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Section 3: Installation & Operation AVI Micro 285 & 480

3.1 Installation

1. AC Power Connection

The AVI Micro 285 and 480 Infusion Pumps are equipped with a detachable power cord, which has a three-prong hospital grade plug. The power cord is designed to minimize leakage current inducing potentials on the ground wire.

The power cord is secured to the rear housing during manufacture, but can be removed from the pump should safety testing of the cord itself becomes necessary. A cord retainer is attached over the cord by four screws. The cord retainer must be reinstalled whenever the cord is reattached or replaced, or ground and power connections may become unreliable.

If the cord becomes damaged, replace it immediately. Replacements should be made using only AVI original equipment in order to maintain grounding safety and acceptable level of leakage currents. Integrity of the three-prong plug is also important to prevent electric shock. DO NOT use extension cords, adapter plugs, or attempt to defeat the plug's ground connection. Always hold the plug itself when unplugging the power cord, as pulling on the cord could damage plug connections.

2. Portable Operation

Each AVI pump comes equipped with a 12 volt battery for portable operation, or in the event AC power fails or is unavailable.

The infusion pumps may be operated while standing on any horizontal surface, provided the bottom of the fluid container drip chamber is at least 6 inches above the top of the pump (12 inches may be required on the 480 with rates greater than 500 ml/h, or on both the Micro 285 and 480 when using 60 drops/ml sets and/or highly viscous solutions). Typically, however, the pump is attached to an IV pole using the pole clamp on the pump's rear housing. IV pole mounting and battery operation make the AVI pumps completely portable for patient mobility.

3.2 Operational Description

The AVI infusion pumps are controlled by a microprocessor based electronic system. The microprocessor controls all user programmable functions and alarm condition sensors. A synchronous stepping motor is used to operate the pumping mechanism accordingly.

The pumping mechanism "backs off" to the *load position* when the pump is turned on and the LOAD KNOB is turned outward (*load position* is indicated by the illumination of the red STBY light). The pistons are best positioned to accept a fluid filled cassette when the pumping mechanism is in the *load position*. Completion of cassette loading results in some additional reverse rotation of the motor as pressure on the cassette is reduced and the pumping mechanism prepares for the continuous forward rotation of delivery. The overpressure valve seals the lower fluid pathway during reverse rotation of the pumping mechanism and reopens upon initial forward rotation.

The Free-Flow Prevention System of the AVI pumps consist of the safety clip located under the cassette on the administration set and the mechanical clip retention slot and associated mechanics on the lower portion of the cassette housing below the door. The safety clip must be placed in the clip retention slot when loading the cassette, or the pump will not operate. When the LOAD KNOB is turned inward the safety clip opens to allow fluid delivery. When the LOAD KNOB is turned outward, the safety clip is allowed to close over the lower tubing, thus preventing unrestricted fluid flow, even when the administration set is removed from the pump.

DANGER
Always close the lower roller clamp before opening the safety clip or unrestricted gravity flow to the patient with the potential for causing severe injury or death will result.

Virtually continuous, non-pulsatile fluid delivery is accomplished by uninterrupted forward rotation of the pumping mechanism when the pump is in the operate mode. The microprocessor stops the pump and sounds the *insistent* audio alarm when one or more of the seven alarm conditions is detected. The alarms are ELECT/MECH, OCCLUSION, SET UP, EMPTY BAG, DOOR/CLIP, AIR, and the secondary low battery alarm. Detection of three alert conditions, the initial ON BATT (low battery voltage), KVO (Keep Vein Open) and the titration call-back alarm (no visual indicator cause the microprocessor to sound the *non-insistent* audio alarm. The pump continues to operate following the initial ON BATT alarm. The KVO alarm signifies that the volume infused has reached the selected volume limit, and the channel is operating at the KVO rate. The titration call-back alarm signifies that an incon... titration procedure was used. (See Section 3.4 for visual alarm descriptions.) A separate alarm, called the malfunction alarm, indicates a malfunction of the microprocessor (see Section 3.5 for alarm tone descriptions).

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Downline pressure is developed by the pumping pistons at the upper two cassette chambers, and is continuously monitored at the smaller, bottom chamber. Pressure monitoring is performed by the overpressure piston, which is free to move independently of the upper two pumping pistons. The OCCLUSION alarm is activated if pressure exceeds the user selected threshold level. The pump briefly backs off to reduce downline pressure, which minimizes the effects of fluid bolus to the patient. At that point, the pump stops and fluid delivery ceases.

WARNING
The AVI occlusion detection sensors detect downline backpressure in the administration set, but are not designed to detect infiltration. In accordance with institution's policies and procedures, operator must periodically inspect patient's infusion site for swelling, temperature changes, and/or other signs of infiltration.

A continuous, cumulative account of fluid delivered is numerically displayed during operation. The rate, volume limit, and volume infused display information is stored indefinitely in pump memory regardless of whether the pump is turned on or off. The volume infused display may only be zeroed by pressing the CLEAR key while the pump is in the standby mode. Recall of the stored data occurs when the power switch is placed in the ON position. This memory function depends upon a very minimal battery voltage being maintained.

The AVI titration feature allows you to instantly change rates without interrupting fluid delivery. Pressing the CLEAR key while the pump is operating readies the microprocessor to receive new rate input. After entering the new rate using the number keys, the new rate will appear in the display, but the pump will continue to infuse at the original rate. Press OPR to lock in the new rate setting. If OPR is not pressed within 10 seconds of pressing CLEAR, the original rate will reappear in the display and the *non-insistent* audio alarm will sound. No visual alarm is displayed, however. This added safety feature prevents unauthorized rate tampering.

The AVI 480 has the capability to be programmed for automatic sequential delivery of two solutions in a piggy-back fashion. The piggyback medication is delivered according to the piggyback mode program of rate and volume limit selections. Then, rather than enter the KVO mode after piggyback infusion, the pump switches to the primary mode and delivers the primary solution according to a separate program. The KVO alarm occurs following delivery of the primary solution.

3.3 Controls And Indicators

Refer to Figure 3-1 for controls 1 and 2.

1. Power Switch

The power switch provides 12 volts DC (nominal) to the motor drive circuit, audio circuit, and the 5 volt regulator for the logic circuitry when in the ON position. Switching to the OFF/CHARGE position removes power from these circuits, but does not remove AC power from the transformer. The transformer and 12 volt battery charging circuit are energized whenever the power cord is plugged in, regardless of power switch position.

DANGER
Potentially dangerous voltages are exposed whenever the pump housing is opened and the power cord is plugged in, regardless of power switch position (ON or OFF/CHARGE). These voltages are present in the following areas: the transformer and AC fuse on the power supply board; the RFI filter where the power cord connects. Always unplug the AC power cord before beginning disassembly.

2. LOAD KNOB

Turning the LOAD KNOB to the OUT position moves the cassette housing and door out to the *load position*. This position is used to install the AVI administration set or remove a set from the pump. Turning to the IN position moves the cassette housing, door, and installed administration set to the *operate position*. The *insistent* audio alarm and the DOOR/CLIP visual alarm are activated if the LOAD KNOB is turned OUT without first pressing STBY. The LOAD KNOB cannot be turned OUT without first placing the power switch in the ON position.

Once a set is loaded into the pump and the safety clip is placed in the clip retention slot, turning the LOAD KNOB to the IN position opens the safety clip to allow for proper fluid delivery. When the LOAD KNOB is turned OUT, the safety clip is allowed to close, thus preventing free-flow through the set.

CAUTION
Open the upper clamp on the administration set before turning the LOAD KNOB to its IN position. Failure to open the upper clamp could cause pump and/or cassette damage when the LOAD KNOB is turned IN.

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1. **Power Switch**

2. **LOAD KNOB**

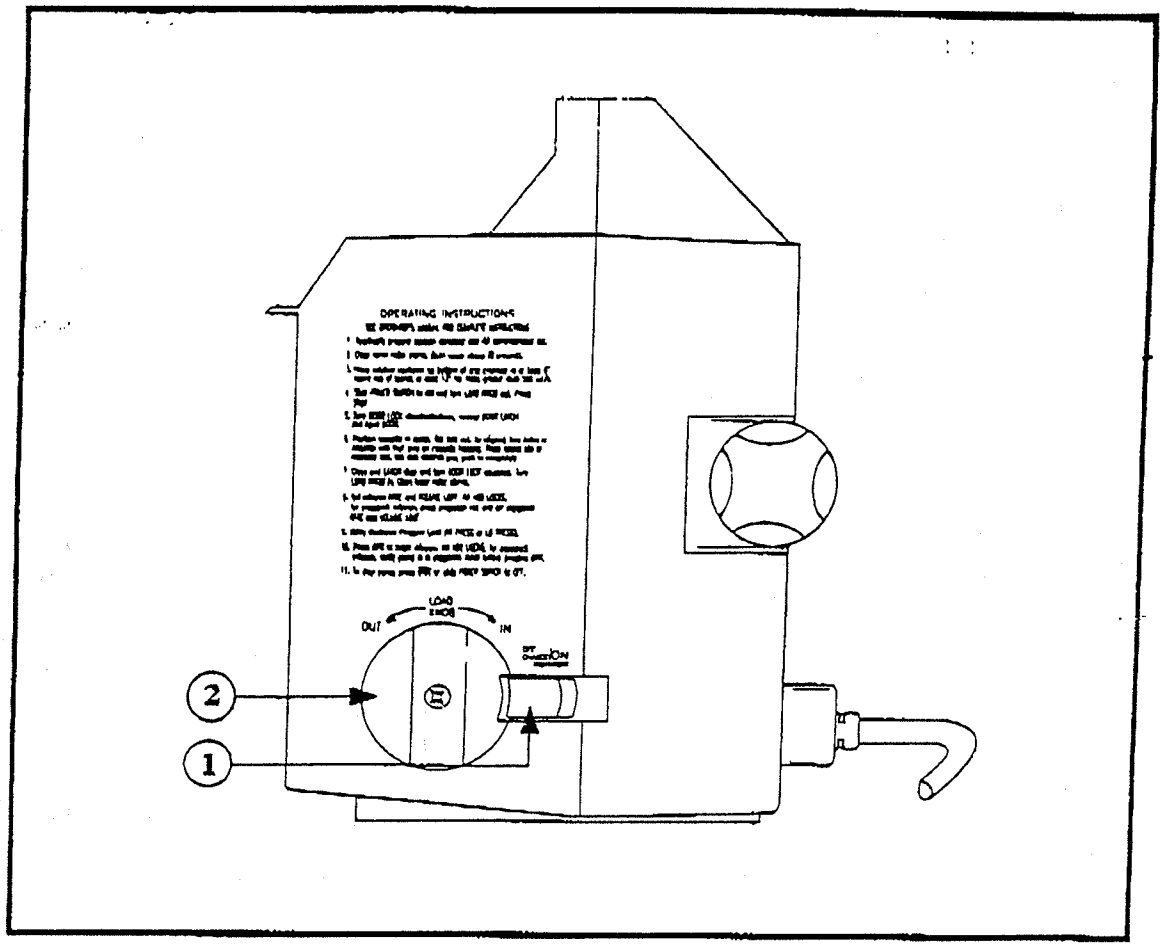


Figure 3-1
Side Panel Controls

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Refer to Figure 3-2 for controls 3 through 13.

3. Door

The door holds the installed cassette in place and provides precise surfaces for pumping and valve sealing. The occlusion valve, located on the inside surface of the door, pinches closed the cassette's fluid pathway whenever the LOAD KNOB is turned OUT (see Section 4.3 for discussion of the occlusion valve).

4. Door Latch

The door latch holds the door against the cassette housing to prevent unrestricted gravity flow through the administration set. It also assists in the engagement of the door lock. The door latch is released by pinching the visible black portion, and cannot be engaged or released unless the LOAD KNOB is first turned to the OUT position. The DOOR/CLIP visual alarm and *insistent* audio alarm activate if the LOAD KNOB is turned in before the door is latched and/or locked.

5. Door Lock

The door lock secures the door over an installed cassette. The *insistent* audio alarm and DOOR/CLIP visual alarm activate if the door lock is opened without first pressing STBY and turning the LOAD KNOB to the OUT position.

6. Clip Retention Slot

During cassette loading the safety clip, located below the cassette on an administration set, must be placed in the clip retention slot and pushed completely in as part of the free-flow prevention system.

When the LOAD KNOB is turned IN, the safety clip is opened to allow proper fluid delivery. When the LOAD KNOB is turned OUT, the safety clip closes over the lower tubing, preventing unrestricted gravity flow through the set, even when it is removed from the pump.

7. STBY (standby) Key

The STBY key halts the pump and cycles it to the standby mode. The pump must be in standby in order to load or unload administration sets, or to program volume limit and rate (except during titration) selections. The STBY key is also used to silence the *insistent* and *non-insistent* audio alarms.

On the AVI 480, switching between primary and piggyback modes for programming also requires that the pump be in the standby mode.

8. OPR (operate) Key

The OPR key is pressed to cycle the pump from standby to the operate mode following entry of the rate and volume limit selections. The OPR key is also used to silence the *non-insistent* audio alarm without interrupting fluid delivery to the patient in the event of the initial ON BATT (low battery voltage) alarm, KVO, or the titration call-back alarms. The OPR key is also used in titration to instantly change rates without first entering the standby mode (see Section 3.2 for titration discussion).

9. Number Keys

The ten keys numbered 0 through 9 are used to set the rate in ml/h and volume limit in ml. The number keys are only active in the standby mode after first pressing either the RATE or LIMIT keys. During operation, the number keys are disabled unless activated for titration by first pressing the CLEAR key (see Section 3.2 for titration discussion).

10. PRIMARY/PIGGYBACK Key (480 Only)

Pressing the PRIMARY/PIGGYBACK key switches the pump from the primary to the piggyback mode, or vice-versa, for either programming or operation. The PRIMARY/PIGGYBACK key will only switch *modes* if pressed while the pump is in standby. Pressing PRIMARY/PIGGYBACK while the pump is operating switches only the displays (rate, volume limit, volume infused) to the opposite mode; however the pump continues to deliver according to the original mode program. After approximately 3 seconds, the displays switch back to the original mode as well.

11. RATE Key

The RATE key sets the pump to receive rate input, in ml/h, when pressed while the pump is in standby. The RATE key is disabled when the pump is operating.

12. LIMIT Key

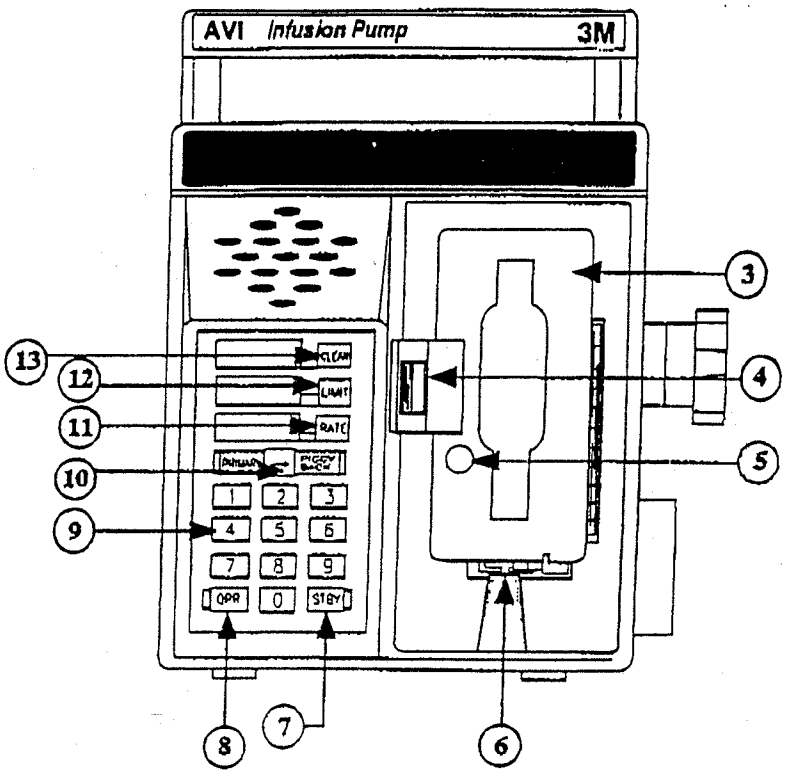
The LIMIT key sets the pump to receive volume limit (dose) input, in ml, when pressed while the pump is in standby. The LIMIT key is disabled when the pump is operating.

13. CLEAR Key

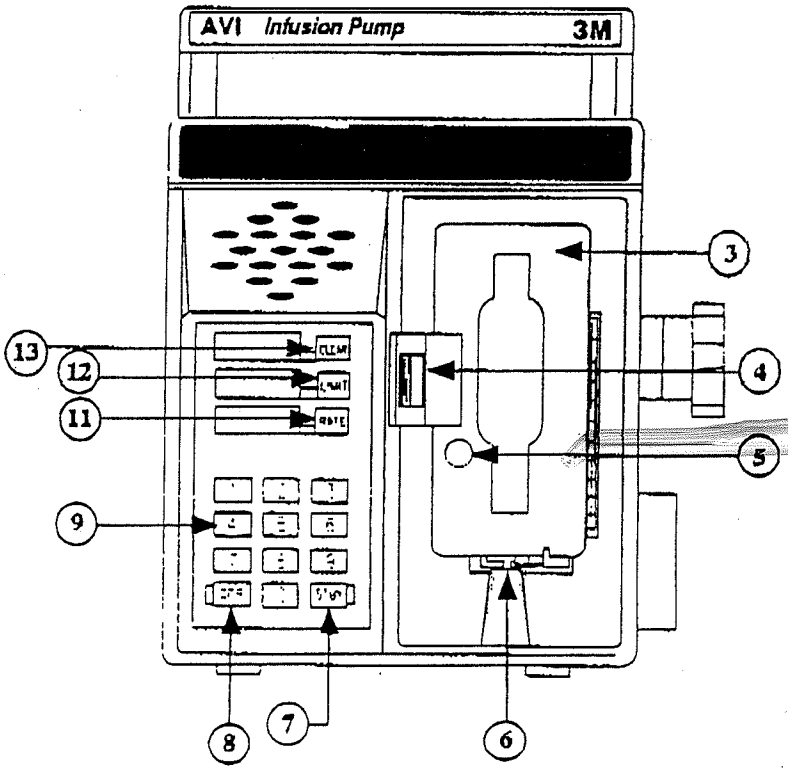
The CLEAR key resets the volume infused display to zero when pressed while the pump is in the standby mode. If the pump is operating, pressing CLEAR readies the pump for titration (see Section 3.2 for discussion of titration).

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3. Door
4. DOOR LATCH
5. DOOR LOCK
6. Clip Retention Slot
7. STBY (standby) Key
8. OPR (operate) Key
9. Number Keys
10. PRIMARY/ PIGGYBACK Key (AVI 480 Only)
11. RATE Key
12. LIMIT Key
13. CLEAR Key



AVI 480



AVI Micro 285

Figure 3-2
Front Panel Controls

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Refer to Figure 3-3 for controls 14 through 17.

14. Ground Stud

The ground stud is used as a test point to verify proper leakage current and ground line resistance levels.

15. Pressure Limit Switch

The AVI pumps are equipped with a pressure limit switch which allows the operator to select from two internally calibrated occlusion alarm thresholds. The lower setting, 4 psi, is calibrated such that if downline pressure reaches 4 psi, the pump stops infusing and the OCCLUSION alarm activates. The higher setting, 9 psi, causes the pump to alarm when downline pressure reaches the 9 psi threshold. Selection of either the 4 psi or 9 psi position of the pressure limit switch must be made while the pump is in the standby mode or the SET UP alarm will activate.

WARNING
The AVI occlusion detection sensors detect downline backpressure in the administration set, but are not designed to detect infiltration. In accordance with institution's policies and procedures, operator must periodically inspect patient's infusion site for swelling, temperature changes, and/or other signs of infiltration.

16. Pole Clamp

Turn the pole clamp clockwise firmly to secure the pump to an IV pole.

17. Audio Alarm Volume Control

The audio alarm volume control adjusts the volume of the audio alarm from high to low, or vice-versa. The low position does not completely eliminate the audio alarm, however.

Refer to Figure 3-4 for indicators 18 through 21.

18. ON BATT (red) Indicator

ON BATT indicates that the pump is operating on battery power either because the AC power cord is unplugged, or because AC power was somehow lost. The ON BATT indicator also serves as the low battery voltage alarm indicator should battery voltage fall below acceptable levels. The alarm function of the ON BATT indicator is discussed further in Section 3.4.

19. AC ON (green) Indicator

AC ON lights to indicate that the pump's power cord is plugged in and the pump is operating on AC power. AC ON also indicates that the battery is charging. This indicator remains lit whenever the power cord is plugged in and the battery is charging, even if the power switch is in the OFF/CHARGE position.

20. LO PRESS (green) Indicator

The LO PRESS indicator is lit when the pressure limit switch is in the 4 psi position. It indicates that the OCCLUSION alarm will activate should downline pressure reach the 4 psi threshold.

21. HI PRESS (green) Indicator

The HI PRESS indicator is lit when the pressure limit switch is in the 9 psi position. It indicates that the OCCLUSION alarm will activate should downline pressure reach the 9 psi threshold.

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14. Ground Stud

15. Pressure Limit Switch

16. Pole Clamp

17. Audio Alarm Volume Control

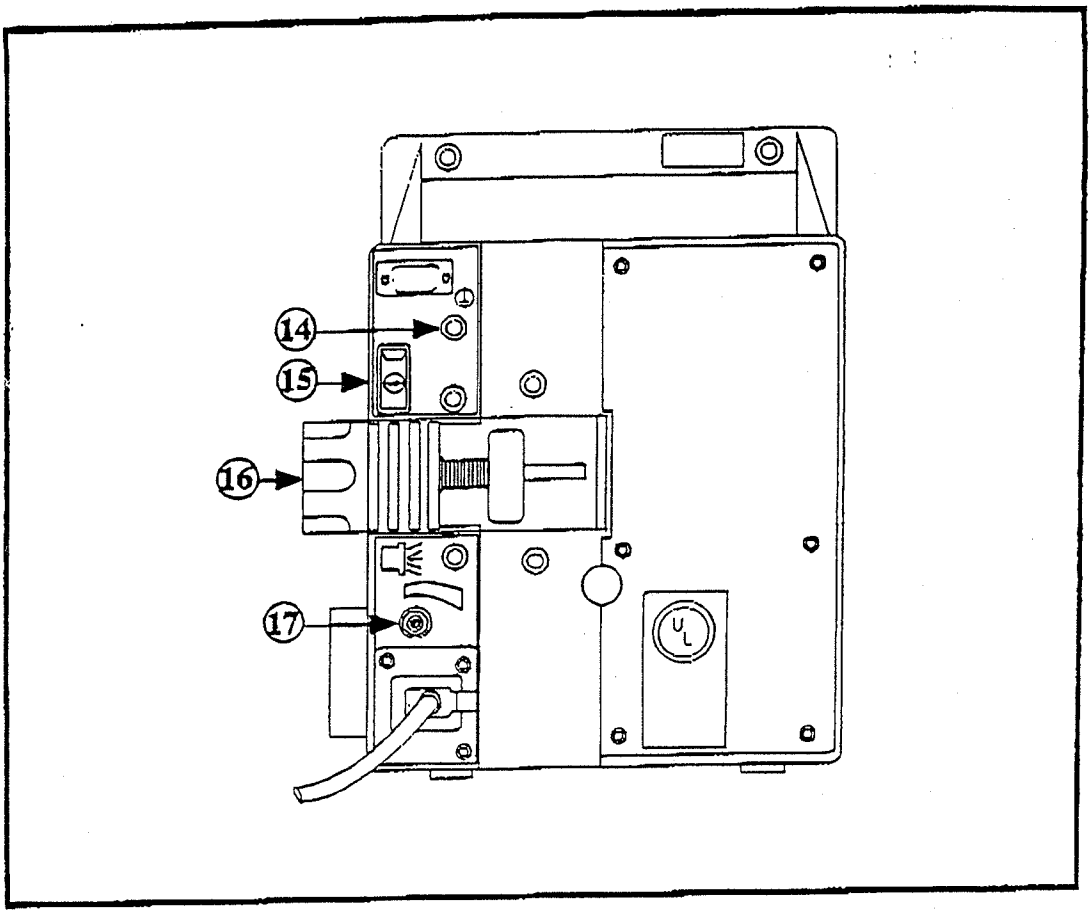


Figure 3-3
Back Panel Controls

18. ON BATT Indicator

19. AC ON Indicator

20. LO PRESS Indicator

21. HI PRESS Indicator

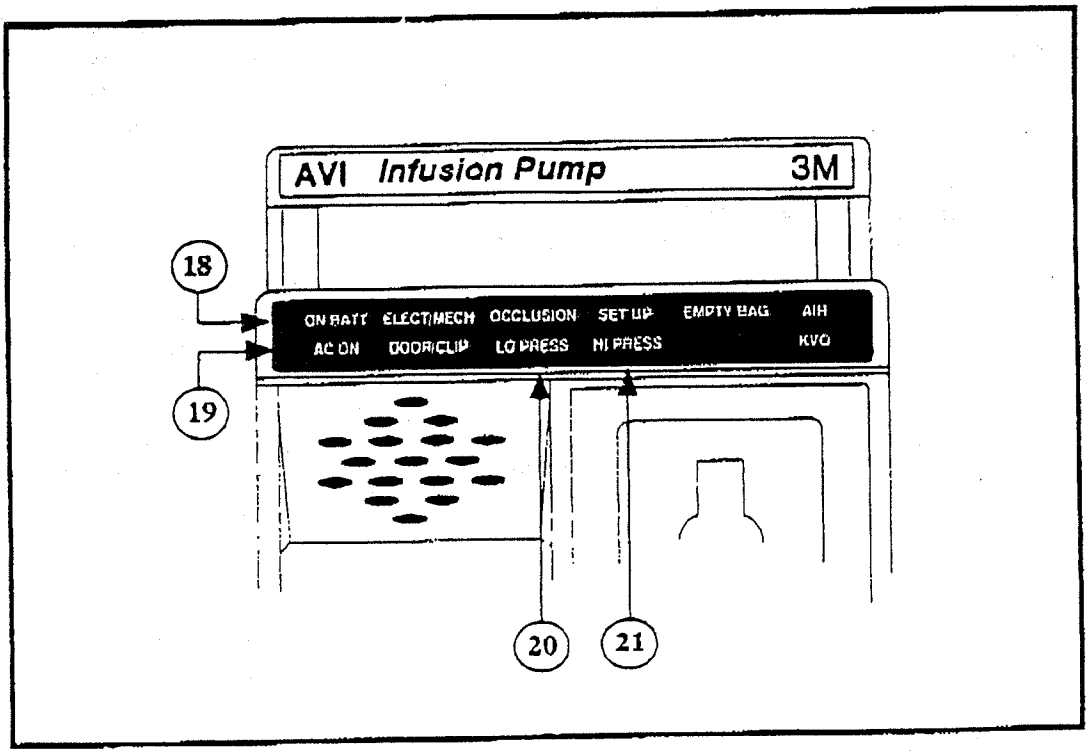


Figure 3-4
Visual Indicators

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Refer to Figure 3-5 for indicators 22 through 29.

22. Volume Infused Display

The volume infused display indicates the cumulative amount of fluid (in ml) which has been delivered to the patient. The volume infused accumulates when the pump is in the operate mode and is maintained when in the standby mode. The volume infused data are stored in pump memory despite placing the power switch in the OFF/CHARGE position. The volume infused display can only be zeroed by pressing the CLEAR key while the pump is in standby.

23. Visual Rate Cursor

Two dot segments at the left side of the volume infused display alternately switch on and off at frequencies which vary in direct proportion to the rate setting. These form the visual rate cursor.

24. Volume Limit Display

The volume limit display indicates the volume limit (dose), in ml, which the operator has selected. The volume limit entry is stored indefinitely in pump memory despite placing the power switch in the OFF/CHARGE position.

On the 480, separate volume limit entries may be made for primary and piggyback modes by pressing the PRIMARY/ PIGGYBACK key between entries. Again, these entries will be stored in pump memory indefinitely despite placing the power switch in the OFF/CHARGE position, unless the battery is depleted or disconnected.

25. Rate Display

The rate display indicates the rate (in ml/h) which the operator has selected. The rate entry is stored in pump memory indefinitely despite placing the power switch in the OFF/CHARGE position.

On the 480, separate rate entries can be made for primary and piggyback modes by pressing the PRIMARY/ PIGGYBACK key between entries. The rate information is only retained in the primary mode memory, however. In the piggyback mode, the rate display has an automatic zeroing function. This is to prevent over-infusing of possible second doses by requiring the rate to be reset each time the piggyback function is used.

26. Primary LED Indicator Light (480 Only)

The green primary LED indicator lights to show that the pump is either operating or in standby in the primary mode.

27. Piggyback LED Indicator Light (480 Only)

The green piggyback LED indicator lights to show that the pump is either operating or in standby in the piggyback mode.

28. Operate LED Indicator Light

The green operate LED indicator lights to show that the pump is operating and fluid is being delivered to the patient.

29. Standby LED Indicator Light

The red standby LED indicator lights to show that the pump is in the standby mode and fluid delivery has stopped.

3.4 Visual Alarms

Refer to Figure 3-6 for the discussions of the visual alarms.

1. ON BATT (red) Visual Alarm

The *non-insistent* audio alarm sounds and the ON BATT visual alarm begins to flash as the first indication of low battery voltage. The pump continues to infuse at the selected rate. To silence the *non-insistent* audio alarm without stopping fluid delivery, press OPR and plug in the pump's AC power cord. If the power cord is not plugged in, the pump will continue to operate for approximately 1 more hour. At this point, the *insistent* audio alarm sounds, and the pump cycles to the standby mode to indicate that battery power is exhausted. The power cord must be plugged in at this time to continue operation.

CAUTION
The pump's power cord should be plugged in whenever possible, including during storage time, to assure battery power is available when required. Always recharge a depleted battery before placing a pump in storage or permanent battery damage will occur.

CAUTION
Continuous deep discharge of the battery will cause damage to the battery cells and could lead to premature battery replacement.

2. ELECT/MECH (red) Visual Alarm

The ELECT/MECH (electromechanical) visual alarm lights and the *insistent* audio alarm sounds to indicate that the pump is stopped due to a motor stall caused by electrical or mechanical failure. A pump experiencing recurring ELECT/MECH alarms should be removed from use and serviced by qualified service personnel.

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22. Volume Infused Display

23. Visual Rate Cursor

24. Volume Limit Display

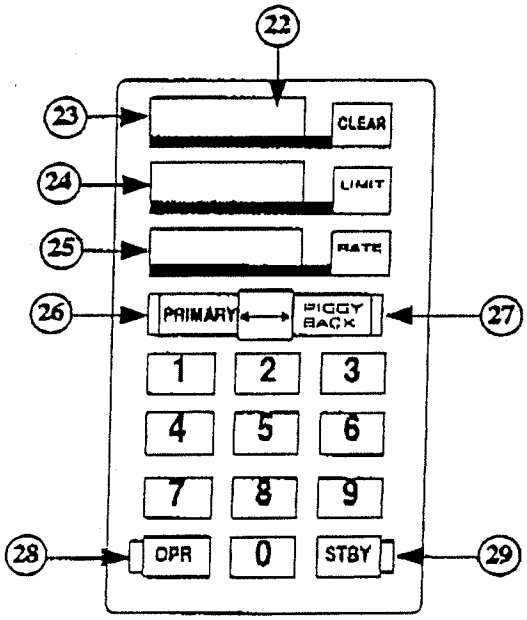
25. Rate Display

26. Primary LED Indicator Light (480 Only)

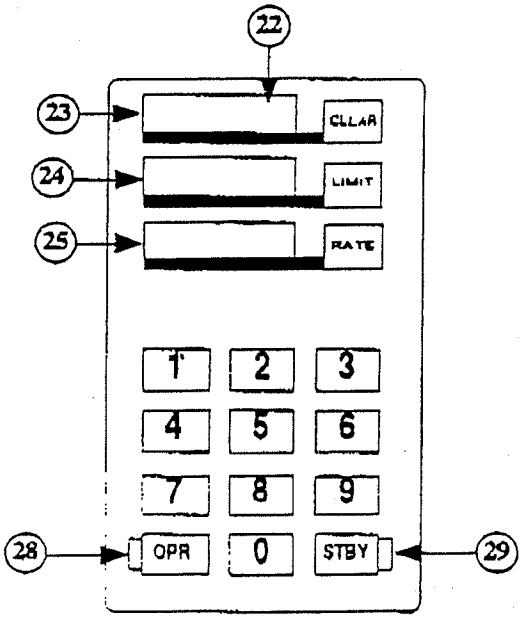
27. Piggyback LED Indicator Light (480 Only)

28. Operate LED Indicator Light

29. Standby LED Indicator Light



AVI 480



AVI Micro 285

Figure 3-5
Visual Indicators

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3. OCCLUSION (red) Visual Alarm

The OCCLUSION visual alarm and *insistent* audio alarm are activated whenever the pumps detect excessive backpressure downline. The pump briefly backs off to reduce pressure before cycling to standby. The alarm thresholds are 4 psi and 9 psi, and are chosen with the pressure limit switch.

WARNING
The AVI occlusion detection sensors detect downline backpressure in the administration set, but are not designed to detect infiltration. In accordance with institution's policies and procedures, operator must periodically inspect patient's infusion site for swelling, temperature changes, and/or other signs of infiltration.

4. SET UP (red) Visual Alarm

The SET UP visual alarm and *insistent* audio alarm activate when any of the following improper procedures are used: the OPR key is pressed while the rate is set to zero (480 only); the position of the pressure limit switch is changed while the pump is operating (the pump must first be placed in the standby mode); the pump is left in standby for longer than approximately 2 1/2 minutes with door closed, or approximately 6 minutes with door open.

NOTE
Fluid delivery is stopped if the SET UP alarm occurs while pump is in the operate mode.

5. EMPTY BAG (red) Visual Alarm

The EMPTY BAG visual alarm and *insistent* audio alarm activate to indicate inadequate fluid pressure at the upper cassette chamber (head pressure). An occurrence of the EMPTY BAG alarm stops fluid flow and cycles the pump to standby. Inadequate pressure may result from an empty fluid container, a closed clamp or other occlusion of the upper line, or inadequate height of the fluid container drip chamber above the pump (see Table 2-1 for fluid container height requirements).

NOTE
Inadequate fluid pressure at the time of pump start-up may be detected by the optical air detector slightly before it would be detected by the empty bag contacts (see Sections 4.9 and 4.16 for discussion of the empty bag contacts and optical air detect circuitry). For this reason, the AIR visual alarm is activated simultaneously with the EMPTY BAG alarm. A quick visual check of the upper cassette chamber through the door will either verify or rule out air in line as the cause of such an alarm.

6. AIR (red) Visual Alarm

The AIR visual alarm and *insistent* audio alarm activate in the event air enters the upper tubing and reaches the upper cassette chamber. The pump stops fluid flow. The AIR visual alarm activates simultaneously with the EMPTY BAG alarm (see NOTE following 5, above).

7. KVO (yellow) Visual Alarm

The KVO visual alarm and *non-insistent* audio alarm activate when the volume infused reaches the selected volume limit. The pump then switches to the KVO (Keep Vein Open) rate of 1 ml/h (on the **Micro 285**, the KVO rate is 1 ml/h or, if selected rate is less than 1 ml/h, continues at selected rate). The audio alarm may be reset without interrupting KVO delivery by pressing OPR. The *non-insistent* audio alarm will re-occur approximately every 6 minutes to remind you that the pump is operating at the KVO rate. Pressing STBY resets the audio alarm and cycles the pump to the standby mode.

8. DOOR/CLIP (red) Visual Alarm

The DOOR/CLIP visual alarm and *insistent* audio alarm activate when one of the following occur: The LOAD KNOB is turned IN before the door is latched and locked; the LOAD KNOB is turned IN and the safety clip is not properly loaded in the clip retention slot; the door lock is loosened while the pump is operating; the LOAD KNOB is turned OUT without first pressing STBY. An occurrence of the DOOR/CLIP alarm while the pump is operating causes the pump to briefly back off before the pumping mechanism stops.

NOTE
When no cassette is installed, the DOOR CLIP alarm will activate when the LOAD KNOB is turned inward. Press STBY and verify that the door is properly latched and locked.

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1. **ON BATT Visual Alarm**
2. **ELECT/MECH Visual Alarm**
3. **OCCLUSION Visual Alarm**
4. **SET UP Visual Alarm**
5. **EMPTY BAG Visual Alarm**
6. **AIR Visual Alarm**
7. **KVO Visual Alarm**
8. **DOOR/CLIP Visual Alarm**

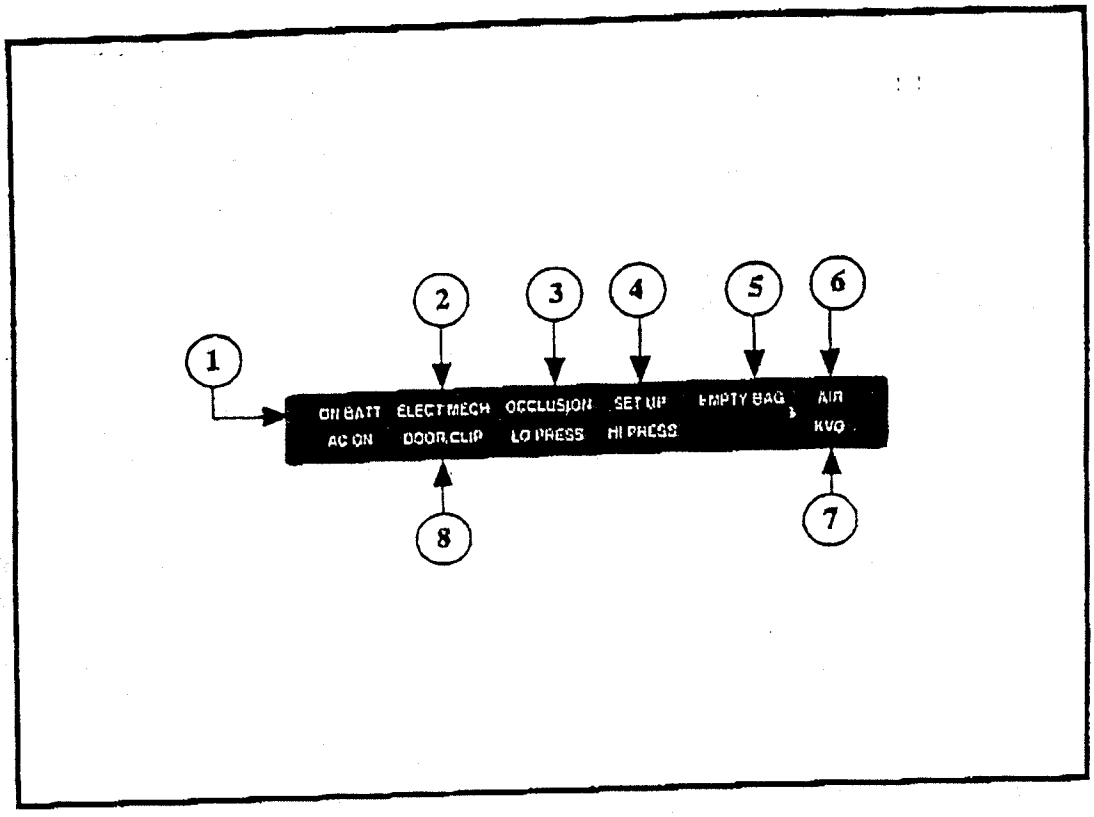


Figure 3-6
Visual Alarms

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3.5 Audio Alarms

When the AVI infusion pumps detect an alarm condition, an audio alarm sounds and, in all cases except titration and malfunction, a visual alarm is displayed. The *insistent* and *non-insistent* audio alarms may both be silenced by pressing STBY. Pressing STBY resets the audio alarm, stops fluid flow, and cycles the pump to the standby mode. The *non-insistent* audio alarm may also be silenced, without interrupting fluid delivery, by pressing OPR. To silence the malfunction alarm, you must place the power switch in the OFF/CHARGE position. No other method will silence the malfunction alarm. Refer to Table 3-1 for a summary of alarm conditions.

1. *Insistent* Audio Alarm

This alarm consists of four rapid tones, three high pitched and one low pitched. This pattern (the first measure of Beethoven's Fifth Symphony) is rapidly repeated, with 1 second pauses, until you press STBY.

The *insistent* audio alarm sounds when an alarm condition which requires immediate attention has occurred. The pump stops infusing and cycles to the standby mode. Press STBY to silence the audio alarm while the cause is found and corrected.

2. *Non-Insistent* Audio Alarm

This alarm consists of two tones, one high pitched and one low pitched. This pattern is slowly repeated, with 2 second pauses, until you press either STBY or OPR. The *non-insistent* audio alarm occurs only during the following conditions:

KVO

When the volume infused reaches the selected volume limit, the *non-insistent* audio alarm sounds and the KVO visual indicator is displayed. The pump switches to the KVO rate.

If you press OPR, the *non-insistent* audio alarm is silenced and the pump continues uninterrupted delivery at the KVO rate. The *non-insistent* audio alarm reactivates approximately every 6 minutes to remind you that the pump is delivering at the KVO rate. If you press STBY, the *non-insistent* audio alarm is silenced and the pump cycles to the standby mode.

ON BATT

The *non-insistent* audio alarm sounds and the ON BATT indicator begins to flash as the initial indication of low battery voltage. The pump continues to infuse at the selected rate.

To silence the *non-insistent* audio alarm without interrupting fluid delivery, press OPR and plug in the pump's AC power cord. If the power cord is not plugged in, the pump will continue to deliver for approximately 1 more hour before the *insistent* audio alarm sounds to signify that battery power is depleted. You must plug in the AC power cord at this point in order to continue infusion.

Titration

The *non-insistent* audio alarm sounds if improper titration procedure is used (see Section 3.2 for discussion of titration). In this case, no visual alarm or indicator accompanies the audio alarm. To silence the alarm without interrupting delivery, press OPR and repeat the correct titration procedure.

3. *Malfunction* Alarm

This alarm consists of the first measure of the Westminster Chimes tune repeated at 1 second intervals. It indicates a malfunction of the pump's electronic system, and can only be silenced by moving the power switch to the OFF/CHARGE position. Remove the pump from patient use and have it repaired by a qualified technician.

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Table 3-1 Summary of Alarm Conditions

Reference Troubleshooting Guide in Section 5 for complete alarm troubleshooting instructions.

Visual Alarm/ Alarm Tone	Instrument Response	To Silence Alarm
ON BATT indicator flashes, *non-insistent* audio alarm sounds;	Continues to operate at selected rate. indicates approximately 1 hour of battery power is available.	Press OPR to silence alarm without interrupting infusion. Plug in power cord.
ON BATT indicator flashes, *insistent* audio sounds.	Pump stops infusing and cycles to standby.	Press STBY to silence audio alarm; pump must be plugged into AC power to continue infusion.
SET UP lights, *insistent* audio alarm sounds.	Pump stops infusing (if running) and cycles to standby.	Press STBY to silence audio alarm; check for: -position of pressure limit switch changed while pump was operating; -rate set to zero (AVI 480 only; Micro 285 rate cannot be set to zero); -pump left in standby for approximately 2-1/2 minutes with door closed or approximately 6 minutes with door open.
OCCLUSION lights, *insistent* audio alarm sounds.	Pump briefly backs off to reduce inline pressure, then cycles to standby.	Press STBY to silence audio alarm; check for: -IV site patency; -kinks in lower tubing; -closed lower roller clamp; -incorrect setting of pressure limit switch.
EMPTY BAG lights, *insistent* audio alarm sounds.	Pump stops infusing and cycles to standby.	Press STBY to silence audio alarm; check for: -air in upper cassette chamber; -closed upper tubing clamp; -inadequate height of fluid container above top of pump (see Table 2-1 for head-height requirements); -empty fluid container.
AIR lights, *insistent* audio alarm sounds.	Pump stops infusing and cycles to standby.	Press STBY to silence audio alarm; check for: -air in upper cassette chamber; -closed upper tubing clamp; -inadequate height of fluid container above top of pump (see Table 2-1 for head-height requirements); -empty fluid container.
DOOR/CLIP lights, *insistent* audio alarm sounds.	Pump cycles to standby.	Press STBY to silence audio alarm. Check for: -door not properly latched and/or locked; -LOAD KNOB turned to OUT position without first pressing STBY. -Improper loading sequence. Latch and lock door before turning LOAD KNOB in. -Safety clip not placed properly in clip retention slot.
KVO lights, *non-insistent* audio alarm	Pump reverts to KVO (Keep Vein Open) rate.	Press OPR to silence audio alarm and continue at KVO delivery for approximately 6 minutes before pump re-alarms; -or- Press STBY to silence audio alarm and place pump in standby.
ELECT/MECH lights, *insistent* audio alarm sounds.	Pump stops infusing and cycles to standby.	Close lower roller clamp, open door and remove cassette. Reload cassette, close, latch, and lock door, turn LOAD KNOB in. Press OPR. If pump re-alarms, remove from patient use.
Titration - no visual alarm, *non-insistent* audio alarm sounds.	Pump continues to operate at selected rate.	Press OPR to silence audio alarm and repeat correct titration procedure.
Malfunction - no visual alarm, Westminster Chimes audio alarm.	Pump stops infusing and cycles to standby. Keypad input is disabled.	Place power switch in OFF/CHARGE position and remove pump from patient use.

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3.6 Start-Up Procedure

NOTE
The following is not a complete procedure for patient use. It is instead intended to acquaint technical personnel with the methods required to operate the pump for functional check and maintenance related operations. Complete procedures for pump use can be found in the operator's manual packaged with each pump.

DANGER
The lower roller clamp must be closed before the safety clip is opened or unrestricted gravity flow to the patient will occur, with the potential to cause severe injury or death.

CAUTION
The administration set's upper clamp must be opened before turning the LOAD KNOB to the IN position, or pump and/or cassette damage may occur.

1. Prime selected administration set according to its instructions.

NOTE
All maintenance and functional and accuracy checks require that a 20 drops/ml, non-checkvalve administration set be used.

2. Place power switch in ON position and press STBY.
3. Turn LOAD KNOB OUT. Open door lock and release door latch; open door.
4. Install primed cassette into pump by aligning four small holes in cassette with four pins on cassette housing. Run your finger around the outside edges and down the center of the cassette to assure it is firmly in place. Place safety clip in clip retention slot and push completely in.
5. Close and latch door, tighten door lock, and turn LOAD KNOB IN.
6. On front of pump, press RATE key and enter desired rate, in ml/h, using number keys.
7. Press LIMIT key and enter desired volume limit (dose), in ml, using number keys

NOTE (480 Only)
The pump automatically powers up in the primary mode upon pump start-up. If piggyback delivery is desired, enter the primary mode program as described first. Hang your piggyback container and prime piggyback set according to its instructions. Then, press PRIMARY/PIGGYBACK key to enter piggyback mode, and enter piggyback infusion parameters (items 6 and 7, above).

8. On back of pump, use pressure limit switch to select either 4 psi or 9 psi setting for OCCLUSION alarm.
9. Open lower roller clamp.
10. If desired, press CLEAR to zero volume infused display, then press OPR to begin infusion.

TOTAL P.14
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