T34L Syringe Pump

Infusion System

SERVICE MANUAL

CE 0473

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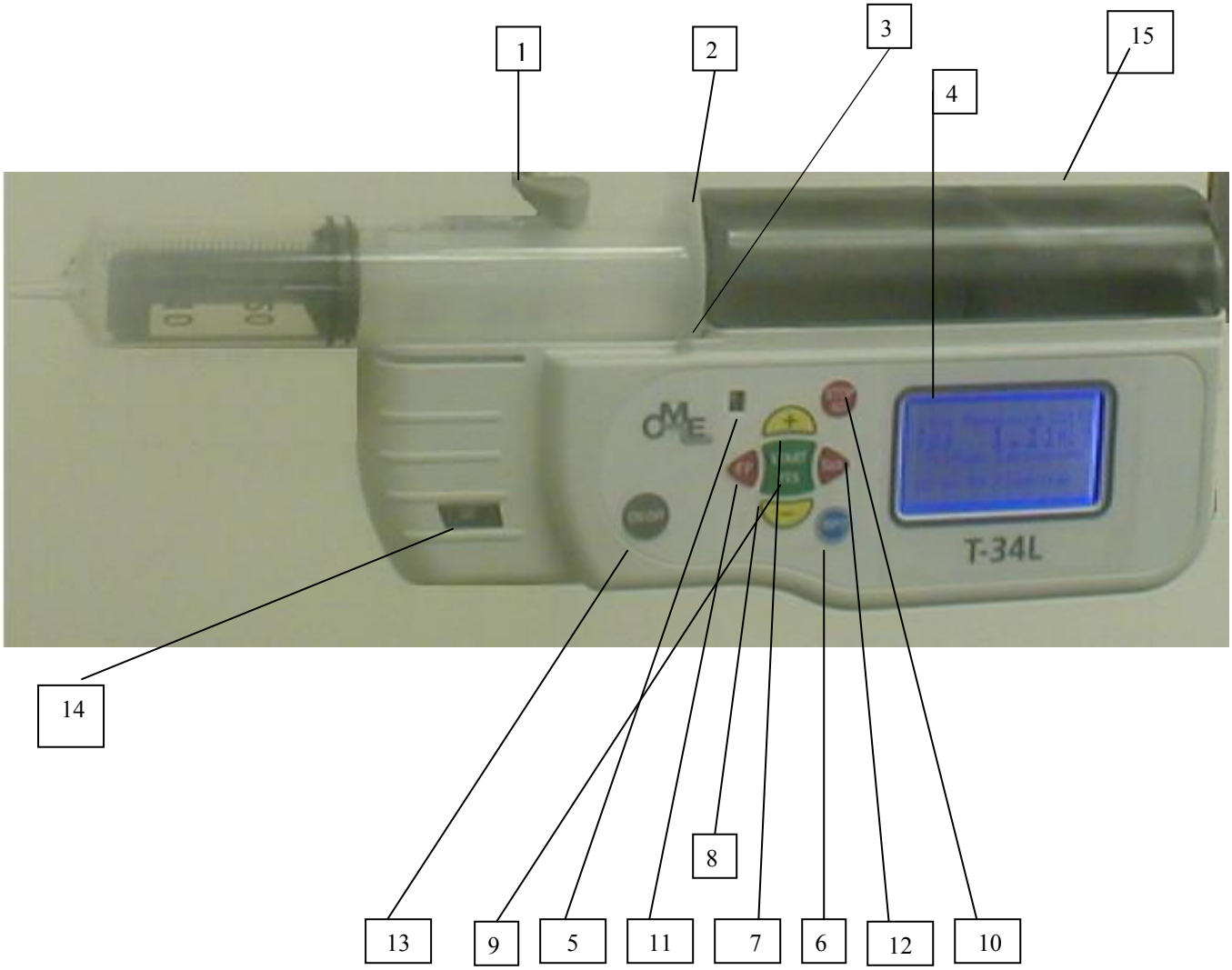

1. Barrel Clamp arm (detects Syringe size/width of barrel)
2. Syringe ear/collar sensor (detects correct loading of syringe collar)
3. Plunger Sensor (detects correct loading of syringe plunger)
4. LCD display (back-light (can be disabled) when any key pressed)
5. Operation LED (green shows infusing (can be disabled), red when Stop or alarm)
6. Info key (a. shows Event Log, Volume Infused, Volume To Be Infused and Battery status b. Long press will Lock/Unlock Keypad)
7. Plus key (a. increase infusion parameters during programming/use. b. scrolls between options)
8. Minus arrow key (a. decreases infusion parameters. b. scroll s between options)
9. YES/START key (confirms choices during programming)
10. NO/STOP key (takes user back a step during programming, stops pump)
11. FF (Forward) key (moves actuator forward when no syringe present)
12. Back (Reverse) key (moves actuator backward when no syringe present)
13. ON/OFF key
14. Infra Red led
15. Syringe actuator cover

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Introduction

- The *T34L Syringe pump* provides the following features:
- Small, light and compact pump.
- Accuracy +/-5%
- Ability to download current patient history & last 500 events
- Post-occlusion bolus prevention
- Free flow protection built into sets
- 3 secure lock levels of keys and program

- Infusion Rate: 0.1 to 1000 ml/hr.
- Operated with a customized safe administration set
- Can be pole mounted
- Silent operation

BEFORE ATTEMPTING TO CARRY OUT ANY PROCEDURES DETAILED IN THIS SERVICE MANUAL YOU MUST HAVE BEEN TRAINED & CERTIFED BY EITHER CME PERSONNEL OR AUTHORISED TRAINER. YOU WILL ALSO NEED A COPY OF THE USER OPERATIONS MANUAL AT HAND FOR REFERENCE.

Terms used in manual

Warning: Indicates that the information is a warning. Warnings advise you of circumstances that could result in injury or death to the patient or operator.
Read and understand this manual and all warnings completely before operating the *T34L Syringe pump*.

Caution: Indicates that the information is a caution. Cautions advise you of circumstances that could result in damage to the device.
Read and understand this manual and all cautions completely before operating the *T34L Syringe pump*.

☞ **NOTE**: Indicates that the information that follows is additional important information or a tip that will help you operating the *T34L Syringe pump*.

Alarms Conditions

At any time, when the pump detects a problem, an alarm is activated and the following will occur:

- An alarm message appears on the display, stating the cause of the alarm and indicates instructions for continued use. The operation LED will light Red.
- An audible alarm sounds.
- The infusion stops.

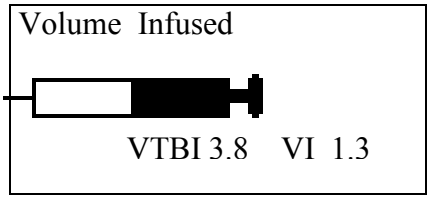
Alarms

- Down Occlusion
- Pump Unattended
- Low Battery
- End Battery
- Internal Malfunction
- End Program
- End Travel
- Syringe Displaced
- Near End 15 minutes before completion.

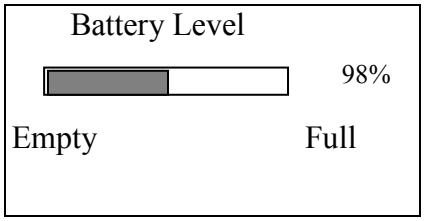
The “Troubleshooting Table” describes the pump’s alarm conditions and remedies.

Info Mode

Pressing on the **INFO** key during operation will display the total Volume To Be Infused and the Infused Volume. The screen will be displayed for 7 seconds.



Pressing **twice** on the **INFO** key during operation will display the battery status.The screen will be displayed for 7 seconds.



☞ **Note:** Exit from the **INFO** mode is automatic after 10 sec, or can be achieved by pressing the **INFO** key.

Access Code List

The T34L Syringe pump has 2 access codes & a Key lock feature to control user access to authorized personnel only and prevent tampering. Service technicians will need to be familiar with these codes to access all areas of the pump to effect service and repair.

Code '99' – Access to pump "Change set up", Allows locking program parameters.

Code123– Allows authorised technicians to access testing & service menu.

Key lock – enables user to lock all but the info & Stop keys to prevent tampering with the pump.

Before performing any maintenance procedure:-

a. You must have training & certification from either the manufacturer or distributor and have the recommended equipment and authorised spare parts at hand to perform the required maintenance or repair.

b. Check the History events to define the frequency & nature of the complaint, and record program and calibration settings at the time of the event.

c. Enter the technicians menu (power up the pump by holding down the INFO & POWER key simultaneously until the Technician Code prompt appears). Enter code 123. Press YES key to confirm.

   Scroll to and perform 'Main Self-Test' and record any failures or issues identified during the test.

Service Decision Pathway

When a T34L Syringe pump is returned for service or repair after a 'fault' is reported by a user always request a full explanation and description of the fault experienced by the user and, if possible and appropriate, ask for the return of the administration set in use at the time of the fault. Be mindful of the following factors as part of the service/repair procedure: -

1. Has the user operated the pump correctly? Cross reference their report with the Operations manual to ensure the steps they took prior to the alarm did not cause or result in the alarm state or error cause.
2. Was the faults in one of the pump sensors (identify which one and replace it) or one of circuit boards (identify which PCB failed and replace the board). Use on the technician mode, either "main self test" to pass all the testable option or "manual test" to select a specific function.

Possible Issues: -	**Corrective Action: -**
1. User error	Refer issues back to department lead and suggest training/alerting all users to prevent the same error being repeated.
2. Fault with Syringe or administration set	Check correct Syringe used. Is it on the approved list of syringes?
3. Failure of pump	Perform Main-Self test on Tech menu
3. Mechanical failure	Change the defective part
4. Electronic failure	Change the relevant PCB
5. Failure of sensors: Syringe detection, sensors 1-3.	Replace the module.

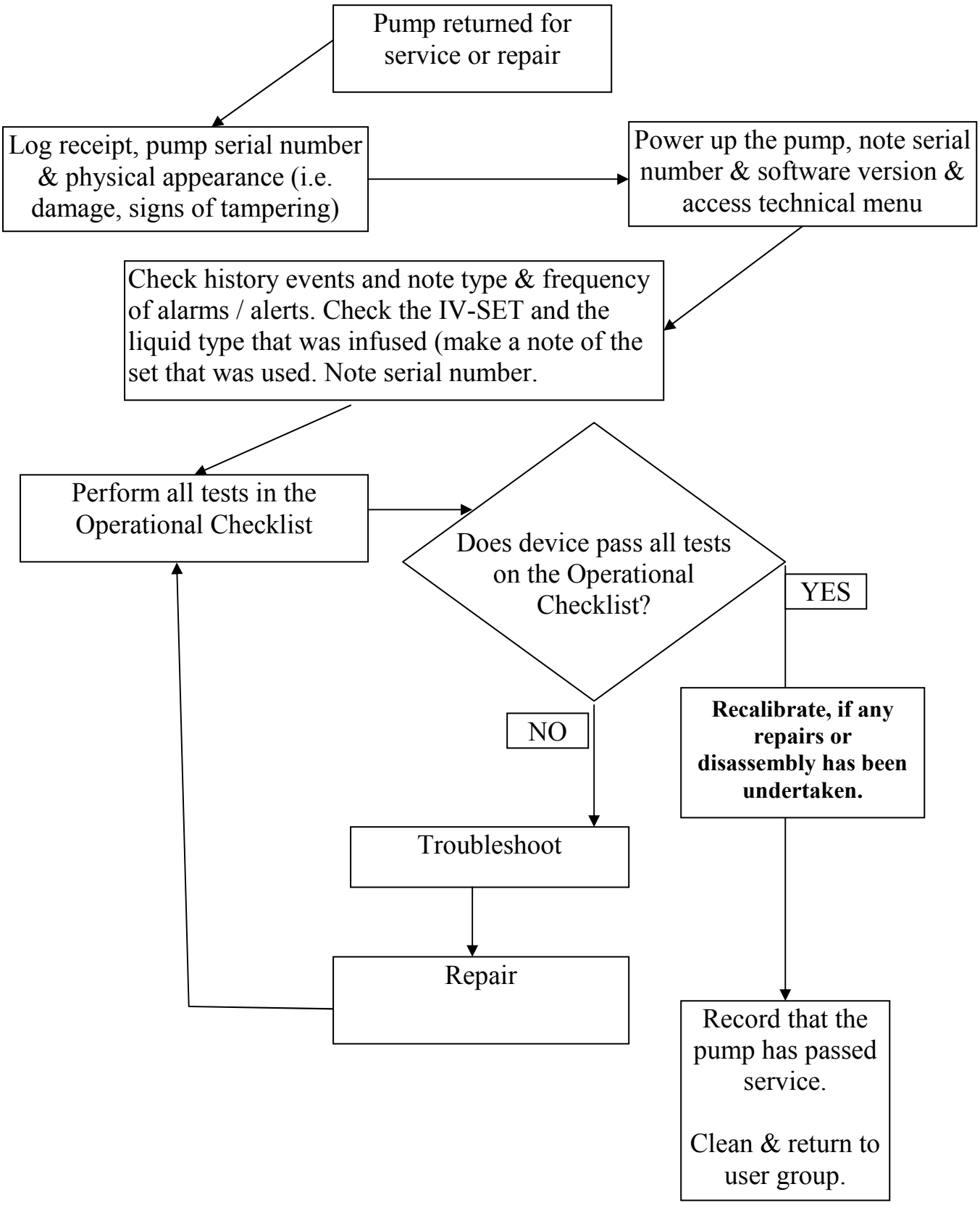
Technician Menu

To access the technician menu, press and hold the **INFO** key and **POWER** button at the same time until "Technician code" prompt appears. The display will show the software version for 2 seconds before the access code prompt. Enter code 123 to access the technical menu.

The pump will display all the parameters that can be set, calibrated or tested. The technician can scroll through all parameters using the **ARROW** keys .

Menu Item	***Setting***	***Screen***
1	Exit from Technician	Exit Technician Mode
2	Serial Number	Displays serial number & production date
3	Main Self-Test	Runs through keypad, display, alarm sound, Syringe sensors test, Syringe diameter test, syringe travel test,Battery voltage test, exit.
4	Manual Test	Same As main self test but with a menu to focus the user on individual tests.
5	Syringe Set-up	Adjust default diameter on the list of approved syringes.
6	Pressure Calibration	Allows calibration and pressure settings
7	Factory Press. Test	Fine tuning of pressure calibrations
8	Pressure Test	Tests actual pressure
9	Syringe Travel	Calibration of syringe movement about 68 mm.
10	Diameter calibration	Tests the syringe barrel sensor
11	Syringe Dead Space	The actuator limitation to deliver all volume
12	Volume Test	Performing flow rate test
13	Factory Setting	**Caution** – pressing START/YES will restore factory defaults and delete all pre-set protocols and set-up changes.
14	Operation Hours	Hours from last service.
15	Service Interval	Number of hrs before Send for Service message
16	Purge Volume	Set Maximum volume user can purge.
17	Maximum Rate	Set Rate Limit

Maintenance Flow Chart



Operational Checklist

Introduction

The operational checklist detailed in this section determines if the device is operating correctly and should be carried out before and after any service or repair work. If the device fails any test in the checklist, the fault must be recorded & corrected prior to placing the device back into clinical use. Please become familiar with all checklist procedures prior to carrying out any tests.

The following test equipment is required to perform the tests in the Operational Checklist: -

- Syringe 50/60 ml filled with tap water
- Pressure gauge
- Electronic Balance or burette or Infusion tester
- Leakage Current testing device (for safety tests)
- Connecting flat cable between the front and rear housing

Once a problem has been identified and isolated to a single assembly, the assembly should be replaced in accordance with the disassembly procedures provided in this manual.

After all repairs are completed, the operational checklist should be repeated and the device should be re-calibrated.

Pump Set-Up for testing

Please ensure you have, & are familiar with, the device Operation Manual before performing these tests. **The procedures in this section are designed to check that the Syringe pump is infusing correctly prior to testing the effectiveness of the alarms.** If the pump fails to perform as described or displays an error cause – troubleshoot and repair before repeating the test. The pump will display Restart pump message, press the info key for more details.

1. Switch the pump on; allow preloading procedure to be completed. *Verify that the syringe holder is set down.*

2. Verify that all sensors (syringe holder, barrel ear and plunger ear) are blinking.

3. Load a syringe, verify that the pump detects the syringe size and brand; the pump may detect a different brand but never a different size. (see operations manual)

4. Select the correct brand and press yes to confirm.

5. The pump will display the calculated volume. Verify that the detection is correct, if not return to step 1.

6. Confirm or change data of time default, calculated rate, and the accumulation screen, start infusion.

7. Verify the operation LED colour does change from red to flashing green, .

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INFUSION TEST

The following test checks that the pump does not exhibit alarms or error causes during normal operation: -

1. Switch the pump on using the on/off key. Allow preloading procedure to be completed.
2. Load a syringe (refer to operation manual for approved list of syringes)
3. Verify the pump will detect the syringe correctly, to confirm syringe type press the YES key or use arrow keys to select another brand.
4. Verify the displayed volume, confirm with YES key.
5. Change the calculated rate to 5ml/h and press YES, verify the warning screen will appear.
6. Press YES key to confirm calculated/set rate.
7. Check accumulated data on the screen and confirm.
8. Press the YES key to start infusion.
9. If the pump stops infusing and reports an alarm troubleshoot using the table on pg37
10. Below is a list of events and alarms that can appear in the Event Log

Alarms	Operation events
1.Timer communication fail	a. event No
2. External EEPROM fail	b. Date & Time
3. Timer battery fail	c. Switch on
4. Internal EEPROM fail	d. info: Volume infused
4. Hardware reset	e. Volume to be infused
5. Setting test fail	f. Rate
6. Startup motor stop fail	g. Type of Syringe
7. Watchdog current	f. Length in ml/mm
8. Watchdog time error	g. Pressure settings: 0 - 10 psi
9. CPU test error	h. Pressure actual
10.Shadow compare error	i. Battery voltage
11.ADC converter fail	j. Rate Titration

12.Oscillators fail	k. Stop
13.STAC overflow	l. Low Battery
14.UPD counter overflow	M .Pump Unattended
15.External light fail	n. Down Occlusion
16.Revolution enc. Fail	o. End travel
17.No motor steps- 20 min	q. Syringe displaced
18.Motor voltage overflow	
19.Long revolution time	
20 Short Rev. time	
21. Over Rev. in minutes	
22. Less Rev .in minutes	
21.No rotation detected	
24. Actual Rate test err.	
22.Startup motor move fail	
23.Ends sensors fail	
24.Current sensor fail	
25.Syringe type diameter	
26.Wrong volume leng	
27.Long stop mode int.	
29.Reset by COP counter	

11. To restart infusion, press the START/YES key.

12. When the pump has delivered the selected volume, an audible alarm will be activated while the display will show “Program End” and default to ‘KVO’ if enabled. To stop the alarm, press the STOP/NO key.

13. Check that the pump is infusing the KVO rate.

Trouble shooting

Alarms or Complaints	Possible cause	Action
Volume Accuracy is not accurate	Wrong detection of syringe, or incorrect setting of hard height.	1. Check that the correct syringe was selected. 2. Perform Syringe Travel Calibration (tech menu) 3. Check Hard Height measurement in Tech menu
Pressure Accuracy is not accurate	If during maintenance the pressure readings are faulty	Recalibrate pressure accuracy as described in pressure calibration section.
-Pump does not switch on	Battery depleted	Change Battery
	On/off key malfunction	Replace the main PCB
	1. External interrupt or electronic malfunction (electrostatic discharge) 2. Encoder plate not mounted properly. 3. Encoder LEDs or phototransistors are damaged 4. In case motor can't turn 5. If the problem consist	1. Restart the pump. 2. Remount the encoder plate. 3. Replace Encoder PCB 4. Replace motor 5. Replace main PCB
Pump will not perform preloading	The syringe holder is located in the upper position.	Set syringe holder to the down position.
The FF & BACK keys will not function	1. A syringe is loaded 2. Syringe holder is up 3. Syringe sensor malfunction	1. Remove Syringe 2. Place syringe holder down 3. Replace syringe sensor. 4. Check connection on the front pumping block. If it has no fault, replace slide potentiometer.
Purge disabled	The pump was switched on, while a syringe was loaded.	Remove syringe, switch off and on again.
Volume can not be increased	The pump will not allow to increase volume above the volume in the syringe	Software protection.
Syringe holder sensor not sliding	Syringe detection sensor malfunction	Replace syringe holder
Operation LED malfunction	Operation LED is not working during operation	Check set up, if enable or Change the main PCB
Maximal basal rate limited	The maximal rate setting was set to a lower value	Change the maximal rate to higher limit in 'Change Set Up'
Rate Titration disabled	1. In the Change set up the rate titration setting was disabled 2. Program is in lock state	1. Enable titration mode 2. Unlock program.

Alarms or Complaints	Possible cause	Action
Down Occlusion	Occlusion detection malfunction	Recalibrate pressure accuracy as described in pressure calibration section, replace main PCB.
Hardware Reset or Reset by external pin	1. External noise 2. 9V battery low or depleted 3. Battery contacts dirty 4.Mechanical malfunction 5. Motor PCB malfunction 6. Main PCB malfunction	1. Turn the pump off and on again and if problem continue send to manufacturer. 2. Replace battery 3. Clean battery contacts 4. Check motor and replace 5. Replace motor PCB 6. Replace main PCB
Setting Test fail	1. Ram corruption 2. Syringe data out of range 3, Data setting corrupted 4. Device not calibrated after main PCB replacement 5. Corruption of s/n, production date and dead space.	1. Turn the pump off and on again using the same syringe, and if problem continue send to manufacturer. 2. Enter technician mode and check the data for the current syringe 3. Restore data by performing Factory Setting 4. Perform calibration of : Syringe travel, syringe diameter and pressure calibration with 50 ml syringe 5. Enter those parameters and confirm
Long Stopmode int or Reset by COP counter	Timer communication fail	1. Turn the pump off and on again if problem continue send to manufacturer. 2. Check lithium battery or replace motor PCB 3. Replace main PCB.
Startup mot or stop fail	1. Failure during switch on test 2. Motor PCB malfunction 3. Malfunction of Main PCB	1. Restart the pump. If problem continue sent to service. 2. Replace motor PCB 3. Replace main PCB
Actual rate test error or Long revolution time or over revolution in minutes or less revolution in minutes	1. Mechanical Malfunction or High friction of syringe 2. End of travel, forcing against housing 3. See revolution encoder fail	1. Check syringe, the pump is calibrated to operate with new syringes or replace pumping assy.
Watch Dog Current	1. External noise during switch on 2. Motor PCB malfunction 3. Main PCB malfunction	1. Turn the pump off and on again , and if problem continue send to manufacturer. 2. Replace Motor PCB 3. Replace Main PCB
Watch Dog time error	Main PCB malfunction	Replace main PCB

Alarms or Complaints	Possible cause	Action
Shadow compare error	1. Curruption Ram 2. MAIN PCB malfunction	1. Turn the pump off and on again , and if problem continue send to manufacturer. 2. Replace main PCB.
Oscillator fail	1. External noise due to electrostatic discharge 2. Water ingress 3. The connector between PCB –pins dirty 4. Lithium battery less than 3V 5. Motor PCB malfunction 6. Main PCB malfunction	1. Turn the pump off and on again , and if problem continue send to manufacturer. 2, Dry the device 3. Clean pins of connector between main and motor PCB's 4. Check and replace lithium battery. 5. Replace motor PCB. 6. Replace main PCB.
Stack Overflow	Microprocessor malfunction	Replace main PCB
UPD counter overflow or Motor current overflow	1. Mechanical malfunction 2. Motor PCB or connection to main PCB 3. Encoder PCB malfunction 4. Encoder plate loose	1. Perform Syringe Travel calibration 2. Replace pumping block 3. Replace motor PCB and clean connectors. 4. Replace encoder PCB. 5. Fasten encoder plate
ADC converter fail	External interrupt or electronic malfunction (electrostatic discharge)	Turn the pump off and on again. If problem continue replace main PCB.
	Electronic malfunction	Replace main PCB
External light fail	1. Encoder detects external light 2. External noise 3. Malfunction of encoder PCB 4. Connecting cable between encoder and main PCB damaged 5. Main PCB malfunction	1. Make sure pump case is closed with 6 screw and not broken 2. Turn the pump off and on again , and if problem continue send to manufacturer. 3. Replace encoder PCB. 4. Check or replace 5. Replace main PCB.

Alarms or Complaints	Possible cause	Action
Internal EEPROM fail	Microprocessor malfunction Memory malfunction	Replace main PCB Turn the pump off and on again. If problem continued: 1. Perform factory setting, from the technician mode. If problem continued: 2. Perform reset calibration and calibrate the pump again. If problem continued: 3. Burn software again (refer to instructions. Do not save previous calibrations).Calibrate the pump again. If problem continued: 4. Replace main PCB.
Revolution encoder fail	1. External noise 2. Magnet on motor adaptor, weak or disconnected 3. READ switch 1, 2 broken 4. Encoder plate loose	1. Turn the pump off and on again. If problem continued send to Manufacturer. 2. Replace magnet on motor adaptor 3. Replace motor PCB. 4. Tighten encoder plate
No motor steps 20 minutes	Main PCB malfunction	Replace main PCB
No rotation detected	Encoder malfunction Motor malfunction	1. Turn the pump off and on again. 2. Replace block assembly. 3. Replace main PCB 4. If problem continues, send to manufacturer.
Start up motor move fail	1. Lock at end travel 2. Mechanical or motor malfunction 3. Motor PCB malfunction 4. Malfunction of Main PCB 5. Encoder plates loose 6. Encoder or connecting flat malfunction	1. Move manually out of looking. 2. Turn the pump off and on again. If problem continued replace pump mechanics. 3. Replace motor PCB and check pins of connector to main PCB. 4. Replace main PCB 5. Tight encoder plates. 6. Check and replace encoder PCB and flat to main PCB.
Ends sensor fail	1. Limit sensors malfunction, 2. Magnet on actuator weak 3. Flat cable malfunction	1. Check or replace read switches 2. Replace encoder magnet. 3. Check or replace flat cable
Current sensor fail	1. Motor PCB Malfunction 2. Main PCB malfunction	1. Replace motor PCB 2. Replace main PCB
Syringe type diameter	Syringe diameter not calibrated	Enter manual test and perform syringe diameter test , recalibrate if necessary.
Wrong Vol. lengths	Wrong data entered mm/ml	Recalibrate syringe
CPU test error	Microprocessor malfunction	Replace main PCB
Timer communication Fail	1. External noise during communication 2. Timer battery – low 3. Motor PCB malfunction 4. Main PCB malfunction	1. Turn the pump off and on again and set pump to operate on 0.1 ml/hr rate, if problem continue send to manufacturer. 2. Check voltage on lithium battery, if less than 3v , replace battery 3. Replace motor PCB 4. Replace main PCB

Alarms or Complaints	Possible cause	Action
Timer's battery Fail	1. It is the first pump operation after service 2. 3V battery damaged	1. Turn the pump off and on again. 2. Replace 3V battery
External e-eprom fail	1. External noise during communication 2. Motor PCB malfunction 3. Main PCB malfunction	1. Turn the pump off and on again and set pump to operate on 0.1 ml/hr rate, if problem continue send to manufacturer. 2. Replace motor PCB 3. Replace main PCB

Note: in order to prevent the possibility of wrong detection of syringes, we recommend using only approved brands. Avoid using brands that their external diameter is close, less than 0.5 mm. The medical institution will have to decide on one of them.

Maintenance Introduction

This section contains a table describing preventive maintenance, which should be performed on the *T34L Syringe pump*. The maintenance procedures outlined in this section may be performed in the hospital, by qualified and certified biomedical engineers. If an abnormal condition occurs, which is not correctable by performing the following procedures, remove the device from service and troubleshoot in accordance with the troubleshooting table, or return to manufacturer or distributor for service.

Maintenance Procedures

Preventive Maintenance

The following table presents a list of problems, tests and correction to aid the diagnostic of possible pump malfunction. Review this list whenever a condition exist that does not appear to be normal. Perform the specified checks and corrections. If the problem cannot be corrected, remove the pump from service user service and troubleshoot in accordance to troubleshooting table, or return to service to manufacturer.

Schedule: at least once a month or as required

Clean pump housing with a suitable cleaning agent, as described on next page.
Check housing for damage and replace any labels that are damaged.

Schedule: at least every 12 month or as required

Perform all above tests, and perform the following Functional Test Procedure

Functional Test Procedures

Remove Program lock.

To perform the following tests, the program lock should be disabled. To do so: -

1. Switch the pump on allow Pre-Loading to complete.

2. Press the blue Info (i) key, then scroll down (using UP/DOWN arrow keys) to ‘Change Setup’ enter code 99 by using the arrow keys. Then press ‘YES’ to confirm code.

3. Scroll up the menu to ‘Program Lock’ press ‘YES’ to confirm selection.

4. Use either arrow key to change the Program Lock status from ON (default) to OFF. Press YES to confirm change.

5. Scroll down to ‘Exit’ Press ‘Yes’ to exit set up menu.

By removing the program lock, this enables you to change the default duration so that the infusion rate available for these tests is anything up to the 5ml/hr maximum set under the Technician Menu.

Syringe Recognition and volume detection test.

Equipment needed: -

- T34L Syringe Pump
- Selection of syringes used in the Hospital or Trust.

Method

1. Switch the pump on and allow Pre-loading to complete. Position of the carriage should not be important except possibly for some smaller syringes where the actuator may have moved beyond the fully extended size of the syringe. Use the FF key to move the actuator to the desired position. FF key movement is limited for safety reasons so repeated presses may be necessary to position.

For each of the syringes: -

2. Lift the barrel clamp arm and place the syringe on the pump as described in the Operations manual ensuring the collar/flange and plunger are position correctly. Place the barrel clamp arm down on top of the syringe barrel.

3. The LCD screen should show the LOAD SYRINGE message and after a few seconds a volume and brand. If this screen remains with parts of the syringe graphic flashing (or a message is shown) check the loading of the corresponding syringe part or follow the message to complete correct placement of the syringe.

4. The pump should ALWAYS display the correct volume but may not always immediately give the correct brand. Use the arrow keys to scroll through the list of syringe brands (pump shows those within +/-3% diameter of the one loaded). Select the correct syringe brand and Press Yes to confirm selection.

5. Read the actual volume on the syringe and compare it with what the pump reads the volume as, these results should be within +/-3%. If the result does not fall within the expected range: -

    a. Check that there is no slack in the system (visible space in the seating of the plunger or the collar/flange. In such cases purge may be required before repeating the test (refer to Operations Manual)

    b. Re-check that the syringe loaded is the same brand as confirmed at step 4

        i. If the error remains outside of specification after checking point a & b then the pump has failed the test and corrective action is required.

6. Remove the syringe, turn the pump off, place the arm down and repeat steps 1-5

Volume Delivery test.

Equipment needed:-

- 10ml Syringe filled with Water for Injection
- Syringe pump infusion set
- Pipette or Flow analyser

1. Prepare the syringe and infusion set by attaching set to the syringe and manually priming the infusion set to eliminate ALL air from the system.

2. Attach infusion set to analyser or pipette (using a three way valve to allow the pipette level to be adjusted to scale)

3. Switch the pump on with barrel clamp arm down and allow Pre-loading to complete.

4. Position the carriage to fit the syringe using the FF or Back key

5. Lift the barrel clamp arm and Load the syringe. Use the arrow/scroll keys to select the correct make from the list (as described in the Operations Manual). Press 'YES' to confirm selection

6. Purge the system to ensure all the slack is taken up. With the volume displayed press the 'FF' key and follow the instructions on screen. (Default purge volume is 0.2ml)

7. Change Volume to be infused to 1ml by using the arrow keys. Press 'YES' to confirm

8. To speed up the test scroll down to reduce the Duration of the infusion to the minimum allowed (scrolling will cease when the minimum is reached – if 1ml volume is selected this should be 00:12 (twelve minutes))

9. Pump will display rate but will not allow change. All changes to rate must be done by Pressing NO to back up to Duration screen and changing the Duration. Confirm Rate 5ml/hr. Press Yes three further times to start infusion.

10. The *Near End Alarm* will sound at about 1 minute/5mm before the end depending on syringe size.

11. The T34L will alarm End Program or End Travel when it has delivered the 1ml

12. Confirm *End Program* Alarm.

13. Check volume delivered against the volume in pipette.

Occlusion Test

Equipment needed: -

- 10ml Syringe filled with Water for Injection
- Pressure gauge

1. Switch the pump on and allow Pre-Loading to complete. Re-position the actuator if necessary using the FF or BACK key.

2. Load the syringe and select the correct brand from the list (as described in the Operations Manual). Press 'YES' to confirm

3. Purge the system to ensure all the slack is taken up. With the volume displayed press the 'FF' key and follow the instructions on screen. (Default purge volume 0.2ml)

4. The volume is not relevant for this test so press YES to confirm the volume detected

5. To reduce the time required for this test, use the arrow keys to scroll and reduce the Duration to the minimum allowable (probably 02:00, two hours) if the 10 ml syringe is full (5ml/hr).

6. Confirm Rate displayed by pressing YES.

7. Connect the syringe to the giving set and pressure gauge assembly.

8. Press Yes 3 further times to start infusion.

9. You need to watch the pump because, As soon as the T34L alarms the anti-bolus system comes into operation causing the pump to reverse and the pressure is almost immediately reduced to a safe level to prevent post-occlusion boluses to the patient. Default pressure is set to 540mmHg.

10. Check Occlusion alarm operates at 540mmHg (tolerance range 413 to 724mmHg)

Alarms Test

T34L has the following alarms: -

Syringe displaced – To Test while the T34L is pumping take the syringe off the pump, the alarm is activated and a screen message describes the cause.

Occlusion/Syringe Empty – pump has sensed a pressure above the alarm level. Possible occlusion or actuator has reached end of travel/syringe empty. Tested during Occlusion Test

Near End – alarms when pump is 5mm or 2 minutes from end of infusion. Whichever is greatest. Tested during Volume test

End Program – Volume to be Infused set during programming has been infused. Tested during Volume Test

Pump Paused to Long – Leave the pump on a setting screen and do not press any key for 2 minutes, the pump should alarm after two minutes.

Restore Program lock.

Once all the tests have been performed, the program lock needs to be turned back on if this is how your facility, department, hospital or Trust has opted to have the devices configured.

To do so: -

1. Switch the pump on allow Pre-loading to complete.

2. Press the Info(i) key scroll down to ‘Change Setup’ enter code 99 by using the arrow keys. Then press ‘YES’ to confirm code

3. Scroll up the menu to ‘Program Lock’ use the arrow key to change the setting from OFF to read ‘ON’ and press YES to confirm.

4. Scroll down to ‘Exit’ Press ‘Yes’. The LCD displays the Flashing Syringe.

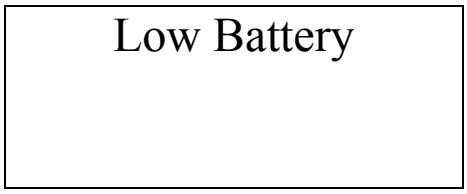
5. Turn the pump off.

Battery Operation

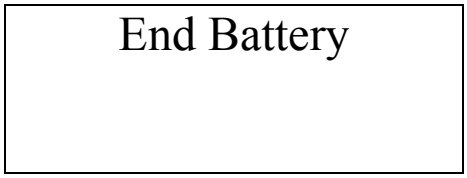
☞ **Note:** User should verify that the battery is in good condition, by pressing the info key during program set up or operation, pressing twice the info key to display the battery status.

There are two battery alarm conditions:

1. The pump will warn that the battery is low before the "end battery" alarm activates.



2. When the battery is depleted, the pump will cease operation and the "end battery" alarm will be activated.



- If the battery runs out, **End Battery** appears on the display. The pump stops the infusion.
- From the "End battery" state the user cannot restart the pump, until the battery has been replaced with a new one.

Electrical Safety

The T34L Complies with the following standards:
EN 60601-1 (Medical Electrical Equipment Safety),
EN 601-2-24 (Infusion pumps and controllers)
IEC 60601-1-4 (Programmable Electrical Medical System)
UL 2601- 1 and CAN/CSA C22.2 No 601.1.

Service Information

While under warranty, the instrument must not be opened by unauthorised personnel.
The customer will pay all units' shipping costs (returned for service or under warranty). The unit must be packed in its original packing or in another container that will provide adequate protection during shipment.
To assure prompt return, the customers' service department must be notified before shipping any unit for repair. When calling the manufacture or distributor service centre, please be prepared to provide the serial number of the device.
A brief written description of the problem should be attached to the instrument when it is returned for service. .

Failure Identification

Specific errors, which may occur in the operation of T34L Syringe pump, and the remedy for each problem, are presented on the troubleshooting table.

On the Info mode, user may display the pump's history, to identify the pump failure. User can scroll through the last 512 events. Press on the arrow up key to show the next event. The events are displayed from the last to the first. Press the info key to full disclosure of all data relevant to the current displayed event.

The displayed failure information can be used to determine the nature of the failure and troubleshoot its cause.

Corrective Actions

Disassembly and calibration

This section of the manual includes a list of tools and test equipment required for maintenance, removing and placing subassemblies.
To ensure the device is operational, perform the operational checkout completing any of the procedures in this section.

Tools and test equipment

The following tools and test equipment is required to perform the procedures contained in this section. Since all fasteners on this device are metric, ensure that all tools used are for metric fasteners. Tightening torque on certain screws are specified in kg – cm and in lb for your convenience. The values in – lb are approximate.

Equipment

- Digital voltmeter
- Pressure gauge
- Digital balance or liquid measurment burette
- Stop watch
- Electronic Balance
- Anti – static mat.
- Anti – static work surface.
- Piston cover mounting device
- Pump front and rear extension cable
- Small craft knife
- Pliers
- Small Diameter Test Bar (12.7mm)
- Large Diameter Test Bar (29.4mm)

Tools

- Phillips screwdriver, M3
- Normal screwdriver, M3
- Allen key 0.9 mm.
- Forceps

Disassembly / Assembly - Pump

Disassembly of the *T34L Syringe pump* is limited to mechanical components. It is recommended that electrical problems be corrected by replacing entire pc board, either main PCB or motor, unless circumstances warrant component repair. Use only the replacement parts list.

Please read all steps in the procedure before beginning. The procedures are given in order of disassembly. Disassembly the device only as far as required in order to complete the repair. All fastening components such as screws, washers and nuts used in the device are metric, be sure using metric tools and replace only with metric components.
Ensure all gasket material is put back in place during reassembly.

Separation of Front and rear housing

1. Turn the device off and place it face down on an anti- static mat or a soft work surface. Make sure there are no metal parts like screws and nuts on the working surface, in order to avoid scratches to the pump housing.
2. Remove the 6 mounting screws. These 10 screws connect the front and rear housing. All 10 screws are M2.
4. Stand the device and separate the front and rear housing.
5. Reassemble the housing in the reverse order.
6. Make sure the front and rear-housing surface are lined up before tightening.
7. Press the syringe collar sensor in to enable connection of rear and rear housing.
8. Replace the 6 mounting screws and tighten them to 5 kg / m with a torque screwdriver.
9. After reassembling switch the pump ON and check that the Self-test and pre-loading procedures are performed correctly.

Replacement of Motor and pumping operations

1. Separate the front from the rear housing of the pump.
2. Remove the upper label (where the syringe sits), remove the 2 fixing screws.
3. Remove 1 fixing screw.
4. Disconnect the motor connector on the main PCB.
5. Pull the block assembly .
6. Reassemble in reverse order.
7. After removing the motor and pump operations the following calibrations will need to be performed:
    a. Syringe Travel
    b. Syringe Diameter
    c. Pressure calibration
8. Refer to the ‘Calibration Procedure’ chapter in this manual.
9. Perform the operation checkout.

Replacement of PC Board – main

1. Separate front and rear housing of the pump.
2. Remove block assembly.
3. Disconnect LCD connectors.
4. Disconnect Backlight connectors.
5. Remove front label.
6. Remove 3 screws connecting the PCB to the housing.
7. Remove the PCB. Collect the 3 spacers released and store for re-assembly.
8. Install a new motor or a new main PCB in reverse order.
9. Perform the operation checkout.
10. When replacing the main PCB, because some of the calibrations are specific to every pump. The following calibrations will need to be performed:
    a. Syringe Travel
    b. Syringe Diameter
    c. Pressure calibration
10. Refer to the 'Calibration Procedure' chapter in this manual.
11. Perform the operation checkout.

Replacement of pump motor assembly

1. Separate front and rear housing of the pump.
2. Remove the block assembly.
3. Remove 2xM2 screws using the 0.9 Allen key from front block.
4. Remove 2 M2 nuts connecting the sensor wiring.
5. Separate front block with motor from screw assembly and bosses.
6. Remove the 2xM2 screws from block. Pull motor backwards.
7. Replace using a thread locking glue between nut and lead.
8. Install a new motor and replace in reverse order. Verify the motor pin is in the screw assembly.
9. After removing the motor and pump operations the following calibrations will need to be performed:
    a. Syringe Travel
    b. Syringe Diameter
    c. Pressure calibration
10. Refer to the 'Calibration Procedure' chapter in this manual.
11. Perform the operation checkout.

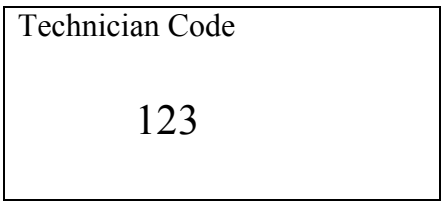
Replacement of Rear PCB

1. Separate front and rear housing of the pump.
2. Remove syringe collar sensor.
3. unsolder connection between PCB and battery, and connection between PCB and charging connector. Mark the disconnected wiring.
4. Open 3 M2 screws.
5. Lift PCB using screw driver to release the PCB.
6. Install a new Rear PCB and replace in reverse order. Use RTV to seal the potentiometer area. Potentiometer arm should fit into the potentiometer housing.
7. Perform the operation checkout.

Volume Test

1. Enter Technician Mode by Hold Info key and Power key down simultaneously until the software version is displayed and, after 5 seconds, the access code prompt will appear.

2. Using the arrow keys set code 123 and confirm by pressing START/YES key.

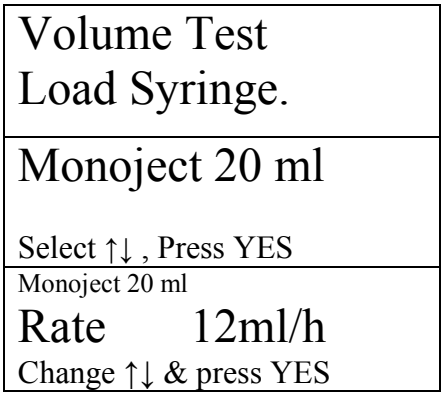


3. Use the arrow keys to scroll to “Volume Test” option and choose this option, using the START/YES key.

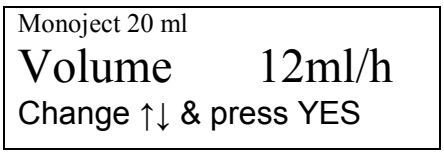
4. The display will instruct to "Load Syringe" do so, **the display will change to show the syringe loaded**

5. Press Yes to confirm, or change to the correct Syringe Brand

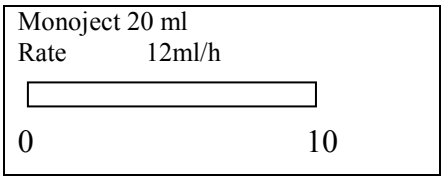
   Pressing the Yes key will enable the user to set the required rate for the volume test, set the rate and confirm with the YES key.



6. Set the required volume for the volume test, select a volume that is lower or equal to the syringe volume.



7. During the volume test the pump will display the volume to be infused in a graph that will empty according to the volume infused.



8. The volume test is recommended after every service.

Occlusion pressure calibration

1. Press continuously the info key, while switching the pump on, wait until the screen will show the Technician Code – set code 123 and press the YES key to enter.
2. Use the arrow keys to scroll to pressure calibration option. Once this option is displayed press YES to enter.
3. The display will read

Pressure Calibration
Load Force device

4. Load the 4Nm calibrated syringe force gauge into the pump.

Set Plunger 1Nm
Use FF and BACK keys
Press YES to confirm

5. The actuator will move to set the Zero pressure point, the display will read TRAVEL FORCE and a number between 4 and 12. Press YES to continue.
6. Repeat the above steps, but with the 49Nm force gauge. The display will read Pressure Sensitive and a number between 70 and 100. Press YES to continue.

   To fine tune the pressure calibration use the Factory Press. Test.

Factory Press. Test

7. Scroll down to Factory Press. Test press YES.
8. Load a 5ml syringe (loaded with water) select the correct brand press YES.

Zero Level
0 mmHg
Connect & Press OK

9. When the pumps display shows the above message connect the syringe to a pressure gauge and press the YES key. The pump will continue to drive the syringe and the pressure can be seen to rise on the gauge and on the pump display. When the pump thinks it has reach 540mmHg it will alarm and the display will read

540mmHg	
Zero Level	Sensitive
11(10)	86
Change↑↓,Press YES	

10. If the reading between the pump and the gauge is different then you need to adjust the Zero Level. Press the Yes key twice.

    Repeat the above test.

    Once the two readings are within spec, remove the 5ml Syringe.

    Repeat steps 7 to 9 but with a 50ml syringe (loaded with water)

540mmHg
Zero Level Sensitive
11(10) 86
Change↑↓,Press YES

11. To adjust the upper limit (Sensitive) from the above screen press the YES key once and using the arrow keys change the Sensitive up or down. Repeat until the readings are with spec.
12. To confirm that the pressure calibration is successful use the Pressure Test routine.

Pressure Test

1. Scroll down the Tech menu until PRESSURE TEST is displayed press YES.
2. Load any test syringe (filled with water) connect the syringe to a pressure gauge and press YES.
3. Select the correct Brand of syringe. Press YES
4. The pump will drive the syringe and the pressure can be seen to rise on the pump display and the pressure gauge. The pump will Bleep when the test has finished.
5. Check the pump display against the pressure gauge to ensure the results are within spec.

Note: The zero level data shall remain in the pump memory until changed by the user. CME is recommending the user to repeat this procedure once a year

.

Pressure Setting

In the Change Set Up option the user can select a pressure level between 100 – 1500mmHg.

Syringe travel Calibration

1 Enter Technician Mode by Hold Info key and Power key down simultaneously until the software version is displayed and, after 5 seconds, the access code prompt will appear.

2 Using the arrow keys set code 123 and confirm by pressing START/YES key.

Technician Code
123

3 Use the arrow keys to scroll to “Syringe Travel” option, press the START/YES key.

4 The display will instruct to "Remove Syringe", if loaded, do so, **the display will change to show Press FF key**

Press FF key

5 Press Yes to confirm, The actuator will move forwards indicating ‘Locating min travel’., when it reaches the end the display will change to say "Confirm min. travel Check that the actuator is touching and Press YES key, Press BACK key, the display will say Locating max. travel, wait until the actuator arrives

Confirm min. travel Press YES- continue
Press Back key

6 The display will change to say Confirm max travel, again check that the actuator is touching and press YES key, the display will show.

Press FF key

7 Press the FF Key and once again the actuator will move to the front, Once the actuator arrives, the display will ask technician to confirm min. travel with YES key.

Locating min. travel

8 Press yes to confirm

Confirm min travel Press YES-continue

9 The Travel is specific to every pump and serves as confirmation screen that the travel calibration was completed successfully.

Travel 65.6 mm Press YES-continue

10 Press YES to exit procedure.

Syringe Diameter Calibration

1 Enter Technician Mode by Hold Info key and Power key down simultaneously until the software version is displayed and, after 5 seconds, the access code prompt will appear.

2 Using the arrow keys set code 123 and confirm by pressing START/YES key.

Technician Code

123

3 Use the arrow keys to scroll to “Diameter Calibration” option, press the START/YES key.

4 The display will instruct user to set the barrel clamp to down position, do so and confirm with YES key.

Locate Barrel Clamp
to down position
0
Press YES - continue

5 Set the barrel clamp to the upper position and press YES key.

Locate Barrel Clamp
to upper position
255
Press YES - continue

6 The display will change to say Load any syringe from 2 to 5 ml and press YES key, load the small diameter test bar or a known diameter syringe into the pump and hold it with the barrel clamp. The pump will show the actual diameter, change the diameter to the correct size or confirm with the YES key

Load 2-5ml syringe
Diameter_12.3 mm
Change ↑↓ Press YES

7 The display will change to say Load any syringe from 35 to 50 ml and press YES key, load the large diameter test bar or a known diameter syringe into the pump and hold it with the barrel clamp. The pump will show the actual diameter, change the diameter to the correct size or confirm with the YES key

Load 35-50ml syringe
Diameter_32 mm
Change ↑↓Press YES

8 Technician will calibrate only one syringe; the pump will adjust the dimension automatically for all the others.

Syringe Diameter Test

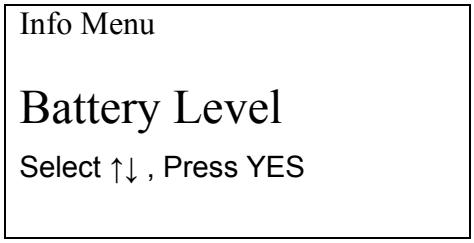
32.4 mm
Press YES - continue

9 Press YES to exit procedure.

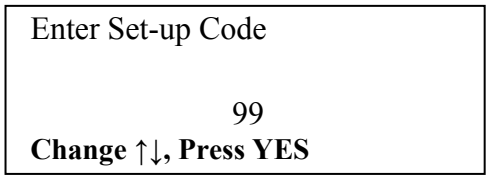
Change Set-up

Swith the pump on in normal mode. Press the INFO key twice.

1 Choose "Change Set-up" to display all software adjustable parameters.

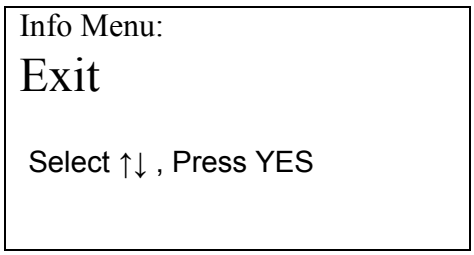


2 Set Change set-up Code (Code 99), using the arrow keys and confirm with **START/YES** key.



3 Confirm with **START/YES** key.

A list of setable parameters on the "Change Set up" menu is on the next page.



4 Scroll through the setting parameters, using the **ARROW** keys and change if necessary.

Change Setup mode access with code 99	
Time & Date	Ensures all events in log are correctly date and time stamped.
FF Key Operation	Limits the forward movement of actuator caused by pressing the FF key during syringe loading
Backlight Duration	Limits backlight duration to help preserve battery life
Info Duration	Limits the length of time the Info screen is displayed
Operation LED	Turns off the grebe flashing operation LED to preserve battery life
Titration Option	Enables setting a titration limit within max. rate range
Default Duration	When a new program is confirmed Pump resets to this default (setting to zero skips duration step during programming). When Program Lock ON (see below) cannot be set to zero.
Occlusion Pressure	setting at which occlusion alarm will activate
KVO Operation	Activates Keep Vein Open infusion at End of Infusion
Program Lock	Prevents alteration of either duration or rate during set up (with Program Lock ON Default Duration cannot be set to zero)

To Re-enable a syringe type to the pump menu

1 Enter Technician Mode by Hold Info key and Power key down simultaneously until the software version is displayed and, after 5 seconds, the access code prompt will appear.

2 Using the arrow keys set code 123 and confirm by pressing START/YES key.

Technician Code
123

3 Use the arrow keys to scroll to “Syringe Set up” option, press the START/YES key.

4 The display will show the sizes of syringe, scroll up or down to the correct syringe size needed. Confirm with YES key.

Syringe Size
2 ml
Select ↑↓ , Press YES

5 The pump will display the list of store brands, select the correct one and confirm with YES key.

Syringe Brand
20 ml BD Plastipak
Select Press YES

If the syringe has been disabled the display will show this, to re – enable this syringe press NO and Yes to confirm.

20 ml, BD Plastipak
Syringe Disabled
Refer to Ops Manual

The display will then show a summary of the manufactures data for that syringe. Press Yes to confirm

Remove a syringe from the pump menu.

TO remove a syringe from the pump menu repeat steps 1,2,3,4 and 5 the display will show the summary of the manufactures data for that syringe press NO, the display will be ‘Delete this syringe?’ press Yes key to delete or No to go back. A deleted syringe can be reinstalled by following the above instructions.

Lock Mode

The *T34L Syringe pump* provides three different level of locking:

- Level 1 Keypad Locking
  During operation all keys are disabled excluding the **STOP/NO** and the **INFO** key.
  During programming all keys are disabled excluding the **START/YES** and the **INFO** key.

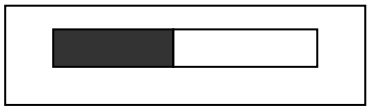
- Level 2 Program Locking
  This feature enables the operator to lock out the setting keys, so that entered parameters, or set programs cannot be changed once they are set. This option is important, for example, with children as users, when there is a danger that the child might play with the pump and unknowingly change the program; or for home-care patients whom repeating the same program every day. Locking the program prevents mistakes in setting.

- Level 3 Maximal Rate Locking
  This feature enables the operator to set a maximal rate for the pump to accept. The program rate then can be adjusted only up to a preset limit.

How to Lock

Level 1 – Keypad locking

Press and hold the INFO until the entire graph is black and a beep is heard. The beep indicates that the locking program is turned ON.



- The number one is displayed in the upper-right corner of the screen.

- The keys are locked in memory until they are unlocked or until entering *Change set up* mode.

To unlock the keys:

Press and hold INFO key until the entire graph is cleared and a beep is heard. The beep indicates that the locking program is OFF. The number one is no longer displayed in the upper-right corner of the screen and the keys are unlock.

Level 2 – Program locking

1. Press INFO key twice from STOP or setting mode.
2. Scroll to "Change Set up" option.
3. Enter code 99, and press

4. Press YES key to enter change Set up Mode

Using the arrow keys scroll to "Lock Mode".

The default setting is OFF.

Unlock in the same procedure.

Level 3 – Maximum rate locking

The home-care company can adjust the Maximal rate acceptable according to patient needs:

1 Press continuously the info key, while switching the pump on, set technician code 123 and press YES key to enter.

Use the arrow keys to scroll to Maximum Rate option.. Once this option is displayed press YES to enter

2 Set technician Code (Code 123), using the arrows keys, and confirm with **YES**.

Technician Code
123
Select ↑↓ , Press YES

3 Scroll through the setting parameters, using the **ARROW** keys, until the "Maximal Rate" option. Confirm with **YES** key.

Bolus Rate
Maximal Rate
KVO Rate

4 Set the maximal rate, using the **ARROW** keys and confirm with **YES** key.

Maximal Rate
500 ml/h
Adjust & press OK

☞ **Note:**

- The selected Locking Option will remain in the pump's memory until changed by the user.
- Whenever the pump is in more than one locking level, the higher level will be displayed on the right side of the screen.

Service and Maintenance

Cleaning

Before connecting the pump to a patient, and periodically during use, clean the unit using a lint-free cloth lightly dampened with warm water and a mild detergent or disinfectant.

Warning: Always turn the pump off, and remove the battery before cleaning.

Warning: Always unplug the docking station from AC power before cleaning.

Caution: Do not clean the pump or docking station with chemicals such as Xylene, Acetone or similar solvents. These chemicals can cause damage to plastic components and paint. Use a lint-free cloth dampened with warm water and a mild detergent or disinfectant.

Caution: Do not soak or immerse any part of the pump or docking station in water.

Storage

If the pump is to be stored for an extended period it should be cleaned and the battery removed. Store in a clean, dry atmosphere at room temperature and, if available, employ the original packaging for protection.

Perform functional tests once every three months.

Symbols, Warnings and Cautions

System Symbols

The following symbols are used on the T34L Syringe pump Infusion System and components. Labels on the system or statements in this manual proceeded by any of the following words and/or symbols are of special significance, intended to help you to operate the pump in a safe and successful manner.

Attention, consult accompanying Instructions.

CSA Mark

CE mark indicates conformance to Medical Device Directive 93/42/EEC.

Do not dispose of in municipal waste. Symbol indicates separate collection for electg,rical and electronic equipment. (WEEE Directive 2002/96/EEC). **NOTE**: Does not apply to the battery.

Do not dispose of battery in municipal waste. Symbol indicates separate collection for battery is required.

IPX1 Level of protection against fluid ingress

The use of single-use disposable components on more than one patient is a biological hazard. Do not reuse single-use disposable components.

Type CF applied part.

Date of Manufacture

SN Serial Number

Expiry Date of disposable

LOT

Lot Number

STERILE	EO

Sterilized with Ethylene Oxide

Intended Use

The T34L syringe pump is designed to transfer medication and fluids intravenously. The system is intended for patients who require maintenance medications and general I.V. fluids therapy in hospital and home care environments.

Warnings

To avoid possible personal injury or loss of life, observe the following:


Read the entire Operation Manual before using the pump, since the text includes important precautions.


The maximum volume that may be infused under SINGLE FAULT CONDITION is 0.1 ml.


Voltage present on internal components may cause severe shock or death upon contact. Disconnect the Docking station from the mains, prior to opening the casing. Only trained service personnel should open the pump cover.


Blown fuses could cause a fire hazard. Replace blown fuses on the Docking station only with fuses of the same type and rating (see fuse values on the Docking station PCB).


The equipment is not suitable for use in the presence of flammable anesthetic-air/oxygen/nitrous oxide mixture. Do not use the T34L in the presence of these gases.


A kinked or occluded IV line may impair the operation of the pump and the accuracy of the infusion. Before operation, verify that the IV line is not kinked or occluded.


Any adjustments, maintenance, or repair of the uncovered pump may impair the operation of the *T34L Syringe pump* Infusion System and/or the accuracy of the infusion. Authorized skilled technicians should perform any adjustments, maintenance, or repair of the uncovered pump. Any adjustments, maintenance, or repair of the uncovered pump while connected to the power should be avoided.


The *T34L Syringe pump* should be operated within a temperature range of 15°C (50°F) to 45°C(115°F) and at up to 85% humidity. Operating the pump at temperatures and/or humidity other than within that range may affect accuracy.


Unsafe operation may result from using improper accessories. Use only accessories and options designed for this system.


The T34L should not be use for blood, blood products or nitroglycerin administration.


Dropping the *T34L Syringe pump* could cause damage to components. If the pump is dropped, return the pump for inspection by qualified service personnel.


Use aseptic technique. Patient infection may result from the use of non-sterile components. Maintain sterility of all disposable components and do not re-use single use IV sets.


Do not operate the pump near high-energy radio-frequency emitting equipment, such as electro-surgical cauterizing equipment, and cellular phones. False alarm signals may occur.

Cautions

To avoid possible damage to the equipment, observe the following:

Do not store the pump with the battery.

Xylene, Acetone or similar solvents could cause damage to components. Do not clean the pump with these chemicals. Clean solution spills on the pump immediately. Use a damp cloth or sponge. A mild detergent may be used. Wipe thoroughly with a dry cloth.

Immersing the *T34L Syringe pump* Infusion pump into liquid could cause damage to components. Do not immerse the pump into any type of liquid.

Battery leakage could occur if left in a temperature warmer than 50^0C

Service Centre Recommended Part List

Part No.	Part Description	Recommended QTY.
500-501SL	Main PCB Assembly	1
500-309XA	Pump Display	1
220-000SL	Pump Motor Assembly	1
300-001SL	Plastic Housing – Front	1
400-001SL	Plastic Housing – Rear	1
230-000SL	Actuator assembly	1
230-200SL	Front sensor	1
230-300SL	Slide potentiometer assay	1
200-000SL	Pumping Block Assembly	1
220-000S	Pump Motor	1
500-547SL	Rear PCB Assembly	1
LS300-040	Keypad Label	1
400-339SL	Rear Label	1

T34L Syringe pump Default Settings

The pump is programmed with a number of default parameters that can be changed using 'Change Set Up' from the Info menu and using the Change Set up Access Code.

PARAMETER	***PURPOSE***	***Default***	***RANGE***
Exit	Exit the Info Mode		Press YES key
Battery Level	Current battery level		Empty >> Full - %
Event Log	Last 512 events		Info for full disclosure
Change Set up	Change default parameters		Enter access code
Change Setup mode access with code 99			
Time & Date	Ensures all events in log are correctly date and time stamped.		Day, Month, Year. Hrs Mins
FF Key Operation	Limits the forward movement of actuator caused by pressing the FF key during syringe loading	2mm	0.1 – 100mm
Backlight Duration	Limits backlight duration to help preserve battery life	5 sec	0 – 60secs.
Info Duration	Limits the length of time the Info screen is displayed	5 sec	1 – 20secs.
Operation LED	Turns off the grebe flashing operation LED to preserve battery life	32 sec.	Disable, 2, 4, 8, 16, 32, 64sec
Titration Option	Enables setting a titration limit within max. rate range	disabled	Enabled/Disabled
Default Duration	When a new program is confirmed Pump resets to this default (setting to zero skips duration step during programming). When Program Lock ON (see below) cannot be set to zero.	24 Hours	00:01 to 99:00 hours
Occlusion Pressure	setting at which occlusion alarm will activate	540mmHg	100 – 1500mmHg
KVO Operation	Activates Keep Vein Open infusion at End of Infusion	Disabled	Enabled/Disabled
Program Lock	Prevents alteration of either duration or rate during set up (with Program Lock ON Default Duration cannot be set to zero)	ON	ON/OFF

Technician Mode (123)			
Serial Number / Production Date	Unique ID number and date pump was produced. (Wk No. Month, Year.)		
Main Self Test	Automatically sequences through the following tests. Keypad, Display, Acoustic Alarm, Syringe Sensors, Diameter, Power Voltage,		
Manual Test	Allows manual selection of the above tests		
Syringe Set up	Add or Delete syringes from the default list		See ADDING/DELETING a Syringe
Pressure Calibration	Pressure Calibration routine using the calibrated force gauges		See Pressure Calibration
Factory Press. Test	Test routine to fine tune the pressure calibrations, using a 5ml and 50ml syringe.		See Pressure Calibration
Pressure Test	Test routine to ensure pressure calibration is within specifications		
Syringe Travel	Sets up the Volume sensing system by ensuring the CPU knows the position of the actuator		See Syringe Travel Calibration in this manual
Diameter Calibration	Sets up the syringe recognition system.		See Diameter Calibration in this manual
Syringe dead space		11 mm	
Volume Test	Can be set to any volume at any flow rate		
Factory Settings	**Reset all settings to default.**		
Operating Hours	Number of hours in use		Can be reset by pressing the NO key
Service Interval	Warning can be set when a preset number of operating hours has been reached		0 – 50000 hrs
Purge Vol.	Reduce the start up time	0.2 ml	0 – 0.5 ml
Maximum Rate	Maximum flow rate the pump will operate at.	5ml/h	0.05 – 1000ml/h

LIMITED WARRANTY

The *T34L Syringe pump* has been carefully manufactured from the highest quality components.

Caesarea Medical Electronics Ltd. (CME) guarantees the pump against defects in material and workmanship for twelve (12) months from date of purchase by the original purchaser.

CME's obligation, or that of its designated representative under this Limited Warranty, shall be limited, at CME's option, or that of its designated representative, to repairing or replacing pumps, which upon examination, are found to be defective in material or workmanship. The repair or replacement of any product under this Limited Warranty shall not extend the above-mentioned Warranty period.

Only qualified, trained service personnel should undertake all repairs under this Limited Warranty. In the event that a pump is found to be defective during the warranty period, the purchaser shall notify CME or its designated representative within thirty (30) days after such defect is discovered.

The defective pump should be sent immediately to CME or its designated representative for inspection, repair or replacement. Mailing costs are the purchaser's responsibility.

Material returned to CME or its designated representative should be properly packaged using CME shipping cartons and inserts. Inadequate packaging may result in severe pump damage.

This Limited Warranty shall not apply to defects or damage caused, wholly or in part, by negligence, spilt fluids, dropping of the pump, misuse, abuse, improper installation or alteration by anyone other than qualified, trained personnel; or to damage resulting from inadequate packaging in shipping the pump to CME or its designated representative.

If, after inspection, CME or its designated representative is unable to identify a problem, CME or its designated representative reserves the right to invoice purchaser for such inspection.

This Limited Warranty is the sole and entire warranty pertaining to CME's products and is in lieu of and excludes all other warranties of any nature whatsoever, whether stated, or implied or arising by operation of law, trade, usage or course of dealing, including but not limited to, warranties of merchantability and warranties of fitness for a particular purpose. Purchaser expressly agrees that the remedies granted to it under this limited warranty are purchaser's sole and exclusive remedies with respect to any claim of purchaser arising under this Limited Warranty.

Managing Director

Drawings

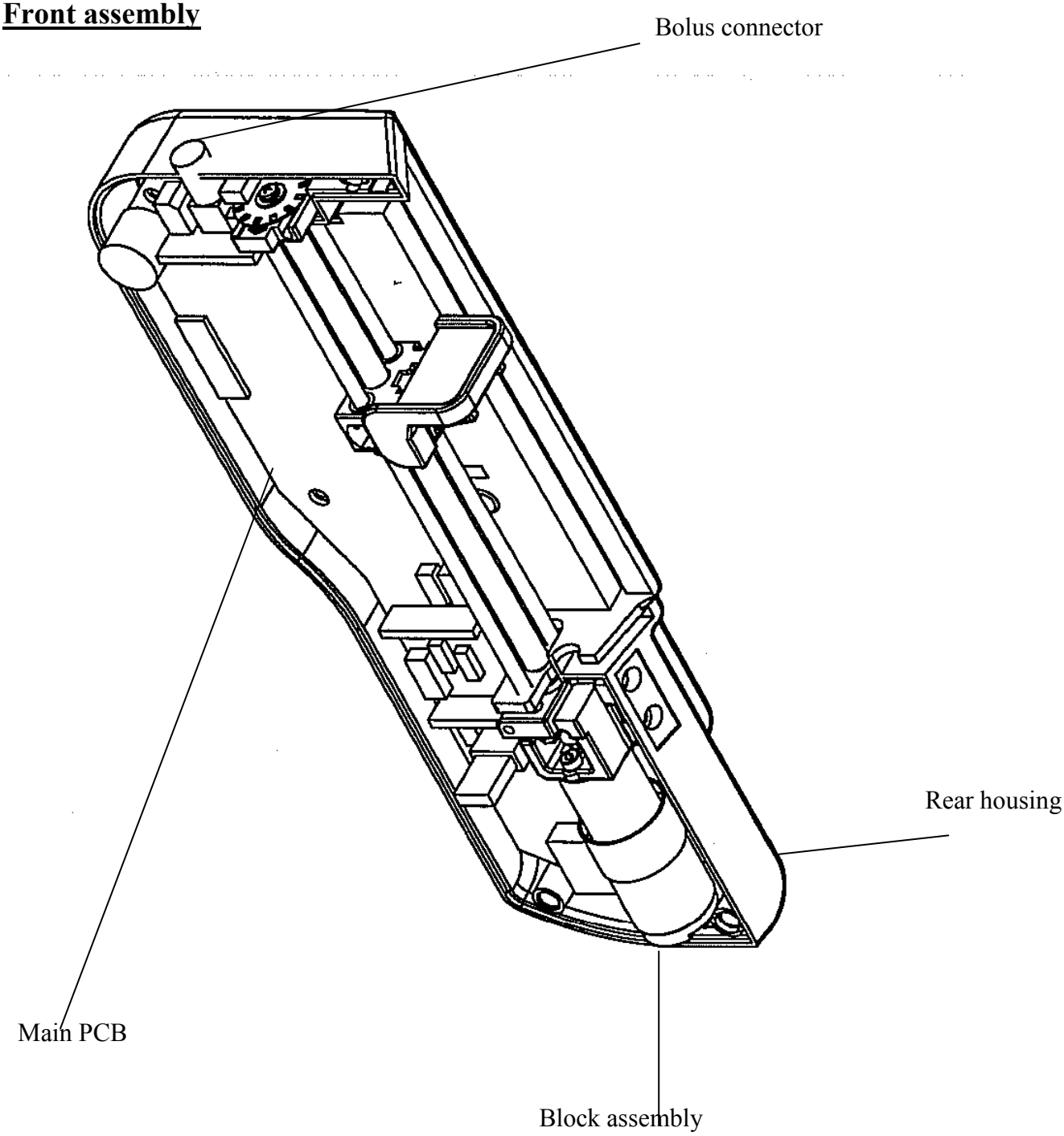
SYRINGE PUMP MAIN PCB - Bill Of Material

Print Version **3**	Layout Edition **1**

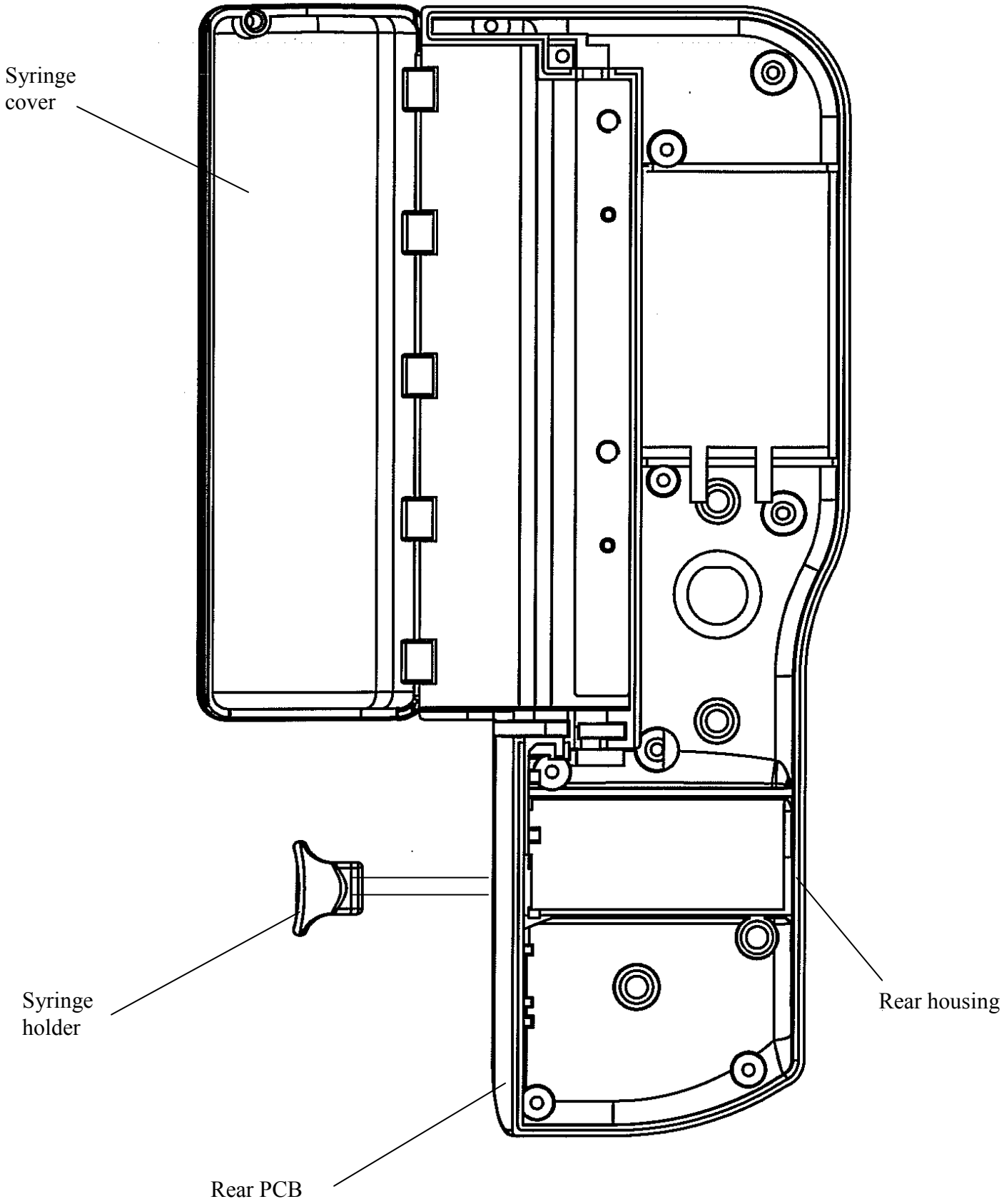
#	Quantity	Reference	Description
1.	1	C1	Ceramic capacitor **27Pf 5%**
2.	1	C2	Ceramic capacitor **16Pf 5%**
3.	1	C3	Ceramic capacitor **18nF 10%**
4.	10	C4, C11, C12, C13, C14, C15, C16, C19, C24, C38	Ceramic Capacitor **0.1uF 20%**
5.	Alternative	C4, C11, C12, C13, C14, C15, C16, C19, C24, C38	Ceramic capacitor **0.1uF +80 –20% 50V**
6.	8	C5, C6, C18, C22, C23, C34, C35,C36	Ceramic capacitor **1nF 20%**
7.	Alternative	C5, C6, C18, C22, C23, C34, C35,C36	Ceramic capacitor **1nF 10%**
8.	1	C7	Tantalum capacitor **47UF, 16V**
9.	5	C8, C17, C20, C21, C25	Ceramic capacitor **10nF 10%**
10.	Alternative	C8, C17, C20, C21, C25	Ceramic capacitor **10nF 5%**
11.	2	C9, C10	Tantalum capacitor **22uF 16v**
12.	1	C26	Tantalum capacitor **1uF 16v 20%**
13.	Alternative	C26	Tantalum capacitor **1uF 25v 10%**
14.	9	C27, C28, C29, C30, C31, C32, C33, C40, C41	Ceramic capacitor **1uF +80-20%**
15.	1	C37	Ceramic capacitor 220PF 10%
16.	1	C39	Ceramic capacitor **1NF 5%**
17.	9	D1, D4, D5, D6, D9, D10, D11, D12, D14	Diode **1SS355** ROHM
18.	1	D2	Diode S1A
19.	Alternative	D2	Diode S1G
20.	Alternative	D2	Diode S1M
21.	1	D3	Diode Schottky **RB160L-40 1A (**ROHM - Critical).
22.	2	D7, D8	Diode Zener **1SMB5919BT3**
23.	3	D15, D16, D17	Diode **SMAJ10A** (Diodes)
24.	2	F2, F3	Fuse **SMD-125-2** (Raychem Critical).
25.	1	J3	**FPC4AMRT1-29U**
26.	1	J5	**PS2M28-205GBCPR**

27.	8	L1, L2, L3, L4, L5, L6, L7, L8	Ferrite-**FR BD 600R 25%**
28.	2	Q2, Q1	Transistor **DTC114TUA** ROHM
29.	6	Q3, Q4,Q5, Q7, Q9, Q18	Digital Transistor PNP **DTA114EUA** ROHM
30.	5	Q6, Q8, Q13, Q14, Q17	Digital Transistor 47K NPN **DTC144EUA**
31.	2	Q11, Q12	**IRF9952** Double Mosfet (International Rectifier)
32.	Alternative	Q11, Q12	**IRF7309** (International Rectifier)
33.	Alternative	Q11, Q12	**MMDF2C03HD** Double Mosfet (Motorola)
34.	1	Q15	Transistor **MMBT3904**
35.	5	RP1,RP2,RP3,RP4,RP5	Resistors **Net 10K**
36.	2	R1, R22	Resistor **1M 5%**
37.	1	R2	Resistor **3.9KR 5%**
38.	15	R3, R5, R12, R16, R17, R18, R19, R21, R23, R36, R37, R38, R40, R48, R49	Resistor **10K 5%**
39.	5	R4, R24, R25, R26, R39	Resistor **2K 5%**
40.	2	R7,R6,	Resistor **51R 5%**
41.	1	R8	Resistor **30.1 K 1%**
42.	3	R9, R10, R11	Resistor **10K 1%**
43.	4	R13, R41, R42, R43	Resister **56K 5%**
44.	4	R14, R20, R28, R29	Resistor **100 K 5%**
45.	4	R30,R31,R32,R33	Resistor **1/4 W 2R 5%**
46.	1	R34	Resistor **150R 5%**
47.	1	R35	Resistor **1K 5%**
48.	2	R44, R50	Resistor **5.1K 5%**
49.	1	R45	Resistor **43K 5%**
50.	1	R46	Resistor **20K 5%**
51.	1	R47	Resistor **33R 5%**
52.	1	SW1	**TACT SWITCH TS-06J-THM-P**

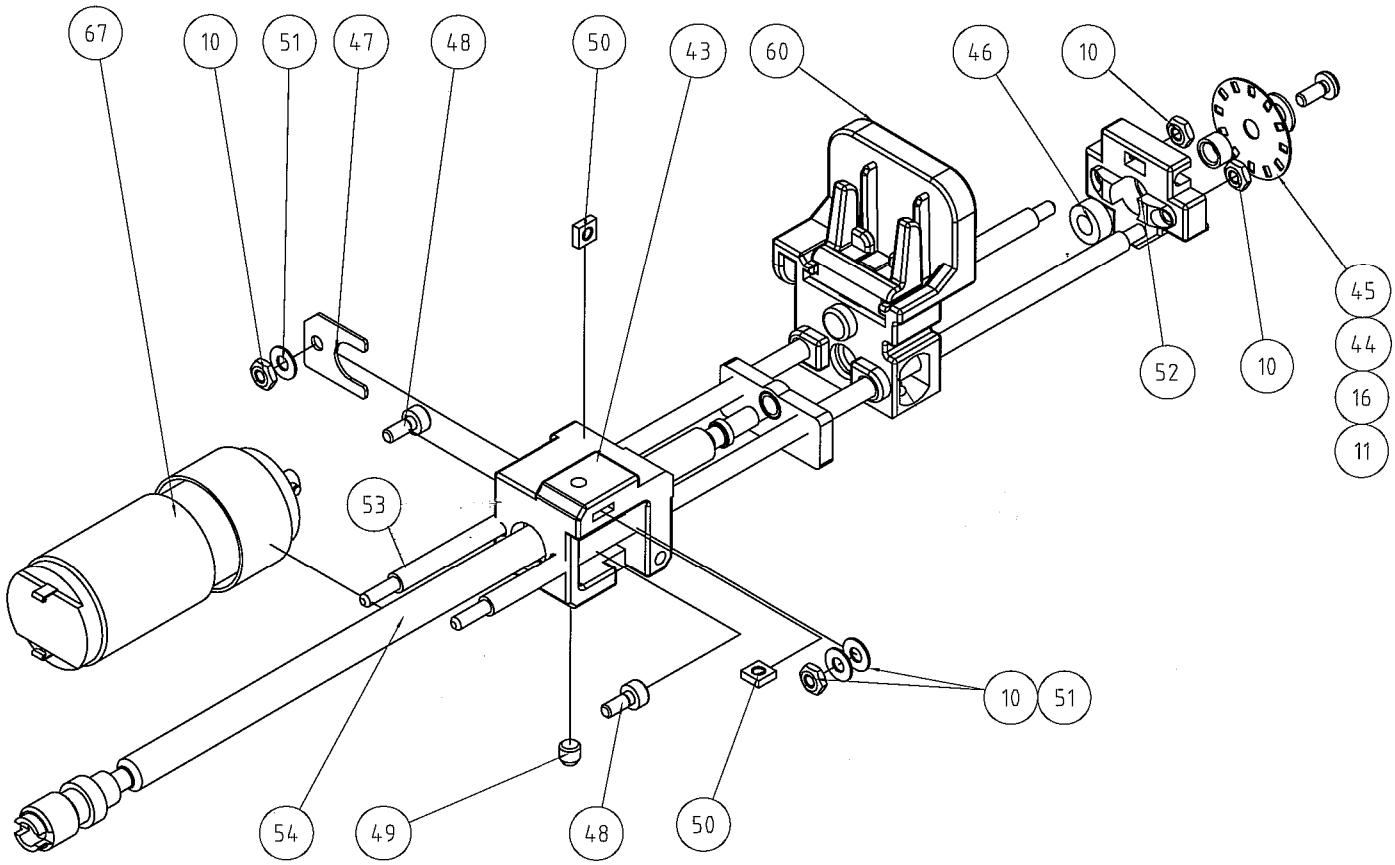
Front assembly



Rear assembly



Block assembly



10 M2 nut
11 Encoder
16 M3 washer
43 Front block
44 Spacer
45 M2 screw
46 Bearing 3mm
47 Screw assembly washer
48 Motor screw
49 Screw
50 Square nut
51 Washer
52 Rear block
53 Lead
54 Screw assembly
60 Actuator assembly
67 Motor assembly