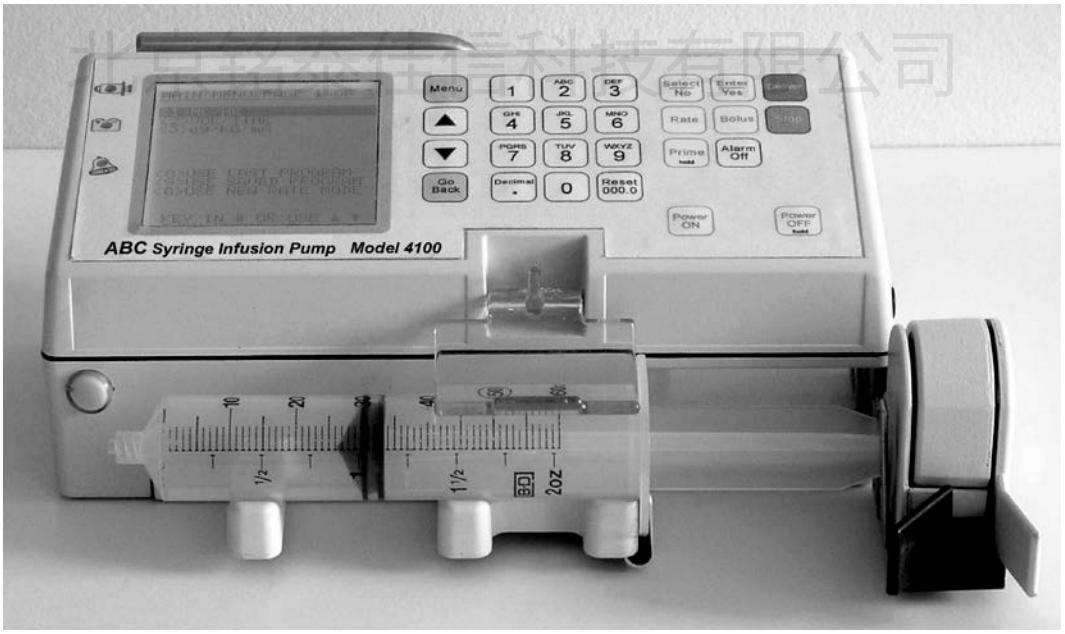
OPERATIONS MANUAL
FOR

SYRINGE INFUSION PUMP
MODEL 100

(Software Version 1.00)

NOTE: The software version on the pump may display a third decimal point that is consistent with a software update that does not affect the operation of the pump and is invisible to the user. Please call Instech if the first or second decimal point on the pump does not correspond to this manual.

This manual is intended to be used with any pump whose software version is 1.0x (i.e. 1.00, 1.01, 1.02 and so forth).



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SECTION 1. INTRODUCTION and WARNINGS

1.1 INTRODUCTION

1.1.1 Indications for Use:

Syringe Infusion Pump Model 100 provides a continuous or bolus infusion in any area such as neonatal and pediatric intensive care, anesthesia, adult critical care or any other area where the pump use can be monitored or supervised by a trained healthcare professional where the precise administration of fluids including drugs, antibiotics, lipids, blood, blood products, enteral solutions, or other therapeutic solutions is required

Delivery routes include: Intravenous, arterial, epidural, spinal, enteral, and subcutaneous.

Delivery modes include: Continuous, volume /time, mass, body weight, and bolus.

! CAUTION:

Federal (USA) law restricts this device to the sale by or on the order of a physician.

! IMPORTANT:

Prior to using any pump it is the responsibility of the operator to be thoroughly familiar with the contents of this manual.

Carefully read the entire contents of this manual including all **CAUTIONS** and **WARNINGS** before attempting to use this pump.

Always verify that the SOFTWARE VERSION of the pump and manual are in agreement.

Only trained medical personnel approved by their institution should attempt to use this pump.

All medications should be delivered per their approved drug labeling.

There are five infusion modes: Body-Weight mode, Mass mode, Unit mode, Continuous mode, and Volume over time mode.

(1) Body-Weight Mode where mass units (e.g., MG or µg) are delivered per weight (e.g., KG) per time (e.g., minute or hour). Rates for this mode would be programmed in MG/kilogram/minute or hour and µg/kilogram/minute or hour.

(2) Mass mode where mass units (e.g., MG or µg) are delivered per time (e.g., minute or hour). Rates for this example would be programmed in MG per hour or minute or in µg per hour or minute.

(3) Unit Mode where milliunits or units (e.g., mU or U) are delivered per time (e.g. minute or hour). Rates for this example would be programmed in mU per hour or minute or in U per hour or minute.

(4) Continuous mode where volume (e.g., ML) is delivered per time (e.g., hour or minute). Rates for this example would be programmed in ML per hour or minute.

(5) Volume over time mode where the total delivery volume in ML and the desired delivery time in hour and minutes are programmed individually.

1.2 WARNINGS

Anyone operating this pump is responsible for knowing and using the information presented in this manual and in particular in this section.

The table below identifies many potentially **serious life and safety hazards**. Others such warnings are posted throughout this manual.

Users	This pump is for use only under the direction of qualified medical professionals.
High Negative Pressures	Do not use this pump where high negative pressures can occur. This includes on the inlet side of any Extracorporeal Membrane Oxygenation (ECMO) system.
Magnetic Fields	Do not expose the pump to strong magnetic fields as it may affect pump function.
Prevent Air Emboli	Purge all air from the syringe and infusion lines before connecting to patient.
Verify Syringe Manufacturer and Size	Verify that both the manufacturer of the syringe in use and the syringe size coincide with the information displayed on LCD display. Use of other manufacturers and sizes can lead to possible inaccurate delivery (over or under delivery). Use only the syringe types and sizes listed in the **general specifications** section of this manual.
Flammables	Do not use in presence of flammable anesthetics, explosive gases or oxygen enriched atmospheres.
Drug Manufacture Guidelines	Follow manufacturers precautions and guidelines for all medications or fluids infused. These fluids may interact with plastic components of the infusion set up (syringes, tubing, stopcocks, injection ports, etc.).
Priming New Syringes	The PRIME function should always be utilized when mounting a newly filled syringe to remove any mechanical tolerances. Failure to do so may delay the delivery of the infusate (medication) and result in a falsely higher TOTAL DELIVERED read-out.
Priming	Never use the Prime function to deliver fluids directly to the patient.
Confirm Settings	Always confirm all settings prior to commencing any infusion.
Syringe Labels	Do not place any labels on the syringe that will be covered by the syringe retainer clamp. This clamp must contact the syringe barrel without interference to ensure accurate syringe size sensing.
Syringe Selection	To optimize delivery performance always select the smallest syringe size for the intended infusion. Using a large syringe at low rates can increase infusion start-up times and increase the occlusion detection time.
Verify Proper Set up	Verify that the syringe and infusion lines are properly set up prior to beginning any infusion. Always verify that the syringe is mounted properly. The finger tabs should be secured by the syringe clamp and the syringe plunger end by the syringe driver retainer.
Syringe Loading and Unloading	Make sure all fluid flow to the patient is turned OFF via clamping the tube, turning off a stopcock, etc. to eliminate the possibility of creating uncontrolled fluid flow to the patient.

Clutch Lever	When open, make sure the clutch lever is not released too fast to close. Allowing the clutch lever to snap closed may cause it to jam or catch on the syringe flange or damage internal gears of the syringe driver.
Syringe Pump Placement	Moving the syringe pump after it is connected to the patient can cause changes in hydrostatic pressure resulting in 1) over deliver if moved above the patient due to possibly bolusing and 2) under delivery if moved below the patient.
Occlusion Alarm	When an occlusion alarm occurs and is corrected, there is a risk of infusing the pressurized buildup of infusate. To avoid delivering an inadvertent bolus to the patient, relieve the pressure before restarting the infusion.
Check for Leaks	Periodically inspect the infusion fluid pathway for leaks.
Verify Default Settings	Prior to using the pump always verify default settings by reviewing the View Options pages.
Dropped or Damaged Pump	The pump must be thoroughly examined and tested to assure proper functioning prior to reuse.
Pump Performance	If the pump fails to perform as described herein, remove from service and consult the manufacturer.
Fluid Exposure Not Waterproof	Do not allow fluids to enter the pump housing. Immediately wipe off all spills.
Do Not Autoclave Or Gas Sterilize	Subjecting the pump to an autoclave or gas sterilization can cause serious pump damage.
Never Use Sharp Objects	Never use any sharp objects on the pump keypad. These can damage the operation of the keys.

SECTION 2. GENERAL SPECIFICATIONS

Overall Size 9.5“ wide × 3.95“ high × 5.9“ deep

Weight 4.99 Pounds

Pump Accuracy ±3%

For additional information regarding syringe pump accuracy variability, see, e.g., “BD Designated Dimensions” for syringe variability.

Infusion Modes

Body-Weight Modes
µg/KG/min
µg/KG/HR
MG/KG/min
MG/KG/HR

Mass Modes/Unit Modes
µg/min
µg/HR
MG/min
MG/HR

mU/min
mU/HR
U/min
U/HR

Continuous Modes
ML/min
ML/HR

Volume/Time Mode
dose volume
delivery time

Flow Rate Dependent on syringe size selected (see Appendix II)

Bolus Rate In Body-Weight, Mass, Unit, and Continuous Modes

Power AC Power or DC Internal rechargeable batteries

Recharge Time No longer than 8 hours

Battery Capacity At 25 degrees C, 8 hour charge will operate the pump for approximately 12 hours at 5.0 ML/HR with a 60 ML syringe

Alarms/Alerts Audio Volume Alarm: LOW, NORM, or HIGH
Battery Depleted

Bolus Delivery
Check Clutch
Empty
Invalid Number
Invalid Size
Low Battery
Near Empty
Occlusion
Plunger Detector
Syringe Not Loaded
Syringe Pops Out
System Malfunction
Temporary Delay Alarm: 2 to 60 minutes

Status Alerts

Battery Charging
Battery Depleted
Battery in use
Deliver
Priming
Standby Mode
Stop/Program

Syringe Manufacturer

Becton Dickinson (B-D)	1,3,5,10,20,30,50/60 ML
Monoject (Mono)	1,3,6,12,20,35,60 ML
Terumo (Teru)	1,3,5,10,20,30,60 ML
B-D Glass (B-D G)	1,2.5,5,10 ML
XXX	140 ML

Total Delivered	
from 0.01	To 99999 ML
from 0.01	To 99999 MG
from 0.01	To 99999 U

Becton Dickinson (B-D) is a trade mark of Becton Dickinson and Co.
Monoject is a trade mark of Kendall Company/Tyco Healthcare
Terumo is a trade mark of Terumo Company
XXX stands for Solsci custom syringe

Normal Operating Conditions

Temperature	5°C to 40°C (40°F to 104°F)
Relative Humidity	15 to 95% non-condensing
Ambient Pressure	70kPa to 106kPa (10.2 psi to 15.4 psi)
Infusion Back Pressure:	-100mmHg to +300mmHg

Storage Conditions:

Temperature:	0°C to 60°C (32°F to 140°F)
Relative Humidity:	0 to 95% non-condensing
Ambient Pressure:	70kPa to 106kPa (10.2 psi to 15.4 psi)

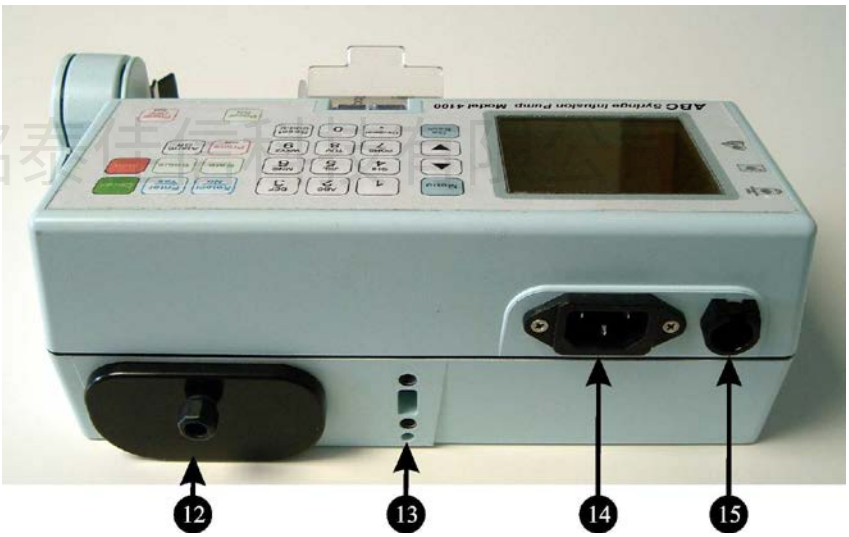
SECTION 3. GENERAL DESCRIPTION/DIAGRAM, ALARM/ALERT

3.1 FRONT VIEW

1 Alarm LEDs
2 LCD Display Screen
3 Syringe Light
4 Disposable Syringe
5 Syringe Saddle
6 Syringe Clamp
7 Syringe Finger Tab
Metal Retainer
8 Clutch Lever
9 Syringe Driver
10 Plunger Retaining Bars
11 Keypad

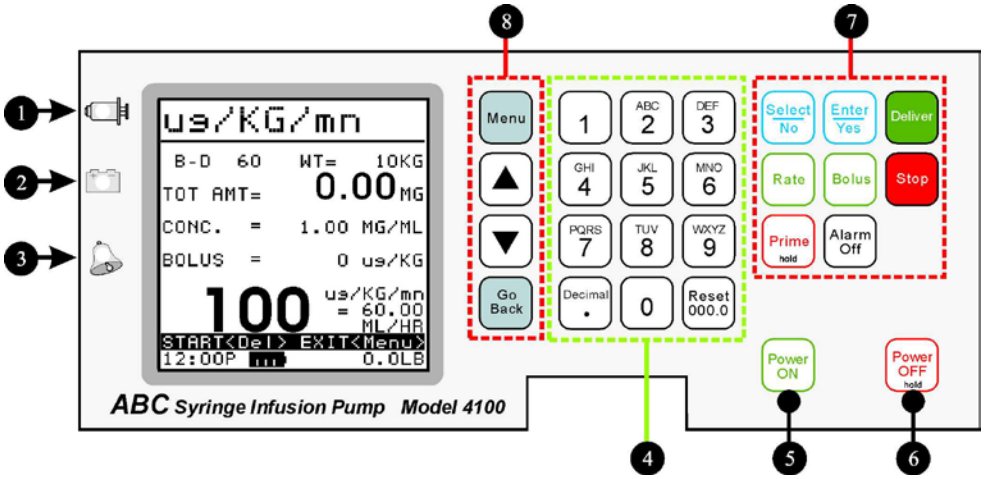
3.2 BACK VIEW

12 Battery Pack
13 Handle Holder Screw
Hole
14 Power Cord Receptacle
15 Communication Port



3.3 KEYPAD LAYOUT

1 Syringe Alarm LED
2 Battery Alarm LED
3 Malfunction LED
4 Number Keys
5 Power on Key
6 Power off Key
7 Function Keys
8 Navigation Keys



3.4 SCREEN FORMAT

3.4.1 OPERATIONS SCREEN

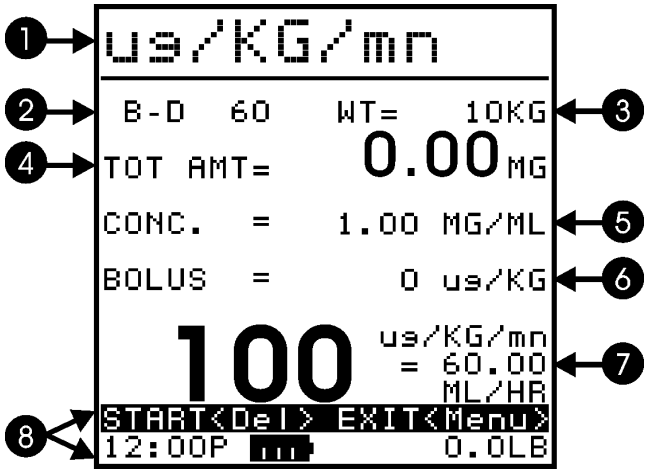


Figure 3.4.1: Operations Screen for Body Weight Mode

(Body-Weight Mode shown)

1 Rate Mode / Program
Displays the current selection of rate mode or program.

2 Syringe Manufacturer and Size
Displays the current selection of syringe manufacturer and detected size.

3 Body Weight
Displays body weight of patient.

4 Total Amount Delivered
Displays total amount of infusate (medication) that has been delivered.

5 Concentration
Displays the concentration of the infusate (medication).

6 Bolus
Displays the bolus amount to be delivered.

7 Rate
Displays the current infusion rate and the equivalent rate in ML/HR.

8 Instruction/Status Lines
Two lines at the bottom of the screen that display the current status of the pump and instructions for the user, including:
(1st line) Instructions (START<Del> EXIT<Menu>) or Near Empty alert message
(2nd line) Time: *displays the present time.*
Battery Symbol: *shows current battery charge condition*
Plunger Force Graph or Reading: *indicates force detected at syringe plunger*

3.4.2 MENU SCREEN

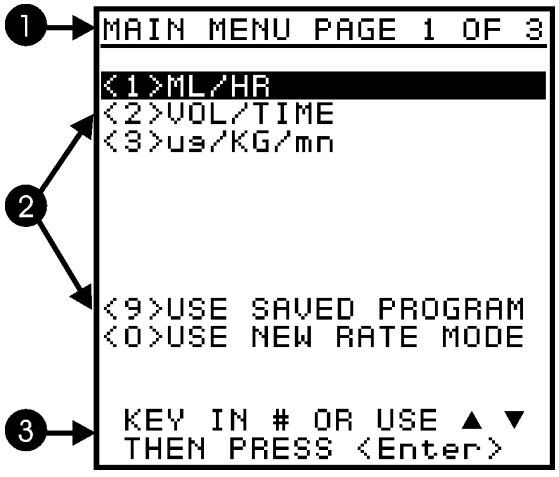


Figure 3.4.2: A typical menu screen displays the menu title (1), a selection area (2), and an instruction area (3).

1 Menu Title
Displays current menu title.

2 Selection Area
Displays options from which user can choose.

3 Instruction Area
Displays instructions for given menu.

3.5 ALARMS/ALERTS

LEDs There are three LEDs to the left of the LCD display:

Syringe Symbol: can either be red, and green.
RED: stop
GREEN: delivering
RED/GREEN: caution—near empty (blinks), etc.

Battery Symbol: can be red, yellow and green.
RED: depleted battery
GREEN: charging
YELLOW: battery in use

Malfunction Symbol
RED: system malfunction

Syringe LED – This front mounted LED can be red and green. It shows the same pattern as the syringe symbol LED.

LCD The LCD display will show written Error/Alert messages.

AUDIO An audio alert will sound to notify the user of various conditions:

Slow beeping: Indicates that the pump has stopped or is Near Empty
Fast beeping: Indicates error conditions
Continuous: Indicates system malfunction

SECTION 4. GETTING STARTED

4.1 TURNING ON THE PUMP

If AC Power is connected, the pump automatically energized. The pump performs Self-Test and enters Power-off/Standby mode, the battery pack is charged if needed. However, if the battery pack is not inserted or is defective, REPLACE BATTERY is displayed. Press the **Power ON** key to turn on the pump.

If Battery Power is used, press the **Power ON** key to turn on the pump. Self-Test is performed after power-on.

In both cases, MAIN MENU PAGE 1 is displayed, showing available Start-Up Rate modes (Refer to paragraph 8.1.1 for description of Start-Up Rate Modes).

NOTE: When multiple menus are available, use the **Menu** and **Go Back** keys to navigate (Refer to SECTION 8 for detailed explanation of Menu Structure).

4.2 PROGRAM INFUSION SETTINGS

The infusion settings of the pump can be programmed in a menu-driven method. Brief instructions to guide the user are provided at the bottom of each menu. The following is a typical infusion setting programming sequence:

4.2.1 Select a Rate Mode (MAIN MENU PAGE 1)

User can choose from the rate modes available on the Start-Up list; these modes are the most commonly used rate modes. User can also use option <9> to choose from Saved Programs, or option <0> to choose from the list of other standard Rate Modes. (Refer to paragraph 6.1 for a detailed explanation of Rate Modes).

The programming sequence varies slightly among the different Rate Modes. **Follow the menus and instructions to program the settings required for the selected Rate Mode**. The following example describes the programming sequence for ML/HR mode.

4.2.2 Select a Syringe Manufacturer

Use the **Select** or ▲ ▼ keys to scroll to the desired Syringe manufacturer. Press **Enter** key to confirm the selection.

(Note: This step may be skipped if only one manufacturer is selected in PUMP DEFAULTS. Refer to paragraph 8.3.2.1.1).

4.2.3 Load Syringe

Syringe must be properly loaded (Refer to SECTION 5 for syringe loading instructions). Press **Enter** key and the syringe size is automatically detected and displayed. Make sure that the syringe size has been correctly recognized.

4.2.4 Program Delivery Limit

Program the Delivery Limit with the **number** or **up/down arrow** keys and use **Enter** key to confirm the number. If a Delivery Limit is not needed, enter 0.

(Note: This step may not be present if disabled in PUMP DEFAULTS. Refer to paragraph 8.3.2.1.3).

4.2.5 Program Bolus

Program the Bolus Amount with **number** or **up/down arrow** keys and use **Enter** key to confirm the number. If Bolus is not needed, enter 0.

(Note: This step may not be present if disabled in PUMP DEFAULTS. Refer to paragraph 8.3.2.1.4).

4.2.6 Program Rate

Program the Infusion Rate with **number** or **up/down arrow** keys, press **Enter** key to confirm the rate.

The programming of the infusion settings is now complete.

4.3 PRIMING THE SYRINGE

! WARNING:
Before starting a delivery, the syringe must be primed to remove any residual air inside the syringe tip and the infusion extension set and to eliminate any mechanical slack. **Make sure that the infusion line is not connected to the patient when priming.**

Press and hold the **Prime** key to start the priming process. Release the **Prime** key when all the air has been pushed out and fluid begins to flow out of the infusion line. Now connect the infusion line to the patient. (Refer to paragraph 7.5 for more details on Priming).

4.4 STARTING AND STOPPING DELIVERY

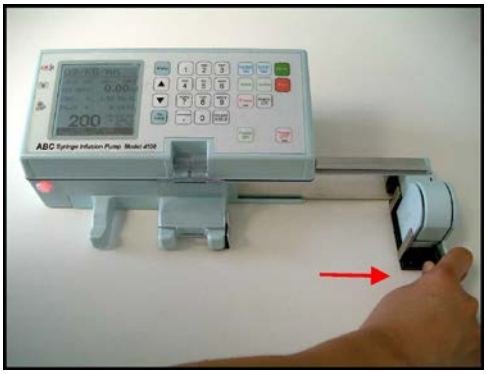
Press the **Deliver** key to start delivery. Use the **Stop** key to stop delivery.
(Refer to SECTION 7 for more details on Delivery).

4.5 TURNING OFF THE PUMP

Press and hold the **Power OFF** key to turn off the pump. If AC Power is used, the pump will go into Power-off/Standby mode. If Battery Power is used, the pump will shut down.

SECTION 5. SYRINGE LOADING INSTRUCTIONS

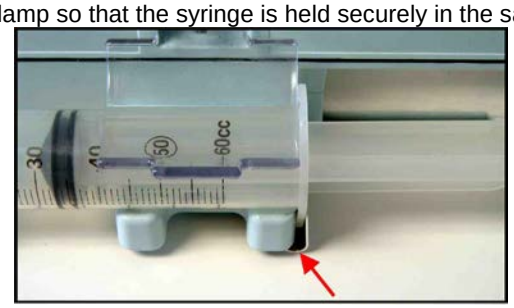
1. Pinch and hold together the CLUTCH LEVER (releases the clutch) and pull the SYRINGE DRIVER outward until it reaches the end of its track.



2. Grasp the clear SYRINGE CLAMP, pull upward allowing room for the syringe in the SYRINGE SADDLE.

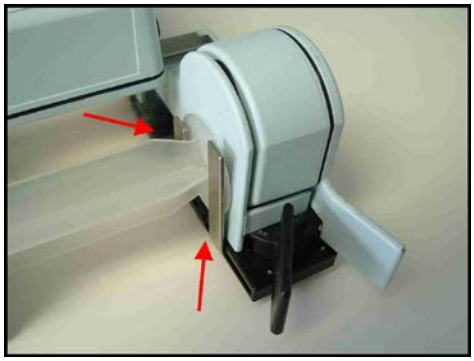
3. Insert the syringe barrel first.

4. Make sure the syringe finger tabs are retained by the METAL RETAINING SPRING, and release the syringe clamp so that the syringe is held securely in the saddle.



5. Pinch together the CLUTCH LEVER and move the SYRINGE DRIVER forward until the SYRINGE DRIVER contacts the end of the DISPOSABLE SYRINGE plunger.

6. Release the CLUTCH LEVER so that the retaining bars secure the end of the plunger to prevent siphoning.



7. Syringe is now properly loaded

SECTION 6. INFUSION SETTINGS

6.1 RATE MODES

Five Rate Modes are provided to match the preferred delivery method of a specific medicine. Some infusion settings, such as Syringe Manufacturer and Size, are the same for all Rate Modes. However, there are differences in the infusion settings required for different Rate Modes. Once a Rate Mode is selected, the pump will provide a sequence of menus to guide the user to enter the required infusion settings.

Once all the required infusion settings are entered, the user is allowed to change Rate or Bolus directly by pressing the **Rate** and **Bolus** keys respectively. However, other infusion settings such as Concentration, Delivery Limits, etc. must be programmed sequentially by pressing the **Select** key while in Stop Mode.

If the syringe is removed the user is asked to load a new syringe and press **Enter** key**.** The size of the new syringe is recognized. If a different size is detected, the Delivery Limit, Bolus, and Rate are reset to 0. A sequence of menus will guide the user to enter the required infusion settings.

If a different Rate Mode is desired, the user can press **Menu** key to return to MAIN MENU PAGE 1 and select a new Rate Mode. The Total Amount Delivered and all other infusion settings are reset to 0 when a new Rate Mode is selected.

Some infusion settings (such as Bolus and Delivery Limit) can be disabled (i.e., programmed to not show up) by configuring PUMP DEFAULT options. The input unit for some infusion settings can also be customized with this option. (Refer to paragraph 8.3.2 for more details on configuring PUMP DEFAULTS).

The five types of rate modes are as follows:

6.1.1 Continuous Modes: *ML/HR, ML/mn*

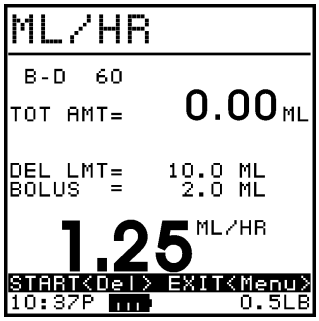


Figure 6.1.1: ML/HR Stop Mode Screen

Infusion settings to be programmed:
Delivery Limit, Bolus, and Rate.
Programming Sequence:
Syringe Manufacturer, Syringe Size, Delivery Limit, Bolus, and Rate.

After the initial programming sequence, Bolus and Rate can be modified directly by using the **Bolus** and **Rate** keys respectively. Delivery Limit can be modified with the **Select** key in Stop Mode. However, after the Delivery Limit is modified, the user is asked to confirm Bolus and Rate. Press **Enter** key to re-confirm the Bolus and Rate if no modification is needed.

If Rate Mode is ML/mn, then the equivalent rate in ML/HR is automatically calculated and displayed to the right of the ML/mn rate.

The syringe size determines the volume range (in ML) for Delivery Limit and Bolus, and the rate range (in ML/HR). (Refer to Appendix II for data).

6.1.2 Volume / Time Mode

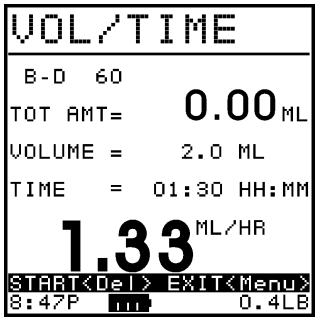


Figure 6.1.2: Vol/Time Stop Mode Screen

Infusion settings to be programmed:

Delivery Volume and Delivery Time.

Programming Sequence:

Syringe Manufacturer, Syringe Size, Delivery Volume, and Delivery Time.

Unlike in other rate modes, the **Rate** key in Vol/Time mode is used to modify both Delivery Volume and Delivery Time.

The equivalent Rate in ML/HR is calculated and automatically displayed.

The syringe size sets the allowable range for Delivery Volume (in ML) and Rate (in ML/HR). The allowable Delivery Time is determined by the programmed Delivery Volume and the syringes maximum and minimum rates. (Refer to Appendix II for this data).

6.1.3 Body-Weight Modes: *µg/KG/mn, µg/KG/HR, MG/KG/mn, MG/KG/HR*

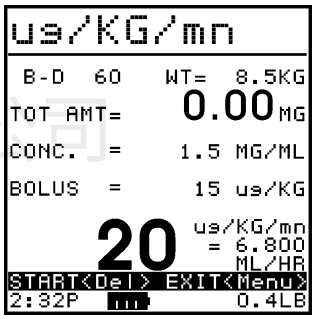


Figure 6.1.3: µg/KG/mn Stop Mode Screen

Infusion settings to be programmed:

Body Weight, Concentration, Bolus, and Rate.

Programming Sequence:

Syringe Manufacturer, Body Weight, Concentration, Syringe Size, Bolus, and Rate.

Bolus and Rate can be modified directly by using **Bolus** and **Rate** keys respectively. The equivalent volume in ML for Total Amount and Bolus can be temporarily viewed by pressing **Enter** key.

Normally, Body Weight and Concentration are not modified once they are programmed for a patient with a specific infusion regimen. However, if modification is needed, pressing the **Select** key in the Stop Mode will initiate the following programming sequence: Concentration, Body Weight, Syringe Size, Bolus, and Rate.

If Concentration is modified, the equivalent Total Amount Delivered in ML is displayed. Since the Total Amount in mass units is invalid for the new concentration, the user is prompted to record the previous Total Amount values and press the **Reset 000.0** key to reset the Total Amount. Bolus and Rate are also reset to 0.

The equivalent Rate in ML/HR is automatically calculated and displayed to the right of the Body-Weight Rate.

The syringe size sets the allowable volume range (in ML) for Bolus and the allowable Rate range (in ML/HR). The allowable ranges for Bolus and Rate in Mass/Body-Weight mode are calculated from the Appendix II with the data from the Programmed Weight and Concentration. (Refer to Appendix I for calculations).

6.1.4 Mass Mode and Unit Mode:

µg/mn, µg/HR, MG/mn, MG/HR and mU/mn, mU/HR, U/mn, U/HR

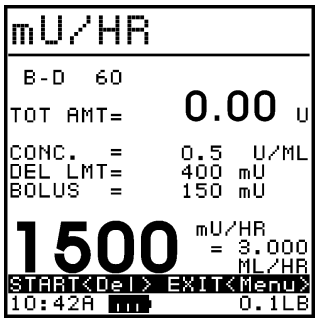


Figure 6.1.4: mU/HR Stop Mode Screen

The Infusion settings to be programmed are:
Concentration, Delivery Limit, Bolus, and Rate.
The Programming Sequence is:
Syringe Manufacturer, Concentration, Syringe Size, Delivery Limit, Bolus, and Rate.

Mass Mode/Unit Mode is similar to Continuous Mode, but with ML replaced by mass units or units.

Bolus and Rate can be modified directly by using the **Bolus** and **Rate** keys respectively. The equivalent volume in ML for Total Amount, Delivery Limit, and Bolus can be viewed temporarily by pressing the **Enter** key.

Pressing the **Select** key in Stop Mode will initiate the following programming sequence: Concentration, Syringe Size, Delivery Limit, Bolus, and Rate.

If Concentration is modified, the equivalent Total Amount Delivered in ML is displayed. Since the Total Amount in mass units is invalid for the new concentration, the user is reminded to record these total amount values and asked to press **Reset 000.0** key to reset Total Amount. Delivery Limit, Bolus and Rate are also reset to 0.

The equivalent Rate in ML/HR is automatically calculated and displayed to the right of the Mass Rate.

The syringe size sets the allowable volume range (in ML) for Bolus and the allowable rate range (in ML/HR). (Refer to Appendix II for values). The allowable ranges for Delivery Limit, Bolus and Rate in Mass Units are calculated from Appendix II with the Programmed Concentration data.

6.2 SAVED PROGRAMS

The pump provides a convenient feature for Creating and Retrieving Saved Programs. This feature allows users to save programs with a specific Rate Mode and infusion settings, for use in repeated infusions of the same medicine.

Programs can be created with option <3> of MAIN MENU PAGE 2 (Refer to paragraph 8.2.2 for instructions on Creating a Program). Note that Weight and Delivery Limit values are not stored in the Saved Program.

Once a program is saved, it can be retrieved using option <9> of MAIN MENU PAGE 1. Saved infusion settings are retrieved, but the user must enter values for Weight and Delivery Limit, as they are not stored.

6.3 GENERAL RULES AND USEFUL TIPS FOR PROGRAMMING THE PUMP

(1) As a general rule, during the programming of a parameter (when the number is blinking), the user must press **Enter**, **Stop**, or **Go Back** keys to conclude the data input. Pressing the **Enter** key accepts the programmed number. Using the **Stop** key abandons the programming process and leaves the current parameter unaltered. Pressing the **Go Back** key abandons the programming of the current parameter and goes back to the previous screen.

If the programming involves a sequence of infusion settings (such as the processes initiated by the **Select** key), the **Stop** key is active only if no change has been made to the infusion settings. In other words, the programming sequence can be abandoned only if nothing has been changed. Once a parameter has been changed, all other infusion settings must be reentered, and the **Stop** key is no longer valid.

(2) On MAIN MENU PAGE 1, the **Stop** key can be used to retrieve the most recently used Rate Mode and infusion settings. It serves as a “Retrieve Previously Used Rate Mode” function.

SECTION 7. DELIVERY

The pump has three types of fluid delivery:
NORMAL delivery, **BOLUS** delivery, and **PRIMING**

The infusion rate for NORMAL delivery is the programmed rate discussed in the previous section. The BOLUS delivery rate is the maximum rate the pump can deliver with the selected syringe size unless the rate is adjusted temporarily (Refer to paragraph 8.2.4 for more on the TEMPORARY ADJUST Option). PRIMING always uses the maximum rate for the syringe in use.

The amount of fluid delivered in NORMAL or BOLUS delivery counts toward the Total Amount as well as the Running Amount. (Further discussed in paragraph 7.1.1 and 7.1.2 below). However, the amount of fluid pushed out of the syringe during PRIMING ***does not*** count toward the Total Amount and Running Amount. (PRIMING is further discussed in paragraph 7.5).

7.1 STARTING NORMAL DELIVERY

All required infusion settings must be programmed before either delivery or priming can begin. Priming should always occur before beginning the actual delivery (Refer to paragraph 7.5 for more on Priming).

After the **Deliver** key is pressed, the pump checks if the Syringe is properly loaded. If the syringe is not properly loaded an audio alarm and LCD message will be actuated.

Otherwise, **NORMAL delivery** will begin. The Syringe Status LED indicator will be a **slow-blinking GREEN**.

The following are the only active keys during NORMAL Delivery:

(1) **Stop** key stops any infusion, including BOLUS or NORMAL delivery.
(2) **Rate** key allows user to change the NORMAL delivery rate.
(3) **Bolus** key activates a process for confirming the bolus parameter. If the **Deliver** key is pressed while the bolus amount is blinking, the pump delivers the Bolus programmed. However, if **Enter** key is pressed, the pump saves any newly entered bolus value and returns to NORMAL delivery. (Refer to paragraph 7.2 for more on BOLUS delivery.)
(4) **Menu** key is used to toggle between detailed and simplified displays (further explained in paragraph 7.1.3).

7.1.1 Information Displayed during Normal Delivery

A comparison between the Stop and Delivery screens for Normal Delivery is shown below:

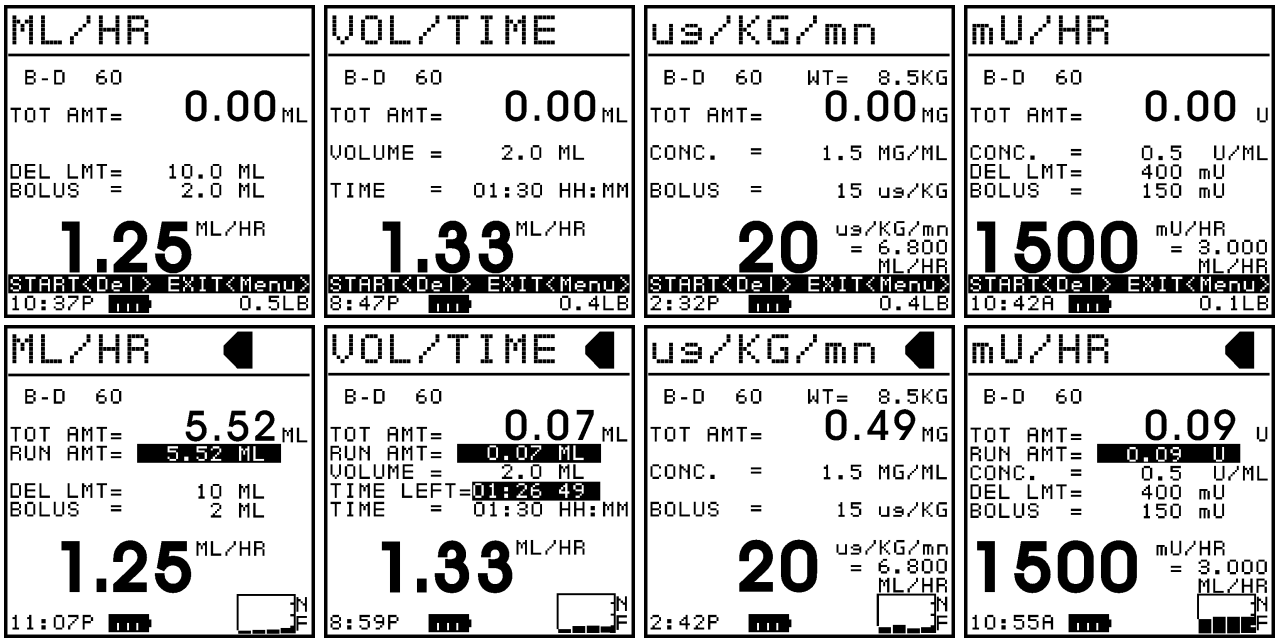


Figure 7.1.1: Stop (top) vs. Delivery (bottom) Screens for various Rate Modes

The following information is displayed on the LCD Screen during Normal Delivery:

- Total Amount:
  This is the accumulated delivery amount since this amount was last reset.

- Running Amount:
  This amount is displayed only if a nonzero Delivery Limit (or Delivery Volume) has been programmed. This is the accumulated amount for the current delivery session. The Running Amount will reset to 0 when its value reaches the Delivery Limit. (Running Amount is discussed further in paragraph 7.3. "Delivery Interruption and Resuming Delivery," of this section).

  In Volume/Time mode, Time Left displays the amount of time remaining to complete the delivery.

- Syringe Plunger Force (Occlusion) Chart:
  This chart is a representation of the force level trend detected at the Syringe Plunger for the past 24 seconds approximately. The right-hand side shows the most recent reading, and higher bars correspond to higher forces.
  The letter F on the right hand side of the chart stands for (plunger) Force, and 'L,' 'N,' 'M,' and 'H' stand for LOW, NORMAL, MIDDLE, and HIGH force threshold levels. The display shows that Normal Force is programmed.

- Moving Delivery Mark:
  A moving delivery mark is displayed on the top of the screen. The speed of its movement corresponds with the delivery rate.

7.1.2 Changing Rate During Delivery

Except for in Volume/Time mode, the delivery rate can be modified without interrupting Normal Delivery by using the **Rate** key. Press **Rate** key to initiate the process and the pump will blink the current rate. Once the user enters a valid rate by either using the **numeric** or the **up and down** keys followed by **Enter** or **Deliver** key, the pump will switch to the new rate.

If the user does not input a new rate within one minute, the pump returns to its previous rate.

7.1.3 Simplified Display

The **Menu** key can be used to remove some of the detailed information from the display for easier viewing (See Figure 7.1.3). The following information is removed from the display: Syringe Manufacturer, Syringe Size, Delivery Limit, Bolus, Running Amount, Time Left, and Rate in alternate units. Pressing **Menu** again will restore the normal display.

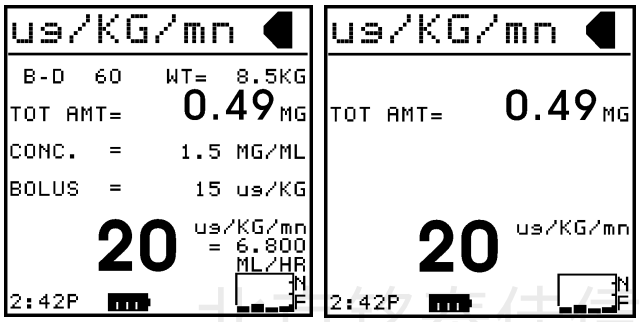


Figure 7.1.3 Un-simplified (left) versus simplified (right) displays for body-weight mode

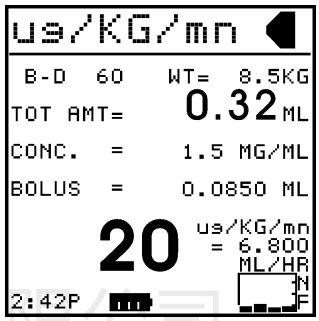


Figure 7.1.4 Alternate Unit Display

7.1.4 Alternate Unit Display

In the Body-Weight and Mass Rate Mode, pressing the **Enter** key during delivery will temporarily display the equivalent in ML for the values on the display. (See Figure 7.1.4).

7.2 ACTIVATING BOLUS DELIVERY

If a non-zero Bolus has been programmed, **BOLUS Delivery** can be activated by pressing the **Bolus** key followed by the **Deliver** key.

The Syringe Status LED indicator becomes a **fast flashing GREEN** and the LCD display shows the BOLUS delivery screen (shown in Figure 7.2). The heading “BOLUSING” and the Bolus Amount being delivered are displayed.

When the programmed bolus has successfully been delivered, an audio beep (if programmed in Pump Defaults) signals the completion of BOULS Delivery and the LCD Screen returns to NORMAL delivery.

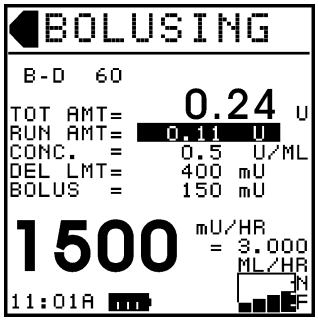


Figure 7.2: Bolus Delivery Screen

The following are the only active keys during BOLUS delivery:

(1) **Stop** key stops any infusion, including BOLUS and NORMAL delivery.
(2) **Deliver** key interrupts BOLUS delivery and resumes Normal Delivery.
(3) **Menu** key simplifies the displayed information on the LCD screen (Refer to paragraph 7.1.3). Bolus Amount and Bolus are shown during simplified display.

If BOLUS delivery is interrupted by the **Deliver** key, and if BOLUS delivery is activated again after the interruption, the running Bolus Amount is reset to 0 and a completely new Bolus is delivered.

If the Delivery Limit is non-zero, the Bolus Amount is added to the Running Amount (not displayed) that counts towards the Delivery Limit. If the Delivery Limit is reached before BOLUS delivery is complete, the pump stops, displays the “DELIVERY LIMIT!” message, and sounds an alarm.

Pressing the **Bolus** key allows the user to adjust the bolus infusion settings. The pump will flash the current bolus amount and wait for user to enter a new bolus amount. User can then press either **Enter** or **Deliver** key:
(1) If the **Enter** key is used, the Bolus is replaced with the new number and the pump continues NORMAL delivery.
(2) If the **Deliver** key is pressed, the pump will immediately deliver the newly programmed Bolus.
If the user does not input a new Bolus within one minute, the modification process is terminated and the original values will reappear.

Bolus Delivery can also be activated directly from the Stop mode (without going through Normal Delivery) by pressing the **Deliver** key at the end of the Bolus programming process. The pump switches from Stop mode to BOLUS Delivery mode and returns to Stop mode after the programmed Bolus has been delivered.

7.3 DELIVERY INTERRUPTION and RESUMING DELIVERY

Both Normal Delivery and Bolus Delivery are interrupted when the **Stop** key is pressed, when the syringe is empty, or when the Delivery Limit has been reached. Delivery will also be interrupted if any of the following error conditions are detected:
(1) Occlusion (Plunger force reading exceeds occlusion force threshold)
(2) Depleted battery
(3) Syringe dislodged
(4) Plunger retainer is disengaged
(5) Track has been moved incorrectly (Abnormal position sensor reading)
(6) Questionable delivery accuracy due to internal check

If delivery is interrupted due to one of the error conditions listed above, NORMAL Delivery will resume if the **Deliver** key is pressed after the error condition is corrected. The accumulation of the Running Amount continues as if the delivery was not interrupted.

! CAUTION:

If either the EMPTY SYRINGE or DELIVERY LIMIT condition occurs, or if any infusion settings besides the Normal Delivery Rate are changed after the interruption, pressing the **Deliver** key will RESTART a new NORMAL delivery and the Running Amount will be reset to zero. This is particularly important when a Delivery Limit is involved, as well as in Volume/Time Mode, because the Running Amount is used to stop the pump when the Delivery Limit or Delivery Volume is reached.

7.4 NEAR-EMPTY

A **Near-Empty** condition occurs at a preset time interval before the syringe reaches empty. The default Near-Empty time is five minutes.

A blinking message “NEAR EMPTY” will be displayed at the lower left corner of the LCD display. The Syringe Status LED alternates between a short RED flash and a long GREEN one. Three short audio beeps will sound once if programmed in PUMP DEFAULT.

The pump uses the Normal Delivery Rate to calculate the syringe plunger position where the Near-Empty alert is actuated. The Near-Empty time is defined in the PUMP DEFAULTS and can be changed by accessing PUMP DEFAULTS at option <3> of MAIN MENU PAGE 3 (Refer to paragraph 8.3.2.3.8).

However, a **PHYSICAL fixed Near-Empty point** is used for BOLUS delivery and PRIMING. It is not determined by a certain time interval, but at a fixed distance before the syringe empty position. The Near-Empty alert is activated when the syringe plunger passes this position.

7.5 PRIMING

! WARNING:

Priming should always occur before beginning infusion. **Priming fluid should never be delivered to the patient.**

When the **Prime** key is pressed, the Priming process will start only if all required infusion settings have been programmed and there is no error condition. The pump always uses maximum motor speed for the syringe in use during Priming.

The **Prime** key must be pressed and held continuously to maintain the Priming process.

PRIMING will stop if:

(1) **Prime** key is released
(2) An error condition is detected
(3) **Prime** key is held down longer than 5 seconds

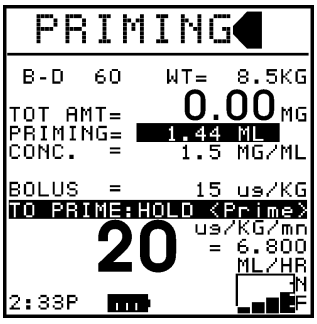


Figure 7.5: Priming Screen

During Priming, the LCD screen displays the following (as shown in Figure 7.5):

(1) “PRIMING” is shown at title line with Moving Delivery Mark
(2) The accumulated Priming Volume in ML
(3) Syringe Plunger Force Chart

The Syringe Status LED indicator becomes a **fast blinking RED**.

! WARNING:
Fluid delivered during Priming does not count towards the accumulated Total Amount.

If the Priming process is interrupted due to the release of the **Prime** key or other error conditions (except Empty Syringe), pressing the **Prime** key again will RESUME the accumulation of the priming volume as though the process was not interrupted. However, the Priming Volume is reset to 0 if an Empty Syringe condition is encountered or if any parameter is reprogrammed.

7.6 STAND-BY AUTO and STAND-BY MANUAL

The pump offers a **STAND-BY feature** with a Stand-by timer for starting delivery at a programmed **later time**.

There are two types of Stand-by: **AUTO** and **MANUAL**. The user can choose between the types using PUMP DEFAULTS, option <3> of MAIN MENU PAGE 3 (Refer to paragraph 8.3.2.1.5).

(1) **Stand-by AUTO** - Normal Delivery will start automatically at the expiration of the standby timer.
(2) **Stand-by MANUAL** - Pump does not start delivery automatically. An audio alert will sound, and the user must manually press the **Deliver** key to start Normal Delivery.

The pump must be programmed and ready to deliver before the activation of the Stand-by timer. Once the pump is programmed, the user can press the **Menu** key to access MAIN MENU PAGE 2 and select option <5>, “SET STAND-BY TIMER,” to activate the Stand-by feature. The user is prompted to program Stand-by time in HH:MM (Hours:Minutes). After the time is programmed, the pump is put into Standby Mode and shows the Stand-by screen (Shown in Figure 7.6). The remaining time in Stand-by is displayed in the title line.

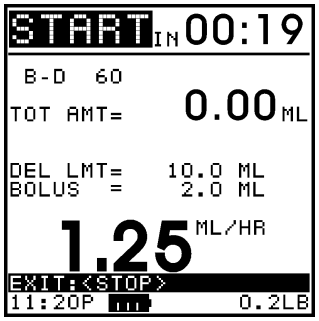


Figure 7.6: Stand-by AUTO Screen (In Stand-by MANUAL, “STBY ENDS” replaces “START” in title line).

During the Stand-by interval, the pump condition is continuously monitored. Any condition preventing the pump from being ready to deliver is detected. Normal Delivery will not start automatically if any error condition exist. Instead, an error alert will be given at the end of Stand-by.

Pressing the **Stop** key in Stand-by will cancel this function and return the pump to the Stop mode.

7.7 ENHANCED PUMP PERFORMANCE

! IMPORTANT

The user can maximize syringe pump performance by selecting the 1) correct syringe size for the given application. 2) optimizing the infusion line set up, and 3) programming the appropriate plunger (occlusion) force.

7.7.1 Program Appropriate Infusion Rate and Bolus Amount for Syringe Size

Always use the smallest syringe for the volume of fluid being given.

The table below list the recommended lowest rate and smallest bolus for each syringe size.

Syringe Size	Lowest Recommended Rate	Smallest Recommended Bolus
140 ML	5.0 ML/HR	0.1 ML
60 ML	2.0 ML/HR	0.05 ML
30 ML	1.0 ML/HR	0.05 ML
20 ML	0.70 ML/HR	0.02 ML
10 ML	0.35 ML/HR	0.02 ML
5 ML	0.20 ML/HR	0.01 ML
3 ML	0.10 ML/HR	0.01 ML
1 ML	0.03 ML/HR	0.01 ML

7.7.2 Use Low Dead Space Infusion Set Ups

Always use components having the lowest deadspace (internal volume) to minimize the residual volume between the syringe pump and the patient.
For example minimize:

(1) Tubing internal diameter – small bore or microbore tubing
(2) Tubing length – shorter is better
(3) Number of stopcocks – minimize the number
(4) Size of in line filters – small volume low deadspace filters
(5) Y Sites – minimize number and use low volume sites

An infusion set up that is less compliant and has low deadspace can reduce both start-up time and occlusion detection time.

7.7.3 Selecting Appropriate Plunger (Occlusion) Force Setting

The pump monitors the pressure required for any infusion. The bar graph on the LCD displays the plunger force setting (Low, Norm, Mid, High) and the pressure trend for the infusion in process. See Appendix III for occlusion force pressures for each syringe.

The tables below displays the relative pressure for each setting for all syringes.

All Syringe Sizes (except 1 ML)

Code	Meaning	Relative Pressure (psi)
LF	Low	5
NF	Normal	10
MF	Mid	15
HF	High	20

Syringe Size 1 ML

Code	Meaning	Relative Pressure (psi)
LF	Low	7.5
NF	Normal	15
MF	Mid	22.5
HF	High	30

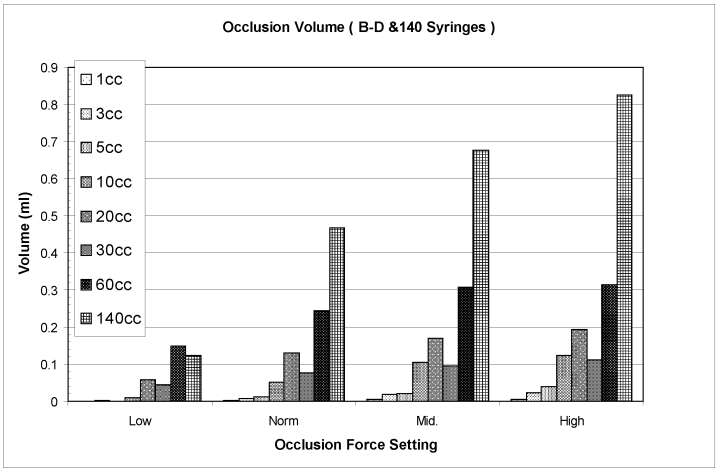
! IMPORTANT The lower the plunger force setting the faster the occlusion detection time.

7.7.4 Post Occlusion Bolus Reduction Option (Pump Defaults Main Menu page 3 option <5> (Motor Reverse))

The pump can be programmed to minimize the amount of fluid released following an occlusion alarm. The table below shows the typical stored volume that is released post occlusion with this feature activated for Becton Dickson 1,3,5,10,20,30,and 60 ML syringes.

NOTE: The Total Volume read out will be reduced slightly following an occlusion alarm if Motor Reverse is active.

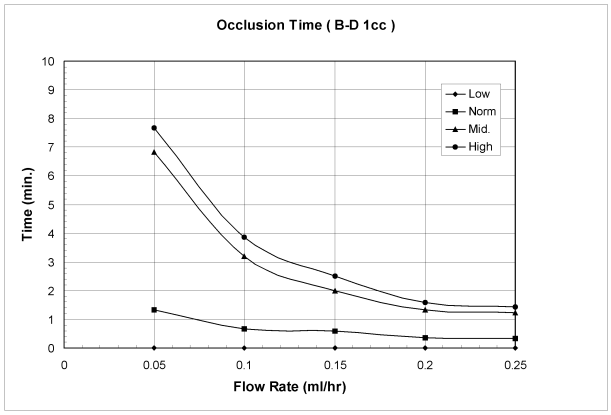
Force Settings	LF	NF	MF	HF
Syringe Size(ML)	Volume of Bolus (ML)			
BD 1	0	0	0	0.01
BD 3	0	0.01	0.02	0.02
BD 5	0.00	0.01	0.02	0.04
BD 10	0.01	0.05	0.10	0.12
BD 20	0.06	0.13	0.17	0.19
BD 30	0.04	0.08	0.10	0.11
BD 60	0.15	0.24	0.31	0.32
XXX140	0.12	0.47	0.68	0.83

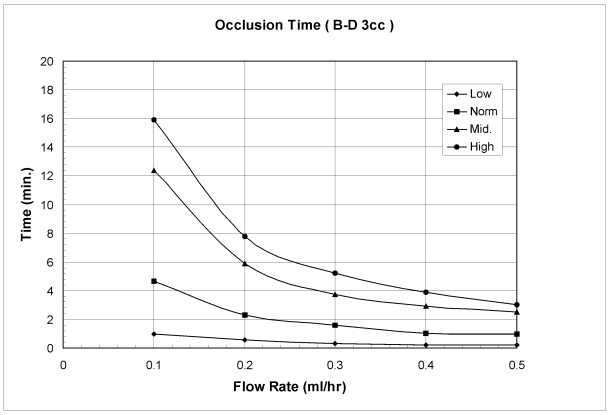


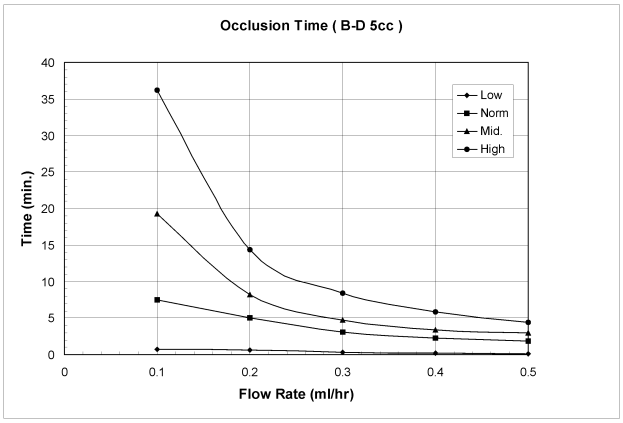
The time required for a pump to detect an occlusion is primarily affected by the following factors:

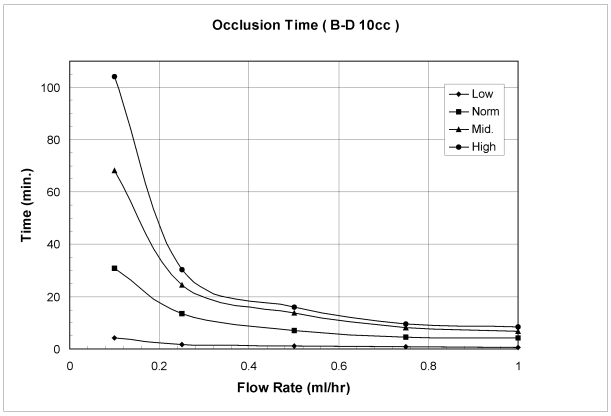
(1) Occlusion Pressure Setting (Plunger Force)
(2) Infusion Rate
(3) Compliance and composition of the Infusion set up (i.e., Tubing and syringe tip softness, tubing internal diameter, existence of injection ports, filters, Y sites, etc.)

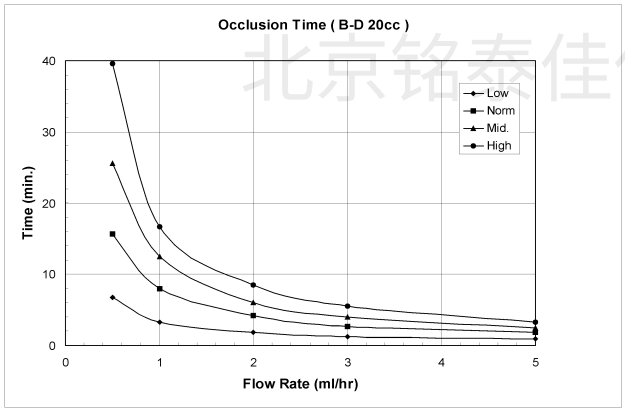
Below are typical time-to-occlusion graphs for several syringes. For best performance always select the smallest syringe size because smaller syringes at lower rates and plunger force settings have shorter occlusion times.

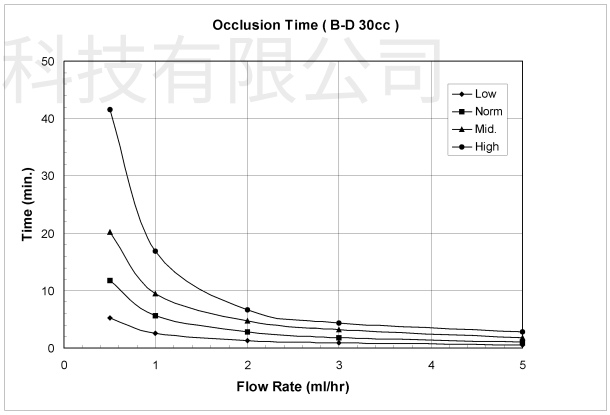


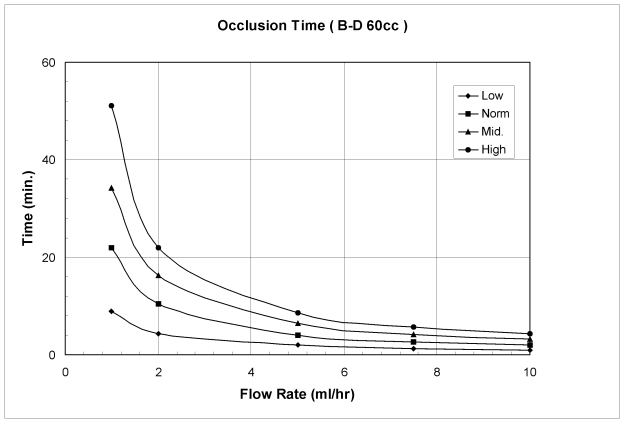






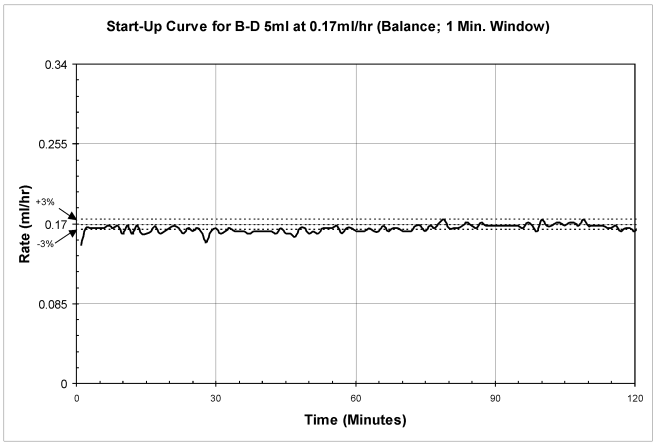


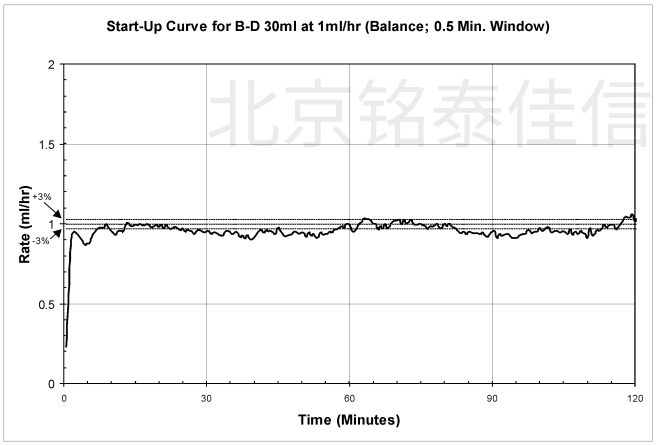


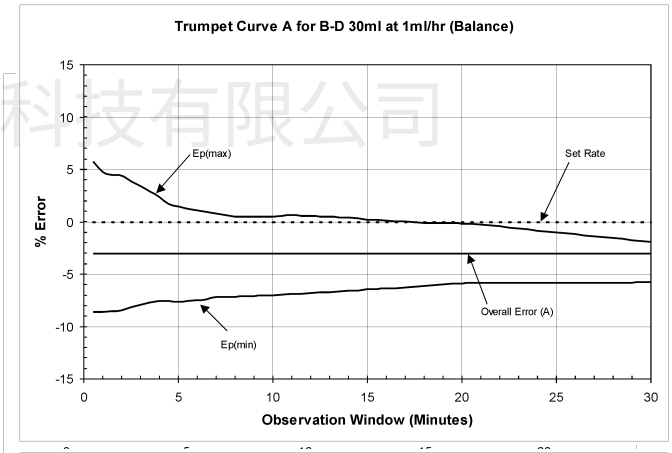


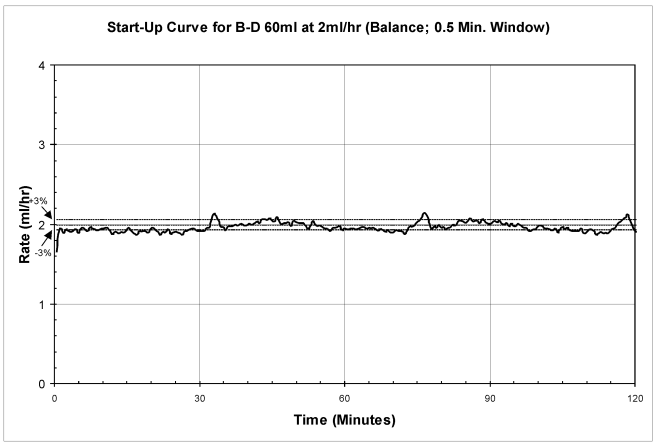
7.7.5 Start-up and Trumpet Curves

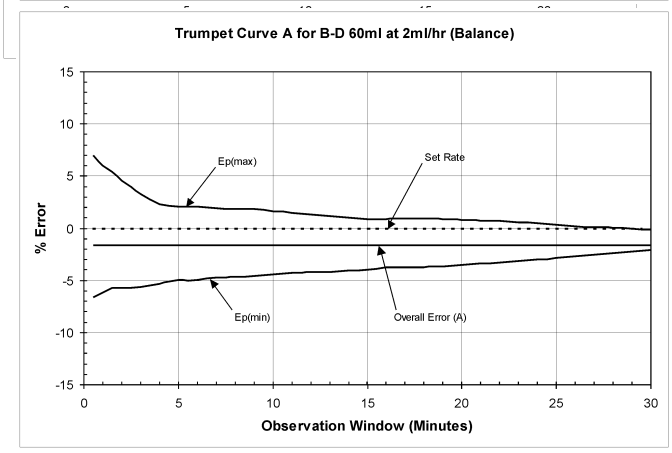
The flow delivery graphs below show the typical start-up times for select BD syringes. For best performance always select the smallest syringe size because smaller syringes at lower rates have faster start-up times compared to larger syringes at the same infusion rate.











SECTION 8. MENU STRUCTURE

To view the MENU screen, press the **Menu** key. If there are multiple MENU screens, use the **Menu** and **Go Back** keys to navigate through the MENU pages.

There are three general areas of each MENU screen (See Figure 3.4.2).
(1) Menu Title at the top of the screen
(2) Selection Area in the middle
(3) Instructions at the bottom

In general, the selection area lists the available options. In order to make a selection, or, in some cases, to enter numeric data, follow the instructions at the bottom of the screen. In most cases, the **up/down arrow** keys, the **Select** key, or the **numeric** keys will be used. When an option is selected, it will become highlighted. Press the **Enter** key to confirm the selection.

To escape from a menu screen, press the **Stop** key.

MAIN MENU has 3 Pages:

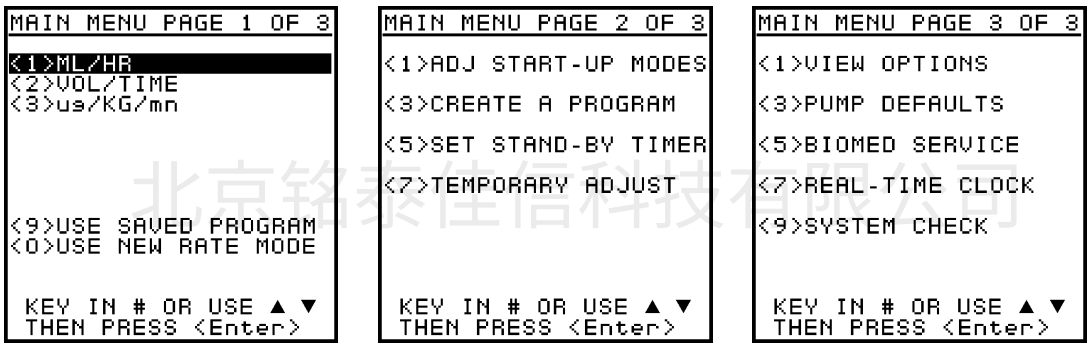


Figure 8.1: MAIN MENU pages 1 through 3

8.1 MAIN MENU PAGE 1 OF 3

This page allows the user to select a rate mode (Refer to paragraph 6.1 for more on rate modes).

8.1.1 Start-Up Modes

Options <1> through <7> (only 3 are shown) are called **Start-up Modes**. These are the most commonly used rate modes. The user can customize this list of Start-up Modes with ADJ START-UP MODES, option <1> of MAIN MENU PAGE 2 (See paragraph 8.2.1).

If the desired rate mode is not on the list of Start-up Modes, the user can select option <9> to choose from **Saved Programs**, or option <0> for a list of **Standard Rate Modes**.

8.1.2 Select Saved Program *(Option <9> of MAIN MENU PAGE 1)*

The pump provides a convenient feature for Creating and Retrieving Saved Programs. This feature allows users to save programs with a specific Rate Mode and infusion settings, for use in repeated infusions of the same medicine.

Up to 9 pages of customized Saved Programs can be stored in the pump. Only the page(s) with valid saved programs will be visible. If there are no Saved Programs already stored in the pump, "NO SAVED PROGRAMS !" will be displayed.

(1) Use **Menu** and **Go Back** keys to navigate the pages.
(2) Use **numeric** or **up/down** keys to select the desired Saved Program and confirm with **Enter** key.
(3) Use the **Stop** key to abandon the selection process.

MAIN MENU PAGE 2 option <3> allows user to CREATE A (SAVED) PROGRAM. (Refer to paragraph 8.2.2).

8.1.3 Select Standard Rate Mode *(Option <0> of MAIN MENU PAGE 1)*

There are 3 pages of Standard Rate Modes (See Figure 8.2):
Page 1 - Continuous Modes and Volume/Time Mode.
Page 2 - Body-Weight Modes and Mass Modes (in µg or MG)
Page 3 - Unit Modes (in mU or U)

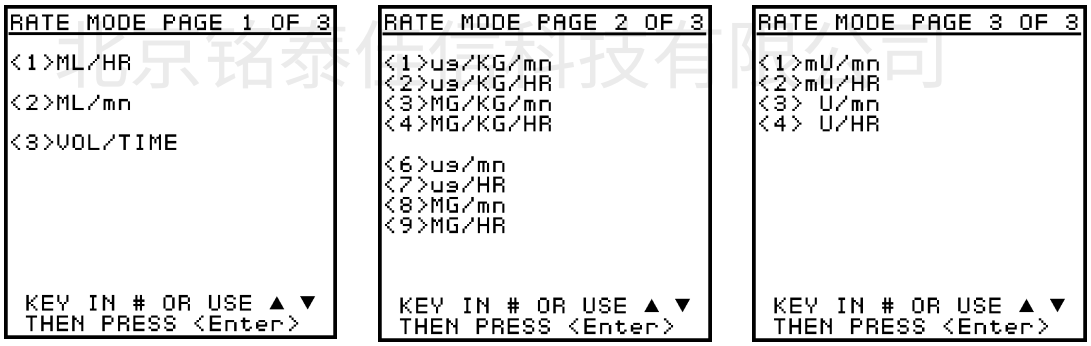


Figure 8.2: Menus 1 through 3 of "Use New Rate Mode," Option <0> of Main Menu Page 1

(1) Use **Menu** and **Go Back** keys to navigate the pages.
(2) Use **numeric** or **up/down** keys to select the desired rate mode and confirm with **Enter** key.
(3) Use the **Stop** key to abandon the selection process.

8.2 MAIN MENU PAGE 2 OF 3

There are 4 options in MAIN MENU PAGE 2:
<1> Adjust Start-Up Modes ("ADJ START-UP MODES")
<3> Create a Program
<5> Set Stand-By Timer
<7> Temporary Adjust

8.2.1 Adjust Start-up Modes *(Option <1> of MAIN MENU PAGE 2)*

Start-Up Rate Modes, the most commonly used modes, are available in the Selection Area of MAIN MENU PAGE 1.

Using this utility (See Figure 8.2.1.1), the user can customize the list of Start-up Rate Modes. The maximum number of start-up modes is limited to 7 (only 3 selections are shown).

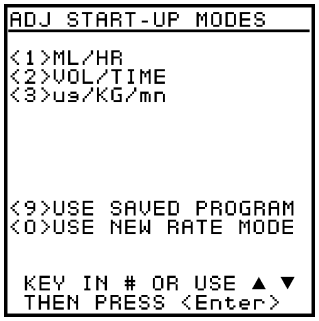


Figure 8.2.1.1: ADJ START-UP MODES Main Screen

There are two ways to customize the list:

(1) Add a rate mode to the Start-up list:
Additional rate modes can be added from the list of Standard Rate Modes (option <0>) or Saved Programs (option <9>). A Rate Mode that is already included in the Start-up list will have a special marking on its item number and will be unavailable for selection, so as to prevent having two identical rate modes on the Start-up list.

(2) Delete or Re-Arrange the Rate Modes on the Start-Up List:
- (A) Select the rate mode to be deleted or moved using the **number** or **up/down arrow** keys, followed by **Enter** key. Once this is done, the instructions at the bottom of the screen change (See Figure 8.2.1.2).
- (B) Per instructions on the menu, use the **Reset** key to delete the selected rate mode and/or the **Up/Down** keys to change the order of the rate mode on the list.
- (C) Press the **Stop** key to confirm the new arrangement and return to the option's main screen. Pressing **Stop** key again saves the new list and returns back to MAIN MENU PAGE 2.

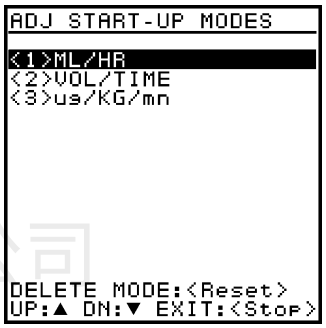


Figure 8.2.1.2: Deleting or Re-Arranging Start-up list Rate Modes

8.2.2 Create a Program *(Option <3> of MAIN MENU PAGE 2)*

Up to 9 pages of customized Saved Programs can be stored in the pump. The steps for creating and saving a Program follow:

Step 1: Select the Page and Number where the new Program is to be stored:

Numbers that show "*Program with a number" are empty and available for storage (see Figure 8.2.2.1).
Use the **Menu** key to select a page for the new program.
Use the **number** or **up/down arrow** keys to select the number where the program will be saved.
NOTE: To delete an existing saved program select (highlight) the program and press **Reset** key.
Press **Enter** key to confirm the selection.

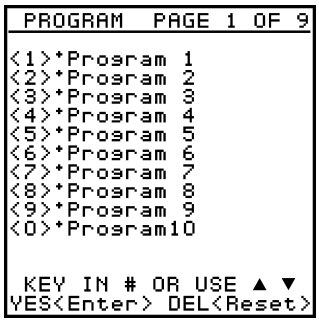


Figure 8.2.2.1: Select Page and Item Number to Store New Program

Step 2: Enter Program Name

(1) A screen will appear where the name of the program can be entered (See Figure 8.2.2.2).

(2) Use the **alphanumeric** keys to choose the desired letter/number. Pressing an **alphanumeric** key repeatedly (or using the **Up/Down** keys) allows the user to scroll through the corresponding lowercase and uppercase letters and numbers.

(3) Move to the next character using the **Select** key.

(4) When finished, press **Enter** key.

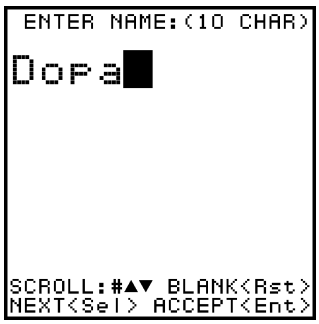


Figure 8.2.2.2: Entering Program Name

Step 3: Determine Rate Mode and the values for the infusion settings to be saved:

There are two options:

(1) Use Current Infusion settings:

If **Enter** key is pressed when "USE CURRENT SETTING?" is prompted (See Figure 8.7), then the current programmed infusion settings are saved to the Program. The pump returns to stop mode with the new program name displayed.

(2) Create new Infusion settings from scratch:

If the **Select** key is pressed when "USE CURRENT SETTING?" is prompted, the user must program a new set of infusion settings beginning with rate mode and followed by other associated infusion settings (Refer to paragraph 6.1).

This new set of infusion settings and Program name is used as the current setting, and saved in memory as a named Program.

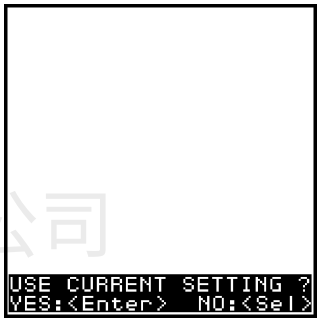


Figure 8.7: Storing Current Infusion Parameters for the Saved Program

Only the following infusion settings are stored into the Saved Program:

NOTE: Weight and Delivery Limit are not stored.

Continuous Mode:	Rate Mode, Bolus, and Rate
Volume/Time Mode:	Delivery Volume and Delivery Time
Body-Weight Mode:	Rate Mode, Concentration, Bolus, and Rate
Mass Mode:	Rate Mode, Concentration, Bolus, and Rate

Once a program is saved, it can be retrieved using option <9> of MAIN MENU PAGE 1 (Refer to paragraph 8.1.2).

8.2.3 Set Stand-by Timer *(Option <5> of MAIN MENU PAGE 2)*

(Refer to paragraph 7.6 for use of Stand-by Timer).
The pump must be completely programmed and ready to deliver before the Stand-by timer is activated. If the infusion settings are not properly programmed, an error message is given and the pump exits to MAIN MENU.

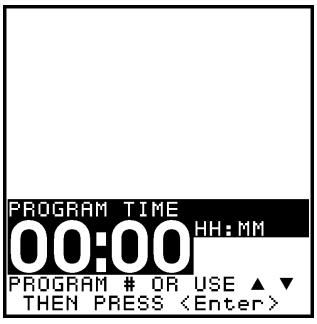


Figure 8.2.3: Setting Stand-By Timer

If the pump has been properly programmed, the user is prompted to program the Stand-by time in HH:MM (Hours:Minutes). See Figure

8.2.3. After the time is programmed, the pump goes into Stand-by Mode, which can be exited by pressing the **Stop** key.

8.2.4 Temporary Adjust *(Option <7> of MAIN MENU PAGE 2)*

The Temporary Adjust feature can be used to eliminate a nuisance occlusion alarm by allowing the user to adjust both the Bolus Rate option <1> and Bolus Plunger Force option < 3>. Normally, the infusion rate for Bolus Delivery is set at the maximum rate for the syringe in use and the plunger force threshold is the same as the default setting. In some situations, a false occlusion alarm can occur when the bolus is delivered into a small diameter tubing at a high rate.

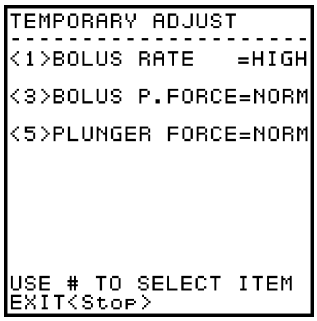


Figure 8.2.4: "Temporary Adjust" allows users to change Occlusion Force threshold and Bolus Delivery Rate until the Pump is turned off

This option allows the user to adjust both the bolus infusion rate and the plunger force threshold for the Bolus Delivery **Temporarily** (See Figure 8.2.4). The user can slow down the Bolus infusion rate and increase the occlusion threshold to overcome the problem.

Temporary Adjust option <5> also allows the user to change the Plunger Force during Normal Delivery to select the best force setting for the given infusion.

NOTE: Any temporary changes are cancelled when the pump is turned off.

(1) Use the **number** keys to select the item to be adjusted.
(2) Use the **Select** or **up/down arrow** keys to adjust the setting of the item. Press the **Enter** key to confirm the change.
(3) Press the **Stop** key to exit to MAIN MENU PAGE 2.

8.3 MAIN MENU PAGE 3 OF 3

MAIN MENU PAGE 3 allows the user to view selected options, customize pump options and includes system maintenance. There are 5 options:

<1> View Options
<3> Pump Defaults
<5> Biomed Service
<7> Real-Time Clock
<9> System Check

8.3.1 View Options *(Option <1> of MAIN MENU PAGE 3)*

This item allows the user to view all the Pump Default Options that have been selected without having to know the Access code (Option <1>).

(1) Use the **Menu** and **Go Back** keys to scroll through the option pages.
(2) Use the **Stop** key to return to MAIN MENU PAGE 3.

The user can review and verify all option defaults programmed but cannot change them (Figure 8.3.1 shows both the defaults that can be programmed and one possible Default settings). At the left side bottom (see arrow) on page one are four digits that identifies the parameters programmed (CRC). The user can verify that another pump is programmed the exact same way provide the numbers are identical.

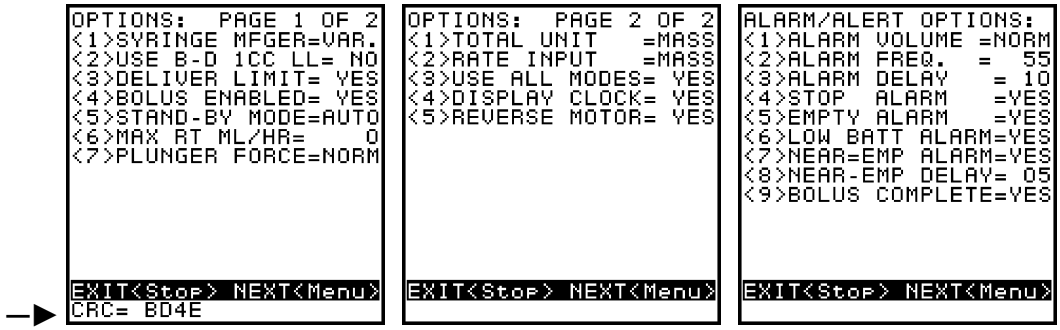


Figure 8.3.1: "Pump Defaults" has two pages of Pump Options (left two) and one page of Alarm Options (right)

To change or program Pump Defaults, the user must enter the PUMP DEFAULTS option code as explained in the next section.

8.3.2 Pump Defaults *(Option <3> of MAIN MENU PAGE 3)*

PUMP DEFAULTS contains 2 pages of Pump Options and 1 page of Alarm Options:

An Access Code is required to program the PUMP DEFAULTS. Please refer to Appendix IV.

! IMPORTANT

Some institutions may wish to limit user access to this code by removing the appendix or blocking out the numerical code.

After entering the Access Code, the user can change Pump Defaults by doing the following:

- Use the **Menu** key to navigate the option pages.
- Use the **number** keys to select the item to be changed.
- Use the **Select** or **up/down arrow** keys to scroll through the available options for the item, or enter a number for the item.
- Press the **Enter** key to confirm the change.

Repeat the same process for each item to be changed. Press **Stop** key to save the changes.

8.3.2.1 Option Page 1:

8.3.2.1.1 SYRINGE MFGER (Manufacturer):

If only one syringe manufacturer is chosen, this will serve as the default syringe manufacturer and the user does not have to program the manufacturer setting. If multiple manufacturers are chosen, PUMP DEFAULTS will show VAR. (for "variable"), and the desired manufacturer can be chosen from the list displayed.

8.3.2.1.2 USE B-D 1ML LL (luer lock): *YES or NO*

B-D 1ML luer lock syringe and B-D 3ML syringe have the same diameter syringe barrel. If B-D 1ML luer lock is enabled, the user must manually select B-D 1ML Luer Lock or B-D 3ML syringe.

8.3.2.1.3 DELIVERY LIMIT: *YES or NO*

If YES is chosen, the pump will prompt user to enter limit. If NO is chosen, there is no prompt.

8.3.2.1.4 BOLUS ENABLED: *YES or NO*

If YES is chosen, the pump will prompt user to enter Bolus. If NO is chosen, there is no prompt.

8.3.2.1.5 STAND-BY MODE: *AUTO or MANU (manual)*

User can program either Auto or Manu setting. Refer to paragraph 7.6 for the differences between Stand-by Modes.

8.3.2.1.6 MAX RT ML/HR (Maximum Rate in ML/HR only): *0-999*

Limits the maximum normal delivery rate in ML/HR mode. No maximum rate limit is in effect if 0 is selected.

8.3.2.1.7 PLUNGER FORCE: *LOW, HIGH, MID, or NORM*

Sets the threshold of the plunger (occlusion) force.

8.3.2.2 Option Page 2:

8.3.2.2.1 TOTAL UNIT: *ML or MASS*

Unit for total amount displayed.

8.3.2.2.2 RATE INPUT: *ML or Mass*

Unit for rate input displayed.

8.3.2.2.3 USE ALL MODES: *YES or NO*

If No is selected, the only available rate modes are those in the start-up list.

8.3.2.2.4 DISPLAY CLOCK: *YES or NO*

If Yes, real-time clock will be displayed during normal operation.

8.3.2.2.5 MOTOR REVERSAL: *YES or NO*

If Yes, Motor will reverse briefly when occlusion is encountered. The motor reversal reduces post occlusion bolus it does not reduce the occlusion detection time.

8.3.2.3 Alarm Options:

8.3.2.3.1 ALARM VOLUME: *LOW, NORM, or HIGH*

Allows user to program audio volume settings.

8.3.2.3.2 ALARM FREQ. (frequency of sound):

Allows user to program audio alarm frequency. Two digits, 0-9 for each. An audio alarm may consist of two different frequencies; the first digit corresponds to the first frequency, and the second digit corresponds to the second frequency. The higher the digit, the higher the sound. For only one sound, set second digit to 0.

8.3.2.3.3 ALARM DELAY: *2-60 minutes*

Allows user to select the amount of time the audio alarm will be temporarily silenced after the ALARM OFF key is pressed.

8.3.2.3.4 STOP ALARM: *YES or NO*

If NO, there will be no slow beep audio alarm in stop state.

8.3.2.3.5 EMPTY ALARM: *YES or NO*

If NO, there will be no audio alarm when the syringe is empty.

8.3.2.3.6 LOW BATT (battery) ALARM: *YES or NO*

If NO, there will be no audio alarm when battery is low.

8.3.2.3.7 NEAR-EMP (empty) ALARM: *YES or NO*

If NO, there will be no audio alarm when near-empty condition is detected.

8.3.2.3.8 NEAR-EMP (empty) DELAY: *2-99 minutes*

Allows user to adjust the amount of time before the syringe is emptied when a Near-Empty audio alarm is triggered.

8.3.2.3.9 BOLUS COMPLETE: *YES or NO*

If NO, there will be no audio alarm when bolus infusion is completed.

8.3.3 Biomed Services *(Option <5> of MAIN MENU PAGE 3)*

This item allows user to:

(1) Perform calibration services for the analog sensors (Size, Position, and Force).
(2) Duplicate the options configuration and saved programs from one device to another device.
(3) Reset the pump to factory default settings.

! WARNING

A special Access Code is required for BIOMED SERVICES. Only technically trained personnel should attempt to perform these functions.
Contact the manufacturer to acquire this code.

8.3.4 Real-Time Clock *(Option <7> of MAIN MENU PAGE 3)*

! WARNING

A special Access Code is required for BIOMED SERVICES. Only technically trained personnel should attempt to perform this function.

This item allows the user to set up the Real-Time Clock. When the clock battery is replaced, the clock needs to be reset. The clock holds data of Year, Month, Day, Hour, Minute, and Second.

(1) The data entered by the user is checked by the pump. For example, 30 is an invalid entry for Days in February, and 13 is an invalid entry for Hour, etc.

(2) The current clock data is displayed (See Figure 8.3.4). All data must be entered. The **Stop** key aborts programming. The **Go Back** key can be used to return to the previous data entry.

(3) The system returns to MAIN MENU when the clock data has been entered.

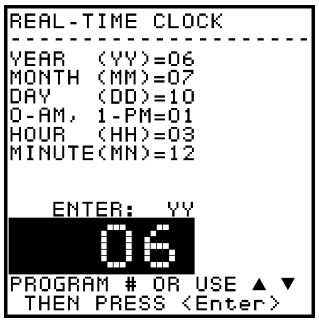


Figure 8.3.4: Real-Time Clock Set Up Screen

8.3.5 System Check *(Option <9> of MAIN MENU PAGE 3)*

This item allows the user to inspect the readings of the system's major sensors in order to verify that they are functioning properly (See Figure 8.3.5). This menu can be used for Quality Control inspection. No Access Code is required.

The following sensors are checked:

(1) Position Sensor
(2) Size Sensor
(3) Battery Voltage
(4) Plunger Force Sensor
(5) Plunger Retainer detector

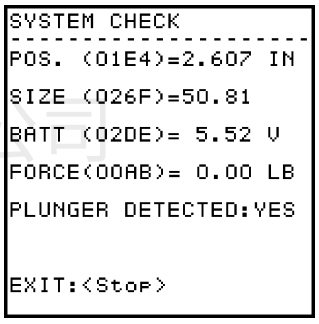


Figure 8.3.5: System Check allows user to verify that the system's major sensors are working properly

The raw Analog to Digital Converter reading as well as the calibrated reading of the analog sensors are displayed. The **Stop** key is used to exit to MAIN MENU.

SECTION 9. BATTERY OPERATION

9.1 AC POWER / BATTERY OPERATION

The pump is designed to operate with AC power backed-up by battery power. The pump can operate with AC power only (i.e., battery pack is not installed or depleted) or with Battery Power only (i.e., AC power interruption or during patient transportation).

The pump automatically switches to battery power if AC power is interrupted during the pump operation. It will switch back to AC power as soon as the AC power is restored.

A battery pack is installed in each pump (See Back View figure - paragraph 3.2). The battery pack can be removed or inserted into the pump without any tool. A thumbscrew on the battery pack secures the battery pack in the pump. A rubber O-ring with the pack is compressed when the thumbscrew is tightened to prevent fluid from entering the battery compartment.

9.2 INSTALLING, CHARGING, AND REPLACING THE BATTERY PACK

The battery can be easily installed into the battery compartment of the pump without any tool.

When AC power is connected to the pump, the condition of the battery pack is assessed and a charging process is initiated if necessary. Under normal conditions, a fast charging process will start immediately. If the pump motor is not running, it takes approximately 8 hours to fully charge the battery pack, depending on the battery condition.

If a battery pack is deeply discharged, with very low battery voltage, the pump will try to "Condition" the battery pack by pulsing energy into it until the battery voltage reaches a threshold to start fast charging. If the battery voltage cannot reach the threshold voltage after a preset time period, then "REPLACE BATTERY" is displayed. User can remove and re-insert the pack to try one more time. However, if the charging process fails again, the user must replace the battery pack.

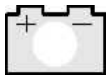
If the battery pack is fully charged, the pump will not continue to charge it in order to prevent over-charging and prolong battery life. The pump will only continue charging if the battery pack voltage falls below a preset threshold or if the battery pack is removed from the pump and replaced. User can always manually trigger battery charging by removing and re-installing the battery pack while AC power is connected.

9.3 INDICATORS FOR BATTERY CONDITION

There are 3 indicators related to battery operation: Battery LED, LCD Battery Symbol, and audio alarm. The Battery LED is the main indicating source, since it is always visible.

9.3.1 Battery LED

The Battery LED is located on the left-hand side of the LCD display. The LED flashes different colors and speeds to indicate the battery condition:



(1) GREEN indicates power coming from an AC source
   (A) SOLID Green: Fully charged battery
   (B) FAST BLINKING Green: Fast charging in progress
   (C) SLOW BLINKING Green: Conditioning stage of battery charging

(2) YELLOW indicates power coming from the Battery
   (A) FAST BLINKING Yellow: Low battery condition
   (B) SLOW BLINKING Yellow: Normal battery condition

(3) RED indicates a battery alarm condition
   (A) FAST BLINKING Red: Absent or Defective Battery, Depleted Battery

9.3.2 Battery Symbol on LCD display

The battery symbol is displayed in the middle of the "Status Line" when it is displayed (See Figure 9.1). The Status line appears on the bottom of the screen when the pump is in:
(1) Stand-by charging state
(2) Ready-to-Deliver state (when all infusion settings are programmed)
(3) Delivery state, when pump motor is running

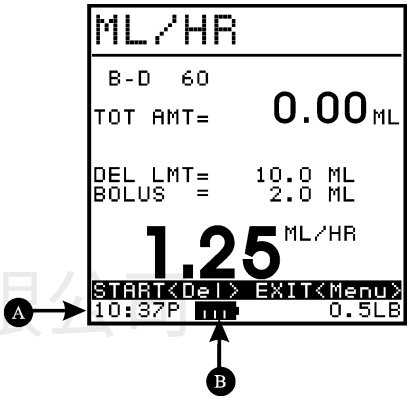


Figure 9.1: Status Line (A) and Battery Symbol (B) on LCD Display – Ready-to-Delivery State

The following battery conditions are indicated during **AC power operation**:
   (A) Fast Charging: Fast moving block inside the battery symbol
   (B) Battery Conditioning: Slow moving block inside the battery symbol
   (C) Fully Charged Battery: Solid battery symbol
   (D) Absent or Defective Battery: Fast Blinking battery symbol

The following battery conditions are indicated during **Battery power operation**:
   (A) Solid battery symbol: More than 90% of battery energy remaining
   (B) Partially filled battery symbol: Proportional to % of energy remaining
   (C) Empty battery symbol: Depleted battery

9.3.3 Audio Alarm

The audio alarm sounds if the battery is low or depleted (this applies only if enabled in PUMP DEFAULTS—Refer to paragraph 8.3.2.3.6):
   (A) Low Battery: distinct, low frequency slow beeping
   (B) Depleted Battery: fast beeping

9.4 BATTERY OPERATION PRECAUTIONS

(1) Prior to battery pack replacement, put the pump in the stop delivery mode then turn off the power using the **Power Off** key. The programmed infusion settings are retained in the pump memory for a short period of time to facilitate the battery replacement. After a new battery pack is installed, the user can resume normal operation by reconfirming the infusion settings with the **Enter** key after the pump is turned back on.

! IMPORTANT: Both the Total volume and Running volume are reset to 0.

(2) Tightened battery thumbscrew by hand. DO NOT over-tighten, as this can cause breakage of the plastic thumbscrew.
(3) The battery pack must be installed when cleaning the pump with disinfecting fluid to prevent liquid from entering the battery compartment.

SECTION 10. IV POLE AND RAIL ATTACHMENT

The pump comes with a clamp, allowing for easy installment on an IV pole.

10.1 DIAGRAMS

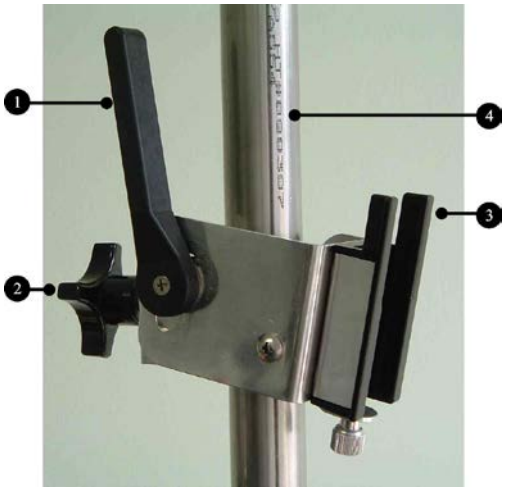


Figure 10.1: Pole Clamp

Pole Clamp

1 Tilt Handle
2 Clamp Tightening Knob
3 Shoe
4 IV Pole

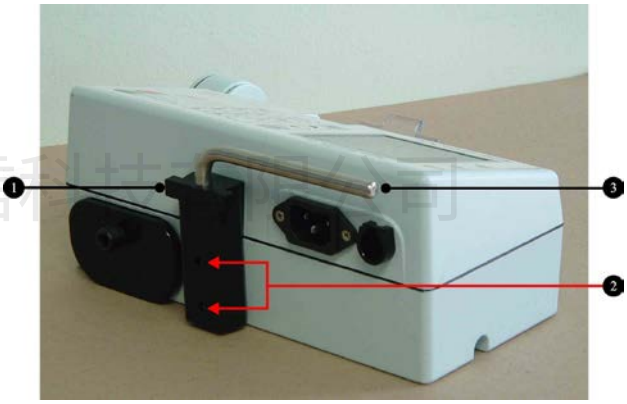


Figure 10.2: Handle Holder

Handle Holder

1 Hook
2 Handle holder screws
3 Handle

10.2 INSTALLING THE PUMP ONTO IV POLE

Step 1: Installing the clamp onto the IV pole

(A) Loosen the knob screw at the back of the clamp.

(B) Slip the metal clamp onto the pole and tighten the knob screw until it pushes against the IV pole, thus trapping the pole securely in the clamp. The tilt handle should be on the left-hand side of the pole.

Step 2: Mounting the Pump on the Clamp

(A) If the handle holder is already installed, skip to step B. If the Handle Holder (pole attachment) is not installed, use a hex key to tighten the screws inside the attachment (Figure 10.2 Item 2) into the holes on the back of the pump.

(B) Hold the pump angled away from you and place the hook on the handle holder over the top of the clamp shoe.

(C) Push down gently but firmly. You should hear a click as the attachment secures itself to the clamp.

The pump is now secure (See Figure 10.3).

Figure 10.3: Pump attached to Pole

10.3 CHANGING THE ANGLE OF THE PUMP FACE

(1) Turn the tilt handle on the left hand side of the clamp counterclockwise to loosen, keeping a hold on the pump.
(2) As the lever loosens, the pump should begin to tilt freely. Hold pump at desired angle and turn lever clockwise to tighten until the pump stands freely and securely at its new angle.

10.4 REMOVING THE PUMP FROM IV POLE

(1) Holding the pump firmly with both hands, angle the pump away from you to unlock it from the clamp.
(2) Pull upwards.

The pump is now removed from the pole.

SECTION 11. CLEANING

Follow your institutions guidelines for disinfecting and cleaning this pump.

The following solutions can be safely used:

(1) Alcohol 70% isopropyl solution
(2) Common bleach 10% solution
(3) Sporicidin solution
(4) Cidex solution
(5) A mild water-soap solution

! CAUTION: To prevent possibility of serious damage

Do not use strong detergents, organic solvents or solutions containing ammonium chloride to clean any portion of the pump

Do not immerse.

Avoid spills and inadvertent entry of fluid in the pump housing.

Make sure that the battery pack is properly installed in the pump prior to cleaning.

SECTION 12. SERVICE AND WARRANTY

! WARNING:

Other than cleaning, any repairs or maintenance must be performed by trained qualified biomedical personnel either at the institution or at the manufacturer.

Testing including all calibration checks should be performed at least yearly or whenever a pump has been dropped or damaged.

WARRANTY

SOLSCI Corp. warrants to the purchaser that the Syringe Infusion Pump shall be free from defects in material and workmanship for a period of one (1) year from the date of purchase. SOLSCI's sole obligation with respect to any such defect is limited to the repair, or at SOLSCI's option, replacement of the Syringe Infusion Pump. Purchaser pays return freight charges.

This warranty is made on the condition that prompt notifications of a defect is given to SOLSCI, within the warranty period, and that SOLSCI shall have the sole right to determine whether a defect exists.

This warranty does not apply to Syringe Pumps that have been partially or completely disassembled, altered, subjected to misuse, negligence, or accident; or operated other than in accordance with the instructions provided by SOLSCI.

This warranty represents the exclusive obligation of SOLSCI, and the exclusive remedy of the purchaser regarding defects in a Syringe Infusion Pump. THIS WARRANTY IS GIVEN IN LIEU OF ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING THE WARRANTY OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. No person is authorized to modify, in any manner, SOLSCI's obligation as described above.

SECTION 13. DEFINITIONS

Alarm Temporary Delay Time: A custom programmed delay time of 2 to 60 minutes that is activated when the alarm off key is pressed once.

Alarm Volume: A program option in the pump default mode that allows programming of the alarm auditory volume to low, normal, or loud.

Biomed Service: This mode is used by trained biomedical technicians to service the pump.

Body-Weight Mode: A level of pump operation that delivers either micrograms (µg, mcg) or milligrams (mg, MG) per kilogram (KG) per time (e.g., minute or hour).

Bolus: A level of pump operation during which a preprogrammed amount is delivered at the fastest rate possible for the syringe size in use, by pressing the BOLUS key.

Continuous Infusion Mode: A level of pump operation that allows delivery of a specific fluid volume at a specified rate. Useful in delivery of a volume of medication at a specific constant rate.

Delivery Limit: The programmable preset volume the pump will deliver before stopping (Dose volume).

Delivery Mode: The level of pump operation during which the infusion occurs as initiated by pressing the DELIVER key and indicated by the blinking of the green DELIVER LED.

Delivery Time (DT): Time in hours and minutes for the programmed volume (dose) to be delivered.

Dose Volume (DV): Volume (ML) or dose size to be administered (the same as program volume in the volume/time mode). Also same as Delivery Limit in Continuous and Mass modes.

Invalid Number: A LCD parameter that indicates what has been programmed is not consistent with other values entered. A valid entry that is programmable will be displayed.

Kilogram: One kilogram (kg, KG) equals 1000 ($1x10^3$) grams.

Light Emitting Diode (LED): A red, yellow or green light function signaled by the pump.

Liquid Crystal Display (LCD): The pump screen.

Infusion Saved Program: Stored information on a particular medication which when retrieved allows the user to deliver that medication in a quicker manner.

Microgram: One microgram (µg, mcg) equals 0.000001 ($1x10^{-6}$) grams.

Milligram: One milligram (mg, MG) equals 0.001 ($1x10^{-3}$) grams.

Prime: A level of pump operation that is only activated in the STOP mode after all other functions have been entered. Priming allows the fluid to be delivered to replace air in the tubing attached to the syringe. The actual priming volume can be verified on the prime volume counter of the LCD. The prime function also eliminates any mechanical tolerances whenever a newly filled syringe is loaded onto the pump. Never use the PRIME function to deliver infusate to a patient.

Pump Default Mode (PD): A level of pump operation that is limited in access by a lockout feature and generally only accessed by specially trained healthcare professionals or biomedical engineers to preprogram or customize the pump by selection of the syringe manufacturers, alarm delay time, alarm types, alarm volume, audio frequency, plunger force, near empty, volume limit, bolus capability, total unit and rate input.

Running Volume (RV): A recording of total volume delivered since the last dose volume reset. The Dose Volume minus running volume equals the volume yet to be delivered.

Total Delivered: Refers to the amount of medication actually delivered during the course of an infusion (Does not include the volume delivered in the priming mode).

User Mode: A level of pump operation that is available to the pump user. Level of operation can be limited by custom programming default settings.

Volume/Time Mode: A level of pump operations that delivers a specific volume (dose) over a specified delivery time (useful in delivery of a single dose over a specific time).

APPENDIX I FLOW RATES AND CALCULATIONS

The following formulas are used to calculate various variables in the BODY-WEIGHT and MASS modes:

RATE MODE = µg/KG/min

RATE in µg/KG/min = (Final conc in MG/ML) (ML/HR) (1000) / (60 min/HR) (Wt in KG)

RATE in ML/HR = (60 min/HR) (Wt in KG) (µg/KG/min) / (Final conc. in MG/ML) (1000)

CONC. In MG/ML = (60 min/HR) (Wt in KG) (µg/KG/min) / (ML/HR) (1000)

RATE MODE = µg/KG/HR

RATE in µg/KG/HR = (Final conc. in MG/ML) (ML/HR) (1000) / (Wt in KG)

RATE in ML/HR = (Wt in KG) (µg/KG/HR) / (Final conc. in MG/ML) (1000)

CONC. In MG/ML = (Wt in KG) (µg/KG/HR) / (ML/HR) (1000)

RATE MODE = MG/KG/min

RATE in MG/KG/min = (Final conc. in MG/ML) (ML/HR) / (60 min/HR) (Wt in KG)

RATE in ML/HR = (60 min/HR) (Wt in KG) (MG/KG/min) / (Final conc. in MG/ML)

CONC. In MG/ML = (60 min/HR) (Wt in KG) (MG/KG/min) / (ML/HR)

RATE MODE = MG/KG/HR

RATE in MG/KG/HR = $\frac{\text{(Final conc. in MG/ML) (ML/HR)}}{\text{(Wt in KG)}}$

RATE in ML/HR = $\frac{\text{(Wt in KG) (MG/KG/HR)}}{\text{(Final conc. in MG/ML)}}$

CONC. In MG/ML = $\frac{\text{(Wt in KG) (MG/KG/HR)}}{\text{(ML/HR)}}$

RATE MODE = MG/HR

RATE in MG/HR = (final conc. in MG/ML) (ML/HR)

RATE in ML/HR = $\frac{\text{(MG/HR)}}{\text{(Final conc. in MG/ML)}}$

CONC. In MG/ML = $\frac{\text{(MG/HR)}}{\text{(ML/HR)}}$

APPENDIX II FLOW RATES and SYRINGE SIZES

Syringe Mfgr	Syringe Size (ML)	Minimum Fill Volume (ML)	ML PER HR	
			Minimum Rate	Maximum Rate
B-D	1.0	0.01	0.01	46.85
MONO	1.0	0.01	0.01	46.34
TERU	1.0	0.01	0.01	46.89
B-D Glass	1.0	0.01	0.01	45.54
B-D	3.0	0.01	0.05	156.3
MONO	3.0	0.01	0.05	166.7
TERU	3.0	0.01	0.05	169.9
B-D Glass	2.5	0.01	0.05	157.7
B-D	5.0	0.01	0.05	304.9
MONO	6.0	0.01	0.05	336.7
TERU	5.0	0.01	0.05	358.6
B-D Glass	5.0	0.01	0.05	290.4
B-D	10.0	0.02	0.1	441.6
MONO	12.0	0.02	0.1	517.7
TERU	10.0	0.02	0.1	529.6
B-D Glass	10.0	0.02	0.1	435.8
B-D	20.0	0.02	0.1	770.0
MONO	20.0	0.02	0.1	860.8
TERU	20.0	0.02	0.1	861.5
B-D	30.0	0.05	0.1	989.0
MONO	35.0	0.05	0.1	1178
TERU	30.0	0.05	0.1	1132
B-D	50/60	0.05	0.1	1500
MONO	60.0	0.05	0.1	1497
TERU	60.0	0.05	0.1	1796
XXX	140.0	0.10	0.5	3055

NOTE: All syringes can be filled to their maximum stated syringe volume.

APPENDIX III OCCLUSION FORCE

OCCLUSION FORCE: (All syringes except 1 ML)
HIGH = 20 PSI MID = 15 PSI NORM = 10 PSI LOW = 5 PSI
1 ML syringe: HIGH = 30 PSI, MID = 22.5 PSI, NORM = 15 PSI, LOW = 7.5 PSI

SYRINGE MFGR	SYRINGE SIZE (ML)	**PLUNGER (OCCLUSION) FORCE (LB)**			
		LOW	NORM	MID	HIGH
B-D	1.0	0.2	0.4	0.61	0.81
MONO	1.0	0.2	0.4	0.6	0.8
TERU	1.0	0.2	0.4	0.61	0.81
B-D Glass	1.0	0.2	0.39	0.59	0.78
B-D	3.0	0.45	0.9	1.35	1.79
MONO	3.0	0.48	0.96	1.43	1.91
TERU	3.0	0.49	0.98	1.46	1.95
B-D Glass	2.5	0.45	0.9	1.36	1.81
B-D	5.0	0.87	1.75	2.62	3.5
MONO	6.0	0.97	1.93	2.90	3.86
TERU	5.0	1.03	2.06	3.09	4.11
B-D Glass	5.0	0.83	1.66	2.49	3.33
B-D	10.0	1.27	2.53	3.80	5.07
MONO	12.0	1.49	2.97	4.46	5.94
TERU	10.0	1.52	3.04	4.56	6.08
B-D Glass	10.0	1.25	2.5	3.75	5.0
B-D	20.0	2.21	4.42	6.63	8.84
MONO	20.0	2.47	4.94	7.41	9.88
TERU	20.0	2.47	4.94	7.41	9.89
B-D	30.0	2.84	5.68	8.51	11.35
MONO	35.0	3.38	6.76	10.15	13.53
TERU	30.0	3.25	6.50	9.74	13.0
B-D	50/60	4.31	8.61	12.92	17.22
MONO	60.0	4.30	8.59	12.89	17.19
TERU	60.0	5.15	10.31	15.46	20.62
XXX	140.0	8.77	17.53	26.3	35.1

Note: PSI is calculated by dividing the force (lbs) by the cross sectional area of the syringe in square inches.

APPENDIX IV PUMP DEFAULT PROGRAMMING CODE

! IMPORTANT

Many Institutions limit who has access to the following code to Biomedical Personnel or trained clinical specialist. If limited access is desired then either remove this page or blacked out the code number below.

In order to program Pump Defaults the following code must be entered 4321.