×20	10A/125V	Medium-Acting, MITI	PCB:25P3231 (IRU_DRV) F1

SYSTEM CONFIGURATION

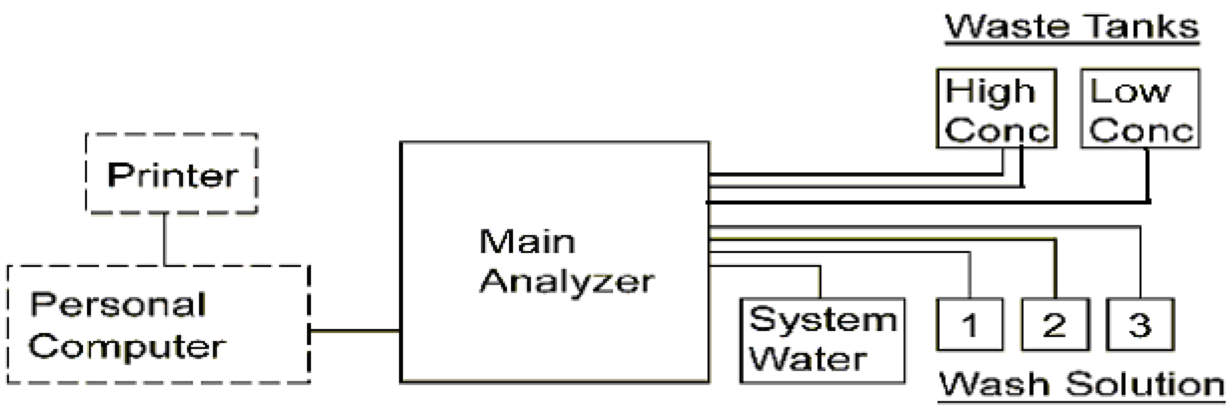


Figure A-1

EQUIPMENT LIST

No.	Equipment	Model/Type/Spec.	Q'ty	Remarks
1	Main Analyzer		1	Optional: Sample bar code reader and ISE unit.
2	Operational PC (Option)	Personal computer PC/AT compatible, MS Windows XP installed and can be operated normally Serial port: 1 or more (RS232C) Parallel port: 1 or more LAN port: 1 or more (10baseT/100baseTX)	1	with keyboard and mouse In the U.S.A, a UL-certified PC has to be used.
3	CRT display (Option)		1	15-inch or larger, XGA In the U.S.A, a UL-certified CRT display has to be used.
4	Printer (Option)	Centronics	1	Accommodates paper size of A4 In the U.S.A, a UL-certified printer has to be used.
5	External tanks	System water (20L x 1) High conc. waste (10L x 1) Low conc. waste (20L x 1) Wash solution (2L x 3 or 5L x 1)	4 or 6	With plastic tube for each tanks. 2L tanks are for using liquid level sensor unit only. (Option)
		Liquid level sensor unit	1 set	Option

(CONT'D)

No.	Equipment	Model/Type/Spec.	Q'ty	Remarks
6	Accessories	Cable for LAN: 1 Power cable for main unit: 1 Lid for sample tray (ASP lid): 1 Sample tray: 1 Lid for bottle container (RCU lid): 1 Reagent bottle tray: 1 Wash solution No.10-2: 1 Operator's Manual: 1	1 set	
		ISE electrode : 1 Calibrant A : 1 Calibrant B : 1 Dilution : 1 Wash solution for ISE : 1	1 set	For optional ISE unit only
7	Spare parts and tools	Glass tube fuse 1.6A/250V : 1 Glass tube fuse 3.15A/250V : 1 Glass tube fuse 6.3A/250V : 2 Glass tube fuse 5A/250V : 3 Glass tube fuse 10A/125V : 1 Halogen lamp : 1 Syringe tip (PTFE tip) : 1 set TEF010 : 1 TEF050 : 1 TEF250 : 3 TEF500 : 3 Syringe tip insertion die :1 Tool set : 1 set (+) Screw driver #1: 1 Hexagonal wrench (6mm): 1 Hexagonal wrench (0.9mm): 1	1 set	

PACKAGING

Items 1 and if provided 2 through 4 in the equipment list are packed individually in each designated package. Items 5 through 7 are packed in one package.
Items 5 (excluding Sample tray, ASP lid, Reagent bottle tray and RCU lid) through 7 are packed in one package. Sample tray, ASP lid, Reagent bottle tray and RCU lid are packed together in another package.

Appendix B
Special Tools and Materials

ITEM	DESCRIPTIONS
Belt Tension Meter	Required when replacing motors with timing belts. After motor/belt replacement, the tension of the belt needs to be adjusted. To measure belt tension, always use a tension meter "DOCTOR TENSION TYPE-I" that is available from the manufacturer of the timing belts. Contact us for the tension meter.
Screw Driver	Phillips (cross) type, with the tip magnetized. Long shaft (30 cm will do). Size No.2.
Silicone Compound (HSC-50)	Required for replacement of Peltier element assemblies.
Liquid Gasket (1212)	Required for replacement of Peltier element assemblies.
Hex. Wrenches	Diagonal: 0.9 and 6 mm
Jigs	1. Plunger tip insertion die (25-012-4101-1) 2. PT nozzle height adjustment jig (25-012-9045-0) (used for RPT and SPT) 3. MIX height adjustment jig (25-012-9083-1) 4. MIX position adjustment jig (25-012-9111-0) 5. WU1 jig (25-012-9108-0) 6. WU7 jig (25-012-9107-0) 7. SPT/RPT nozzle cleaning jig (25-012-4102-0) 8. WU nozzle cleaning jig (25-012-4103-0)

Appendix C
Maintenance Parts List

1. General

This section consists of:
- Maintenance Parts List
- Parts Locations (Illustrations)

The Maintenance Parts List comprises the following columns:

COLUMN	DESCRIPTIONS
Sht-#	The parts locations are given as several sheets of illustrations. See the sheet indicated by the Sht number. The dashed number # indicates the item number on that Sheet.
Code	Please indicate this information when ordering.
Name	
Type	
R/NR	R: Repairable. NR: Not repairable.
Q'ty	Indicates an ordering quantity. If Q'ty is 100, for example, please order quantity of 100's multiple.
Rank	A: Vitally important. Subject to waste. B: Vitally important. Not subject to waste. C: Not vitally important.

Parts locations are indicated on a series of illustrations:

Sheet 1	Chassis
Sheet 2	IRU
Sheet 3	MIX1/MIX2
Sheet 4	DTR
Sheet 5	SPT
Sheet 6	RPT
Sheet 7	WU
Sheet 8	ASP
Sheet 9	RCU
Sheet 10	PP
Sheet 11	SWU
Sheet 12	Tube Assemblies – 1 (SWU: 1/2)
Sheet 13	Tube Assemblies – 1 (SWU: 2/2)
Sheet 14	Tube Assemblies – 2 (PP)
Sheet 15	Tube Assemblies – 3 (External Tank)

2. Consumables

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
4-Con1	003B0550100	Halogen Lamp	25AP-X7501	NR	1	A
2-Con2	003B0550200	Cuvette	25AP-X7502	NR	10	A
	003B0550300	Cuvette	25AP-X7503	NR	3	A
	003B0550400	Cuvette	25AP-X7504	NR	1	A
10-Con3	003B0550500	Plunger Tip 1.4	25AP-X7505	NR	10	A
	003B0550600	Plunger Tip 1.4	25AP-X7506	NR	5	A
	003B0550700	Plunger Tip 1.4	25AP-X7507	NR	3	A
10-Con4	003B0550800	Plunger Tip 3.26	25AP-X7508	NR	10	A
	003B0550900	Plunger Tip 3.26	25AP-X7509	NR	5	A
	003B0551000	Plunger Tip 3.26	25AP-X7511	NR	3	A
10-Con5	003B0551100	Plunger Tip 7.29	25AP-X7512	NR	10	A
	003B0551200	Plunger Tip 7.29	25AP-X7513	NR	5	A
	003B0551300	Plunger Tip 7.29	25AP-X7514	NR	3	A
10-Con6	003B0551400	Plunger Tip 10.3	25AP-X7515	NR	10	A
	003B0551500	Plunger Tip 10.3	25AP-X7516	NR	5	A
	003B0551600	Plunger Tip 10.3	25AP-X7517	NR	3	A
7-Con7	003B0551700	Wipe Tip	25AP-X7518	NR	10	A
	003B0551800	Wipe Tip	25AP-X7519	NR	5	A
	003B0551900	Wipe Tip	25AP-X7521	NR	3	A
5-Con8	003B0552000	Sample Pipettor	25AP-X7522	NR	1	B
6-Con9	003B0552100	Reagent Pipettor	25AP-X7523	NR	1	B
3-Con10	003B0552200	Stirrer Paddler	25AP-X7524	NR	1	B
11-Con25	003B0553700	WU1 Diaphragm Pump	25AP-X7541 (PML3912-NF10)	NR	1	B
11-Con26		WU2 Diaphragm Pump		NR	1	B
11-Con27		WU3 Diaphragm Pump		NR	1	B
11-Con28		WU4 Diaphragm Pump		NR	1	B
11-Con29		WU5 Diaphragm Pump		NR	1	B
11-Con30		WU6 Diaphragm Pump		NR	1	B
11-Con31		WU7 Diaphragm Pump		NR	1	B
11-Con33		MIX1 Diaphragm Pump		NR	1	B
11-Con34		MIX2 Diaphragm Pump		NR	1	B
11-Con32	003B0554400	WU8 Diaphragm Pump	25AP-X7548 (PML3914-NF30)	NR	1	B
11-Con39		TRGH Diaphragm Pump		NR	1	B
11-Con35	003B0554700	SPT Diaphragm Pump	25AP-X7552 (PML3911-NF10)	NR	1	B
11-Con36		RPT Diaphragm Pump 1		NR	1	B
11-Con37		RPT Diaphragm Pump 2		NR	1	B
11-Con38		RPT Diaphragm Pump 3		NR	1	B
11-Con40	003B0594100	In-line Filter	(25S3253)	NR	1	A
	003B0594200	In-line Filter	(25S3253)	NR	8	A
	003B0594300	In-line Filter	(25S3253)	NR	800	A
	003B0555200	Wash Solution (20L)	25AP-X7557 (#10-2)	NR	1	A
	003B0555300	Wash Solution (500g)	25AP-X-7558 (#10-2)	NR	1	A
	003B0581500	Wash Solution (20KG)	(#3)	NR	1	A

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
	003B0581600	Wash Solution (500g)	(#3)	NR	1	A
	003B0581700	Wash Solution (20Kg)	(#9)	NR	1	A
	003B0581800	Wash Solution (500g)	(#9)	NR	1	A
	003B0594000	Wash Solution (500mL)		NR	1	A
1-Con41	003B0555500	ISE Electrode	(Na)	NR	1	A
	003B0581900	ISE Electrode	(K)	NR	1	A
	003B0582000	ISE Electrode	(Cl)	NR	1	A
	003B0582100	ISE Electrode	(Ref)	NR	1	A
	003B0555600	ISE Electrode kit	25AP-X-7566	NR	1	A
	003B0556200	ISE Urine Diluent (125mL)	25AP-X-7573	NR	1	A
1-Con42	003B0555800	ISE Calibrant A (500mL)	25AP-X-7568	NR	1	A
	003B0556000	ISE Calibrant B (125mL)	25AP-X-7571	NR	1	A
	SK008913800	ISE Cleaning Solution (Pepsin)		NR	1	A
1-Con43	003b0595300	ISE Pump Cassette	(5501)	NR	2	B
Material						
	003B0556600	P.V.C. Tube	1.6x3.2	NR	20m	B
	003B0556700	P.V.C. Tube	3x5	NR	20m	B
	003B0556800	P.V.C. Tube	4x6	NR	20m	B
	003B0556900	P.V.C. Tube	6x8.4	NR	20m	B
	003B0594800	P.V.C. Tube	6x10	NR	10m	B
	003B0557000	P.T.F.E. Tube	2x3	NR	10m	B
	003B0557100	F.E.P. Tube	1.15x1.95	NR	10m	B
	003B0595200	Silicon Tube	1.5x4	NR	10m	B
	003B0595100	Silicon Tube	2x6	NR	10m	B
	003B0594900	Silicon Tube	3x7	NR	10m	B
	003B0595000	Silicon Tube	6x11	NR	10m	B
	003B0557300	Urethane Tube	5x8	NR	10m	B
	003B0557400	Urethane Tube	1x3	NR	10m	B
	003B0557500	Mini Fitting (Type-I)	VFI-136	NR	10	B
	003B0557600	Mini Fitting (Type-I)	VFI-146	NR	10	B
	003B0557700	Mini Fitting (Type-T)	VFT-306	NR	10	B
	003B0557800	Mini Fitting (Type-Y)	VFY-106	NR	10	B
	003B0557900	Mini Fitting (Type-Y)	VFY-306	NR	10	B
	003B0558000	Tube Connector	S-1	NR	10	B
	003B0558100	Tube Connector	T-1.5	NR	10	B
	003B0558200	Tube Connector	Y-1	NR	10	B
	003B0558300	Tube Connector	E-1	NR	10	B

3. **Chassis**

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
1-1	003B0589700	PP Cover 1	25AP-X-7599	NR	1	C
1-2	003B0589800	SWU Cover 1	25AP-X-7602	NR	1	C
1-3	003B0589900	SWU Cover 2	25AP-X-7604	NR	1	C
1-4	003B0590000	Rear Cover	25AP-X-7606	NR	1	C
1-5	003B0590100	Mosaic Plate-1	25AP-X-7608	NR	1	C
1-6	003B0590200	Mosaic Plate-2	25AP-X-7611	NR	1	C
1-7	003B0590300	Mosaic Plate-4	25AP-X-7613	NR	1	C
1-8	003B0590400	Mosaic Plate-5	25AP-X-7615	NR	1	C
1-9	003B0590500	Mosaic Plate-6	25AP-X-7617	NR	1	C
1-10	003B0590600	Mosaic Plate-9	25AP-X-7619	NR	1	C
1-11	003B0559400	Acrylic Window	25AP-X-7621	NR	1	C
1-12	003B0590700	ISE Tank Cover	25AP-X-7623	NR	1	C
1-13	003B0590800	M3 Colored Screw	25AP-X-7625	NR	10	C
1-14	003B0590900	M4 Colored Screw	25AP-X-7627	NR	10	C
1-15	003B0559800	Dust Filter L	25AP-X-7628	NR	5	B
1-16	003B0559900	Dust Filter R2	25AP-X-7629	NR	5	B
1-17	003B0560000	SPT Guide 1	25AP-X-7631	NR	5	B
1-18	003B0560100	SPT Guide 2	25AP-X-7632	NR	5	B
1-19	003B0560200	RPT Guide	25AP-X-7633	NR	5	B
1-20	003B0591000	Cover Assy.	25AP-X-7635	NR	1	C
1-21	003B0591100	Top Cover Assy.	25AP-X-7637	NR	1	C
1-22	003B0591200	Left Cover Assy.	25AP-X-7639	NR	1	C
1-23	003B0591300	Right Cover Assy.	25AP-X-7642	NR	1	C
1-24	003B0591400	Front Cover Assy.	25AP-X-7644	NR	1	C
1-25	003B0560800	Plastic Clip	25AP-X-7645 (CP-522-2-3W)	NR	10	B
1-26	003B0560900	Free Stop Hinge	25AP-X-7646 (TH-122-1A)	NR	1	B
1-27	003B0561000	Springed Hinge	25AP-X-7647 (TH-91)	NR	1	B
1-28	003B0561100	Switching Regulator	25AP-X-7648 (LEA50F-12-G)	NR	1	B
1-29	003B0561200	Switching Regulator	25AP-X-7649 (LEA50F-5-Y-G)	NR	1	B
1-30	003B0561300	Switching Regulator	25AP-X-7651 (LEB225F-0524-G)	NR	1	B
1-31	003B0561400	Switching Regulator	25AP-X-7652 (LEA150F-24-H-G)	NR	1	B
1-32	003B0561500	Switching Regulator	25AP-X-7653	NR	1	B

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
			(HSV4-50F)			
1-33	003B0561600	SSR	25AP-X-7654 (G3NA-210B-UTU-DC5-24)	NR	1	B
1-34	003B0561700	LED Lamp (Yellow)	25AP-X-7655	NR	1	B
1-35	003B0561800	LED Lamp (Green)	25AP-X-7656	NR	1	B
1-36	003B0561900	Fan motor 1	25AP-X-7657 (109P0624H702)	NR	1	B
1-37	003B0562100	Fan motor 2	25AP-X-7659 (109R0624S402)	NR	1	B
1-39	003B0562200	Modular Jack	25AP-X-3710 (NW07E-188-BK)	NR	1	C
1-40	003B0562300	Power Inlet	25AP-X-7662 (8843.0463)	NR	1	C
1-41	003B0562400	Fuse Holder	25AP-X-7663 (8843.0902)	NR	1	C
1-44	003B0562500	Glass Tube Fuse	25AP-X-7664 (21706.3, 6.3A)	NR	1	B
1-45	003B0562600	Noise Filter	25AP-X-7665 (SUP-P10H-E1PR-4)	NR	1	C
1-46	003B0562700	Power Switch	25AP-X-7666 (LLK35C1)	NR	1	B
1-49	003B0563100	Power Supply Assy.	25AP-X-7671	R	1	B
1-51	003B0563300	AC Power Input Assy.	25AP-X-7673	R	1	B
1-52	003B0759500	CNT-IBM Board	25P3521-12-M08	NR	1	B
	003B0759600	CF Card	TS128MCF80-NF	NR	1	B
1-53	003B0759700	CNT-CN Board	25P3237	R	1	B
1-54	003B0759800	POWER-CN Board	25P3238	R	1	B
1-55	003B0759900	AD Board	B25P3706	R	1	B
1-56	----	Control Unit Assy		R	1	B

4. **IRU**

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
2-1	003B0563400	Cuvette Holder Plate	25AP-X-7701	NR	1	C
2-2	003B0563500	IRU Cover	25AP-X-7702	NR	1	C
2-3	003B0563600	Heat Insulator	25AP-X-7703	NR	5	B
2-4	003B0563700	Cuvette spring	25AP-X-7704	NR	10	B
2-5	003B0563800	Timing Belt	25AP-X-7705 (B100S2M480)	NR	1	B
2-6	003B0563900	Bearing	25AP-X-7705 (6004ZZ)	NR	1	B
2-7	003B0564000	IRU Motor	25AP-X-7707	NR	1	B
2-8	003B0564100	Slip Ring	25AP-X-7708	NR	1	B
2-9	003B0564200	IRU Heater	25AP-X-7709	NR	1	B
2-10	003B0564300	Thermal Fuse	25AP-X-7711	NR	1	B
2-13	003B0564600	TSP Board	25AP-X-7031	NR	1	B
1-16	003B0564900	IRU_CNT Board	25AP-X-7717 (25P3215)	R	1	B
2-17	003B0585400	IRU_DRV Board	25AP-X-7718 (25P3231)	R	1	B
2-18	003B0565100	IRU_CN1 Board	25AP-X-7719 (25P3217)	R	1	B
2-19	003B0565200	IRU_CN2 Board	25AP-X-7720 (25P3218)	R	1	B
2-20	003B0565300	SEN2 Board	25AP-X-7721 (25P3225)	R	1	B
2	003B0565400	IRU Assy.	25AP-X-7722	R	1	B
2	003B0565500	IRU-DTR Assy.	25AP-X-7723	R	1	B

5. MIX1/MIX2

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
3-1	003B0565600	Trough	25AP-X-7731	NR	10	C
3-2	003B0565700	Arm Cover	25AP-X-7732	NR	1	C
3-3	003B0565800	Sliding Plate	25AP-X-7733	NR	1	C
3-4	003B0565900	Linear Guide	25AP-X-7734 (LWLF14C1R90BHS1)	NR	1	B
3-5	003B0566000	Linear Guide	25AP-X-7735 (LWLG7C1R90BHS1)	NR	1	B
3-6	003B0566100	Bearing	25AP-X-7736 (DDL-840ZZ)	NR	1	B
3-7	003B0566200	Spring	25AP-X-7737 (1104)	NR	1	B
3-8	003B0566300	MIXR Motor (For Stirrer of Mix-1/2)	25AP-X-7738	NR	1	B
3-9	003B0566400	MIXU Motor (For Mix-1/2 movement)	25AP-X-7739	NR	1	B
3-12	003B0566700	SENSA Board	25AP-X-7743 (25P3207)	NR	1	B
3	003B0566800	MIX1 Assy.	25AP-X-7744	R	1	B
3	003B0566900	MIX2 Assy.	25AP-X-7745	R	1	B

6. DTR

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
4-1	003B0591500	Optical-filter Assy.	25AP-X-7752 (25S3201-2)	NR	1	B
4-2	003B0567100	Timing Belt	25AP-X-7756 (B60S2M236)	NR	1	B
4-3	003B0567200	Bearing	25AP-X-7757 (FLW689ZZ)	NR	1	B
4-4	003B0567300	Fan	25AP-X-7758	NR	1	B
4-5	003B0567400	FLT Motor	25AP-X-7759	NR	1	B
4-6	003B0566700	SENSA Board	25AP-X-7761 (25P3207)	NR	1	B
4-7	003B0567500	DTA Board	25AP-X-7762 (25P3219)	R	1	B
4	003B0567600	DTR Assy (without filter).	25AP-X-7763	R	1	B

7. SPT

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
5-1	003B0567700	Nozzle Cover S	25AP-X-7771	NR	1	C
5-2	003B0567800	Spring	25AP-X-7772 (1053)	NR	1	B
5-3	003B0567900	Timing Belt	25AP-X-7773 (B60S2M194)	NR	1	B
5-4	003B0568000	Timing Belt	25AP-X-7774 (B60S2M334)	NR	1	B
5-5	003B0568100	Bearing	25AP-X-7775 (6901ZZNR)	NR	1	B
5-6	003B0568200	Flanged Bearing	25AP-X-7776 (LF-850ZZ)	NR	1	B
5-7	003B0568300	Linear Guide	25AP-X-7777 (RSR12ZM+170LM)	NR	1	B
5-8	003B0568400	Stepping Motor (SPTU)	25AP-X-7778	NR	1	B
5-9	003B0568500	Stepping Motor (SPTR)	25AP-X-7779	NR	1	B
5-10	003B0566700	SENSA Board	25AP-X-7781 (25P3207)	NR	1	B
5-11	003B0568600	SEN_CN Board	25AP-X-7782 (25P3223)	R	1	B
5-12	003B0568700	SEN_LL/DL Board	25AP-X-7783 (25P3234)	R	1	B
5-13	003B0565300	SEN2 Board	25AP-X-7784 (25P3225)	NR	1	B
5	003B0568800	SPT Assy.	25AP-X-7785	R	1	B

8. RPT

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
6-1	003B0568900	Nozzle Cover R	25AP-X-7791	NR	1	C
6-2	003B0567800	Spring	25AP-X-7792 (1053)	NR	1	B
6-3	003B0567900	Timing Belt	25AP-X-7793 (B60S2M194)	NR	1	B
6-4	003B0568000	Timing Belt	25AP-X-7794 (B60S2M334)	NR	1	B
6-5	003B0568100	Bearing	25AP-X-7795 (6901ZZNR)	NR	1	B
6-6	003B0568200	Flanged Bearing	25AP-X-7796 (LF-850ZZ)	NR	1	B
6-7	003B0569000	Linear Guide	25AP-X-7797 (RSR12ZM+170LM)	NR	1	B
6-8	003B0568400	Stepping Motor (RPTU)	25AP-X-7798	NR	1	B
6-9	003B0569200	Stepping Motor (RPTR)	25AP-X-7799	NR	1	B
6-10	003B0566700	SENSA Board	25AP-X-7801 (25P3207)	NR	1	B
6-11	003B0568600	SEN_CN Board	25AP-X-7802 (25P3223)	R	1	B
6-12	003B0568700	SEN_LL/DL Board	25AP-X-7803 (25P3234)	R	1	B
6-13	003B0565300	SEN2 Board	25AP-X-7804 (25P3225)	NR	1	B
6	003B0569300	RPT Assy.	25AP-X-7805	R	1	B

9. **WU**

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
7-1	003B0569400	Nozzle	25AP-X-7811	NR	1	B
7-2	003B0569500	Nozzle B	25AP-X-7812	NR	1	B
7-3	003B0569600	Compressed Coil Spring	25AP-X-7813 (#5135)	NR	1	B
7-4	003B0569700	Compressed Coil Spring	25AP-X-7814 (#5149)	NR	1	B
7-5	003B0569800	Expanded Coil Spring	25AP-X-7815 (#6658)	NR	1	B
7-6	003B0569900	Linear Guide	25AP-X-7816 (2RSR9ZM+115LM)	NR	1	B
7-7	003B0570000	Timing Belt	25AP-X-7817 (B60S2M250)	NR	1	B
7-8	003B0568200	Flanged Bearing	25AP-X-7818 (LF-850ZZ)	NR	1	B
7-9	003B0570100	WU Motor	25AP-X-7819	NR	1	B
7-10	003B0570200	SEN_OVFR Board	25AP-X-7821 (25P3224B)	R	1	B
7-11	003B0566700	SENSA Board	25AP-X-7822 (25P3207)	NR	1	B
7-12	003B0570300	WU Nozzle Assy.	25AP-X-7823	R	1	
7	003B0570400	WU Assy.	25AP-X-7824	R	1	B

10. **ASP**

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
8-1	003B0570500	ASP Case	25AP-X-7831	NR	1	C
8-2	003B0570600	Sample Tube Holder	25AP-X-7832	NR	10	B
8-3	003B0570700	Timing Belt	25AP-X-7833 (B100S2M474)	NR	1	B
8-4	003B0563900	Bearing	25AP-X-7834 (6004ZZ)	NR	1	B
8-5	003B0570800	ASP Motor	25AP-X-7835	NR	1	B
8-6	003B0570900	Hole Sensor	25AP-X-7836	NR	1	B
8-7	003B0566700	SENSA Board	25AP-X-7837 (25P3207)	NR	1	B
8-8	003B0571000	Barcode Reader	25AP-X-7838	NR	1	B
8-9	003B0571000	ASP Lid Assy.	25AP-X-7839	NR	1	C
8-10	003B0571200	ASP Tray Assy.	25AP-X-7841	NR	1	C
8	003B0571300	ASP Assy. (without tray, cover and BCR)	25AP-X-7832	R	1	B

11. RCU

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
9-1	003B0571400	RCU Holder	25AP-X-7851	NR	10	B
9-2	003B0570700	Timing Belt	25AP-X-7852 (B100S2M474)	NR	1	B
9-3	003B0563900	Bearing	25AP-X-7853 (6004ZZ)	NR	1	B
9-4	003B0570800	RCU Motor	25AP-X-7854	NR	1	B
9-5	003B0571000	Barcode Reader	25AP-X-7855	NR	1	B
9-6	003B0571700	Hole Sensor	25AP-X-7856	NR	1	B
9-7	003B0566700	SENSA Board	25AP-X-7857 (25P3207)	NR	1	B
9-8	003B0571800	TSP Board	25AP-X-3412	NR	1	B
9-9	003B0571900	ASP/RCU_DRV Board	25AP-X-7859 (25P3222)	R	1	B
9-10	003B0572000	RCU Cover Assy.	25AP-X-7861	NR	1	C
9-11	003B0572100	RCU Tray Assy.	25AP-X-7862	NR	1	C
9-12	003B9572200	RCU Window Assy.	25AP-X-7863	NR	1	B
9-13	003B9572300	RCU Case Assy.	25AP-X-7864	NR	1	C
9-14	003B9572400	Peltier Element Assy 1	25AP-X-7865	NR	1	B
9-15		Peltier Element Assy.2		NR	1	B
9-16		Peltier Element Assy.3		NR	1	B
9-17		Peltier Element Assy.4		NR	1	B
9	003B0572800	RCU Assy. (without tray and cover)	25AP-X-7869	R	1	B

12. **PP**

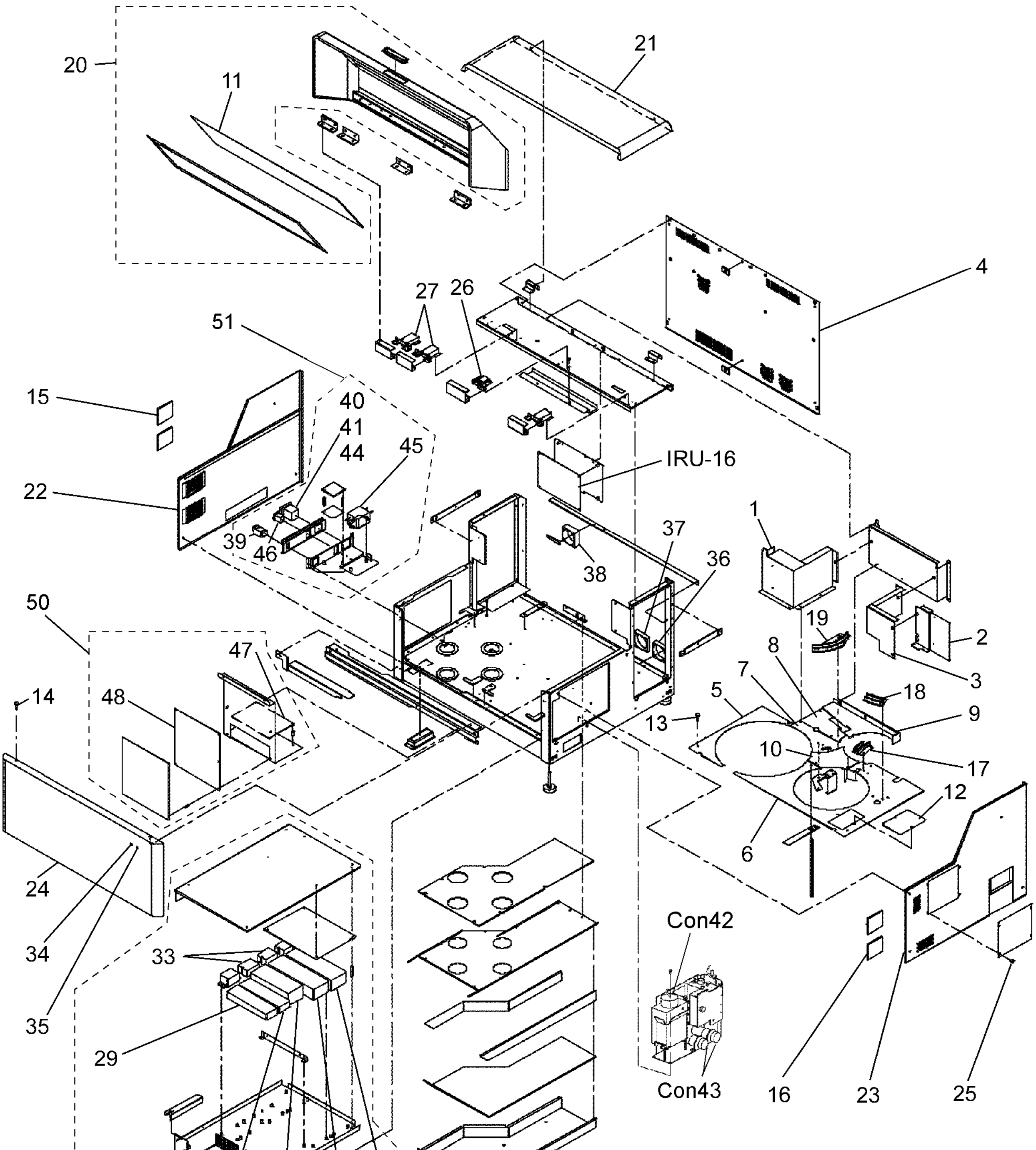
Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
10-1	003B0572900	Syringe 1.46S	25AP-X-7871	NR	1	B
10-2	003B0573000	Syringe 7.29S	25AP-X-7872	NR	1	B
10-3	003B0573100	Syringe 10.3R	25AP-X-7873	NR	1	B
10-4	003B0573200	Syringe 3.26R	25AP-X-7874	NR	1	B
10-5	003B0573300	Syringe 10.3W	25AP-X-7875	NR	1	B
10-6	003B0573400	Syringe 7.29W	25AP-X-7876	NR	1	B
10-7	003B0573500	M6 Joint	25AP-X-7877	NR	10	B
10-8	003B0573600	Seal 2.0		NR	10	B
10-9	003B0573700	Sealing 3.0		NR	10	B
10-22	003B0575000	Timing Belt	25AP-X-7894 (B100S2M220)	NR	1	B
10-23	003B0568200	Flanged Bearing	25AP-X-7895 (LF-850ZZ)	NR	1	B
10-24	003B0575100	Linear Guide	25AP-X-7896 (RSR9ZM+95LM)	NR	1	B
10-25	003B0575200	SPP Motor	25AP-X-7897	NR	1	B
10-26	003B0575300	RPP Motor	25AP-X-7898	NR	1	B
10-27		WPP Motor		NR	1	B
10-28	003B0575500	SPP-EV Assy.	25AP-X-7901	NR	1	B
10-29	003B0575600	RPP-EV Assy.	25AP-X-7902	NR	1	B
10-30	003B0575700	WPP-EV1 Assy.	25AP-X-7903	NR	1	B
10-31		WPP-EV2 Assy.		NR	1	B
10-32		WPP-EV3 Assy.		NR	1	B
10-33		WPP-EV4 Assy.		NR	1	B
10-34		WPP-EV5 Assy.		NR	1	B
10-35		WPP-EV6 Assy.		NR	1	B
10-36	003B0566700	SENSA Board	25AP-X-7909 (25P3207)	NR	1	B
10-37	003B0566300	PP_DRV Board	25AP-X-7911 (25P3220)	R	1	B
10	003B0566400	PP Assy.	25AP-X-7912	R	1	B

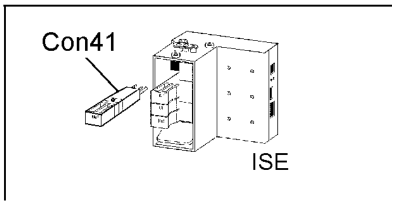
13. **SWU**

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
2-SWU-1	003B0576500	SPT Trough	25AP-X-7921	NR	10	C
2-SWU-2	003B0576600	RPT Trough	25AP-X-7922	NR	10	C
11-35	003B0580200	Tube Coupling	25AP-X-7962 (PMCD16-02-12)	NR	1	B
11-36	003B0580300	Tube Coupling	25AP-X-7963 (PMCD16-04-12)	NR	1	B
11-37	003B0580400	SWU_DRV Board	25AP-X-7964 (25P3221)	R	1	B
11	003B0580500	SWU Assy.	25AP-X-7965	R	1	B
(11)	003B0594700	Anti-back Flow Valve	(0.1C-AB)	NR	1	B

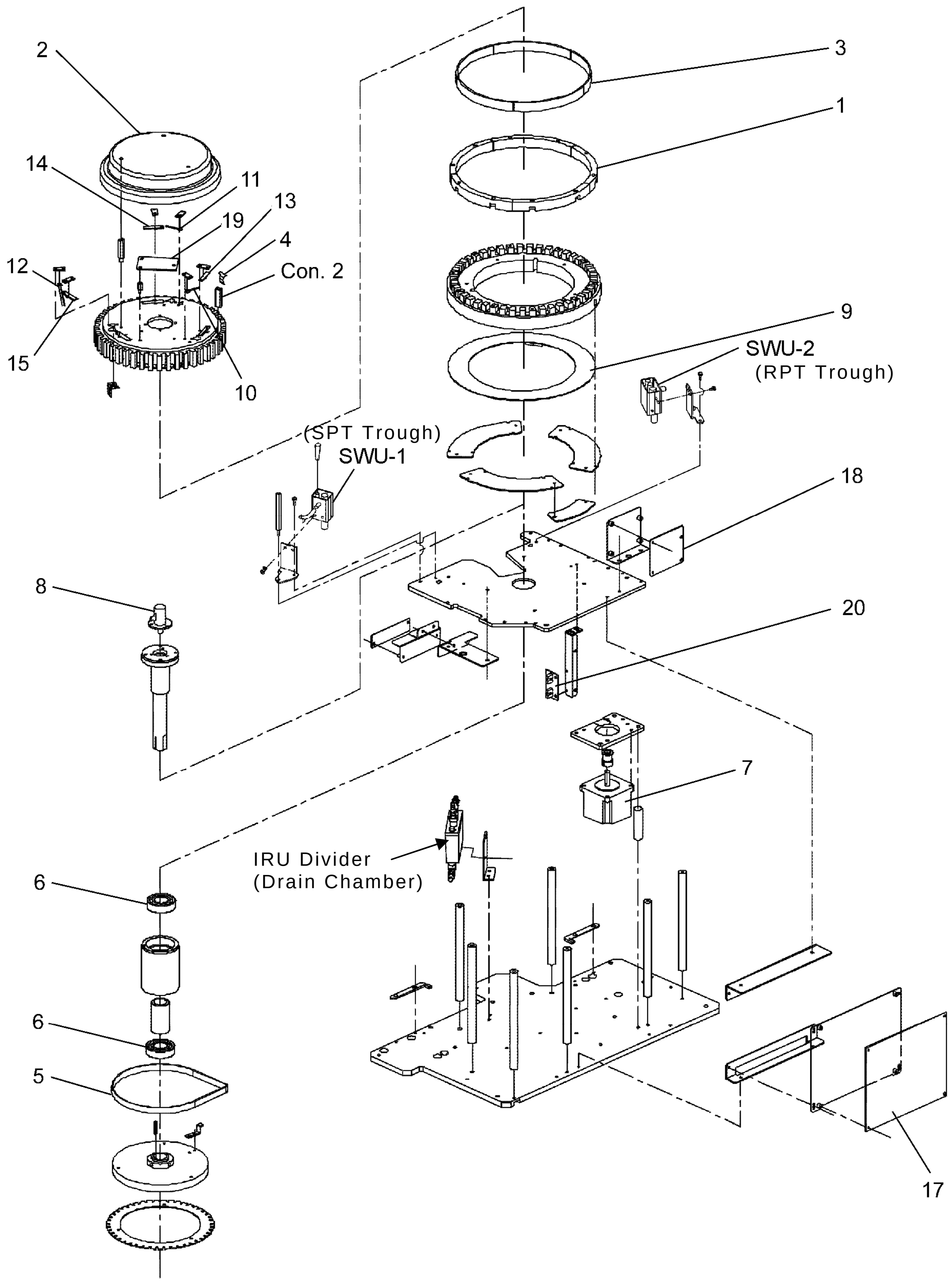
14. **External Tank**

Sht-#	Code	Name	Type	R/NR	Q'ty	Rank
15	003B0580600	Tube Assy.-41	25AP-X-7971	NR	1	B
15	003B0580700	Tube Assy.-42	25AP-X-7972	NR	1	B
15	003B0580800	Tube Assy.-43	25AP-X-7973	NR	1	B
15	003B0580900	Tube Assy.-44	25AP-X-7974	NR	1	B
15	003B0581000	Tube Assy.-45	25AP-X-7975	NR	1	B
15	003B0581100	Tube Assy.-46	25AP-X-7976	NR	1	B

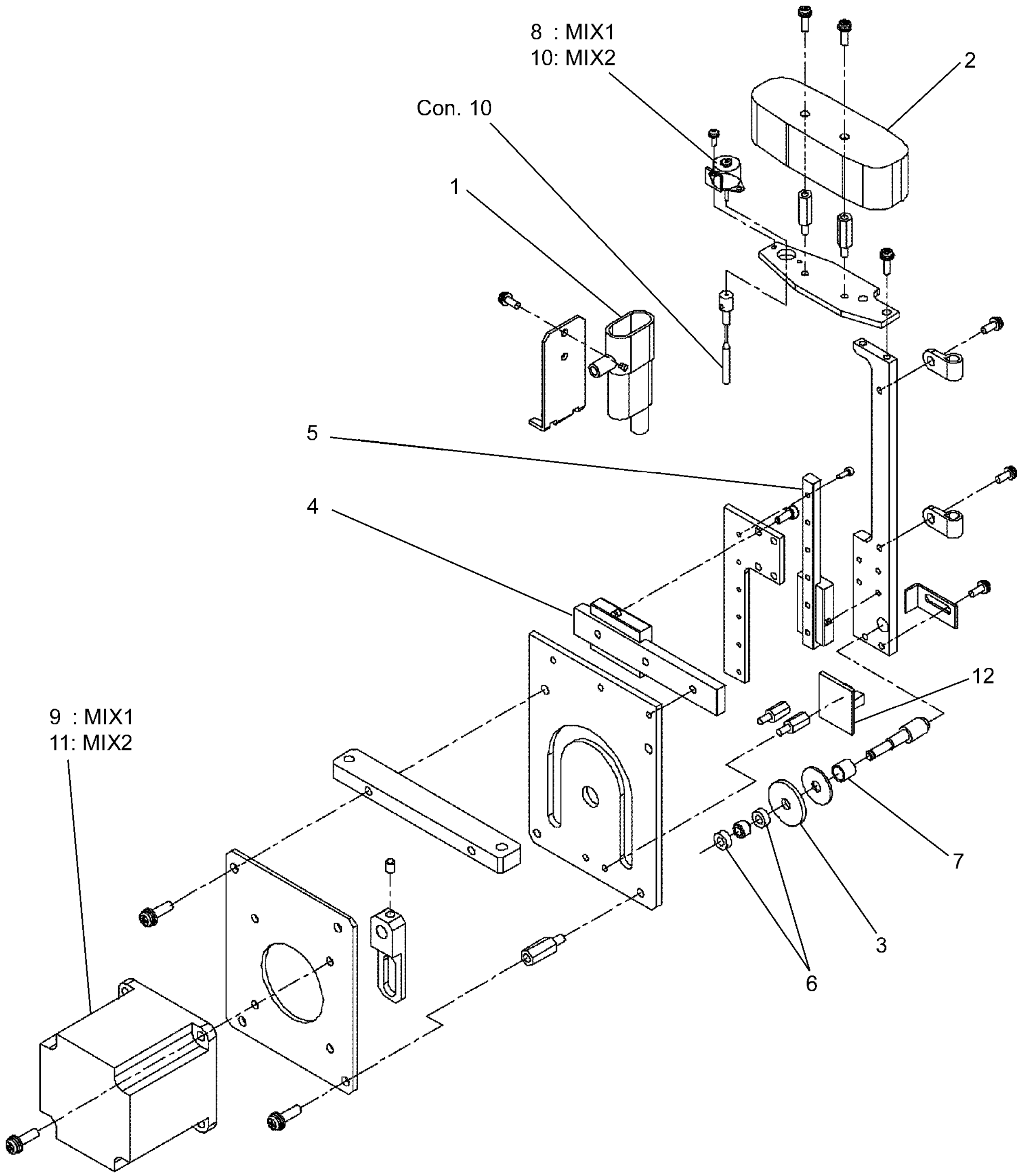




Sheet 1 (Chassis)


2
3
1
14
11
13
19
4
12
Con. 2
15
10
9
SWU-2
(RPT Trough)
(SPT Trough)
SWU-1
18
8
20
7
IRU Divider
(Drain Chamber)
6
6
5
17

Sheet 2 (IRU)



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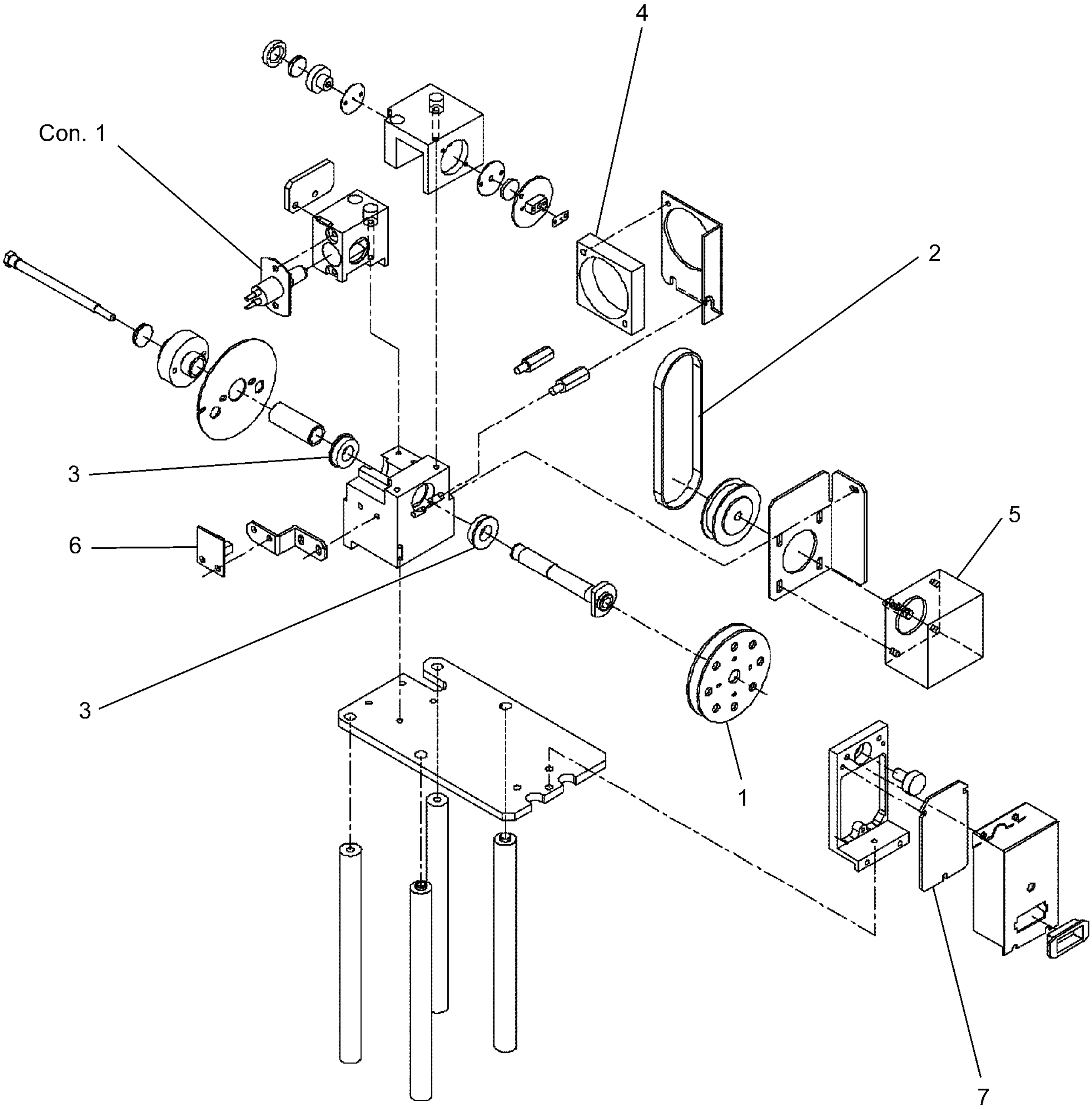

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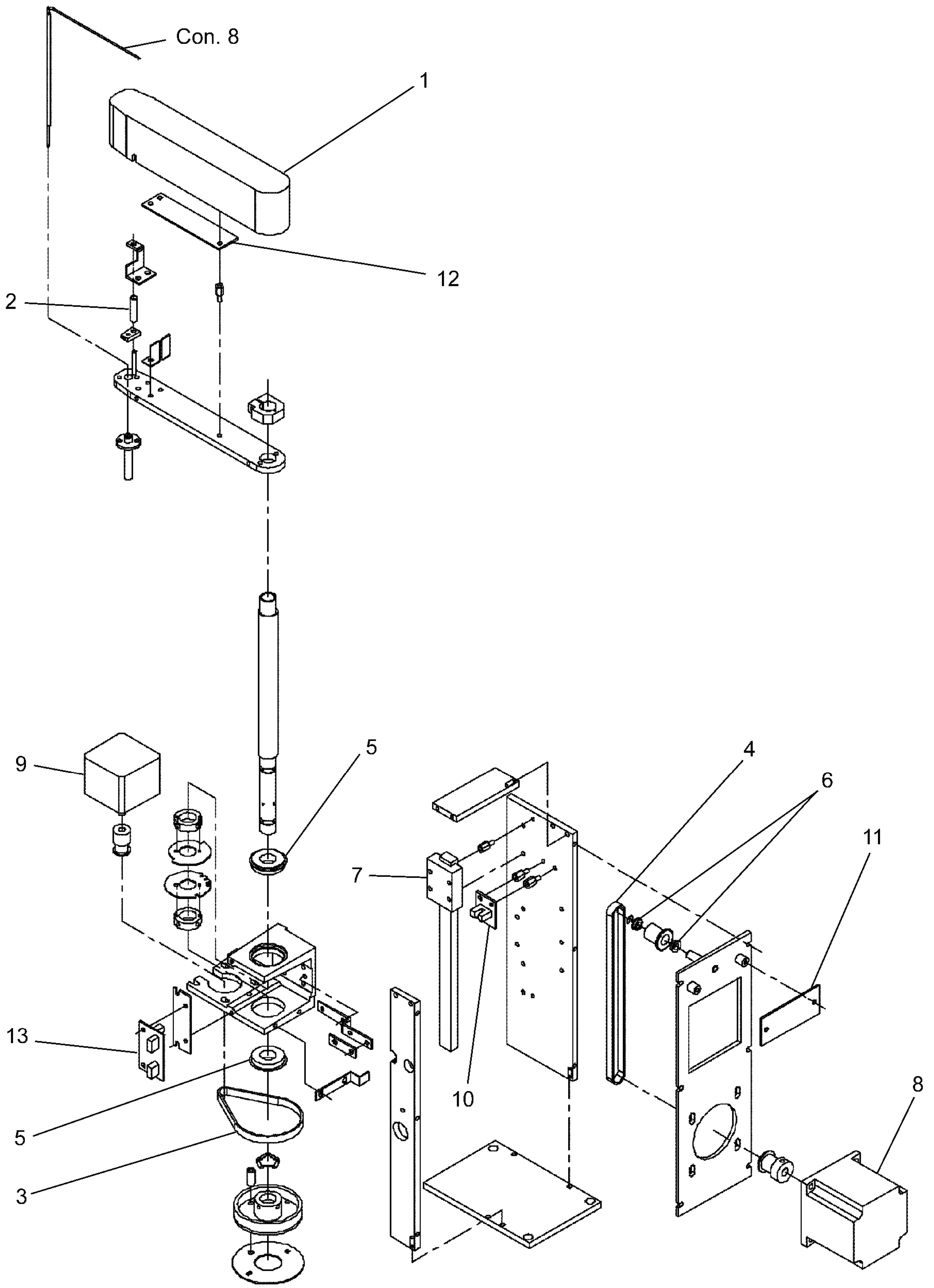
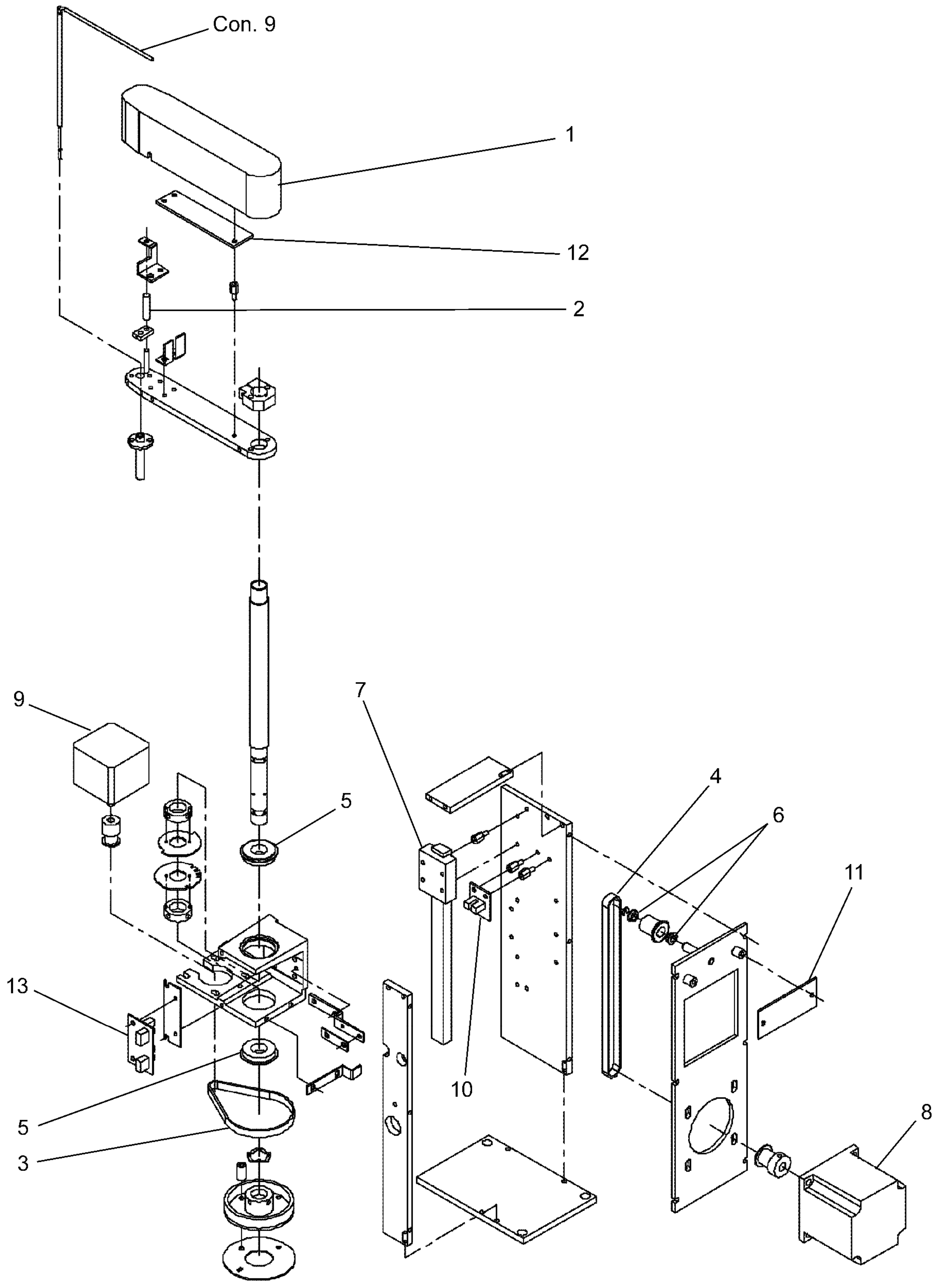
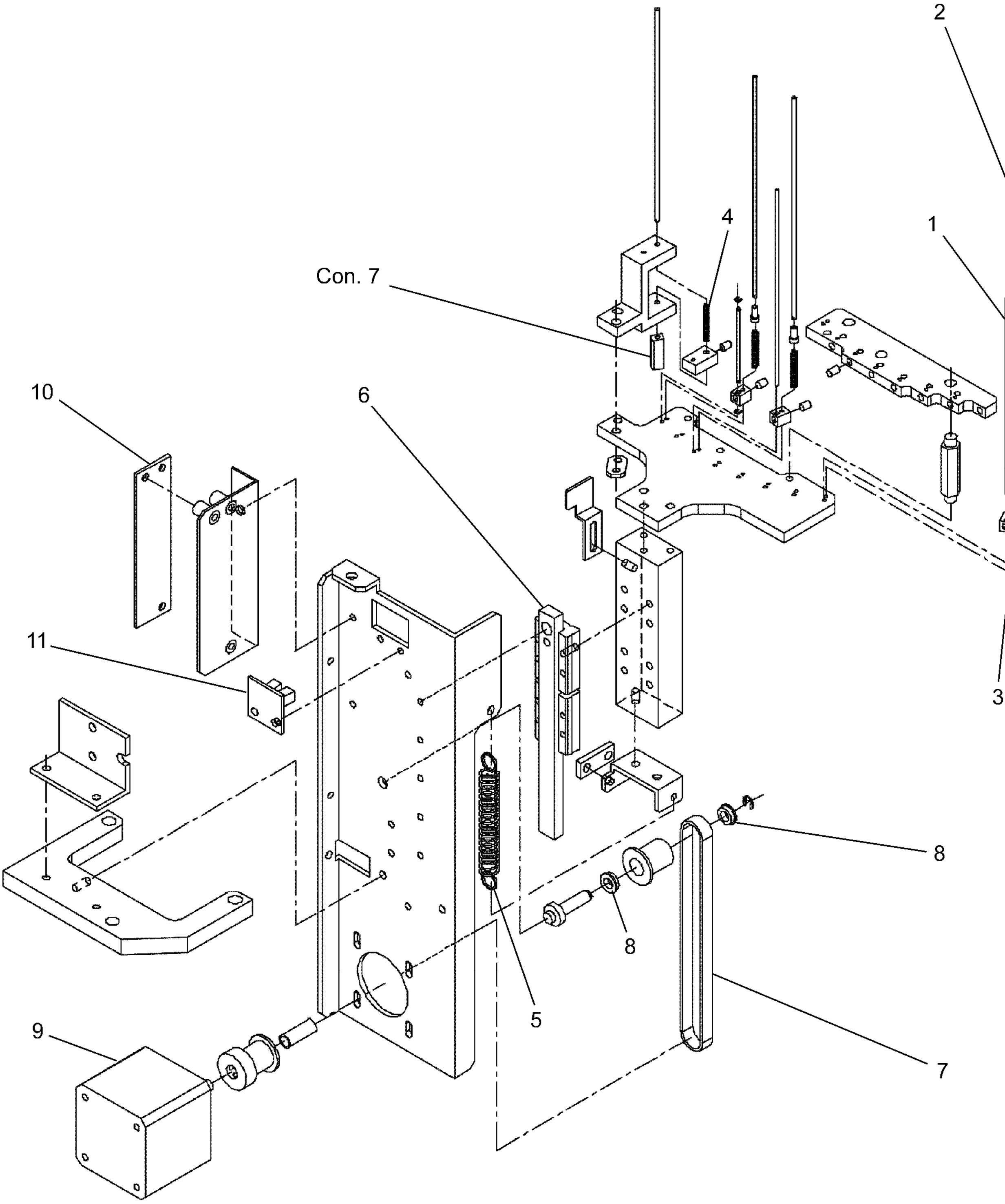


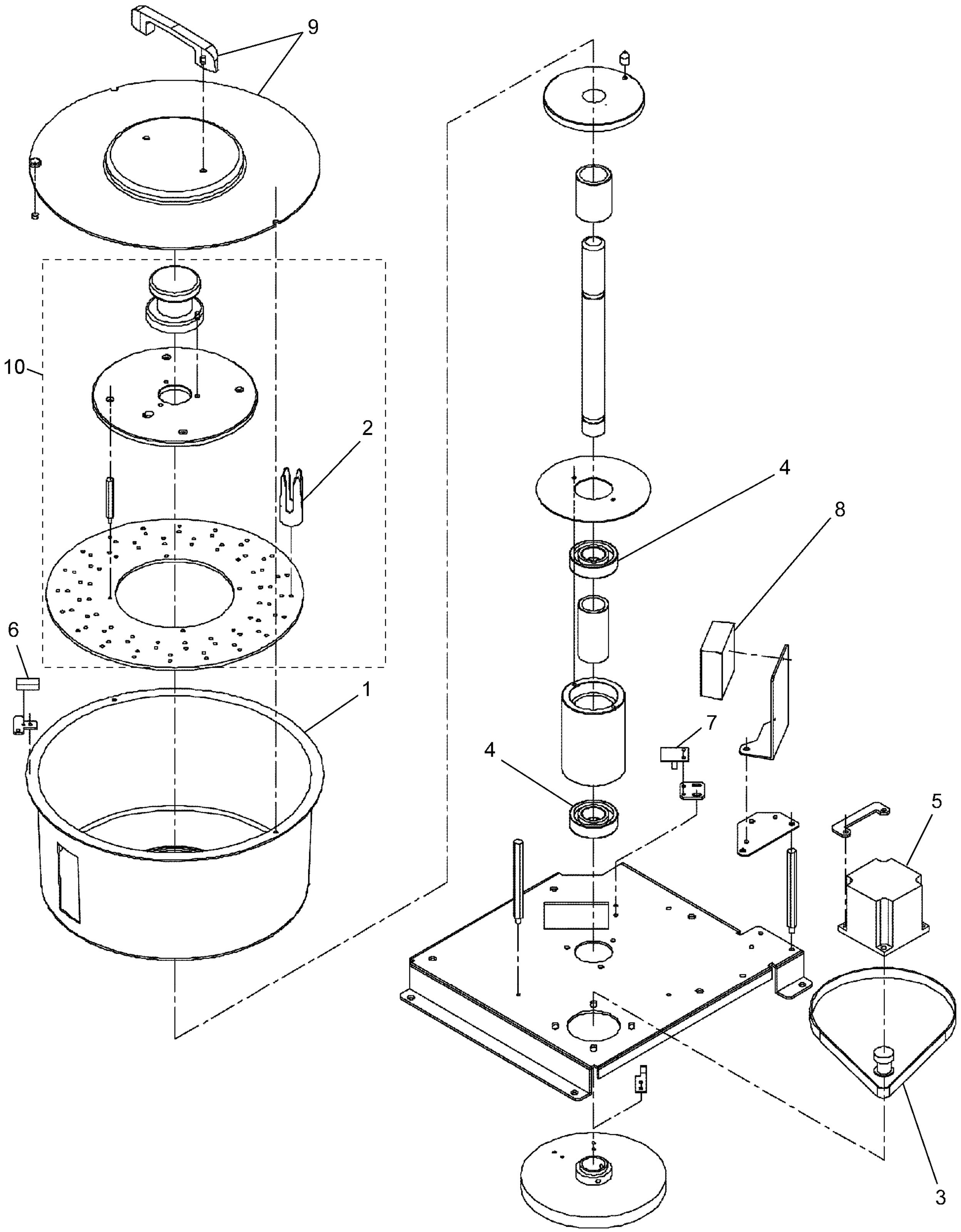
Sheet 5 (SPT)



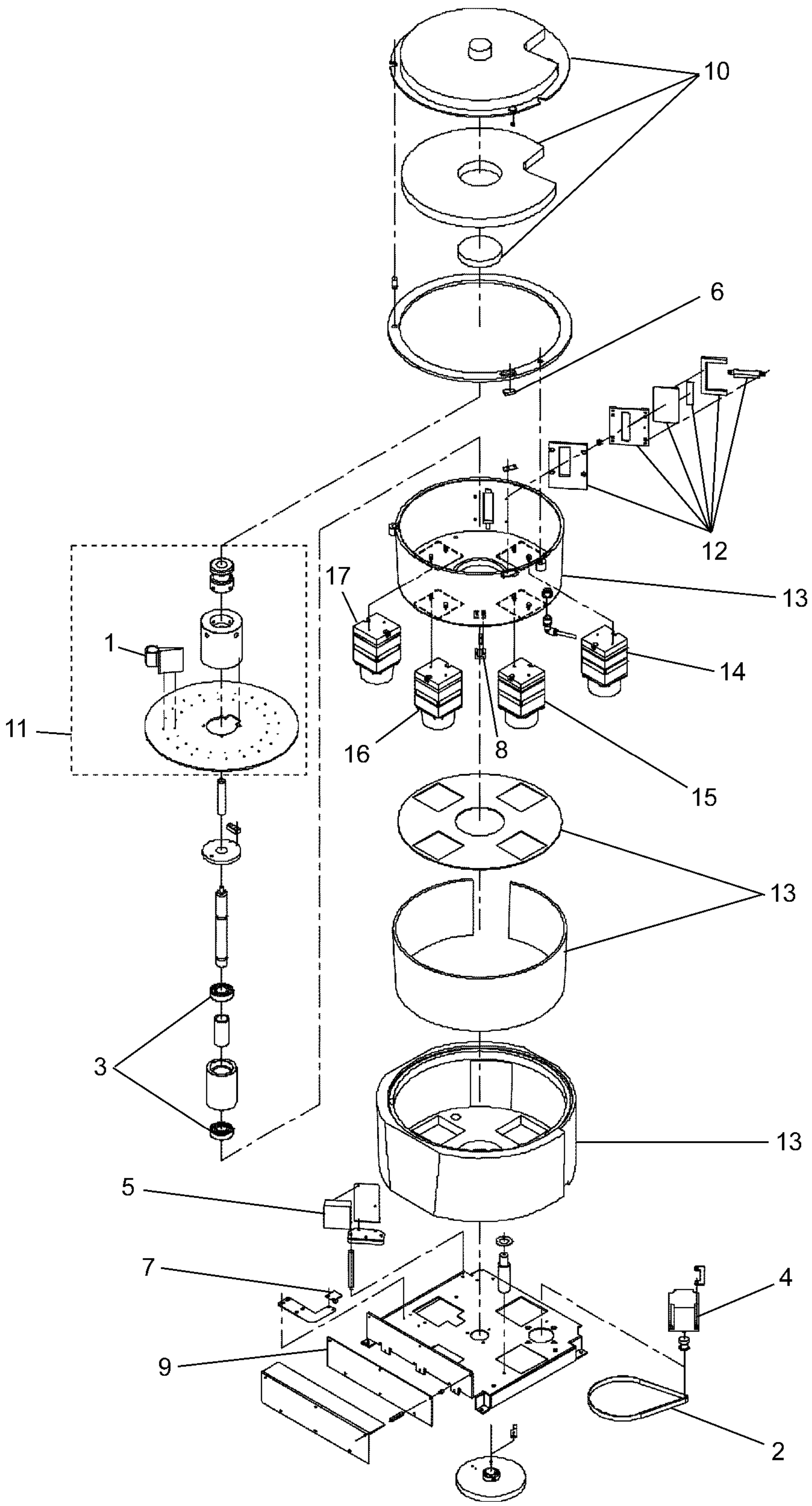
Sheet 6 (RPT)



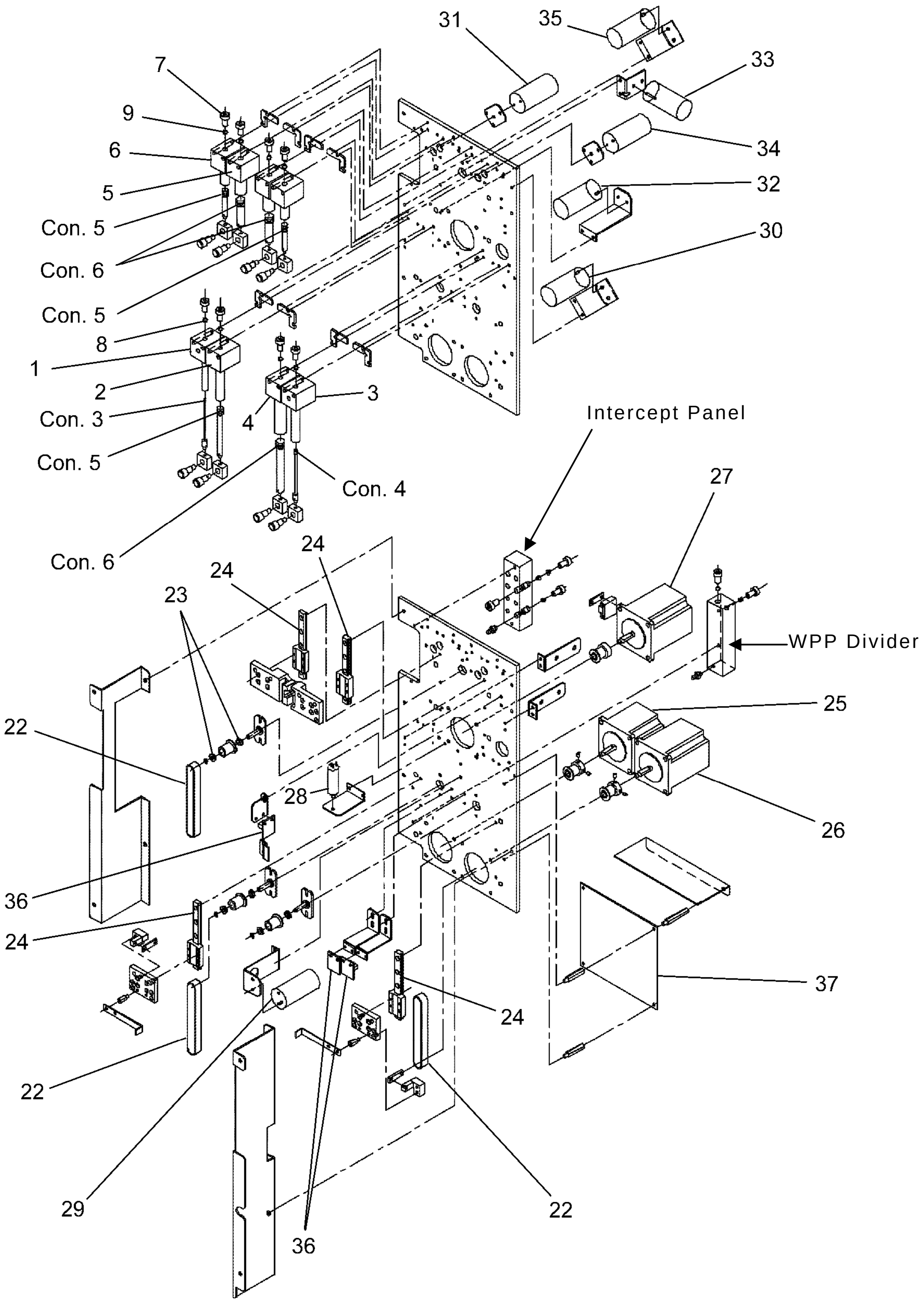
Sheet 7 (WU)



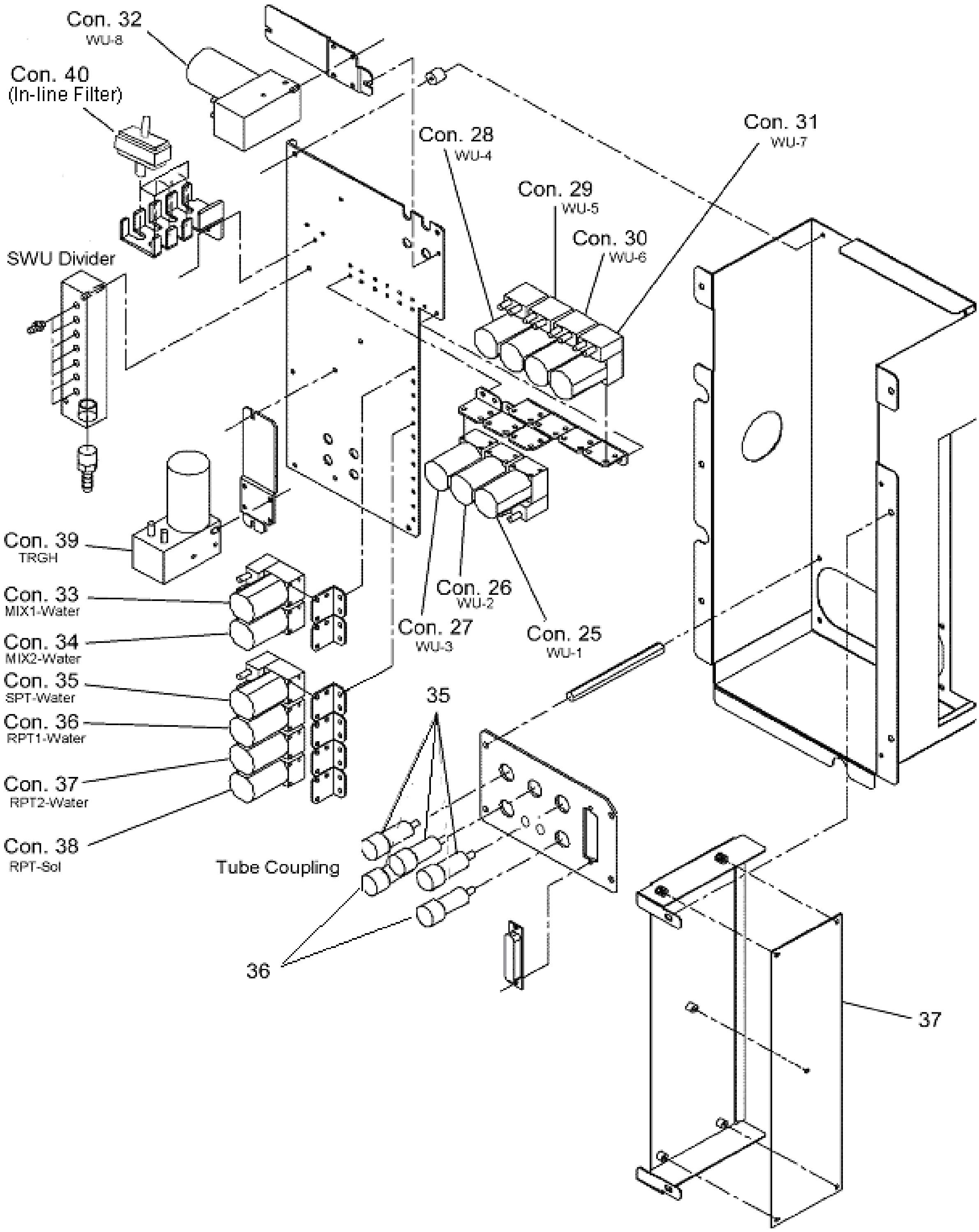
Sheet 8 (ASP)



Sheet 9 (RCU)


31
35
7
33
9
6
34
5
32
Con. 5
30
Con. 6
Con. 5
8
1
2
3
Con. 3
4
Intercept Panel
Con. 5
Con. 4
27
Con. 6
24
24
23
WPP Divider
22
25
28
26
36
24
37
24
22
29
22
36

Sheet 10 (PP)


Con. 32
WU-8
Con. 40
(In-line Filter)
SWU Divider
Con. 28
WU-4
Con. 29
WU-5
Con. 30
WU-6
Con. 31
WU-7
Con. 39
TRGH
Con. 33
MIX1-Water
Con. 34
MIX2-Water
Con. 35
SPT-Water
Con. 36
RPT1-Water
Con. 37
RPT2-Water
Con. 38
RPT-Sol
Con. 26
WU-2
Con. 27
WU-3
Con. 25
WU-1
35
Tube Coupling
36
37

Sheet 11 (SWU)

SWU (1/2)

Ref -#	NAME	TUBE SPEC. In-dia. x Out-dia. (Length)	LOCATION
11	Tube Assy.-1	P.V.C.: 3x5 (20)	Mini Fitting (Type-T) – Mini Fitting (Type-T)
		P.V.C.: 3x5 (40)	Mini Fitting (Type-)– SPT Water Pump
		P.V.C.: 3x5 (40)	Mini Fitting (Type-T) – RPT1 Water Pump
		P.V.C.: 3x5 (40)	Mini Fitting (Type-T) – RPT3 Water Pump
		P.V.C.: 3x5 (40)	Mini Fitting (Type-T) – MIX2 Water Pump
		P.V.C.: 3x5 (60)	Mini Fitting (Type-T) – MIX1 Water Pump
		P.V.C.: 3x5 (150)	Mini Fitting (Type-T) – Tube Connector-E1
7, 11	Tube Assy.-2	Silicon: 1x3 (300)	WU1 Drain Nozzle – Mini Fitting (Type-I)
		Silicon: 3x7 (25)	Mini Fitting (Type-I) – Inline Filter
		Silicon: 3x7 (200)	Inline Filter – WU1 Drain Pump
7, 11	Tube Assy.-3	Silicon: 1x3 (300)	WU2 Drain Nozzle – Mini Fitting (Type-I)
		Silicon: 3x7 (25)	Min Fitting (Type-I) – Inline Filter
		Silicon: 3x7 (200)	Inline Filter – WU2 Drain Pump
7, 11	Tube Assy.-4	Silicon: 1x3 (300)	WU3 Drain Nozzle – Min Fitting (Type-I)
		Silicon: 3x7 (25)	Min Fitting (Type-I) – Inline Filter
		Silicon: 3x7 (200)	Inline Filter – WU3 Drain Pump
7, 11	Tube Assy.-5	Silicon: 1x3 (300)	WU4 Drain Nozzle – Mini Fitting (Type-I)
		Silicon: 3x7 (25)	Mini Fitting (Type-I) – Inline Filter
		Silicon: 3x7 (200)	Inline Filter – WU4 Drain Pump
7, 11	Tube Assy.-6	Silicon: 1x3 (300)	WU5 Drain Nozzle – Mini Fitting (Type-I)
		Silicon: 3x7 (25)	Min Fitting (Type-I) – Inline Filter
		Silicon: 3x7 (200)	Inline Filter – WU5 Drain Pump
7, 11	Tube Assy.-7	Silicon: 1x3 (300)	WU6 Drain Nozzle – Mini Fitting (Type-I)
		Silicon: 3x7 (25)	Mini Fitting (Type-I) – Inline Filter
		Silicon: 3x7 (200)	Inline Filter – WU6 Drain Pump
7, 11	Tube Assy.-8	Silicon: 1x3 (300)	WU7 Drain Nozzle – Mini Fitting (Type-I)
		Silicon: 3x7 (25)	Mini Fitting (Type-I) – Inline Filter
		Silicon: 3x7 (200)	Inline Filter – WU7 Drain Pump
7, 11	Tube Assy.-9	P.V.C.: 1.6x3.2 (300)	WU8 Drain Nozzle – Mini Fitting (Type-I)
		P.V.C.: 3x5 (30)	Mini Fitting (Type-I) – WU8 Drain Pump
11	Tube Assy.-10	P.V.C.: 3x5 (80)	WU1 Drain Pump – Tube Connector-Y1
		P.V.C.: 3x5 (100)	WU2 Drain Pump – Tube Connector-Y1
		P.V.C.: 6x10 (230)	Tube Connector-Y1 – Coupling Body for high conc. waste liquid
2, 11	Tube Assy.-11	P.V.C.: 6x8.4 (220)	IRU Divider – Tube Connector-E1
		Silicon: 3x7 (25)	Tube Connector-E1 – Inline Filter
		Silicon: 3x7 (200)	Inline Filter – Trough Drain Pump
11	Tube Assy.-12	P.V.C.: 3x5 (150)	RPT-Sol. Pump – Sol-3 Coupling Body
11	Tube Assy.-13	P.V.C.: 3x5 (200)	WU3 Drain Pump – SWU Divider
11	Tube Assy.-14	P.V.C.: 3x5 (200)	WU4 Drain Pump – SWU Divider
11	Tube Assy.-15	P.V.C.: 3x5 (200)	WU5 Drain Pump – SWU Divider
11	Tube Assy.-16	P.V.C.: 3x5 (200)	WU6 Drain Pump – SWU Divider
11	Tube Assy.-17	P.V.C.: 3x5 (200)	WU7 Drain Pump – SWU Divider
11	Tube Assy.-18	P.V.C.: 3x5 (200)	WU8 Drain Pump – SWU Divider

Sheet 12 (Tube Assemblies – 1:1/2)

SWU (2/2)

Ref -#	NAME	TUBE SPEC. In-dia. x Out-dia. (Length)	LOCATION
11	Tube Assy.-19	Silicon: 6x11 (150)	SWU Divider – Coupling Body for low concentration waste liquid
2	Tube Assy.-20	P.V.C.: 6x8.4 (120)	IRU Divider – SPT Trough
2, 3	Tube Assy.-21	P.V.C.: 6x8.4 (300)	IRU Divider – MIX1 Trough
2	Tube Assy.-22	Urethane: 5x8 (175)	IRU Divider – RCU Drain
2, 11	Tube Assy.-23	P.V.C.: 3x5 (80)	Trough Drain Pump – SWU Divider
	Tube Assy.-24	P.V.C.: 3x5 (450)	SPT-Water Pump – Tube Connecter-S1
		P.V.C.: 3x5 (250)	Tube Connector-S1 – SPT Trough
3, 11	Tube Assy.-25	P.V.C.: 3x5 (600)	MIX1-Water Pump – Mini Fitting (Type-I)
		P.V.C.: 1.6x3.2 (100)	Mini Fitting (Type-I) – Mini Fitting (Type-I)
		P.V.C.: 4x6 (250)	Mini Fitting (Type-I) – MIX1 Trough
3, 11	Tube Assy.-26	P.V.C.: 3x5 (200)	MIX2-Water Pump – Mini Fitting (Type-I)
		P.V.C.: 1.6x3.2 (100)	Mini Fitting (Type-I) – Mini Fitting (Type-I)
		P.V.C.: 4x6 (250)	Mini Fitting (Type-I) – MIX2 Trough
2, 11	Tube Assy.-27	P.V.C.: 3x5 (550)	RPT1-Water Pump - Tube Connecter-S1
		P.V.C.: 4x6 (250)	Tube Connecter-S1 – RPT Trough
	Tube Assy.-28	P.V.C.: 3x5 (750)	RPT-Sol Pump – RPT Trough
11	Tube Assy.-30	P.V.C.: 6x10 (45)	Tube Connector-T1.5 – Coupling Body for System Water
		P.V.C.: 6x10 (40)	Tube Connector-T1.5 – Anti-back Flow Valve
		P.V.C.: 6x10 (150)	Anti-back Flow Valve – Tube Connecter-E1
		Silicon: 3x7 (200)	Tube Connector-T1.5 – Tube Connector-Y1
2, 11	Tube Assy.-31	P.V.C.: 3x5 (750)	RPT-Water Pump – RPT Trough
10	Tube Assy.-32	P.V.C.: 3x5 (1100)	Intercept Panel (SOL1) – Coupling Body for Solution-1
10	Tube Assy.-33	P.V.C.: 3x5 (1100)	Intercept Panel (SOL2) – Coupling Body for Solution-2
10	Tube Assy.-34	Silicon: 3x7 (40)	Mini Fitting (Type-I) – Tube Connector-Y1
		Silicon: 1.5x4 (700)	Mini Fitting (Type-I) – Intercept Panel (S)
10	Tube Assy.-35	Silicon: 2x6 (400)	Mini Fitting (Type-Y) – Intercept Panel R(S)
10	Tube Assy.-36	Silicon: 3x7 (360)	Tube Connector-Y1 – Mini Fitting (Type-Y)
		Silicon: 3x7 (270)	Mini Fitting (Type-Y) – WPP Divider
2	Tube Assy.-37	P.V.C.: 6x8.4 (190)	IRU Divider – RPT Trough
2, 3	Tube Assy.-38	P.V.C.: 6x8.4 (260)	IRU Divider – MIX2 Trough

Sheet 13 (Tube Assemblies – 1:2/2)

PP

Ref -#	NAME	TUBE SPEC. In-dia. x Out-dia. (Length)	LOCATION
10	Tube assy.-51	PTFE: 2x3 (120)	WPP Divider – WPP-EV4 (NC)
10	Tube assy.-52	PTFE: 2x3 (130)	WPP-EV1 (NO) – WPP-EV3 (COM)
		PTFE: 2x3 (130)	WPP-EV2 (COM) – Syringe 7.29W (WU3)
		PTFE: 2x3 (130)	WPP-EV5 (COM) – Syringe 10.3W (WU2, 4)
10	Tube assy.-54	PTFE: 2x3 (150)	WPP-EV3 (NO) – Intercept Panel (Sol-1)
		PTFE: 2x3 (150)	WPP-EV2 (NC) – Intercept Panel (WU3)
		PTFE: 2x3 (150)	WPP-EV5 (NC) – Intercept Panel (WU2, 4)
		PTFE: 2x3 (150)	WPP-EV1 (COM) – Syringe 7.29W (WU1)
		PTFE: 2x3 (150)	WPP-EV6 (COM) – Syringe 10.3W (WU5, 6)
		PTFE: 2x3 (150)	RPP-EV (COM) – Syringe 10.3R
10	Tube assy.-55	PTFE: 2x3 (190)	WPP-EV4 (NO) – Intercept Panel (Sol-2)
		PTFE: 2x3 (190)	RPP-EV (NC) – Syringe 3.26R
10	Tube assy.-56	PTFE: 2x3 (220)	WPP-EV3 (NC) – WPP Divider
		PTFE: 2x3 (220)	WPP-EV6 (NC) – Intercept Panel (WU5, 6)
		PTFE: 2x3 (220)	WPP-EV4 (COM) – WPP-EV2 (NO)
10	Tube assy.-57	PTFE: 2x3 (265)	WPP-EV1 (NC) – Intercept Panel (WU1)
10	Tube assy.-58	PTFE: 2x3 (330)	WPP-EV6 (NO) – WPP Divider
10	Tube assy.-59	PTFE: 2x3 (360)	RPP-EV (NO) – Intercept Panel (R/Wat)
10	Tube assy.-60	PTFE: 2x3 (370)	WPP-EV5 (NO) – WPP Divider
10	Tube assy.-61	F.E.P.: 1.15x1.95 (120)	SPP-EV (COM) – Syringe 7.29S (S2)
10	Tube assy.-62	F.E.P.: 1.15x1.95 (200)	SPP-EV (NC) – Syringe 1.4S (S1)
10	Tube assy.-63	F.E.P.: 1.15x1.95 (280)	Intercept Panel (S/Wat) – SPP-EV (NO)
7, 10	Tube assy.-64	F.E.P.: 1.15x1.95 (600)	Intercept Panel (WU1) – Silicon Tube (1x3 (200))
		Silicon: 1x3 (200)	F.E.P. Tube – WU1 Supply Nozzle
7, 10	Tube assy.-65	F.E.P.: 1.15x1.95 (600)	Intercept Panel (WU3) – Silicon Tube (1x3 (200))
		Silicon: 1x3 (200)	F.E.P. Tube – WU3 Supply Nozzle
7, 10	Tube assy.-66	F.E.P.: 1.15x1.95 (600)	Intercept Panel (WU2, 4) – Silicon Tube (1x3 (300))
		Silicon Tube: 1x3 (300)	Silicon Tube (1x3 (300)) – Mini Fitting (Type-Y)
		Silicon Tube: 1x3 (100)	Mini Fitting (Type-Y) – WU2 Supply Nozzle
		Silicon Tube: 1x3 (100)	Mini Fitting (Type-Y) – WU4 Supply Nozzle
7, 10	Tube assy.-67	F.E.P.: 1.15x1.95 (600)	Intercept Panel (WU5, 6) – Silicon Tube (1x3 (300))
		Silicon Tube: 1x3 (300)	Silicon Tube (1x3 (300)) – Mini Fitting (Type-Y)
		Silicon Tube: 1x3 (100)	Mini Fitting (Type-Y) – WU5 Supply Nozzle
		Silicon Tube: 1x3 (100)	Mini Fitting (Type-Y) – WU6 Supply Nozzle
6, 10	Tube assy.-68	PTFE: 2x3 (950)	Syringe 10.3R(R1) – RPT Nozzle
		Silicon Tube: 1.4x3 (20)	RPT Nozzle
5, 10	Tube assy.-69	F.E.P.: 1.15x1.95 (1500)	Syringe 1.4R(S) – SPT Nozzle
		Silicon Tube: 1x3 (20)	SPT Nozzle

Sheet 14 (Tube Assemblies – 2)

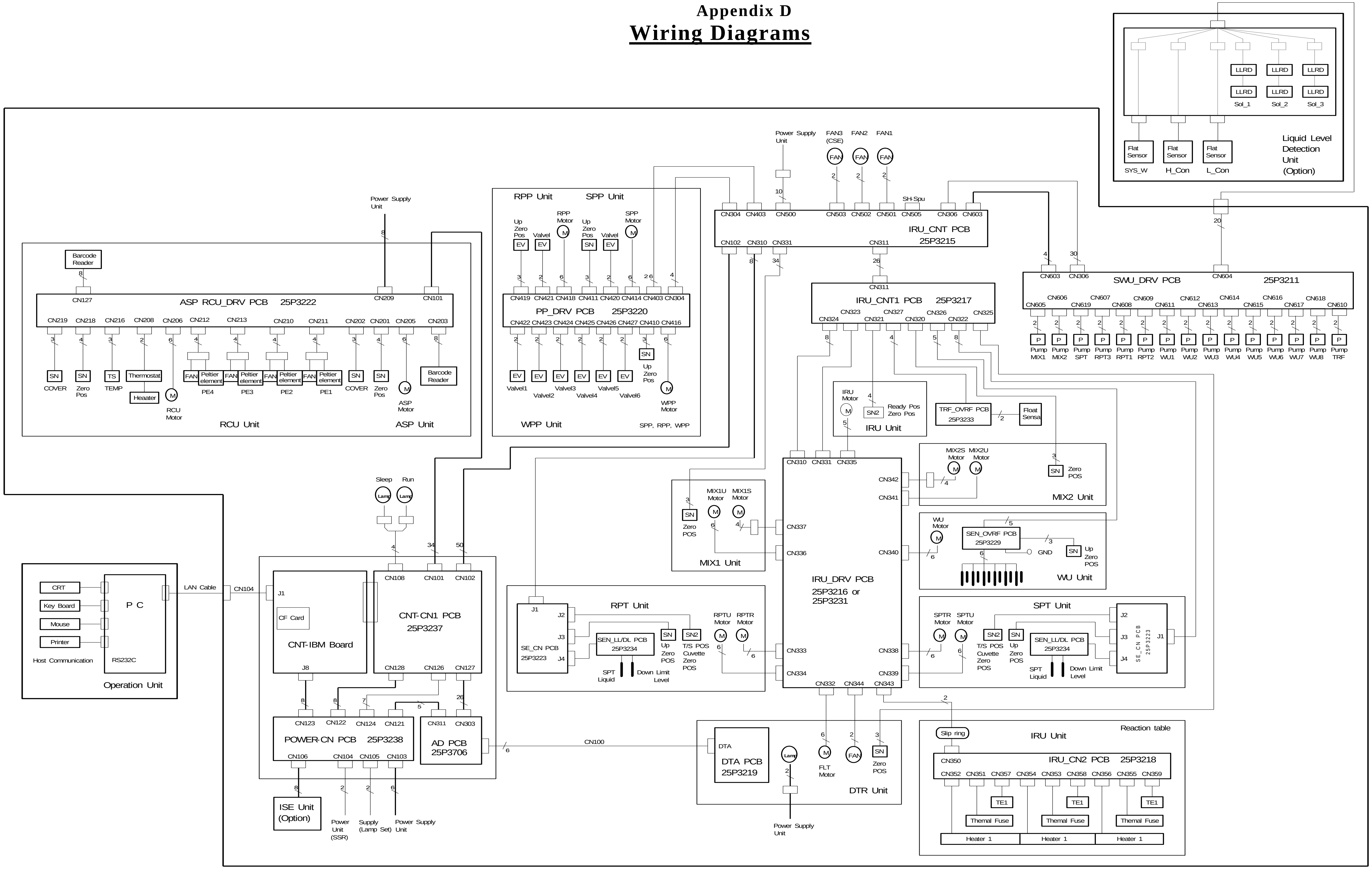
External tank

#	NAME *	TYPE In-dia. x Out-dia. (Length)	LOCATIONS
	Tube Assy.-41	P.V.C.: 3x5 (1500)	Wash Solution 1
	Tube Assy.-42	P.V.C.: 3x5 (1500)	Wash Solution 2
	Tube Assy.-43	P.V.C.: 3x5 (1500)	Wash Solution 3
	Tube Assy.-44	P.V.C.: 6x8.4 (1500)	Purified Water
	Tube Assy.-45	P.V.C.: 6x8.4 (1500)	Waste Liquid (high concentration)
	Tube Assy.-46	P.V.C.: 6x8.4 (1500)	Waste Liquid (low concentration)

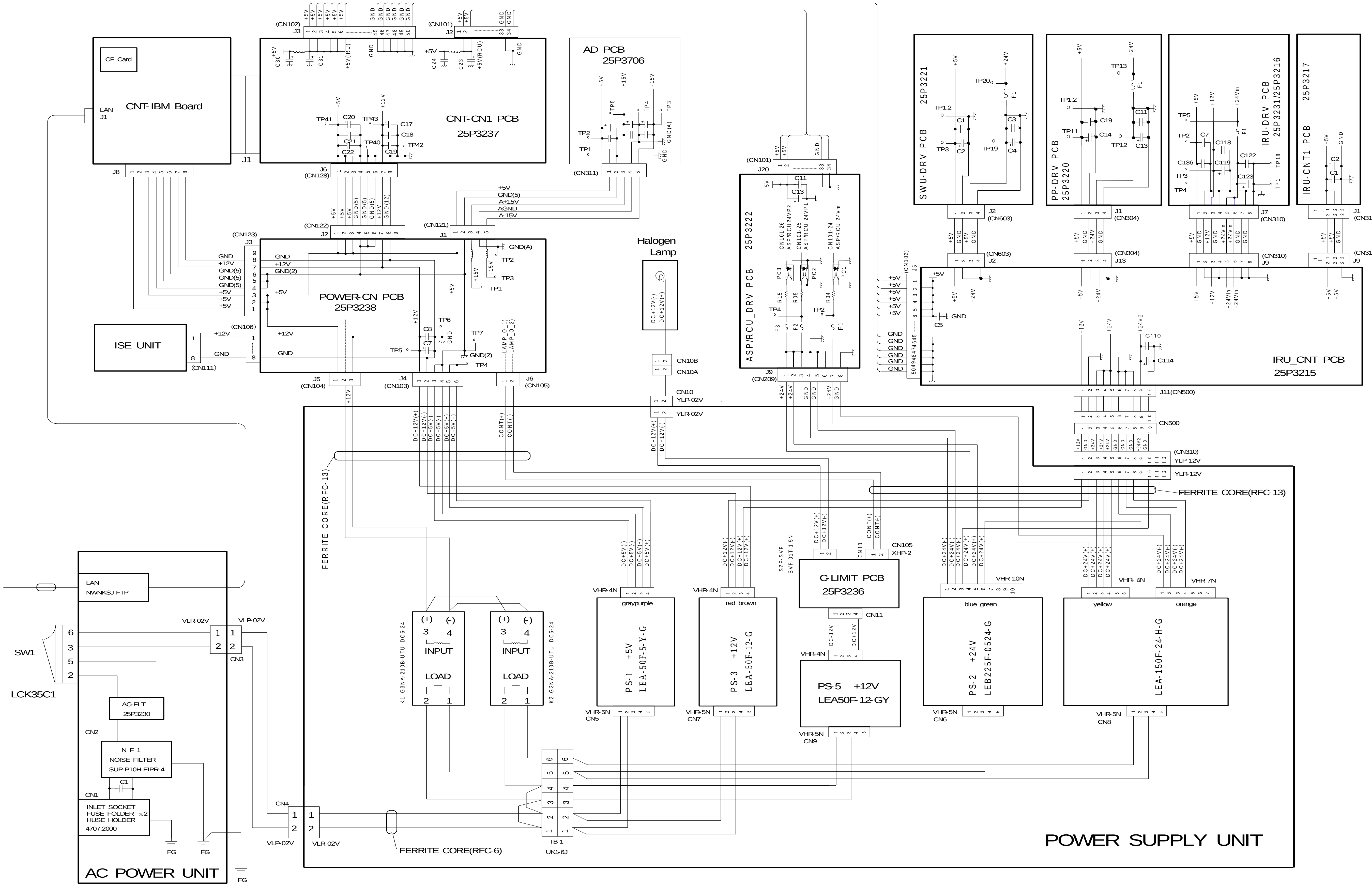
*NOTE: Tube Assy number is indicated in Fluidic System Diagram (Appendix-E), enclosed in < >.

Sheet 15 (Tube Assemblies - 3)

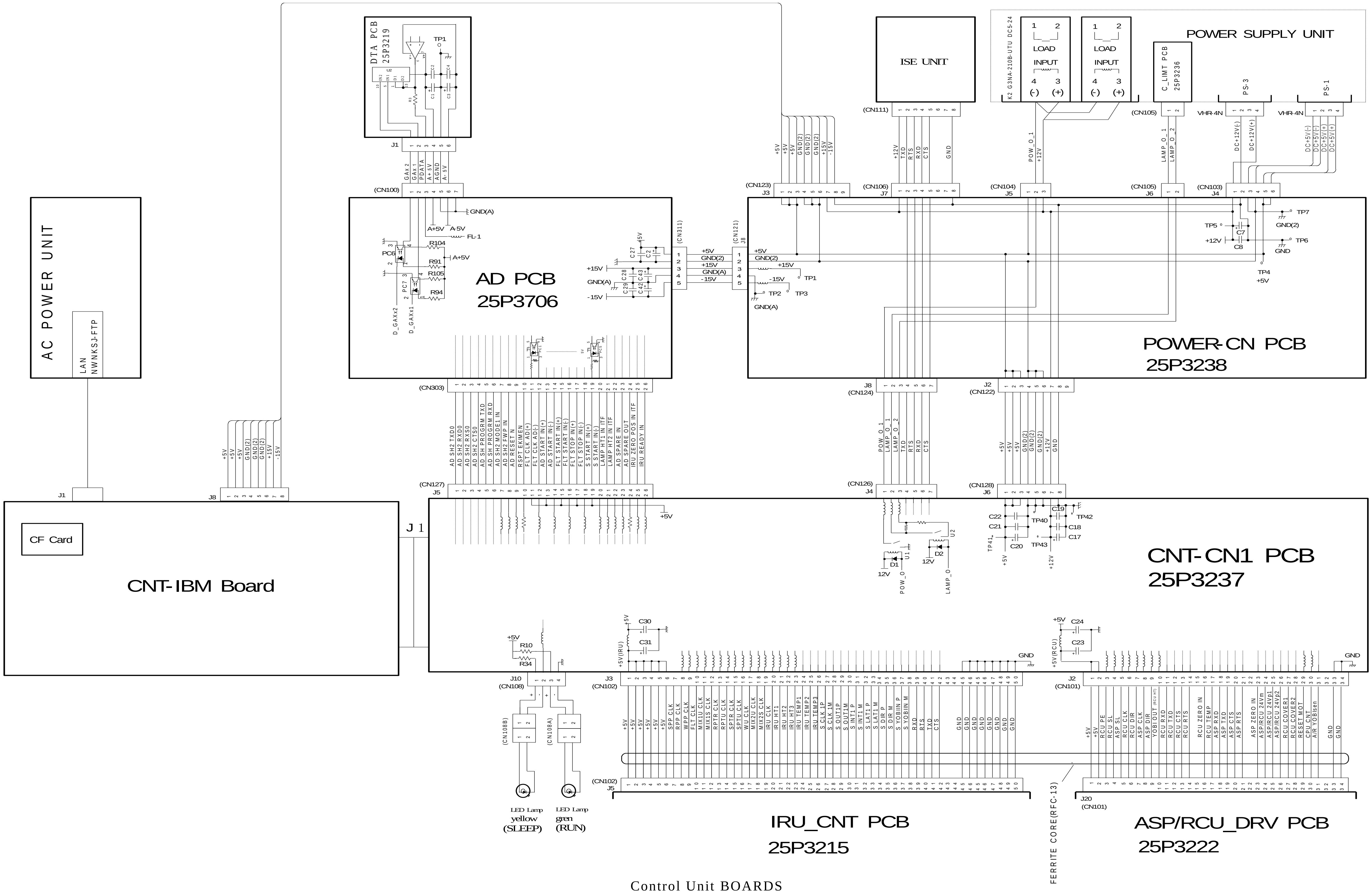
Appendix D
Wiring Diagrams



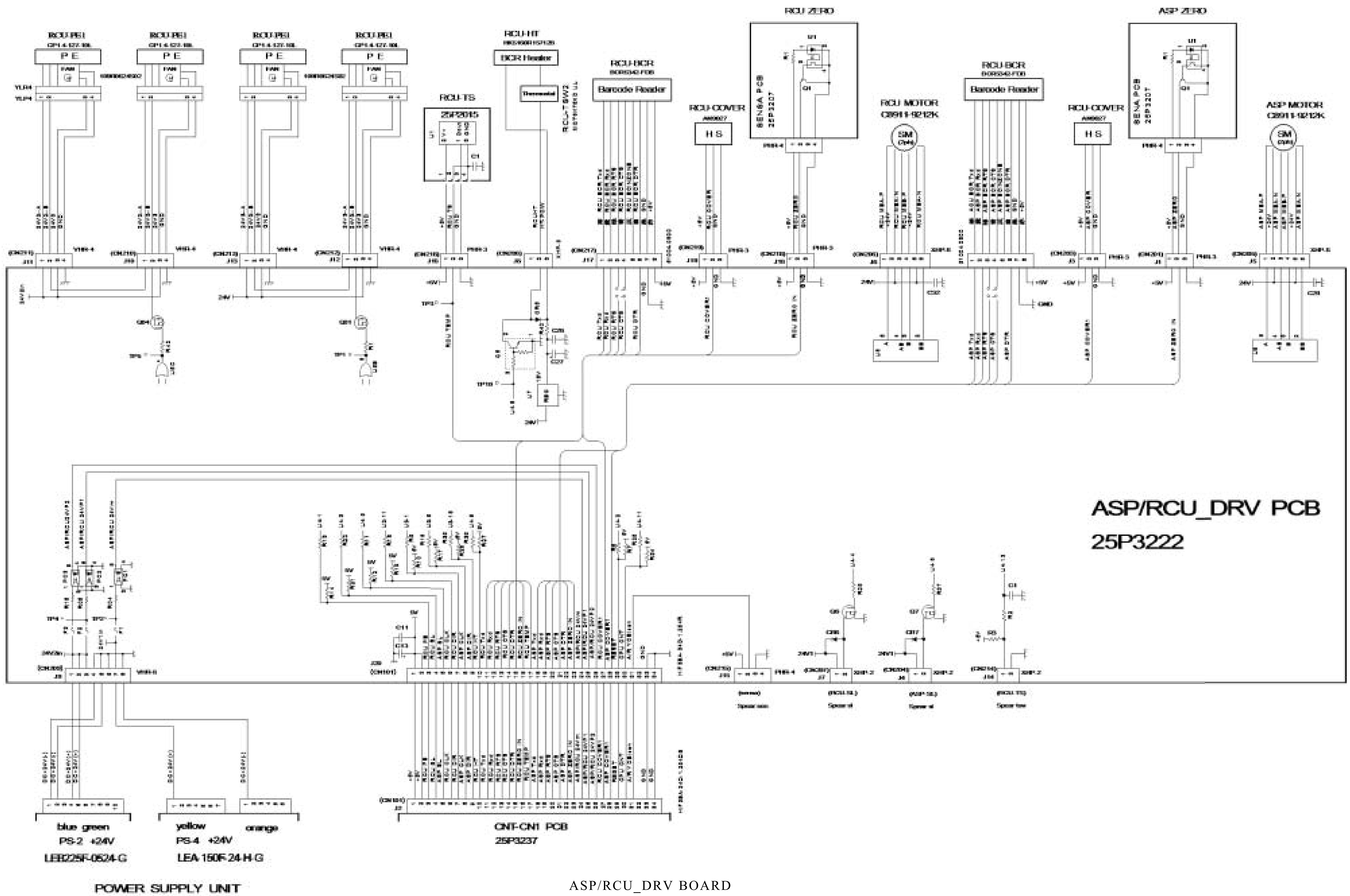
SIGNAL LINES INTERCONNECTION DIAGRAM
Figure D-1



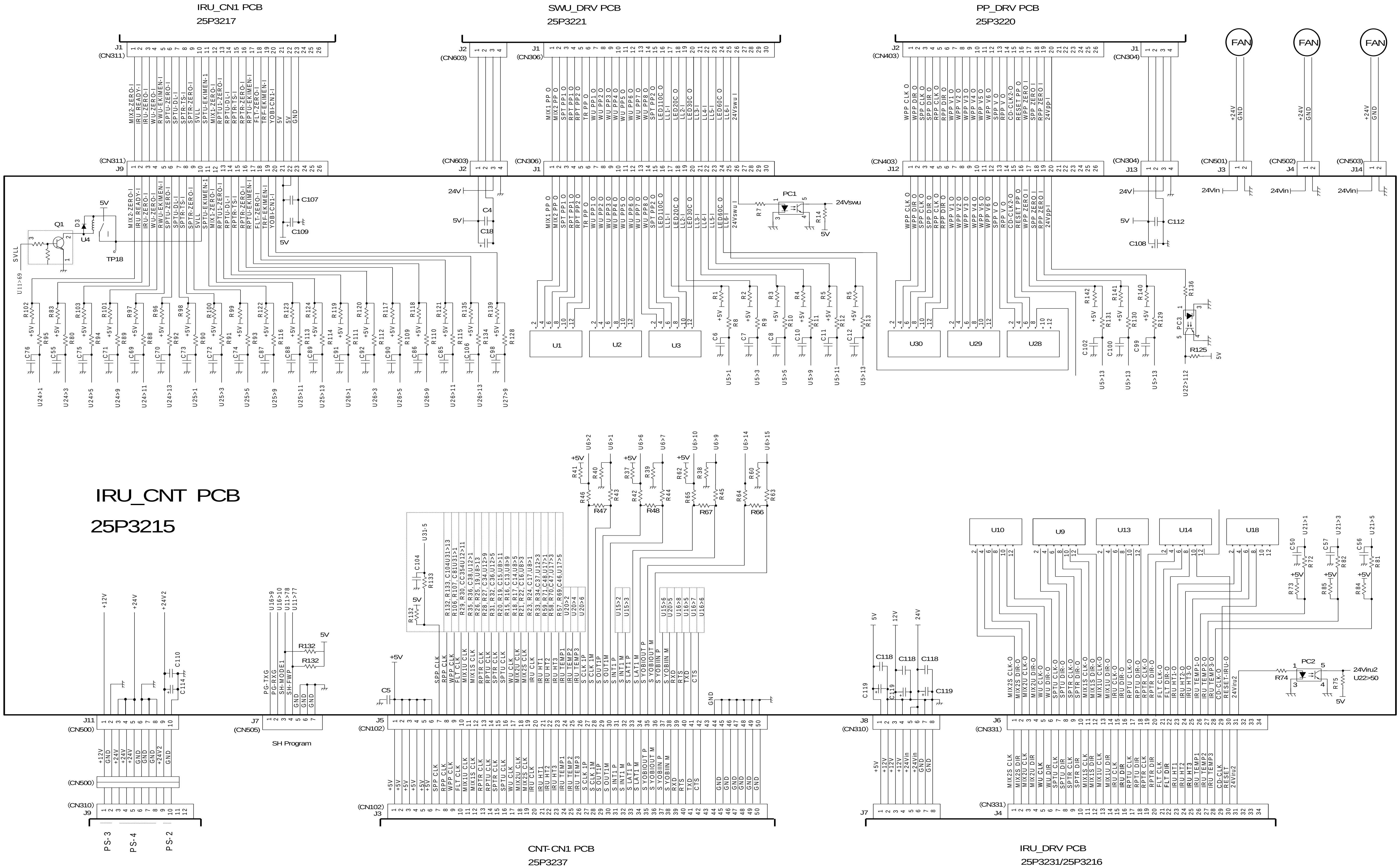
POWER SUPPLY UNIT / DISTRIBUTION DIAGRAM
Figure D-2



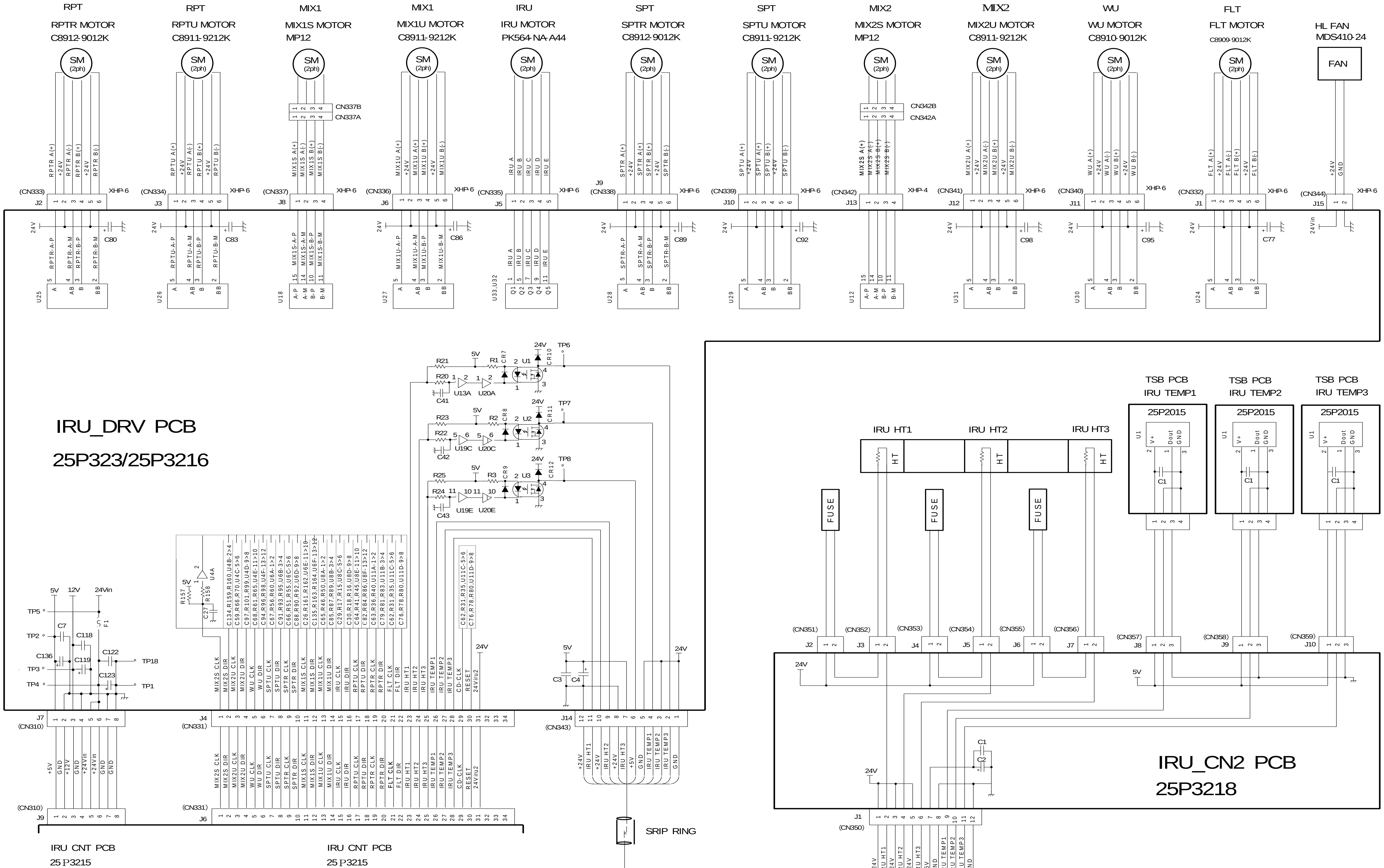
Control Unit BOARDS
Figure D-3



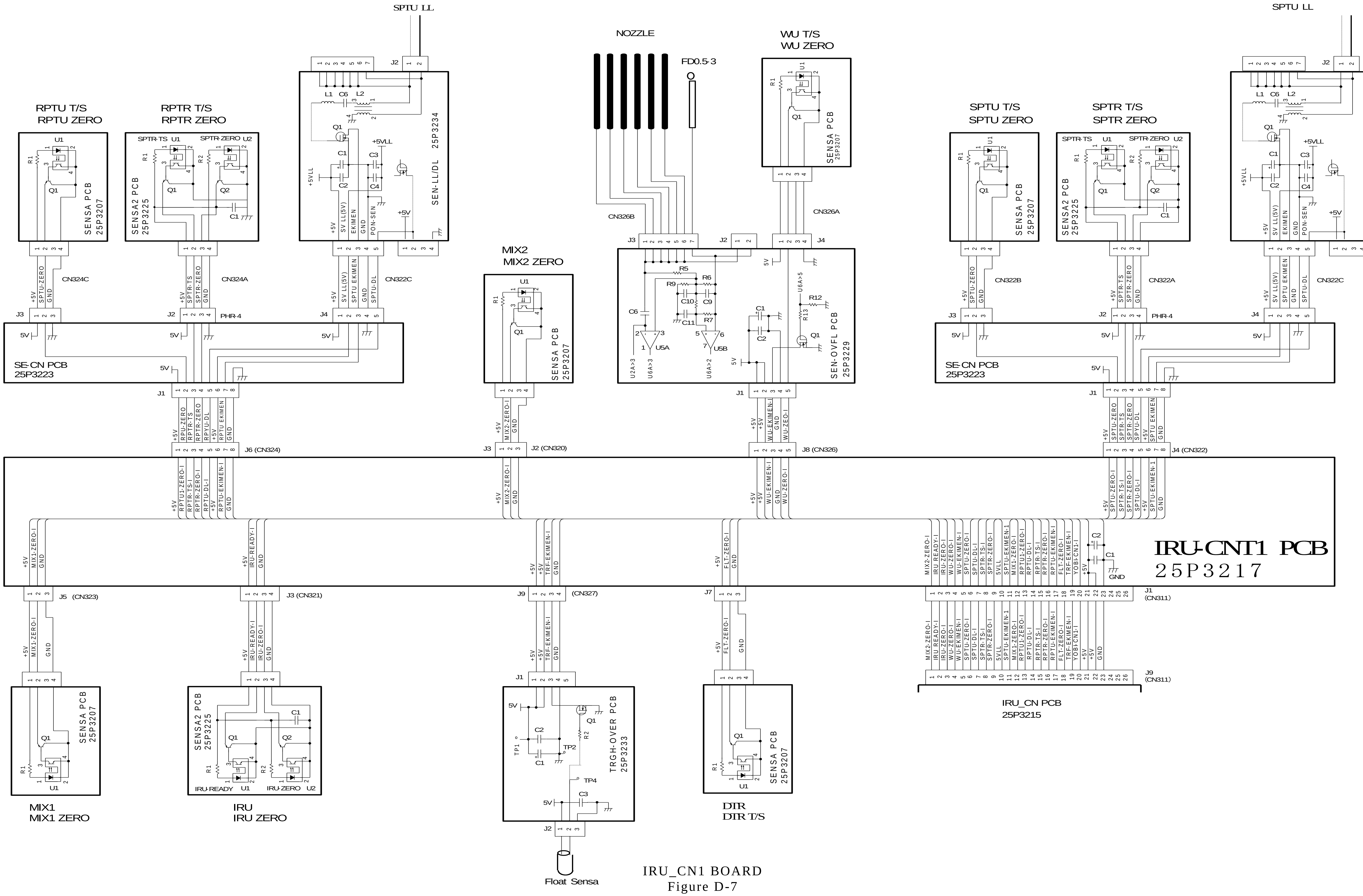
ASP/RCU_DRV BOARD
Figure D-4



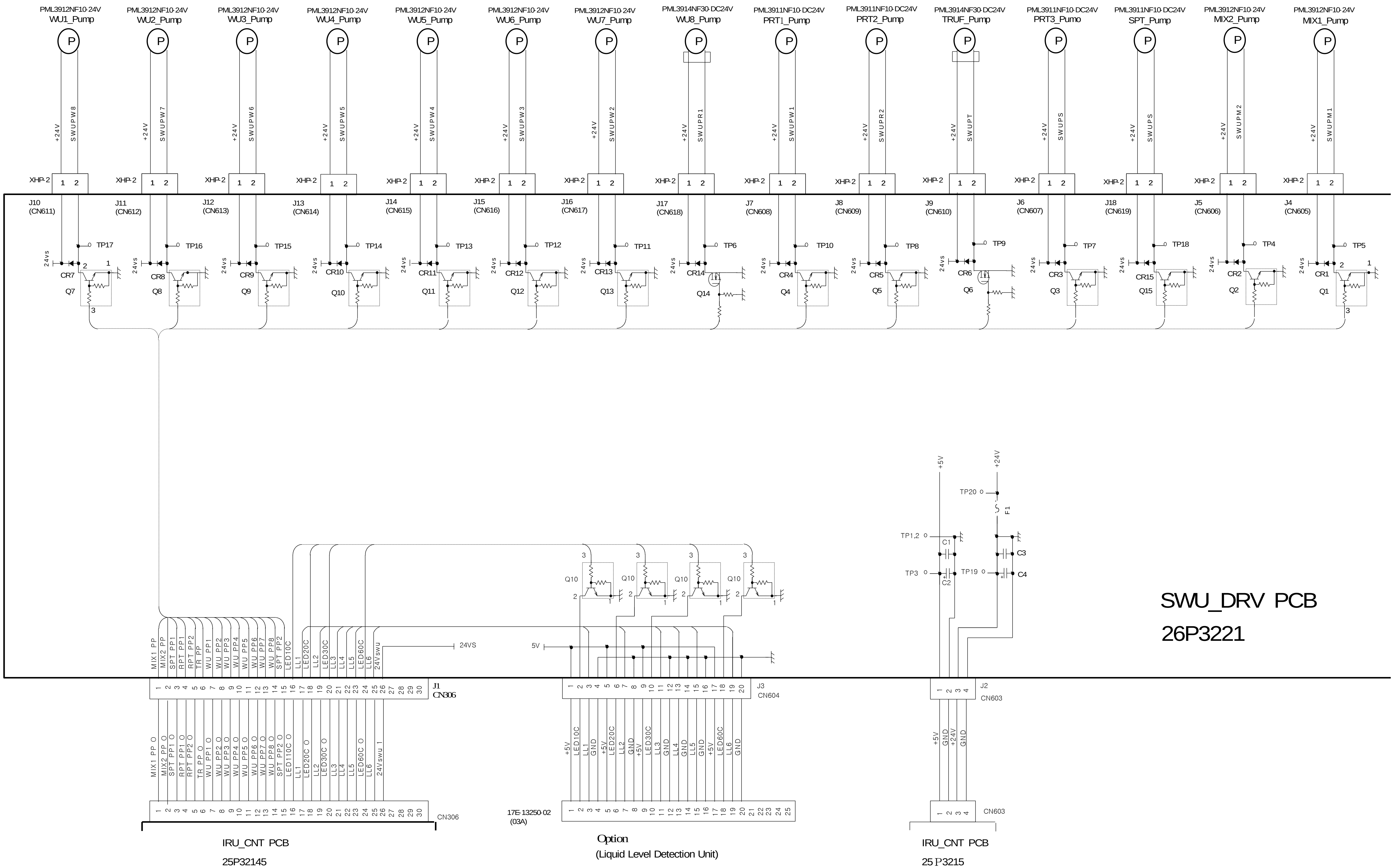
IRU_CNT BOARD
Figure D-5



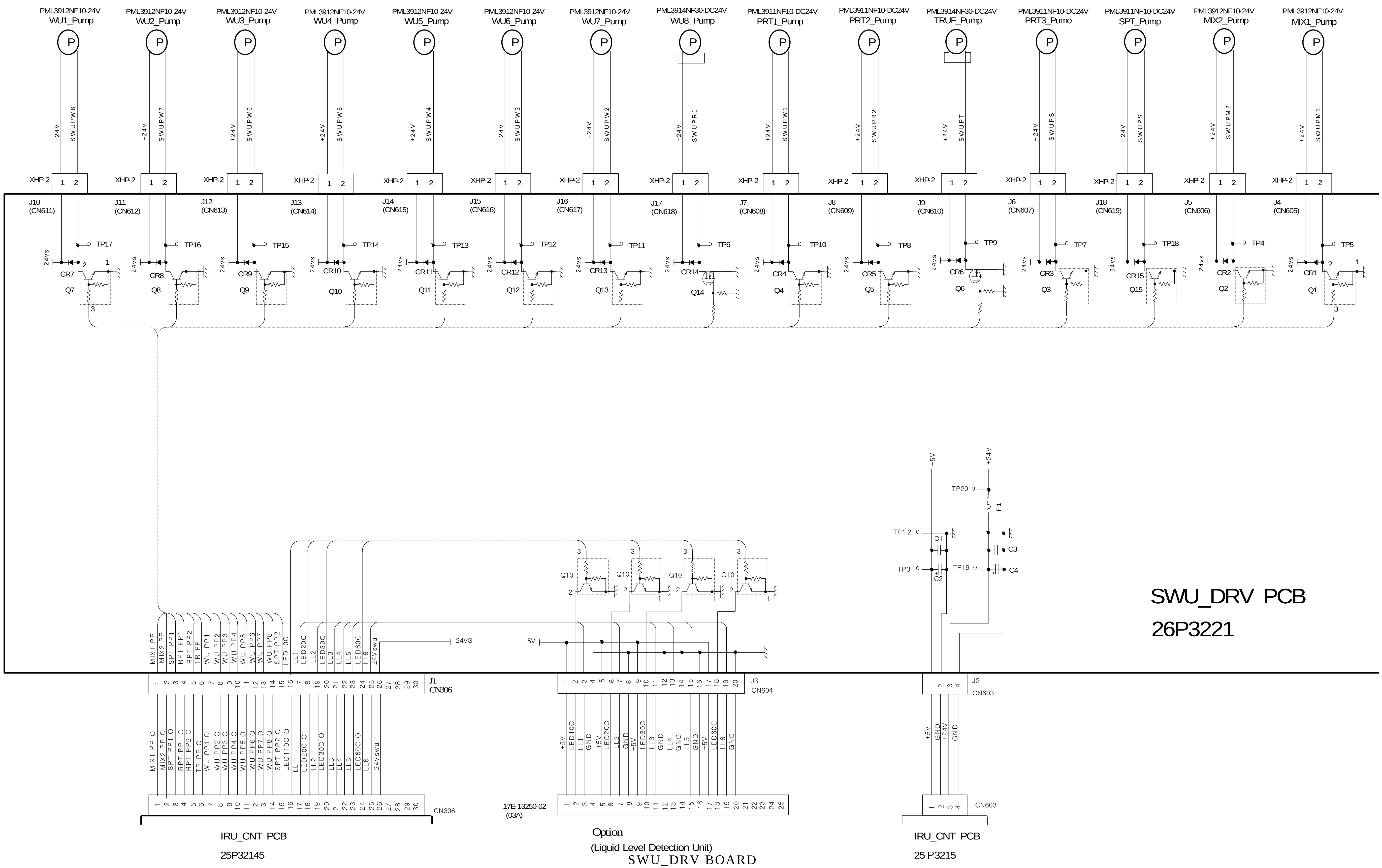
IRU_DRV & IRU_CN2 BOARDS
Figure D-6



IRU_CN1 BOARD
Figure D-7

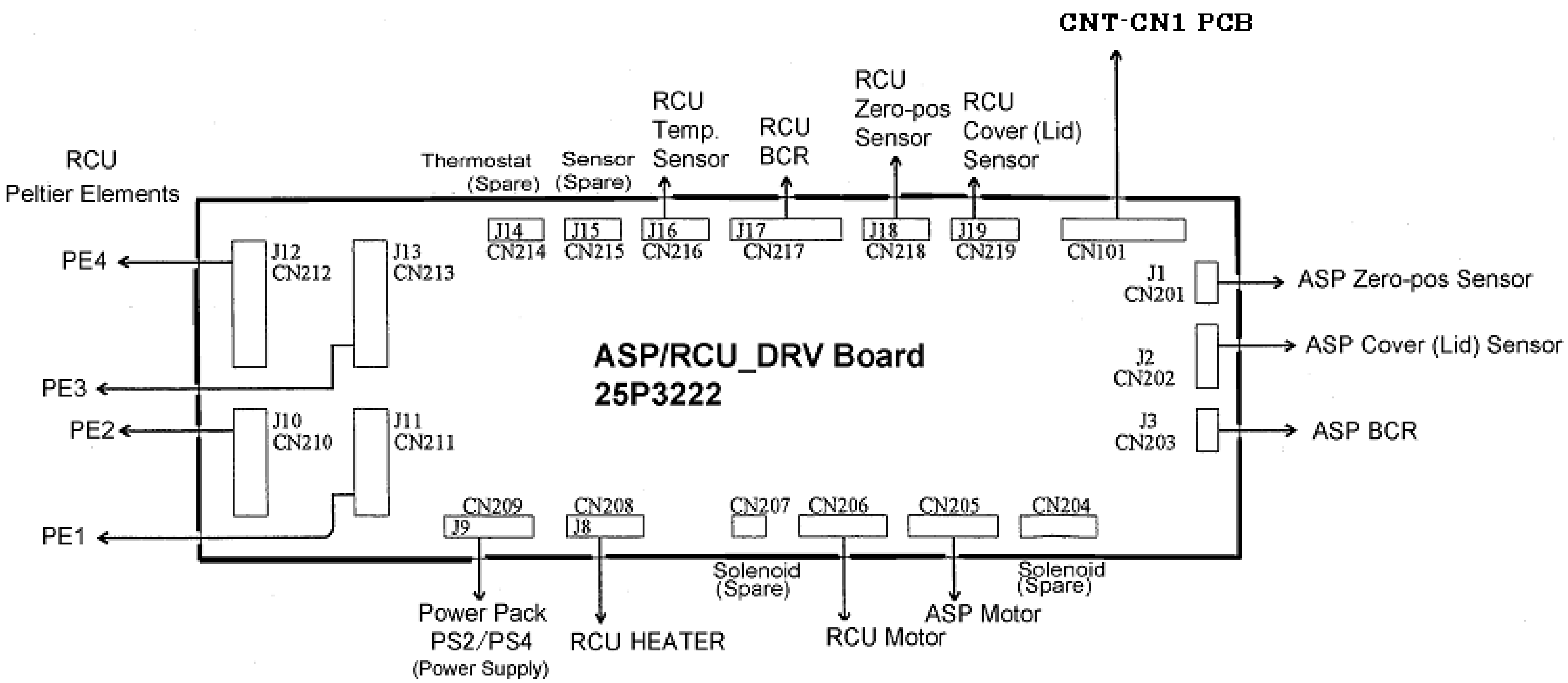


PP_DRV BOARD
Figure D-8



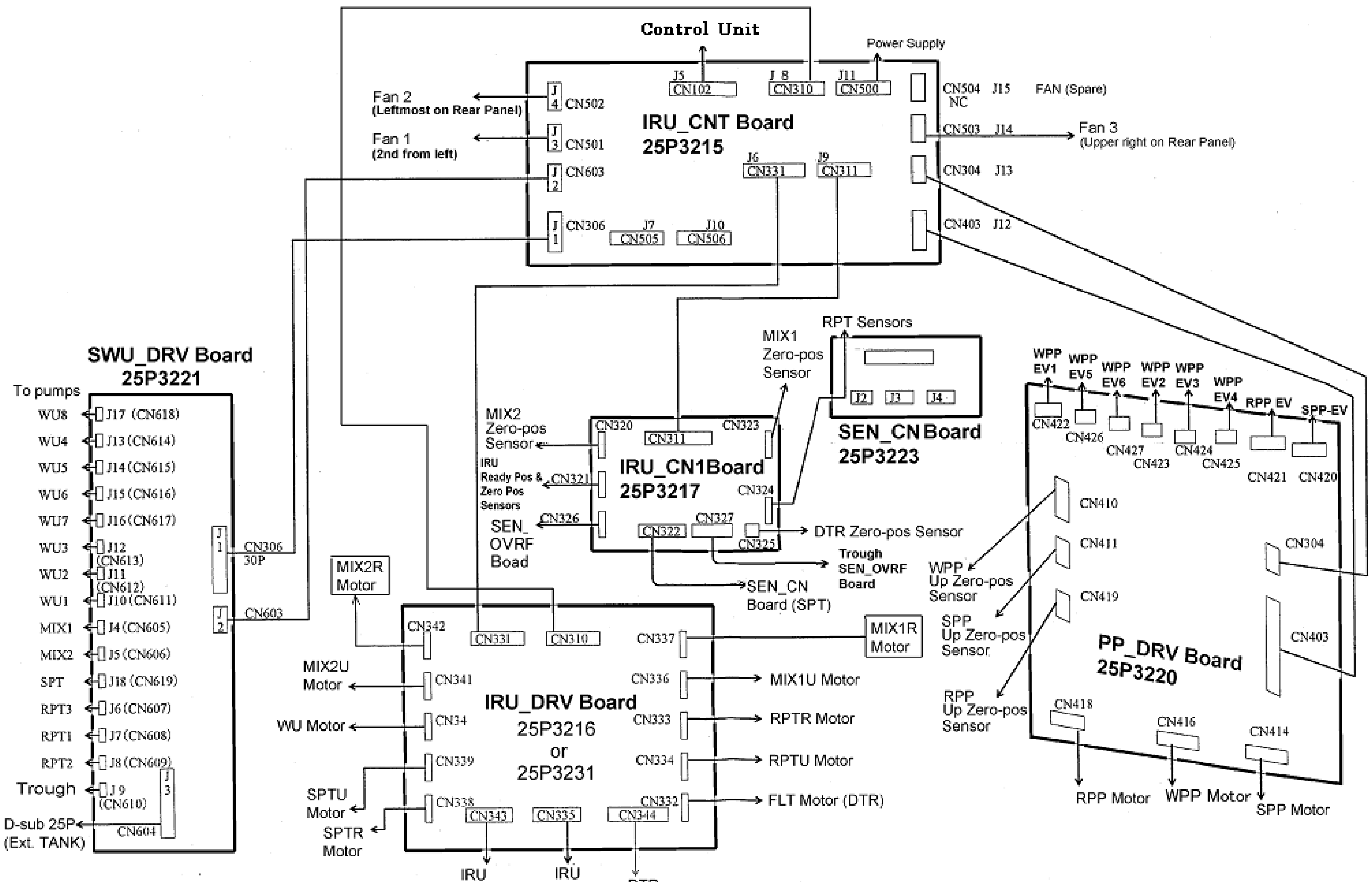
SWU_DRV BOARD

Figure D-9



ASP/RCU_DRV BOARDS

ILLUSTRATED WIRING DIAGRAM
Figure D-10 (Sheet 1)

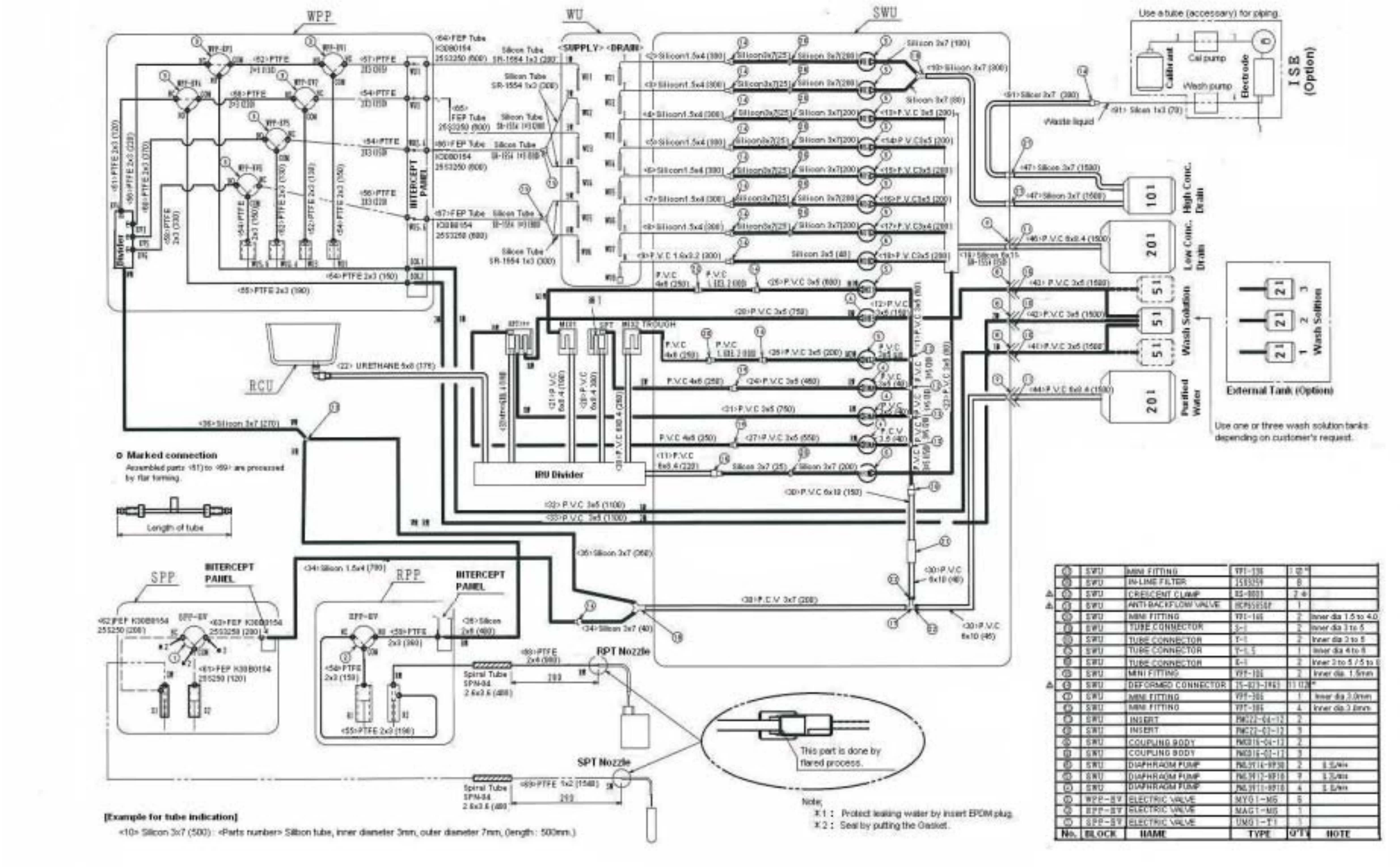


OTHER PC BOARDS

ILLUSTRATED WIRING DIAGRAM
Figure D-10 (Sheet 2)

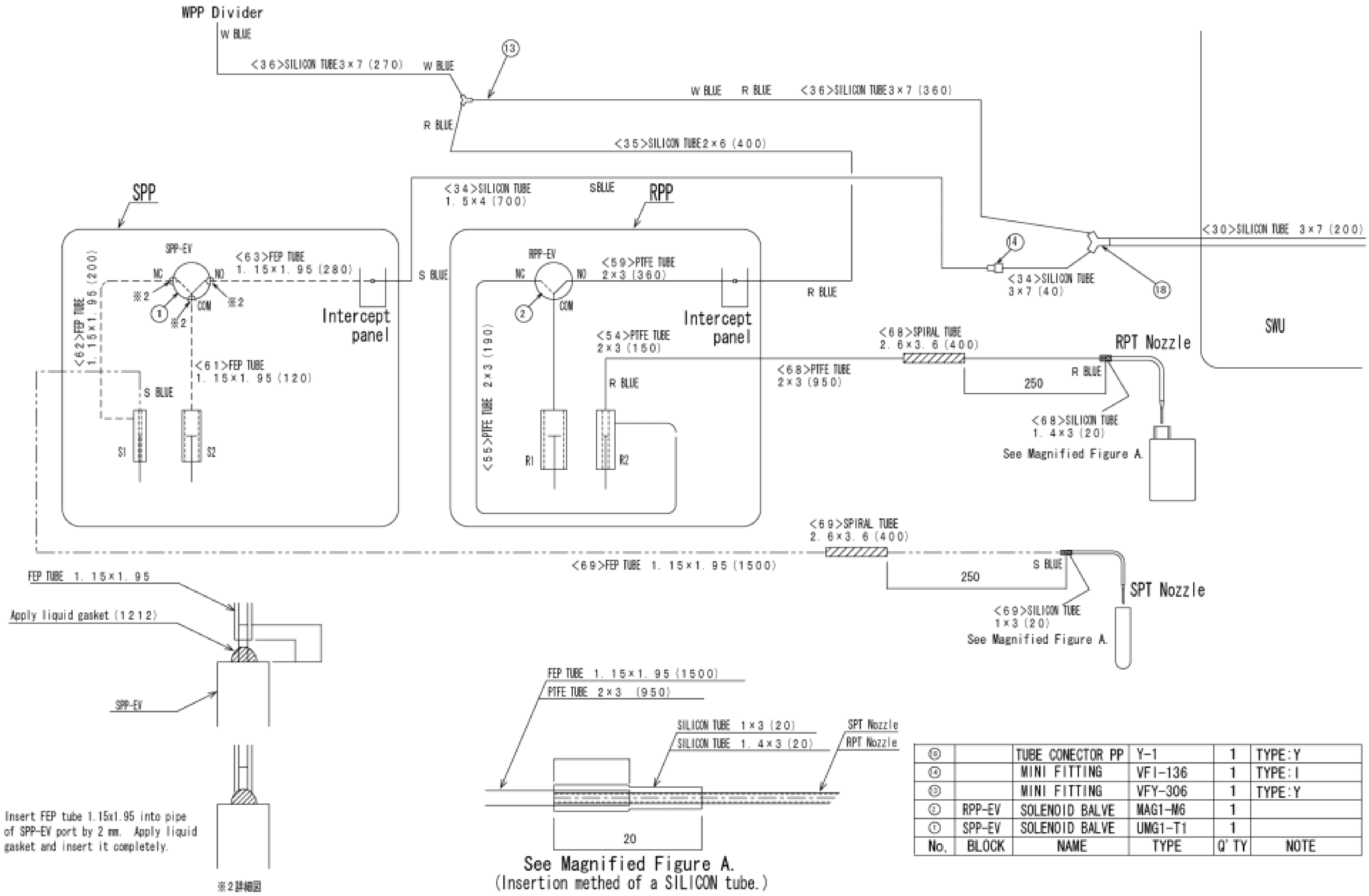
Appendix E

Fluidic System Diagram



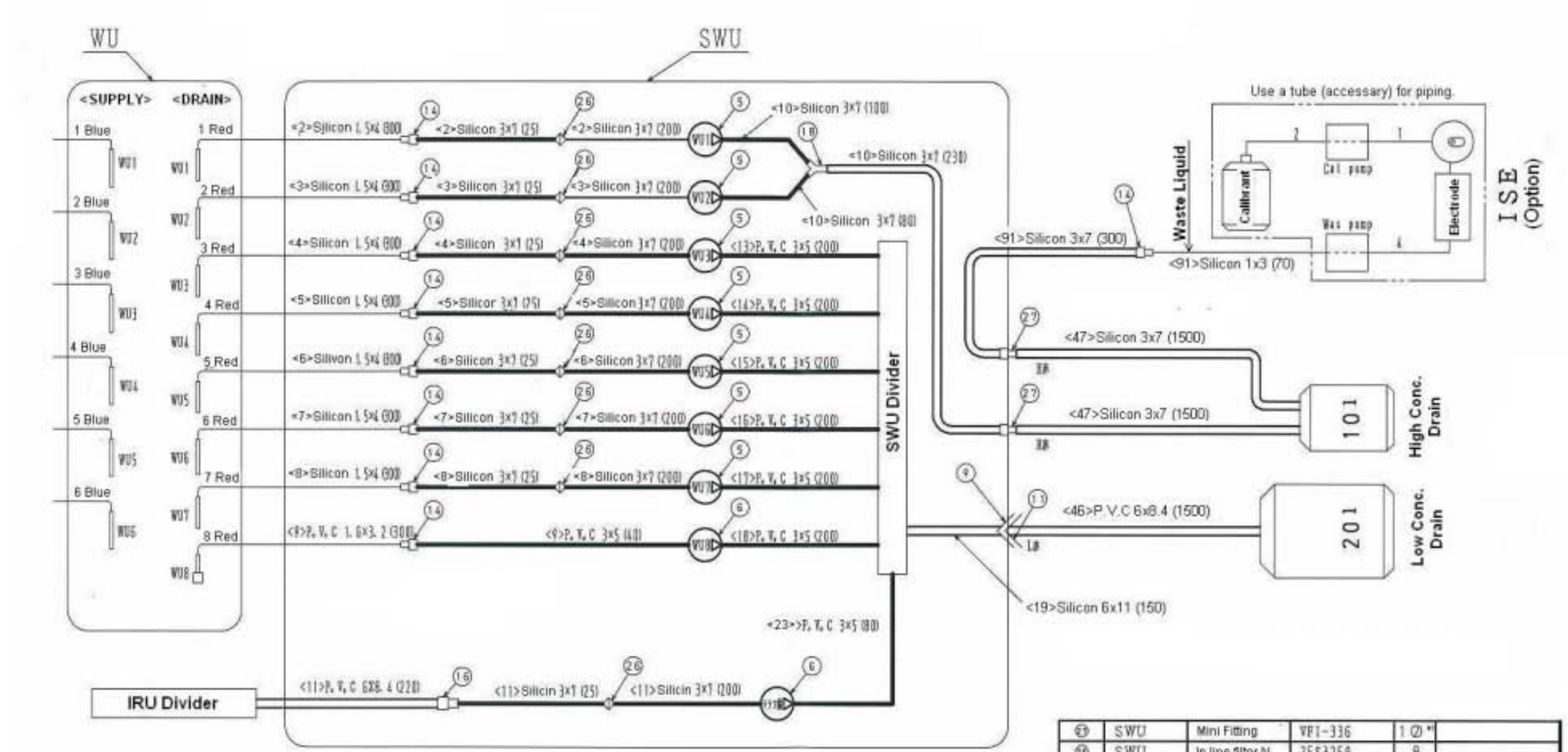
OVERALL FLUIDIC SYSTEM DIAGRAM
Figure E-1

WPP PIPING DIAGRAM
Figure E-2



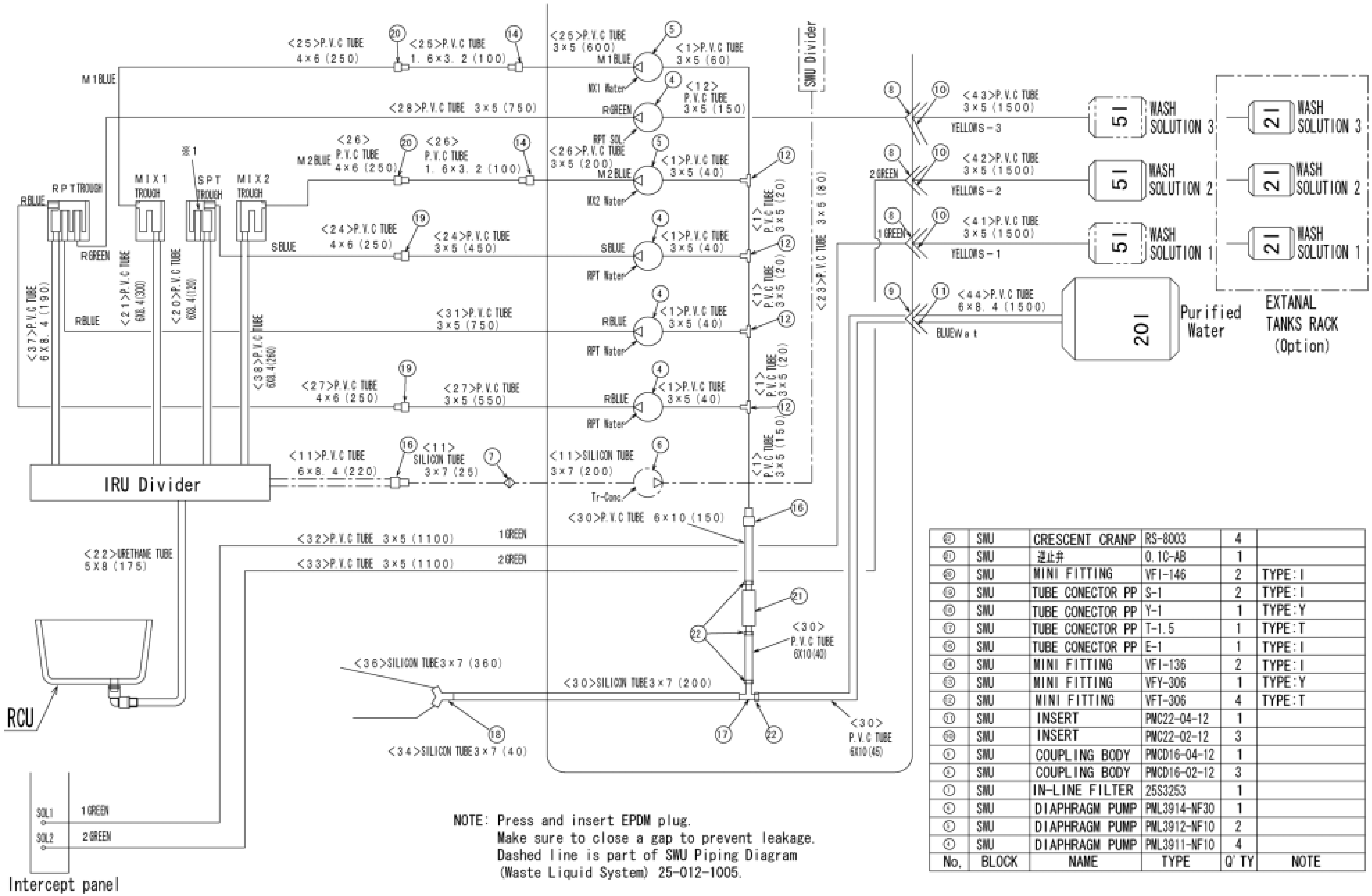
18		TUBE CONECTOR PP	Y-1	1	TYPE:Y
14		MINI FITTING	VFI-136	1	TYPE:I
13		MINI FITTING	VFY-306	1	TYPE:Y
2	RPP-EV	SOLENOID BALVE	MAG1-M6	1	
1	SPP-EV	SOLENOID BALVE	UMG1-T1	1	
No.	BLOCK	NAME	TYPE	Q'TY	NOTE

SPP/RPP PIPING DIAGRAM
Figure E-3



27	SWU	Mini Fitting	VFI-336	1 (2) *1	
26	SWU	In line filter N	2553259	8	
18	SWU	Tube Connector	Y-1	1	Y, Inn. dia 3 to 5
16	SWU	Tube Connector	I-1	1	Inner dia. 3-5 and 5-8
14	SWU	Tube Connector	25-023-2963	8 (9) *1	
11	SWU	Insert	PMC22-04-12	1	
9	SWU	Coupling Body	PMCD16-04-12	1	
6	SWU	Diaphragm Pump	PML3914-NF30	2	
5	SWU	Diaphragm Pump	PML3912-NF10	7	
No.	Block	Name	Type	Q'ty	Note

SWU PIPING DIAGRAM(WASTE LIQUID SYSTEM)
Figure E-4



No.	BLOCK	NAME	TYPE	Q'TY	NOTE
22	SMU	CRESCENT CRANP	RS-8003	4	
21	SMU	逆止弁	0.1C-AB	1	
20	SMU	MINI FITTING	VFI-146	2	TYPE:I
19	SMU	TUBE CONECTOR PP	S-1	2	TYPE:I
18	SMU	TUBE CONECTOR PP	Y-1	1	TYPE:Y
17	SMU	TUBE CONECTOR PP	T-1.5	1	TYPE:T
16	SMU	TUBE CONECTOR PP	E-1	1	TYPE:I
14	SMU	MINI FITTING	VFI-136	2	TYPE:I
13	SMU	MINI FITTING	VFY-306	1	TYPE:Y
12	SMU	MINI FITTING	VFT-306	4	TYPE:T
11	SMU	INSERT	PMC22-04-12	1	
10	SMU	INSERT	PMC22-02-12	3	
9	SMU	COUPLING BODY	PMCD16-04-12	1	
8	SMU	COUPLING BODY	PMCD16-02-12	3	
7	SMU	IN-LINE FILTER	25S3253	1	
6	SMU	DIAPHRAGM PUMP	PML3914-NF30	1	
5	SMU	DIAPHRAGM PUMP	PML3912-NF10	2	
4	SMU	DIAPHRAGM PUMP	PML3911-NF10	4	

NOTE: Press and insert EPDM plug.
Make sure to close a gap to prevent leakage.
Dashed line is part of SWU Piping Diagram
(Waste Liquid System) 25-012-1005.

SWU PIPING DIAGRAM (SUPPLY SIDE)
Figure E-5

Appendix F
Sensor List

The following table lists the sensors in alphabetic order of the unit names in which the sensors are used, and summarizes their functions.

UNIT	LABEL	SENSOR	FUNCTIONS
ASP RCU	ASP/RCU_24Vm	24 V DC Voltage Sensor	Detects the presence of 24 V DC supply for the ASP and RCU motors.
	ASP/RCU_24Vp1	24 V DC Voltage Sensor	Detects the presence of 24 V DC supply (1) for the Peltier elements (RCU).
	ASP/RCU_24Vp2	24 V DC Voltage Sensor	Detects the presence of 24 V DC supply (2) for the Peltier elements (RCU).
ASP	ASP_ZERO	Zero-position Sensor	Photo interrupter. Detects the zero position of the sample turntable. When position No. 18 comes to the SPT-pipetting spot the sensor output goes ON. Under this condition, No. 1 position faces the BCR. The rotation angle is tracked by counting the pulses fed to the ASP motor after detecting the zero position.
	ASP_COVER2	Cover Sensor	Detects if the cover (lid) is set properly.
DTR	FLT_ZERO	Zero-position Sensor	Photo interrupter. Detects the zero position of the optical-filter disk. The filter position is tracked by counting the pulses fed to the FLT motor after detecting the zero position.
IRU	IRU_ZERO	Zero-position Sensor	Photo interrupter. Detects the zero position of the cuvette turntable. The sensor output goes ON at the moment when cuvette No. 1 comes to the RPT-dispensing spot. The rotation angle is tracked by counting the pulses fed to the IRU motor after detecting the zero position.
	IRU_READY	Ready Position Sensor	A disk is coaxially fixed to the turntable pulley. Along the disk edge 45 slits are arranged. These slits indicate 45 cuvette positions, respectively. After a desired cuvette is positioned to the SPT or RPT-dispensing spot, the ready position sensor output is checked. If the sensor output is ON, then the SPT or RPT nozzle is descended into the cuvette safely.
		Temperature Sensors	The temperature sensors TS1 thru TS3 mounted on the cuvette turntable monitor the turntable temperature. The heaters are driven based on this temperature measurement. Thanks to this arrangement, the incubation (reaction) liquid in the cuvettes is maintained at 37 ± 0.3ºC.
	IRU_24Vm	24 V DC Voltage Sensor	Detects the presence of 24 V DC power supply for the IRU_DRV board.
	TRF_OVER	Overflow Sensor	Detects overflow of the IRU-divider that collects waste liquid from: - RCU - SPT trough - RPT trough - MIX1 trough - MIX2 trough. A pair of electrodes are placed within the IRU divider. Overflow is detected by sensing the conduction between the electrodes.
MIX1	MIX1_ZERO	Zero-position Sensor	Photo interrupter. Detects the zero position of the stirrer. The position of the stirrer is tracked by counting the pulses fed to the MIX1 motor after detecting the zero position.
MIX2	MIX2_ZERO	Zero-position Sensor	Photo interrupter. Detects the zero position of the stirrer. The position of the stirrer is tracked by counting the pulses fed to the MIX2 motor after detecting the zero position.
PP	PP_24Vm	24 V DC Voltage Sensor	Detects the presence of 24 V DC power supply for the SPP, RPP and WPP motors and solenoid valves.

(CONT'D)

UNIT	LABEL	SENSOR	FUNCTIONS
RCU	RCU_COVER1	Cover Sensor	Detects if the cover (lid) is set properly.
	RCU_ZERO	Zero-position Sensor	Photo interrupter. Detects the zero position of the reagent turntable.
			The sensor output goes ON at the moment when position No. 1 comes to the RPT-pipetting spot. In the initialization, the reagent turntable is returned to the zero position.
			The rotation angle is tracked by counting the pulses fed to the RCU motor after detecting the zero position.
		Temperature Sensor	Monitors the temperature in the reagent container.
			The Peltier elements are driven based on this temperature measurement. Thanks to this sensor, the reagents are maintained from 8 to 15ºC.
RPP	RPP_ZERO	Up Zero-position Sensor	Photo interrupter. Detects the upward zero-position of the plungers. Pumping-in starts by lowering the plungers from this position.
			The plunger position is tracked by counting the pulses fed to the RPP motor after detecting the up zero position.
RPT	RPTR_ZERO	Cuvette Zero-position Sensor	Photo interrupter. Detects the zero position for the rotary movement of the nozzle. The cuvttet zero-position is identical to the RPT-dispensing spot.
			The rotary position is tracked by counting the pulses fed to the RPTR motor after detecting the cuvette zero position.
	RPTR_TS	T/S Position Sensor	Photo interrupter. Detects the RPT trough spot and the pipetting spot on the reagent turntable (RCU) by sensing the slits on the disk.
	RPTU_ZERO	Up Zero-position Sensor	Photo interrupter. Detects the upward zero position of the nozzle.
			The vertical position is tracked by counting the pulses fed to the RPTU motor after detecting the up-zero position.
	RPTU_LL	Liquid Level Sensor	The nozzle itself functions as a sensor. It detects that the nozzle tip has reached reagent liquid. When the sensor output becomes active, the RPTU motor stops.
			Touch to the reagent liquid is detected by sensing a sudden change of capacitance.
	RPTU_DL	Down Limit Sensor	Photo interrupter. Normally the nozzle neck rests in the photo interrupter, i.e. the photo interrupter is OFF. When the nozzle tip reaches the bottom of a reagent bottle, the nozzle neck is lifted up, resulting that the photo interrupter goes ON.
			This sensor is used for protection of the nozzle. When the sensor output becomes ON, the RPTU motor stops.
	RPTU_LOW		Not used.
SPP	SPP_ZERO	Up Zero-position Sensor	Photo interrupter. Detects the upward zero-position of the plungers. Pumping-in starts by lowering the plungers from this position.
			The plunger position is tracked by counting the pulses fed to the SPP motor after detecting the up zero position.

(CONT'D)

UNIT	LABEL	SENSOR	FUNCTIONS
SPT	SPTR_ZERO	Cuvette Zero-position Sensor	Photo interrupter. Detects the zero position for the rotary movement for cuvette-dispensing. The cuvttet zero-position is identical to the SPT-dispensing spot. The rotary position is tracked by counting the pulses fed to the SPTR motor after detecting the cuvette zero position.
	SPTR_TS	T/S Position Sensor	Photo interrupter. Detects the SPT trough spot and the pipetting (e.g. sampling) spot on the sample turntable (ASP) by sensing the slits on the disk.
	SPTU_ZERO	Up Zero-position Sensor	Photo interrupter. Detects the upward zero position of the nozzle. The vertical position is tracked by counting the pulses fed to the SPTU motor after detecting the up zero position.
	SPTU_LL	Liquid Level Sensor	The nozzle itself functions as a sensor. It detects that the nozzle tip has reached sample liquid. When the sensor output becomes active, the SPTU motor stops. Touch to the sample liquid is detected by sensing a sudden change of capacitance.
	SPTU_DL	Down Limit Sensor	Photo interrupter. Normally the nozzle neck rests in the photo interrupter, i.e. the photo interrupter is OFF. When the nozzle tip reaches the bottom of a sample tube, the nozzle neck is lifted up, resulting that the photo interrupter goes ON. This sensor is used for protection of the nozzle. When the sensor output becomes ON, the SPTU motor stops.
	SPTU_LOW		Not used.
SWU	SWU_24Vm	24 V DC Voltage Sensor	Detects the presence of 24 V DC power supply for the pumps in SWU.
WPP	WPP_ZERO	Up Zero-position Sensor	Photo interrupter. Detects the upward zero-position of the plungers. Pumping-in starts by lowering the plungers from this position. The plunger position is tracked by counting the pulses fed to the WPP motor after detecting the up zero position.
WU	WU_ZERO	Up Zero-position Sensor	Photo interrupter. Detects the upward zero position of the nozzles. The position of the nozzles is tracked by counting the pulses fed to the WU motor after detecting the zero position.
	WU_OVER	Overflow Sensor	Detects overflow from cuvettes. Each pair of drain and dispensing nozzles (WU1 to WU6) form an electrode pair. After draining the cuvettes, conduction between paired electrodes is checked. If conduction is detected (due to liquid in a cuvette) on either electrode pair, it is recognized as overflow.
Tanks	BOT1_EMP	Tank-emptiness Sensor	Float sensor. Detects emptiness of Purified Water Tank (20 liters).
	BOT2_EMP	Tank-emptiness Sensor	Photo-interrupter. Attached on the corner (outer surface) of the tank. Normally light is interrupted by liquid e.g. OFF. In the event of emptiness of Wash Solution Tank 1 (5 liters), the sensor goes ON.
	BOT3_EMP	Tank-emptiness Sensor	Photo-interrupter. Attached on the corner (outer surface) of the tank. Normally light is interrupted by liquid e.g. OFF. In the event of emptiness of Wash Solution Tank 2 (5 liters), the sensor goes ON.
	BOT4_FULL	Tank-fullness Sensor	Float sensor. Detects fullness of Waste Liquid Tank 1 (thin 20 liters)
	BOT5_FULL	Tank-fullness Sensor	Float sensor. Detects fullness of Waste Liquid Tank 2 (concentrated 10 liters)
	BOT6_EMP	Tank-emptiness Sensor	Photo-interrupter. Attached on the corner (outer surface) of the tank. Normally light is interrupted by liquid e.g. OFF. In the event of emptiness of Wash Solution Tank 3 (5 liters), the sensor goes ON.

(CONT'D)

UNIT	LABEL	SENSOR	FUNCTIONS
-	CNT_YOBI1		Not implemented.
	CNT_YOBI2		Not implemented.
	CNT_YOBI3		Not implemented.
	CNT_YOBI4		Not implemented.
	CNT_YOBI5		Not implemented.

2. 25P3238 POWER-CN Board (See Figure G-1.)

TP	SIGNAL	DESCRIPTIONS
TP1	A+15V	+15V ± 0.75V supply for analog circuits
TP2	AGND	Analog ground
TP3	A-15V	-15V ± 0.75V supply for analog circuits
# TP4	**+5V**	**+5V (+5 ～ 5.25V) supply**
# TP5	**+12V**	**+12V ± 0.6V supply**
# TP6	**GND**	**Ground**
TP7	GND	Ground

3. 25P3237 CNT-CN1 Board (See Figure G-2.)

TP	SIGNAL	DESCRIPTIONS
TP15	GND	Ground
TP20	S_IN1	Serial input data from IRU_CNT board
TP22	FLT_CLK_O	Clock signal for FLT motor
TP23	S_CLK1	Clock signal for serial communication with IRU_CNT board
TP24	S_OUT1	Serial data output to IRU_CNT board
TP25	S_DIROUT1	Serial data output to IRU_CNT board
TP26	S_LAT1	Serial-data latch signal for communication with IRU_CNT board
TP27	IRU_TEMP1_S	Temperature sensor signal 1 for cuvette turntable
TP28	IRU_TEMP2_S	Temperature sensor signal 2 for cuvette turntable
TP29	RCU_TEMP_S	Temperature sensor signal for RCU
TP30	IRU_TEMP3_S	Temperature sensor signal 3 for cuvette turntable
TP40	GND	Ground
TP41	+5V	+5V (+5 ～ 5.25V) supply
TP42	GND	Ground
TP43	+12V	+12V ± 0.6V supply

LED	SIGNAL	DESCRIPTIONS
# LED1	**ASP/RCU_24v1**	**24V1 supply monitor for ASP/RCU_DRV board (motors)**
# LED2	**ASP/RCU_24v2**	**24V2 supply monitor for ASP/RCU_DRV board (Peltier elements)**
# LED3	**IRU24v1**	**24V1 supply monitor for IRU_DRV board**
# LED4	**PP24v1**	**24V1 supply monitor for PP_DRV board**
# LED5	**SWU24v1**	**24V1 supply monitor for SWU_DRV board**
# LED6	**12V**	**12V supply monitor**

4. **25P3215 IRU_CNT Board** (See Figure G-4.)

TP	SIGNAL	DESCRIPTIONS
TP1	GND	Ground
TP2	GND	Ground
TP3	S_CLK	Clock signal for serial communication with CNT
TP4	S_DATA	Serial data input from CNT board
TP5	S_LAT	Serial-data latch signal for communication with CNT board
TP6	S_YOBI_D	Serial data input from CNT board
TP7	CLK	Clock signal
TP8	5VLL	Power supply for SEN_LL/DL board of SPT
TP9	TRF_OVER	WU overflow-sensor signal
TP10	S_SENSA	Serial data output to CNT board
TP11	SPTU_EKIMEN	SPT liquid-level signal (input)
TP12	SPTU_LL	SPT liquid-level signal (after judgement)
TP13	RPTU_EKIMEN	RPT liquid-level signal (input)
TP14	RPTU_LL	RPT liquid-level signal (after judgement)
TP15	WU_EKIMEN	WU overflow signal (input)
TP16	TRF_EKIMEN	Trough-divider overflow signal (input)
TP17	WU_OVER	Trough-divider overflow signal (after judgement)
TP18	S_YOBI_S	Not used.
TP19	INT_DONE	Not used.
TP20	*RESET_DRV	Power-on reset signal
TP21	GND	Ground
TP22	GND	Ground

25P3215 IRU_CNT Board

LED	SIGNAL	DESCRIPTIONS
LED1	LED1	For debugging

CONNECTOR	PIN	DESCRIPTIONS
J11	1	+12V ± 0.6V (GND=TP22)
J11	4	+24V1 ± 1.2V (GND=TP22)
J11	9	+24V2 ± 1.2V (GND=TP22)
J13	1	+5V ± 0.25V (GND=TP22)

5. 25P3216 or 25P3231 IRU_DRV Board (See Figure G-5.)

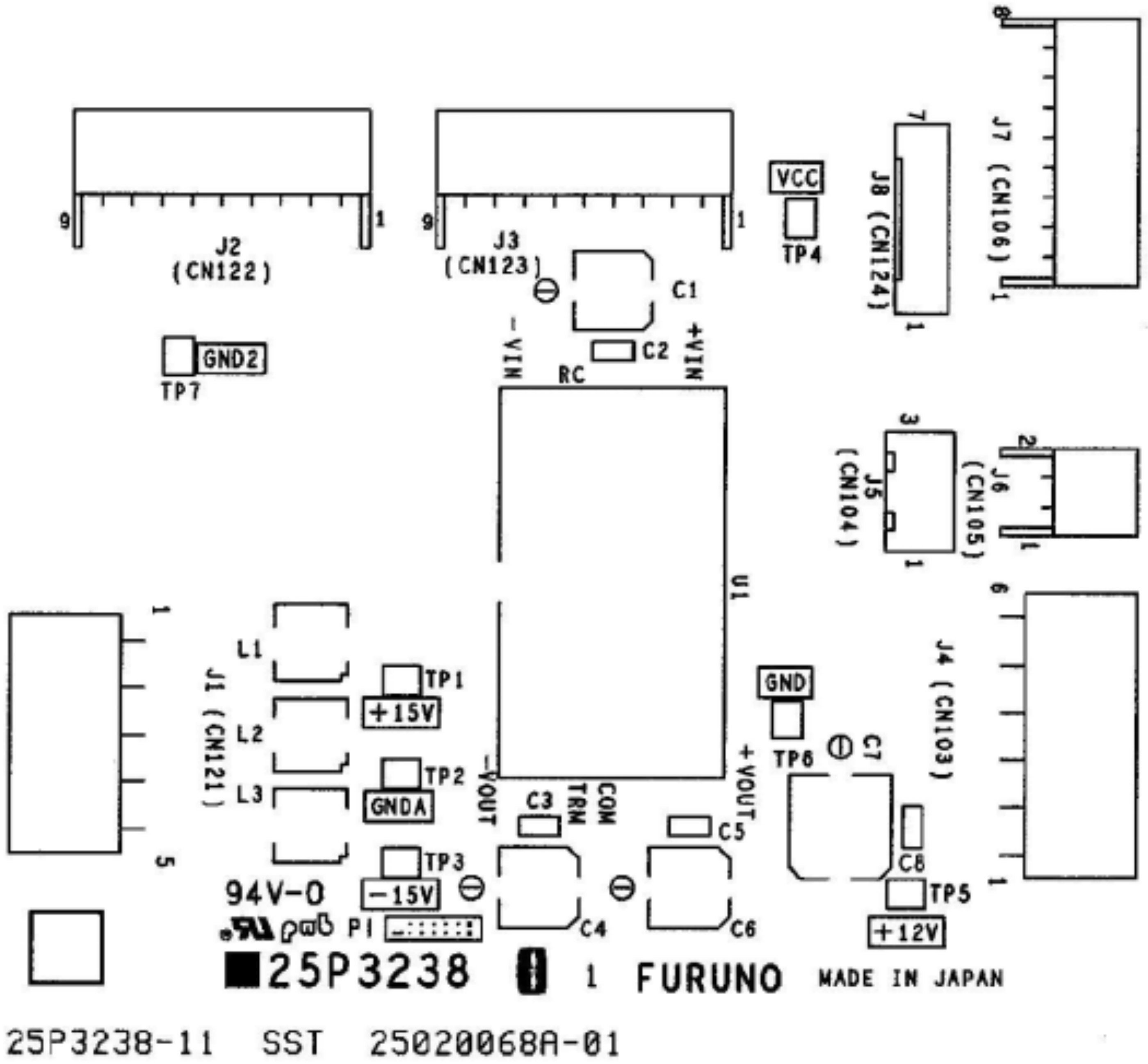
TP	SIGNAL	DESCRIPTIONS
# TP1	**GND**	**Ground**
# TP2	**+5V**	**+5V ± 0.25V supply**
# TP3	**+12V**	**+12V ± 0.6V supply**
TP4	+24V1	+24V ± 1.2V supply (before fuse)
# TP5	**+24V1**	**+24V ± 1.2V supply (after fuse)**
TP6	IRU_HEATER1	Signal to energize heater 1 (Heater ON=LOW)
TP7	IRU_HEATER2	Signal to energize heater 2 (Heater ON=LOW)
TP8	IRU_HEATER3	Signal to energize heater 3 (Heater ON=LOW)
TP18	GND	Ground

6. 25P3220 PP_DRV Board (See Figure G-6.)

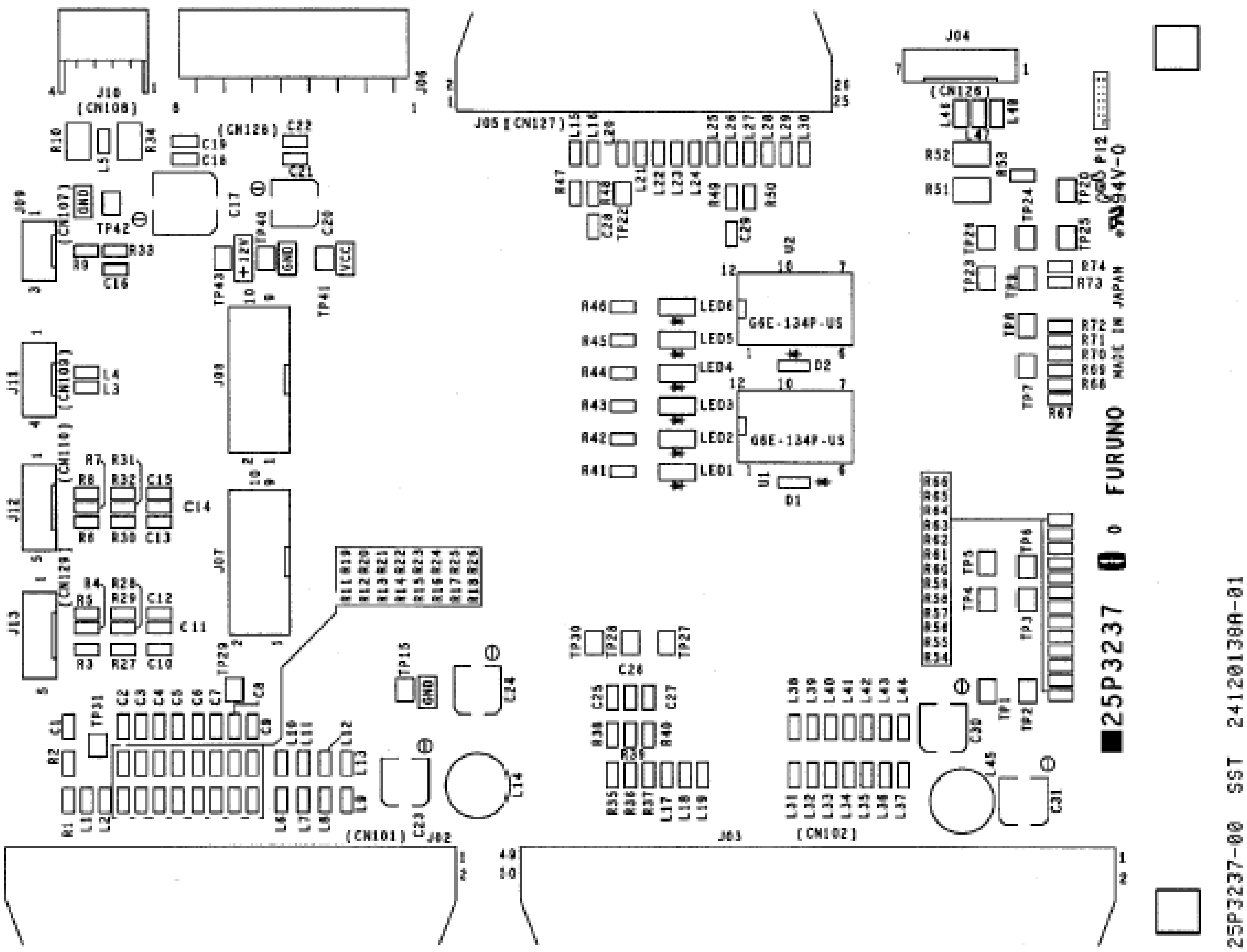
TP	SIGNAL	DESCRIPTIONS
# TP1	**GND**	**Ground**
TP2	GND	Ground
TP3	WPP_V1	Signal to energize WPP valve 1 (Energize=LOW)
TP4	WPP_V2	Signal to energize WPP valve 2 (Energize=LOW)
TP5	WPP_V3	Signal to energize WPP valve 3 (Energize=LOW)
TP6	WPP_V4	Signal to energize WPP valve 4 (Energize=LOW)
TP7	WPP_V5	Signal to energize WPP valve 5 (Energize=LOW)
TP8	WPP_V6	Signal to energize WPP valve 6 (Energize=LOW)
TP9	SPP_V	Signal to energize SPP valve (Energize=LOW)
TP10	RPP_V	Signal to energize RPP valve (Energize=LOW)
# TP11	**+5V**	**+5V ± 0.25V supply**
TP12	+24V1	+24V ± 1.2V supply (before fuse)
# TP13	**+24V1**	**+24V ± 1.2V supply (after fuse)**

7. **25P3221 SWU_DRV Board** (See Figure G-8.)

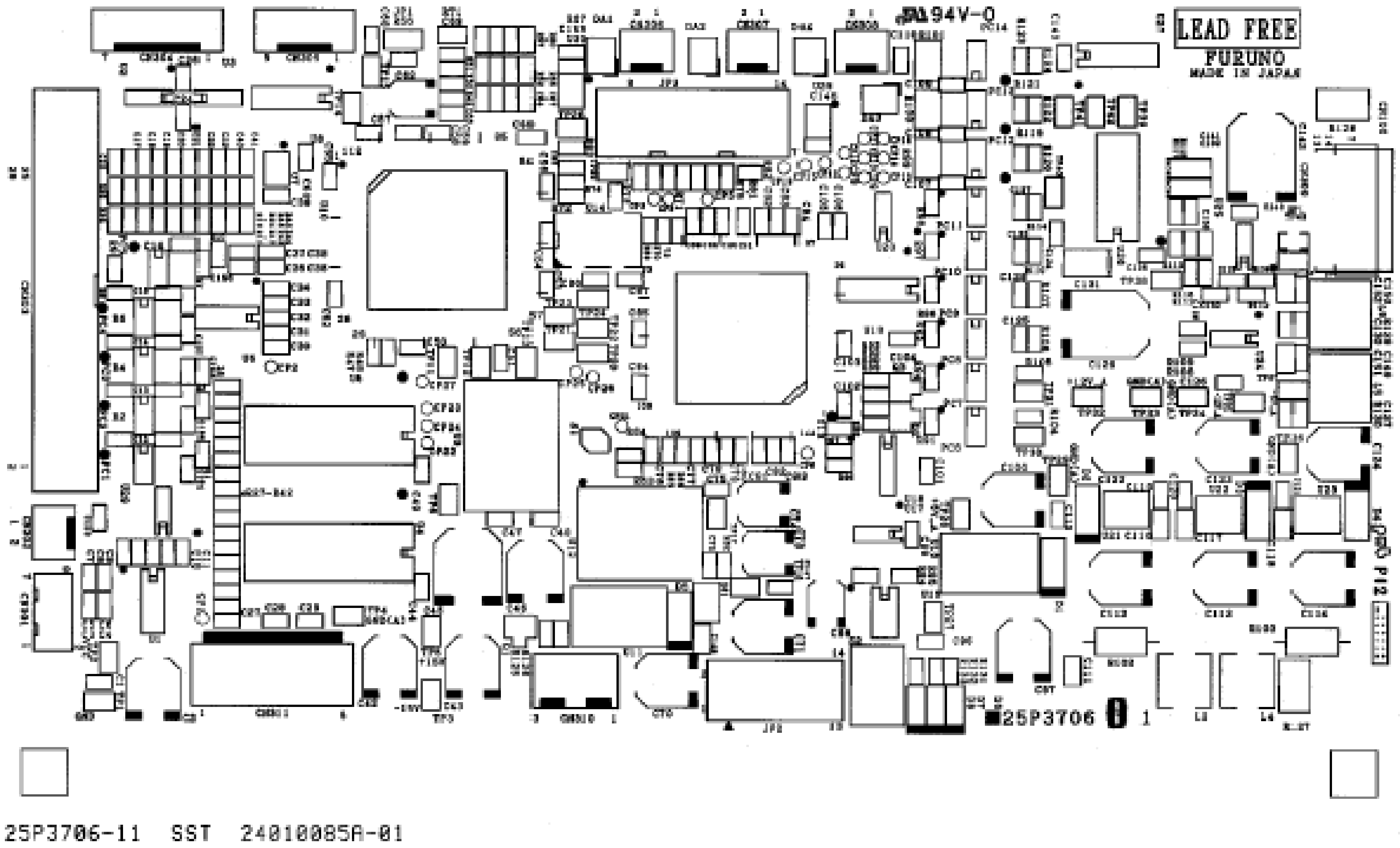
TP	SIGNAL	DESCRIPTIONS	
# TP1	**GND**	**Ground**	
TP2	GND	Ground	
# TP3	**+5V**	**+5V ± 0.25V supply**	
TP4	MIX2_P	Signal to energize MIX2 pump	(Energize=LOW)
TP5	MIX1_P	Signal to energize MIX1 pump	(Energize=LOW)
TP6	W8_P	Signal to energize W8 pump	(Energize=LOW)
TP7	R3_P	Signal to energize R3 pump	(Energize=LOW)
TP8	R2_P	Signal to energize R2 pump	(Energize=LOW)
TP9	TRGH_P	Signal to energize trough pump	(Energize=LOW)
TP10	R1_P	Signal to energize R1 pump	(Energize=LOW)
TP11	W7_P	Signal to energize W7 pump	(Energize=LOW)
TP12	W6_P	Signal to energize W6 pump	(Energize=LOW)
TP13	W5_P	Signal to energize W5 pump	(Energize=LOW)
TP14	W4_P	Signal to energize W4 pump	(Energize=LOW)
TP15	W3_P	Signal to energize W3 pump	(Energize=LOW)
TP16	W2_P	Signal to energize W2 pump	(Energize=LOW)
TP17	W1_P	Signal to energize W1 pump	(Energize=LOW)
TP18	SPT_P	Signal to energize SPT pump	(Energize=LOW)
TP19	+24V1	+24V ± 1.2V supply (before fuse)	
# TP20	**+24V1**	**+24V ± 1.2V supply (after fuse)**	



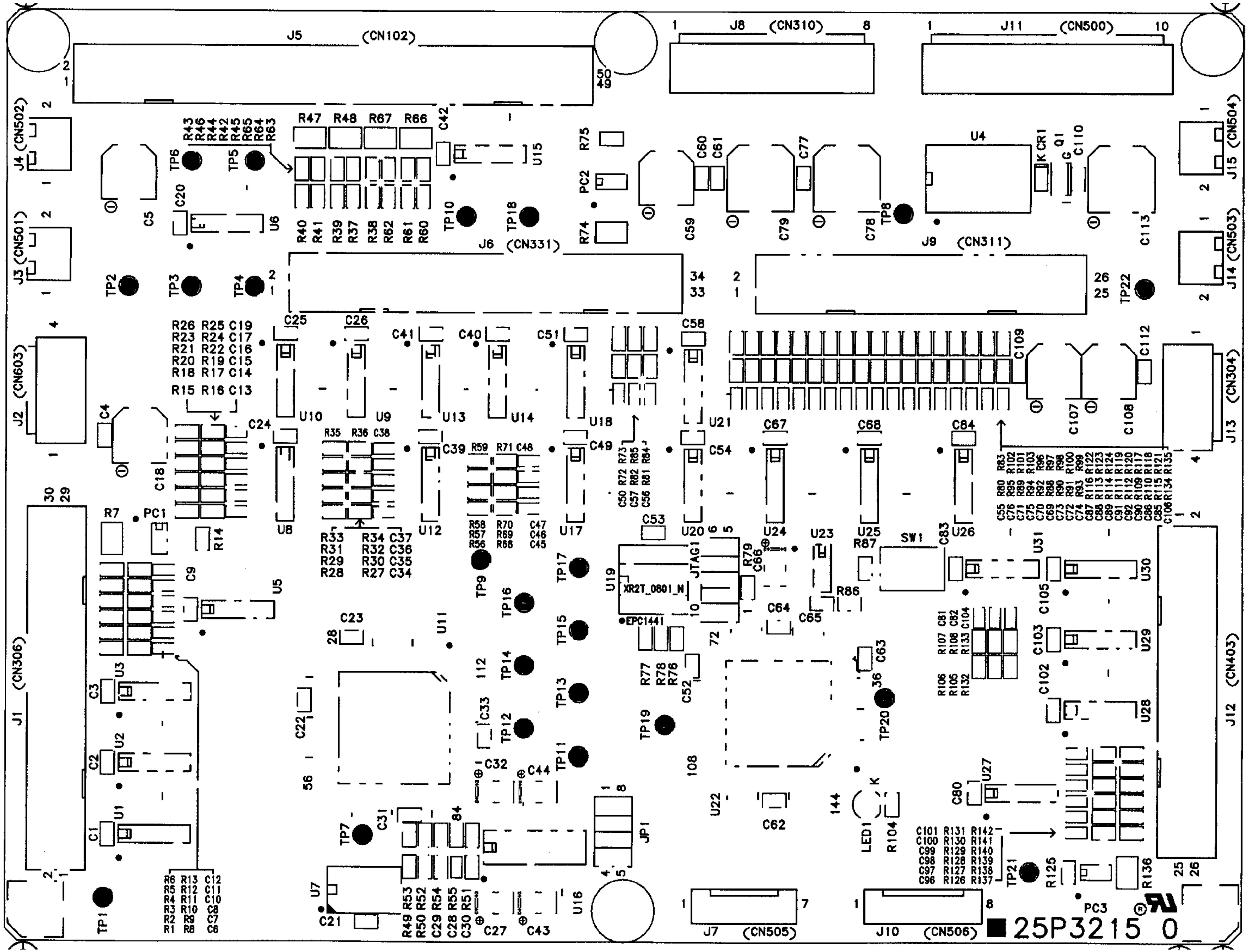
25P3238 POWER-CN Board
Figure G-1



25P3237 CNT-CN1 Board
Figure G-2

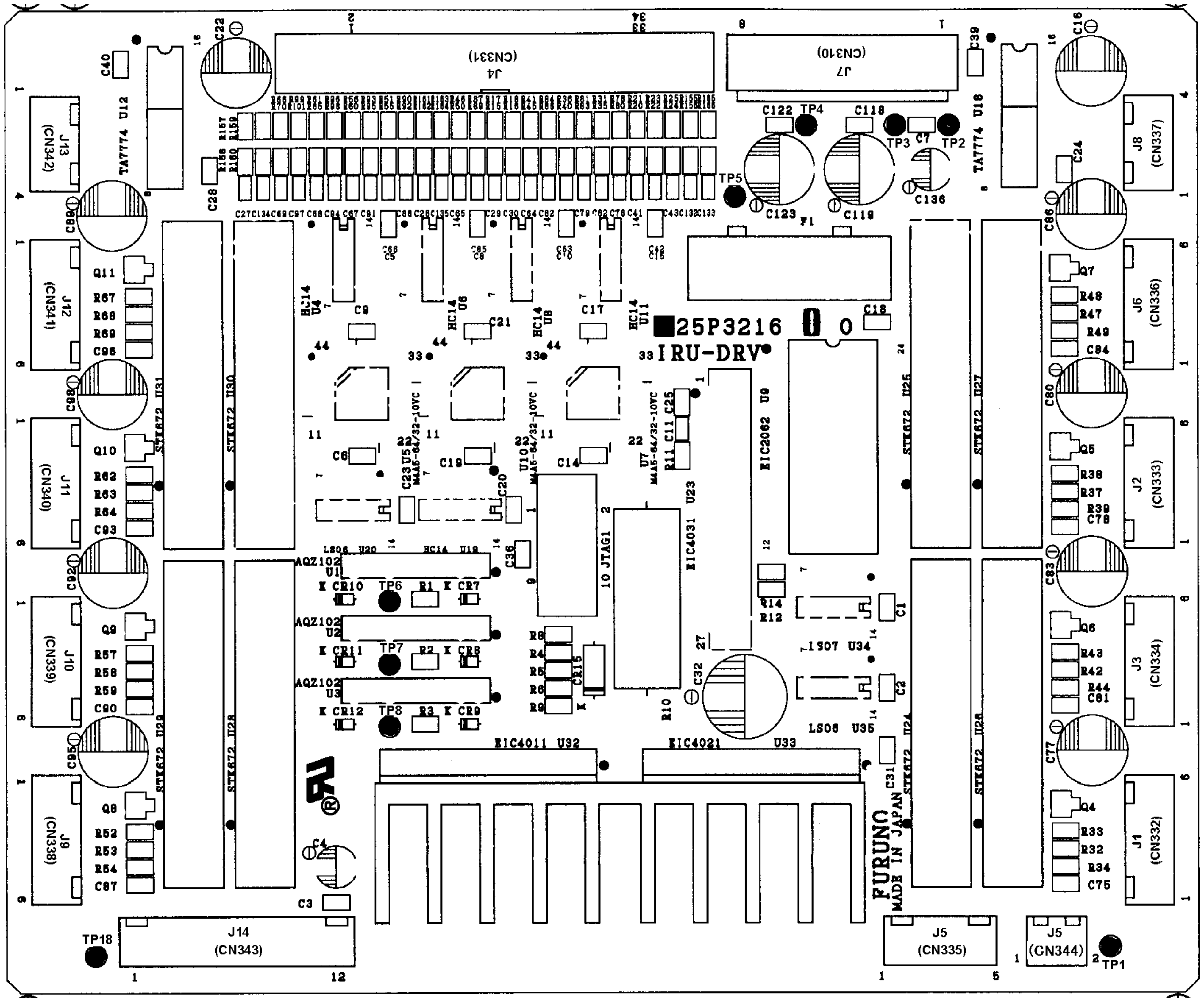


25P3706 AD PCB
Figure G-3



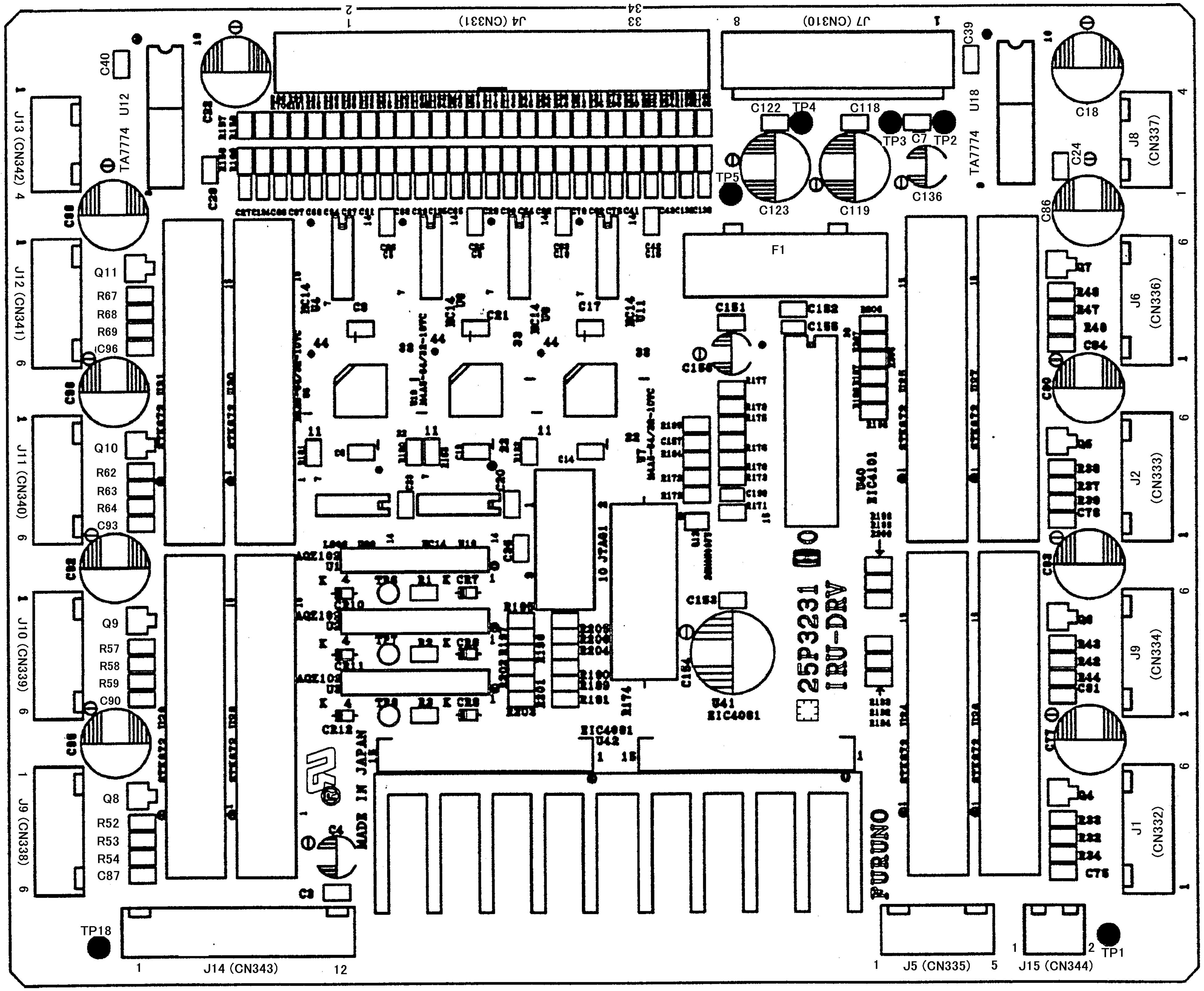
25P3215 IRU_CNT
Figure G-4

Note: Print board 25P3216 and 25P3231 are compatible for IRU driver circuit.

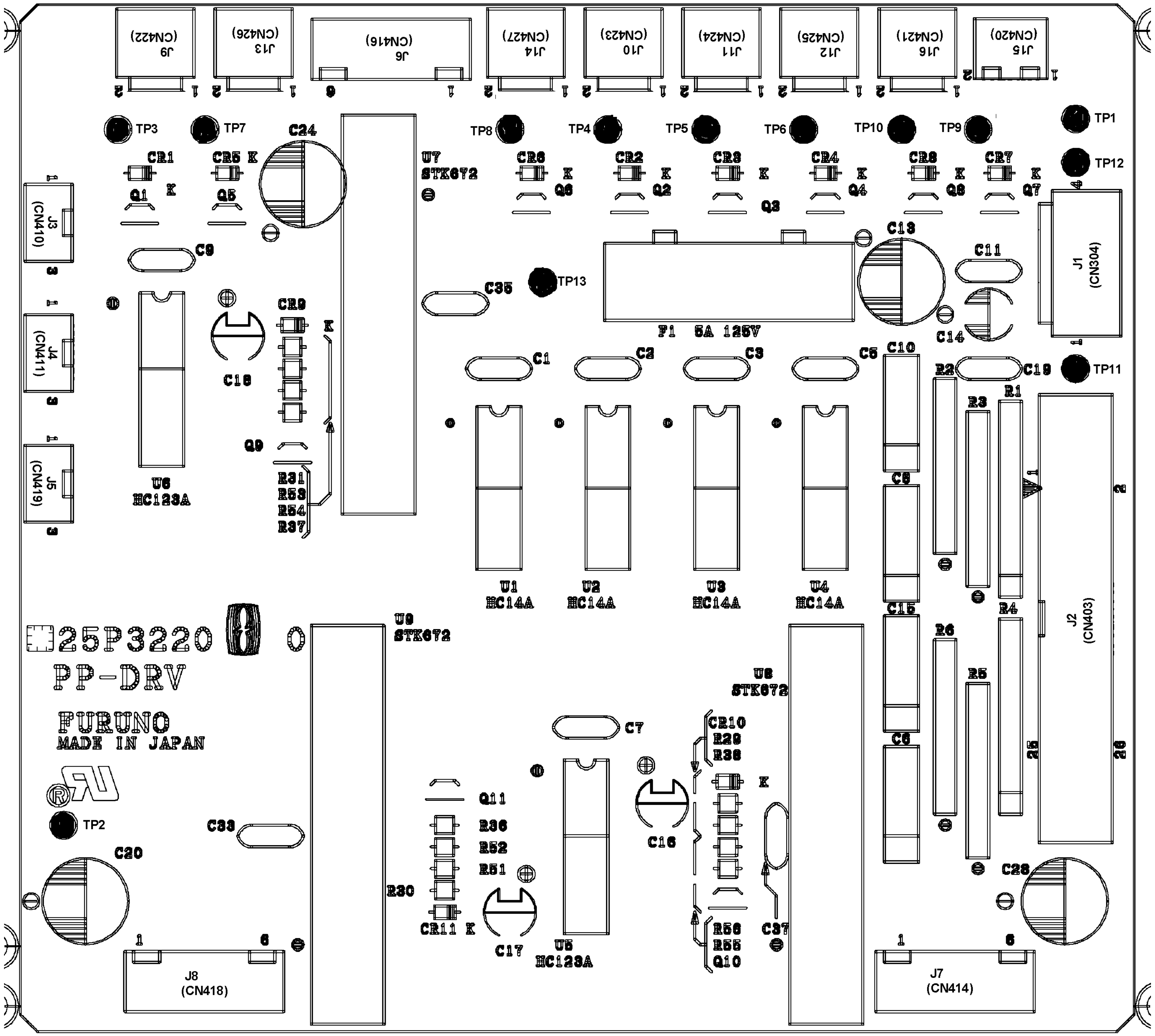


25P3216 IRU_DRV (Old)
Figure G-5 (A)

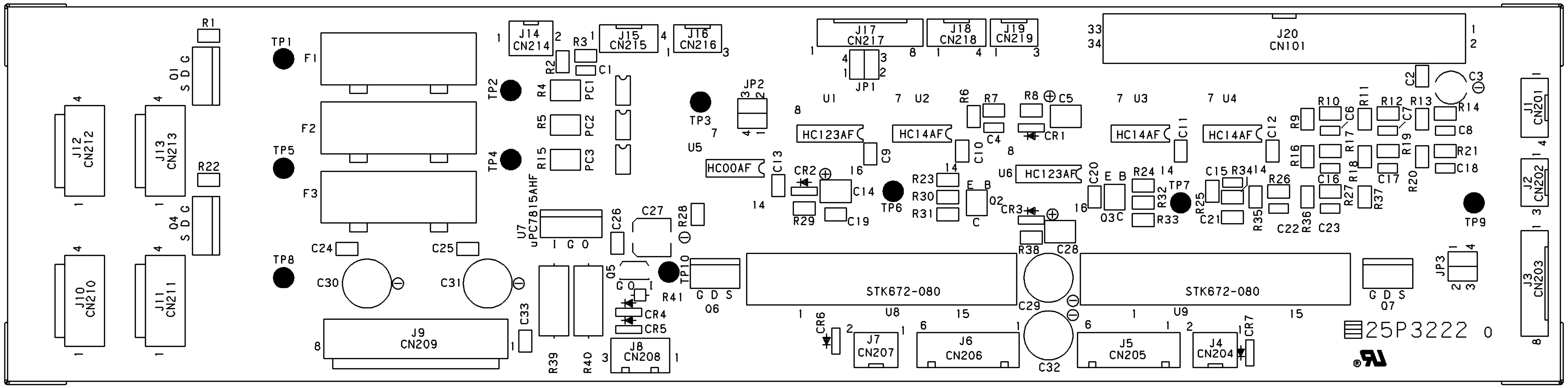
Note: Print board 25P3216 and 25P3231 are compatible for IRU driver circuit.



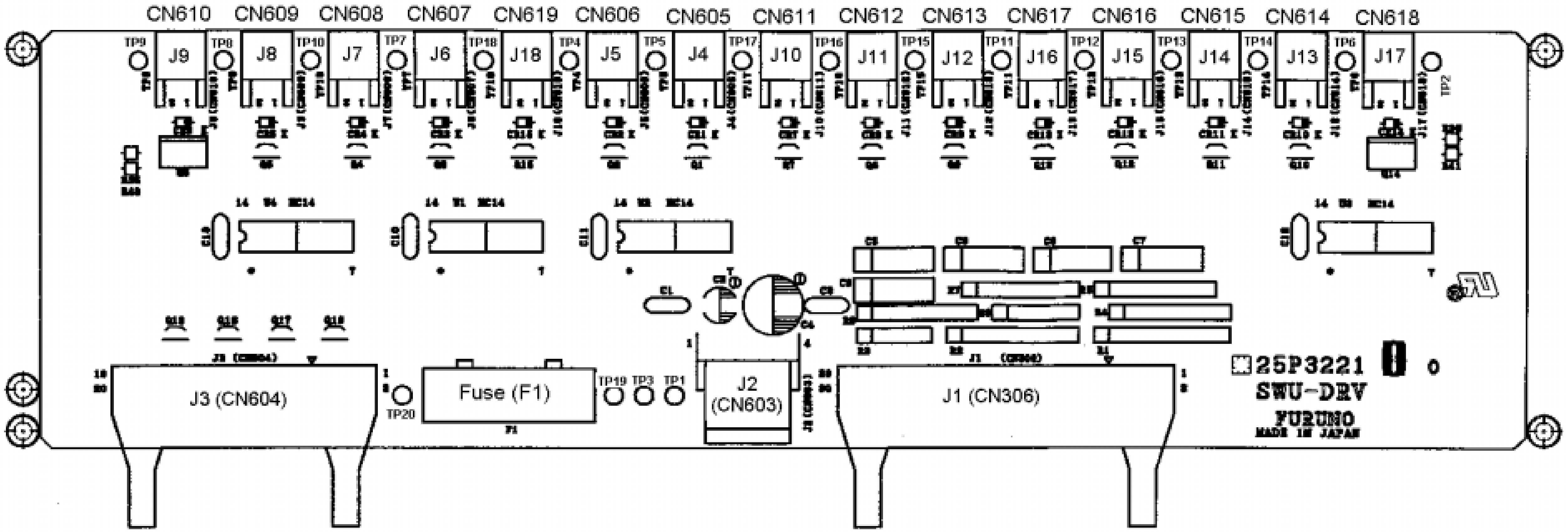
25P3231 IRU_DRV (New)
Figure G-5 (B)



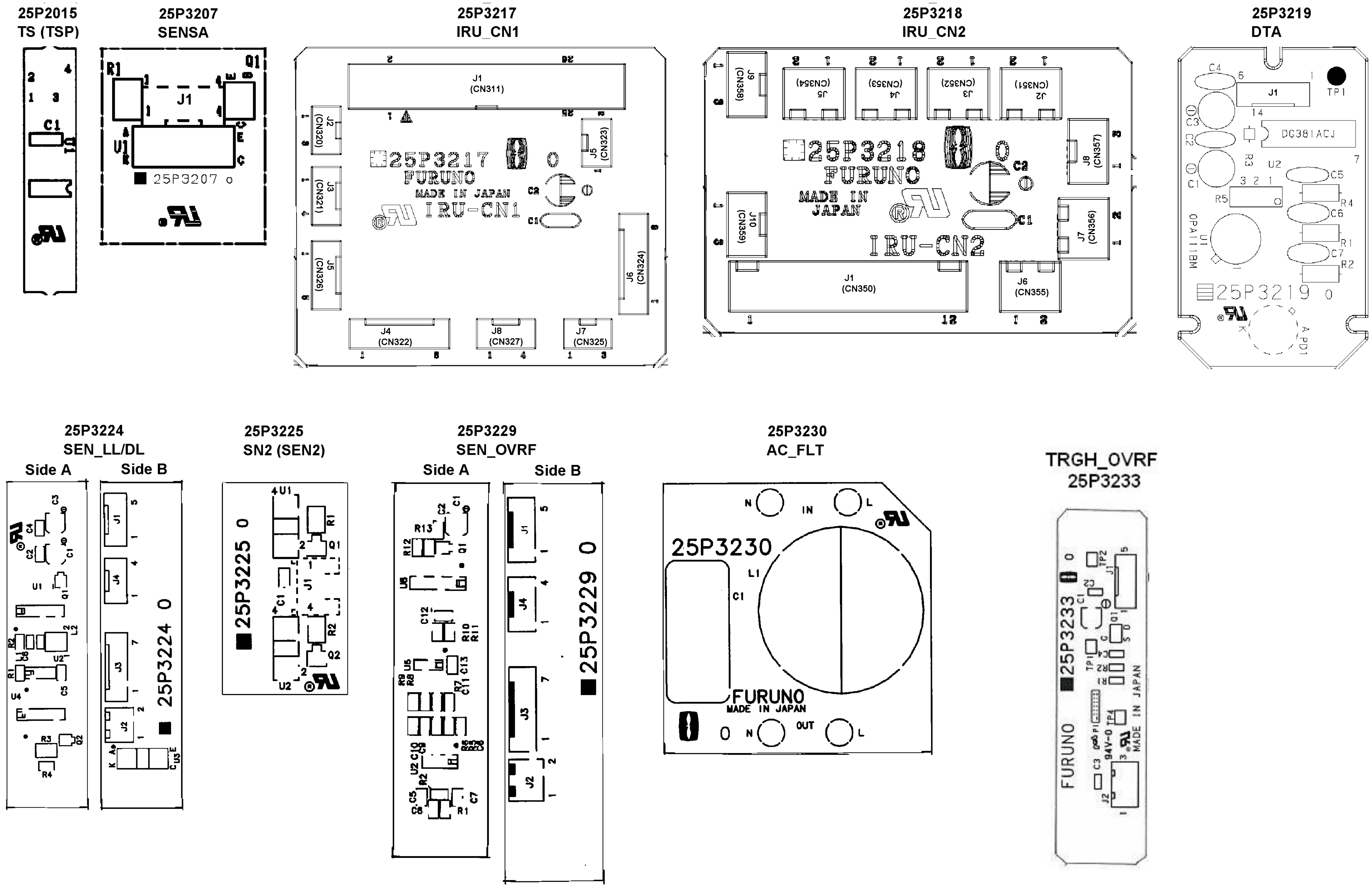
25P3220 PP_DRV
Figure G-6



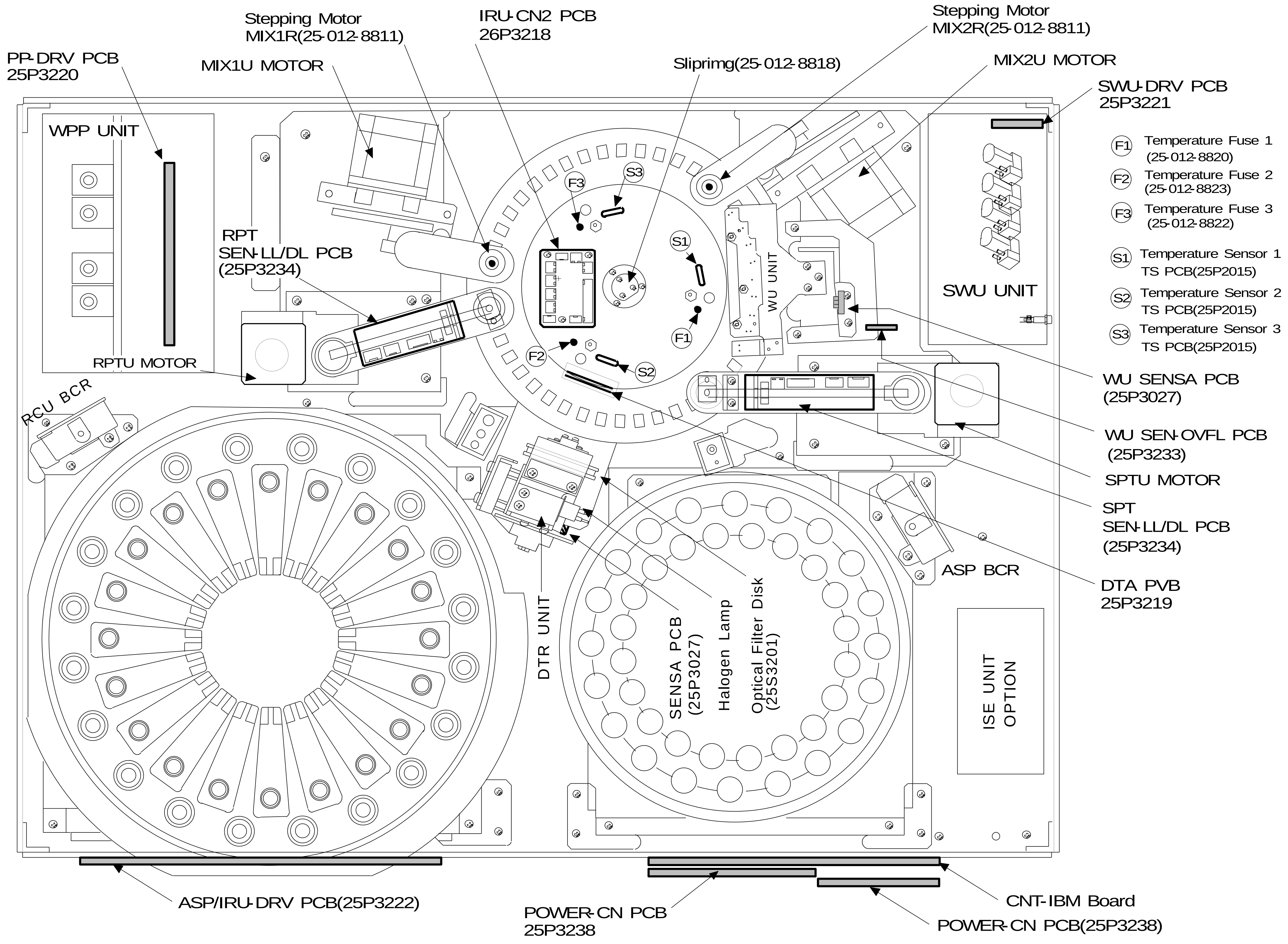
25P3222 ASP/RCU_DRV
Figure G-7



25P3221 SWU_DRV
Figure G-8

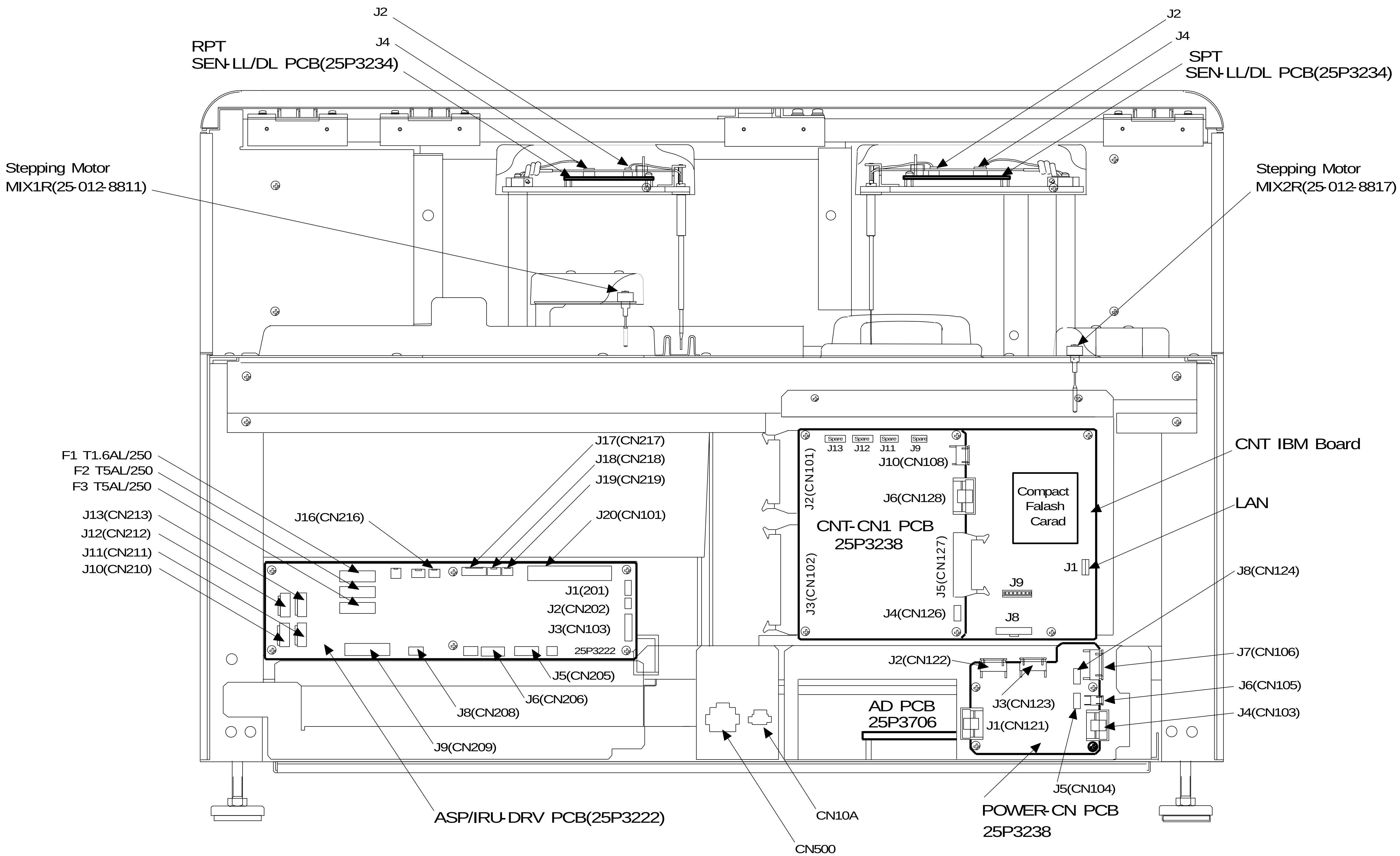


OTHER PC BOARDS
Figure G-9



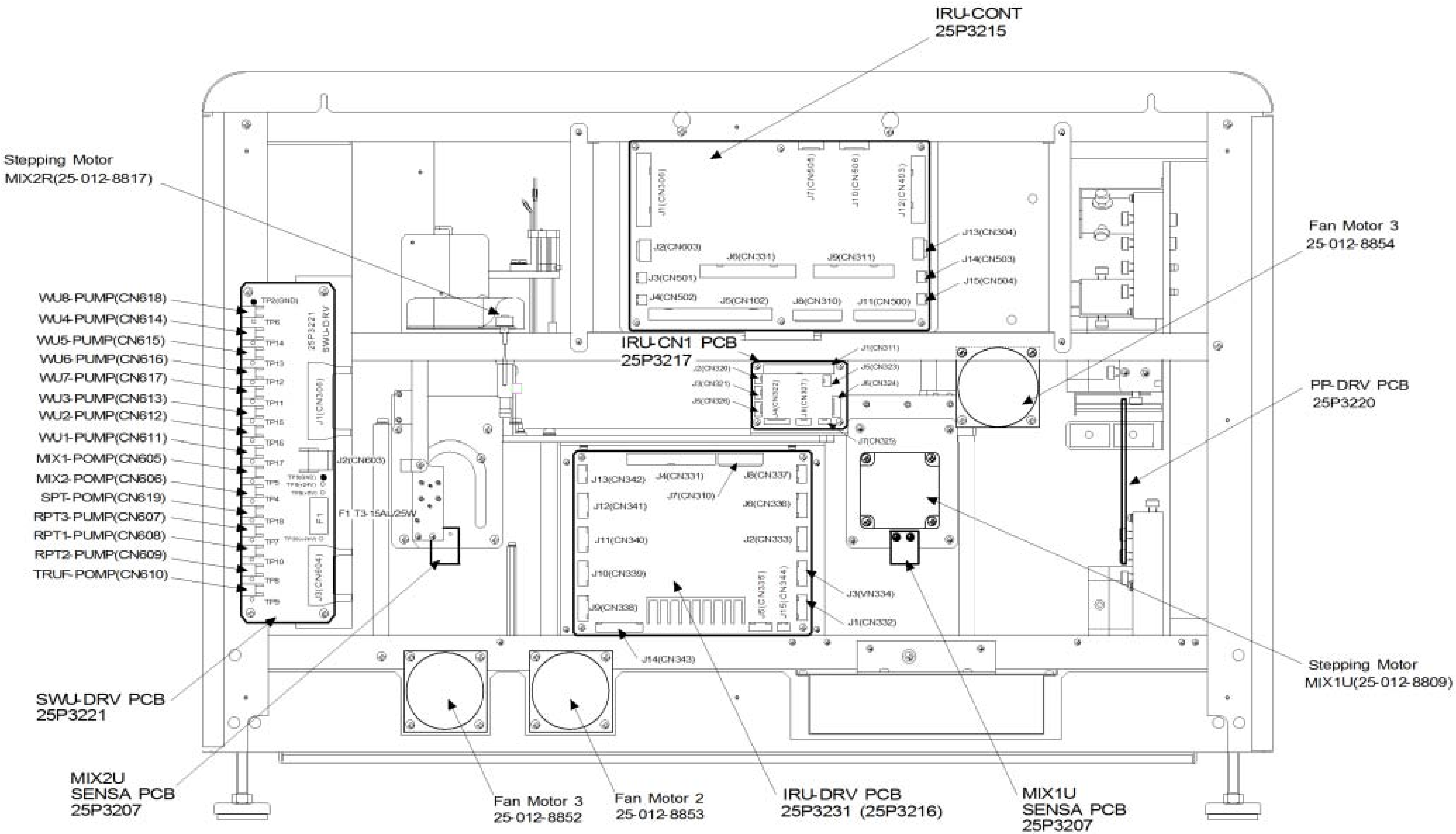
TOP VIEW

BOARD LAYOUT
Figure G-10 (A)



FRONT VIEW

BOARD LAYOUT
Figure G-10 (B)



REAR VIEW

BOARD LAYOUT
Figure G-10 (C)

Appendix H

Adjustment of BCR

1. Conditions of Bar Code Label

Checkpoint	Remarks	Check
Aren't the margins on the both ends of bar code too narrow?	Margins of 4 mm or a size more than ten times wider than a thin bar are required on the both ends of bar code.	
Is the bar code stained or chipped?		
Are widths of any bars thinner or thicker than specified?	When thinner or thicker bars are exist, the ratio of the space between bars to the width of a bar differs and resultantly the bar code may not be read.	
Are the length of label and the position at that the label is affixed as specified?	See the Operator’s manual 2-6 for the position of label.	

2. Specifications of Bar Code

Checkpoint	Remarks	Check
Are the symbols in use as specified?	<u>ASP</u> Symbols of ITF, UPC, CODE39, NW7 and CODE 128 (A・B・C) can be used. Note: In the case of UPC, it is accompanied by check digit without fail. <u>RCU</u> The equipment, which has already been delivered, can read NW7 (without check digit) only.	
Is the setting by a personal computer in agreement with availability of check digit on the label?	The availability of check digit can only be defined for the ASP.	

3. Conditions of Equipment

Checkpoint	Remarks	Check
Is the bar code is being read in the condition that the lid is closed?	If the bar code label or the photoreceptor device of the reader is exposed to disturbing light, the reader may not read the bar code.	
Is the surface on which the bar code label is attached oriented outward?	The bottle is placed so that the bar code label is located in the center of cutout of bottle holder.	
Is sample tube of 13 to 16 mm in diameter used?	If the sample tube having a diameter of more than 16 mm is used, the holder widens and consequently label on the inner circumference is hidden.	
Is the glass window of the RCU for bar code stained or does condensation occur on the glass window?	If the lid of the RCU is kept open or opened and closed frequently, condensation may be caused on the glass.	

4. Procedures to Adjust Position of Bar Code Reader for RCU

Note: If the fixing position of the bar code reader is carelessly moved, there is a fear that it is not returned to its correct position. The position of the reader is precisely adjusted in a unit-by-unit basis at factory. When the position is to be moved, follow the procedures of troubleshooting and do it after it has been made sure that there is no problem in the bar code label, board, harness, etc.

＜RCU＞

1) Remove left cover and mosaic plate 1 (see Figure H-1 below).
2) Load trays.
3) Carry out readout operation of bar code with Telnet.

   Operation: ① Finish ANALYZER with Ctrl + . (period).
   ② Double-click on [Telnet] to connect to [QNX].
   ③ Login: kogata
   Password: qnx
   ④ Enter cd sysboot／offboot／4.Initialize+Rgtscan／? (number of Round. ? = appropriate number of round such as 100)
4) Loosen the two M4 fixing screws of bar code reader assembly (see Figure H-2 below) and move the assembly to and fro observing the results of bar code readouts on the PC screen. Fix the screws at the position where the bar code can be read (see Display Sample of Personal Computer).
5) Continue to read bar codes for about 30 minutes and make a final check.
6) Finish readout operation of bar code with Ctrl + C and perform offboot／3.Initialize. (To prevent the bar code reader from stopping while its LED remains on.)

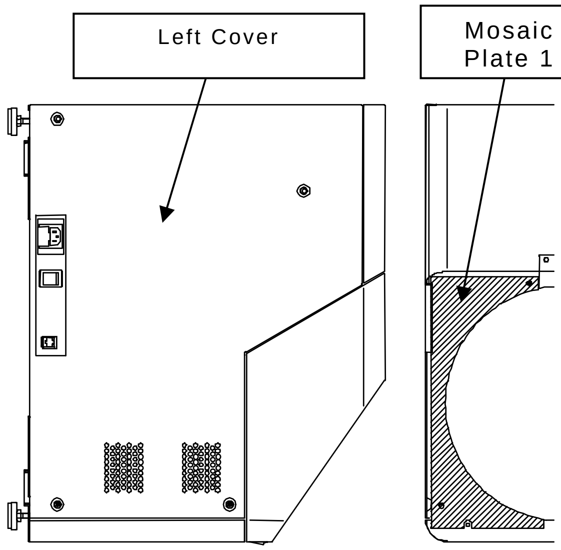
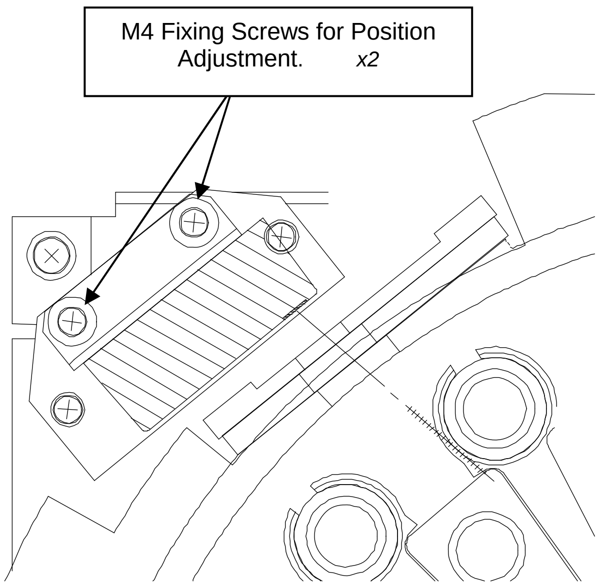


Figure H-1



BAR CODE READER OF RCU
Figure H-2

5. Procedures to Adjust Position of Bar Code Reader for ASP

＜ASP＞

1) Remove right cover and mosaic plate 2 (see Figure H-3 below).
2) Load trays.
3) Carry out readout operation of bar code with Telnet.

   Operations: ① Finish ANALYZER with Ctrl + . (period).
   ② Double-click on [Telnet] to connect to [QNX].
   ③ Login: kogata
   Password: qnx
   ④ Enter cd sysboot／aspboot／6.Initialize+Run(order)／2.TEST.
   (For 2.TEST, the readout operation continues until Ctrl + C is entered.)

4) Loosen the two M4 fixing screws of bar code reader assembly (see Figure H-4 below) and move the assembly to and fro observing the results of bar code readouts on the PC screen. Fix the screws at the position where the bar code is read (see Display Sample of Personal Computer).
5) Continue to read bar codes for about 30 minutes and make a final check.
6) Finish readout operation of bar code with Ctrl + C and perform offboot／3. Initialize. (To prevent the bar code reader from stopping while its LED remains on.)

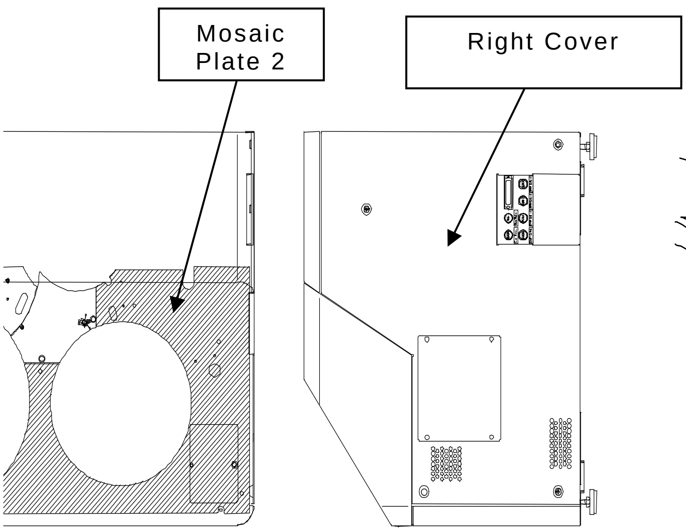
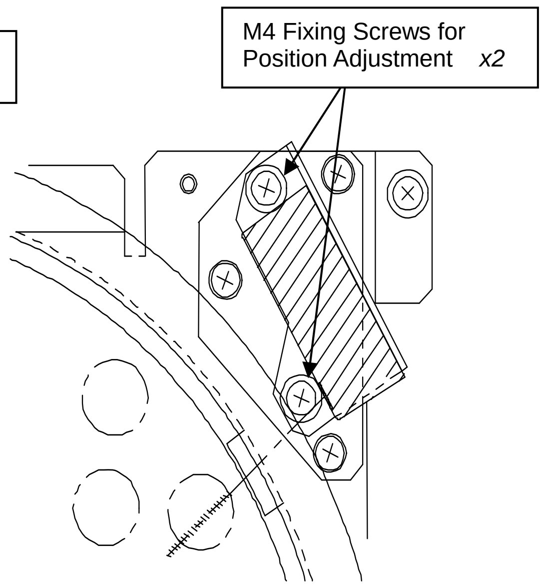


Figure H-3



BAR CODE READER OF ASP
Figure H-4

6. Display Sample of Personal Computer

<ASP>

Relevant No. is displayed here.

In the case that No. 22 could be read.

```
asp   :ASP_Rotate()>SPTCell=19,BCRCell=22,Dir=1,Pls=400
asp   :SampBC>[22]:31,31,33,34,35,36,37,38,39,30,31,32,33,34,35,36,33,0d,(18)
asp   :ASP_CheckEnd()>SPTCell=19->20,BCRCell=22->23
asp   :ASP_StartMove()>SPTCell=20,BCRCell=23, BCRMove=1

asp   :ASP_Rotate()>SPTCell=20,BCRCell=23,Dir=1,Pls=238
asp   :SampBC>[23]: 31,31,33,34,35,36,37,38,39,30,31,32,33,34,35,36,31,0d,(18)
asp   :ASP_CheckEnd()>SPTCell=20->21,BCRCell=23->24
asp   :ASP_StartMove()>SPTCell=21,BCRCell=24, BCRMove=1

asp   :ASP_Rotate()>SPTCell=21,BCRCell=24,Dir=1,Pls=400
asp   :SampBC>[24]: 3f,0d,(2)
asp   :ASP_CheckEnd()>SPTCell=21->22,BCRCell=24->25
asp   :ASP_StartMove()>SPTCell=22,BCRCell=25, BCRMove=1

asp   :ASP_Rotate()>SPTCell=22,BCRCell=25,Dir=1,Pls=400
asp   :SampBC>[25]: 3f,0d,(2)
asp   :ASP_CheckEnd()>SPTCell=22->23,BCRCell=25->26
asp   :ASP_StartMove()>SPTCell=23,BCRCell=26, BCRMove=1
```

In case that No. 24 could not be read.

<RCU>

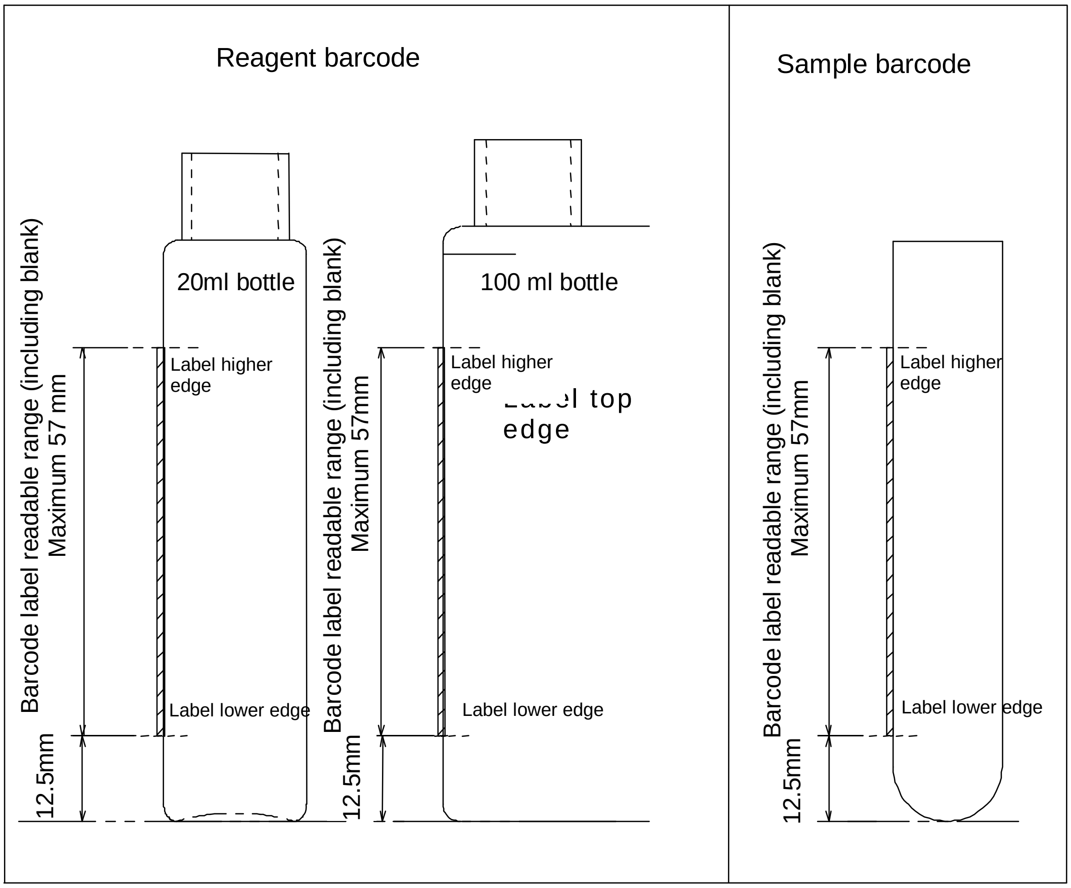
Relevant No. is displayed here.

In the case that No. 8 could be read. (Data display)

```
rcu   : ReadBC>[08]: 4f,41,31,31,39,30,30,31,33,36,35,30,30,39,0d,(15)
rcu   : RGTBCR=08, OA119001365009          , 0
rcu   : ReadBC>[09]: 4f,41,31,31,39,30,30,31,33,36,35,30,30,39,0d,(15)
rcu   : RGTBCR=09, OA119001365009          , 0
rcu   : ReadBC>[10]: f,0d,(2)
rcu   : RGTBCR=10, ?                       , 0
rcu   : ReadBC>[11]: f,0d,(2)
rcu   : RGTBCR=11, ?                       , 0
```

In the case that No. 10 could not be read.

7. Bar Code Label Fixing Specifications



<Notes>

1. The above figure shows the maximum area within which the bar code label can be read by the reader.
   For example, when the 55 mm (including margins on both sides) is used for the 20 ml bottle, the label is attached to the bottle so that the distance between the lower end of the label and the bottom of the bottle is 13.5 ± 1 mm.

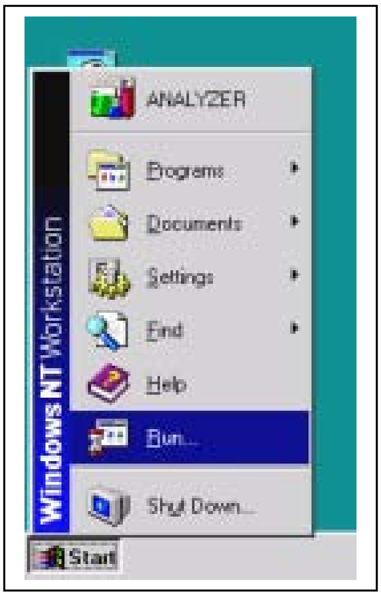
2. The above figure shows the maximum area within which the bar code label prepared by Furuno can be read by the reader.
   Please make sure that the label prepared by you can be read by the reader.

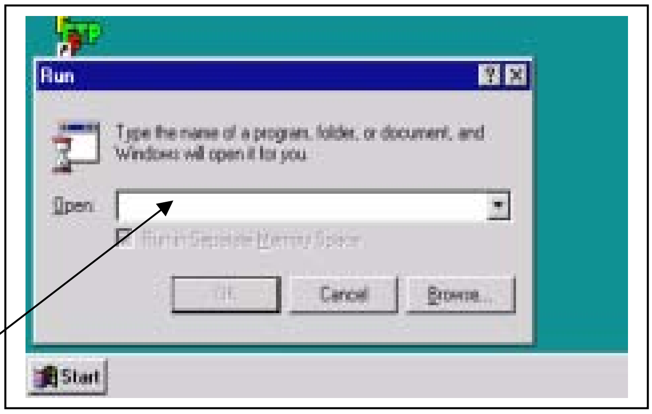
Appendix J
Ping Command for checking of LAN

This command is used for examining whether a LAN cable between PC and analyzer is correctly connected.

(1) Input the “Ping” command to the command prompt window.

Click the Start button at the lower left-hand side of the PC’s screen and select the Run... line. Command input window is appeared as below picture.
You can enter the “Ping” command in the Open box. After input “Ping –t 172.17.31.202” to the command box, click on the OK button.
“Ping” command is curried out.





Ping -t 172.17.31.202

(2) Following information is displayed on the PC’s screen when the communication is carried out by “Ping command”.

```
Ping –t 172.17.31.202

Reply from 172.17.31.202: byte=32 time<10ms TTL=128
Reply from 172.17.31.202: byte=32 time<10ms TTL=128
Reply from 172.17.31.202: byte=32 time<10ms TTL=128
Reply from 172.17.31.202: byte=32 time<10ms TTL=128
          .
          .
          .
Request timed out.
Request timed out.
```

Normal situation (Reply lines)

When the wrong situation is happened in the communication line. (Request timed out lines)

(3) When you want to stop the execution of “Ping” command, you must simultaneously push the keys of “Control” and “C”.

Appendix K

Draining the water from Analyzer

When the analyzer is left for long time (more than 1 week) without any movement, some kind of bacteria or algae could grow in the tubing system by the cause of staying of fluid.
Therefore, it is needed to drain the fluid from the analyzer to prevent the bacterial or algal growth in the tubing system.
And for ISE unit, to avoid deteriorating quality of the electrodes, it is needed to take proper storage measures against each electrode.
Each procedure is shown below.

1. Draining the water from the analyzer main unit.

1. Remove the external tubes for Sol-1, Sol-2 and Sol-3 from the tube joints at the right side of the analyzer main unit, and drain the fluid from each tube.
2. After draining the fluid from tubes, connect again each external tube to the respective tube joints.
3. Insert each external tube, for Sol-1, Sol-2, Sol-3 and System water, into the system water tank that is contained purified water.
4. Perform three times the ”Prime Sequence” in [Sequence (F9)] of [Maintenance].
5. Remove all external tubes from the system water tank.
6. Perform three times the ”Prime Sequence” in [Sequence (F9)] of [Maintenance].
7. Perform five times the “SPT/RPT(C)” in [Wash (F10)] of [Maintenance].
8. Perform five times the “SPT/RPT（W）” in [Wash (F10)] of [Maintenance].
9. Perform the “Cuvette Check” in [Sequence (F9)] of [Maintenance].

2. Keeping the ISE（in the case of with ISE unit）

1. Remove the tube from bottle of Calibrant-A.
2. Perform sixteen times the “ISE Prime” in [Sequence (F9)] of [Maintenance].
3. Perform the “Electrode Exchange” in [Wash (F10)] of [Maintenance].
4. Turn the power of Analyzer main unit off, and remove all electrodes from ISE unit.
   After each electrode is wrapped separately by waxed paper, they are packed with plastic bag and kept in a dark and cool place at room temperature.