

System Operating Manual



For use with List Numbers:

20677, 20678, 20679-04



Back
Prime

A

B

Options/
Vol Inf



HOSPIRA, INC., LAKE FOREST, IL 60045, USA

430-95597-001 (Rev. 06/05)

Change History

Title	Description of Changes	Pages Affected
430-95597-001 (Rev. 06/05)	First Release	All

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SECTION 1

Descriptive Information

NOTE: In this manual, references to Plum A+ apply to both systems unless otherwise noted.

**Plum A+®
List # 20679-04**

NOTE: This operating manual may also be used with Device List Numbers 12391-04 & 11971-04-03+ which use Module List Number 20677-04.



**Plum A+®3
List # 20678-04**

CAUTION: THIS DEVICE IS TO BE USED WITH AN IV POLE WITH A 6-WHEEL BASE AND A SHELF.



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The Plum A+ and Plum A+3 Volumetric Infusion Systems are designed to meet the fluid delivery requirements of today's evolving healthcare environments. Both are cassette based multi-function infusion systems. The Plum A+ allows two lines in and one line out while the Plum A+3 allows six lines in and three lines out. Each pump can be used for standard, piggyback, or concurrent delivery. Delivery modes include:

- Standard Infusions
- Multistep Programming
- Loading Dose
- Dose Calculation

The Plum A+ and Plum A+3 are designed to deliver parenteral, enteral, or epidural infusions over a broad range of infusion rates from multiple fluid container types.

Both are designed to be used in most areas of patient care, including, but not limited to:

- *General Floor*
- *Labor/Delivery/Post Partum*
- *Burn Unit*
- *Medical/Surgical*
- *OR/Anesthesia*
- *Hemodialysis*
- *ICU/CCU*
- *Post Op/Recovery*
- *Oncology*
- *Pediatrics*
- *Cardiac Cath Lab*
- *Mobile Intensive Care*
- *Neonatology*
- *Emergency*
- *Nutritional*

Product Description

Each system includes a pumping module (hereafter called the infuser) and an assortment of disposable IV sets (hereafter called a set), optional accessories, and this operator's manual.

The Plum A+ host device contains a Connectivity Engine peripheral module that provides wired Ethernet and wireless 802.11b local area networking capabilities. This allows the

Hospira Mednet™ networked application software for drug library downloads and Auto-programming to the infuser.

Indications for Use

USER QUALIFICATION

The Plum A+ is intended for use at the direction or under the supervision of licensed physicians or certified healthcare professionals who are trained in the use of the infuser and the administration of parenteral, enteral, and epidural fluids and drugs and whole blood or red blood cell components. The training should emphasize preventing related IV complications, including appropriate precautions to prevent accidental infusion of air. The epidural route can be used to provide anesthesia or analgesia.

WARNING


ADMINISTER ONLY ANESTHETICS/ANALGESICS APPROVED FOR EPIDURAL ADMINISTRATION (AS INDICATED OR ALLOWED BY THE DRUGS' FDA APPROVED LABELING). EPIDURAL ADMINISTRATION OF DRUGS OTHER THAN THOSE INDICATED FOR EPIDURAL USE COULD RESULT IN SERIOUS INJURY TO THE PATIENT.

Conventions

This section describes the conventions used throughout this manual, as follows:

CONVENTION	APPLICATION	EXAMPLE
<i>Italic</i>	Reference to a section, figure, or table Function or mode specific instructions	(See Figure 3-1, Priming Cassette) <i>Primary Only:</i> Attach an empty container.

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CONVENTION	APPLICATION	EXAMPLE
[BRACKETED ALL CAPS]	Keys or buttons on the device are displayed in [BRACKETED ALL CAPS] or with a graphic.	[START] or 
▲ <i>[Italic]</i>	Softkey Options	▲ <i>[Choose]</i>
Initial Caps lowercase	Screen displays and device labels (as appropriate)	Program Dose Calculation
Bold	Emphasis	...sets are supplied Sterile and are for....

WARNINGS, CAUTIONS, AND NOTES

Alert messages used throughout this manual are described below. Pay particular attention to these messages.

WARNING

A WARNING MESSAGE CONTAINS SPECIAL SAFETY EMPHASIS AND MUST BE OBSERVED AT ALL TIMES. FAILURE TO OBSERVE A WARNING MESSAGE IS POTENTIALLY LIFE THREATENING.

CAUTION: A CAUTION USUALLY APPEARS IN FRONT OF A PROCEDURE OR STATEMENT. IT CONTAINS INFORMATION THAT COULD PREVENT IRREVERSIBLE PRODUCT DAMAGE OR HARDWARE FAILURE. FAILURE TO OBSERVE A CAUTION COULD RESULT IN SERIOUS PATIENT OR USER INJURY.

NOTE: A Note highlights information that helps explain a concept or procedure.



This symbol directs the user to consult accompanying documents.

When visible on the display, this symbol informs the user to use CAUTION because the specified drug has NOT been programmed with specified safety limits.

NOTE: Figures are rendered as graphic representations to approximate the actual product. Therefore, figures may not exactly reflect the product.

Precautions

The Plum A+ has been designed and manufactured to be safe, reliable, and easy to use. This section details precautions and possible hazards.

For safe operation of the Plum A+, observe the following precautions and hazards.

HEALTHCARE PROFESSIONALS AND PATIENT RELATED

- In vitro studies have suggested that packed red blood cells with unusually high hematocrit be diluted with blood-compatible fluids, such as 0.9% sodium chloride injection, to decrease hemolysis and increase flow rate.
- Setting the primary rate greater than the secondary rate will result in a more rapid infusion of any residual secondary drug remaining in the line and the cassette.
- Consult drug labeling to confirm drug compatibility, concentration, delivery rates, and volumes are all suitable for secondary, concurrent and piggyback delivery modes.
- Arrange tubing, cords, and cables to minimize the risk of patient strangulation or entanglement.
- Before opening the door, close clamp on the primary line or remove the secondary container from the secondary port to prevent mixing of primary and secondary fluids.

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- Although unlikely, failure of certain robust mechanical components such as the anti-free flow mechanism or valve control springs could cause fluid delivery limited to the contents of the fluid container. Single fault failure of certain electronic/motor control components would result in no more than 5 mL of unexpected fluid delivery.
- A small amount of fluid is expelled from the set (less than 0.05 ml) each time the door is opened or closed with a set installed. If potent drugs are being used, take appropriate action to guard against overmedication of the patient.
- Before disconnecting a syringe from the cassette, pull up the plunger slightly to avoid spilling the fluid. For rigid containers, close the upper slide clamp, open the cassette door, then remove and invert the cassette (ports down).
- Air bubbles may form distal to the cassette as result of normal outgassing of dissolved air in the fluid. This may occur if chilled solution is in use, if the infuser is mounted significantly above the patient, or when using certain fluids known to routinely outgas. In these cases, an air eliminating filter may be used.
- Repeated opening and closing of the door may defeat the proximal air-in-line alarm and may cause a distal air-in-line alarm, requiring repriming.
- The screen displays the VTBI (volume to be infused) in integers when value is above 99.9. Any fraction of a milliliter delivered is not displayed, but is retained in memory.
- For Plum A+3 users, be aware that changing the weight on one device does NOT change the weight on the other two devices. Patient weight must be changed on each device when delivering weight-based therapy dependent on medication requirements.

CONCURRENT FLOW

GUIDELINES

When delivering short half-life critical drugs (*see Critical Drugs, this section*) using the Plum A+ in the Concurrent mode, the following delivery rate guidelines should be observed:

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- If the critical drug (with half-life less than 6 minutes) is to be infused at less than 2 mL/hr, the other infusion should be no faster than 5 times the critical drug's rate. Dopamine, for example, delivered at 1.5 mL/hr should not be accompanied by an infusion programmed any faster than 7.5 mL/hr.
- If the critical drug (with half-life less than 6 minutes) is to be infused at 2 - 5 mL/hr the other infusion should be no faster than ten times the critical drug's rate. Dopamine, for example, delivered at 3.5 ml/hr should not be accompanied by an infusion programmed any faster than 35 mL/hr.
- If the critical drug (with half-life less than 6 minutes) is to be infused at 5.1 mL/hr or greater, the other infusion can be programmed at any desired rate.

NOTE: The total of the primary rate plus the secondary rate cannot exceed 500 mL/hr.

These guidelines apply *only* when infusing *short half-life critical drugs* in *Concurrent mode*. Individual patient responses may vary requiring adjustment of delivery rates.

DELIVERY RATE GUIDELINES	
SHORT HALF-LIFE (LESS THAN 6 MINUTES) CRITICAL DRUG INFUSION RATE	MAXIMUM RATE OF ACCOMPANYING INFUSION
0.5 - 1.9 mL/hr	5 Times the Critical Drug Rate
2 - 5 mL/hr	10 Times the Critical Drug Rate
5.1 or Greater	Any Desired Ratio

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CRITICAL DRUGS

Examples of drugs with a short half-life (approximately 6 minutes or less when given IV) include:

Dobutamine	Lidocaine
Dopamine	Nitroglycerin
Epinephrine	Nitroprusside
Epoprostenol	Norepinephrine
Esmolol	Oxytocin
Isoproterenol	Procainamide

For these drugs, the concurrent flow guidelines should be followed when the infusion rate of the drug will be 5 mL/hr or less.

NOTE: This list of critical drugs is not intended to be all-inclusive of critical drugs or drugs with a short half-life.

The clinician should become familiar with the pharmacodynamics of any critical drug before administration.

This information is presented to inform clinicians of a rare situation that could be misinterpreted if they are unfamiliar with this phenomenon.

EPIDURAL ADMINISTRATION

- Recommended use of the epidural route is to provide anesthesia or analgesia for periods up to 96 hours.
- This device can be used to administer only those anesthetics/analgesics approved for epidural administration (as indicated or allowed by the drugs' FDA approved labeling). Epidural administration of drugs other than those indicated for epidural use could result in serious injury to the patient.
- For epidural administration, the use of Hospira catheters, Plum sets without Y-sites, and "epidural" stickers indicating ongoing epidural administration are recommended.

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- Administration of drugs via the epidural route should be limited to personnel familiar with associated techniques and patient management problems. Proper epidural placement of the catheter is essential since catheter migration could result in intravascular or intrathecal administration. Facilities practicing epidural administration must be equipped with resuscitative equipment, oxygen, naloxone, and other resuscitative drugs. Adequate monitoring equipment (e.g., Oximetry) is recommended for continuous monitoring of the patient during epidural administration. Patients must be observed frequently for side effects in a fully-equipped and staffed environment for at least 24 hours following completion of drug administration by the epidural route. **DELAYED RESPIRATORY DEPRESSION FOLLOWING CONTINUOUS EPIDURAL ADMINISTRATION OF PRESERVATIVE-FREE MORPHINE SULFATE HAS BEEN REPORTED.**
- The epidural space has 58 openings through which fluid can exit. Pressure buildup during administration is transient. However, if a large volume of fluid is administered over a short time period, the pressure will take longer to return to normal. If overdelivery occurs during administration, observe the patient closely for signs of spinal cord compression (disorientation, headache, transient neuralgias) and drug overdose.

BATTERY OPERATION

- When the battery is removed from the Plum A+, do not operate on patients. Use of a properly maintained and charged battery helps confirm proper operation.
- The battery may not be fully charged upon receipt. Connect the infuser to AC power for at least six hours.
- Use AC power whenever possible. Connect to AC power during storage to ensure a fully charged battery for emergencies. If the quality of the earth grounding source is in doubt, use battery power.
- If the low-battery alarm sounds, connect the infuser to AC power immediately.

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SETS AND ACCESSORIES

- Only compatible LifeCare PlumSets can be used with the Plum A+. See individual set instructions for additional information.
- Administration sets should be changed per CDC guidelines or healthcare provider policy. Discard after use.
- LifeCare IV infusion sets with integral nonblood filters are not for use in the administration of blood, blood products, emulsions, suspensions, or any medications not totally soluble in the solution being administered. These medications may be administered through the lower Y-injection site, below the filter.
- When infusing at low delivery rates (5 mL/hr or less) the use of thick-walled microbore PlumSets is recommended. This will reduce the amount of the fluid bolus that may be delivered when a distal line occlusion is released.
- Syringes must be larger than 3 cc. Use syringe adapter (List 11986-48) when using syringes smaller than 10 cc. Some 10 cc syringes may require use of a syringe adapter. Syringes larger than 10 cc may be attached directly to the secondary port of the cassette. Use of a syringe adapter may decrease the occurrence of proximal occlusion alarms.
- Use a 19-gauge or larger needle or catheter at the venipuncture site for viscous fluids if operating at rates greater than 500 ml/hr.
See *Section 10 for information on sets and accessories.*

BACKPRIMING

- Backpriming is not recommended for reconstituting secondary containers containing dry powders.
- To avoid pressurization when backpriming into a syringe, the user must confirm there is sufficient empty space to accept the backprimed fluid.

GENERAL

- Possible explosion hazard exists if used in the presence of flammable anesthetics.

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- Do not place Plum A+ in service if it fails the self-test.
- Do not operate the Plum A+ with the case opened.
- Keep the cassette door securely closed while the infuser is not in use, to avoid cassette door damage.
- Values beyond a field's maximum hard limit will be displayed as dashes (-- -- --). The user must clear these fields using the [CLEAR] key prior to entering new values.
- The Plum A+3 is to be used with an IV pole with a 6-wheel base and a shelf.

CLEANING

For more information on cleaning the infuser, *see Section 8*.

- To avoid mechanical or electronic damage, do not immerse the Plum A+ in any fluids or cleaning solutions.
- Do not spray cleaning solutions toward any opening in the instrument.
- Certain cleaning and sanitizing solutions may slowly degrade components made from some plastic materials. Using abrasive cleaners or cleaning solutions not recommended by Hospira may result in product damage. Do not use compounds containing combinations of isopropyl alcohol and dimethyl benzyl ammonium chloride.
- Never use sharp objects such as fingernails, paper clips, or needles to clean any part of the infuser.
- Do not sterilize by heat, steam, ethylene oxide (ETO), or radiation.
- To avoid infuser damage, cleaning solutions should only be used as directed. The disinfecting properties of cleaning solutions vary; consult the manufacturer for specific information.

BOLUS RELATED

Use the following procedure to avoid the administration of a bolus following a distal occlusion (i.e., a closed distal clamp):

- If a secondary container is in use, clamp proximal tubing before opening cassette door.

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- Open cassette door and remove the cassette.
- Open the flow regulator briefly to dissipate the pressure and then close it.
- Eliminate the source of occlusion (closed clamp).
- Reinsert the cassette and close the cassette door.
- Open all clamps and resume infusion.

NOTE: When troubleshooting an occlusion where all clamps are in the OPEN position, use care to avoid delivery of a bolus by opening the flow regulator to release any built-up pressure. Close the clamp between the cassette and the patient before opening the flow regulator to relieve the pressure. *See Section 7, Alarms and Troubleshooting, for more information.*

ARTIFACTS

- Nonhazardous, low-level electrical potentials are commonly observed when fluids are administered using infusion devices. These potentials are well within accepted safety standards, but may create artifacts on voltage-sensing equipment such as ECG, EMG, and EEG machines. These artifacts vary at a rate that is associated with the infusion rate. If the monitoring machine is not operating correctly or has loose or defective connections to its sensing electrodes, these artifacts may be accentuated so as to simulate actual physiological signals. To determine if the abnormality in the monitoring equipment is caused by the infusion device instead of some other source in the environment, set the infusion device so that it is temporarily not delivering fluid. Disappearance of the abnormality indicates that it was probably caused by the electronic noise generated by the infusion device. Proper setup and maintenance of the monitoring equipment should eliminate the artifact. Refer to the appropriate monitoring equipment system documentation for setup and maintenance instructions.
- The Plum A+ system is designed to operate normally in the presence of most encountered electromagnetic interference (EMI) conditions. In the event of extreme levels of interference, such as encountered next to an electrosurgical

generator, it is possible that the normal operation of a sensor or microcomputer might be disrupted. Even in this event, the outcome would likely be a false alarm or detected system malfunction and would not result in a hazard to patient or operator.

- This equipment has been tested and found to comply with the EMC limits for the Medical Device Directive 93/42/EEC (EN 55011 Class B and IEC/EN 60601-1-2:2001). These limits are designed to provide reasonable protection against harmful interference in a typical medical installation. The equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to other devices in the vicinity. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference with other devices, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
 - Reorient or relocate the receiving device
 - Increase the separation between the equipment
 - Connect the equipment into an outlet on a circuit different from that to which the other device(s) is connected
 - Consult the manufacturer or field service technician for help
- Portable and mobile RF communications equipment, such as cellular telephones, 2-way radios, Bluetooth devices, microwave ovens, in close proximity to this device may affect wireless and wired communications with the Infusion pump and/or the operation of the Infusion pump. Special precautions need to be exercised regarding EMC, These include:
 - Use of a shielded Ethernet cable (CAT5 STP or better) for plugging into the RJ45 Ethernet connector. Using an unshielded Ethernet cable may result in increased emissions.

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- Maintaining a minimum separation distance of 2 ½ ft between the Infusion pump system and portable/mobile RF communications equipment
- List Numbers 12391 and 11971 are compliant to IEC/EN 60601-1-2 (1993)

List Numbers 20678 & 20679 are compliant to IEC/EN 60601-1-2 (2001) and have been tested and found to comply with EMC limits for the Medical Device Directive 93/42/EEC (EN 55011 Class B and EN 60601-1-2:2001).

Guidance on EMC Compatibility

- There is a shared responsibility between manufacturers, customers and users to ensure that Medical Equipment and Systems are designed and operated as intended. Medical electrical equipment needs special precautions regarding electromagnetic compatibility and needs to be installed and used according to the electromagnetic compatibility information provided in this manual.
- The device is suitable for use in all establishments, including domestic establishments. If extended operation during power mains interruption is needed, use battery power.
- Always manage the electromagnetic environment.
- The guidance included in this manual provides information needed to:
 - Determine the device's suitability for use in the intended environment.
 - Manage the electromagnetic environment to permit the device to perform as intended without disturbing other equipment.
- Separate the device from all other electronic equipment. If the device must be used near other electrical equipment, monitor the equipment to ensure there is no electromagnetic interference.
- Devices should not be used adjacent to or stacked with other equipment. If the device must be used adjacent to or stacked

with other equipment, monitor the devices to verify normal operation.

- USE ONLY components specifically labeled for use with the Plum A+ Infusion System to help ensure the device operates as intended.
- If you suspect external RF sources or other equipment are influencing device operation, contact the biomedical engineering department for additional guidelines concerning electromagnetic immunity.
- Contact the biomedical engineering department for additional information in the technical service manual concerning operating devices near RF sources.

FCC Information



US FCC (FEDERAL COMMUNICATIONS COMMISSION) STATEMENT

- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including that may cause undesired operation of these devices.

FCC INTERFERENCE STATEMENT

- This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, it may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to

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try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
 - Increase the distance between the equipment and the receiver.
 - Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
 - Consult the dealer or an experienced radio/TV technician for help.
- Changes or modifications not expressly approved by Hospira could void the user's authority to operate the equipment.

RADIO FREQUENCY EXPOSURE STATEMENT

- The Wireless LAN radio device in the Connectivity Engine peripheral board with this infusion device has been evaluated and found compliant to the requirements of the following Radio Frequency exposure standards:
 - Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields, July 2001.
 - Industry Canada, Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields, Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.
- The radiated output power of this Wireless LAN device is far below the FCC radio frequency exposure limits. The Wireless LAN device has been evaluated with zero inches separation of human body from the antenna and found to be compliant with FCC RF exposure limits.

SECTION 2

Principles of Operation

Features

The Plum A+ is a dual-line volumetric infusion system designed to meet the growing demand for hospital-wide, as well as alternate site and home healthcare, standardization. With its primary line, secondary line, and piggyback fluid delivery capability, the Plum A+ is suited for a wide range of medical/surgical and critical care applications. Full compatibility with LifeCare Plum Series administration sets and accessories and the LifeShield® and CLAVE® needleless protection systems, makes the Plum A+ a convenient and cost-effective infusion system.

PROGRAMS

- Standard Programming
- Loading Dose
- Multistep Programming

LINE PROGRAMMING OPTIONS

- Drug List
- Nurse Call Back
- Delayed Start/Standby Setting
- Concurrent delivery
- Titration
- Micro 0.1-99.9 mL/hr (in 0.1 mL increments) flow rate range for both lines
- Macro 100-999 mL/hr (in 1 mL increments) flow rate range for both lines
- Automated Secondary drug delivery (Piggyback)

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PLUMSET CAPABILITIES

- Anti Free-Flow Protection
- Direct Connection for syringe delivery

AIR MANAGEMENT

- Air Trap
- Air Removal/Backpriming
- Air Detection-Proximal
- Air Detection-Distal

BATTERY

NOTE: The Plum A+3 utilizes three batteries.

- Battery Gauge
- Less than 8-Hour Battery Recharge Time
- Long battery life (3 hours) for emergency backup and temporary portable operation

BIOMEDICAL

- Upgradability (Field- Single Channel Devices Only)
- Variable Rate Cap
- Alarm History
- Nurse Call Relay Connector

OPTIONS

- Volumes Infused (A, B, Total Volume)
- KVO at dose end (1 ml/hr or less depending on delivery rate) or Continue Rate (CR) to continue at the current rate
- Variable Distal Pressure Settings

OTHER FEATURES

- Nonpulsatile volumetric accuracy

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- Microprocessor control
- Large liquid crystal display (LCD) screen
- Panel back illumination on mains power
- Lockout switch
- Standard syringe use
- Parenteral and nonparenteral (enteral) fluid delivery
- Blood and blood products delivery
- Wide range of Standard and Specialty administration sets
- Password protected keypad lock

COMMUNICATION

- Networked Communication (Ethernet & Wireless)
- Autoprogramming
- Drug Library Download

Definitions

TERM	DEFINITION
<i>Administration Set</i>	<i>The sterile, disposable assembly with flexible tubing that connects to a source fluid container for input to the Cassette pumping chamber and to some output device for administration to the patient.</i>
<i>Alarm</i>	<i>A condition requiring operator intervention that invokes both audible and visible alarm indicators. Confirmation of the condition usually is required.</i>
<i>Alert</i>	<i>While entering a program, a visual warning that informs the clinician of the violation of a hospital-defined rule set, e.g., a dose limit for a specific drug.</i>
<i>Alternate Units</i>	<i>Dose Rate units that may be selected. Alternate Units are any units other than mL/hr.</i>

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TERM	DEFINITION
Alternate Units Parameters	Drug Amount, Diluent, Patient Weight (if applicable), and Dose Rate.
Auto-Program	A physician order sent to the infuser.
Auto-Program (new)	An auto-program is considered “new” if either of the following conditions are met: A) There is no program on the associated line. B) The drug and concentration in the auto-program is different from a currently-programmed drug and concentration.
Auto-Program (titration)	An auto-program is considered a “titration” if the drug and concentration in the auto-program match the currently-programmed drug and concentration. Non-promotion titration programs include some subset of the following: Rate, Dose, Duration. Promotion titration programs include some subset of the following: Rate, Dose, Duration, Patient Weight, Dosing Units, Drug Amount, Drug Units, Diluent Amount.
Awake CE	The CE is considered awake when the infuser is powered on with battery power and the battery is above the low battery threshold or is plugged into AC.
Backpressure	Resistance to fluid flow on the Distal or output portion of the Administration Set, usually expressed as PSIG.
Backprime	Removal of air or fluid from the proximal tubing and Cassette air trap by rapid pumping of fluid from Line A to an output receptacle on Line B. No fluid delivered distal to the cassette during a Backprime.
Basic Delivery	A single-step delivery specifying rate, VTBI, and duration only. Drug name may or may not be specified.

Plum A+® Infusion Systems

TERM	DEFINITION
<i>Biomed Mode</i>	<i>The name for the non-delivery or service mode of Infuser operation.</i>
<i>Bolus</i>	<i>A single uninterrupted discrete volume of fluid delivered over a discrete period of time.</i>
<i>Cassette</i>	<i>A Hospira standard Plum Macro Cassette that contains the actual pumping chamber with inlet and outlet valves. It also contains access ports to diaphragms for proximal and distal line pressure sensing and chambers for air trapping and air quantity measurement.</i>
<i>Caution</i>	<i>Contains information which could prevent hardware failure, irreversible damage to equipment, or loss of data.</i>
<i>Channel</i>	<i>Distal Line output to the patient.</i>
<i>Cleared Program</i>	<i>Same as Cleared Settings, but restricted to the program delivery settings for an individual line.</i>
<i>Cleared Settings</i>	<i>Programmed delivery settings for both lines and the general control parameters are at their default values.</i>
<i>Clinical Care Area (CCA)</i>	<i>An area of the hospital for which authorized hospital staff has allowed use of up to 149 specific drugs, plus No Drug Selected. The clinician selects a CCA after turning on the Infuser. The hospital may create from one to eighteen CCA's.</i>

For Systems With Hospira MedNet™ Software

TERM	DEFINITION
Concentration	<i>For Dose Calculation based Line A or B delivery programming of premixed drugs, the concentration consists of Drug Amount (in micrograms [mcg], milligrams [mg], grams, milliequivalents [mEq], millimols [mmols], or units [USP Units]) and Diluent (Volume in milliliters [mL]). Abbreviated on screen displays as “Conc”.</i>
Concurrent Delivery	<i>Simultaneous delivery of two fluids at independent flow rates.</i>
Concurrent Mode	<i>The Line B control selection mode that allows either Line A or Line B (or both) of the Mechanism to be programmed for delivery that completes with KVO or CR. Line A operation is unaffected by Line B delivery.</i>
Connectivity Engine (CE)	<i>A component of the infuser that controls ethernet and wireless communication between the MMU and Infuser processor.</i>
Continue Rate (CR)	<i>An option used to provide fluid delivery at the current fluid delivery rate when the VTBI becomes zero.</i>
Default Drug Library (DDL)	<i>A drug list of 99 drug names, default units and default concentrations, plus ‘No Drug Selected’. Does not contain Soft or Hard Limits. The DDL is a subset of Plum A+ Version 11.3 drug list. The Infuser functions initially with the DDL.</i>
Deliver Together	<i>A Biomed Delivery option setting, which selects default of Piggyback or Concurrent delivery mode.</i>
Delivery Mode	<i>The normal operational mode for the Infuser, either Concurrent or Piggyback, during which fluid delivery may occur.</i>

Plum A+® Infusion Systems

TERM	DEFINITION
<i>Delivery Rate</i>	<i>The delivery rate (as Volume/Time) assigned by the operator or calculated from other delivery parameters.</i>
<i>Device</i>	<i>The Plum A+ IV Infusion Device (Infuser), not including the disposable administration sets.</i>
<i>Diluent (Volume)</i>	<i>The volume of fluid used with the Diluent Unit (e.g., 250 mL), which dilutes the drug to be infused.</i>
<i>Distal</i>	<i>Downstream (output) from the Cassette portion of the Administration Set.</i>
<i>Door</i>	<i>The lever-operated, bottom-hinged, Cassette holder on the front of the Mechanism.</i>
<i>Dose (Rate)</i>	<i>Delivery rate times drug concentration.</i>
<i>Dose Calculation</i>	<i>Allows programming Dose Rates in alternative units of measure. Dose Calculation can be used in Simple Delivery, Loading Dose, and Multistep.</i>
<i>Drug Amount</i>	<i>The mass or quantity of the drug premixed with a Diluent to express the Concentration for the Line being programmed.</i>
<i>Drug Library</i>	<i>Drug names available for use with the Infuser in the selected CCA, and each drug's concentration, units of measure, and dose limits, as determined by authorized hospital staff. The Drug Library is based on hospital-defined best practices. The Drug Library is customized and downloaded into the Infuser by authorized hospital personnel using Hospira MedNet Networked software.</i>

For Systems With Hospira MedNet™ Software

TERM	DEFINITION
<i>Duration</i>	<i>The time period used to deliver a VTBI at an existing Delivery Rate or as set by the operator.</i>
<i>Enteral</i>	<i>Delivery via an intestinal route.</i>
<i>Error</i>	<i>A condition resulting in an audible warning and often an accompanying message, such as an invalid key press, resulting from an operator attempt to make an input that is not valid for the current operational context. Not a Malfunction.</i>
<i>Filling Head Height (FHH)</i>	<i>The gravity induced Proximal Line pressure due to fluid height in source container above the Distal Line output level.</i>
<i>Flow Rate</i>	<i>The resulting rate of fluid flow. (See Rate and Dose.)</i>
<i>Fluid Delivery Begin</i>	<i>The time required, measured from the initial start of a keypad press, for a digit in the third decimal place of a scale measuring grams to change when pumping water, the delivery tube is fluid filled, and the end of the delivery tube is immersed.</i>
<i>Hard Limit</i>	<i>The dosing amount (upper and/or lower amount) that when assigned to a drug cannot be overridden. Defined by the hospital for each drug in its Drug Library. The hard limits for a particular drug may vary across different CCAs.</i>
<i>Infuser</i>	<i>A Plum A+ device, not including the disposable administration set.</i>
<i>Initialized Position</i>	<i>The plunger is in the Plunger Park Position, and each valve is in the Valve Home Position.</i>

Plum A+® Infusion Systems

TERM	DEFINITION
Key	<i>Any of the marked locations on the front panels intended for user input via a pressing action.</i>
KVO	<i>(Keep Vein Open) Internally selected minimal delivery rate, the lesser of 1.0 mL/Hr or actual Rate, intended to provide sufficient fluid flow to decrease the potential for clotting at the IV infusion site.</i>
Line A	<i>Inlet tubing on the top center of Cassette when viewed after it has been loaded in Mechanism Door.</i>
Line B	<i>Inlet connector on the top right of Cassette when viewed after it has been loaded in Mechanism Door.</i>
Loading Dose	<i>Allows programming of an initial infusion rate for a specific volume, followed automatically by a maintenance rate from the same container (e.g., a fluid challenge). If Dose Calc is used, the Loading Dose and Maintenance Dose are in the same unit of measure, over the same period of time (mcg/min), from the same container.</i>
Macro Cassette	<i>The Plum Cassette as part of an Administration Set whose attainable delivery performance is for general purpose uses.</i>
Malfunction	<i>One of a number of conditions that indicate a failure of the Infuser. These conditions usually require a repair action.</i>

For Systems With Hospira MedNet™ Software

TERM	DEFINITION
<i>Mechanism</i>	<i>The provider of the physical activities of: 1) valve control for Line selection and inlet to or outlet from the Cassette; 2) Plunger extension and retraction for changing fluid volume of the Cassette pumping chamber.</i>
<i>MedNet software</i>	<i>Networked application software used to define and download the custom drug library to the Infuser.</i>
<i>Multistep</i>	<i>Allows a sequential program to deliver up to 10 steps; fluid volumes and delivery rates may be programmed for each step. The program may be entered based on Rate and Volume or Volume and Time. If Dose Calc is used, the delivery steps are in the same unit of measure, over the same period of time, from the same container.</i>
<i>MMS</i>	<i>Medication Management Suite- a product suite that will be used to support safe and efficient caregiver administration of intravenous medications.</i>
<i>MMU</i>	<i>Medication Management Unit- the MMU is a product of the MMS and provides external communications with infusers and other systems supporting medication management. It supports drug library downloads and status/log updates to the infusers. MMU also delivers a variety of pre-built and custom reports related to the infuser activities.</i>
<i>Network-Enabled Module</i>	<i>The hardware that facilitates communication between the infuser and the network.</i>

Plum A+® Infusion Systems

TERM	DEFINITION
Note	<i>A Note explains something new, gives tips on performing an activity, or provides a reminder of necessary preparations.</i>
Override	<i>The clinician acknowledges an Alert, confirms and proceeds with a program containing a parameter that falls outside the hospital-defined Soft Limits.</i>
Parenteral	<i>Delivery via other than an intestinal route, such as intravenous (IV) injection.</i>
Patient Weight	<i>The Alternate Units Parameter whose value entry is required with Dose rates (quantity/time) having the third parameter of weight, such as mcg/kg/min.</i>
Piggyback Delivery	<i>Infusion will stop Line A and infuse Line B until VTBI completes.</i>
Piggyback Mode	<i>The Line B control selection mode that requires Line A delivery suspension while Line B delivers and then its resumption when Line B VTBI completes. If Line A is not programmed and started, Line B delivery just stops when its VTBI completes. Line A operation is delayed for duration of its interruption by Line B.</i>
Plunger Park Position	<i>The position of the pumping plunger that allows the cassette to be withdrawn from the Infuser without restriction, with an opened Door.</i>
POST	<i>Power On Self Tests. Startup initialization and test of critical hardware modules and software functions, to determine Infuser readiness for its Intended Use.</i>
Power On	<i>When the power is first applied to the Infuser processor. It occurs when Infuser is in the off condition and the AC power is applied or during battery operation when the ON/OFF key is pressed.</i>

For Systems With Hospira MedNet™ Software

TERM	DEFINITION
Pressure	<i>The measured fluid pressure for Proximal Line A, Proximal Line B, or the Distal line when a fully primed administration set is loaded into a Mechanism with the Cassette Door closed.</i>
Programs	<i>A Concentration-based extension to basic Volume/Rate delivery for Dose Rate applications. Softkey-selected types are: 1) Standard Program for single rate delivery; 2) Loading Dose for up to two steps of delivery at differing rates; 3) Multistep for up to ten steps of delivery at differing rates. Loading Dose and Multistep include the basic Delivery Rate option.</i>
Protocol	<i>In the medical field, hospital-approved procedures. For devices with an electronic communications interface, the format and content of messages being exchanged.</i>
Proximal	<i>Upstream (input, as Line A and/or B) with respect to the Cassette portion of the Administration Set.</i>
Rate	<i>See Delivery Rate</i>
Rounding	<i>To round-off to the closest whole number (e.g., 25.5 would round to 26, but 25.4 would round to 25).</i>
Rule Sets	<i>The compilation of Soft and Hard Limits associated with a drug entry.</i>
Screen	<i>That active portion of the LCD assigned to a delivery or other user interactive display operation.</i>

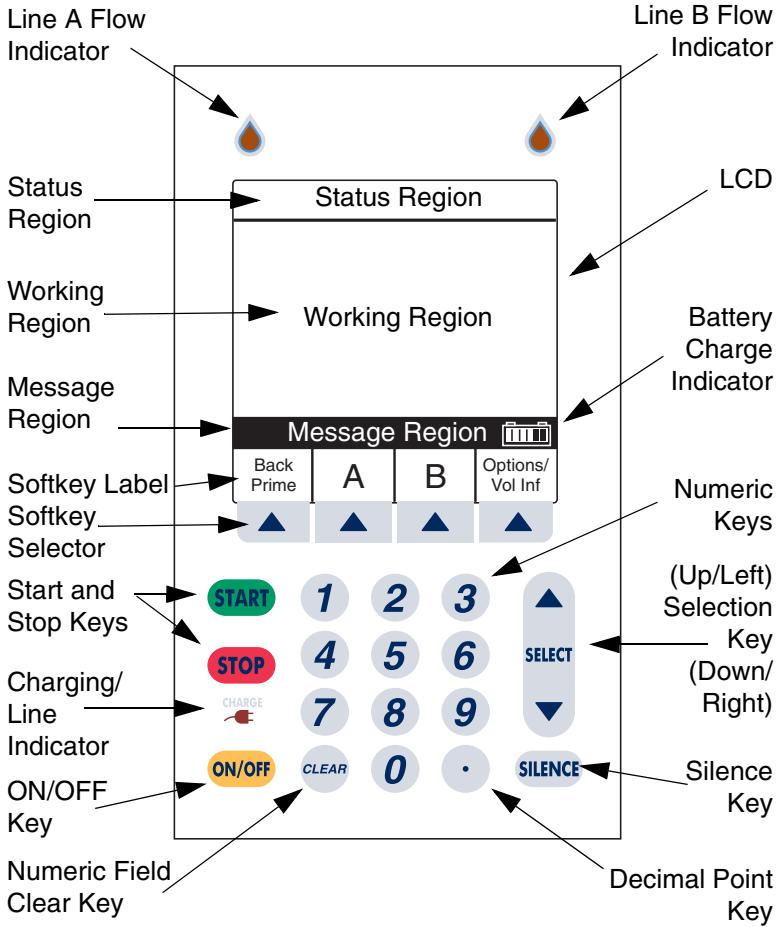
TERM	DEFINITION
Softkey	<i>A front panel key whose function label is on the bottom portion of the display screen just above its location, so that label may be changed to indicate differing key functions within the operational context of the defined screens.</i>
Soft Limit	<i>The dosing amount (upper and/or lower amount) that when assigned to a drug can be overridden based on confirmation. Defined by the hospital for each drug in its Drug Library. The soft limits for a particular drug entry may vary across CCAs.</i>
Standard Programming	<i>(see Basic Delivery)</i>
Standby	<i>A delivery program state that resembles a delayed start for a line in all respects, but status display of STANDBY instead of DELAYED. A press of the START key (and a Start Softkey if necessary) will begin the programmed delivery.</i>
System	<i>The Plum A+ Infuser system with its associated accessories and Administration Sets.</i>
Tall-Man Lettering	<i>Tall-Man lettering uses upper-case letters in combination with lower-case letters to help clinicians differentiate among sound-alike or look-alike drug names. Certain Hospira Default Library drug names are displayed in Tall-Man lettering.</i>
Truncate	<i>To round-down to the last whole number (e.g., 103.7 would be 103).</i>
Units	<i>A Drug Amount (without a quantity of mass referent) adopted as the United States Pharmacopoeia (USP) standard of measure for use in a Concentration.</i>

For Systems With Hospira MedNet™ Software

TERM	DEFINITION
VI	<i>Volume Infused.</i>
VTBI	<i>Volume To Be Infused – The volume of fluid or IV solution (remaining) for delivery by a program or Therapy step from a Line.</i>
Warning	<i>Audible indication at the defined Warning sound level, often accompanied by a brief message, to advise operator that: 1. Input was attempt to use a function in wrong sequence, with wrong values, or at wrong time (resulting in an Invalid Key Warning); 2. Input was properly related to a function (resulting in a Valid Key Warning). (The Low Battery Warning is an exception, using the Alarm Indication sound level.)</i>
Weight	<i>The Alternate Units Parameter whose value entry is required with Alternate Units for Dose that include /kg/.</i>

SECTION 3

Equipment Description



Front Panel Display and Keypad

Operating Keys

NOTE: For Plum A+3, all three pumps act as individual Plum A+'s.

The [ON/OFF] key is used to control the power of the Plum A+.

NOTE: All deliveries must be stopped in order to turn the power off.

NOTE: To confirm proper shutdown of infuser, do not unplug until “**double beep**” is heard (approximately 5 seconds). If “**double beep**” is not heard, the infuser will turn itself back ON sensing the AC power was lost and revert to battery back-up power.



The [START] key is used to begin infusion. It brings up the Confirmation screen. If all information appears correct, select ▲ [Yes] to start program.




The [STOP] key is used to stop the current delivery on one line; used in conjunction with soft keys to stop delivery on both lines.



The [SILENCE] key is used to silence an audible alarm during actions to correct its cause.



The [SELECT] key (or ) is used to move the highlighting cursor between the programming fields.



The numeric keys are used to enter values for any highlighted field requiring numeric data.

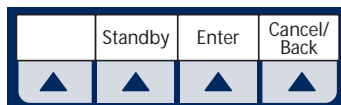


The [CLEAR] key will cause a highlighted numeric field to be cleared in preparation for data entry. It is also used to clear the displayed dashes (-- -- --) that occur when entering values beyond the pre-programmed hard limits. It WILL NOT clear the entire program.

The [DECIMAL POINT] key is used to manually enter numbers other than whole numbers (i.e., 1.2 mL).

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Softkeys are located at the bottom of the main display and serve a variety of functions. What each key does is indicated by the text in the display above the actual softkey.



Indicators

The Charge/Line Indicator is illuminated to indicate the battery is currently charging.

NOTE: If the device is plugged into AC power, with a battery installed, and the Charge Indicator is not illuminated, contact technical support.

CHARGE



The fluid drop symbol, when flashing, indicates an active infusion on Line A and/or Line B.



Display Symbols

Battery Capacity Symbol (located on right side of message region on display) indicates relative charge with number of white boxes from left to right.



Cautionary Symbol is displayed to alert the user that the infuser is being operated without rule sets (soft or hard limits). Read the drug package insert for information on proper usage.



Soft Limit Override Symbol indicates the programmed soft limits upper (up arrow) or lower (down arrow) have been overridden.



NOTE: The infuser will display the rule set icon from the first step in a situation where a 2-step process is completed and the infuser is stopped after going to KVO.

The "Wireless Connection Available" icon is displayed when the device is receiving a wireless signal. The infuser will connect to the network if a wireless network access point is recognized.



For Systems With Hospira MedNet™ Software

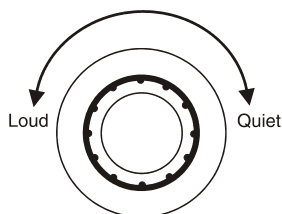
It may appear on any Main Delivery Screen whether pumping or stopped. It also may appear regardless of Auto-Programming. However, in a wireless network environment, Auto-Programming will not be successful if the icon is not visible during the Auto-Program transfer. If wireless Auto-Programming is desired and the icon is not displayed on the Main Delivery Screen, try relocating the pump towards the wireless access point until the icon is displayed. The icon will not be displayed if the infuser is communicating via an ethernet connection.

A	STOPPED	PUMPING	B
DOPamine		Lidocaine	
Dose Calculation		Rate	Dose Calculation
26.3		mL/hr	30
▲		Vol Inf	0.1
1		mL	2
mcg/kg/min		Dose	mg/min
		MedSurg	
		Options/ Vol Inf	
▲		▲	▲

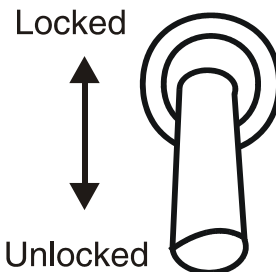
Rear Case Controls

NOTE: For Plum A+3, each control applies to all three pumps

The audio level rotary knob, located on the back, adjusts the alarm audio level.



The toggle switch, located below the audio level control, activates the lockout function when the lever is placed in the “up” position, disabling all front panel keys except [STOP].



Password Protected Keypad Lock may also be used. It both locks and unlocks the keypad by pressing the decimal key, followed by 9, 6, & 3.



Plum A+® Infusion Systems

NOTE: For Plum A+3, keypad lock applies to individual pump in use.

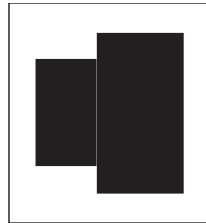
NOTE: Pressing of a key while lockout is active results in the display of the lockout enabled message. This action is recommended to confirm each lockout activation.

NOTE: If the lockout switch is put in the “Locked” position while the infuser is off, the [ON/OFF] key allows the unit to turn on.

The connector located below the lockout switch is the Nurse Call Relay Connector, for providing remote notification of a nurse call event.

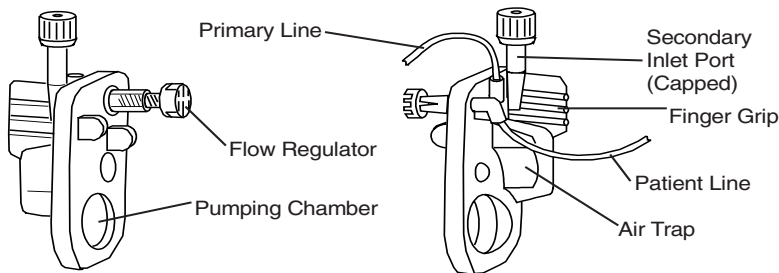


The Ethernet port is used to connect to a local area connection.



Administration Sets

The Plum A+ is compatible with a wide range of LifeCare Plum series administration sets. Become familiar with the set components before preparing the administration set.



Preparing the Administration Set

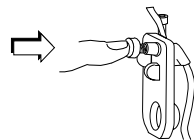
NOTE: For detailed instructions, see administration set packaging.

WARNING

ARRANGE TUBING, CORDS, AND CABLES TO MINIMIZE THE RISK OF PATIENT STRANGULATION OR ENTANGLEMENT.

Use the aseptic technique to prepare the administration set for priming, then proceed as follows:

- 1 Make sure flow regulator is closed.**

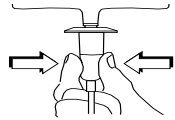


- 2 Insert piercing pin into container outlet with a twisting motion.**



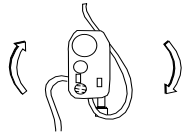
- 3 Fill Drip chamber to about 1/2 full or to the score mark. Do not completely fill.**

NOTE: To avoid getting Distal Air Alarms, confirm the fluid bag is positioned higher than the infuser. This should be set up prior to priming the cassette.

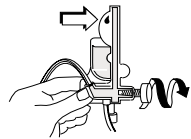


Priming the Administration Set

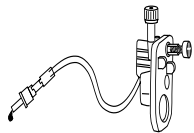
- 1 Invert the cassette.**



- 2 Turn the flow regulator counter-clockwise until a drop of fluid is seen in the pumping chamber.**

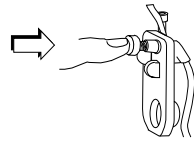


- 3 Turn the cassette upright, then prime the remainder of the administration set.**



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- 4 Push in the flow regulator to close. Confirm there is no flow.



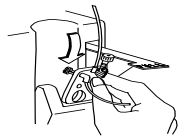
Loading the cassette

To load the primed cassette into the plum A+, proceed as follows.

- 1 Open the cassette door by lifting up the handle.



- 2 Insert cassette into door guides. Close the cassette door. Confirm there is no flow and no kinks appear in tubing.



NOTE: If flow is observed, close the tubing clamps and replace the administration set.

NOTE: The administration set should be changed per CDC guidelines or healthcare provider policy. Discard after use.

Preparing the Secondary Line

CAUTION: CONSULT THE DRUG LABELING TO CONFIRM DRUG COMPATIBILITY, CONCENTRATION, DELIVERY RATES, AND VOLUMES ARE ALL SUITABLE FOR CONCURRENT DELIVERY OR PIGGYBACK

Plum A+® Infusion Systems

DELIVERY (SECONDARY FOLLOWED AUTOMATICALLY BY PRIMARY) MODES.

The Plum A+ features concurrent or piggyback delivery modes when program requires administering more than one fluid.

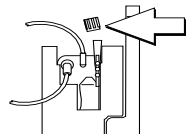
In addition to standard containers, the Plum A+ can use syringes on the secondary port. The secondary line can be prepared without removing or repriming the cassette.

Before preparing the secondary line, observe the following guidelines:

- Review the backpriming function.
- Attach the secondary container using an 18- or 19-gauge, 31 mm (or shorter) needle, if the cassette secondary inlet port has a piercing reseal.
- Syringes must be larger than 3 cc. Use syringe adapter (List 11986-48) when using syringes smaller than 10 cc. Some 10 cc syringes may require use of a syringe adapter. Syringes larger than 10 cc may be attached directly to the secondary port of the cassette. Use of a syringe adapter may decrease the occurrence of proximal occlusion alarms.
- When using a syringe adapter, retract the plunger to draw approximately 1 mL of fluid into the syringe to clear air from the adapter filter.

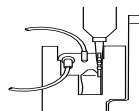
To prepare the secondary line, use aseptic technique and proceed as follows:

- 1 With cassette door closed: Loosen and remove white cap, then discard. Add secondary tubing or syringe.**
- 2 Open all proximal clamps before pressing [START].**

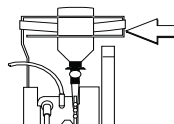


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- 3 Set up per operating instructions.
(See Sections 4 - 6 of this manual.)



- 4 **Syringe:** Secure the container to the cassette door using the optional container support arm (List 12095-03).



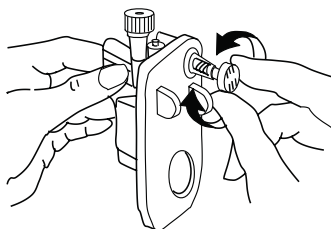
Discontinuing Electronic Flow Control & Setting Gravity Flow

CAUTION: BEFORE OPENING DOOR, CLOSE CLAMP ON PRIMARY OR SECONDARY SET OR REMOVE SECONDARY CONTAINER FROM SECONDARY PORT TO PREVENT MIXING OF PRIMARY AND SECONDARY FLUIDS.

If electronic flow needs to be stopped, the precision flow regulator on the cassette can be used to manually set and maintain fluid flow in a gravity mode (see the following graphics).



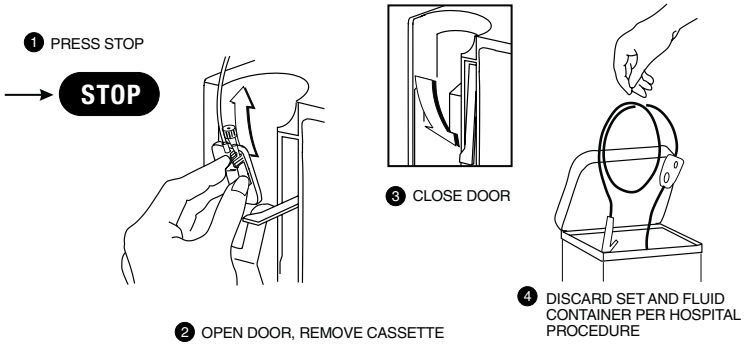
- 2 OPEN DOOR & REMOVE CASSETTE
NOTE: FLOW REGULATOR CLOSES AUTOMATICALLY WHEN DOOR IS OPENED TO PREVENT ACCIDENTAL FREE FLOW



- 3 SET GRAVITY RATE BY TURNING FLOW REGULATOR COUNTER-CLOCKWISE
NOTE: CASSETTE SHOULD BE IN UPRIGHT POSITION

NOTE: IF DOOR OPEN ALARM OCCURS, TURN PUMP OFF

Discontinuing Fluid Administration



NOTES

SECTION 4

Basic Operation

Getting Started

UNPACKING

CAUTION: PRODUCT DAMAGE MAY OCCUR UNLESS PROPER CARE IS EXERCISED DURING UNPACKING AND INSTALLATION. DO NOT USE THE PLUM A+ IF IT APPEARS DAMAGED IN ANY WAY. THE BATTERY MAY NOT BE CHARGED UPON RECEIPT.

Inspect the Plum A+ packaging for possible shipping damage. If damage is found, contact the delivery company immediately.

Use care when unpacking the infuser. Retain the packing slip and save all packing material in case the infuser is damaged or fails the infuser self-test and has to be returned to Hospira.

Inspect thoroughly for damage.

CAUTION: IF THE PLUM A+ APPEARS TO BE DAMAGED, CONTACT HOSPIRA, INC.

To set up, connect the AC (mains) cord to a properly grounded receptacle, unless temporary battery operation is desired.

NOTE: Use AC (mains) power whenever possible. Store the infuser connected to AC (mains) to confirm a fully charged battery for emergencies.

NOTE: If the quality of the earth grounding source is in doubt, use battery power.

CAUTION: THE PLUM A+ SYSTEM IS DESIGNED TO OPERATE NORMALLY IN THE PRESENCE OF MOST ENCOUNTERED ELECTROMAGNETIC INTERFERENCE (EMI) CONDITIONS. IN THE EVENT OF EXTREME LEVELS OF INTERFERENCE, SUCH AS ENCOUNTERED NEXT TO AN ELECTROSURGICAL GENERATOR, CELLULAR TELEPHONES, OR 2-WAY RADIOS, IT IS POSSIBLE THAT THE NORMAL OPERATION OF A SENSOR OR MICROCOMPUTER MIGHT

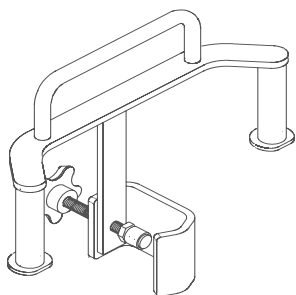
For Systems With Hospira MedNet™ Software

BE DISRUPTED. OPERATION OF THE INFUSER UNDER THESE CONDITIONS SHOULD BE AVOIDED.

TANDEM CARRIER INSTRUCTIONS

NOTE: The Plum A+3 is NOT to be used with the tandem carrier. It is only to be used with the Plum A+ and other single-channel devices.

The Plum A+ may be safely and conveniently mounted on an IV stand or on a tandem carrier mounted on an IV stand.



Always mount the tandem carrier (List# 12270-01) to the pole before attaching the infuser(s) to the tandem carrier.

Make sure tandem carrier clamp is attached firmly to pole.

Make sure infusers are firmly attached to tandem carrier.

This section details the Plum A+ instrument setup procedures.

SYSTEM SELF-TESTS

The infuser performs a suite of System Self-Tests when power is applied to confirm readiness for use.

Failure during the Self-Tests is reported as a Malfunction Condition.

CAUTION: DO NOT PLACE THE PLUM A+ IN SERVICE IF IT FAILS THE SYSTEM SELF-TESTS.

Connect the AC power (mains) cord to an AC power receptacle, then confirm that the Charging/Line indicator illuminates (above the [ON/OFF] key on the front panel).

A systematic self-testing of the processing, delivery, and safety systems is performed whenever the Plum A+ is turned on, to verify readiness for operation.

Plum A+® Infusion Systems

NOTE: If the quality of the earth grounding source is in doubt, use battery power.

Press the [ON/OFF] key to turn the power on. Check screen display and listen for a beep to indicate the audio is working. Wait for the self-tests to complete. If successful, put a fully primed macro cassette into the cassette door and close the door. See *Loading Cassette* in *Section 3* for details of correct procedure.

When the Charging/Line indicator is off and the battery symbol on the display is flashing, this indicates that the Plum A+ is operating on low battery power and should be recharged.

CAUTION: WHEN THE BATTERY IS REMOVED FROM THE PLUM A+, DO NOT OPERATE ON PATIENTS. USE OF A PROPERLY MAINTAINED AND CHARGED BATTERY HELPS CONFIRM PROPER OPERATION.

To confirm battery is fully charged, connect the Plum A+ to AC (mains) power for a minimum of six hours while in the OFF mode.

If an alarm occurs during the power on self-test, identify the alarm message, then take corrective action (see *Section 7, Alarms and Troubleshooting*).

Turn infuser OFF, then back ON. If the self-test alarm recurs, remove the infuser from service and contact the local Hospira representative.

The infuser performs a suite of System Self-Tests when power is applied to confirm readiness for use.

Failure during the Self-Tests is reported as a Malfunction Condition.

DATA RETENTION

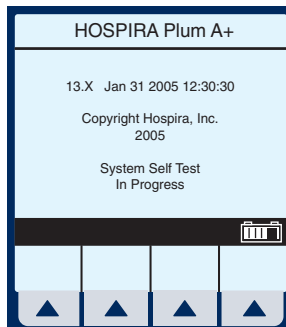
Delivery program settings and programming option selections are retained in non-volatile memory. If the Plum A+ has been turned off for longer than four hours, all delivery settings are cleared and programming option selections are restored to their default selections for next use.

Power On

- 1 Press **ON/OFF** to Power On the Plum A+ and the System Self-Tests Screen is displayed.

After self-testing successfully completes, the display will proceed to the next screen.

Programming the infuser may begin during the cassette check phase of the start-up testing.



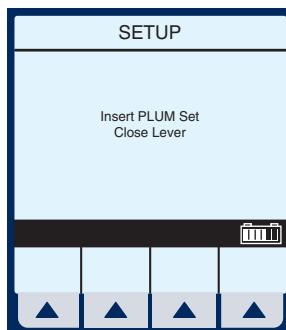
SCREENS SHOWN IN THIS MANUAL ARE EXAMPLES ONLY AND DON'T NECESSARILY REFLECT ACTUAL CLINICAL PRACTICE

NOTE: If battery is missing or defective, a "Battery not installed" message with a "Continue without battery" prompt will appear (AC power only).


CAUTION: WHEN THE BATTERY IS REMOVED FROM THE PLUM A+, DO NOT OPERATE ON PATIENTS. USE OF A PROPERLY MAINTAINED AND CHARGED BATTERY HELPS CONFIRM PROPER OPERATION.

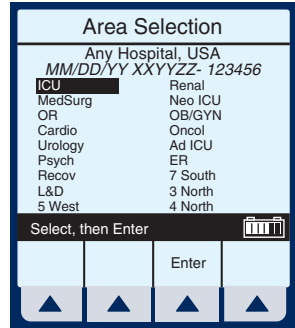
- 2 To set up the Plum A+, insert selected Plum Set and close cassette holder door lever.

NOTE: If cassette is already inserted, this screen is skipped. If Infuser ID Entry screen appears, consult your hospital's biomed personnel.



The Area Selection screen will appear if your system has been programmed with the Hospira


MedNet accessory. Use  to choose. If only one CCA has been entered, it becomes the default and this screen is skipped.



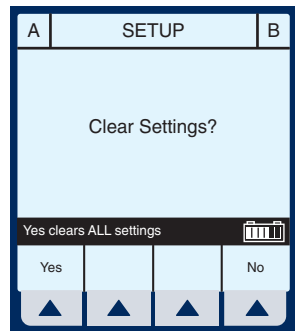
NOTE: To change the CCA while infusing, see page 6-12, *Changing CCA While Infusing*.

If not using MedNet, the display will go straight to the “Clear Settings?” option.

Example of Clear Settings Screen

- 3** The on-screen message “Clear Settings?” may appear. Select  [\[Yes\]](#) to clear all settings.

Clear ALL settings when changing patients or multiple programming parameters.



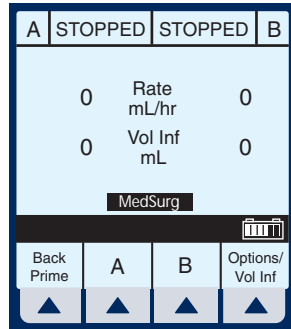
NOTE: This clears all delivery parameters, such as Rate and VTBI on both lines, as well as setting items, such as the KVO and Nurse Callback options, to their default values.

NOTE: If no settings currently exist or all settings are zero, this screen will be bypassed.

Simple Delivery

Example of MedNet Main Delivery Screen (with cleared settings). The selected area is displayed at the bottom.


SCREENS SHOWN IN THIS MANUAL ARE EXAMPLES ONLY AND DON'T NECESSARILY REFLECT CURRENT ACTUAL PRACTICE



NOTE: For clarity, whole number font sizes will appear larger than fractional number font sizes (numbers on the right-side of the decimal).

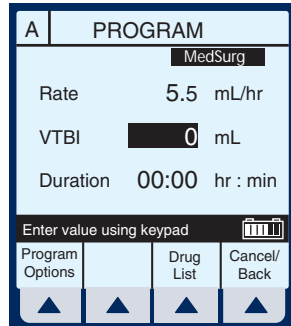
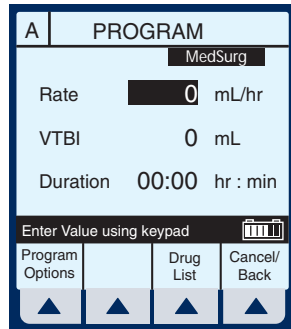
1 To Program a delivery rate, select ▲ [A].

2 To enter delivery rate, use numeric keypad.

3 Use  to move down to the VTBI field.

4 To enter VTBI amount, use keypad.

NOTE: While the VTBI is being entered, the duration is automatically computed. If the computed value is greater than 99:59, dashes (- -) appear in place of hours.

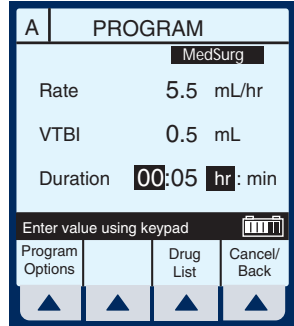



- 5** Use  to move down to the DURATION field.

If auto-calculated Duration is acceptable, skip to step 9.

- 6** Use keypad to change/enter the hours part of duration if desired.


NOTE: When all parameters are displayed, changing any one parameter will result in other parameters automatically being computed. To understand the Automatic Calculation feature, see *Examples of Automatic Calculation on page 6-10.*



- 7** Use  to move from hours to minutes.

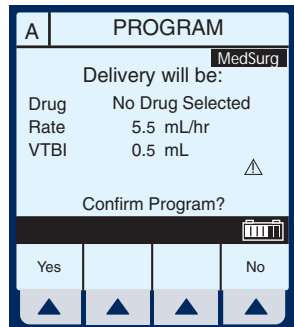
NOTE: The maximum hours allowed is 99 and the maximum minutes is 59.

- 8** Use keypad to enter minutes.

- 9** Press .

CAUTION: VERIFY ALL VALUES BEFORE STARTING INFUSION.

Program Confirmation screen will appear. If correct, press ▲ **[Yes]** to begin infusion.



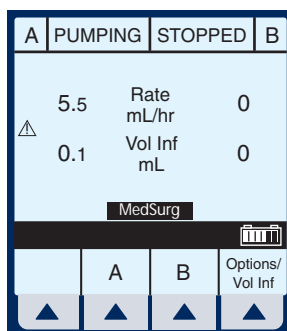
For Systems With Hospira MedNet™ Software

Example of Main Delivery Screen just after being programmed and started.

NOTE: The Line A Fluid Flow Indicator also will flash to indicate pumping.

NOTE: VTBI (volume *to be* infused) values over 100 mL are displayed *truncated*. This means that the number displayed *rounds-down* to the last whole number (e.g., 105.7 would be displayed as 105). An example would be the Programming or Pumping screens.

NOTE: VI (volume infused) values over 100 mL are displayed *rounded*. This means that the number displayed rounds-off to the *nearest* number (e.g., 105.7 would be displayed as 106, but 105.3 would be displayed as 105). An example would be the Program Options screen.

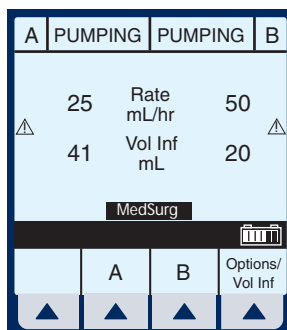


The screenshot shows the Main Delivery Screen with Line A selected. The status bar at the top indicates 'A PUMPING STOPPED B'. The main display area shows a flashing triangle next to '5.5' (Rate mL/hr) and '0.1' (Vol Inf mL). The 'MedSurg' label is visible below the main display. The bottom navigation bar has buttons for 'A', 'B', and 'Options/Vol Inf', with 'A' being the active selection.

A	PUMPING	STOPPED	B
△	5.5	Rate mL/hr	0
	0.1	Vol Inf mL	0
MedSurg			
	A	B	Options/Vol Inf

Titration

- 1 Select Line ▲ [\[A\]](#) (or ▲ [\[B\]](#)) at the Main Delivery Screen.

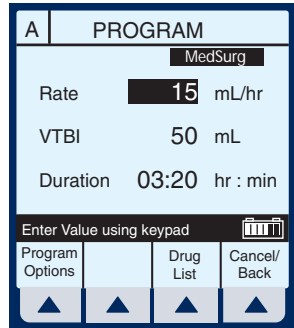


The screenshot shows the Main Delivery Screen with both Line A and Line B selected for pumping. The status bar at the top indicates 'A PUMPING PUMPING B'. The main display area shows a flashing triangle next to '25' (Rate mL/hr) and '41' (Vol Inf mL) for Line A, and '50' (Rate mL/hr) and '20' (Vol Inf mL) for Line B. The 'MedSurg' label is visible below the main display. The bottom navigation bar has buttons for 'A', 'B', and 'Options/Vol Inf', with 'A' and 'B' being active selections.

A	PUMPING	PUMPING	B
△	25	Rate mL/hr	50
	41	Vol Inf mL	20
MedSurg			
	A	B	Options/Vol Inf

- 2 Enter the desired Rate using the keypad.

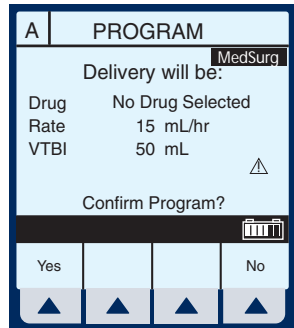
NOTE: When Rate is changed, the duration is automatically recomputed using the current VTBI. To understand the Automatic Calculation feature, see *Examples of Automatic Calculation on page 6-10.*



- 3 Press **START**.

CAUTION: VERIFY ALL VALUES BEFORE STARTING INFUSION.

Program Confirmation screen will appear. If correct, press **▲ [Yes]** to begin infusion.

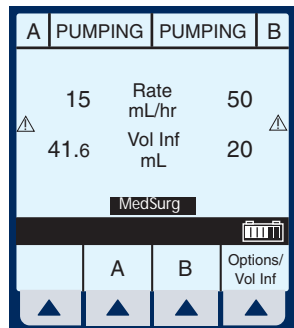


NOTE: During Titration, infuser continues to deliver at previous parameters until new program is confirmed.

Example of Main Delivery Screen after being titrated.

NOTE: Volume Infused is an incrementing value which is cleared in **▲ [Options/Vol Inf]**.

The following 3 screens are examples of changed values.



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Example of changed rate.

- From the Main Delivery Screen, select ▲ [A].
- Use keypad to change the RATE value.

A	PROGRAM		
	MedSurg		
Rate	15	mL/hr	
VTBI	50	mL	
Duration	03:20	hr : min	
Enter Value using keypad			
Program Options		Drug List	Cancel/Back
▲	▲	▲	▲

NOTE: The display time is only accurate to ± one minute. As shown in this example, the delivery shows 3 hours and 20 minutes (not 3 minutes and 20 seconds).

- Press **(START)**.

Program Confirmation screen will appear. If correct, press ▲ [Yes] to begin infusion.

NOTE: [START] accepts the change. Delivery is changed to the new RATE and DURATION and display returns to Main Delivery Screen.

Example of Changed VTBI value.

- Use **(SELECT)** to highlight the VTBI field.
- Use the keypad to change the VTBI value.

A	PROGRAM		
	MedSurg		
Rate	15	mL/hr	
VTBI	100	mL	
Duration	06:40	hr : min	
Enter Value using keypad			
Program Options		Drug List	Cancel/Back
▲	▲	▲	▲

NOTE: When the VTBI is changed, the Duration is recomputed with respect to the current Rate. To understand the Automatic

Calculation feature, see *Examples of Automatic Calculation on page 6-10*.

9 Press **START**.

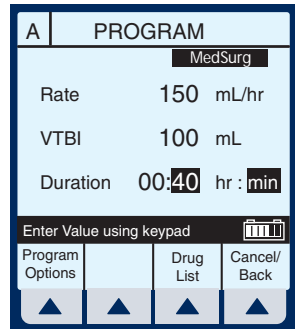
Program Confirmation screen will appear. If correct, press ▲ **[Yes]** to begin infusion.

NOTE: [START] accepts the change. Delivery is changed to the new VTBI and DURATION and the display brings up the Confirmation screen before returning to the Main Delivery Screen.

Example of changed DURATION field.

10 Use **SELECT** to highlight the Duration field, then use the keypad to change its value.

NOTE: When DURATION is changed, RATE is automatically recomputed using the current VTBI value. To understand the Automatic Calculation feature, see *Examples of Automatic Calculation on page 6-10*.



11 Press **START**.

CAUTION: VERIFY ALL VALUES BEFORE STARTING INFUSION.

Program Confirmation screen will appear. If correct, press ▲ **[Yes]** to begin infusion.

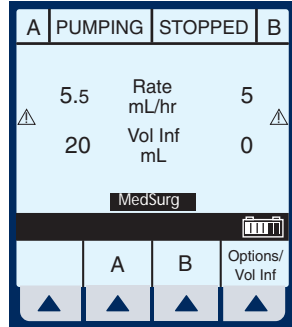
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NOTE: [START] accepts the change. Delivery is changed to the new DURATION and RATE and the display brings up the Confirmation screen before returning to the Main Delivery Screen.

Piggyback Delivery

PIGGYBACK DELIVERY-
Infusion will stop Line A and
infuse Line B until VTBI
completes. Line A will
automatically restart.

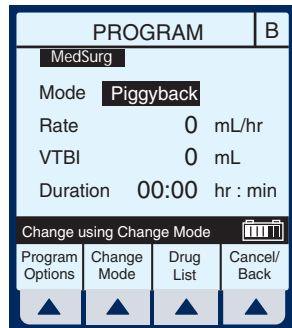
- 1 With Line A pumping, to
program a Piggyback delivery,
select ▲ [B].



The Delivery Mode field is
highlighted.


NOTE: If an entry was previously
programmed, RATE is highlighted. If
no previous entries, MODE is
highlighted.

- 2 If field reads “Concurrent”,
select
▲ [Change Mode] to switch to
“Piggyback”.



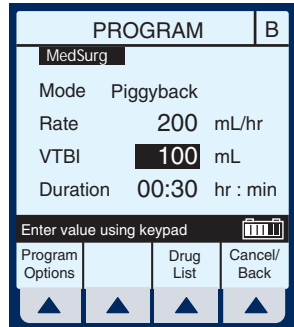
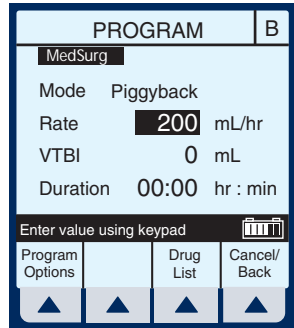
3 Select  to highlight the RATE field.

4 To enter delivery rate, use numeric keypad.


5 Use  to move down to the VTBI field.

6 To enter VTBI amount, use keypad.

NOTE: While the VTBI is being entered, the duration is automatically computed. If the computed value is greater than 99:59, dashes (- -) appear in place of hours. To understand the Automatic Calculation feature, see *Examples of Automatic Calculation* on page 6-10.

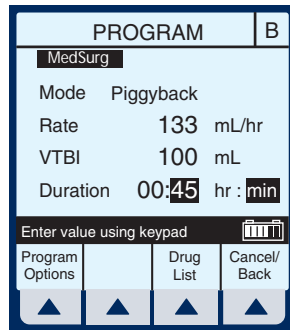






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- 7 Use  to move down to the DURATION field.

(Optional) Use keypad to change duration.


When all parameters are displayed, changing any one parameter will result in other parameters automatically being computed.



PROGRAM		B
MedSurg		
Mode	Piggyback	
Rate	133	mL/hr
VTBI	100	mL
Duration	00:45	hr : min
Enter value using keypad 		
Program Options		Drug List
		Cancel/Back
		

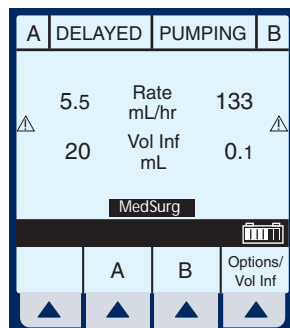
- 8 Press .







CAUTION: VERIFY ALL VALUES BEFORE STARTING INFUSION.

Program Confirmation screen will appear. If correct, press  *[Yes]* to begin infusion.

NOTE: If Line A has a Delay Start remaining or is stopped, a message will appear warning of a possible non-delivery (see page 6-4).

Example of Main Delivery Screen just after being programmed and started.

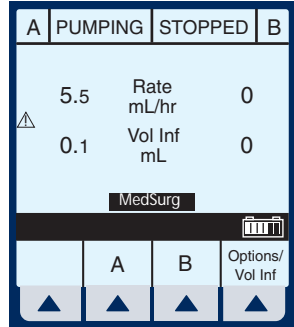


A	DELAYED	PUMPING	B
	5.5	Rate mL/hr	133
	20	Vol Inf mL	0.1 
MedSurg			
	A	B	Options/ Vol Inf
			

Concurrent Delivery

CONCURRENT DELIVERY-
Simultaneous delivery of two fluids at independent flow rates.

CAUTION: CONSULT DRUG LABELING TO CONFIRM DRUG COMPATIBILITY, CONCENTRATION, DELIVERY RATES, AND VOLUME ARE ALL SUITABLE FOR CONCURRENT AND PIGGYBACK DELIVERY MODES. SEE SECTION 8 FOR INFORMATION ON CONCURRENT FLOW, SEE SECTION 9 FOR DELIVERY RATE RANGES.



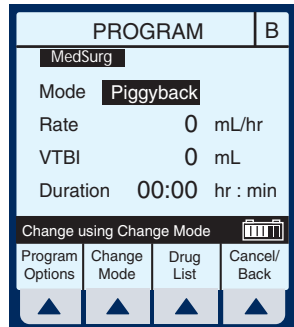
NOTE: In concurrent mode with certain alarm conditions, one line may stop while the other line may continue to deliver.

- 1 With pumping started on line A, to program a Concurrent delivery rate, select ▲ [B].

The Delivery Mode field is highlighted.


NOTE: If an entry was previously programmed, RATE is highlighted. If no previous entries, MODE is highlighted.





If field reads “Piggyback”, select ▲ [Change Mode] to switch to “Concurrent”.



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Verify change to “Concurrent” mode.

- 2 Use  to highlight Rate field.


PROGRAM		B
MedSurg		
Mode	Concurrent	
Rate	0	mL/hr
VTBI	0	mL
Duration	00:00	hr : min
Change using Change Mode 		
Program Options	Change Mode	Drug List
		Cancel/Back
		

- 3 To enter delivery rate, use numeric keypad.

NOTE: When Rate for Line A plus Rate for Line B is greater than valid rate ranges, a “Concurrency violation” message will explain why second line did not start. See Section 9 for valid delivery rate ranges.





PROGRAM		B
MedSurg		
Mode	Concurrent	
Rate	10	mL/hr
VTBI	0	mL
Duration	00:00	hr : min
Enter value using keypad 		
Program Options		Drug List
		Cancel/Back
		

NOTE: “Concurrency violation” may not be displayed if unit is displaying “VTBI Complete”. The device will not start and an invalid keypress sound will occur when [START] is pressed.

- 4 Use  to move down to the VTBI field.

- 5 To enter VTBI amount, use keypad.

NOTE: While the VTBI is being entered, the duration is automatically computed. If the computed value is greater than 99:59, dashes (- -) appear in place of hours. To

PROGRAM		B
MedSurg		
Mode	Concurrent	
Rate	10	mL/hr
VTBI	100	mL
Duration	10:00	hr : min
Enter value using keypad 		
Program Options		Drug List
		Cancel/Back
		


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understand the Automatic Calculation feature, see *Examples of Automatic Calculation* on page 6-10.


- 6** Use  to move down to the DURATION field.

(Optional) Enter values for desired hours and minutes.

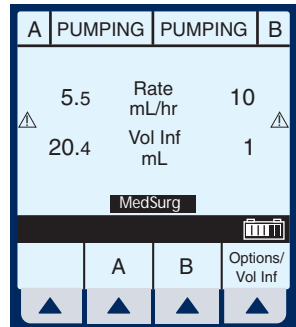
NOTE: When Duration is entered, Rate is automatically computed.

- 7** Press .

CAUTION: VERIFY ALL VALUES BEFORE STARTING INFUSION.

Program Confirmation screen will appear. If correct, press  [*Yes*] to begin infusion.

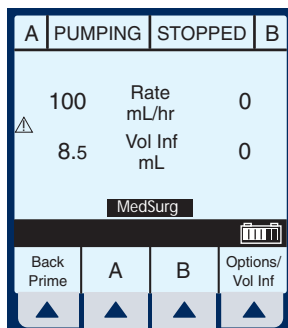
Example of a concurrent delivery.



Stop and Start with only 1 Line Pumping

- 1 Press **STOP** at the Main Delivery Screen.

NOTE: If ▲ [A] (or ▲ [B]) is selected prior to pressing [STOP], the display will return to the programming screen. Select ▲ [Cancel/Back] to return to the Main Delivery screen.

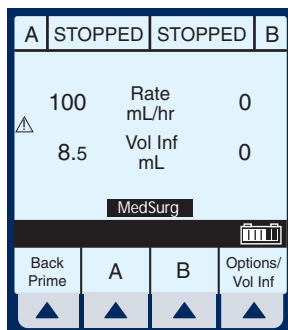


Example of STOPPED delivery.

- 2 To discontinue infusion, press **ON/OFF**.

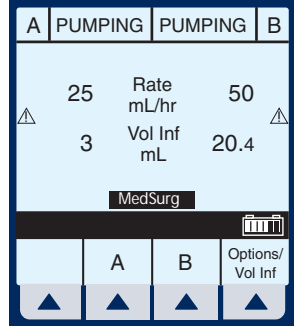
- 3 Clamp secondary tubing if connected.

- 4 Open door, remove set and close door. Or, press **START** to resume infusion.



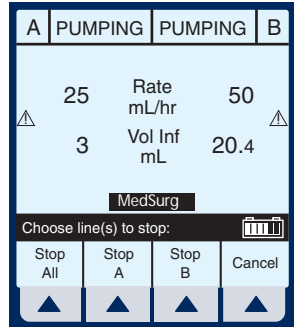
Stop and Start with Both Lines pumping

- 1 Press **STOP** at the Main Delivery Screen.



- 2 Select ▲ [Stop A], ▲ [Stop B], or ▲ [Stop All].

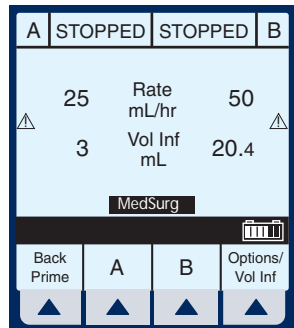
NOTE: If ▲ [A] (or ▲ [B]) is selected prior to [STOP], the display will show the programming screen. Select ▲ [Cancel/Back] to return to the Main Delivery screen.



Example of stopped infusion.

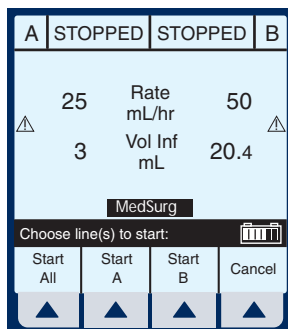
NOTE: This is an example using ▲ [Stop All].

CAUTION: VERIFY ALL VALUES BEFORE STARTING INFUSION.



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- To resume infusion, press **START**.
- Select ▲ *[Start A]*, ▲ *[Start B]*, or ▲ *[Start All]*. Or, to discontinue infusion, press **ON/OFF**.



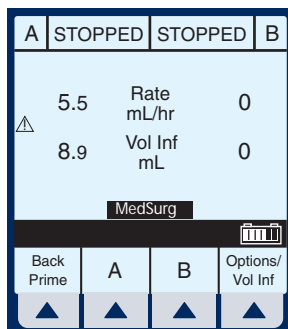
- Clamp secondary tubing if connected.
- Open door, remove set and close door.

Backpriming

BACKPRIMING- Removal of air or fluid from the proximal line and cassette airtrap.

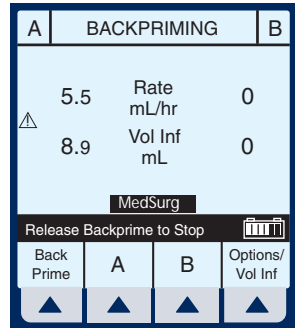
- To initiate a backprime, select ▲ *[Back Prime]*.

NOTE: Backpriming is available only when all delivery is stopped. Secondary container is necessary to receive the air.



- Select and hold ▲ **[Back Prime]** until fluid pumped from line A to line B has expelled the air from cassette air trap into Secondary container.

NOTE: Fluid flow is at maximum rate possible.



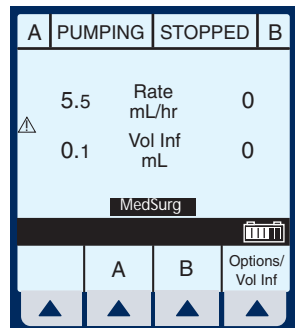
- Upon release of ▲ **[Back Prime]**, the cassette test is performed to confirm readiness for pumping.

Pressing **(START)** will resume programmed delivery.

Clearing Settings

- Press **(STOP)** at the Main Delivery Screen.

Clear ALL settings when changing patients or multiple programming parameters.



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- 2 Select Line ▲ [A] (or B if active) from the stopped Main Delivery Screen.

NOTE: If Line A or B is programmed with a Therapy (i.e., Dose Calculation), Rate, VTBI and Duration will not display values. The values to be cleared may be viewed in applicable programming screen under ▲ [Drug List].

A	STOPPED	STOPPED	B
△	5.5	Rate mL/hr	0
	8.9	Vol Inf mL	0
MedSurg			
Back Prime	A	B	Options/ Vol Inf
▲	▲	▲	▲

- 3 Select ▲ [Yes].

Clear ALL settings when changing patients or multiple programming parameters.

A	PROGRAM		
Clear Line A Settings?			
MedSurg			
Yes			No
▲	▲	▲	▲

Example screen of “Cleared Settings”.

- 4 Select ▲ [Cancel/Back] to return to the Main Delivery screen or program new settings.

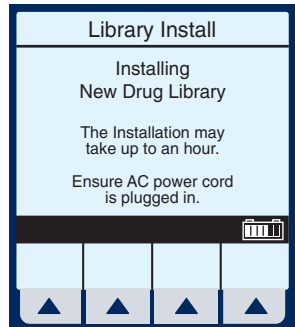
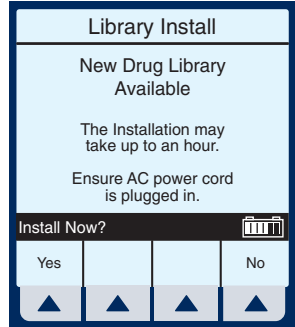
A	PROGRAM		
MedSurg			
Rate	0	mL/hr	
VTBI	0	mL	
Duration	00:00	hr : min	
Enter Value using keypad			
Program Options		Drug List	Cancel/ Back
▲	▲	▲	▲

Updating Drug Library

If a new Drug Library is available, the New Drug Library Install screen will be displayed.

- 1 Select ▲ *[Yes]* to begin the installation (It may take up to an hour).
Select ▲ *[No]* to skip the installation and continue using the current library.

Example screen of Library Installing.



NOTES

SECTION 5

Advanced Programs

Standard Program	<i>(Dose Calculation) Allows programming Dose Rates in alternative units of measure. Dose Calculation can be used in Simple Delivery, Loading Dose, and Multistep.</i>
Loading Dose	<i>Allows programming of an initial infusion rate for a specific volume, followed automatically by a maintenance rate from the same container (e.g., a fluid challenge). If Dose Calc is used, the Loading Dose and Maintenance Dose are in the same unit of measure, over the same period of time (mcg/min), from the same container.</i>
Multistep	<i>Allows a sequential program to deliver up to 10 steps; fluid volumes and delivery rates may be programmed for each step. The program may be entered based on Rate and Volume or Volume and Time. If Dose Calc is used, the delivery steps are in the same unit of measure, over the same period of time, from the same container.</i>

NOTE: During programming, user must identify desired drug with softkey Drug List prior to setting program parameters.


Use drug manufacturer recommendations for IV administration when using the Plum A+ infuser.

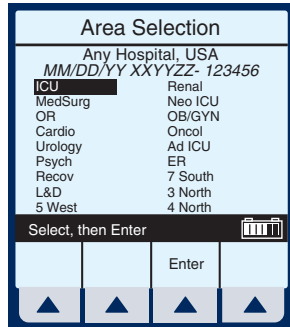
Dose Calc (mcg/kg/min on A)

DOSE CALCULATION- Allows programming Dose Rates in alternative units of measure. Dose Calculation can be used in Simple Delivery, Loading Dose, and Multistep.


Clear ALL settings when changing patients or multiple programming parameters.

The Area Selection screen will appear if your system has been programmed with the MedNet accessory.

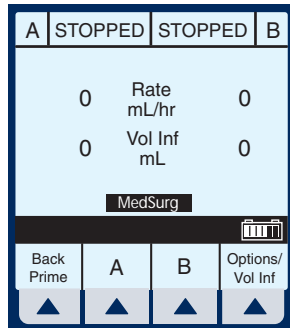
Use  to select CCA and bring you to the Main Delivery Screen.



NOTE: To change the CCA while infusing, see *Changing CCA While Infusing* on page 6-12.

- 1 Select  [A] at the Main Delivery Screen.

SCREENS SHOWN IN THIS MANUAL ARE EXAMPLES ONLY AND DON'T NECESSARILY REFLECT CURRENT ACTUAL PRACTICE



The Line A Programming screen appears.

- 2 Select ▲ *[Drug List]* for Dose Calculation programming.

A	PROGRAM		
	MedSurg		
Rate	0	mL/hr	
VTBI	0	mL	
Duration	00:00	hr : min	
Enter Value using keypad			
Program Options		Drug List	Cancel/Back
▲	▲	▲	▲

The Drug List Screen appears, in mainly alphabetical order.

NOTE: Default entry is “No Drug Selected”.

A	MedSurg		
No Drug Selected			
Albumin 5%	25 grams/500 mL		
Aldesleukin	2.6 mg/50 mL		
Alfentanil	10 mg/250 mL		
Alteplase	50 mg/50 mL		
Alteplase	100 mg/100 mL		
Amikacin	100 mL		
Amiodarone	150 mg/100 mL		
Select, then Enter			
Page Up	Page Down	Enter	Cancel/Back
▲	▲	▲	▲

- 3 Use to highlight desired drug name.

When list does not contain desired generic drug name or group name select

▲ *[Page Down]* (or ▲ *[Page Up]*) until it shows, then use

to highlight choice.

A	MedSurg		
Antibiotic			
DOBUtamine	250 mg/500 mL		
DOBUtamine	500 mg/500 mL		
Docetaxel	100 mg/250 mL		
DOPamine	/ mL		
DOPamine	400 mg/250 mL		
DOPamine	800 mg/250 mL		
Heparin	25,000 units/500 mL		
Select, then Enter			
Page Up	Page Down	Enter	Cancel/Back
▲	▲	▲	▲

- 4 Select ▲ *[Enter]* to indicate selection and advance to the Therapy selection screen.

Based on this selection, assume the hospital has set the following rules for the Med/Surg Area:

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Soft upper limit of 8 mcg/kg/min
Hard upper limit of 12 mcg/kg/min

NOTE: The SOFT and HARD limits are not displayed. However, the limit is provided if a value is programmed outside the acceptable range. Typically, the pharmacy will set the limit.

The Select Therapy screen for Line A appears.


- 5 Select ▲ *[Choose]* to select Standard Program (Dose Calc) and continue.

If selected drug has been programmed with established dosing units and concentration, skip to step 8.

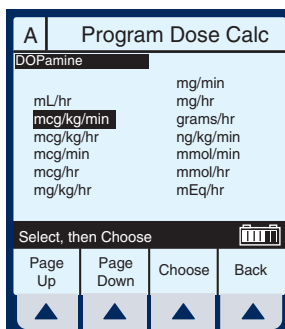
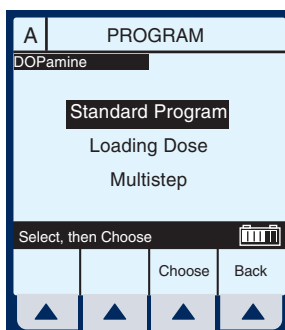
The Program Dose Calc screen appears.

NOTE: Cursor defaults to package insert (or hospital) recommended dose units associated with the selected drug.

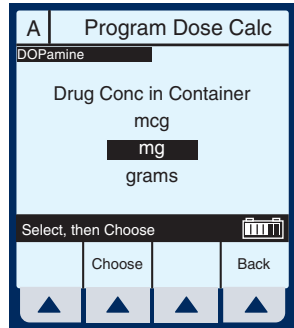
- 6 Select ▲ *[Choose]* to continue.

Or, use  to change the units to use in the delivery.


If desired, select ▲ *[Page Down]* to see more units of measure.



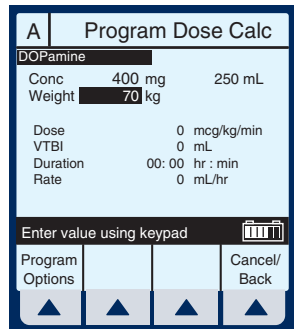
The Container Concentration Selection screen appears whenever the selected Dose Units are gram-based (e.g., grams, mg, mcg, or ng), otherwise this screen is skipped.




NOTE: Cursor defaults to package insert (or hospital) recommended concentration units associated with the selected drug.

- 7** Select ▲ [Choose] to continue. Or, use  to change the Container Concentration units to use in the delivery.

The next page of the Program Dose Calc screen appears to provide for entry of delivery program parameters.




The Concentration and Volume fields are filled in per drug selection.






- 8** Use keypad to enter desired values. Once each value is entered, use  to highlight the next programming field.


NOTE: The Concentration elements and weight value must be entered before the [SELECT] key allows access to remaining fields.

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- 9 Continue to enter values using the keypad, and advancing to the next field using .






NOTE: As the Dose value is entered, the Rate is automatically calculated. To understand the Automatic Calculation feature, see *Examples of Automatic Calculation* on page 6-10.

A Program Dose Calc			
DOPamine			
Conc	400 mg	250 mL	
Weight	70 kg		
Dose	10	mcg/kg/min	
VTBI	0	mL	
Duration	00:00	hr : min	
Rate	26.3	mL/hr	
Enter value using keypad 			
Program Options		Cancel/Back	
			


- 10 Use  to scroll down to the VTBI field.

- 11 Enter a value for VTBI using the keypad.

NOTE: As the VTBI value is entered or changes, Duration is automatically updated.

A Program Dose Calc			
DOPamine			
Conc	400 mg	250 mL	
Weight	70 kg		
Dose	10	mcg/kg/min	
VTBI	250	mL	
Duration	09:30	hr : min	
Rate	26.3	mL/hr	
Enter value using keypad 			
Program Options		Cancel/Back	
			

NOTE: At this point, programming is complete unless ▲ [Program Options] are desired. See Section 6, *Additional Features*, for more information.

- 12 Press .

CAUTION: VERIFY ALL VALUES BEFORE STARTING INFUSION.