Global Service Manual

Colleague
VOLUMETRIC INFUSION PUMP

Colleague 3
VOLUMETRIC INFUSION PUMP

Baxter

Prior to servicing these pumps, read this manual and the pump's Operator's Manual carefully to fully understand the pump's functionality and to ensure safe and proper servicing.

Warning

There are risks associated with using anything other than the recommended sets with this device. Sets designated for use with this device are identified in Chapter 3 of the Operator's Manual. Baxter's warranty on this device will be null and void and Baxter will assume no responsibility for incidents which may occur if the product is not used in accordance with product labeling. See Chapter 1 for a complete list of warnings and cautions.

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Year 2000 Compliance

This product is Year 2000 Compliant and will function as designed through 2035 without interruption or failure by the occurrence of dates prior to, during or after year 2000.

Patent Information

This device is protected under one or more of the following U.S. and Foreign Patents: **United States:** 5,151,019; 5,764,034; 5,782,805; 5,799,207; 5,842,841; 5,843,035; 6,013,057; 6,068,612; 6,129,517; D390,654. **Foreign:** Australia: 130,693; 706,742; 710,286; 712,859; 713,132; 721,076; 723,365; 727,479; 730,132; 736,366; 739,019; 740,655; 742,059; 744,398; 750,280; Benelux: 27657; Canada: Des. 80218 (BII); 2,224,239; Denmark: 165/97; Europe: 0837708; Germany: M9608875.3; GB: 2,059,861; 2,224,239; 2,312,049; 2,312,055; 2,319,079; 2,338,753; 2,338,756; 2,338,757; 2,338,758; 2,338,992; 2,342,188; Hong Kong: HK1002291; Japan: 1002447; Korea: 10-344380; 207012; 376076; New Zealand: 329316; 329317; 329318; 329320; 333087; 333088; 333089; 333090; 333091; 333092; 333093; Des. 28022; R.O.C.: 098653; 096216; 090525; 092501; 101,347; 102,585; Des. 058282; Singapore: 47257; 54666; 75193; 79298; 83175; South Africa: 2000/5266; Sweden: 61479; other U.S. and Foreign patents pending.

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Chapter 1

Introduction

Overview

This manual provides service and maintenance information for the Colleague and Colleague 3 Volumetric Infusion Pump (hereinafter referred to as "the pump"). The manual is intended for trained, qualified personnel and qualified Baxter employees. Refer to the appropriate Operator's Manual for detailed operating instructions and applicable precautionary statements. Table 1-1 lists all Colleague Pump product codes covered by this service manual.

This chapter contains the following information:

Product Features

The Colleague and Colleague 3 Pumps are electromechanical devices that deliver fluid at user-selected rates through clinically acceptable routes of administration, such as intravenous (IV), intra-arterial (IA), subcutaneous, epidural, or irrigation of fluid spaces applications. Colleague pumps are approved for use in hospital and alternate care facilities, Colleague 3 pumps are approved for hospital use only.

The Colleague Pump has one pump module and the Colleague 3 pump has three pump modules, enabling it to deliver up to three independently-programmed infusions simultaneously.

- Fluid delivery applications include parenteral fluids, drugs, electrolytes, total parenteral nutrition (TPN) solutions, whole blood, and blood products.
- Uses Baxter Standard Administration Sets equipped with Keyed On/Off Clamps
- Automatically loads administration set tubing
- Can be used with a variety of source containers
- Micro and Macro rate range
- Piggybacking Secondary Medications with Callback Option
- Dose programming modes
- Configurable air sensor settings
- User selectable downstream occlusion pressure settings (psig and mmHg)
- Flow check display indicating downstream in-line resistance
- Panel Lockout with optional Auto Lock function minimizes potential for tampering and administration set removal
- Configurable Personality feature sets
- The Colleague 3 Pump has three independent pump channels that allow up to three infusions simultaneously.
- Label library
- Battery charge level indicator
- Nurse call
- Communications port available for computer monitoring of pump
- Built-in diagnostics
- Optional Colleague Guardian feature allows limits to be programmed for drugs in the label library, including custom labels.

Note: For information on conformance to the CE Mark, refer to the appropriate Operator's Manual.

Manual Conventions

Pump Items

In this manual, all keys and switches are shown using the exact name shown on the pump itself. Examples are provided below. See Figure 2-1 or Figure 2-2 for the location of front panel keys and displays.

Pump keys or switches with a single function are shown like this: ***START***

The function of the pump's four soft keys changes depending on the pump's current activity. The current function of each soft key is shown on the Main Display above the key. Soft keys are shown in text like this: **Done**

Main display messages (other than the soft keys) are shown like this:
Main Display Text

Pump module messages are shown like this: PUMPING

Warnings, Cautions, and Notes

Certain items in this manual are highlighted by special messages. The definitions are provided below.

Warnings

Warning messages indicate a possible hazard which, if not avoided, could result in personal injury or death.

Cautions

Caution messages indicate a problem or unsafe practice which, if not avoided, could result in minor or moderate personal injury, product or property damage.

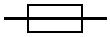
Notes

Notes provide supplemental information to the accompanying text. Notes precede the text to which they apply.

Labeling

See Figure 11-6 for a diagram identifying all labels affixed to the pump.

Labeling Symbol Definitions

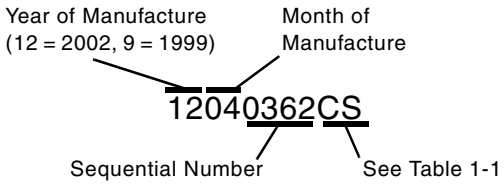
IPX1	Drip-proof equipment; enclosed equipment protected against dripping fluids.
~	Alternating current or equipment intended to be connected to an alternating current source.
	Fuse.
	Attention, consult accompanying documents.
	Type CF applied part.
	Marked item is recyclable.
	This product is classified by Underwriters Laboratories Inc. with respect to electric shock, fire, and mechanical hazards only in accordance with UL-2601-1, Second Edition, and CAN/CSA C22.2 No. 601-1.
	The symbol of conformity to the Council directive 93/42/EEC. EU Authorized Representative: Baxter S.A. B-7860 Lessines, Belgium

Labeling Abbreviations

COMM. PORT	Communications Port
VOL.	Volume
CONT.	Contrast

Serial Number Format

This manual is applicable to all the Baxter product codes listed in Table 1-1. The table lists the serial number suffix applicable to each Colleague pump product code covered by this manual, and the language of the pump's exterior labeling and software user interface. The date of manufacture can be determined from the serial number as shown in the following example.



Examples:

8060517CS U.S. Colleague Pump manufactured June 1998
10025678TG German Colleague 3 Pump manufactured Feb. 2000
11081234TE Spanish Colleague 3 Pump manufactured Aug. 2001

Table 1-1 Product Code to Serial Number Suffix Cross-Reference List

Product Code	Product	Serial Number Suffix
2M8151	U.S. English Colleague Pump	CS
2M8151K	U.K. English Colleague Pump	CK
2M8153	U.S. English Colleague 3 Pump	CT
2M8153K	U.K. English Colleague 3 Pump	TK
BRM8151	Brazilian Portuguese Colleague Pump	CB
BRM8153	Brazilian Portuguese Colleague 3 Pump	TB
CNM8151	Swedish Colleague Pump	CW
CNM8153	Swedish Colleague 3 Pump	TW
DNM8151	French Colleague Pump	CF
DNM8153	French Colleague 3 Pump	TF
GNM8151	Danish Colleague Pump	CN
GNM8153	Danish Colleague 3 Pump	TN
HNM8151	German Colleague Pump	CG
HNM8153	German Colleague 3 Pump	TG
PNM8151	Spanish Colleague Pump	CE
PNM8153	Spanish Colleague 3 Pump	TE
TRM8151	Turkish Colleague Pump	CY
TRM8153	Turkish Colleague 3 Pump	TY
WNM8151	Dutch Colleague Pump	CD
WNM8153	Dutch Colleague 3 Pump	TD

Safety Summary

General precautions to observe while using the pump are shown below. Warnings and cautions related to personal safety that appear throughout the manual are also summarized in this section.

General

- **BEFORE INITIALLY POWERING ON THE PUMP, CHARGE THE BATTERIES FOR AT LEAST 12 HOURS. A COMPLETE CHARGE MAY TAKE LONGER THAN 12 HOURS.**
- In accordance with the International Standard, IEC 60601-1 (1988-12) Medical Electrical Equipment — Part 1: General Requirements for Safety, Colleague and Colleague 3 Pumps are classified as:
  - Class 1
  - Type CF
  - Drip-proof
  - Not suitable for use with flammable anesthetic mixtures with air, oxygen or nitrous oxide
  - Continuous operation
- This manual has been developed with consideration to the requirements in the International Standard, IEC 60601-2-24 (1998-02) Medical Electrical Equipment — Part 2-24: Particular Requirements for Safety of Infusion Pumps and Controllers. Data presented in the Technical Specifications reflect specific test conditions defined in this standard. Other external factors such as varying back pressure, temperature, head height, set usage, fluid restrictions, solution viscosity, or combinations of these factors, may result in deviations from the performance data enclosed.
- This product is classified by Underwriters Laboratories Inc. with respect to electric shock, fire and mechanical hazards only in accordance with UL2601-1, and CAN/CSA C22. 2 No. 601-1-M90. In accordance with these documents, this equipment is classified as:
  - Class 1
  - Type CF
  - IPX1 (Drip-proof)
  - Not suitable for use with flammable anesthetic mixtures with air, oxygen or nitrous oxide.
  - Continuous operation
- Prior to operating the pump, carefully read its Operator's Manual to fully understand the pump's functionality and to ensure safe and proper operation. An Operator's Manual in the appropriate language is shipped with each pump.
- Although the pump has been designed and manufactured to exacting specifications, it is not intended to replace trained, qualified personnel in the supervision of infusion therapy.

- Read and understand this manual before attempting to perform service or maintenance on the pump.
- To ensure that the pump continues to perform within specifications, perform the routine maintenance procedures described in Chapter 6 of this manual at least once every 12 months.

Warnings

! WARNING ! **Before using the pump, charge the batteries for at least 12 hours. A complete charge may take longer than 12 hours.**

! WARNING ! **Pump modules from Colleague and Colleague 3 pumps are not interchangeable. Do not replace Colleague pump modules with Colleague 3 pump modules or vice-versa.**

! WARNING ! **U.S. AND CANADA: Use only Baxter standard administration sets equipped with keyed On/Off Clamps that have an "s" after the code number, or are labeled as pump compatible. If you have questions about administration set compatibility, contact the Baxter Product Information Center at the number shown on the administration set labeling. There are risks associated with using anything other than the recommended administration sets with this device.**

! WARNING ! **LATIN AMERICA: Use only the following administration sets with the pump:**

- **Baxter "Green Label" C96XX administration sets equipped with keyed On/Off Clamps, or**
- **Baxter standard administration sets equipped with keyed On/Off Clamps that have an "s" after the code number, or are labeled as pump compatible. If you have questions about administration set compatibility, contact the Baxter Product Information Center at the number shown on the administration set labeling. There are risks associated with using anything other than the recommended administration sets with this device.**

! WARNING ! **EEC Countries: Use only Baxter "Green Label" C96XX administration sets equipped with keyed On/Off Clamps. There are risks associated with using anything other than the recommended administration sets with this device. See "Recommended Administration Sets" in Chapter 3 of the appropriate Operator's Manual for more information.**

! WARNING ! **In EEC Countries, use only Continu-Flo "Green Label" C96XX administration sets as the primary fluid line when administering a secondary medication. Carefully follow the directions on the primary and secondary administration set labels.**

! WARNING ! **Always read and follow the instructions which accompany the source container and the administration sets you are using. Carefully follow any label copy instructions for loading, removing, and reloading the set, as well as the recommended set change interval. For optimal pump performance, set use should not exceed the change interval shown on the set's label copy or 72 hours, whichever is less.**

! WARNING ! **For infection control purposes, consider the set change interval recommended by the United States Centers for Disease Control and Prevention (CDC), your institution's guidelines, and the instructions provided with the administration set, using whichever is most appropriate.**

! WARNING ! **Baxter will assume no responsibility for incidents which may occur if the product is not used in accordance with product labeling.**

! WARNING ! **DO NOT CONNECT THE ADMINISTRATION SET TO THE PATIENT WHEN PRIMING.**

! WARNING ! **DO NOT USE FUNCTIONAL TEST MODE ON PATIENTS.**

! WARNING ! **While the pump automatically closes the keyed On/Off clamp, always close the regulating clamp on the administration set before removing the tubing from the pump module.**

! WARNING ! **The administration sets should be disposed of in an appropriate manner, considering the nature of the residual fluid that may be contained within, in accordance with the hospital disposal practices.**

! WARNING ! **If the device has been dropped or appears to be damaged, it should be taken out of service and inspected by qualified service personnel.**

! WARNING ! **Prior to starting an infusion, verify that no drops are falling in the drip chamber and the programmed information is correct.**

! WARNING ! **This device should be used only with Baxter accessories specified for this device. There are risks associated with using anything other than the recommended accessories with this device. Accessories designated for use with this device are listed in Chapter 4.**

! WARNING ! **To avoid the possibility of electric shock, use caution when the power supply is connected to the AC input during calibration.**

! WARNING ! **This device should be repaired only by qualified Baxter employees or Baxter-trained, qualified personnel, using only Baxter recommended parts. There are risks associated with using anything other than Baxter recommended parts. Baxter will assume no responsibility for incidents which may occur if the product was not repaired in accordance with procedures authorized by Baxter.**

! WARNING ! **Epidural administration of drugs other than those indicated for epidural use could result in serious injury to the patient.**

- **Epidural administration of anesthetics is limited to short term infusion (not to exceed 96 hours) with indwelling catheters specifically indicated for short term anesthetic epidural drug delivery.**
- **Epidural administration of analgesics is limited to use with indwelling catheters specifically indicated for either short term or long term analgesic epidural drug delivery.**
- **To prevent infusion of drugs not indicated for epidural use, do not use administration sets incorporating injection sites during epidural delivery.**
- **Clearly distinguish pumps used for epidural drug delivery from pumps used for other routes of administration.**

! WARNING ! **DO NOT CHANGE THE USER INTERFACE LANGUAGE TO OTHER THAN THAT OF THE PUMP'S EXTERIOR LABELS.**

! WARNING ! **Ensure that the pump is powered off and unplugged from the AC receptacle before performing maintenance procedures.**

! WARNING ! **To avoid the possibility of electric shock, use caution when the power supply is connected to the AC input during calibration. Power supply line input is energized whenever the pump is connected to an AC outlet.**

! WARNING ! **Before connecting the pump to an AC outlet, make certain that the plastic insulator shield is in place over the power supply assembly.**

! WARNING ! **During the power-up test, do not wear a grounding wrist strap. Put the wrist strap back on only when the pump is disconnected from the AC outlet.**

Cautions

Caution **Use of this device is restricted by Federal Law (USA) to sale or use by, on the order of, or under the supervision of a physician or other licensed health care professional.**

Caution **The power cord must be connected to a 100-120 VAC/220-240 VAC, 50/60 Hz, properly grounded 3-wire receptacle designated as "Hospital Grade."**

Caution **To avoid possible damage to the pump, make Nurse Call connections only as shown in Figure 3-1.**

Caution **Use only accessory equipment complying with the device's safety requirements; failure to do so may lead to reduced safety levels of the resulting system. Consideration relating to accessory choice shall also include:**

- **use of the accessory in the patient vicinity**
- **evidence of the safety certification of the accessory has been performed in accordance with the appropriate UL2601-1 or IEC 601-1 and/or IEC 601-1-1 harmonized national standard.**

Caution **As with all medical electronic equipment, care must be exercised to avoid exposing this device to powerful sources of electromagnetic interference. This device design has been tested to current U.S. and European standards and guidelines for medical devices. The device was not found to be adversely affected by these susceptibility tests and will perform safely. The device's emissions were also found to be acceptable. Using the pump near operating equipment which radiate high energy radio frequencies (such as electrosurgical/cauterizing equipment, two-way radios, or cellular telephones) may cause false alarm condition. If this happens, reposition the pump away from the source of interference; or turn off the pump and, if clinically necessary, manually regulate the flow with the regulating clamp according to your institution's guidelines.**

Caution **When infusing through a central line catheter, Baxter recommends using sets with a Luer lock adapter.**

Caution **Follow the cleaning schedule and methods described in Chapter 6 to ensure proper maintenance of the device.**

Caution **When mounting the Colleague pump to an IV pole or other mounting location, ensure it has been securely clamped. The Colleague 3 Pump, due to its weight, cannot be mounted on a headboard or other location except an IV pole.**

Caution **To avoid personal injury, ensure that the IV pole is stable and secure. Ensure that the pole is able to support the pump, along with any other devices, without tipping or falling. The pole diameter should be between 0.95 and 3.81 cm (0.37 and 1.5 in.).**

Caution **Never place the pump on the bed with the patient.**

Caution **If mounting a Colleague pump on a headboard or footboard, ensure that the headboard or footboard is stable, secure, and has a depth greater than 1.91 cm (0.75 in.) and height of at least 5.08 cm (2 in.).**

Caution **Ensure pump is mounted where it is easily accessible and the administration set can be installed without stretching or kinking the tubing.**

Caution **This device may interact with some electrocardiograph (ECG) equipment during infusions. Proper setup of ECG should eliminate any difficulties. Consult the ECG instruction manual for more information.**

Caution **Do not clean, disinfect, or sterilize any part of the device by autoclaving, or with ethylene oxide gas. Doing so may damage the device and void the warranty. Only external parts of the device should be disinfected.**

Caution **Do not use hard instruments for cleaning. Do not spray cleaners directly into the tubing channel, the bezel openings adjacent to the Volume and Contrast controls, or the area where the power cord enters the housing.**

Caution **Do not use the following chemicals on the pump, as they will damage the front panel: acetoaldehyde, acetone, ammonia, benzene, hydroxytoluene, methylene chloride, and ozone. Do not use cleaners containing n-alkyl dimethyl ethyl benzyl ammonium chloride.**

Caution **Wear a grounding wrist strap when assembling and disassembling the pump.**

Caution **Do not lay the pump face down on components or tools which could scratch or damage the keypad.**

Caution **Ensure that wires are not pinched or overstressed.**

Caution **Grounding reliability can only be achieved when this pump is connected to an earth-grounded receptacle marked "Hospital Grade." (When grounding receptacle reliability is in doubt, the equipment should be powered by its batteries.)**

Caution **When troubleshooting the pump, do not inject or apply signals unless the procedures in this chapter specifically instruct you to do so. Damage to the pump or its subassemblies could result.**

Caution **If any evidence of damage is found, repair as necessary or contact your authorized service provider.**

Caution **Do not use anything other than distilled water and a foam swab to clean the prisms. Cloth or cotton swabs may scratch the prisms' surfaces and anything other than distilled water can fog the prisms.**

Caution **Do not use hot air or attempt to dry the area using a cloth.**

Caution **Do not store the pump unplugged and powered on. The batteries may discharge completely, permanently damaging them.**

Caution **Failure to plug the pump into an AC power supply when a Battery Depleted alert occurs may cause permanent damage to the batteries.**

Caution **Unlock locking connectors before attempting to disconnect them.**

Caution **Ensure that the locking flange on connector J5 is unlocked before removing the flat ribbon cable.**

Caution **Ensure that connectors are mated and observe the correct orientation.**

Caution **LED/icon PCB harness connector P15 is not keyed. Make certain that the connector is correctly oriented before connecting. The connector is correctly oriented when the black, yellow, and green leads face toward the handle (top) of the front bezel housing.**

Caution **Unlock the flat ribbon connector flange for CN1 before removing the flat ribbon cable.**

Caution **P109 connector harness is not keyed. Ensure that the connector is oriented so that the green, yellow, and black leads face away from the PCB surface when it is connected.**

Caution Make certain that the contrast control wiring harness is routed under the EMI shield when routing wiring harness under adjacent UIM PCB mounting tab.

Caution Unlock the volume control header connector before disconnecting the connector.

Caution Overtightening the fuse caps may cause the fuse holder to break.

Caution Where connectors are identified as "locking," unlock the connectors before removing cables.

Caution Ensure that the battery bracket lower mounting tabs are correctly engaged in the housing.

Ensure that the wiring harnesses beneath the batteries are not pinched, and that all four harnesses protrude away from the batteries.

Caution Ensure that the DC output harness connector is oriented on the power supply connector such that the lock on the harness connector engages the lock on the PCB connector.

Caution Ensure that fan leads are correctly oriented within the connector SK2 harness.

Caution If the backup beeper is secured in place with push nuts and they are loose, or a standoff breaks, you must replace the rear housing. Ensure that no loose parts remain inside the pump. A broken standoff or loose backup beeper could cause the pump to malfunction.

Caution Keep the electrical connections on the beeper away from the clip's center tab even though the connections are insulated.

Caution When removing the 12 VDC connector nut, use care to ensure that the 12 VDC connector wiring is not caught in the flare nut socket.

Caution To avoid cracking the PANEL LOCKOUT button, do not squeeze it with pliers or pry it sideways off of the shaft.

Caution Wiring must be routed clear of standoffs and not pulled around standoffs.

Caution Improper positioning of ferrite rings can result in short circuits.

Caution To ensure correct reassembly, note the routing and connecting points of AC fuse holder wiring before removing AC fuse holder(s).

Caution Ensure that the AC leads that connect to the fuse holders are not touching the fan blades.

Caution Note the routing of the wires before removing them.

Caution Note the routing and connecting points of the AC Connector wiring before removing the wiring.

Caution This procedure involves removing the screws that secure the pump modules to the user interface module. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Caution Do not short across any other solder joints other than those shown.

Caution **Do not disconnect the lithium backup battery at any time during the calibration procedure. The pump's Battery and Pump History will be erased if you disconnect the backup battery.**

Caution **The potentiometers are held in adjustment with Red Glpt varnish. If adjustments are necessary, use a stylus to carefully remove the varnish without damaging the potentiometer. Rotate the pot fully clockwise and then counterclockwise once before making the final adjustment.**

Caution **Correct placement of the wiring and fuse holders is critical; incorrect placement can damage the elevated IC heat sink on the UIM PCB.**

Caution **Do not damage or change the setting of VR1 while removing the varnish.**

Caution **Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving the pump module.**

Caution **The clamp VB locking tab must be installed with the beveled surface facing away from the "V" portion.**

Caution **Ensure that the wiring harnesses are clear of the module mounting surfaces before mating the module to the mounting surface.**

Caution **Unlock the flat ribbon cable connector flange on J7 before removing the keypad flat ribbon cable.**

Caution **Forcing the housing off of the pump mechanism can damage the mechanism. If you have difficulty removing the housing, recheck the jaw opening, and repeat the procedure.**

Caution **Forcing the mechanism into place can damage it.**

Caution **The accessory harness connector is not keyed. The connector is correctly oriented when the violet and blue leads on the harness face toward the accessory connector on the housing.**

Caution **Unlock flat ribbon cable connector flange before removing cable.**

Caution **Maintain a soldering pencil tip temperature of 536° to 662° F (280° to 350° C) to avoid damaging the insulation.**

Tip the pump module on its side to avoid solder splashes.

Caution **Do not damage the flex ribbon by pulling it too hard.**

Caution **Check the bezel for broken alignment tabs. You may remove damaged tabs by cutting or breaking them off. After inspecting the interior of the pump to verify that no broken pieces remain, mark the broken tab(s) with indelible ink to indicate that the broken pieces have been accounted for.**

Caution **Ensure that wiring is not pinched and that the ring terminal is parallel to the case edge.**

Caution **Ensure that connectors are mated correctly. Failure to correctly orient connector P8 can cause a blown fuse.**

Caution **Do not start or tighten motor screws until it is verified that motor is fully flush with mounting position.**

Caution **Configuration data may not be transferable between pumps with different UIM master software versions. Read "Transferring Device Configuration Data" on page 5-51 before attempting to transfer configuration data between pumps with different software versions.**

Notes

Note: No natural latex was used in the manufacture of this pump, its power cable, or its accessory cables.

Note: U.S. Law requires tracking of this device.

Note: Baxter requests that parties acquiring this device:

- **Promptly report the receipt of this device to Baxter.**
- **Report the device's purchase, receipt in trade, return after sale, loss, destruction, or retirement.**
- **If this is an initial purchase from Baxter, returning a signed copy of the packing list to Baxter will fulfill this request. Contact your local Baxter service facility for additional information.**

Note: Contact your Baxter customer service representative to obtain manual updates.

Authorized Service Centers

In North America, call **1-800-THE-PUMP** for service and repair information.
Or go to **www.Baxter.com**, click **Services**, then click **Medication Delivery Services**.
Or, type the following URL directly into your browser:

http://www.baxter.com/products/medication_management/infusion_pumps/medication_delivery_services/index.html

Elsewhere, to find the customer service office closest to your location, visit Baxter's worldwide website

http://www.baxter.com/baxter_worldwide.html

Choose your country, click Go, and browse to find service information.

Chapter 2

Description

Overview

This chapter contains the following information:

For detailed instructions on using the pump, refer to the Operator's Manual appropriate for your location.

Front Panel Description

Table 2-1 lists and describes keys and indicators located on the pump user interface module (UIM). The UIM features of Colleague and Colleague 3 pumps are identical.

The keys are shown in all of the currently available user interface languages, in the following order: English, French, German, Spanish, Danish, Dutch, Swedish, Brazilian Portuguese, and Turkish.

Table 2-1 User Interface Module Keys and Indicators

Name	Function
Status Keys	
Main Display Key ***Ecran Principal*** ***Hauptanzeige*** ***Pantalla Principal*** ***Hoveddisplay*** ***Hoofdscherm*** ***Huvudbild*** ***Tele Principal*** ***ANA EKRAN***	Press to access the Main Display screen from all other operating screens, except screens with pop-up windows or passcode service functions.
Volume History Key ***Historique Volume*** ***Volumendaten*** ***Historial Volumen*** ***Volume Historik*** ***Volume Historie*** ***Volym historik*** ***Histórico do volume*** ***VOLÜM DURUMU***	Press to view the Volume History screen.
Alarm Silence Key ***Silence Alarme*** ***Alarm stummsch*** ***Silenciar Alarma*** ***Alarmafbryder*** ***Alarmstil*** ***Larmtystnad*** ***Silenciar Alarme*** ***ALARMI SUSTAR***	Press to silence alarms and alerts for two minutes, except the Battery Depleted alarm.

Table 2-1 User Interface Module Keys and Indicators — continued

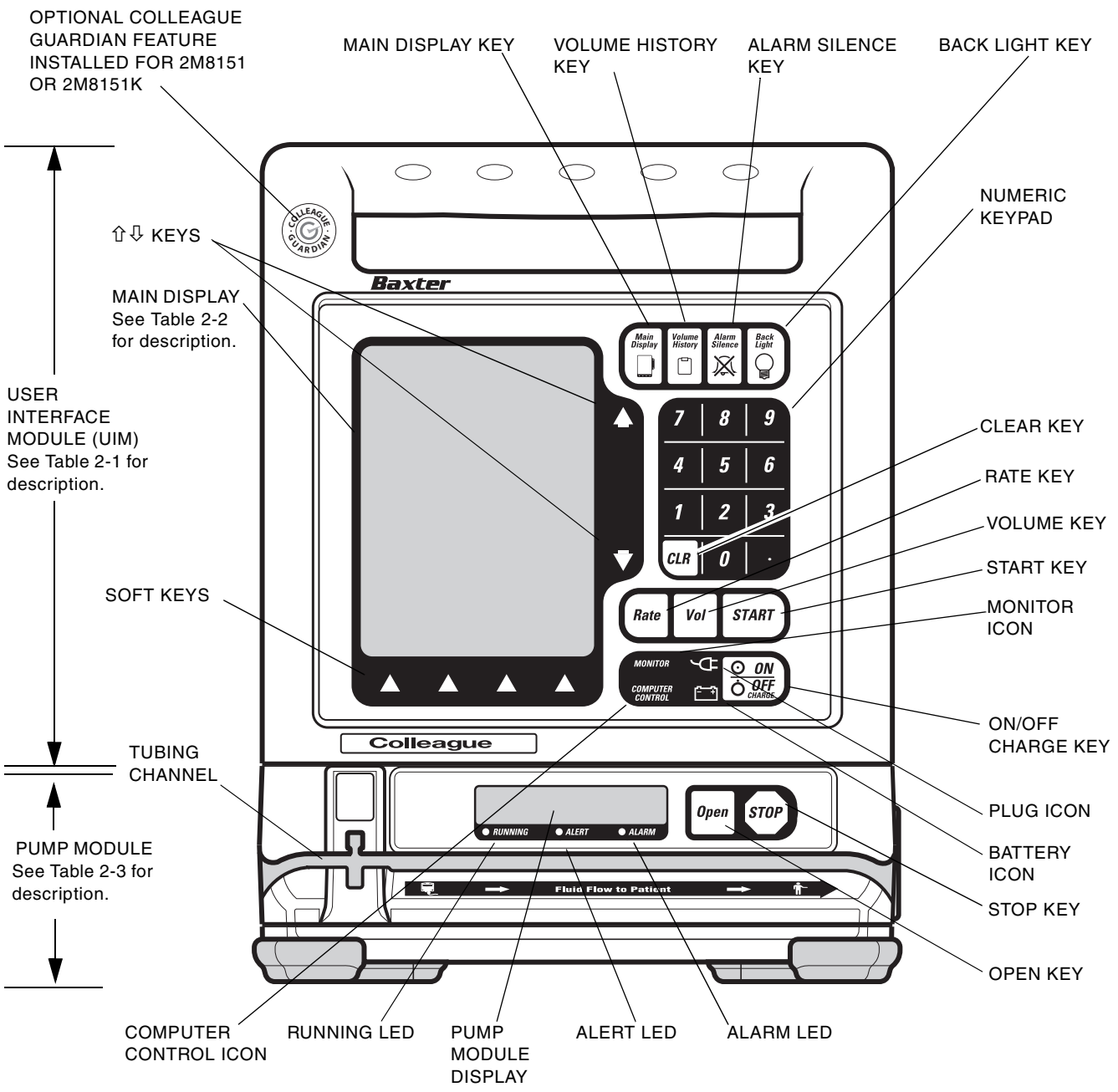
Name	Function
Back Light Key ***Eclairage Ecran*** ***Hinterg. -Bel*** ***Luz de Fondo*** ***Displaybelysning*** ***Achtergrand verlichting*** ***Belysning*** ***Luz de fundo*** ***EKRAN ISIGI***	Press to turn the back lights for the displays on or off. When the pump is battery-operated, this key turns on the back lights for one minute following the last key press.
Action Keys	
Rate Key ***Débit*** ***Rate*** ***Velocidad*** ***Hast.*** ***Snelheid*** ***Hastighet*** ***Fluxo*** ***HIZ***	Press to select the Rate field.
Vol Key ***Vol.*** ***Vol*** ***Vol*** ***Volume*** ***Vol*** ***Vol*** ***Vol*** ***VOLÜM***	Press to select the Vol (Volume to be Infused) field.

Table 2-1 User Interface Module Keys and Indicators — continued

Name	Function
START Key ***DEPART*** ***START*** ***INICIO*** ***START*** ***START*** ***START*** ***INICIAR*** ***BASLAT***	Press to begin infusion from any programming screen, if all the required programming values have been entered and confirmed (where required). After the resolution of any alarms press to cancel the alarm notification and start the infusion.
ON/OFF CHARGE Key ***I/O*** ***EIN/AUS*** ***ON/OFF CARGA*** ***ON/OFF*** ***AAN/UIT Laden*** ***På/AV Ladda*** ***Lig./Desl. Carga*** ***AÇ/KAPA Sarj***	Powers the pump on and off. ***Note:*** Memory and circuits that monitor battery charge level remain active when pump is powered off.
Numeric keypad	Press to enter programming values.
CLR Key ***SUPPR*** ***LÖSCH*** ***BORRAR*** ***SLET*** ***WIS*** ***C*** ***LIMPAR*** ***SIL***	Press to clear values from the field highlighted on the display. After clearing the field, press the key a second time to restore the last value saved if desired. If multiple fields are cleared, the pump attempts to restore values whenever possible. Press to clear a label if the label field is highlighted and the infusion is stopped.

Table 2-1 User Interface Module Keys and Indicators — continued

Name	Function
Icons	
Plug icon	Green indicator remains lit as long as the pump is plugged into AC power or the battery is being charged.
Battery icon	Yellow indicator remains lit only when the pump is operating on battery power.
MONITOR Icon ***SURVEILLANCE*** ***MONITOR*** ***MONITOR*** ***MONITORERING*** ***MONITOR*** ***MONITORERING*** ***MONITOR*** ***MONITÖR***	The pump can be monitored by a computer connected to the COMM port on the rear. Refer to the *Colleague Pump Computer Monitoring Guide*, available from your Baxter customer representative, for information on computer monitoring.
COMPUTER CONTROL Icon ***CONTRÔLE PAR ORDINATEUR*** ***COMPUTERSTE-UERUNG*** ***CONTROL DE ORDENADOR*** ***COMPUTERSTYRING*** ***COMPUTERSTURING*** ***DATORSTYRNING*** ***COMPUTADOR DE CONTROLE*** ***BILGISAYAR KONTROLÜ***	For future use.



Note: Items shown on this figure are the same for all Colleague Pump product codes. The keypad language must match the selected user interface language.

Figure 2-1 Front View of Colleague Pump

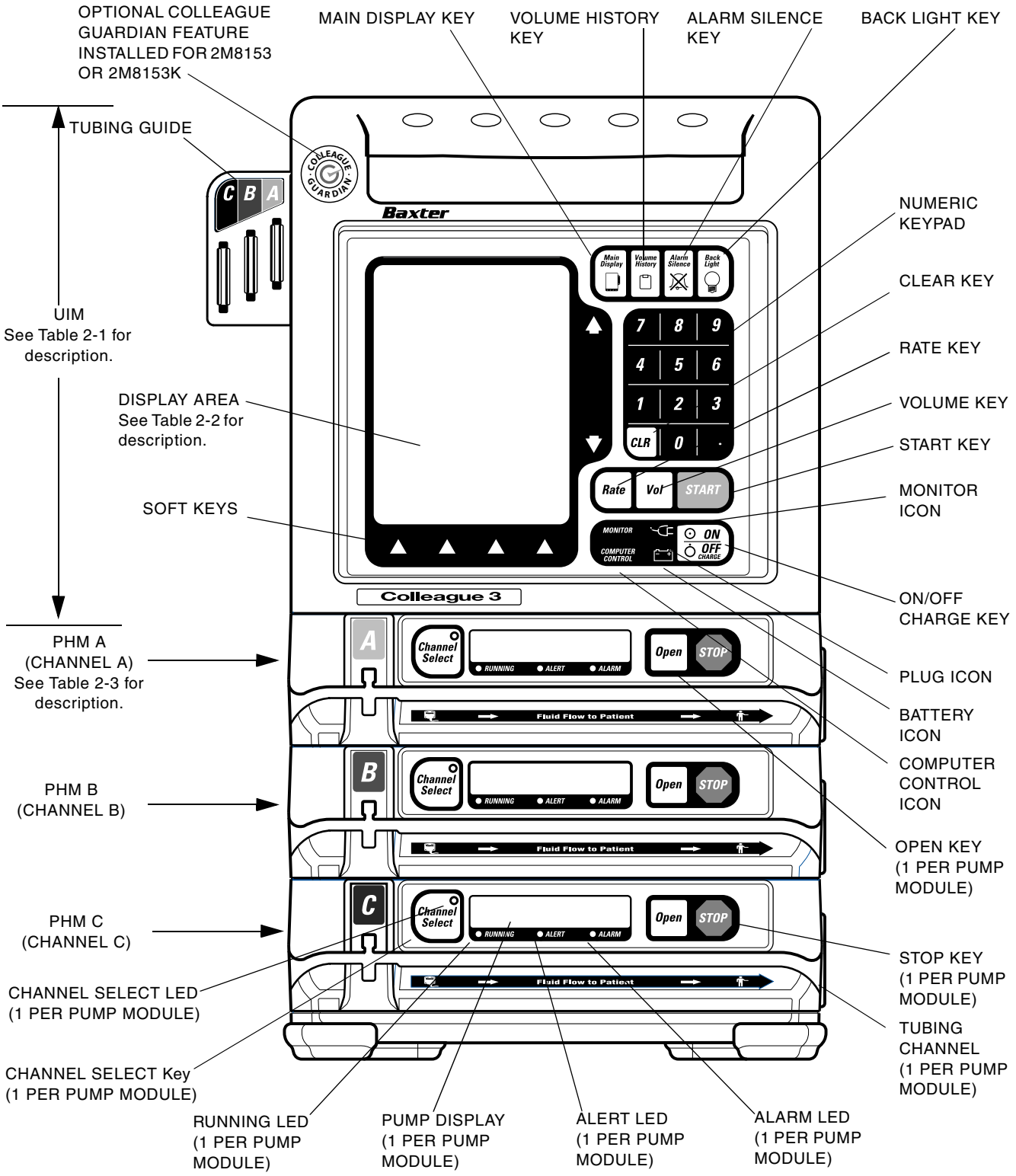


Figure 2-2 Front View of Colleague 3 Pump

Main Display Description

The Main Display has six areas for information display and entry, as described in Table 2-2. Figure 2-3 shows the display for both types of pump.

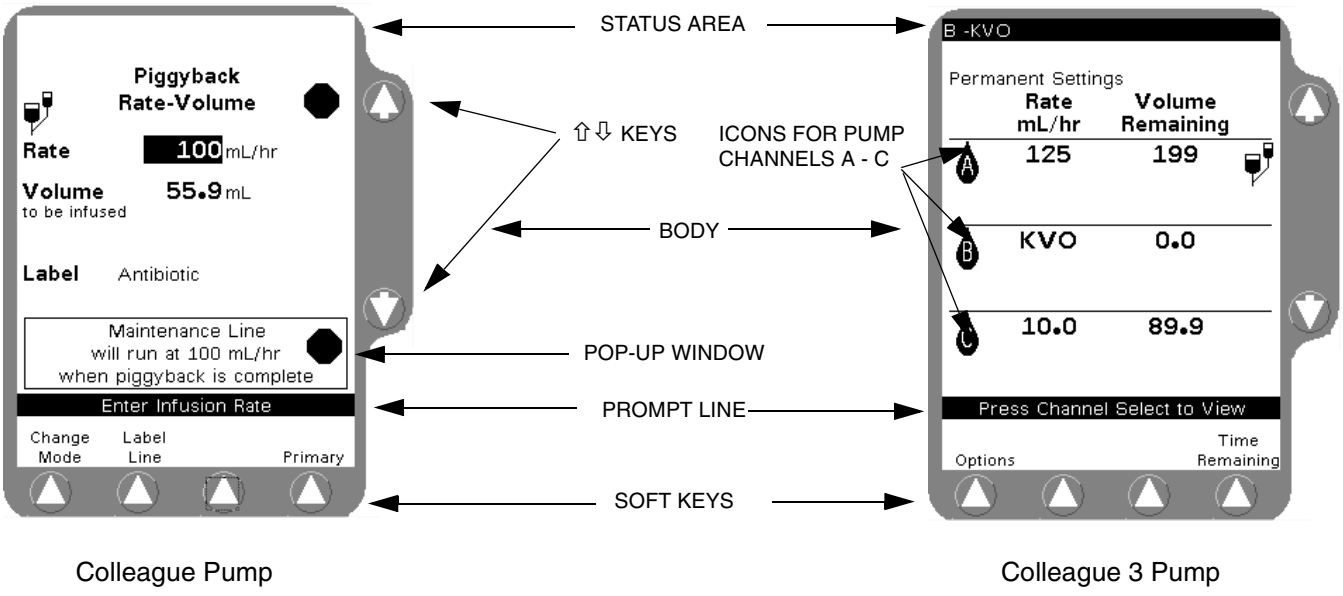


Figure 2-3 Display Area

Table 2-2 *Main Display Functions*

Area	Function
Status Area	Displays alert, alarm, and failure conditions.
Body	Displays selections, programming, and running conditions.
Prompt Line	Displays prompts for user action.
Soft Keys	The function of each soft key changes depending on the pump's current activity. The function is displayed above each soft key. Refer to the appropriate Operator's Manual for instructions on using the soft keys to program the pump.
⇧⇩ (Up and Down Arrow) Keys	Press to select programming fields or to perform actions.
Pop-Up Window	Displays additional information.

Pump Module Description

The pump module is located below the UIM. Colleague pumps have one pump module. Colleague 3 pumps have three pump modules, identified as A, B, and C. Pump modules on a Colleague 3 pump have a channel identifier label (shown in Figure 2-4) that is not present on pump modules from a Colleague pump.

The eight-character vacuum fluorescent display shows status information messages. These messages vary depending on the pump's configuration.

Figure 2-4 and Table 2-3 illustrate and describe pump module controls and indicators.

Note: Items shown with an asterisk are unique to Colleague 3 pump modules.

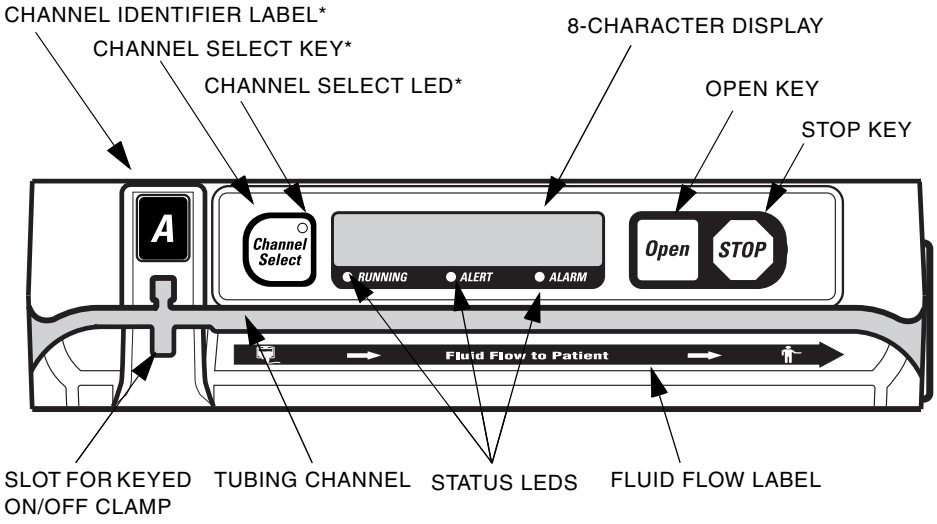


Figure 2-4 Pump Module Features

Table 2-3 Pump Module Controls and Indicators

Message Types	Description
Pump Channel Display	
	Displays one of the following messages during routine infusion: • Rate • Time Remaining • Volume Infused • Label ***Note:*** If the pump is running on battery power with no alarm or alert, the display is blank to conserve energy.
	Displays the activity of the pump module during specific operations such as tube loading.
	Displays alarm or alert conditions when they occur.
Key	**Description**
Channel Select Key ***SÉLECTION VOIE*** ***KANAL AUSWÄHLEN*** ***ELEGIR CANAL*** ***Kanalvalg*** ***Kanaalselectie*** ***Kanalväljare*** ***Selecionar Canal*** ***Kanal Seç***	When pressed once, this key selects or deselects a particular pump channel for use. The LED on this key lights and the selected channel's programming screen is displayed. Pressing this key when the LED is on, with no alerts or alarms present and the channel stopped, brings up the Standby pop-up on the selected channel. When the pump channel is in Standby, pressing this key removes the channel from Standby.
Open Key ***OUVRIR*** ***ÖFFNEN*** ***ABRIR*** ***Åbn*** ***Openen*** ***Öppna*** ***Abrir*** ***Aç***	Press to open the loading mechanism to load or remove the administration set.

Table 2-3 Pump Module Controls and Indicators — continued

STOP Key ***ARRET*** ***STOP*** ***STOP*** ***STOP*** ***STOP*** ***STOPP*** ***PARAR*** ***DURDUR***	Press to stop the infusion when the pump module is running.
Symbol	**Description**
	Solution container symbol, located below the left side of the tubing channel, indicates the upstream side of the pump. When loaded correctly, the tubing from the container must enter the left side of the tubing channel.
	Patient symbol, located on the right side of the tubing channel, indicates the downstream side of the pump. When loaded correctly, the tubing to the patient must exit the right side of the tubing channel.
	Shows correct direction of fluid flow.
Status LEDs	**Description**
Channel Select LED (Colleague 3 Pumps only)	Lights to indicate the currently selected pump module.
RUNNING LED EN MARCHE BETRIEB FUNCIONANDO IGANG IN WERKING INFUNDERAR FUNCIONANDO CALISIYOR	Green LED remains lit during an infusion.

Table 2-3 Pump Module Controls and Indicators — continued

ALERT LED ALERTE WARNUNG ALERTA ADVARSEL ATTENTIE VARNING ALERTA UYARI	Yellow LED remains lit during an alert condition, if there are no active alarms.
ALARM LED ALARME ALARM ALARMA ALARM ALARM LARM ALARME ALARM	Red LED flashes on and off during an alarm condition or remains lit during a failure condition.

Rear Panel Description

Figure 2-5 shows and Table 2-4 describes items on the rear of all Colleague Pumps.

Note: The pump is equipped with a power cord plug appropriate to the country of use. See Chapter 11 for information on power cord part numbers.

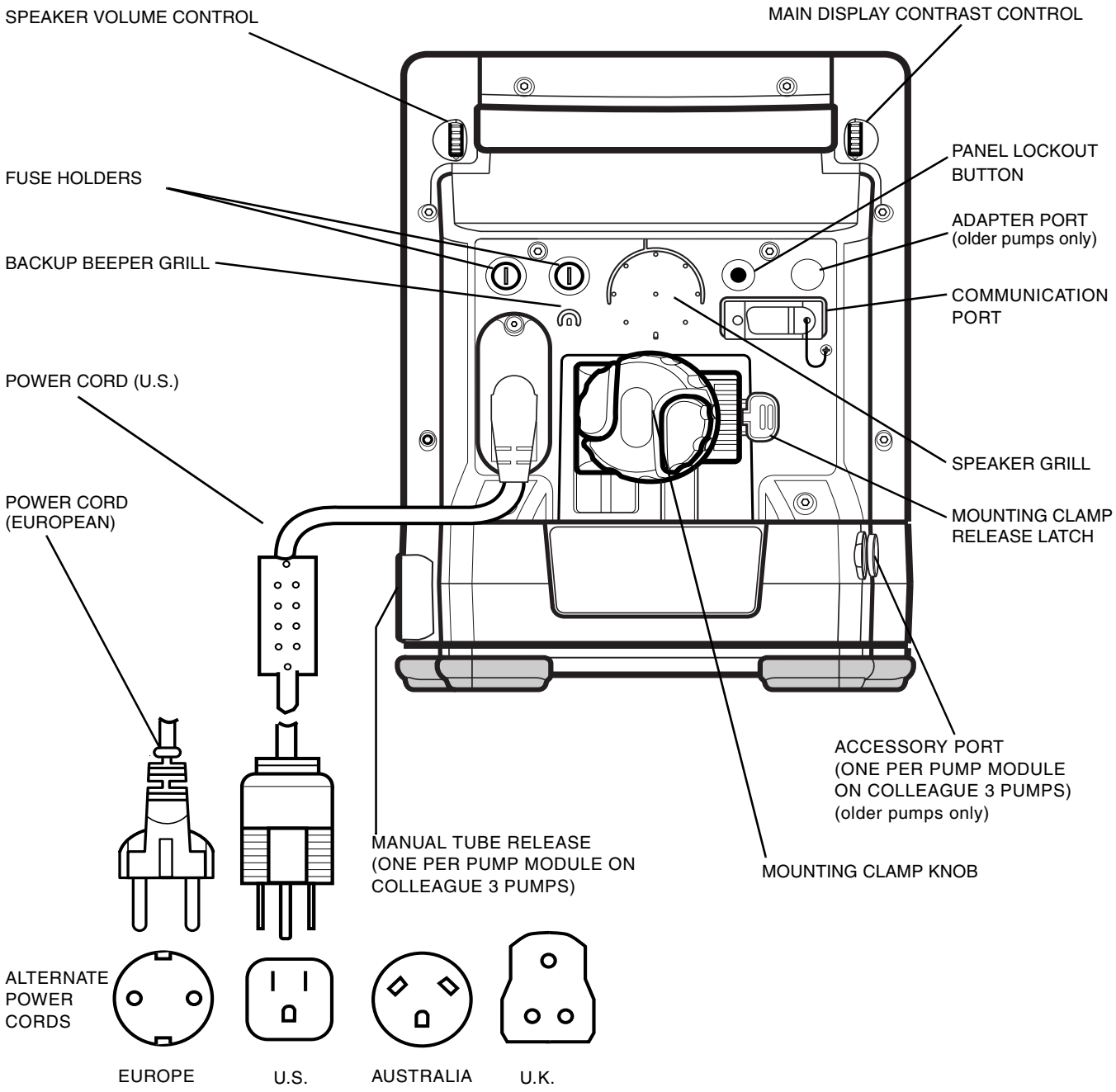


Figure 2-5 Rear View of Colleague Pumps

Table 2-4 Rear Panel Features

Item	Description
Power cord	Removable power cord equipped with EMI filter and hospital-grade plug appropriate to the region.
Backup beeper grill	Location of the backup beeper. The backup beeper generates alarm tones if the speaker fails or other failure conditions exist.
Fuse holders	Each fuse holder holds one 1.6 A fuse.
Speaker volume control	Increases or decreases the speaker volume. The volume cannot be turned off.
Main display contrast control	Increases or decreases the contrast between the lettering and the background on the display screen.
Panel lockout button	Press to lock all front panel keys (except the soft and status keys) to prevent unauthorized users from changing the pump's settings.
Adapter port	Present on older pumps only; not used.
Communication port	An RS232/RS423 interface enables optional nurse call and communication functions. The pump can be monitored by a computer. Refer to the *Colleague Pump Computer Monitoring Guide*, available from your Baxter customer representative, for information on computer monitoring. The communication port also allows configuration information to be transferred from one pump to another. ***Note:*** On older pumps, this interface is RS232 only.
Speaker grill	Location of the speaker. The speaker generates alert and alarm tones.
Mounting clamp release latch	Allows removal of mounting clamp assembly.
Accessory port	Present on older pumps only; not used.
Mounting clamp knob	Allows Colleague pumps to be mounted on an IV pole 0.95 to 3.81 cm (0.375 to 1.5 in.) in diameter, or on a headboard or footboard that is at least 1.91 cm (0.75 in.) thick and 5.08 cm (2 in.) high. ***Note:*** Colleague 3 Pumps are pole-mountable only.
Manual tube release	Allows the administration set to be manually unloaded if the pump malfunctions. To unload the tubing manually: Lift the tab on the manual tube release. Turn tab counterclockwise to its stop, then remove the tubing. Turn the tab clockwise to its stop, then lower it to its original position.

Configuration Summary

Pump Configuration Summary

Since the Colleague pump was first introduced, a number of software versions have been released and several hardware configuration changes have been made. Colleague pumps are now available in nine languages, with localized labeling and user interface software. All product codes except 2M8151 and 2M8153 are CE-marked. Table 2-5 summarizes hardware configuration differences and compatibilities between the Colleague pump product codes covered in this manual. Table 2-6 summarizes software releases.

Note: Astec power supplies may be replaced by Condor power supplies but Condor power supplies may not be replaced by Astec power supplies.

Table 2-5 Pump Configuration Summary

Product Code	Labeling Language	Power Supply		Communication (COMM) Port	
		Manufactured by Astec	Manufactured by Condor	No ISOCOM (RS232 only)	ISOCOM (RS232, RS423)
2M8151	English (US, non-CE-marked)	✓ Older pumps only (Replace with Condor supply if required)	✓ Current production	✓ (serial numbers prior to 10110001CS)	✓ (starting with serial number 10110001CS)
2M8151K	English	✓ Older pumps only (Replace with Condor supply if required)	✓ Current production		✓
BRM8151	Brazilian Portuguese		✓ Current production		✓
CNM8151	Swedish		✓ Current production		✓
DNM8151	French	✓ Older pumps only (Replace with Condor supply if required)	✓ Current production		✓
GNM8151	Danish		✓ Current production		✓
HNM8151	German	✓ Older pumps only (Replace with Condor supply if required)	✓ Current production		✓
PNM8151	Spanish	✓ Older pumps only (Replace with Condor supply if required)	✓ Current production		✓
TRM8151	Turkish		✓ Current production		✓

Table 2-5 Pump Configuration Summary — continued

Product Code	Labeling Language	Power Supply		Communication (COMM) Port	
		Manufactured by Astec	Manufactured by Condor	No ISOCOM (RS232 only)	ISOCOM (RS232, RS423)
WNM8151	Dutch		✓ Current production		✓
2M8153	English (US, non-CE-marked)		✓ Current production	✓ (serial numbers prior to 11010001CT)	✓ (starting with serial number 11010001CT)
2M8153K	English		✓ Current production		✓
BRM8153	Brazilian Portuguese		✓ Current production		✓
CNM8153	Swedish		✓ Current production		✓
DNM8153	French		✓ Current production		✓
GNM8153	Danish		✓ Current production		✓
HNM8153	German		✓ Current production		✓
PNM8153	Spanish		✓ Current production		✓
TRM8153	Turkish		✓ Current production		✓
WNM8153	Dutch		✓ Current production		✓

Table 2-6 Major Software Releases

Description/Date	User Interface Module Master Version	User Interface Module Slave Version	Pump Module Version
2M8151 Colleague Pump Releases			
Field Hardening, 7/98	1.02.00[1]	3.03.00	3.02.00
Add computer monitoring, 1/99	1.03.00[1]	3.05.00	3.02.00
Power Off correction, 9/99	1.03.00[1]	3.06.00	3.02.00
2M8151K Colleague Pump Releases (CE-Marked)			
Initial Release, 2/99	2.01.00	3.05.00	2.01.00
Service Code 862:08, 7/99	2.01.00	3.05.00	2.02.00
Power Off Correction, 9/99	2.01.00	3.06.00	2.02.00

Table 2-6 Major Software Releases — continued

Description/Date	User Interface Module Master Version	User Interface Module Slave Version	Pump Module Version
Colleague Guardian release, 9/03 • Optional Colleague Guardian feature • Revised label library for monochrome pumps • Reduction in occurrences of 12:506, 12:510, and 12:303 errors	5.02.00[2]	3.06.00	2.06.00
• Allows configuration transfer from 4.XX version pumps • Reduction in occurrences of 714 errors • Reduction in occurrences of 715 errors • User message regarding set removal	5.04.00[2]	3.06.00	2.02.00
HNM8151 German Colleague Pump Releases			
TUV Release, 9/99	2.02.00	3.05.00	2.02.00
Power Off Correction, 9/99	2.02.00	3.06.00	2.02.00
2M8153 Colleague 3 Pump Software Releases			
Initial release, 7/98	3.03.00[1]	3.02.00	3.01.00
567 failure correction, 9/98	3.03.00[1]	3.04.00	3.01.00
Field hardening, 2/99	3.03.00[1]	3.05.00	3.02.00
Service Code 533, 5/99	3.04.00[1]	3.05.00	3.02.00
Power Off Correction, 9/99	3.04.00[1]	3.06.00	3.02.00
Global Software Versions			
Initial global release (English/ French/German/Spanish)	4.01.00	3.06.00	2.03.00
Tube loading error corrections	4.02.00	3.06.00	2.03.00
Nuisance 804:34 failure code correction	4.02.00	3.06.00	2.04.00
Danish/Dutch/English/Swedish	4.23.00	3.06.00	2.04.00
English/Turkish/Portuguese/Spanish	4.44.00	3.06.00	2.04.00
• Optional Colleague Guardian feature (available for English language product codes 2M8151, 2M8151K, 2M8153, and 2M8153K only) • Revised label library for monochrome pumps • Reduction in occurrences of 12:506, 12:510, and 12:303 failure codes	5.02.00[2]	3.06.00	2.06.00

Table 2-6 Major Software Releases — continued

Description/Date	User Interface Module Master Version	User Interface Module Slave Version	Pump Module Version
• Allows configuration transfer from 4.XX version pumps • Reduction in occurrences of 714 failure codes • Reduction in occurrences of 715 failure codes • User message regarding set removal	5.03.00[1,4]	3.06.00	2.06.00
• Allows configuration transfer from 4.XX version pumps • Reduction in occurrences of 714 failure codes • Reduction in occurrences of 715 failure codes • User message regarding set removal	5.04.00[2]	3.06.00	2.06.00
All features of 5.03.00 version, and corrects translation errors in French, German, and Spanish languages. **This is the current release for English, French, German, and Spanish pumps.**	5.05.00	3.06.00	2.06.00
Incorporates UIM V5.03.00 software into Swedish, Danish, and Dutch	5.23.00[1]	3.06.00	2.06.00
All features of 5.03.00 version, and corrects translation errors in Danish, Dutch, and Swedish languages. **This is the current release for Danish, Dutch, and Swedish pumps.**	5.25.00	3.06.00	2.06.00
Incorporates UIM V5.03.00 software into Turkish and Brazilian Portuguese	5.43.00[1]	3.06.00	2.06.00
All features of 5.03.00 version, and corrects translation errors in Brazilian Portuguese and Turkish languages. **This is the current release for Brazilian Portuguese and Turkish pumps.**	5.45.00	3.06.00	2.06.00

Notes:

1. Obsolete

2. Optional

3. If not marked for Notes 1, 2 or 4 the software version is standard

4. This is not part of the upgrade path from 4.02.00 to 5.04.00. Using this software version as an upgrade from 4.02.00 will remove the Colleague Guardian feature from your pump. To upgrade 4.02.00 software use version 5.04.00.

Service Upgrade Label

Some pumps may have a Service Upgrade label. This label is affixed to the pump by authorized service facilities when hardware configuration changes, which may include software changes, are incorporated into the pump. The Service Upgrade label allows service personnel to determine the extent of internal configurations, modifications, or upgrades without having to open the pump to inspect for these items. Figure 2-6 shows the label.

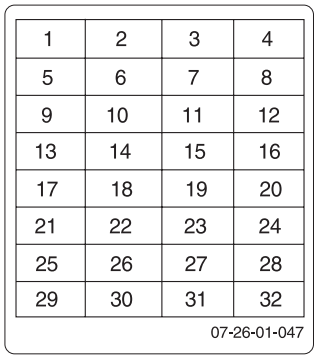


Figure 2-6 Service Upgrade Label

When an upgrade has been applied to a pump, the number on the label corresponding to the upgrade is permanently altered. Table 2-7 lists the sequence numbers used for both Colleague and Colleague 3 pumps, along with the corresponding descriptions of the upgrades.

Note: Sequence numbers and corresponding descriptions may vary between Colleague and Colleague 3 pumps.

Table 2-7 Service Upgrade Label Sequence Numbers

Sequence No.	Applicable To[1]:	Description of Upgrade
Colleague Pumps		
1	2M8151	Araldite (epoxy) on jaws
2	all	Ferrite insulator (rear housing)
3	all	AIL PCB and new motors on upgraded PHM assemblies
4	all	MicroMo shuttle motor replacement
5	all	UIM PCB upgrade to Revision 5
6	all	Keypad flex connector upgrade
7	all	Pump module keypad cable insulator installation

Table 2-7 Service Upgrade Label Sequence Numbers — continued

Sequence No.	Applicable To[1]:	Description of Upgrade
Colleague 3 Pumps		
1	XXX8153 2M8153 2M8153K	UIM, AIL, and SW upgrades on serviced pumps (does not apply to new pumps)
2	XXX8153	Modified PHM bottom gasket (part no. F069630502)
3	–	not used
4	all	MicroMo shuttle motor replacement
5	XXX8153	UIM PCB upgrade to Revision 5
6	all	Keypad flex connector upgrade
7	all	Pump module keypad cable insulator installation

1. XXX denotes the non-English language pumps.

Technical Specifications

Table 2-8 lists the technical specifications for the pump. See the appropriate Operator's Manual for detailed specifications regarding operating parameters.

Table 2-8 Technical Specifications

Item	Characteristic	
	Colleague Pump	**Colleague 3 Pump**
Catalog code number	2M8151 (U.S.) 2M8151K (U.K.) BRM8151 (Brazilian Portuguese) CNM8151 (Swedish) DNM8151 (French) GNM8151 (Danish) HNM8151 (German) PNM8151 (Spanish) TRM8151 (Turkish) WNM8151 (Dutch)	2M8153 (U.S.) 2M8153K (U.K.) BRM8153 (Brazilian Portuguese) CNM8153 (Swedish) DNM8153 (French) PNM8153 (Spanish) GNM8153 (Danish) HNM8153 (German) TRM8153 (Turkish) WNM8153 (Dutch)
Description	Shuttle volumetric infusion pump	
Administration set	Standard Baxter "S" suffix administration sets equipped with keyed On/Off clamps. See the appropriate Operator's Manual for recommended sets.	
Keep Vein Open (KVO) rate	0.1 - 5 mL/hr in 0.1 mL increments or programmed rate, whichever is less. KVO rate is a configurable option.	
Battery	***Note:*** Batteries should be used ONLY as a back-up power source. ***Note:*** Colleague Pumps with UIM master software version 4.XX and newer are factory-equipped with two batteries. **Older pumps equipped with one battery must be upgraded to two battery operation as described in "Adding a Second Battery (Colleague Pumps Only)," 8-38.** Main Batteries: Two 12 V, 2.0 Ah sealed lead acid Lithium back-up battery: Two 3.6 V lithium cells (7.2 V total), rated at 2.1 Ah	***Note:*** Batteries should be used ONLY as a back-up power source. Main Batteries: Two 12 V, 2.0 Ah sealed lead acid Lithium back-up battery: Two 3.6 V lithium cells (7.2 V total), rated at 2.1 Ah

Table 2-8 Technical Specifications — continued

Item	Characteristic	
	Colleague Pump	**Colleague 3 Pump**
Battery life	***Note:*** **Pumps with one battery must be upgraded to two battery operation as described in "Adding a Second Battery (Colleague Pumps Only)," 8-38.** 7 hours operating time at 100 mL/hr (pumps with two fully charged new batteries) 2.5 hours operating time at 100 mL/hr for the warranted life of the batteries ***Note:*** Specifications are made on the condition that the batteries are undamaged. See "Verifying Battery Operation" on page 6-8 for more information. ***Note:*** Specifications are made on the condition that pump is dual-battery configuration, uses batteries of same make and model installed together, and that batteries bear date codes within 3 months of each other.	3 hours operating time with all three channels operating at 100 mL/hr (with fully charged new batteries). 2 hours operating time with all three channels at 100 mL/hr for the warranted life of the batteries. ***Note:*** Specifications are made on the condition that the batteries are undamaged. See "Verifying Battery Operation" on page 6-8 for more information. ***Note:*** Specifications are made on the condition that pump uses batteries of same make and model installed together, and that batteries bear date codes within 3 months of each other.
Battery recharge	12 hours to recharge to 80% of capacity. Internal charge system recharges battery whenever pump is plugged into an AC outlet.	12 hours to recharge to 80% of capacity. Internal charge system recharges batteries whenever pump is plugged into an AC outlet.
AC power requirements	100-240 VAC, 50/60 Hz (automatically sensed)	Pumps with UIM master software versions below 4.XX: 100-120 VAC, 60 Hz Pumps with UIM master software 4.01.00 and higher: 100-240 VAC, 50/60 Hz, automatically sensed
Power cord	Approximately 2.7 m (9 ft.) long with EMI filter and integrally moulded hospital grade plug appropriate for the region.	
Leakage current (tested per UL-2601)	< 300 µA earth leakage with ground open < 100 µA earth leakage with ground intact	
Fuses	Two, 1.6 A Type T (time delay), 250 V	
Ground impedance	< 0.2 Ω (tested per UL 2601) < 0.15 Ω (tested per NFPA 99, manufacturing criteria) < 0.5 Ω (tested per NFPA 99, healthcare facility criteria)	

Table 2-8 Technical Specifications — continued

Item	Characteristic	
	Colleague Pump	**Colleague 3 Pump**
Range of programmable flow rates	Primary Infusion: 0.1 - 1200 mL • 0.1 - 99.9 mL in 0.1 mL/hr increments • 1-1200 mL in 1 mL/hr increments Piggyback infusion: 0.1 - 500 mL/hr • 0.1 - 99.9 mL in 0.1 mL/hr increments • 1-500 mL in 1 mL/hr increments ***Note:*** Rate limits can be configured for values less than the maximum values shown.	Primary Infusion: 0.1 - 1200 mL per channel • 0.1 - 99.9 mL in 0.1 mL/hr increments • 1-1200 mL in 1 mL/hr increments Piggyback infusion (per channel): 0.1 - 500 mL/hr • 0.1 - 99.9 mL in 0.1 mL/hr increments • 1-500 mL in 1 mL/hr increments ***Note:*** Rate limits can be configured for values less than the maximum values shown.
Volume To Be Infused (VTBI)	0.1 - 9999 mL • 0.1 - 99.9 mL in 0.1 mL increments • 1 - 9999 mL in 1 mL increments ***Note:*** VTBI limits can be configured for values less than the maximum values shown.	0.1 - 9999 mL per channel. • 0.1 - 99.9 mL in 0.1 mL increments • 1 - 9999 mL in 1 mL increments ***Note:*** VTBI limits can be configured for values less than the maximum values shown.
Priming rate	500 mL/hr ***Note:*** To be used only when not connected to the patient.	
Nominal Downstream Occlusion Values at Power On	**Rate Range in mL/hr** **<21** / **21-200** / **>200** 103 mmHg (2 psig) / 206 mmHg (4 psig) / 310 mmHg (6 psig) Minimum 258 mmHg (5 psig) / 413 mmHg (8 psig) / 568 mmHg (11 psig) Moderate 465 mmHg (9 psig) / 620 mmHg (12 psig) / 775 mmHg (15 psig) Maximum	
Power consumption	40 Watts maximum	
Weight	Approximately 5.5 kg (12.1 lb) including mounting clamp	Approximately 7.9 kg (17.5 lb) including mounting clamp
Dimensions	Approximately 254 mm x 197 mm x 187 mm (10.0” H x 7.75” W x 7.75” D), excluding mounting clamp knob or power cord	Approximately 353 mm x 197 mm x 203 mm (13.88” H x 7.75” W x 8.00” D) excluding mounting clamp knob or power cord

Table 2-8 Technical Specifications — continued

Item	Characteristic	
	Colleague Pump	Colleague 3 Pump
Nurse Call	***Note:*** Interface port on older pumps are RS-232 only. RS232/RS423 9-pin, subminiature D-connector: • Pin 1: N/O (RS423); N/C (RS232) • Pin 4: N/C (RS423); N/O (RS232) • Pin 9: common • Contact rating: 0.4 A @30 VDC resistive load • Activated on all alarms and KVO, Battery Low and Piggyback Callback alerts	
Accuracy	±5% or better for any one hour period over the course of 72 hours at a programmed rate of 100 mL/hr For rates below 1 mL/hr, the accuracy can be maintained at ±10% or better for any one hour period or 0.5 mL of delivery, whichever is greater. The accuracy figures as stated are based upon operation at an ambient temperature of 22° C (72° F) with a source container height of 50.8 cm (20 in.), when measured from the top of the fluid level in the source container. See Operator's Manual for trumpet curve data.	
Air bubble setting (alarm thresholds)	Approximately: • 25 microliters of air in 0.83 mL delivered • 50 microliters of air in 1.67 mL delivered • 100 microliters of air in 3.33 mL delivered • 150 microliters of air in 5.0 mL delivered Air alarm sensitivity is a configurable option.	

Environmental Specifications

Table 2-9 lists the requirements for the pump's operating environment.

Table 2-9 Operating Environmental Specifications

Temperature	15° C to 38° C (59° F to 100° F)
Humidity	20 to 95% RH (non-condensing)
Barometric pressure	700 to 1060 hPa (13.6 psig to 20.58 psig)

Table 2-10 lists environmental requirements for storing the pump.

Table 2-10 Storage Environmental Specifications

Temperature	-29° C to 57° C (-20° F to 135° F)
Humidity	20 to 95% RH (non-condensing)
Barometric pressure	700 to 1060 hPa (13.6 psig to 20.58 psig)
Air quality	Equivalent to or better than normal warehouse air

Applicable Standards

The Colleague and Colleague 3 Volumetric Infusion Pumps have been designed in accordance with applicable portions of the following standards:

- *NFPA 99. Standard for Health Care Facilities;* National Fire Protection Association, Dated 2/12/93 ANSI/NFPA 99.
- *IEC 601-1-2 Medical Electrical Equipment — Part 1: General Requirements for Safety, Collateral Standard: Electromagnetic Compatibility — Requirements and Tests,* First Edition (excluding sections pertaining to label copy).
- *IEC 60601-2-24. (1998-02) Medical Electrical Equipment — Part 2, Particular Requirements for the Safety of Infusion Pumps and Controllers*
- *UL 2601-1. Medical Electrical Equipment, Part 1, General Requirement For Safety,* First Edition including Amendment 2
- *CAN/CSA C22.2 No. 601.1-M90. Medical Electrical Equipment, Part 1, General Requirements For Safety, A National Standard of Canada.*

Material Specifications

The pump contains the plastics and alloys listed below.

Note: No natural latex was used in the manufacture of this pump and its power and accessory cords.

- Acrylonitrile Butadiene Styrene (ABS)
- Acetal
- Acetal 25% Glass Fiber (GF) Reinforced
- Acetal + Polytetrafluoroethylene (PTFE)
- Acrylic
- Aluminum A380.0
- 13% GF Nylon

- 30% GF Nylon
- 33% GF Nylon
- 30% GF Reinforced Polybutylene Terephthalate (PBT)
- 30% GF PBT + PTFE
- 40% GF Polyphenylene Sulfide (PPS)
- PBT
- Polycarbonate (PC)/ABS[1]
- Polyetheretherketone (PEEK)
- Polyester PBT
- Polypropylene
- Thermoplastic Synthetic Rubber

1. Pump housing components may be made of PC/ABS or Acetal. Some pumps may contain PC/ABS and Acetal components.

Chapter 3

Preparation for Use

Overview

This chapter contains the following information about putting new pumps into service:

Unpacking Instructions

Open the shipping carton. Take the pump out of the box and remove the plastic bag. Keep the packaging materials to re-use if the pump has to be shipped. To order additional packaging materials, see Chapter 11 for part number information.

Save the packing inserts for use as a stable work platform for holding the pump upside-down during disassembly/reassembly.

Remove the plastic covers on the main display and pump module display(s).

Place the Operator's Manual and any Operator's Manual addenda shipped with the pump into the Service Manual binder, or store in a safe place.

Inspect the pump for signs of damage incurred during shipment. If you find any damage, notify the shipping company immediately.

Factory Testing

The tests listed below were performed at the factory.

- Final Functional Inspection Test 1
  - Power up self-test
  - Icon test, speaker and beeper
  - KVO test
  - Keypad test
  - software version pop-up screen
  - Set time and date
  - Misload sensor test
  - Emergency open key test
- Final Accuracy Test
  - Pump was tested at 1200 mL/hr, 100 mL/hr, and 10 mL/hr.
- Final Run-In Test
  - Pump modules run at 1200 mL/hr for 3 hours
- Final Functional Inspection Test 2
  - Power-up self-test
  - Tube load and unload test
  - software version pop-up screen
  - Keypad test and Panel Lock switch test
  - Nurse call test
  - Voltage sensor display test
  - Main speaker test
  - Back-up beeper test
  - Channel calibration constants checked
  - Valve check
  - Forward/rear slide clamp
  - Manual tube release test
- Upstream and Downstream Occlusion Inspection
  - Upstream occlusion time to alarm
  - Downstream occlusion
  - 8 psi linearity check
  - 4 psi linearity check
  - Temperature sensors test
- Upstream/Downstream Tube Present and Air in Line Inspection
  - Up/Downstream tube present - no tube loaded
  - Up/Downstream tube present - with tube loaded
  - AIL sensor value with empty tube
  - AIL sensor value with primed tube
  - AIL with back pressure service code check
  - Air alarm test

Charging the Batteries

! WARNING ! **Before using the pump, charge the batteries for at least 12 hours. A complete charge may take longer than 12 hours.**

To charge the batteries, plug the pump into a hospital-grade AC outlet. Verify that the Plug icon lights.

Testing New Pumps

Before placing new pumps into service at your facility, perform the three tests described below. If the pump fails to pass any of the tests, contact Baxter Customer Service.

If you want to perform additional testing before placing pumps into service, refer to the complete Operational Checkout provided in Chapter 10.

Self-test

Note: Allow the pump to stabilize at operating temperature (15° – 38° C (59° – 100°F)), and perform the initial battery charge before performing the self-test.

Note: If you miss any of the indications listed below during the self test, repeat the self test as many times as required to observe all the indications. To repeat the self test power the pump off and back on.

Note: **Colleague 3 pumps only**: If any of the three ***Channel Select*** key LEDs do not light during the self-test, press the corresponding ***Channel Select*** key and verify that the LED lights.

Note: Adjust the contrast control (located on the rear of the left side of the handle) for optimum screen visibility if required.

Note: Adjust the volume control (located on the rear of the right side of the handle) to its highest setting.

Verify that the pump is operating correctly by performing the following self-test.

1. With the pump unplugged from the AC supply, press the ***ON/OFF CHARGE*** key. Verify that all of the following indications occur:
   - For Colleague pumps: All eight digits of the pump module display are completely lit, then completely dark, then display the word CLOSED at the end of the self test.

- For Colleague 3 pumps: All eight digits of the three pump module displays are completely lit, then completely dark, then momentarily display the word PATIENT. The self test ends with channel A displaying CLOSED and with the channel B and C displays blank (Standby appears in UIM Main Display).
- All LEDs and icons, except the Plug icon, light momentarily, and the Battery icon lights continuously.
- The backup beeper sounds two distinct times.
- The alarm tone sounds once.

Do not place the pump in service if any of the following occurs during self-test:

- Dark spots or lines appear on the main display while it is supposed to be completely lit.
- Light spots or lines appear on the main display while it is supposed to be completely dark.
- One or more segments on the pump module display(s) do not light fully.
- One or more LEDs and/or icons (except the Plug icon) do not light.
- The backup beeper is not heard two distinct times.
- The alarm tone is not heard.
- A pump or pump module failure occurs.

2. Plug the cord into a hospital-grade, properly grounded AC outlet.
3. Verify that the Plug icon lights and the battery icon turns off as soon as the pump is plugged in.
4. Verify that the power cord is not damaged by grasping the cord near the strain relief and moving it. If there are breaks in the cord's conductors the Battery icon will light alternating with the Plug icon, otherwise the Plug icon will remain lit steadily. If the power cord is damaged, replace it as described in “Power Cord,” 8-30.
5. If the Plug icon fails to light, or any other part of the self-test fails, refer to the troubleshooting procedures in Chapter 7.

Electrical Safety Tests

Ground Impedance

The ground impedance **must not exceed 0.5 Ω** using the NFPA-99 test method. Measure the impedance between the AC plug ground and the screw holes on the **COMM. PORT** block located on the rear of the pump. Ensure that the test leads make good contact. Use care to prevent damaging the threads.

Leakage Current

The leakage current **must not exceed 100 µA with ground intact** and **300 µA with ground open**. Using the NFPA-99 test method, measure leakage current with ground intact and ground open.

Volume Delivery Accuracy Test

To perform this test, you need a bag of distilled water, a Baxter standard administration set with keyed On/Off clamp, a stopwatch or timer, and either a graduated cylinder (ASTM Type TC, 0.2 mL resolution) **OR** a scale and a collection container.

1. **Skip this step if using a graduated cylinder.** Obtain a container of at least 30 mL capacity. Weigh the empty container and record the weight.
2. Load an unused segment of tubing from an administration set fully primed with distilled water into the pump module under test.
3. Place the distal end of the tubing into the collection container or cylinder.
4. Program a primary rate of **100 mL/hr** and a volume of **25 mL**.
5. Start the timer and simultaneously press the ***START*** key. Verify that solution is delivered into the collection container without interruption.
6. Press the ***STOP*** key when the timer reaches 12 minutes ± 3 seconds.
7. **Skip this step if using a graduated cylinder.** Weigh the container and record the weight. Determine the volume delivered by subtracting the weight of the container from the total weight of the solution and the container. The fluid weight of distilled water in grams is equal to the volume pumped in mL.
8. If the amount of fluid delivered measures within 19.0 and 21.0 grams (19.0 and 21.0 mL), the pump has passed the test. Record the net (fluid) weight obtained.
9. **Colleague 3 Pumps only:** Repeat the test procedure for the remaining two pump modules.

If any pump module fails the test, repeat the test five consecutive times. If the pump does not pass all five attempts, do not use the pump. Contact your Baxter customer service representative for further assistance.

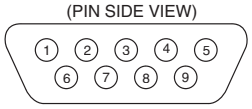
Note: "Volume Delivery Accuracy Test" on page 10-16 offers an alternate method of performing this test using the pump's Functional Test mode.

Nurse Call Cable

Note: Ensure that the connector locking screws are tightened before use.

The optional Nurse Call feature enables a user to connect the pump to a nurse call system at a care site. Authorized service personnel must first construct a cable equipped with a 9-pin, subminiature male D-connector, compatible with the pump's Communications Port. The other end of the cable connects to the care site's nurse call system. Authorized service personnel can disconnect the nurse call cable at any time. Figure 3-1 shows nurse call cable pinout details, and Figure 13-3 shows pin connections.

For information on how to purchase a cable or components, contact your local Baxter authorized service center.



PIN	SIGNAL
1	NURSE CALL N/O (ISOCOM pumps); N/C (non-ISOCOM pumps)
2	No connection
3	No connection
4	NURSE CALL N/C (ISOCOM pumps); N/O (non-ISOCOM pumps)
5	No connection
6	No connection
7	No connection
8	No connection
9	NURSE CALL Common
SHIELD	No connection

Figure 3-1 Nurse Call Cable Pinouts

Computer Monitoring Cable

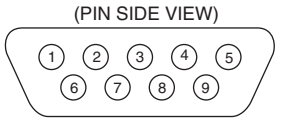
Note: Ensure that the connector locking screws are tightened before use.

The pump's optional computer monitoring feature allows pump operation to be monitored by a personal computer (PC) connected to the pump. A manual explaining the computer monitoring feature is available from Baxter upon request.

The communication port on pumps with UIM master software version 4.XX and higher is compatible with RS232 and RS423 interface communication protocols.

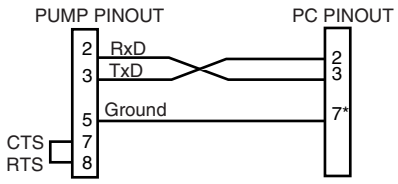
Authorized service personnel must use a serial cable equipped with a 9-pin, subminiature male D-connector, compatible with the pump's communication port. The other end of the cable connects to the serial port on the PC. Authorized service personnel can disconnect the computer monitoring cable at any time.

Figure 3-2 shows computer monitoring cable pinout details. The communications cable can be used with 9-pin or 25-pin PC serial port connectors. The only difference in the wiring for 9-pin PC serial ports is that the ground is on pin 5 instead of pin 7. For information on purchasing a cable, contact your local Baxter authorized service center.



9-PIN, SUBMINIATURE
D-MALE CONNECTOR
WITH 6.3 MM SECURING SCREWS

FROM PUMP PIN	SIGNAL	TO PIN
1	Not Used	
2	RxD	PC PIN 3
3	TxD	PC PIN 2
4	Not Used	
5	Ground	PC PIN 7*
6	Not Used	
7	CTS	PUMP PIN 8
8	RTS	PUMP PIN 7
9	Not Used	
SHIELD	Ground	



*25-pin serial ports use pin 7 as ground.
9-pin serial ports use pin 5 as ground.

Figure 3-2 Computer Monitoring Cable Pinouts

Administration Sets

Refer to the appropriate Operator's Manual for a list of the administration sets recommended for use with the pump.

! WARNING ! **U.S. AND CANADA: Use only Baxter standard administration sets equipped with keyed On/Off Clamps that have an "s" after the code number, or are labeled as pump compatible. If you have questions about administration set compatibility, contact the Baxter Product Information Center at the number shown on the administration set labeling. There are risks associated with using anything other than the recommended administration sets with this device.**

! WARNING ! **LATIN AMERICA: Use only the following administration sets with the pump:**

- **Baxter "Green Label" C96XX administration sets equipped with keyed On/Off Clamps, or**
- **Baxter standard administration sets equipped with keyed On/Off Clamps that have an "s" after the code number, or are labeled as pump compatible. If you have questions about administration set compatibility, contact the Baxter Product Information Center at the number shown on the administration set labeling. There are risks associated with using anything other than the recommended administration sets with this device.**

! WARNING ! **EEC Countries: Use only Baxter "Green Label" C96XX administration sets equipped with keyed On/Off Clamps. There are risks associated with using anything other than the recommended administration sets with this device. See "Recommended Administration Sets" in Chapter 3 of the appropriate Operator's Manual for more information.**

! WARNING ! **In EEC Countries, use only Continu-Flo "Green Label" C96XX administration sets as the primary fluid line when administering a secondary medication. Carefully follow the directions on the primary and secondary administration set labels.**

! WARNING ! **Always read and follow the instructions which accompany the source container and the administration sets you are using. Carefully follow any label copy instructions for loading, removing, and reloading the set, as well as the recommended set change interval. For optimal pump performance, set use should not exceed the change interval shown on the set's label copy or 72 hours, whichever is less.**

! WARNING ! **For infection control purposes, consider the set change interval recommended by the United States Centers for Disease Control and Prevention (CDC), your institution's guidelines, and the instructions provided with the administration set, using whichever is most appropriate.**

! WARNING ! **Baxter will assume no responsibility for incidents which may occur if the product is not used as described in product labeling.**

! WARNING ! **DO NOT CONNECT THE ADMINISTRATION SET TO THE PATIENT WHEN PRIMING.**

! WARNING ! **While the pump automatically closes the keyed On/Off clamp, always close the regulating clamp on the administration set before removing the administration set from the pump.**

! WARNING ! **The administration sets should be disposed of in an appropriate manner, considering the nature of the residual fluid that may be contained within, in accordance with the hospital disposal practices.**

Chapter 4

Accessories

This chapter lists the optional accessories available for use with the Colleague and Colleague 3 Volumetric Infusion Pumps. To order accessories in North America, call 1-800-THE-PUMP. Outside North America, contact your local service center.

! WARNING ! **This device should be used only with Baxter accessories specified for this device. There are risks associated with using anything other than the recommended accessories with this device.**

Caution **Use only accessory equipment that complies with the pump's safety requirements; failure to do so may lead to reduced safety levels of the resulting system. Consideration relating to accessory choice shall also include:**

- **use of the accessory in the patient vicinity**
- **evidence that the safety certification of the accessory has been performed in accordance with the appropriate UL2601-1 or IEC 60601-1 and/or IEC 601-1-1 harmonized national standard**

■ Configuration Transfer Cable (product code: 2M8155)

The Configuration Transfer Cable transfers Personality configuration information from pump to pump, allowing multiple pumps to be quickly programmed with the same configuration.

Note: Read "Transferring Device Configuration Data" on page 5-51 for complete information about transferring configuration data between pumps with different UIM master software versions.

■ Syringe Adapter (product code: 2D0300)

The Syringe Adapter allows a syringe to be used as the pump's fluid container. The Syringe Adapter attaches to the pump and holds the syringe in the proper position. A syringe adapter administration set is also required in order to use a syringe with the pump.

- ON/OFF CHARGE Key Cover (part number: 724001115)

  This is a hinged plastic cover that helps prevent accidental ***ON/OFF CHARGE*** key presses. When the cover is installed, users must deliberately raise the cover before they can press the ***ON/OFF CHARGE*** Key.

To install the key cover:

1. Clean the area around the ***ON/OFF CHARGE*** key with isopropyl alcohol. Rinse and dry the area thoroughly.

2. Orient the cover over the ***ON/OFF CHARGE*** key so that the hinged side is against the right side of the bezel and the bottom of the key cover is against the bottom of the bezel. The key should be completely covered, but the non-movable portion of the key cover should not touch the white area of the key.

3. Fasten the key cover to the keypad using the adhesive tape included.

Note: If the cover is accidentally positioned incorrectly, do not attempt to remove and reposition it. Remove and discard it, and repeat the process with a new cover.

- Colleague Pump Event History Download Software Application (product code: 2M8317)

  The Event History Download Software Application, when installed on a PC, allows the pump's event history to be downloaded to a PC. The downloaded data can be placed on the Windows clipboard. As such, the data can then be viewed, printed, and copied like any other PC data. The CD-ROM supplied with this product leads you through the setup and installation process. The program is installed from a CD-ROM. A download cable and instructions are also supplied.

Note: This product requires pump User Interface Module master software versions between 3.04.00 and 5.xx.00.

- Colleague Guardian Feature Kit (product code 2M8378)

  The Colleague Guardian feature allows authorized hospital personnel to preset drug parameters for some or all drugs in the pump's Label Library, including custom labels, based on hospital protocol. See "Configuring the Colleague Guardian Feature" on page 5-36 and the Operator's Manual addendum for full information on programming it and its use.

Note: The Colleague Guardian Feature Kit is compatible with product codes 2M8151/2M8153 and 2M8151K/2M8153K only. See Table 2-6 on page 2-16 for current software revision information.

Chapter 5

Configuration and Service Features

Overview

This chapter contains the following information about configuring the pump.

You can configure independent settings for up to eight custom pump Personality feature sets. You cannot modify or delete the factory default Personality feature set, called Permanent Settings. You can, however, disable the Permanent Settings Personality if desired.

For detailed instructions on programming infusions and using the pump, refer to the appropriate Operator's Manual.

Refer to Figure 13-1 for a map of the Configuration/Service screens.

Special Key Sequences

The pump has some special key sequences for use during servicing only. The special key sequences are described in Table 5-1.

Table 5-1 Special Key Sequences

To...	Press....
View software version information from the Main Display	***CLR*** and ***Silence*** keys simultaneously.
Silence the alarm tone and power the pump off after an alarm caused by a stuck ***ON/ OFF CHARGE*** key during power-down	***PANEL LOCKout*** button and ***Clear*** key simultaneously.

Summary of Configurable Pump Options

Table 5-2 lists configurable options that apply to the entire pump. Table 5-3 lists configurable options that can be configured individually for each of the pump's Personality feature sets.

Table 5-2 Configurable Pump Options and Available Settings

Option	Available Settings	Factory Settings
Personality feature set names and configuration settings	One permanent and eight custom Personality feature sets	"Permanent Settings" Personality enabled and factory-programmed with factory default settings listed in Table 5-3. Eight other Personality feature sets, unnamed and disabled. These may be programmed as desired by your institution.
Time Setting	Hours:Minutes	EEC Countries: GMT ELSEWHERE: Central Standard time
Date Setting	Month/Day/Year	EEC Countries: current date in European format (DDMMYY) ELSEWHERE: current date for Central Standard time, in U.S. format (MMDDYY)
Computer Monitoring	Colleague 3 pumps: Available only in UIM master software version 4.XX and higher.	Disabled
Power On Default	Any of the enabled Personality feature sets	Permanent Settings (1)
Optional Colleague Guardian feature	Sets dose limits for any label	No entry for all labels

Table 5-3 Configurable Personality Feature Set Items

Personality Option	Available Settings	Factory Setting
Volume-Time Infusion Mode	Enabled Disabled	Enabled
Piggyback Infusion Mode	Enabled Disabled	Enabled
Dose Modes	Enabled Disabled	Enabled
Individual dose formulas (Dose Mode must be enabled before you can enable individual dose formulas.)	mg/hr mg/min mcg/hr mcg/min units/hr mg/kg/hr mg/kg/min mcg/kg/hr mcg/kg/min units/kg/hr (available only with UIM master software version 4.XX and higher)	All Formulas Enabled
Pump Module Message Display	Rate (mL/hr) used if no label is selected Time Remaining (before KVO) Label (the Label Library feature and individual labels must be enabled) Volume Infused (mL)	Rate
Prime Feature (pump-assisted priming for sets that are difficult to prime by gravity)	Enabled Disabled	Enabled
Flow Check Display (provides visual indication of distal resistance to flow)	Always displayed when the pump is running (Enabled) Display on demand (Disabled)	Disabled
Infusion Flow Rate Limit (Piggyback limited to 500 mL/hr or the Infusion Flow Rate Limit, whichever is less)	0.1 mL/hr to 1200 mL/hr	1200 mL/hr
Volume To Be Infused Limit	0.1 to 9999 mL	9999 mL
KVO Rate Limit	0.1 mL/hr to 5 mL/hr (when programmed infusion delivery is complete, pump infuses at the preselected KVO rate or the programmed rate, whichever is lower)	5 mL/hr

Table 5-3 Configurable Personality Feature Set Items — continued

Personality Option	Available Settings	Factory Setting
Air Bubble Setting	Measured accumulations (in fluid pumped) of approximately: 25 Micro-liters (0.83 mL) volume) 50 Micro-liters (1.67 mL) volume) 100 Micro-liters (3.33 mL) volume) 150 Micro-liters (5.0 mL) volume)	150 Micro-liters
Nominal Downstream Occlusion Values at Power On	**Rate Range in mL/hr** **<21** / **21-200** / **>200** **Minimum** 103 mmHg (2 psig) / 206 mmHg (4 psig) / 310 mmHg (6 psig) **Moderate** 258 mmHg (5 psig) / 413 mmHg (8 psig) / 568 mmHg (11psig) **Maximum** 465 mmHg (9psig) / 620 mmHg (12 psig) / 775 mmHg (15 psig)	Moderate
Clinician Override of Downstream Occlusion Pressure Settings	Enabled (Clinicians can change the occlusion limit settings. Setting remains in effect until pump is powered off.) Disabled	Enabled
Number of Auto Restarts	0 to 9	5
Piggyback Callback Alert	Enabled Disabled	Disabled
Alert Off Interval (time interval between audible alert tones)	1 to 7 seconds	4 seconds
Alarm Off Interval (time interval between audible alarm tones)	1 to 7 seconds	1 second

Table 5-3 Configurable Personality Feature Set Items — continued

Personality Option	Available Settings	Factory Setting
Auto Lock	Enabled (front panel keys lock automatically to help prevent tampering) Disabled	Disabled
Label Library Feature	Enabled (A label can be selected to identify the programmed infusion) Disabled	Enabled
Select Available Labels	Enable (YES) Disable (NO) (Individual labels can be enabled or disabled by using the **Label Library Set Up** soft key.)	All predefined labels Enabled (YES)
Select Language (UIM software version 4.XX and higher.)	English **– OR –** English **– OR –** English French Danish Spanish German Dutch Brazilian Portuguese Spanish Swedish Turkish **! WARNING !** **DO NOT CHANGE THE USER INTERFACE LANGUAGE TO OTHER THAN THAT OF THE PUMP'S EXTERIOR LABELS.**	Language matching pump exterior labeling
Custom Labels (Available on all Colleague 3 Pumps and Colleague Pumps with UIM software version 4.XX and higher.)	Up to 32 custom labels can be defined and included in the Label Library	No custom labels

Accessing the Configuration/Service Menu

To access the Configuration/Service Menu:

1. Power the pump on.
2. When the self-test completes, press the ***Main Display*** key.
3. Press the **Options** soft key.

   The Options Menu is displayed.
4. Use the ⇧⇩ keys to highlight Configuration/Service and press the **Select** soft key.

   The Passcode Entry screen is displayed.

Note: If you enter the wrong passcode and want to try again, press the **Cancel** soft key.

5. Enter the passcode: ***8151***
6. Press the **Enter Passcode** soft key.

   The Configuration/Service Menu (Figure 5-1) is displayed.

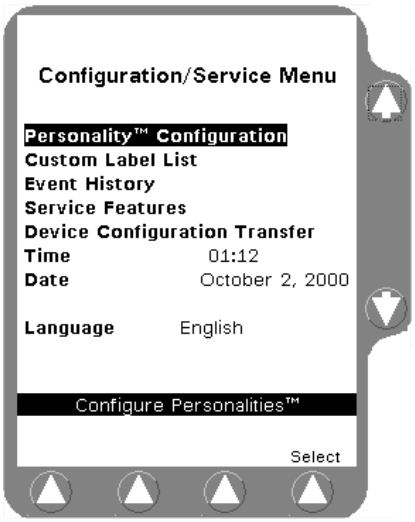


Figure 5-1 Configuration/Service Menu

Configuring Personality Feature Sets

The first option on the Configuration/Service Menu is Personality Configuration. The pump allows you to configure and store pump parameter settings as a group, known as a Personality feature set. The first Personality feature set, called Permanent Settings, consists of the factory default settings, which you can copy but cannot change or delete. If you don't want the Permanent Personality Settings to be available for use, you can disable it after you have programmed and enabled at least one other Personality feature set. You can program up to eight additional Personality feature sets with different settings as appropriate for your institution.

The Personality Configuration utility allows you to perform the following functions:

- Choose the Personality feature set that will be in effect when the pump is powered on.
- Reconfigure a Personality feature set.
- Enable/disable Personality feature sets.
- Name and configure a new Personality feature set.
- Configure a new Personality feature set by copying an existing feature set and then modifying and renaming the copy.

Personality List screen

When you first enter the Personality Configuration Utility, the Personality List screen is displayed. Use this screen to:

- Choose the Personality feature set that will be in effect when the pump is powered on (referred to as the Power-on Default Personality).
- Enable/disable other Personality feature sets.
- Name and enable a new Personality feature set.

Choosing the Power On Default Personality Feature Set

The Power On Default is set at the factory to 1 (Permanent Settings). To choose a different Power On Default Personality:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key.

Note: To select an alternate default Personality feature set, you must define and enable a Personality feature set other than Permanent Settings.

The list of configured Personality feature sets is displayed. The power on default Personality feature set currently in effect is highlighted in the bottom right corner of the display.

Note: Only the enabled Personality feature sets appear when scrolling.

3. Press the **Next** or **Previous** soft key to scroll through the numbered choices.

4. Press the **Done** soft key when the appropriate Personality feature set number is shown in the bottom right corner of the display.

Note: The Power On Default Personality feature set is used at power on unless temporarily changed using the **Change Personality** soft key. The change remains in effect for up to 5 hours after the pump is powered off. The pump then reverts to the designated power-on default Personality feature set.

5. When you are finished, press the ***ON/OFF CHARGE*** key to return to the Configuration/Service Menu. If the pump is powered on within the 5-hour memory retention period, the setting you chose will be in effect.

Enabling or Disabling a Named Personality Feature Set

1. Enter the Configuration/Service Menu.

Note: You cannot disable a Personality feature set that was selected as the power on default Personality feature set until you select another default Personality feature set.

2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key.

The Personality List is displayed, with the Enable/Disable column highlighted.

3. Use the ⇧⇩ keys to highlight the Personality feature set that you want to enable or disable.

4. Press the **Enable/Disable** soft key to change the status of the highlighted Personality feature set.

5. Press the **Done** soft key.

Note: Verify from the View Personality Settings screen that your changes took effect.

6. When you are finished, press the ***ON/OFF CHARGE*** key to return to the Configuration/Service Menu. The next time the pump is powered on, the changes you made will take effect.

Changing or Viewing a Personality

Note: If the **Change Personality** soft key is used to select a different Personality, the change remains in effect for up to 5 hours after the pump is powered off. The pump then reverts to the power on default Personality feature set.

Note: To exit the Configuration/Service Menu, you must power the pump off and on again. All settings that you changed will be retained.

Personality feature sets allow an institution to individually customize groups of pump parameter settings. You can configure the pump with up to eight additional different Personality feature sets. To select a Personality feature set other than the Power On default setting from the Power On screen, press the **Change Personality** soft key.

To change or view a Personality feature set:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key.

   The Personality List is displayed, with the Enable/Disable column highlighted. The first item in the list is Permanent Settings. The permanent settings are set at the factory and cannot be modified. You can, however, disable, enable, or copy the permanent settings.

Note: Always verify your changes before enabling the Personality feature set.

3. To change the parameters for a Personality feature set, use the ⇧⇩ keys to highlight the Personality feature set you want to change, and press the **Change Settings** soft key.

   The Configuration Menu for that Personality feature set is displayed. See Figure 5-2 for an example.

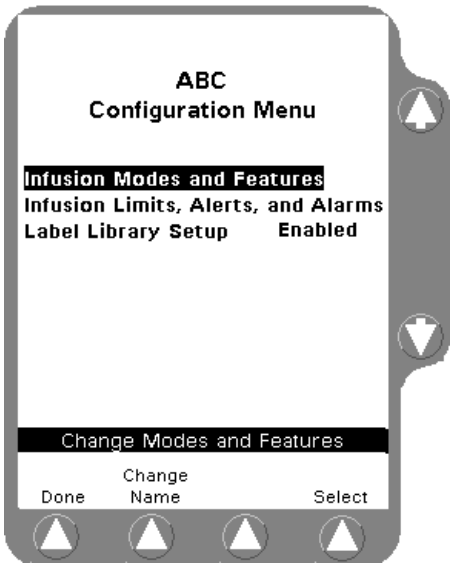


Figure 5-2 Personality Configuration Menu

Renaming a Personality

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight a listed Personality name.
4. Press the **Change Settings** soft key. The Configuration Menu for the selected Personality is displayed.

Note: Press the **No Change** soft key if you decide not to change the name.

5. Press the **Personality Name** soft key. The Create Personality Name screen is displayed, showing the letters of the alphabet and some punctuation characters.

Note: Do not use “Permanent” as a Personality name.

Note: Press the ***CLR*** key to erase a mistake.

6. To enter a new name, select characters using the ⇧⇩ keys and the **<** and **>** soft keys. Press the **Select** soft key to enter the selected character.
7. When you are finished, press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Copying a Named Personality Feature Set

Note: You cannot copy an existing Personality feature set to an unnamed Personality feature set. You must enter a name for the new Personality feature set first.

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key.

   The Personality List is displayed, with the Enable/Disable column highlighted.
3. Highlight the Personality that you want to copy.
4. Press the **Copy Settings** soft key.

   The Copy Personality Settings pop-up screen is displayed.
5. On the To list, use the ⇧⇩ keys to highlight the Personality that you want to receive the copied Personality feature set.
6. Press the **Select** soft key to copy the Personality feature set.

   A WARNING! screen is displayed, alerting you that you are about to overwrite any information that may already be stored in the Personality that you selected in the To list.

   To cancel the copy, press the **Cancel** soft key.

   To proceed with the copy, press the **Yes** soft key.

   The name of the new Personality feature set is displayed on the Personality List screen.

Creating a New Personality Feature Set

To create a new Personality, you must highlight and name an unnamed Personality. After you name a Personality, you can configure its features, or copy and modify an existing Personality feature set.

The following constraints apply when naming Personality feature sets:

Note: The eight unnamed Personality feature sets initially contain the same settings as the Permanent Settings.

- Names can be from 1 to 12 characters long.
- Names can contain punctuation and spaces.

- To simplify the task of selecting the appropriate Personality feature set when the pump is in use, choose names that are easily distinguished from one another. For example, avoid naming one Personality "NICU" and another "NICU2."
- Do not use the space character as the last character in a name. The space will not be apparent when the name is displayed. For example, avoid naming one feature set "NICU" and another "NICU_."
- You cannot copy an existing Personality feature set to an unnamed Personality feature set. You must first enter a name.

Note: Do not name or rename a Personality feature set "Permanent."

- You cannot name or rename a Personality feature set using dashes (-).
- If all Personality feature sets have been named and you want to create a new feature set, you must rename an existing Personality and then alter the settings.

To create a new Personality feature set:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key.

   The Personality List is displayed.
3. Use the ⇧⇩ keys to scroll to an unnamed Personality feature set.
4. Press the **Personality Name** soft key.

   The Create Personality Name screen is displayed, showing the letters of the alphabet and some punctuation characters.

Note: Press the ***CLR*** key to erase a mistake.

5. Use the ⇧⇩ keys and the **<** and **>** soft keys to highlight the characters of the name you want to use. Press the **Select** soft key after you highlight each character.
6. When you are finished, press the **Done** soft key to return to the Configuration Menu.

   Continue creating the new Personality feature set by configuring infusion modes and features, limits, and so on.
7. Scroll through the list until the Personality feature set that you just named is highlighted. Press the **Enable/Disable** soft key to enable the Personality feature set.

Configuring a Personality Feature Set

You can independently configure the settings for each Personality feature set. The configuration menu showing the three main categories to be configured for each Personality are shown in Figure 5-2. The following paragraphs describe how to configure each category.

Note: View the View Personality Settings screen to verify that your changes took effect when you're done programming the Personality.

Infusion Modes and Features

Use the Infusion Modes and Features Menu (Figure 5-3) to choose the features and functions that you want displayed and how some features and functions will appear to the clinical user.

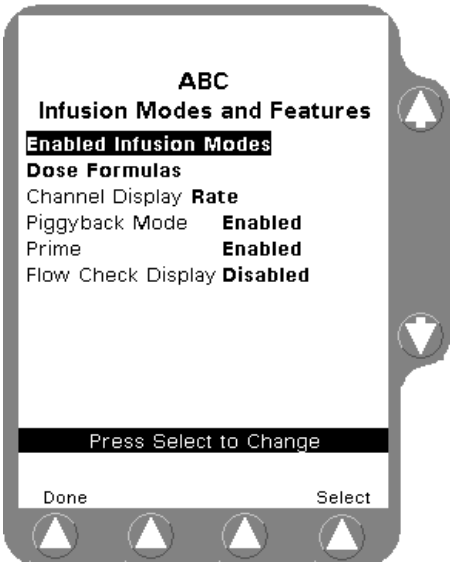


Figure 5-3 Infusion Modes and Features Menu

Enable Infusion Modes — All modes are enabled at the factory. Permitted infusion modes are:

- Rate-Volume: This mode is always available and cannot be disabled.
- Volume-Time
- Dose Formulas: If the Dose Formulas mode is disabled, all dose formulas are disabled. When the Dose Formulas mode is enabled, each individual dose formula can be enabled and disabled independently.

To enable or disable a mode:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to enable/disable infusion modes.
4. Press the **Change Settings** soft key. The Configuration Menu is displayed.
5. Select Infusion Modes and Features from the Configuration Menu. The Infusion Modes and Features menu is displayed, with Enabled Infusion Modes highlighted.
6. Press the **Select** soft key. The Enabled Infusion Modes pop-up (Figure 5-4) is displayed.

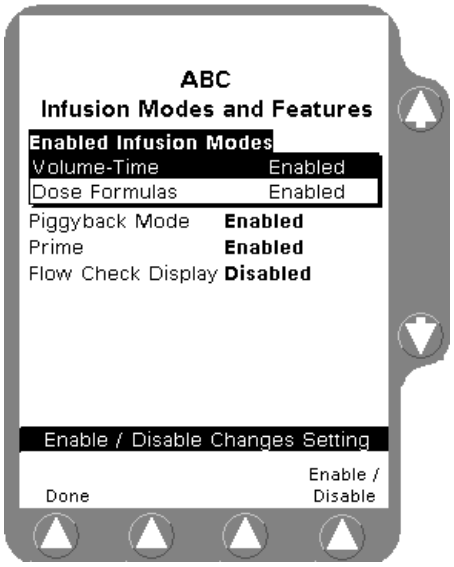


Figure 5-4 Enabled Infusion Modes Pop-Up

7. Use the ⇧⇩ keys to highlight the mode that you want to enable/disable.
8. Press the **Enable/Disable** soft key to change the selected mode to the opposite state.
9. When you are finished, press the **Done** soft key to return to the Infusion Modes and Features Screen for the selected Personality feature set.

Dose Formula Selection — If the Dose Formulas mode is enabled, you can individually enable any or all of the available dose formulas.

To select the available dose formulas for a given Personality feature set:

1. Enter the Configuration/Service Menu.

2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.

3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to enable/disable individual dose formulas.

4. Press the **Change Settings** soft key. The Configuration Menu for the highlighted Personality feature set is displayed.

5. Use the ⇧⇩ keys to highlight Infusion Modes and Features and press the **Select** soft key. The Infusion Modes and Features screen is displayed.

6. Use the ⇧⇩ keys to highlight Dose Formulas.

Note: If Dose Formulas has been disabled in the Enabled Infusion Modes Menu, you cannot select the menu option.

7. Press the **Select** soft key. A pop-up window showing the allowable dose formulas and their current settings is displayed (Figure 5-5).

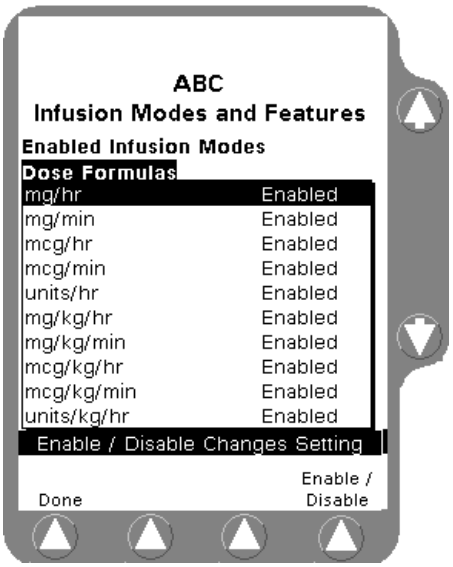


Figure 5-5 Dose Formulas Pop-Up

8. Use the ⇧⇩ keys to highlight the formula that you want to enable/disable, then press the **Enable/Disable** soft key to change the selected formula to the opposite state.

9. When you are finished, press the **Done** soft key to return to the Infusion Modes and Features screen for the selected Personality feature set.

Set Pump Channel Display — You can choose to have one of the following displayed on the pump channel display during pump operation. Alerts and alarms occurring during an infusion override the setting.

- Rate (factory default setting)
- Time remaining on the infusion
- Label
- Volume infused

To select the information that will be displayed in the pump channel display while the channel is running:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the pump channel display.
4. Press the **Change Settings** soft key. The Configuration Menu is displayed.
5. Use the ⇧⇩ keys to highlight Infusion Modes and Features and press the **Select** soft key. The Infusion Modes and Features screen is displayed.
6. Use the ⇧⇩ keys to highlight Channel Display and press the **Select** soft key. The Rate, Time Remaining, Label, and Volume Infused pop-up window is displayed.
7. Use the ⇧⇩ keys to highlight one of the four choices, and press the **Select** soft key. The Infusion Modes and Features screen is displayed, with the new choice highlighted.
8. When you are finished, press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Enable/Disable Piggyback Mode — When the Piggyback mode is disabled, the **Piggyback** soft key is not available from the Main Display and piggyback infusions cannot be programmed. The factory default is Enabled.

To enable/disable Piggyback mode:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.

3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the piggyback mode status.

4. Press the **Change Settings** soft key. The Configuration Menu is displayed.

5. Use the ⇧⇩ keys to highlight Infusion Modes and Features and press the **Select** soft key. The Infusion Modes and Features screen is displayed.

6. Use the ⇧⇩ keys to highlight Piggyback Mode, and press the **Enable/Disable** soft key to change the Piggyback mode status.

7. When you are finished, press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Enable/Disable Prime Mode — When the Prime mode is disabled, the **Prime** soft key is not available and users are unable to use the pump to prime the administration set. The factory default is Enabled.

To enable/disable the Prime function:

1. Enter the Configuration/Service Menu.

2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.

3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to enable/disable the Prime function.

4. Press the **Change Settings** soft key. The Configuration Menu is displayed.

5. Use the ⇧⇩ keys to highlight Infusion Modes and Features and press the **Select** soft key. The Infusion Modes and Features Menu is displayed.

6. Use the ⇧⇩ keys to highlight Prime and press the **Enable/Disable** soft key to change the Prime mode status.

7. When you are finished, press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Enable/Disable Flow Check Display — When enabled, a graphic display indication of downstream resistance to flow is displayed on the Main Display. The factory default is Disabled.

To change the Flow Check Display status:

1. Enter the Configuration/Service Menu.

2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.

3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to display Flow Check information.

4. Press the **Change Settings** soft key. The Configuration Menu is displayed.

5. Use the ⇧⇩ keys to highlight Infusion Modes and Features and press the **Select** soft key. The Infusion Modes and Features screen is displayed.

6. Use the ⇧⇩ keys to highlight Flow Check Display and press the **Enable/ Disable** soft key to change the Flow Check Display status.

7. When you are finished, press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Setting Infusion Limits, Alerts, and Alarms

Note: You can change multiple items in this menu without exiting.

Use the Infusion Limits, Alerts, and Alarms Menu (Figure 5-6) to set clinical feature limits and infusion alert and alarm characteristics for each of the pump's Personality feature sets. Table 5-4 lists the menu items.

Table 5-4 Infusion Limits, Alerts, and Alarms Menu Items

Setting	Definition	Default/ Permanent Setting
Rate Limit	Maximum flow rate	1200 mL/hr
Volume to be Infused	Maximum volume for one infusion	9999 mL
KVO Rate Limit	Flow rate used when primary infusion is complete	5.0 mL/hr
Air Bubble Setting	Minimum air bubble size that will cause an AIR alarm	150 µL
Downstream Occl Values	Approximate downstream pressure that will cause an Occlusion alarm	Moderate
Occlusion Override	Allows bedside caregiver to override occlusion settings	Enabled
Auto Restarts	Number of times the pump will automatically restart after an Occlusion alarm occurs	5
Piggyback Callback	An alert that occurs when the piggyback infusion is complete and the pump has reverted to the primary program	Disabled
Alert Off Interval	Number of seconds between alert tones	4 seconds
Alarm Off Interval	Number of seconds between alarm tones	1 second
Auto Lock	Keypad automatically locks to prevent tampering	Disabled

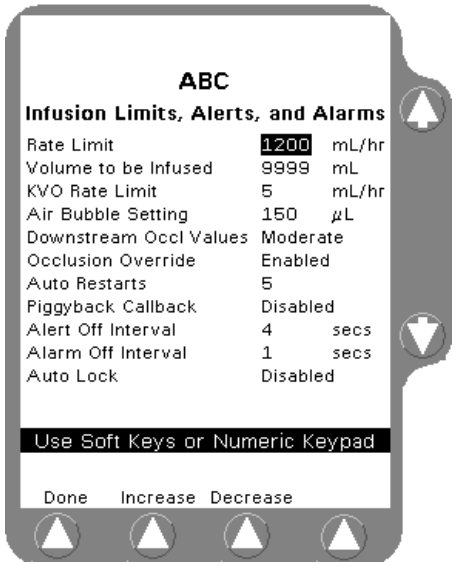


Figure 5-6 Infusion Limits, Alerts and Alarms Screen

Set Rate Limit — The maximum programmable flow rate for each Personality feature set can be set to any value from 0.1 mL/hr to 1200 mL/hr. The default or Permanent setting is 1200 mL/hr.

To set the maximum programmable flow rate:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the rate limit setting, and press the **Change Settings** soft key. The Configuration Menu is displayed.
4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The settings for the infusion limits, alerts, and alarms are displayed.
5. Use the ⇧⇩ keys to highlight Rate Limit then change the value by doing one of the following:
   - Press the **Increase** or **Decrease** soft keys.
   - Enter the new value using the numeric keypad.
6. Use the ⇧⇩ keys to highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Set VTBI Limits — You can set the maximum programmable volume to be infused (VTBI). The maximum programmable VTBI can vary between 0.1 mL and 9999 mL. The factory default is 9999 mL.

To set the maximum programmable VTBI:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the VTBI limit setting, and press the **Change Settings** soft key. The Configuration Menu is displayed.
4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.
5. Use the ⇧⇩ keys to highlight Volume to be Infused then change the value by doing one of the following:
   - Press the **Increase** or **Decrease** soft keys.
   - Enter the new value using the numeric keypad.
6. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Set KVO Rate — You can change the KVO rate for each Personality feature set to any value between 0.1 mL/hr and 5.0 mL/hr, in 0.1 mL/hr increments. The factory default is 5.0 mL/hr.

Note: The KVO rate for programmed flow rates less than the KVO rate will be the programmed flow rate.

To set the KVO rate:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the KVO rate, and press the **Change Settings** soft key. The Configuration Menu is displayed.
4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.
5. Use the ⇧⇩ keys to highlight KVO Rate.

6. Change the value by doing one of the following:
   - Press the **Increase** or **Decrease** soft keys.
   - Enter the new value using the numeric keypad.

7. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Set Air Bubble Size — You can set the bubble size that will cause an AIR alarm to 25, 50, 100, or 150 micro liters (µL). The alarm will occur for bubbles approximately this size or larger. The factory default setting is 150.

To set the detectable bubble size:

1. Enter the Configuration/Service Menu.

2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.

3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the air bubble size setting, and press the **Change Settings** soft key. The Configuration Menu is displayed.

4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.

5. Use the ⇧⇩ keys to highlight Air Bubble Setting, and press the **Select** soft key. The Air Bubble Setting pop-up screen is displayed.

6. Use the ⇧⇩ keys to highlight the preferred setting, and press the **Select** soft key. To exit without changing the setting, press the **No Change** soft key.

   The Infusion Limits, Alerts, and Alarms screen is displayed, showing the new (or unchanged) air bubble size.

7. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Set Downstream Occlusion Values — You can set the downstream occlusion values for the pump. Occlusion values are expressed in three levels. Each setting indicates an approximate threshold pressure for each of three flow rate ranges, as shown in Table 5-5:

Table 5-5 Nominal Downstream Occlusion Values

	<21 mL/hr	21 to 200 mL/hr	>200 mL/hr
Minimum	103 mmHg (2 psig)	207 mmHg (4 psig)	310 mmHg (6 psig)
Moderate	258 mmHg (5 psig)	414 mmHg (8 psig)	569 mmHg (11 psig)
Maximum	465 mmHg (9 psig)	620 mmHg (12 psig)	776 mmHg (15 psig)

The factory default setting is Moderate. If the Occlusion Override feature is enabled, the occlusion limit can be overridden at the bedside. To set the occlusion limit:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the occlusion pressure limit setting, and press the **Change Settings** soft key. The Configuration Menu is displayed.
4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.
5. Use the ⇧⇩ keys to highlight Downstream Occl Values and press **Select**. The Downstream Occl Values pop-up window is displayed.
6. Press the **psig/mmHg** soft key to change the unit of measure for the downstream occlusion pressure display if desired.
7. Use the ⇧⇩ keys to highlight the preferred occlusion range setting, and press the **Select** soft key. To exit without changing the setting, press the **No Change** soft key.
8. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Enable/Disable Occlusion Override — When enabled, the Occlusion Override feature allows the occlusion limit to be overridden at the bedside. The factory default setting is Enabled.

To change the Occlusion Override status:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to enable/disable the Occlusion Override feature, and press the **Change Settings** soft key. The Configuration Menu is displayed.
4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.
5. Use the ⇧⇩ keys to highlight Occlusion Override and press the **Enable/ Disable** soft key to change the Occlusion Override status if desired.
6. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Set Number of Auto Restarts After Occlusion — You can set the number of automatic restarts that will occur after a downstream occlusion alarm occurs and is relieved. The value can vary between 0 and 9 (0 is displayed as Disable). The factory default is 5.

To set the number of auto restarts after occlusion:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the number of Auto Restarts, and press the **Change Settings** soft key. The Configuration Menu is displayed.
4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.
5. Use the ⇧⇩ keys to highlight Auto Restarts. Change the value by doing one of the following:
   - Press the **Increase** or **Decrease** soft keys.
   - Enter the new value using the numeric keypad.
6. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Enable/Disable Piggyback Callback Alert — You can enable or disable the Piggyback Callback Alert feature. When enabled, the piggyback callback alert starts when the piggyback infusion completes and the pump module switches to the primary. If disabled, the alert will not occur, but the pump module will still switch to the primary. The factory default setting is Disabled.

To change the piggyback callback alert status:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the Piggyback Callback Alert setting, and press the **Change Settings** soft key. The Configuration Menu is displayed.
4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.
5. Use the ⇧⇩ keys to highlight Piggyback Callback and press the **Enable/ Disable** soft key to change the Piggyback Callback Alert feature status.
6. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Set Alert or Alarm Off Interval — You can adjust the time interval between alert and alarm tones from 1 to 7 seconds, in 1-second increments. The factory default is 4 seconds for alert off and 1 second for alarm off.

To set the alert or alarm interval:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩keys to highlight the Personality feature set for which you want to change the Alert or Alarm Off setting.
4. Press the **Change Settings** soft key. The Configuration Menu is displayed.
5. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.
6. Use the ⇧⇩ keys to highlight Alert Off or Alarm Off as appropriate. Change the value by doing one of the following:

- Press the **Increase** or **Decrease** soft keys.
- Enter the new value using the numeric keypad.

7. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Enable/Disable Auto Lock — You can enable or disable the Auto Lock feature. When the channel is running without an alert, the Auto Lock feature automatically locks the front panel keys for two minutes after the last key press. The factory default is Disabled.

To change auto lock setting:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the Auto Lock setting, and press the **Change Settings** soft key. The Configuration Menu is displayed.
4. Use the ⇧⇩ keys to highlight Infusion Limits, Alerts, and Alarms and press the **Select** soft key. The current infusion limits, alert, and alarm settings are displayed.
5. Use the ⇧⇩ keys to highlight Auto Lock and press the **Enable/Disable** soft key to change the Auto Lock setting if desired.
6. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Label Library

Use the Label Library feature to select informational labels from a list of 64 medication and application labels stored in the pump's label library. When selected, the label is displayed on the Main Display. Each label also has an 8-letter abbreviation that is displayed on the pump module display when the label is selected. You can enable or disable the labels in each Personality feature set, but you cannot modify the labels.

Colleague 3 Pumps and Colleague Pumps with UIM master software version 4.XX and higher allow you to configure up to 32 optional custom labels in addition to the 64 labels in the library. When the Label Library feature is enabled, the user can select from the pre-configured and custom labels. Custom labels appear in the list in alphabetical order. See "Creating Custom Labels," 5-33.

Pump UIM Master software versions 5.01 and higher include different medications in the label library than software versions prior to version 5.01. Table 5-6 lists all drugs included in all UIM Master software versions and shows the labels included in each version.

See “Transferring Device Configuration Data,” 5-51 for information on how differences in the label library are indicated when transferring pump configuration from a pump with the older label library to a pump with the newer label library.

Note: If a label is configured using the Colleague Guardian feature, it is selectable from the Colleague Guardian list and is not displayed in the Label Line list.

Predefined Labels

Table 5-6 and Table 5-7 list the predefined drug labels, application labels, and abbreviations in the pump’s label library. Check marks indicate the labels included in each major software version.

Table 5-6 Predefined Drug Labels

Name	Abbreviation	UIM Master Software 4.XX	UIM Master Software 5.XX and higher
Abciximab	ABCIXIMA		✓
Alfentanil	ALFENTAN		✓
Alfentanil HCL	ALFENTAN	✓	
Alteplase	ALTEPLAS	✓	✓
Aminophylline	AMINOPHY	✓	✓
Amiodarone	AMIODARO		✓
Amrinone	AMRINONE		✓
Amrinone Lactate	AMRINONE	✓	
Atracurium	ATRACURI		✓
Atracurium Besylate	ATRACURI	✓	
Bretylium Tosylate	BRETYLIU	✓	
Carboplatin	CARBOPLA	✓	✓
Carmustine	CARMUSTI	✓	✓

Table 5-6 Predefined Drug Labels — continued

Name	Abbreviation	UIM Master Software 4.XX	UIM Master Software 5.XX and higher
Cefazolin Sodium	CEFAZOLI	✓	
Cisatracurium	CISATRAC		✓
Cisplatin	CISPLATI	✓	✓
Cyclophosphamide	CYCLOPHO	✓	✓
Diltiazem	DILTIAZE		✓
Diltiazem HCL	DILTIAZE	✓	
Dobutamine	DOBUTAMN		✓
Dobutamine HCL	DOBUTAMI	✓	
Dopamine	DOPAMINE		✓
Dopamine HCL	DOPAMINE	✓	
Doxapram HCL	DOXAPRAM	✓	
Doxorubicin	DOXORUBI		✓
Doxorubicin HCL	DOXORUBI	✓	
Droperidol	DROPERID	✓	
Eptifibatide	EPTIFIBA		✓
Esmolol	ESMOLOL		✓
Esmolol HCL	ESMOLOL	✓	
Etoposide	ETOPOSID	✓	✓
Fentanyl	FENTANYL		✓
Fluorouracil	FLUOROUR	✓	✓
Heparin Sodium	HEPARIN	✓	✓
Ifosfamide	IFOSFAMI	✓	✓
Isoproterenol	ISPROTER		✓
Isoproterenol HCL	ISPROTER	✓	
Ketamine	KETAMINE		✓
Ketamine HCL	KETAMINE	✓	

Table 5-6 Predefined Drug Labels — continued

Name	Abbreviation	UIM Master Software 4.XX	UIM Master Software 5.XX and higher
Labetalol	LABETALO		✓
Labetalol HCL	LABETALO	✓	
Lidocaine	LIDOCAIN		✓
Lidocaine HCL	LIDOCAIN	✓	
Magnesium Sulfate	MAGNESIU	✓	✓
Metaraminol Bitartrate	METARAMI	✓	
Methohexital	METHOHEX		✓
Methohexital Sodium	METHOHEX	✓	
Methotrexate	METHOTRE		✓
Methotrexate Sodium	METHOTRE	✓	
Methyldopate HCL	METHYLDO	✓	
Midazolam	MIDAZOLA		✓
Milrinone	MILRINON		✓
Milrinone Lactate	MILRINON	✓	
Mivacurium	MIVACURI		✓
Mivacurium Chloride	MIVACURI	✓	
Morphine Sulfate	MORPHINE	✓	✓
Naloxone	NALOXONE		✓
Naloxone HCL	NALOXONE	✓	
Nicardipine	NICARDIP		✓
Nitroglycerin	NITROGLY	✓	✓
Nitroprusside	NITROPRU	✓	✓
Norepinephrine	NOREPINE		✓
Norepinephrine Bitartrate	NOREPINE	✓	
Octreotide	OCTREOTI		✓
Oxytocin	OXYTOCIN	✓	✓

Table 5-6 Predefined Drug Labels — continued

Name	Abbreviation	UIM Master Software 4.XX	UIM Master Software 5.XX and higher
Paclitaxel	PACLITAX		✓
Phenylephrine	PHENYLEP		✓
Phenylephrine HCL	PHENYLEP	✓	
Plicamycin	PLICAMYC	✓	✓
Procainamide	PROCAINA		✓
Procainamide HCL	PROCAINA	✓	
Propofol	PROPOFOL	✓	✓
Prostaglandin E1	PROSTAGL	✓	✓
Ritodrine HCL	RITODRIN	✓	
Rocuronium	ROCURONI		✓
Rocuronium Bromide	ROCURONI	✓	
Streptokinase	STREPTOK	✓	
Succinylcholine Chloride	SUCCINYL	✓	
Sufentanil	SUFENTAN		✓
Sufentanil Citrate	SUFENTANI	✓	
Tirofiban	TIROFIBA		✓
Tolazoline HCL	TOLAZOLI	✓	
Trimethaphan Camsylate	TRIMETHA	✓	
Urokinase	UROKINAS	✓	
Vecuronium	VECURONI		✓
Vecuronium Bromide	VECURONI	✓	

Application Labels

Note: The Colleague Guardian feature cannot be used with the application labels.

Table 5-7 Application Labels

Name	Abbreviation	UIM Master Software 4.XX	UIM Master Software 5.XX
Antibiotic	ANTIBIOT	✓	✓
Arterial Line	ARTERIAL	✓	✓
Blood	BLOOD	✓	✓
Central Line	CENTRAL	✓	✓
Epidural	EPIDURAL	✓	✓
Irrigation	IRRIGATE		✓
Keep Vein Open	KVO	✓	✓
Lipids	LIPIDS	✓	✓
Maintenance Line	MAINTENA	✓	✓
Subcutaneous	SUBCUTAN		✓
Total Parenteral Nutrition	TPN	✓	✓
Umbilical Arterial Catheter	UAC	✓	✓
Umbilical Venous Catheter	UVC	✓	✓

Enable/Disable Label Library

You can enable or disable the Label Library feature for each Personality feature set. When enabled, the clinician can select medication and application labels for display during programmed infusions. When disabled, the clinician cannot select any label for display. The factory default is Enabled.

To change the Label Library's status:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed, with the Enable/Disable column highlighted.
3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to change the Label Library status, and press the **Change Settings** soft key. The Configuration Menu is displayed.

4. Use the ⇧⇩ keys to highlight Label Library Setup and press the **Enable/Disable** soft key to change the status.

5. Highlight the next parameter to be modified, or press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Set Label Library List

You can also enable or disable individual labels for each Personality feature set. When the Label Library feature is enabled, the clinician can select from only those labels that have been enabled. Labels that have been disabled do not appear in the list seen by the clinician when the pump is in use. The factory default is Enabled for all factory defined labels.

To change the Label Library List settings:

1. Enter the Configuration/Service Menu.

2. Use the ⇧⇩ keys to highlight Personality Configuration and press the **Select** soft key. The Personality List is displayed.

3. Use the ⇧⇩ keys to highlight the Personality feature set for which you want to enable, disable, or set up the Label Library, and press the **Change Settings** soft key.

4. Use the ⇧⇩ keys to highlight Label Library Setup.

5. If the feature is not enabled, press the **Enable/Disable** soft key to change the Label Library status to Enabled.

   If the feature is enabled, press the **Library Setup** soft key to view the Label Library List.

Note: The list will return to the first label if you scroll past the last label in the list.

6. Use the ⇧⇩ keys or the **Page Up/Page Down** soft keys to scroll through the list. To enable/disable a label, press the **Yes/No** soft key.

7. When you are finished, press the **Done** soft key to return to the Configuration Menu for the selected Personality feature set.

Creating Custom Labels

Note: Custom labels can be configured for all Colleague 3 Pumps and Colleague Pumps with UIM Master software version 4.XX and higher. Custom labels are not available on Colleague pumps with UIM software older than version 4.XX.

The Custom Label List option allows you to create up to 32 custom labels and store them in the pump. When custom labels have been configured, they are displayed alphabetically in the same list as the predefined labels.

Note: You can enter the maximum number of characters, but labels that use wide characters, such as % or W, may run off the edge of the screen. Test long names to ensure that they display accurately on all screens.

The custom labels can be up to 14 characters long. Each label also requires you to configure an abbreviated version (up to eight characters) that will appear on the pump module display when the label is selected.

The Personality feature sets can be programmed to include the custom labels.

To work with custom labels:

1. Enter the Configuration/Service Menu.
2. Select Custom Label List from the menu and press the **Select** soft key.

   The Custom Label List is displayed, showing the custom labels currently configured for the pump. The left side of the list shows the full label, and the right side shows the abbreviation that will be displayed on the pump module during operation. Figure 5-7 is an example of a custom label list.

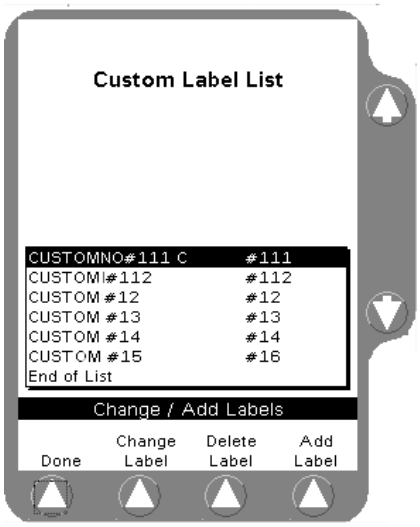


Figure 5-7 Example of a Custom Label List

Adding a custom label —

1. Press the **Add Label** soft key. The Create Label Name/Abbreviation screen is displayed.
2. Use the ⇧⇩ keys and the **>** soft key to highlight characters for the label. Press the **Select** soft key to enter each highlighted character.
3. When you are finished, press the **Edit Abbrev.** soft key. The Abbrev portion of the screen is highlighted.

Note: You must enter an abbreviation for every custom label you create.

4. Use the ⇧⇩ keys and the **>** soft key to highlight characters for the custom label abbreviation. Press the **Select** soft key to enter each highlighted character.

5. To exit without making changes, press the **No Change** soft key.

6. When you are finished, press the **Done** soft key.

   The Custom Label List screen is displayed, showing the custom label you created. Labels are listed in the order in which they were added to the list.

7. Press **Done** to return to the Configuration/Service menu.

Changing a custom label —

1. From the Custom Label List, use the ⇧⇩ keys to highlight the label that you want to change, and press the **Change Label** soft key. The Create Label Name/ Abbreviation screen is displayed.

2. Use the⇧⇩ keys and the **>** soft key to highlight characters in the custom label that you want to change. Press the **Select** soft key to enter each highlighted character.

3. When you are finished, press the **Edit Abbrev.** soft key. The Abbrev portion of the screen is highlighted.

Note: You must enter an abbreviation for every custom label you change.

4. Use the ⇧⇩ keys and the **>** soft key to highlight characters for the custom label abbreviation. Press the **Select** soft key to enter each highlighted character.

   To exit without making changes, press the **No Change** soft key.

5. When you are finished, press the **Done** soft key. The Custom Label List screen is displayed.

6. Press **Done** to return to the Configuration/Service menu.

Deleting a custom label —

1. From the Custom Label List, use the ⇧⇩ keys to highlight the label to delete. Press the **Delete Label** soft key. The label is deleted from the list.

2. Press **Done** to return to the Configuration/Service Menu.

Configuring the Colleague Guardian Feature

Note: Refer to the Addendum to Colleague Operator's Manual, Colleague Guardian Feature (See Table 11-3) for instructions on programming infusions using the Colleague Guardian feature.

The Colleague Guardian feature allows dose limits to be preset for any drug label in the pump's label library, including custom labels. The Colleague Guardian feature displays a warning when a programmed dose is not within the dose limits determined by your institution. The following parameters can be set in the Colleague Guardian feature for each label:

- Dose mode: You can select any of the pump's dose modes. The selected dose mode will be the units displayed to the operator when the Colleague Guardian configured label is selected for an infusion.
- Drug amount: This is a value determined by your institution for the drug label being configured. If the concentration is changed after the drug amount value was entered, the drug amount changes automatically to provide the desired concentration using the set diluent volume value.
- Diluent volume: This is a value that reflects the standard bag volume used by your institution for the drug label being configured.
- Concentration: This is calculated automatically using the drug amount and the diluent volume values. If the concentration is changed, the drug amount will change accordingly. The diluent volume will not change.
- Dose: This is a value determined by your institution for the drug label being configured.
- Dose limits, high and low: These values set the upper and lower limits for the drug label being configured, as determined by your institution. The operator can choose to override the limits if appropriate for the infusion being programmed. The low limit value must be greater than zero.

Table 5-8 provides a listing of the infusion parameter limits for all supported dose modes.

Table 5-8 Infusion Parameter Limits

Parameter	Limits	Unit
Drug Amount	0.0001 to 999.9 0.01 to 99,999 0.01 to 999,999 1 to 99,999,999	gram (g) milligram (mg) microgram (mcg) units
Concentration	0.0001 to 125 1.0 to 999 0.01 to 999,999	mg/milliliter (mL) mcg/mL units/mL
Diluent Volume	0.1 to 99.9 and 100 to 9,999	mL mL
Delivery Time	00:01 to 99:59	hour:minute (hr:min)
Dose	0.001 to 9,999 0.01 to 9,999,999	For dose modes: mg/hr, mg/min, mcg/hr, mcg/min, mg/kilogram (kg)/hr, mg/kg/min, mcg/kg/hr, and mcg/kg/min For dose modes: units/hr and units/kg/hr

During the Colleague Guardian feature configuration, the software calculates certain parameters as data is entered. For example, concentration is automatically calculated when data is entered in the drug amount and diluent volume fields. If the concentration value is changed, the pump automatically calculates the drug amount value to achieve the desired concentration (the diluent volume value is left unchanged).

Any drug label or custom label can be configured using the Colleague Guardian feature. In order for a Colleague Guardian label to be available for use by a clinician, the following must be enabled:

- The Colleague Guardian label must be enabled in the selected Personality feature set.
- The Label Library must be enabled for that Personality feature set.
- The dose mode selected for the label in the Colleague Guardian feature must also be enabled in the Dose Formulas for the selected Personality (in the Infusion Modes and Features menu)

When a Colleague Guardian label is enabled in a Personality feature set, it is displayed in the Colleague Guardian feature label list. All other enabled labels will be available to the operator in the label line list.

The Colleague Guardian feature warns the operator if they program an infusion using values outside the limits configured for the selected label using the Colleague Guardian feature. When the **Confirm** soft key is pressed a warning screen is displayed, forcing the operator to either accept or cancel the dose.

Note: The Colleague Guardian feature cannot be used for piggyback infusions. A piggyback infusion can be programmed to run in conjunction with a primary infusion that uses the Colleague Guardian feature.

Colleague Guardian Configuration Process Overview

To simplify configuration, it is important to ensure that the labels in the label library are properly set up before you create Personality feature sets that will use them. The following is an overview of the suggested sequence of steps for programming Colleague Guardian software:

- Determine the custom labels that must be created for the pump.
- Create all custom labels.

  Custom labels appear in the Label Library list in alphabetical order. It is recommended that custom labels be named so they clearly identify the medication they represent.

- Determine the custom and standard library labels that will be configured using the Colleague Guardian feature. These are labels that your institution has determined require an indication of dose limits.
- Record the Colleague Guardian feature dose modes, doses, and limits for each label as determined by authorized personnel at your institution. It is recommended that the limits be determined by your institution's clinical and pharmacy staff.
- Use the Colleague Guardian feature to configure all standard and custom labels as appropriate for your institution in accordance with the completed worksheets.
- Configure the pump's Personality feature sets:
  - Enable the labels appropriately for each Personality feature set
  - Enable the Label Library for each Personality feature set
  - Enable the appropriate infusion modes and dose formula(s) (in the Infusion Modes and Features menu).

Note: If a Colleague Guardian feature label is configured to use a Dose Mode that is not enabled in the Dose Formulas list for the selected Personality feature set, then that label is not available for that Personality feature set.

Note: If the Label Library is not enabled for a Personality feature set, then no labels are available for selection when that Personality feature set is in use.

- Enable the configured Personality feature sets and select the appropriate Power On Default Personality as described in "Choosing the Power On Default Personality Feature Set," 5-8.

- Verify that all Personality feature sets are properly configured.
- Using the Configuration Transfer Cable (product code 2M8155), transfer the configuration to all pumps equipped with the Colleague Guardian Feature that require it.

Colleague Guardian Feature Configuration Procedure

The Colleague Guardian feature provides a means of entering a default dose for any label in the label library. This list includes all configured custom labels. The Colleague Guardian feature configures a label globally, which means that a label's parameters are the same for all Personality feature sets in which that label has been enabled.

Note: This procedure is also used to make changes to a previously configured Colleague Guardian feature label.

Note: An operator can override the limits programmed in Colleague Guardian feature if it is determined to be necessary. See the Addendum to Colleague Operator's Manual, Colleague Guardian Feature (see Table 11-3) for information on using the Colleague Guardian feature when programming infusions.

To set Colleague Guardian feature parameters for a label do the following:

1. Enter the Configuration/Service menu.

Note: Program any custom labels for which you want to configure Colleague Guardian limits first. See "Adding a custom label" on page 5-34 and "Changing a custom label" on page 5-35 for instructions on configuring custom labels.

2. Highlight Configure Colleague Guardian using the up/down arrows. See Figure 5-8.

Figure 5-8 Configure Colleague Guardian Menu Selection

3. Press the **Select** soft key. The Configure Colleague Guardian label list is displayed (Figure 5-9).

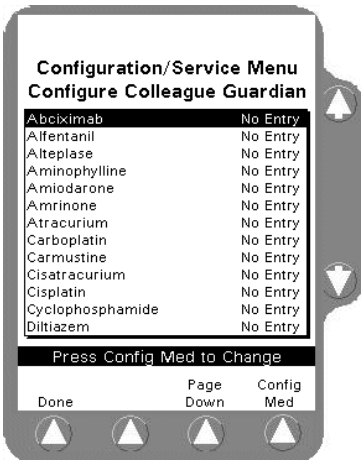


Figure 5-9 Colleague Guardian Feature Label Select Screen

4. Select the label you want to configure using the up/down arrows.

5. Press the **Config Med** soft key. The Configure Colleague Guardian screen is displayed. See Figure 5-10.

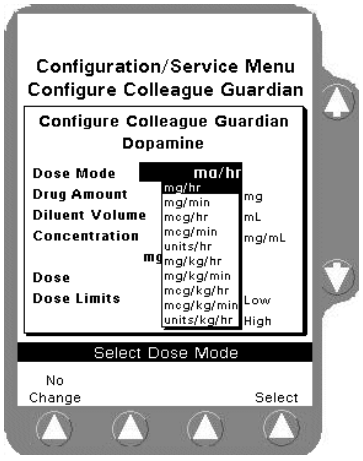


Figure 5-10 Colleague Guardian Feature Configuration Screen - Dose Modes

6. Use the arrow keys to highlight the desired Dose Mode in the list, then press the **Select** soft key.

Note: If you change the Dose Mode units after you have entered values for any of the other fields on this screen, those values will blank and require re-entry.

7. Use the arrow keys to highlight the next field (Figure 5-11 shows the Drug Amount field highlighted).

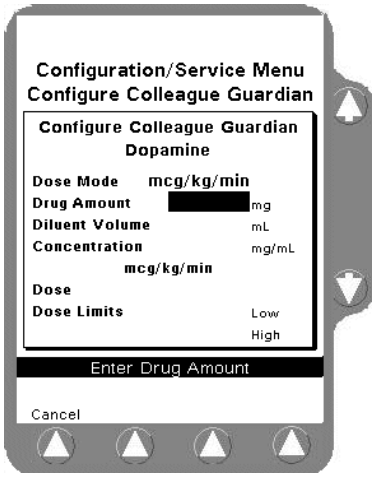


Figure 5-11 Colleague Guardian Feature Configuration Screen Fields

8. Using the keypad, enter the desired value for this label in the highlighted field.

9. Repeat steps 7 and 8 to fill in all the fields on the screen.

Note: If you enter a value outside the pump's capabilities, an error message is displayed. Consult with your pharmacy to correct the situation. No changes to the values should be made without the consent of the responsible individual(s) or department(s) of your institution.

Note: The Colleague Guardian feature allows a label to be programmed using the same value for the Dose, Dose Limits High, and Dose Limits Low.

Note: These parameters are the limits determined and recorded by your institution.

10. When all parameters are set correctly, press the **Confirm** soft key to save the parameters for the label. The label list is displayed. See Figure 5-12.

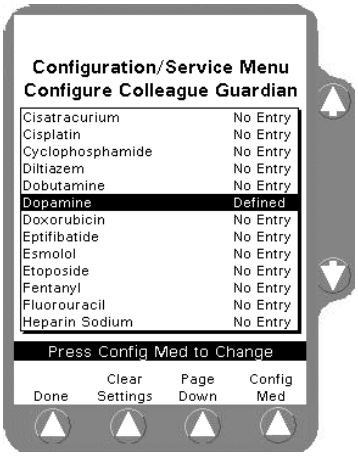


Figure 5-12 Colleague Guardian Feature Defined Label Screen

11. Verify that the label you just configured shows `Defined`. This shows that its parameters have been set and stored.

12. Repeat steps 1 through 11 to program dose limits for all other labels that require them. When finished, press the **Done** soft key. The Configuration/ Service Menu screen is displayed.

Labels for which dose limits have been configured using the Colleague Guardian feature have an asterisk (*) next to them in the Label Library listing and must be enabled for each Personality for which the drug is to be used.

Clearing/Restoring Colleague Guardian Feature Labels

See Figure 5-13 for the Colleague Guardian feature configuration screen that provides the **Clear** and **Restore** soft keys. To clear the data configured into a Colleague Guardian feature label press the **Clear** soft key. This will erase the data from all fields for that label. You can restore that data to the label if you press the **Restore** soft key before you press any other soft key. If you press any soft key before you press **Restore** all data will be lost and you will have to configure that label again.

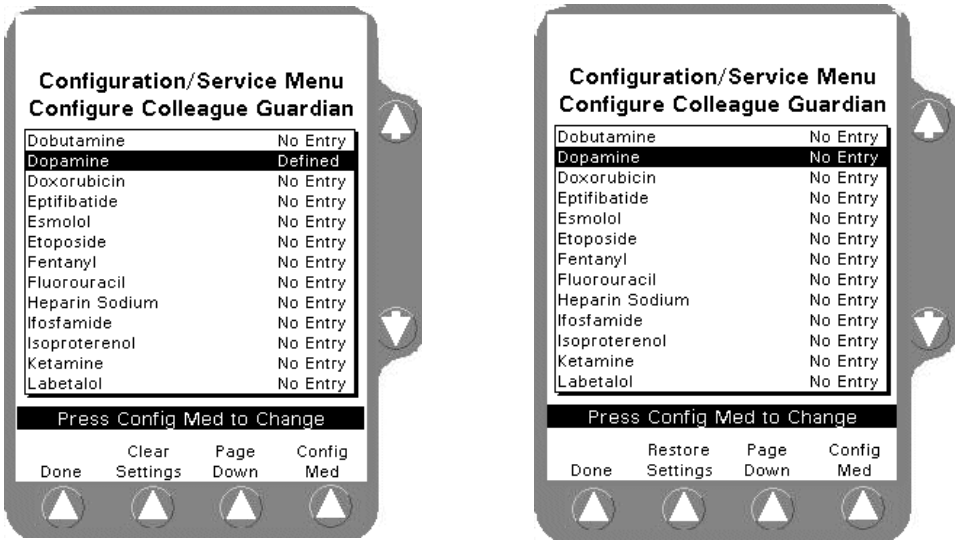


Figure 5-13 Clear/Restore Soft Key in Configure Colleague Guardian Screen

Viewing the Event History

Note: To avoid disruption from a low battery situation or a Manual Tube Release pop-up when viewing event history, plug the pump in, and do not manually open the pump mechanism when viewing event history.

The Event History option on the Configuration/Service Menu lets you view up to 1,000 pump events that have occurred, including key presses.

Soft key presses are indicated in the event history by a number (1 through 4) corresponding to the soft keys as shown in Figure 5-14. The function of the soft keys varies depending on the Main Display screen displayed at the time.

To view the history:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Event History.

Note: To maximize the number of events that can be shown, do not press the ***Main Display*** key when the pump is first powered on. Allow the display to appear automatically.

3. Press the **Select** soft key. The Event History screen (Figure 5-14) is displayed.
4. Use the **Page Up**, **Page Down**, or **Most Recent** soft keys or the ⇧⇩ keys to scroll through the event history.
5. Press the **Done** soft key to return to the Configuration/Service Menu.

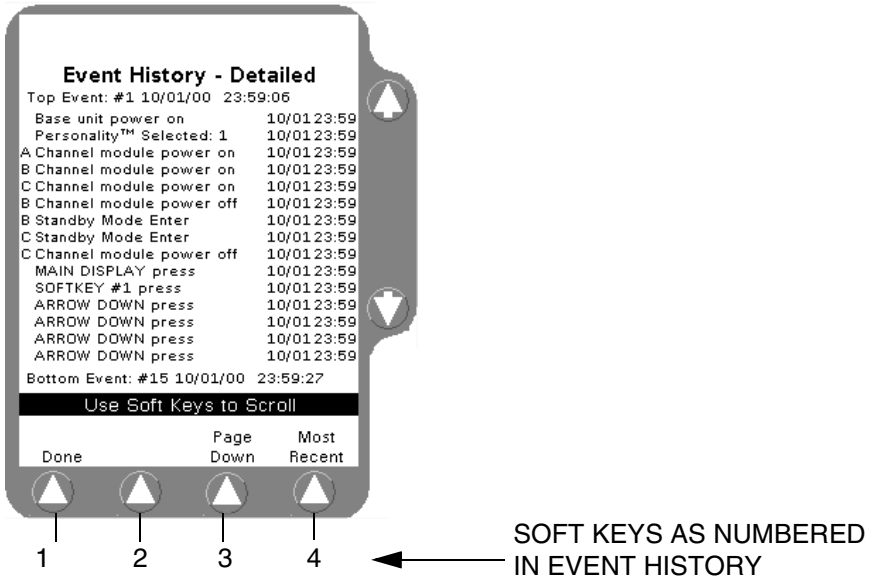


Figure 5-14 Example of Event History Display

Using the Pump's Service Features

The Service Features option on the Configuration/Service Menu allows you to:

- Verify the function of internal circuits as an aid in fault isolation.
- Ensure that the pump is functioning properly after repair.

Accessing the Service Features

1. Enter the Configuration/Service Menu. Allow the pump to complete the power up self-test before proceeding.
2. Use the ⇧⇩ keys to highlight Service Features.
3. Press the **Select** soft key. The Service Features Menu is displayed.

The following sections describe each item on the Service Features Menu.

Battery and Pump History

This menu option displays the following information about the pump and battery (see Figure 5-15):

- Amp Hours Left: This is a proportional value calculated from the battery charging current level for use by the Battery Charge Level Indicator: not actual amp-hours
- Battery Voltage High/Low Range: voltage measured internally
- Battery Current High/Low Range: current measured internally
- Time On Battery
- Time Device Powered On
- Time Pumping
- Time Pumping On Battery
- # Charge/Discharge Cycles
- # Discharges < ALRM Thrshld
- Battery Installed — Date and time used for battery history information
- Battery's relative charge level

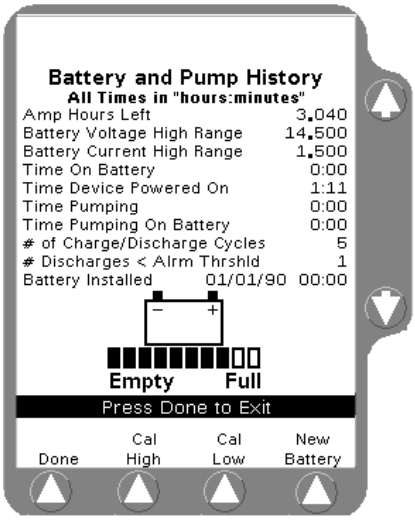


Figure 5-15 Typical Battery and Pump History Display

The following soft keys are provided. Their functionality is outlined below:

- **New Battery**: Used when you replace the battery. This updates all items on the Battery and Pump History screen except Battery Voltage, Battery Current, Time Device Powered On, and Time Pumping, and clears all boxes in the Battery Charge Level Indicator. After charging, when the battery current low range reaches 0.025 A or less, all 10 boxes are filled. See "Main Batteries" on page 8-34 for the procedure for replacing the pump's batteries.
- **Cal High:** Pressing this displays the upper threshold of battery current in the Battery High/Low Range field.
- **Cal Low:** Pressing this displays the lower threshold of battery current in the Battery High/Low Range field.
- **Done**: When you are finished, press to return to the Service Features Menu.

Note: When viewing the Battery and Pump History screen on a Colleague Pump that was upgraded to add a second main battery (UIM Master software version 2.02 and older), *divide* the # of Charge/Discharge Cycles shown by two and *multiply* the number of Amp Hours Left shown by two. It is not necessary to do this if your pump was originally manufactured with two main batteries (UIM Master software version 4.01 and higher).

Keypad Test

Note: The Keypad Test screen shows only the last 8 keys tested.

Select this menu option to test all pump keys and verify that the pump correctly interprets key presses. For example, verify that if you press the ***6*** key, a 6 is displayed; if you press the ***Rate*** key, the word Rate is displayed. You can test the ***PANEL LOCKOUT*** button, keypad keys, function keys, and soft keys, *except* the ***ON/OFF CHARGE*** key and the **Done** soft key. The pump verifies the ability to correctly interpret ***ON/OFF CHARGE*** key presses each time it is powered on or off.

When you are finished, press the **Done** soft key. This also tests the **Done** key's functionality.

Voltage Sensor Data

Select this menu option to display the pump's internal DC voltages. Figure 5-16 shows typical data.

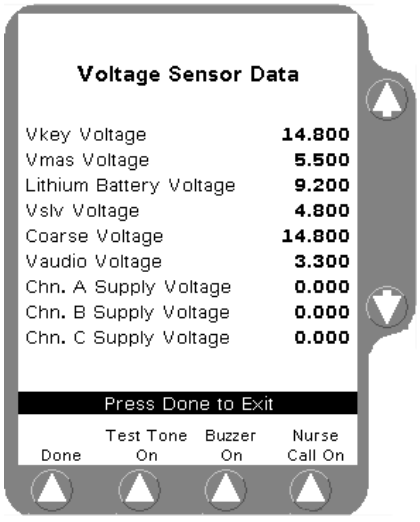


Figure 5-16 Typical Voltage Sensor Data Display

1. To test the pump's main alarm speaker, press the **Test Tone On** soft key.
2. To test the pump's backup beeper, press the **Buzzer On** soft key.
3. To test whether or not the Nurse Call signal is present, press the **Nurse Call On** soft key and refer to Chapter 10,"Operational Checkout" for details on completing this test.
4. When you are finished, press the **Done** soft key to return to the Service Features Menu.

Functional Test Mode

! WARNING ! **DO NOT USE FUNCTIONAL TEST MODE ON PATIENTS!**

Functional test mode is available on the following pumps:

- All Colleague 3 Pumps
- Colleague Pumps with UIM master software version 4.XX and higher

Functional test mode is a special mode for use only when testing the pump. In functional test mode, you have the option of disabling all alarms to prevent alarms from occurring while you are testing the pump. The Functional Test screen is shown in Figure 5-17.

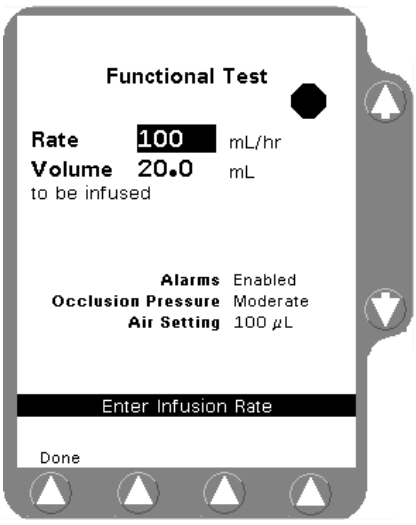


Figure 5-17 Functional Test Mode Setup Screen

To use functional test mode when testing the pump's operation, program the rate and volume appropriate for the test you are conducting, then choose whether to enable or disable the pump's alarms. You can also choose different settings for the downstream occlusion pressure detection and the air sensor. The pump reverts to the previously-configured settings when you exit functional test mode.

Channel Status

Select this menu option to display activity of pump module components, sensors, logical devices, and accessories (if present). The display highlights active or current conditions for each item. Figure 5-18 shows a typical display. Press the **Done** soft key to return to the Service Features Menu.

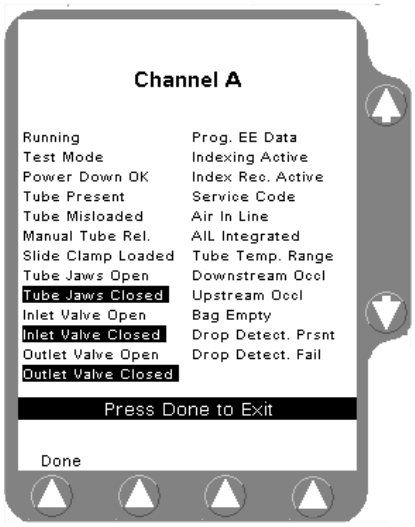


Figure 5-18 Typical Channel Status Display

Channel Raw Sensor Data

Select this menu option to display data from the sensors in the pump module. Figure 5-19 shows a typical display. Press the **Done** soft key to return to the Service Features Menu.

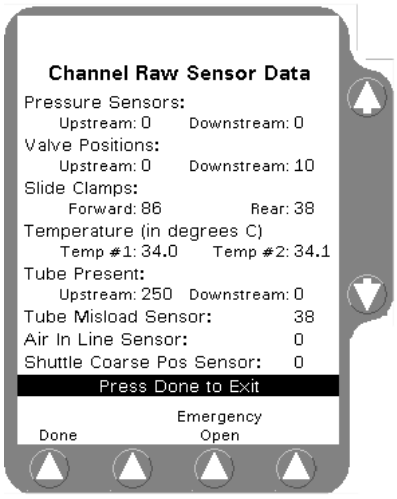


Figure 5-19 Typical Channel Raw Sensor Data Display

Post Processed Data (Manufacturing Only)

Select this menu option to display data from the pump module. Figure 5-20 is a typical post-processed data screen. Press the **Done** soft key to return to the Service Features Menu.

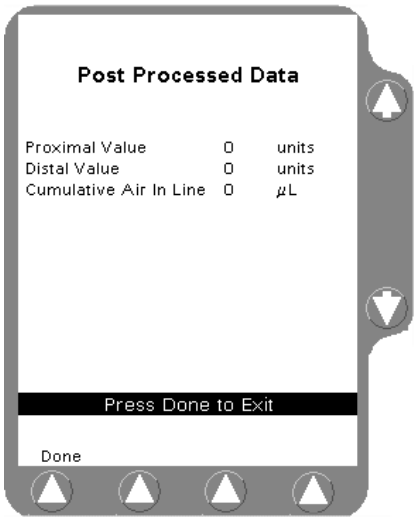


Figure 5-20 Typical Post Processed Data Display

Channel Calibration Constants (Manufacturing Only)

Select this menu option to display pump module calibration data. Figure 5-21 shows a typical display. Press the **Done** soft key to return to the Service Features Menu.

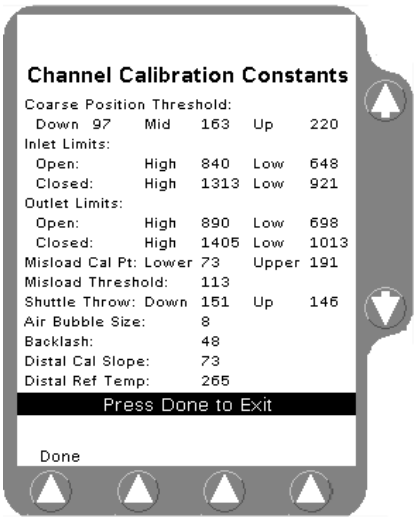


Figure 5-21 Typical Channel Calibration Constants Data Display

Transferring Device Configuration Data

The Device Configuration Transfer option on the Configuration/Service Menu lets you transfer configuration settings from one pump to another. You must use the Configuration Transfer Cable (product code 2M8155) to transfer configuration settings from one pump to another.

Configuration settings can be transferred between pumps as outlined in Table 5-9.

Table 5-9 Configuration Data Transfer Capability Matrix

	Target Version[6]															
Source Version	**4.01**[1]	**4.02**	**4.22**	**4.42**	**4.04**	**4.24**	**4.44**	**5.01**	**5.02**	**5.03**	**5.04**[8]	**5.05**[7]	**5.23**[7]	**5.25**[7]	**5.43**	**5.45**[7]
4.01[1]	X															
4.02		X	X	X	X	X	X			X	X	X	X	X	X	X
4.22		X	X	X	X	X	X			X	X	X	X	X	X	X
4.42		X	X	X	X	X	X			X	X	X	X	X	X	X
4.04		X	X	X	X	X	X			X	X	X	X	X	X	X
4.24		X	X	X	X	X	X			X	X	X	X	X	X	X
4.44		X	X	X	X	X	X			X	X	X	X	X	X	X
5.01								X	X	X	X	X	X	X	X	X
5.02								X	X	X	X	X	X	X	X	X
5.03[7]								X	X	X	X	X	X	X	X	X
5.04[8] Colleague Guardian								X	X	X	X	X	X	X	X	X
5.05[7]								X	X	X	X	X	X	X	X	X
5.23[7]								X	X	X	X	X	X	X	X	X
5.25[7]								X	X	X	X	X	X	X	X	X
5.43[7]								X	X	X	X	X	X	X	X	X
5.45[7]								X	X	X	X	X	X	X	X	X

Notes: These notes apply to all versions unless specifically indicated within the table.

1. If pumps have different versions, pump with earliest version must be the source and pump with later version must be target.
2. Version 4.XX: Configuration data **cannot** be transferred between Colleague and Colleague 3 pumps of the same version.
3. Version 5.XX and higher: Configuration data **can** be transferred between Colleague and Colleague 3 pumps.
4. Though configuration transfer between pumps with different user interface languages will work, it should be avoided because any custom labels configured in one language may not be understandable in other languages.
5. The Label Library of predefined drug labels in software version 5.03 and higher has been updated from previous software versions available for these pumps. When transferring the configuration from a pump with an older software version (4.02.xx and higher), the enabled/disabled status of predefined labels transfers to a pump with the 5.03 and higher software only if the label is one that is also included in the new label library. If an enabled label in the older configuration is no longer included in the new software's label library, the message Label library has changed! is displayed.
6. Pre-4.X.X Colleague pumps do not provide for custom labels. Attempting a transfer configuration data from a pre-4.X.X version Colleague pump to a 4.X.X version Colleague pump will corrupt the pump's label library.
7. The currently manufactured versions are 5.05, 5.25, and 5.45, which supersede obsolete versions 5.03, 5.23, and 5.43, respectively.
8. Version 5.04 includes the Colleague Guardian feature for monochrome pumps.

To transfer configuration settings:

Note: Ensure that the configuration transfer cable is secured to both pumps.

1. With both pumps powered off, connect the configuration transfer cable to the communications port on the rear of each pump.
2. Power both pumps on by pressing both ***ON/OFF CHARGE*** keys.
3. Enter the Configuration/Service Menu on both pumps.

Note: Be sure you know which pump is the source pump before beginning the transfer. If you designate the wrong pump as the source and execute the transfer, you will overwrite the configuration data that you were attempting to transfer.

4. Use the ⇧⇩ keys to highlight Device Configuration Transfer from the Configuration/Service Menu of both pumps, and press each pump's **Select** soft key. The Device Configuration Transfer screen is displayed (Figure 5-22).

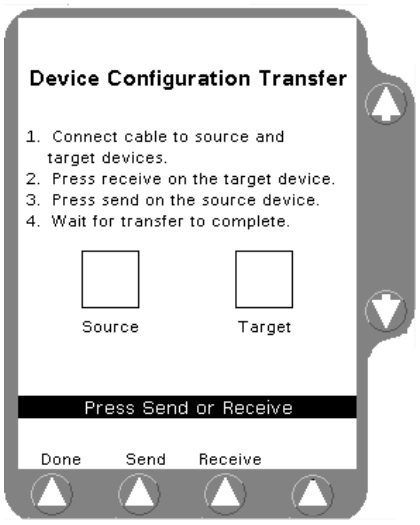


Figure 5-22 Typical Device Configuration Transfer Display

5. Follow the instructions displayed on each screen.

Note: If the ***Cancel*** soft key is pressed on the sending pump during a device configuration transfer, a Press Restart to Start Transfer Again message is displayed on the receiving pump along with ***Done*** and ***Restart*** soft keys. Pressing ***Restart*** displays the initial transfer screen. Pressing ***Done*** displays the Configuration/Service Menu.

6. When you are finished, press the **Done** soft key on each pump to return to the Configuration/Service Menu.

Note: Time and Date do not transfer from the source pump to the receiving pump. Manually set the time and date on the receiving pump as described in Setting the Time and Date, p. 5-57.

Caution **Failure to power off the pumps when finished can result in battery depletion and damage if the pump(s) are operating on battery power, because a battery low alarm will not occur when the pumps are in Configuration/Service mode.**

7. Power off both pumps by pressing their ***ON/OFF CHARGE*** keys.

Version 4.02 Software Upgrade Installation

Note: Version 4.02 Software Upgrade can only be installed on pumps equipped with Dual Battery Pack (as identified by Signature Rating Label no. 07-26-X1-903). Refer to "Adding a Second Battery (Colleague Pumps Only)," 8-38 for instructions on adding a second battery.

Note: Before performing an upgrade operation verify the pump's installed software version as shown in "Check Software Version," 10-6.

The Version 4.02 Software Kit (part no. 710726926A) offers the following features:

- **Additional 32 Custom Labels**. In addition to the 64 pre-configured drug labels, V4.02 allows another 32 custom labels to be added.
- **Standby Mode**. Enables the user to place a pump channel in Standby mode while the rest of the pump remains on. It also allows preprogramming of a pump channel without starting the infusion.
- **"Units/kg/hr Dose" Mode**. In addition to the 9 existing dose modes, V4.02 added a "units/kg/hr" dose mode (10 total modes).
- **Expanded Patient Weight Range**. Patient weight range for dose programming expanded from a maximum weight of 150 kg (330 lb) to a maximum weight of 600 kg (1322 lb).
- **Functional Test Mode**. Allows service personnel to perform flow accuracy tests without automatic KVO mode.
- **Channel Failure/ Volume History Access**. Allows access to the Volume History screen if a channel failure occurs.
- **Battery Charge Level Display Improvement**. Displays calculated "Amp Hours Left" and "# of Charge/Discharge Cycles" of the dual battery pack in the Battery and Pump History service screen.

The Version 4.02 Software Kit consists of the following:

- UI Master V4.02 PROM chipset U4 and U5
- UI Slave V3.06 PROM chip U65
- Channel (PHM) V2.04 PROM chip U12

Software Installation

Note: Under some circumstances, performing this procedure may result in the loss of custom configuration settings. Either transfer the configuration settings of the pump being upgraded to a suitable drone pump as described in "Transferring Device Configuration Data," 5-51, or manually document the settings (for manual re-entry) before performing this procedure.

1. If possible, transfer the configuration settings of the pump being upgraded to a suitable drone pump as described in "Transferring Device Configuration Data," 5-51.

Note: In the following steps, do not disconnect lithium battery connector P1. Disconnection will result in loss of event history data.

2. Replace the UIM PCB Master PROMs (U4 and U5) and the Slave PROM (U65) as described in "Master and/or Slave Software," 8-27. However, do not perform Operational Checkout tests at this time.

Note: Make certain removed software is fully segregated from new software to be installed.

3. Remove pump module(s) as described in "Pump Module," 8-60.

4. On the underside of each PHM, locate Channel PROM U12. (U12 is the only socketed chip on the PCB.)

5. Use the 32-pin Software Extractor (P/N 821980-1) to remove Channel PROM U12.

6. Install the upgrade Channel PROM. Verify that the chip is oriented properly in the socket.

7. Install the pump module(s) as described in "Pump Module," 8-60. However, do not perform Operational Checkout tests at this time.

8. With the pump upright and unplugged, power the pump on and verify that it completes the following self test. (The batteries must be in good condition for the self-test to complete as described.)
   - The Main Display lights up completely, followed by a completely dark screen, and then graphics appear.
   - All eight digits of the pump module display(s) momentarily fully illuminate.
   - The Battery icon lights up and remains lit, and all LEDs momentarily light up.
   - The backup beeper sounds two times (The beeps may be of very short duration).
   - The speaker tone sounds once.

9. Plug the pump in and verify that the AC (plug) icon lights and the Battery Icon extinguishes.

10. Verify that the Battery Charge Level Indicator (BCLI) reads full (all 10 segments of the display illuminated).

    - If the BCLI reads full, proceed to step 11.
    - If the BCLI reads half-full, perform steps 10.1 through 10.7 below.

    10.1 Open the front bezel as described in "Front Bezel Assembly," 8-10. However, do not disconnect any connections or remove the front bezel.

Note: In the next step, all history and configuration data will be lost when the lithium battery is disconnected. Back up the data by performing configuration data transfer to a drone pump as described in "Transferring Device Configuration Data," 5-51, or manually document the settings (for manual re-entry) before performing this step.

10.2 Disconnect lithium battery connector P1, then disconnect main battery connector P12.

10.3 Reconnect connectors P1 and P12.

10.4 Install the front bezel as described in "Front Bezel Assembly," 8-10.

10.5 After the pump is fully reassembled, access the Battery and Pump History screen as described on page 5-46.

10.6 Press the **New Battery** soft key to reset the battery information displayed on the Battery and Pump History screen.

10.7 Exit the Configuration/Service Menu by powering the pump off and back on again.

11. Perform the tests listed in the table on page 8-7 for both the Front Bezel Assembly and Pump Module Software. Record the results on a copy of the Operational Checkout Data Sheet.

Transfer the configuration settings stored in the drone pump to the pump being upgraded as described in "Transferring Device Configuration Data," 5-51.

Setting the Time and Date

The Time and Date option on the Configuration/Service Menu allows you to view and set the time and date. The clock is a 24-hour format. The date is in month, day, year format.

- In North America, the time and date are factory-set to the current date, United States Central Standard time, in U.S. format (MMDDYY).
- In EEC Countries, the time and date are factory-set to the current date, UK Greenwich Mean Time (GMT), in European format (DDMMYY).

To set the time and date:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Time and Date and press the **Select** soft key. The Set Time and Date screen is displayed (Figure 5-23).
3. Use the ⇧⇩ keys to highlight the field that you want to change. Change the value by doing one of the following:
   - Enter the new value using the numeric keypad.
   - Enter the new value using the **Increase/Decrease** soft keys.
4. To change the month, press the **Select Month** soft key and choose from the pop-up menu.
5. When you are finished, press the **Done** soft key to return to the Configuration/Service Menu.

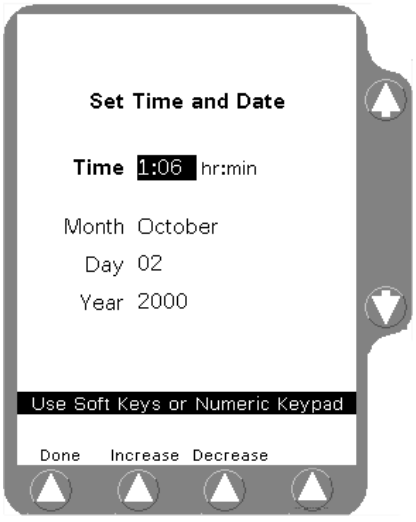


Figure 5-23 Typical Set Time and Date Display

Resetting the User Interface Language

For pumps with UIM Master Software versions 4.XX.00, 5.03.00, 5.05.00, 5.23.00, 5.25.00, 5.43.00 and 5.45.00, the Configuration/Service menu allows you to change the user interface language. The language must match the language of the pump's exterior labeling.

! WARNING ! **DO NOT CHANGE THE USER INTERFACE LANGUAGE TO OTHER THAN THAT OF THE PUMP'S EXTERIOR LABELS.**

To change the language setting if necessary:

1. Enter the Configuration/Service Menu.
2. Use the ⇧⇩ keys to highlight Language and press the **Select** soft key. A pop-up window showing the available languages is displayed (Figure 5-24).

Figure 5-24 Language Selection Pop-Up Window

3. Use the ⇧⇩ keys to highlight the language of the pump's exterior labels.
4. Press the **Select** soft key to select the language. To close the pop-up window without changing the language, press the **No Change** soft key.

Chapter 6

Routine Maintenance

Overview

This chapter contains the following routine maintenance procedures for the pump:

If an abnormal condition is discovered during routine maintenance, remove the pump from service and troubleshoot as described in Chapter 7. If unable to troubleshoot, contact your authorized service provider.

Routine Maintenance

Table 6-1 is a routine maintenance schedule for the pump. Perform the checks at the intervals shown.

Caution **If any evidence of damage is found, repair as necessary or contact your authorized service provider.**

Table 6-1 Routine Maintenance Schedule

Check	Action
Perform as required but recommended after every use	
Housings	Clean housing and front panel as recommended in the cleaning instructions. Check for cracks or large dents.
Labels	Clean as recommended in the cleaning instructions. Check for scratches, cuts, obliterated words, or missing labels. Replace as necessary.
Power cord	Verify that the entire length of the power cord and both molded connectors are free of damage. Power the pump on and check for intermittent power, indicated by panel flickering, by flexing the cable near the plugs. Replace the power cord if flickering occurs during flexure.
Feet	Verify that all four feet are present, free of significant cuts or deterioration, and securely fastened. Replace as necessary.
External connectors	Verify that there are no loose or missing parts, including caps, covers, and retainers, and that any attached accessories are free of damage.
Contrast and Volume controls	Verify that the controls are free of damage and rotate freely from stop to stop. ***Note:*** The thumbwheel may slip on its shaft at the ends of travel. This is acceptable as long as the control rotates properly throughout the range.
Mounting clamp knob and mechanism	Verify that the knob operates freely throughout its range of motion. Make sure that pads are present, and that the mounting clamp operates properly from stop to stop.
Main batteries	Pump should be plugged in whenever possible to maintain batteries at full charge. If batteries are not at full charge, recharge them by plugging the pump into a 100-120 VAC, 50/60 Hz or 220-240 VAC, 50/60 Hz power outlet for at least 12 hours. Check that the plug icon is illuminated during this time.
Perform as required but recommended monthly	
Main batteries	Charge as described in “Battery Care Information,” 6-5.
Perform as required but recommended once every 12 months	
Entire pump	Perform the operational checkout described in Chapter 10.
Power cord	Power the pump on and check for intermittent power, indicated by panel flickering, by flexing the cable near the plugs. Replace the power cord if flickering occurs during flexure.
Mounting clamp	Lubricate the threaded shaft with a 3 mm (1/8 inch) bead of Lubriko CW-606-B food machinery grease, then turn the mounting clamp knob to its stops (open and closed) for the length of the shaft.

Cleaning

Caution

Do not use hard instruments for cleaning.

Do not spray cleaners directly into the tubing channel, the bezel openings adjacent to the Volume and Contrast controls, or the area where the power cord enters the housing.

Do not submerge the pump in liquids of any kind.

Do not clean, disinfect, or sterilize any part of the pump by autoclaving or with ethylene oxide gas. Doing so may damage the pump and void the warranty. Only external parts of the pump should be disinfected.

Do not use the following chemicals on the pump, as they will damage the front panel: acetoaldehyde, acetone, ammonia, benzene, hydroxytoluene, methylene chloride, or ozone. Do not use cleaners containing n-alkyl dimethyl ethyl benzyl ammonium chloride.

Cleaning the Exterior

Clean the pump after each use with soapy water, a solution of 10% bleach and water, isopropyl alcohol (up to 95%), or a commercial cleaning solution that **does not** contain any of the ingredients listed above. Follow the manufacturer's dilution instructions for concentrated cleaners. Clean the exterior using a soft cloth sparingly dampened (**not** soaked) with cleaning solution. To clean pumps that have been in an isolation area, select a cleaner that cleans and disinfects.

Cleaning the Tubing Channel

If fluid enters the tubing channel, clean it as soon as possible using the following procedure. You will need isopropyl alcohol (up to 90%) and foam-tipped applicators (available from TEXWIPE; item TWTX 740).

1. Open the tubing channel by lifting the Manual Tube Release and rotating it counterclockwise (toward the front of the pump). The pump powers on and displays a Manual Tube Release alarm.
2. Press the ***Alarm Silence*** key to silence the alarm.
3. Inspect and gently clean all visible surfaces within the channel using a foam-tipped applicator moistened with up to 90% isopropyl alcohol. Use as many applicators as required.
4. To prevent solution from pooling and drying in the pumping mechanism, use a dry applicator to remove excess solution and alcohol immediately.
5. Close the tubing channel by rotating the Manual Tube Release fully clockwise. The **Done** soft key is displayed on the Main Display.
6. Press the **Done** soft key to reset the Manual Tube Release alarm.

If you cannot clean the tubing channel adequately, contact your authorized service provider for assistance.

Cleaning the Pump Assembly Prisms

This procedure should be performed when directed to by the corrective action presented in Table 7-7 on page 7-44. These codes may be caused by residue on the pump assembly prisms. There are four prisms in each pump module. The prisms are located on either side of the bottom portion of the Keyed On/Off Clamp slot. Use a flashlight to see the prisms if necessary. You will need two foam swabs and some distilled water.

Note: These failure codes may also be caused by improper seating of the flex cable in J12 of the PHM PCB. Remove and carefully reinsert the flex cable in J12 to ensure proper seating.

1. Power the pump off.
2. Use the manual tube release to open the pump mechanism. For Colleague 3 pumps, perform this procedure on all three pump modules.
3. Moisten a foam swab with the distilled water.

Caution **Do not use anything other than distilled water and a foam swab to clean the prisms. Cloth or cotton swabs may scratch the prisms' surfaces and anything other than distilled water may fog the prisms.**

4. Gently rub the prisms with the swab to clean off any residue.
5. Use the second swab to remove all water from the cleaning.
6. Close the jaws using the manual tube release.
7. Power the pump on and verify that the pump successfully completes its self-test. If the failure codes appear again, check the following:
   - Water may have seeped under the prisms during cleaning. Allow the pump to dry overnight or use a blow dryer set on cold to dry the pump mechanism.

Caution **Do not use hot air or attempt to dry the area using a cloth.**

   - Verify that the flex cable is properly seated in J12 of the PHM PCB. To access the interior of the pump module see page 8-60.
   - Replace the prisms. See "Slide Clamp Prism Replacement Procedure" on page 8-94.

Battery Care Information

The pump can be battery-powered in emergency situations and while transporting patients. When battery-powered, the Battery icon is lit. To check the charge level of the batteries, access the Battery Charge Level display via the Options Menu. See “Checking Battery Charge Level,” 4-5 for details.

The following information is intended to assist in optimizing the performance and service life of the Colleague infusion pump's primary batteries. Routine battery care enhances battery performance, which helps ensure optimal pump performance.

Battery Service Life

Service life is the time a battery can be discharged and recharged to useful capacity. While lead-acid batteries are rechargeable, in the course of use they gradually lose the chemical electrolytes needed to recharge them to useful capacity. When a battery reaches the point in its service life where it is no longer capable of being recharged to a level adequate to operate the device, it must be replaced.

Factors that most commonly affect battery life are as follows:

- Frequency of discharge/recharge

  A lead-acid battery has 68 or more full discharge/recharge cycles during its service life. The more often a battery is cycled, the sooner it requires replacement.

- Depth of discharge

  The more often a lead-acid battery is discharged to a low battery or deep discharge state, the sooner it requires replacement.

- Leaving batteries in a discharged condition

  If a battery is less than fully charged, and the pump is not connected to AC power, battery damage can occur within hours. In a less than fully charged state, the battery undergoes chemical changes that produce sulfate and lead precipitate. These chemical changes severely reduce the battery recharge capability.

Optimizing Battery Service Life

Ensuring the following procedures are a part of routine device use can optimize battery service life:

- Connect pumps to AC power at all times except in the event of AC power loss or short-term portable operation.
- Store pumps plugged in to AC power to maintain the battery charge whenever possible. See Table 6-2 on page 6-10 for information on the effects of temperature on the battery storage time.
- Notify Central Supply or other appropriate departments as soon as a pump is removed from patient use so that it can be cleaned and the battery can be recharged.
- Recharge a pump that is in the Battery Low alert condition for a minimum of 12 uninterrupted hours.

Battery Preventive Maintenance Program

The most reliable way to check the condition (capacity) of the pump's batteries at any time during their life is to measure discharge time. The batteries should provide an operating time of no less than 2.5 hours (Colleague pump) or 2 hours (Colleague 3 pump) from fully charged to Battery Depleted alarm when all channels infuse at 100 mL/hr on battery power. See "Verifying Battery Operation" on page 6-8 for the test procedure. Battery packs that do not pass the test are at the end of their service life and must be replaced. Implementing a program to replace the batteries prior to the projected end of their service life can reduce battery problems.

For additional information about lead-acid battery use in Baxter infusion devices, contact Baxter Medication Delivery Services at 1-800-THE-PUMP.

Charging the Batteries

The batteries are charging whenever the pump is plugged into a 100-120 VAC, 50/60 Hz or 220-240 VAC 50/60 Hz outlet, regardless of whether the pump is on or off. Whenever the batteries are charging, the Plug icon is lit. Store the pump plugged in to maintain batteries at full charge. In the event that the pump cannot be stored plugged in, charge the batteries at least once a month. See "Storage," 6-10 for more battery information.

In general, the more often the batteries are discharged and recharged, the sooner they will need to be replaced. **Batteries should only be replaced by Baxter authorized service personnel. Always replace both batteries at the same time, with two new batteries manufactured within three months of one another.**

Call your authorized Baxter Service Center (see "Warranty and Service Information," 10-1) to obtain replacement batteries (Baxter part number 5009480001).

1. To charge the batteries, with the pump off, plug the pump into an AC outlet.

   The AC Plug icon lights, indicating that the pump has sensed the presence of AC current.

2. Allow the batteries to charge for a minimum of 12 hours.

3. Press the ***ON/OFF CHARGE*** key.

   The Power On screen (Figure 6-1) is displayed. If eight or fewer boxes are filled, the batteries may need to be replaced, or the Battery Charge Level Indicator requires recalibration.

Note: Colleague pumps provide a graphic Battery Charge Level Indicator feature. This feature operates correctly only if the main batteries are not damaged or defective. To ensure that the batteries are fully charged, you must allow the batteries to charge until all 10 boxes of the Battery Charge Level Indicator are filled. It will take a relatively short time to fill the first 9 boxes, but it will take a relatively long time (an additional 8 to 11 hours) to fill the remaining one box. The Battery Charge Level Indicator is not an indication of the remaining operating time on battery, but should be used only during charging to determine one of three states of the batteries during the charging process: fully charged, partially charged, or empty.

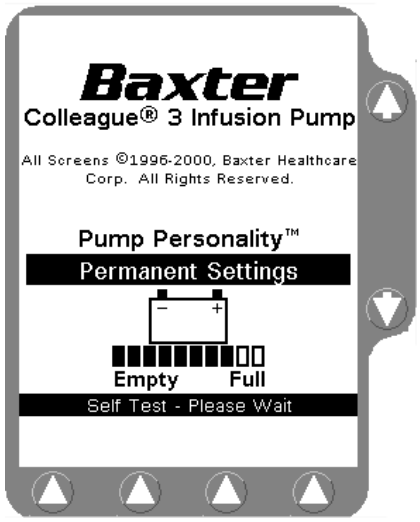


Figure 6-1 Power On Screen

Disposing of Used Batteries

The pump's sealed lead acid batteries should not be disposed of in the trash. They may be disposed of in accordance with local regulations or returned to your authorized Baxter Service Center marked "FOR DISPOSAL."

Verifying Battery Operation

As long as the batteries are not damaged, their run time gradually declines from 7 hours to not less than 2.5 hours over their warranted life. The rate of the decline in battery capacity, or run time, varies and is dependent to the greatest extent on the depth of each discharge and the number of discharge cycles. The deeper the discharge and the more often the batteries are discharged, the more rapid the degradation of the batteries. According to the battery manufacturer's information, a battery will permanently lose approximately 40% of its original capacity after being fully discharged (to a voltage level of 10.4 V) approximately 180 times. However, if the same battery is discharged to 50% of its capacity during each discharge cycle, this battery can undergo approximately 430 cycles before it will permanently lose 40% of its original capacity. A clear implication from this data is that in order to maintain the longest possible battery life, the pump's batteries should be charged as often as possible and the pump should be connected to AC power as frequently as possible. These statements and recommendations apply to the battery packs consisting of two batteries.

Note: Because it isn't possible to know the utilization history of each battery, the most reliable way to assess the condition of the batteries at any time during their life is to measure battery discharge time.

View the Battery and Pump History service screen to verify that the batteries installed in the pump can continue to be used.

1. Enter the Configuration/Service Menu.
2. Use the arrow keys to highlight Service Features.
3. Press the **Select** soft key. The Service Features Menu is displayed.
4. Select Battery and Pump History from the menu. Figure 6-2 shows and describes a typical screen display.
5. If the # of Charge/Discharge cycles is greater than 68, test the batteries.

   If the batteries have had one or more discharges below the alarm threshold, or if the performance of the batteries are suspect, test the batteries as follows:

   5.1 Charge the batteries until at least nine boxes on the Battery Charge Level Indicator are filled, or for a minimum of 12 hours if at least nine of the boxes are not filled.

   5.2 Unplug the pump, and power it on so it is operating on battery power.

   5.3 Set up an infusion, and program each pump module for a rate of 100 mL/hr and a volume to be infused of 300 mL.

   5.4 Start the infusion, and verify that the pump operates at 100 mL/hr for at least 2.5 hours (2 hours for Colleague 3 Pumps) before the Battery Depleted alarm occurs.

6. If a Battery Depleted alarm occurs before the time period elapses, replace the batteries.

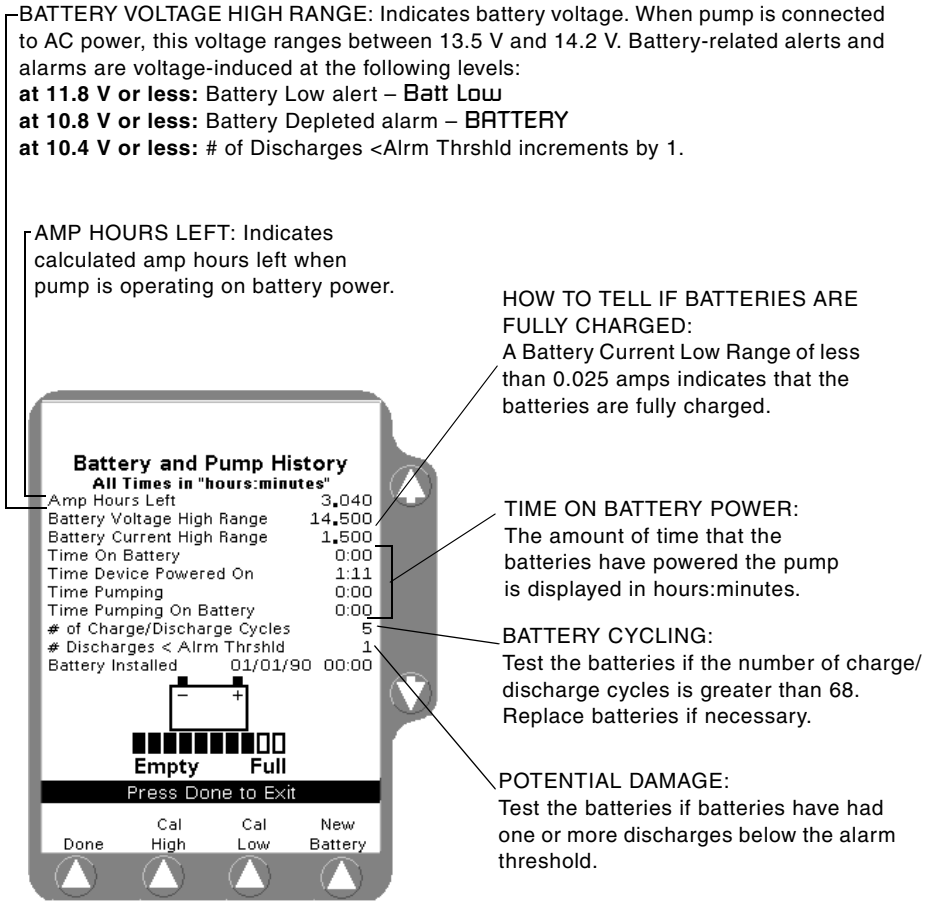


Figure 6-2 Typical Battery and Pump History Display

The times shown on the Battery and Pump History screen may differ from actual past usage if the lithium backup battery and main batteries were disconnected simultaneously, if the UIM board was replaced, or if certain failures occurred.

The # of Discharges < Alarm Thrshld and # of Charge/Discharge Cycles shown may not reflect real time. For example, if you are viewing this screen while charging the batteries, you may not see a change in the # of Charge/Discharge Cycles unless you exit the Battery and Pump History screen and then redisplay it.

Storage

Caution **Never store the pump unplugged and powered on. The batteries may discharge completely, permanently damaging them.**

Store the pump under the following conditions to maximize battery life.

- Whenever possible, store the pump with the power cord plugged into an AC outlet to maintain the batteries at full charge.
- Ideal storage temperature is normal room ambient conditions, at 30° C (86° F) or lower. Storing the pump at higher temperatures will not damage the batteries as long as the pump is plugged in during storage or the batteries are fully recharged at the intervals shown in the table below.
- Never store the pump with the ***ON/OFF CHARGE*** key ON and the pump unplugged. The batteries may discharge completely, permanently damaging them.
- If pumps must be stored unplugged, fully recharge their batteries at the intervals shown in the first row of the table below, according to the temperature of the storage area.
- Recharge spare batteries or batteries removed from pumps at the intervals shown in the bottom row of the table, according to the temperature of the storage area.

Table 6-2 Battery Storage Temperature

	Storage Temperature						
	-29° C (-20° F)	**10° C (50° F)**	**20° C (68° F)**	**30° C (86° F)**	**40° C (104° F)**	**50° C (122° F)**	**57° C (135° F)**
Maximum pump storage time without recharging batteries (batteries installed)	90 days	90 days	90 days	90 days	70 days	46 days	27 days
Maximum battery storage time (batteries removed from pump)	450 days	450 days	360 days	270 days	135 days	68 days	34 days

- Storing pumps at temperatures greater than 30° C (86° F) without recharging the batteries at the intervals shown in the table will hasten battery discharge, which may shorten the batteries' overall operating life.
- Pumps or batteries stored at temperatures below freezing (0° C or 32° F) must be warmed to room temperature before using the pump.
- When unpackaged, ensure the pump is stored in a clean and dry (20-95% RH, non-condensing) environment to safeguard against prolonged exposure to dust and moisture. In conditions falling outside the Environmental Operating Limits (see "Technical Specifications," 8-1), Baxter recommends that the pump be repackaged in the original shipping materials.

Chapter 7

Troubleshooting

Overview

This chapter contains the following troubleshooting information:

When you have isolated the cause of a problem using the procedures in this chapter, replace the assembly you believe to be malfunctioning as described in Chapter 8.

After you have repaired the pump, verify that it operates properly by performing the Operational Checkout procedure described in Chapter 10.

Service Information

For service and repair, use an authorized Baxter service provider. Additional service information may be provided to individuals who have undergone Baxter-authorized service training. For service and repair information for this product, contact your local authorized service center.

Troubleshooting Methods

This document provides instructions for troubleshooting the origin of problems to a single subassembly. When you have isolated the problem to a subassembly, replace the subassembly as described in Chapter 8, then return the faulty subassembly to Baxter for repair. Do not attempt to troubleshoot the individual components, or to repair circuit boards or other subassemblies unless instructed to do so by the procedure. The circuit boards are multi-layer and thus difficult to repair in the field.

Caution **When troubleshooting the pump, do not inject or apply signals unless the procedures in this document specifically instruct you to do so. Damage to the pump or its subassemblies could result.**

Note: Do not disconnect the main batteries and the lithium backup battery before reviewing or downloading the event history. Disconnecting main and backup batteries at the same time erases the event history from the pump's memory.

Categorizing Trouble Reports

If the trouble report accompanying a pump does not give specific details about the suspected problem, troubleshoot the pump using the procedure shown in Figure 7-1. If there is an explicit trouble report accompanying the pump, then troubleshoot using the procedure shown in Figure 7-2.

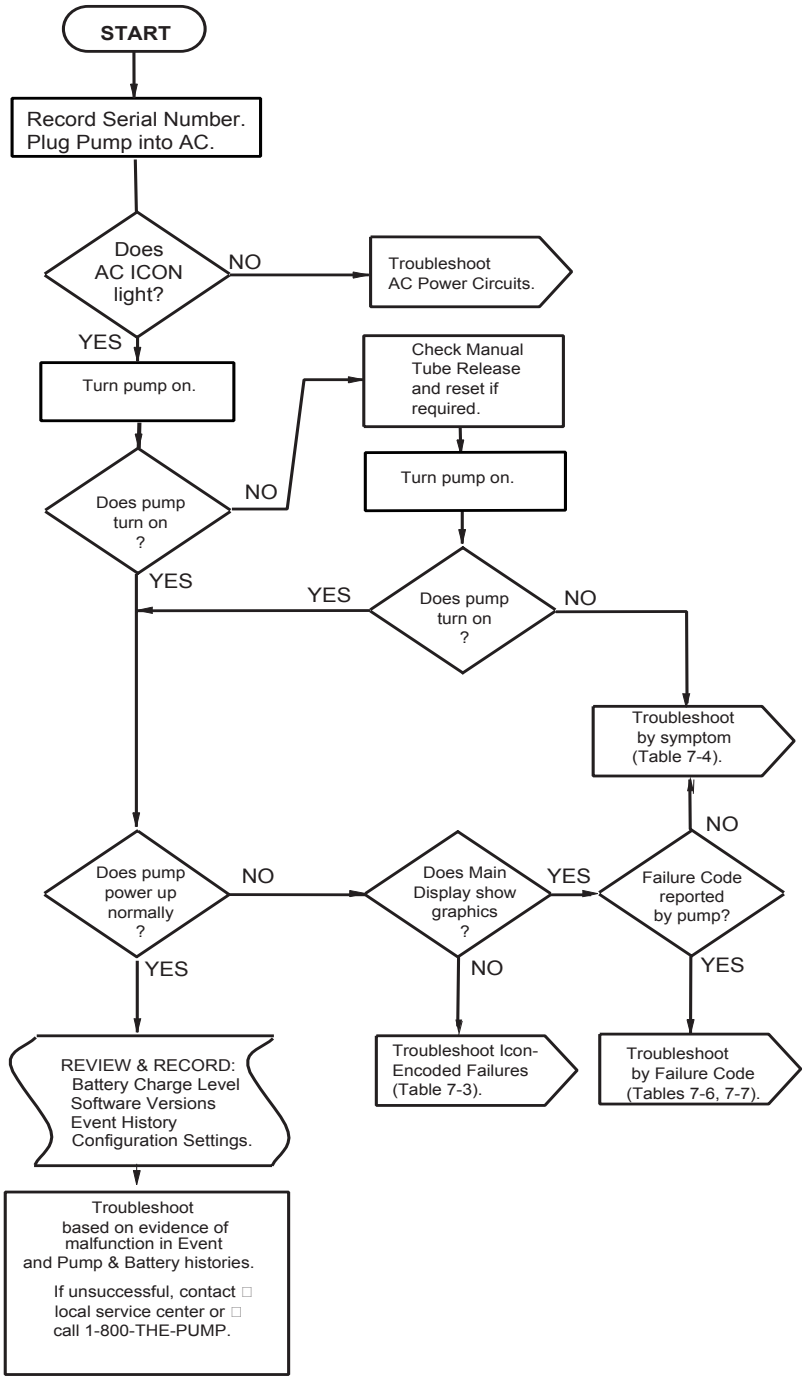


Figure 7-1 Troubleshooting Procedure for Pumps with Non-Specific Trouble Reports

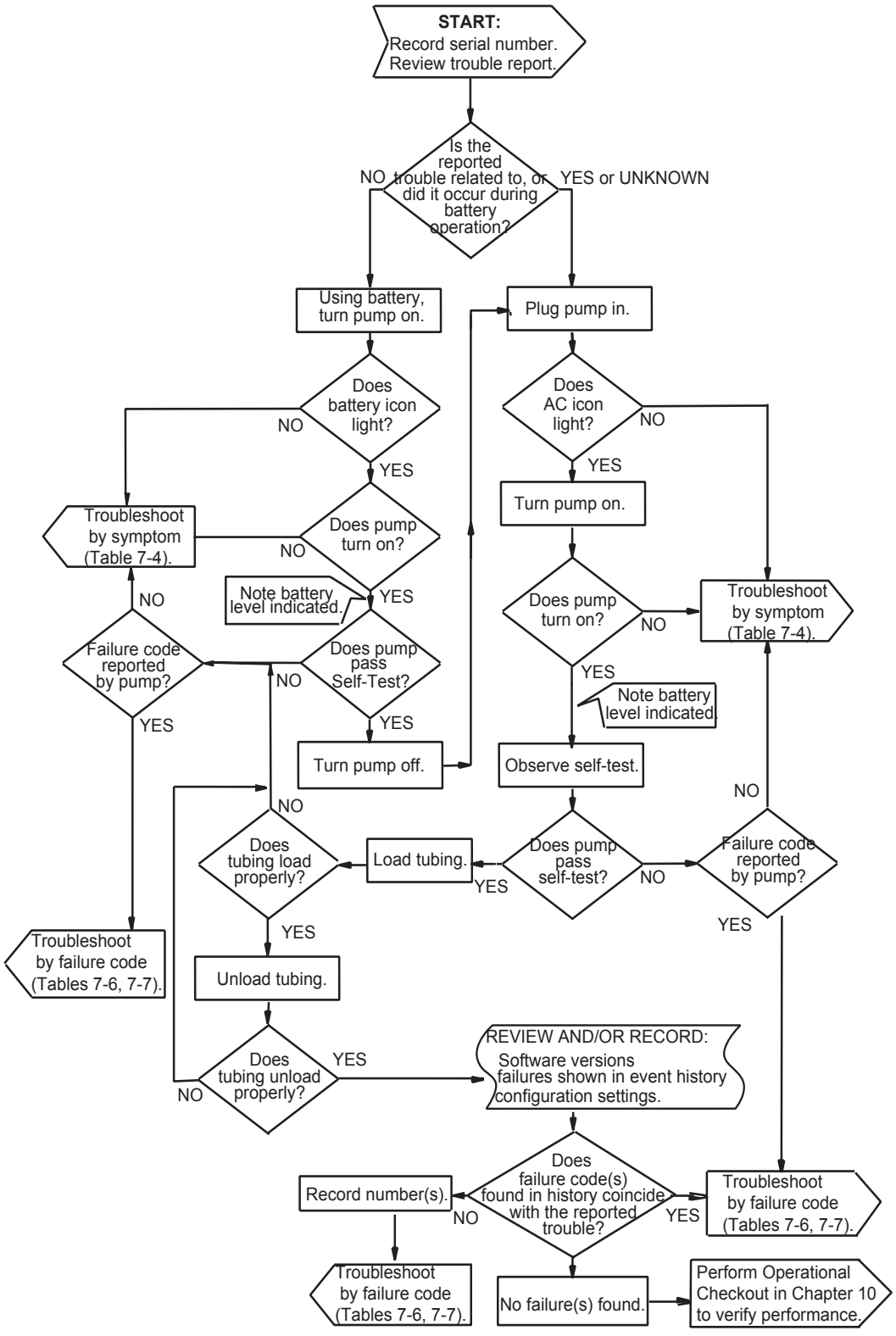


Figure 7-2 Troubleshooting Procedure for Pumps with Specific Trouble Reports

Generally, trouble reports can be categorized into one of three groups:

1. User-induced conditions

Before you begin troubleshooting, verify that the reported problem is in fact a pump failure and not a user-induced condition. User-induced conditions occur if a user performs an action unexpected by the pump, causing an alarm or failure. During troubleshooting, the condition can be re-created by repeating the user's actions.

Review the pump's event history log to determine the actions the user performed at the time of the reported malfunction. To preserve as much of the event history as possible, limit the number of key presses you make until you review the Power On screen, the Main Display, the Volume History screen, and the Event History. Do not press **New Patient** or **Change Personality** when reviewing these screens, particularly if the pump's 5-hour memory has not yet been cleared.

The pump may stop storing event data immediately after a failure code occurs. Event data storage resumes after failure code recovery.

2. Device Failures

Device failure codes, described in Table 7-6, are caused by a malfunction detected by the pump software, and may not be the result of user interaction. Device failures are indicated by a failure code on the Main Display and by the word FAILURE displayed on the Pump Module (Channel A on Colleague 3 pumps).

3. Pump Module Failures

Pump Module failure codes, described in Table 7-7, are caused by a pump module malfunction detected by the pump software, and may not be the result of user interaction. Pump Module failures are indicated by the word Failure on the pump module display and a corresponding failure code on the Main Display.

Final Check Outs

Troubleshoot failures to the faulty subassembly using the procedure outlined in Figure 7-2, then repair or replace the subassembly. Verify your repairs by performing the Operational Checkout in Chapter 10 or as required by the applicable Service Procedure.

Alert, Alarm, and Failure Message Displays

Alert, alarm, and failure messages are displayed at the top of the Main Display. An abbreviation of the message also appears on the pump module display.

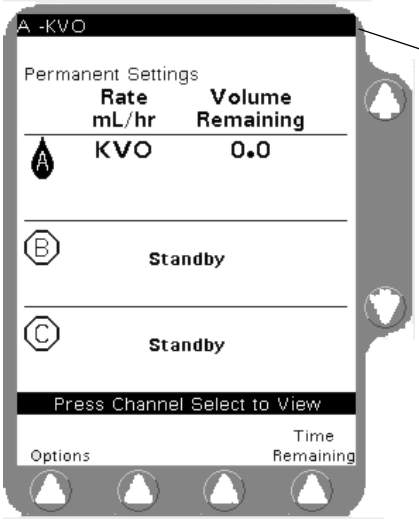


Figure 7-3 Alert or Alarm Message Display

Failures have priority over alerts and alarms. Alarms have priority over alerts. If two events occur simultaneously, the highest priority message is displayed and the highest priority alarm tone sounds.

All alarms are stored in the event history file for use in troubleshooting.

Event History

Note: Event history can be downloaded to a PC using the Event History Download Software Application (product code: 2M8317). Using a PC allows viewing the event history on the PC screen instead of the pump screen. See Chapter 4,"Accessories" for more information.

Up to 1000 events, including key presses, are stored in the pump's event history log. The history log can be used by trained, qualified personnel as a troubleshooting aid. To view the event history, access the Configuration/Service Menu as described below.

1. From the Main Display, press the **Options** soft key.
2. The Options Menu is displayed.
3. Use the ⇧⇩ keys to highlight Configuration/Service, then press the **Select** soft key.
4. At the Configuration/Service Passcode Entry screen, enter the passcode: ***8151***
5. Use the ⇧⇩ keys to highlight Event History.

6. Press the **Select** soft key.

   The Event History screen is displayed, allowing you to choose a detailed report and (if appropriate) the pump channel for which you want to see the history report. You can also choose to view the history for all events occurring on all three channels.

7. **Colleague 3 Pumps only:** Press the **Select Channel** soft key. A pop-up window displays the choices All, Channel A, Channel B, or Channel C.

8. Use the ⇧⇩ keys to highlight your choice, then press the **Select** soft key.

9. The detailed report is shown for the channel you selected. An example of a detailed event history report is shown in Figure 7-4.

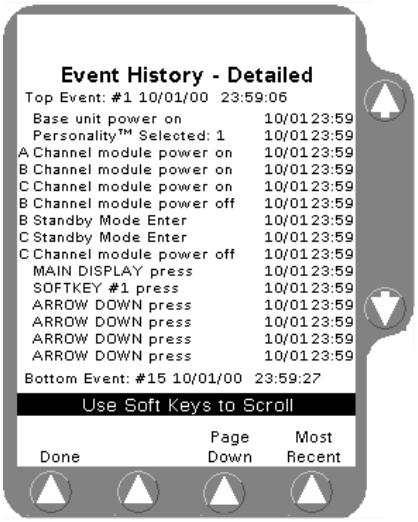


Figure 7-4 Example of Detailed Event History Report

10. Use the **Page Up**, **Page Down**, or **Most Recent** soft keys or the ⇧⇩ keys to scroll through the event history. Press the **Most Recent** soft key to quickly see the most recently stored event. On any page other than the first page, the **Oldest Event** soft key allows you to quickly return to the beginning (oldest) of the stored events display.

11. When you are finished, press the **Done** soft key to return to the Configuration/Service Menu.

Alerts

Note: If the pump has been configured to display a label on the pump module, the label alternates with the alert message on the pump module display. In this manual, the alternating display is indicated by a "/" mark.
Example: KVO.xx/Label.

Refer to the Operator's Manual for user corrective action to be taken when an alert occurs. Alert conditions may require user intervention, but do not stop the infusion and normally are not caused by a malfunctioning pump. Occurrence of an alert condition:

- Displays a message in the status line of the Main Display and on the pump module display
- Lights the yellow Alert LED located below the pump module display
- Sounds the alert tone (a single intermittent tone)

The alert tone can be silenced for two minutes by pressing the ***Alarm Silence*** key. If alerts appear to be occurring inappropriately refer to Table 7-1 for troubleshooting guidelines.

Table 7-1 Alert Messages, Causes and Corrective Actions

Main Display Message	Pump Module Message	Cause	Corrective Action
Advance Air	ADV AIR	The device is in Advance Air mode. The Advance Air message screen is displayed.	Advance air and remove the air bubble as described in the procedure detailed in the pump's Operator's Manual.
Battery Low	BATT LOW	The main batteries have discharged to 11.8 V. The batteries have approximately 30 minutes or less of infusion time left depending on the infusion rate and condition of the batteries.	**Caution** **Failure to plug the pump into an AC power supply when a Battery Depleted alert occurs may cause permanent damage to the batteries.** Plug the pump into an AC power source for at least 12 hours. To maintain optimum battery performance, do not allow the batteries to discharge completely. The pump should be connected to AC power as soon as possible after the occurrence of a Battery Low alert. If the batteries cannot be charged sufficiently, check the battery harness in use: • If harness (F069140020) is used, replace the batteries as described in "Main Batteries" on page 8-34. • If harness with protection circuit (F069180620) is used, verify F1 and F2 are intact. If not, replace the harness. Otherwise, replace the batteries as described in "Main Batteries" on page 8-34.

Table 7-1 Alert Messages, Causes and Corrective Actions — continued

Main Display Message	Pump Module Message	Cause	Corrective Action
Changing Piggyback Program	(x.x) (x.x=infusion rate)	The piggyback rate is being changed during a piggyback infusion.	Finish entering new piggyback data and press ***START*** key.
Changing Primary Program	(x.x) (x.x = infusion rate)	A primary rate or dose is being changed during an infusion.	Finish the primary data entry and press ***START*** key.
Channel Stopped	STOPPED	The device is on and the infusion is not running.	1. Select Primary or Piggyback, then complete the remaining programming steps. 2. Press the ***START*** key or power off the pump.
Lithium Battery Low	BATT LOW	The charge remaining in the lithium backup battery is low, or the lithium battery is disconnected.	Verify that the lithium backup battery is connected, or replace as described in "Backup Battery Assembly" on page 8-20.
KVO	KVO=x.x/ Label (x.x = infusion rate)	The Volume to be Infused has decremented to zero and the pump is infusing at the KVO rate (or the programmed rate, whichever is lower).	Prepare a new infusion or power off the pump.
Piggyback Callback at HH:MM	CALLBACK	The piggyback infusion has been completed and the pump has switched over to the primary rate or KVO. The callback feature was enabled.	Press the ***Alarm Silence*** key or any programming key if appropriate.
Priming	PRIMING	The **Prime** soft key is being pressed.	Release the **Prime** soft key after the administration set is primed.
Programming Piggyback	x.x (x.x = infusion rate)	Programming of a piggyback infusion is occurring during the primary infusion. The alert is a reminder to complete the piggyback program and start the piggyback infusion, if appropriate.	1. Complete the piggyback program. 2. Press the ***START*** key from any programming screen.

Alarms

Note: If the pump has been configured to display a label on the pump module, the label may alternate with an abbreviation of the alarm message shown in the status line of the Main Display. In this manual, the alternating display is indicated by a "/" mark. Example: `AIR/Label`.

Refer to Table 7-2 for corrective action to be taken when an alarm occurs. The occurrence of an alarm automatically stops the infusion. Immediate operator attention is required before the infusion can be restarted.

Occurrence of an alarm condition:

- Displays a message in the status line of the Main Display and on the pump module display.
- Flashes the red Alarm LED on the Pump Module
- Sounds the alarm tone (three beeps followed by a pause) repeatedly

The occurrence of an alarm overrides an existing alert condition.

The alarm tone (except for `BATTERY DEPLETED` alarms and device failures) can be silenced for two minutes by pressing the ***Alarm Silence*** key. To silence a `BATTERY DEPLETED` alarm, press the ***ON/OFF CHARGE*** key to power the pump off, or plug the pump into an AC power source to recharge the batteries, then restart the infusion.

To silence a device failure alarm, power the pump off then back on. If an alarm cannot be cleared by powering the pump off and back on again, perform the corrective action described in Table 7-2.

Table 7-2 Alarms, Causes and Corrective Actions

Main Display Message	Pump Display Message	Cause	Corrective Action
Air Detected Air Detected pop-up window	AIR/Label	An air bubble has been detected based on a configured setting.	Remove the air bubble per your approved care site procedures. Refer to the Operator's Manual for complete instructions on using the pump's Advance Air feature. If this alarm occurs while a fluid-filled tubing segment is loaded in the pump, check the AIL PCB calibration as described in "AIL PCB Calibration" on page 9-10 and recalibrate or replace AIL PCB as required. If alarm recurs with a new or newly calibrated AIL PCB, replace the pump mechanism as described in"Pump Mechanism" on page 8-66.
Battery Depleted	BATTERY	***Note:*** To maintain optimum battery performance, do not allow the batteries to discharge completely. The main batteries have discharged to 10.8 V. The batteries may be damaged if they are discharged below 10.4 Volts and held in that state for an extended period of time. While reaching the Battery Depleted alarm level in itself does not damage the main batteries, it does signify that 100% of battery capacity was discharged.	**Caution** **Failure to plug the pump into an AC power supply when a Battery Depleted alarm occurs may cause permanent damage to the batteries.** Colleague pumps with two batteries issue the Battery Low alert at least 30 minutes prior to issuing the Battery Depleted alarm. Plug the pump into an AC power supply as soon as possible. Continue with the current activity, or power the pump off by pressing the ***ON/OFF CHARGE*** key. Keep the pump plugged in and allow the batteries to charge for at least 12 hours. If after 12 hours of charging the alarm recurs, check the Battery and Pump History screen. If the # of Discharges Below Alarm Threshold is greater than 1, test the batteries as described in "Battery Discharge Test" on page 10-16. If necessary, replace the batteries as described in "Main Batteries" on page 8-34.
No display, 3-beep alarm tone	No display	The Battery Depleted alarm occurred for longer than 3 minutes.	Power pump off, plug pump into AC power, then power pump back on. After self test, restart pump from appropriate programming screen. (If pump is plugged in before it is turned off, the ***ON/OFF CHARGE*** key must be pressed twice to power the pump back on.)
Close Regulating Clamp	PATIENT-->>>	The ***Open*** key was pressed when administration set was loaded and the pump was powered on. The manual tube release was used and tubing remains in the tubing slot.	1. Close the regulating clamp and remove the keyed On/Off clamp from the On/Off clamp slot. 2. Reload the administration set, if desired. 3. If alarm recurs, replace the pump mechanism.

Table 7-2 Alarms, Causes and Corrective Actions — continued

Main Display Message	Pump Display Message	Cause	Corrective Action
Downstream Occlusion	DWN OCCL/ Label	A closed distal clamp, stopcock, clogged filter or other occlusion is downstream of the pump. Some combinations of administration sets and flow rates create higher than normal operating pressures. Pressure sensor malfunction	***Note:*** When the pump is configured for Auto Restart, it automatically restarts when the occlusion is removed within one minute after detection. Auto Restart is disabled if any key is pressed during a Downstream Occlusion alarm. ***Note:*** The pump establishes a baseline pressure of 0 psi when the tubing is loaded. The pump will not restart following a downstream occlusion alarm as long as the downstream pressure remains above the selected alarm threshold. Pressing the ***START*** key does not cause the pump to benchmark downstream occlusion pressure levels. 1. Clear the problem causing the occlusion, OR 2. Unload and reload the tubing, OR 3. Verify that the occlusion level setting is appropriate for your application and change the pressure setting if necessary, OR 4. Verify pressure sensor response linearity by performing the Downstream Occlusion Pressure Test provided in Chapter 10. If the pressure sensor response is not linear, replace the pump mechanism.
FAILURE, accompanied by a failure code	FAILURE	The pump has experienced an internal failure.	Record the failure code, then look up the failure code in Table 7-6 or Table 7-7 and perform corrective action indicated. Contact your local Baxter-authorized service provider for troubleshooting assistance if necessary.
Incomplete Piggyback/ Primary Program	STOPPED	The ***START*** key was pressed prior to entering or confirming programming information.	1. Enter the missing parameter value(s). 2. Press the **Confirm Settings** soft key, if required. 3. Press the ***START*** key.
Piggyback/ Primary Out of Range	STOPPED	A piggyback/primary value outside of the allowable range has been entered. This alarm appears as soon as the **Confirm Settings** soft key or the ***START*** key is pressed.	Verify the appropriate piggyback/primary values have been entered. Press the **Confirm Settings** soft key, if required, and the ***START*** key to start the infusion. If alarm recurs, the value range available in the current Personality feature set may not be broad enough to accommodate the entry. Check the current Personality feature set.

Table 7-2 Alarms, Causes and Corrective Actions — continued

Main Display Message	Pump Display Message	Cause	Corrective Action
Reset Manual Tube Release	RESET	The manual tube release was activated. The microswitch in the manual tube release is not being reset or is malfunctioning. If the pump does not respond when you press the **Done** soft key, and you cannot power the pump off as a result, the slave microprocessor in the UIM is not responding.	Completely remove the administration set and reset the manual tube release. Press the **Done** soft key. Open and close the manual tube release several times, making sure that it is turned fully clockwise to make sure the microswitch is activated. If the **Done** soft key is not available after resetting the manual tube release, replace the pump mechanism. ***Note:*** To prevent loss of configuration data, do not disconnect the lithium backup battery from the UIM PCB. To power the pump off, unplug it, remove the front bezel, and disconnect the main batteries only. Reconnect the batteries, close the front bezel, and perform the tests listed for the Front Bezel Assembly in Table 8-5. If alarm recurs, replace the UIM PCB.
Temperature Too High	TEMP HGH/ Label	The operating temperature of the administration set is outside the pump's design limits.	Move the pump to a suitable temperature environment, 15° to 38° C (59° to 100° F). Check solution temperature and ensure it is within suitable limits, 15° to 38° C (59° to 100° F).
Temperature Too Low	TEMP LOW/ Label	The operating temperature of the administration set is outside the pump's design limits.	Move the pump to a suitable temperature environment, 15° to 38° C (59° to 100° F). Check solution temperature and ensure it is within suitable limits, 15° to 38° C (59° to 100° F).
Tube Loading in Progress	LOADING/ Label	The administration set was not fully loaded in the tubing channel when the ***Start*** key was pressed. Obstruction in tubing channel.	1. Wait for the loading action to complete, then press the ***Start*** key from a programming screen. 2. Unload and reload administration set. 3. Check for foreign objects, dirt, or moisture in the tubing channel and clean if necessary. 4. Replace mechanism.
Tube Misloaded	CHK TUBE	Improperly loaded administration set or the administration set was not fully removed from the tubing channel. A hardware problem may have occurred.	1. Close administration set regulating clamp before removing tubing from the pump. 2. Remove the administration set. 3. Load the administration set properly (as described in Operator's Manual). 4. Press the ***Start*** key from a programming screen. 5. Check for foreign objects, dirt, or moisture in the tubing channel and clean if necessary. 6. If the alarm recurs after the tube loading procedure is performed properly, replace the pump mechanism as described in "Pump Mechanism" on page 8-66.

Table 7-2 Alarms, Causes and Corrective Actions — continued

Main Display Message	Pump Display Message	Cause	Corrective Action
Tube Not Loaded	NO TUBE	The administration set was not loaded prior to pressing the ***Start*** key.	1. Load the administration set, then press the ***Start*** key from a programming screen. 2. Use the manual tube release to remove the administration set. Press the ***Open*** key to reset the alarm. 3. Check for foreign objects, dirt, or moisture in the tubing channel and clean if necessary. 4. If the pump will not load the tubing properly, or if the alarm occurs when the tubing is loaded properly, replace the pump mechanism as described in "Pump Mechanism" on page 8-66.
Upstream Occlusion	UPOCCL/ Label	Tubing is occluded between the source container and the pump.	1. Verify source container is adequately pierced by the spike on the administration set and properly vented. 2. Inspect the administration set above the pump for closed clamps or kinks. 3. Ensure that any **Buretrol** sets or source containers are vented. 4. Press the ***START*** key to restart the infusion. 5. Unload and reload the tubing several times. 6. If alarm recurs, test as described in "Upstream Occlusion Test" section of Chapter 10. If pump fails to pass the test, replace the pump mechanism as described in "Pump Mechanism" on page 8-66.
Tube Misloaded when no tubing is loaded	CHK TUBE	A misloaded tube is not removed within 30 seconds after a Tube Misloaded alarm occurred. Reset Manual Tube Release pop-up is displayed. Tubing is removed after Reset Manual Tube Release pop-up. **Done** soft key is pressed to clear pop-up.	Manually reload tubing, then press the ***Open*** key to automatically unload the tubing.

Icon-encoded Failures

Some failures caused by a faulty UIM PCB are indicated by abnormal illumination of the Computer Control, Monitor, and Battery icons. When the pump is first powered on, if no graphics appear on the Main Display and the icons continuously display any of the combinations shown in Table 7-3 instead of the normal power-on self-test, replace the UIM PCB.

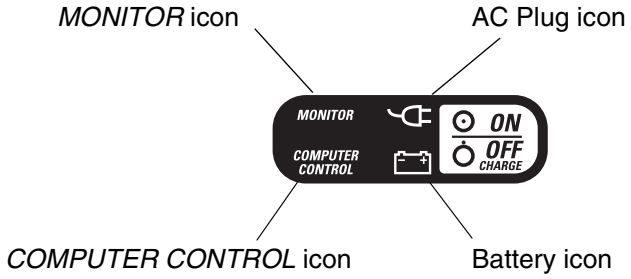


Table 7-3 *Icon-encoded Failures of the UIM PCB*

COMPUTER CONTROL **Icon**	***MONITOR*** **Icon**	**Battery Icon**	**Cause**
OFF	OFF	ON (with pump plugged in to AC power)	Internal CPU error
OFF	ON	OFF	ROM Checksum error
OFF	ON	ON	RAM check error
ON	OFF	OFF	LCD Controller or RAM failure

Troubleshooting by Symptom

If the pump exhibits any of the symptoms listed in Table 7-4, follow the troubleshooting instructions provided. Instructions for replacing pump assemblies are provided in Chapter 8.

Table 7-4 Troubleshooting by Symptom

Symptom	Check	Corrective Action
Unintended shutdown or power on.	View the event history to check whether the pump was turned off or on inadvertently.	If there is no record that the operator turned the pump off or on and the insulator is installed between the flex cables at UIM PCB P4, contact your local service provider for technical assistance.
	Verify that the flex connector (UIM PCB P4) has an insulator installed.	Install the insulator between the flex connectors inserted at UIM PCB P4 and then perform the keypad check as outlined in "Keypad and PANEL LOCKOUT Switch Test," 10-8. If the test fails contact your local service provider for technical assistance.
Keypad does not function	Press the Panel Lockout button on the rear of the pump. The lockout button may have been inadvertently pressed thus deactivating the pump's keypad.	If the lockout icon is displayed, press the Panel Lockout button. If the pump does not react to keypad button presses verify keypad operation as outlined in "Keypad and PANEL LOCKOUT Switch Test," 10-8. If the test fails repair/replace as required.
The pump cannot be turned on when plugged into a known good AC outlet (AC Icon is lit).	Press ***ON/OFF CHARGE*** key a second time to verify full contact.	If pump still does not power on, continue checking.
	Check that the manual tube release is fully closed.	Reset the manual tube release. Rotate the manual tube release fully clockwise and close the tab. Then press the **Done** soft key. Check the Event History for other failure codes and repair as required.
	Check the main batteries (see Table 7-8 on page 7-62 for battery alerts and alarms).	Recharge or replace the main batteries.
	Check the keypad interconnections and check for keypad malfunction.	Repair keypad interconnections. Replace Front Bezel and keypad assembly.
	Check the UIM PCB interconnections for open circuits.	Restore interconnection. Repair or replace cable harness.
	Check the UIM PCB.	Replace the UIM PCB per "Replacement of the User Interface Main PCB Assembly," 8-14.

Table 7-4 Troubleshooting by Symptom — continued

Symptom	Check	Corrective Action
The pump cannot be turned on when powered by main batteries (AC Icon not lit).	Press ***ON/OFF CHARGE*** key a second time to verify full contact.	If pump still does not power on, continue checking.
	Check that the manual tube release is fully closed.	Reset open manual tube release and press the **Done** soft key.
	Check the main batteries (see Table 7-8 on page 7-62 for battery alerts and alarms).	Recharge or replace the main batteries.
	Check the main battery fuse/harness for discontinuity and proper interconnection.	Check the Event History for other failure codes and repair as required. Replace the main battery fuse/harness.
		Repair or restore interconnection.
The pump cannot be turned off.	Check that the front panel is unlocked.	Press the PANEL LOCKOUT button to unlock if necessary.
	Check that the manual tube release has been reset.	Reset the manual tube release several times.
	Check that the UIM peripheral software is version 3.06 or greater.	If it is, proceed to the next step.
		If it is not, upgrade the UIM software to the current revision.
	Check if the pump was powered on for the first time following reconnection or replacement of the main and backup batteries.	Open the Front Bezel Assembly and disconnect the main and backup batteries. Reconnect all batteries and power the pump back on. Try the key again.
	If failure recurs, check the keypad interconnections for open circuits.	Repair or replace cable harness.
		Replace keypad as described in “Front Bezel and Keypad” on page 8-26.
	Check the UIM PCB.	Replace the UIM PCB per “Replacement of the User Interface Main PCB Assembly” on page 8-14.
One or more keypad key presses are not accepted.	Check that the front panel is unlocked.	Press the PANEL LOCKOUT button to deactivate.
	Check configuration mode/Personality Feature Set selection.	Refer to Operator’s Manual to ensure the function is available for the operation intended.
	Verify that the key’s function(s) is appropriate for the operation intended.	
	Perform Keypad Test (accessed through the Configuration/Service Menu, Service Features option).	Replace keypad as described in “Front Bezel and Keypad” on page 8-26.
	Check the UIM PCB interconnections for open circuits.	Repair or replace cable harness.
	Check the UIM PCB.	Replace the UIM PCB per “Replacement of the User Interface Main PCB Assembly” on page 8-14.

Table 7-4 Troubleshooting by Symptom — continued

Symptom	Check	Corrective Action
PANEL LOCKOUT button presses are not accepted.	Verify that PANEL LOCKOUT can be initiated from the current screen. ***Note:*** The PANEL LOCKOUT button is active only when the pump is running with no alerts/alarms.	Refer to Operator's Manual to ensure the function is available for the operation intended.
	Check operation of the PANEL LOCKOUT button by performing the Keypad Test.	Replace the PANEL LOCKOUT switch as described in "PANEL LOCKOUT Switch" on page 8-48, or troubleshoot/replace the wiring harness assembly.
	Check PANEL LOCKOUT switch harness for discontinuity.	Replace the UIM PCB per "Replacement of the User Interface Main PCB Assembly" on page 8-14.
	Check the UIM PCB.	
Battery Icon is lit when the pump is plugged into AC (AC Icon off).	Check AC power available at outlet.	Use a different outlet.
	Check the external AC power fuses.	Replace fuses if necessary.
	Check power cord.	Replace power cord per "Power Cord," 8-30.
	Check the fuse on the AC input of the Power Supply Module.	Replace the fuse if necessary.
	Check Power Supply Module.	Replace the "Power Supply Assembly" on page 8-40 and calibrate.
	Check the UIM PCB interconnections for discontinuities.	Restore interconnection.
		Repair or replace cable harness.
	Check the UIM PCB.	Replace the UIM PCB per "Replacement of the User Interface Main PCB Assembly" on page 8-14.
Battery Icon is off while pump is being powered by the main batteries (pump is unplugged and pump is powered on).	Check interconnections between the UIM PCB and the LED PCB.	Power the pump off then on again. If condition recurs, repair or replace wiring harness.
	Check LED PCB Assembly.	Replace the LED PCB as described in"LED PCB Assembly" on page 8-21.
	Check UIM PCB.	Replace the UIM PCB per "Replacement of the User Interface Main PCB Assembly," 8-14.
Battery Icon is off while the pump is being powered by the main batteries, but lights momentarily during Self-Test.	Check the UIM PCB.	Replace the UIM PCB per "Replacement of the User Interface Main PCB Assembly," 8-14.
Main Display appears blank when pump is powered on (screen is all black or white with no graphics or characters displayed).	Check Contrast Control setting.	Adjust the Contrast Control. If problem recurs, proceed to the following symptom.
	Check Back Light on.	Turn Back Light on by pressing the ***Back Light*** key.
	Check Display Assembly.	Replace faulty Display Assembly.

Table 7-4 Troubleshooting by Symptom — continued

Symptom	Check	Corrective Action
Contrast Control has little or no effect.	Check control switch and interconnections. ***Note:*** Some slippage at ends of rotation (stops) is normal.	Restore interconnections or replace contrast control and harness assembly.
	Check Display interconnections.	Restore interconnections or replace ribbon cable.
	Check Display Module.	Replace Display Module.
	Check UIM PCB.	Replace the UIM PCB per "Replacement of the User Interface Main PCB Assembly" on page 8-14.
Back Light does not light when pump is powered on.	Power Back Light on by pressing the ***Back Light*** key.	
	Check Back Light circuit interconnections.	Restore interconnection; repair or replace harness.
	Check Cold Cathode Fluorescent Tube (CCFT) assembly.	Replace CCFT Assembly per "Inverter PCB Module" on page 8-22 or replace Main Display Module per "Main Display Assembly" on page 8-16.
	Check Inverter PCB and interconnections.	Restore interconnections; replace Inverter PCB per "Inverter PCB Module" on page 8-22.
	Check UIM PCB.	Replace the UIM PCB per "Replacement of the User Interface Main PCB Assembly" on page 8-14.
Back Light does not light or does not turn off when ***Back Light*** key is pressed.	Check for keypad malfunction by performing the Keypad Test.	Replace Front Bezel and keypad assembly per "Front Bezel and Keypad" on page 8-26.
Alarm LED is lit continuously during an alarm, or does not extinguish when there is no alarm.	Power the pump off then on again. If condition recurs, check PHM keypad assembly and flex cable interconnection.	Replace PHM keypad assembly per "Pump Module Keypad" on page 8-87. Replace pump mechanism per "Pump Mechanism" on page 8-66.
Alarm LED does not light when an alarm occurs.	Power the pump off then on again. If condition recurs, check PHM keypad assembly and flex cable interconnection.	Replace PHM keypad assembly per "Pump Module Keypad" on page 8-87. Replace pump mechanism per "Pump Mechanism" on page 8-66.
Alert LED is lit continuously during an alert, or does not extinguish when there is no alert.	Power the pump off then on again. If condition recurs, check PHM keypad assembly and flex cable interconnection.	Replace PHM keypad assembly per "Pump Module Keypad" on page 8-87. Replace pump mechanism per "Pump Mechanism" on page 8-66.
Alert LED does not light when an Alert occurs.	Power the pump off then on again. If condition recurs, check PHM keypad assembly and flex cable interconnection.	Replace PHM keypad assembly per "Pump Module Keypad" on page 8-87. Replace pump mechanism per "Pump Mechanism" on page 8-66.

Table 7-4 Troubleshooting by Symptom — continued

Symptom	Check	Corrective Action
Running LED is lit when pump is not running.	Power the pump off then on again. If condition recurs, check PHM keypad assembly and flex cable interconnection.	Replace PHM keypad assembly per "Pump Module Keypad" on page 8-87. Replace pump mechanism per "Pump Mechanism," 8-66.
Running LED does not light while pump is running.	Power the pump off then on again. If condition recurs, check PHM keypad assembly and flex cable interconnection.	Replace PHM keypad assembly per "Pump Module Keypad," 8-87. Replace pump mechanism per "Pump Mechanism" on page 8-66.
Audible tone on constantly, AC Icon on.	Check for failure code on Main Display. Reset manual tube release. ***Note:*** If you power the pump off and are unable to power it on again, check the manual tube release and reset if necessary.	Record the failure code number, then power the pump off. Troubleshoot by failure code. Rotate manual tube release fully clockwise, close the tab and press **Done**. Pump turns itself off after manual tube release is reset. If none of the previous actions allows you to silence the pump, see symptom "Audible tone on constantly, AC Icon off" on page 7-22.
Audible alarm does not sound when an alarm occurs.	Perform the Speaker Test in the Operational Checkout Section. Check Speaker Circuit interconnections and speaker's continuity.	Restore interconnections. Replace Rear Harness assembly. Replace UIM PCB per "Replacement of the User Interface Main PCB Assembly," 8-14.
One or more tones is not heard during Power On sequence (AC Icon on).	Perform "Speaker and Backup Beeper Test," 10-9; check appropriate interconnections. ***Note:*** The first two tones are heard from the Backup Beeper; the final tone is heard from the main speaker.	Restore interconnections. Replace malfunctioning components: • Speaker and Harness assembly • Backup Beeper and Harness assembly • UIM PCB.
Backup Beeper tone is on constantly, failure code is displayed, and FAILURE is displayed on PHM display(s) (AC Icon on).	Record failure code number; check that manual tube release is closed and tab is fully pressed in. Reset manual tube release if necessary. Power pump off.	Troubleshoot by failure code. See Table 7-6 or Table 7-7.
Tube Misloaded alarm occurs with no tubing present.	Occurs if tubing was **NOT** removed during a previous Tube Misloaded alarm, then was removed after the Manual Tube Release screen was displayed, and then the **Done** soft key was pressed after the manual tube release was reset.	Manually open the jaws, insert the tubing and manually close the jaws. Press the ***Open*** key, then remove the tubing.
Tube Misloaded alarm occurs frequently and/ or multiple alarms occur while loading tubing.	Check tightness of tube loading motor securing screws by performing "Tube Loading Motor Mounting Inspection/ Gear Tightening Procedure," 8-78.	Open pump module and tighten tube loading motor screws to 5 kgf-cm (4.3 lb-in) as described in "Tube Loading Motor Mounting Inspection/ Gear Tightening Procedure," 8-78.

Table 7-4 Troubleshooting by Symptom — continued

Symptom	Check	Corrective Action
Pump does not complete power on sequence. The Main Display does not display any graphics (AC Icon on).	Check "Icon-encoded Failures of the UIM PCB," 7-15.	Troubleshoot as described in "Icon-encoded Failures of the UIM PCB," 7-15.
Three-beep alarm tone sounds and no visual displays are present, including LEDs.	Pump has been in Battery Depleted alarm for more than 3 minutes, and all displays have shut down to conserve power.	Plug the pump in to an AC outlet to power the pump from AC and to charge the batteries. ***Note:*** Failure to do so may cause permanent battery damage. ***Note:*** Plugging the pump in without also powering it off just silences the alarm tone. The pump does not power off unless you press the ***ON/OFF CHARGE*** key. Power pump off by pressing the ***ON/OFF CHARGE*** key. Power the pump back on by pressing the ***ON/OFF CHARGE*** key again.

Table 7-4 Troubleshooting by Symptom — continued

Symptom	Check	Corrective Action
Audible tone on constantly, AC Icon off.	Check for a failure code on Main Display.	Record the failure code number, then power the pump off. Troubleshoot by failure code.
	Check that the pump is operating from AC power.	Plug the pump into an AC outlet, record any failure code, then power the pump off. Charge batteries and check their condition. If pump does not power off, rotate manual tube release fully clockwise, close the tab fully, and press the **Done** soft key. Pump turns itself off after manual tube release is reset. Repeat several times if the **Done** soft key is not available after resetting the manual tube release.
	Power the pump off using the ***ON/OFF CHARGE*** key. ***Note:*** If you power the pump off and are unable to power it on again, check the manual tube release and reset if necessary.	To silence the alarm tone, verify that manual tube release is reset, then press and hold the ***ON/OFF Charge*** key. When second tone is heard, release the key. Press ***ON/OFF Charge*** key again within 5 to 8 seconds. Tone is silenced and pump turns off. ***Note:*** All information stored in pump memory will be lost if P1 is disconnected. If none of the previous actions silences the pump, open the front bezel and disconnect the P2 (power) connector from the UIM PCB. If this does not silence the pump, disconnect lithium backup battery connector P1.

Table 7-4 Troubleshooting by Symptom — continued

Symptom	Check	Corrective Action
The Battery Charge Level Indicator does not increment after extended charging period (AC Icon on).	Ensure AC outlet is good and power is continuous. View Battery and Pump History screen. ***Note:*** 25 mA or less indicates fully charged batteries. Higher current levels indicate battery charging in progress.	Use a different outlet. Check battery fuse; replace as necessary. If charging current is >25 mA and does not decrease with time, check Battery Charge Level Indicator calibration as described in "BCLI Calibration Procedure" on page 9-6. Test or replace both main batteries. For Colleague pumps with 4.XX UIM software, and all Colleague 3 pumps: if the Battery Charge Level Indicator is half full with 1.9 Ah left at <25 mA, remove all power (AC, Main and Lithium batteries) from the UIM for 10 seconds, then reconnect and power on again. ***Note:*** All pump history will be lost. ***Note:*** Colleague pumps with UIM software of any revision before 4.01 assume only one battery is installed. Therefore the "Amp Hours Left" value will be 1.9 Ah (maximum) even if two batteries are installed.

Table 7-4 Troubleshooting by Symptom — continued

Symptom	Check	Corrective Action
Configuration transfer between two pumps was unsuccessful.	Check cable connections between pumps.	
	Verify that pump UIM Master software versions are compatible. See "Transferring Device Configuration Data," 5-51 for information on software compatibility for configuration transfer.	Configuration transfers between pumps with different UIM Master software versions can only be performed when the older software is used as the source pump, and the constraints listed in "Transferring Device Configuration Data," 5-51 are met.
	If, after verifying that you performed the procedure correctly, it still does not work properly, use an ohmmeter to verify continuity between the following pins of the configuration transfer cable: • Pin 2 on one end to pin 3 on the other end • Pin 3 on one end to pin 2 on the other end • Pin 5 on one end to pin 5 on the other end	Repair or replace the configuration transfer cable.
	If there are no open circuits in the cable, check the following: • communications port on the back of each pump (J108) • internal communication connectors (J117, P117)	Repair/replace harnesses as required.
	• RS232 connector on the UIM PCB (J12).	Replace UIM PCB if J12 is damaged.
	• (newer pumps) ISOCOM board	Replace ISOCOM board.
R118 on the UIM PCB is burnt (underside, immediately below U66 and U4).	If fuse F103 is removed from its holder ensure that both contacts are fully within their part of the fuse holder.	Disconnect the power connector from P2 prior to removing F103 to preclude shorting to ground. Replace R118.
F3 on UIM PCB is blown.	Verify that the keyed connector of the power cable is oriented correctly in relation to UIM PCB P2.	Replace F3 and properly orient power connector to P2 prior to insertion.
	Verify that there is no loose metal debris to act as a short from power to ground.	Replace F3. Ensure that all fasteners are securely fastened and that there is no debris left in the chassis prior to powering the pump on.

Troubleshooting by Failure Codes

A failure overrides all alerts and alarms. The detection of a pump failure automatically stops any infusion. When a failure occurs:

- FAILURE is displayed on the pump module(s).
  Failure XXX:YY...Y is displayed on the Main Display.
- The Alarm LED is lit continuously.
- A continuous audible tone sounds.

The XXX is the failure code and the Ys represent additional data to be used to further diagnose the failure. Record this data *exactly* as it is displayed. If it is a device failure code, take the pump out of service immediately, and troubleshoot as described in Table 7-6. If the failure is a pump module failure, troubleshoot as described in Table 7-7.

If you are unable to troubleshoot and repair the problem using the information in this manual, or if your pump displays a failure code not listed in Table 7-6 or Table 7-7, record the failure code and contact your local service provider for technical assistance.

As shown in Table 7-5, failure codes fall into ranges identifying the general cause of the failure.

Table 7-5 *Description of Failure Code Ranges*

Failure Code Ranges	Description
0 to 196	Internal software failures detected by the master software.
197	Verified memory attribute corrupted.
198	Verified Memory PROM Upgrade or software incompatibility.
199	Verified Memory CRC Check Failed. Configuration memory has been corrupted.
200 to 399	Hardware diagnostic failures detected by the master software.
400 to 499	Slave related failures detected by the master software.
500 to 699	Slave related failures reported by the slave software.
700 to 799	Communications problems between the pump module and the user interface module.
800 to 899	Pump module failures reported by the pump module software.

Table 7-6 describes the corrective action to take for UIM failure codes. Table 7-7 describes corrective action to take for pump module failure codes. Except where indicated, the numbers listed are the first of a set of numbers in the form of (xx)x:(xxx:xxx:xxxx) for failure codes 1 through 599 and xxx:xx for series 700 and 800 failure codes.

Note: For failure codes 1 through 599 the last set of xs can be from four (typical) to eight characters.

Table 7-6 User Interface Module Failure Codes

Code	Failure Focus	Error Name/Condition	Corrective Action
Note: If your pump displays a failure code not listed in Table 7-6 or Table 7-7, record the entire failure code and contact your local Baxter authorized service center for additional troubleshooting information. Unlisted failure codes are indicated as xx in the following table.			
1:xxx:xxx:xxxx	Software	Array Out Of Range. Message to UIM failure.	Power off then on. If failure code recurs, replace UIM PCB.
4:xxx:xxx:xxxx	Software	Selection Statement Default	Close manual tube release, power the pump off and then on. If failure code recurs, replace UIM PCB.
6:xxx:xxx:xxxx	Software	Null Pointer Assignment	Power off then on. If failure code recurs, replace UIM PCB.
7:xxx:xxx:xxxx	Software	Too Many Enable Labels.	Power off then on. If failure code recurs, replace UIM PCB.
9:xxx:xxx:xxxx	Software	Divide By Zero.	Power off then on. If failure code recurs, replace UIM PCB.
12:xxx:xxx:xxxx	Software	Invalid value in RAM.	Power off then on. If failure recurs, remove the power connections from the UIM PCB for five minutes. Reinstall the connections then power the pump on. If failure code recurs, replace the UIM PCB. Check for corrosion on the UIM to PHM cable connector contacts. Clean as required. Reset the manual tube release, then power the pump off and back on again. If failure code recurs, replace UIM PCB.
12:303:984:xxxx	Software	Indicates that a communications packet was not fully transmitted within one second of transmission initiation.	Power power off then back on. Upgrade the pump's software to the current version.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
12:323:xxx:xxxx	Software	Event History shows too many key presses occurring in a short time, particularly in the Service screen when the arrow keys may be used frequently. Multiple operation of manual tube release when PANEL LOCKOUT was active.	Power off then on, and try to allow more time between key presses. Verify that there is no corrosion on the UIM to PHM cable connector contacts. Clean as required. Verify that the UIM to PHM cable has no intermittent connections. If intermittents are found replace the cable. Verify proper seating of the UIM to PHM cable connectors. Verify that the PHM keypad ribbon is not shorted to the subplate. If a short is found replace the cable. Verify that there are no solder bridges connecting traces on the UIM PCB. Reset the manual tube release, then power the pump off and back on again. If failure recurs, contact your local Baxter service center. If failure code recurs, replace UIM PCB.
13:xxx:xxx:xxxx	Software	Out of Memory	Power off then on. If failure code recurs, replace UIM PCB.
15:xxx:xxx:xxxx	Software	CRC Var Failed (refers to safe variable, Possible RAM failure)	Power off then on. If failure code recurs, replace UIM PCB.
16:xxx:xxx:xxxx	Software	Memory failure. Message to UIM failure. Insert to list failed.	Cycle power to the pump. If failure code persists replace UIM PCB.
16:336:928:0000	Software	Upon completion of configuration data transfer, one pump is returned to normal mode while the transfer cable is still connected.	Disconnect the transfer cable and cycle power to the pump.
18:xxx:xxx:xxxx	Software	Invalid Parameter	Manually reset the configuration of the v4.xx drone and perform transfer again.
18:111:1223:xxxx	UIM software	Occurs on pumps with UIM master software version 4.01 or greater that receive configuration data from a pump with version 4.01 or greater that previously received a configuration transfer from a pump with pre-4.01 UIM master software.	Perform a configuration data transfer to a pump with UIM master software version 4.01 or greater from a known good pump running UIM master software version 4.01 or greater.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
18:115:413:0000	UIM software 1.01.00, 1.02.00, 1.03.00, 2.01.00, 2.02.00	User entered the value of 0.1 for patient weight in kg and “low” is displayed for lbs.	Cycle power to the pump. If failure code persists replace UIM PCB.
18:115:450:0000	UIM software 1.01.00, 1.02.00, 1.03.00, 2.01.00, 2.02.00	User entered the value of 0.1 to 0.4 for patient weight in lbs and “low” is displayed for kg.	Cycle power to the pump. If failure code persists replace UIM PCB.
18:115:417:0000	UIM software 3.03.00, 3.04.00	User entered the value of 0.1 for patient weight in kg and “low” is displayed for lbs.	Cycle power to the pump. If failure code persists replace UIM PCB.
18:115:454:0000	UIM software 3.03.00, 3.04.00	User entered the value of 0.1 to 0.4 for patient weight in lbs and “low” is displayed for kg.	Cycle power to the pump. If failure code persists replace UIM PCB.
18:115:499:0000	UIM software 4.01.00, 4.02.00, 4.23.00, 4.44.00	User entered the value of 0.1 for patient weight in kg and “low” is displayed for lbs.	Cycle power to the pump. If failure code persists replace UIM PCB.
18:115:536:0000	UIM software 4.01.00, 4.02.00, 4.23.00, 4.44.00	User entered the value of 0.1 to 0.4 for patient weight in lbs and “low” is displayed for kg.	Cycle power to the pump. If failure code persists replace UIM PCB.
18:115:898:0000	UIM software 5.23.00, 5.43.00	User entered the value of 0.1 for patient weight in kg and “low” is displayed for lbs.	Cycle power to the pump. If failure code persists replace UIM PCB.
18:115:935:0000	UIM software 5.23.00, 5.43.00	User entered the value of 0.1 to 0.4 for patient weight in lbs and “low” is displayed for kg.	Cycle power to the pump. If failure code persists replace UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
18:115:1083:xxxx	5.xx.00 UIM software	Occurs when the values for Rate are less in the active Personality feature set (PFS) than the values in the functional test mode (FTM) for the following situations: • When entering FTM from within a PFS • When the ***Start*** key is pressed during FTM ***Note:*** Permanent Settings PFS values do not generate this failure code.	Perform one of the following procedures: • Enter the Personality Configuration screen, enter the Configuration Menu screen for the relevant PFS, record the current Rate Limit and Volume to be Infused values, change Rate to 1200 mL/hr and Volume to 9999 mL, press the **Done** softkey, power the pump off then on, enter the FTM from this PFS and continue with testing. After testing has been completed change the relevant PFS Rate and Volume limits back to their values as recorded. • Press the **Change Personality** softkey during the power up sequence, select Permanent Settings as the PFS to use ensuring that the **Select** softkey is pressed once this PFS is highlighted, enter the FTM and continue with the testing. After testing, reconfigure the pump back to the desired default PFS. • Enter the Personality Configuration screen, examine the profiles of the other PFSs listed and find one that has higher Rate and Volume values than the FTM values, configure the pump to either make this PFS or the Permanent Settings PFS the Power On Default Personality, power the pump off then on, enter the FTM and continue with the testing. After testing, reconfigure the pump back to the desired default PFS.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
18:115:1293:xxxx	UIM software version 5.xx.00	Occurs when the values for Volume are less in the active Personality feature set (PFS) than the values in the functional test mode (FTM) for the following situations: • When entering FTM from within a PFS • When the ***Start*** key is pressed during FTM ***Note:*** Permanent Settings PFS values do not generate this failure code.	Perform one of the following procedures: • Enter the Personality Configuration screen, enter the Configuration Menu screen for the relevant PFS, record the current Rate Limit and Volume to be Infused values, change Rate to 1200 mL/hr and Volume to 9999 mL, press the **Done** softkey, power the pump off then on, enter the FTM from this PFS and continue with testing. After testing has been completed change the relevant PFS Rate and Volume limits back to their values as recorded. • Press the **Change Personality** softkey during the power up sequence, select Permanent Settings as the PFS to use ensuring that the **Select** softkey is pressed once this PFS is highlighted, enter the FTM and continue with the testing. After testing, reconfigure the pump back to the desired default PFS. • Enter the Personality Configuration screen, examine the profiles of the other PFSs listed and find one that has higher Rate and Volume values than the FTM values, configure the pump to either make this PFS or the Permanent Settings PFS the Power On Default Personality, power the pump off then on, enter the FTM and continue with the testing. After testing, reconfigure the pump back to the desired default PFS.
18:200:xxx:xxxx	UIM software version 5.xx.00	Occurs when RAM U2 and U3 cannot be accessed by the UIM microprocessor.	Power the pump off, open the front bezel and disconnect the batteries to the UIM PCB for at least five minutes. Reassemble the pump and power it on. Verify the event history download function still works properly. If the error recurs replace the UIM PCB.
18:407:1143:0000	UIM software	Occurs when attempting to view the Label Library setup of a personality that has Library Setup enabled but the power-on default personality has the Library Setup disabled.	Power on the default personality that has the Library Setup enabled before attempting to view the Label Library of the desired personality.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
18:416:xxx:xxxx	UIM software	Occurs when RAM U2 and U3 cannot be accessed by the UIM microprocessor.	Power the pump off, open the front bezel and disconnect the batteries to the UIM PCB for at least five minutes. Reassemble the pump and power it on. Verify the event history download function still works properly. If the error recurs replace the UIM PCB.
19:113:xxx:xxxx	UIM software	Occurs when RAM U2 and U3 cannot be accessed by the UIM microprocessor.	Power the pump off, open the front bezel and disconnect the batteries to the UIM PCB for at least five minutes. Reassemble the pump and power it on. Verify the event history download function still works properly. If the error recurs replace the UIM PCB.
21:xxx:xxx:xxxx	Software	Safe Variable Failed	Power off then on. If failure code recurs, replace UIM PCB.
36:416:xxx:xxxx	UIM software	RAM U2 and U3 cannot be accessed by the UIM microprocessor.	Power the pump off, open the front bezel and disconnect the batteries to the UIM PCB for at least five minutes. Reassemble the pump and power it on. Verify the event history download function still works properly. If the error recurs replace the UIM PCB.
38:xxx:xxx:xxxx	Software	Invalid State May occur when entering the Configuration/Service Menu after a pump module failure.	Exit the Configuration/Service Menu and try to restart pump module. Power pump off and back on. If failure code recurs, repair the pump module and attempt to enter the Configuration/ Service Menu again. If failure recurs, replace the UIM PCB.
39:xxx:xxx:xxxx	Software	Out of Timers	Power off then on. If failure code recurs, replace UIM PCB.
41:113:xxx:xxxx	UIM software	RAM U2 and U3 cannot be accessed by the UIM microprocessor.	Power the pump off, open the front bezel and disconnect the batteries to the UIM PCB for at least five minutes. Reassemble the pump and power it on. Verify the event history download function still works properly. If the error recurs replace the UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
100:0:0:0000	UIM software	Defective RAM on UIM PCB.	Power the pump off, open the front bezel and disconnect the batteries to the UIM PCB for at least five minutes. Reassemble the pump and power it on. Verify the event history download function still works properly. If the error recurs replace the UIM PCB.
197:xxx:xxx:xxxx	At Power Up	Verified Memory Attribute Corrupt.	Power pump off and back on. If failure code recurs, troubleshoot and replace software and/or UIM PCB.
198:xxx:xxx:xxxx	At Power Up	Verified Memory PROM Upgrade or software incompatibility ***Note:*** It is normal for this alarm code to occur the first time the pump is powered on after software (Master, Slave, or Pump Module) is upgraded.	Power pump off and back on. If failure code recurs, troubleshoot and replace software and/or UIM PCB.
199:xxx:xxx:xxxx	Following a total power loss	Verified Memory CRC Check Failed; batteries may have been damaged by deep discharge. Configuration memory has been corrupted. May occur when pump is powered on following loss of AC and battery power, or after UIM PCB replacement. ***Note:*** Deep discharge of batteries may reset Personality feature sets to the "Permanent Settings" defaults and may reset the Battery and Pump History Screen information.	Power pump off and back on. If failure code recurs, perform "Verifying Battery Operation," 6-8 and replace batteries if necessary. Troubleshoot Battery Circuits and repair as required. Reprogram the pump if configuration information was lost.
200:xxx:xxx:xxxx	80186 faulty	Hardware initialization failure	Power off then on. If failure code recurs, troubleshoot. Replace UIM PCB if required.
201:xxx:xxx:xxxx	80186 faulty	Internal CPU Timer 0	If only one occurrence in Event History (EH), cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
202:xxx:xxx:xxxx	80186 faulty	Internal CPU Timer 1	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
203:xxx:xxx:xxxx	80186 faulty	Internal CPU Timer 2	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
204:xxx:xxx:xxxx	80186 faulty	Internal CPU Serial 0	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
205:xxx:xxx:xxxx	80186 faulty	Internal CPU Serial 1 (RS-232 Port)	Troubleshoot and replace wiring harness. Replace UIM PCB.
206:xxx:xxx:xxxx	MSM62X42B Clock	Init RTC	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
207:xxx:xxx:xxxx	16550D UART	Init Serial	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
301:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Intr Divide Error	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
302:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Intr Unexpected	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
303:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Port 1	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
304:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Port 2	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
305:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Serial 0	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
306:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Serial 1	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
307:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Timer 0	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
308:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Timer 1	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
309:xxx:xxx:xxxx	80186 internal	Diagnostic CPU Timer 2	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
310:xxx:xxx:xxxx	UPD71055 Parallel port	Diagnostic CPU Port 0	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
311:xxx:xxx:xxxx	UPD71055 Parallel port	Diagnostic CPU Port 1	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
312:xxx:xxx:xxxx	Ongoing ROM Check	Diagnostic ROM CRC	Check PROMs U4 and U5. Replace U4, U5, UIM PCB.
313:xxx:xxx:xxxx	MSM62X42B Clock	Diagnostic RTC 1 Hz	Verify that connector at P12 of UIM PCB is securely connected. Replace UIM PCB.
313:425:xxx:xxxx	Poor continuity	Check for continuity between pins U67-1 and U41-78. Check that all front bezel ground connections are secure.	Tighten all ground connections. Verify that the display shield is well grounded. If continuity exists replace the UIM PCB.
314:xxx:xxx:xxxx	Software	Diagnostic real time heap is corrupted.	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
314:432:201:0000	Software	Data heap corrupted. Pointer check to ends of memory bytes show incorrect values compared.	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
315:423:514:1111	Software	Diagnostic Real Time Kernel Stack Overflow	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
316:xxx:xxx:xxxx	RAM	Diagnostic Safe Var Corrupted	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
317:xxx:xxx:xxxx	16550D UART	Diagnostic Serial A	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
320:xxx:xxx:xxxx	MSM62X42B Clock	Diagnostic RTC	If only one occurrence in EH, cycle power to the pump. If failure code recurs, replace the UIM PCB. Perform the Standard Functional Test completely. If any memory failure occurs, replace the UIM PCB.
321:xxx:xxx:xxxx	Manual tube release	UIM check of manual tube release switch indicates manual tube release is not fully closed during power-up. Occurs with UIM master software versions earlier than 4.XX when there is no response from the MTR switch when a channel is closing or opening. Global software (UIM Master version 4.XX) displays the MTR popup instead of the 321 code. UIM master software determined the UIM Parallel Interface Unit (PIU) and PHM PIU software do not match. MTR activated during pump head activity or MTR fault	Check if UIM to PHM ribbon cable is seated properly at UIM PCB. Check J12 flex cable. Check for mechanical obstruction that prevents the MTR switch from actuating. Reset manual tube release several times. If failure recurs, replace the pump mechanism. Verify that the PHM-to-UIM cable is securely seated and continuity exists end-to-end. Repair/replace as required. Replace the UIM PCB. Verify operation of MTR switch. Replace the PHM if the MTR switch is defective.
400:xxx:xxx:xxxx	Slave Communications	Slave Communication Failure	Check U65 PROM, troubleshoot and replace U65, UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
401:xxx:xxx:xxxx	Slave Communications	Slave Communication Init Fail	Check U65 PROM, troubleshoot and replace U65, UIM PCB. ***Note:*** All history and configuration data will be lost when batteries are disconnected. If unable to power off the pump during this failure, unplug AC power and disconnect main and backup batteries for approximately 30 seconds, then reconnect.
		U65 not seated correctly or damaged.	Power pump off. Remove and inspect the physical condition of U65: • If damaged, replace U65. • If not damaged, reseat U65 in its socket. Ensure that the chip is oriented correctly so that it contacts all pins of the socket.
		Socket for U65 is damaged.	Replace the UIM PCB.
402:xxx:xxx:xxxx	Slave Communications	Slave Communication Nak Fail	Check U65 PROM, troubleshoot and replace U65, UIM PCB. ***Note:*** All history and configuration data will be lost when batteries are disconnected. If unable to power off the pump during this failure, unplug AC power and disconnect main and backup batteries for approximately 30 seconds, then reconnect.
403:xxx:xxx:xxxx	Slave Communications	Slave Communication Time-out Fail	Check U65 PROM, troubleshoot and replace U65, UIM PCB. ***Note:*** All history and configuration data will be lost when batteries are disconnected. If unable to power off the pump during this failure, unplug AC power and disconnect main and backup batteries for approximately 30 seconds, then reconnect.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
500:xxx:xxx:xxxx	Stuck key	Any key *except* ***ON/OFF CHARGE*** key pressed for more than 50 seconds If the key becomes stuck or is pressed for more than 50 seconds and the pump has been plugged into AC but remains powered off, the UIM slave chip is active and this failure can occur immediately after the pump is powered on (the key press will not be recorded in event history). Otherwise, the key press or stuck key will only cause this failure if the key is active for more than 50 seconds after the pump has been powered on (the event history will record the key press).	Troubleshoot and replace keypad circuits if failure is not the result of holding the key down for more than 50 seconds.
501:xxx:xxx:xxxx	Stuck key	Peripheral software version 3.03 or greater: ***ON/OFF CHARGE*** key pressed for more than 50 seconds Peripheral software versions less than 3.03: ***ON/OFF CHARGE*** key pressed for more than 5 seconds	Replace keypad circuits if failure is not the result of pressing the key too long. Verify that there is no corrosion on the UIM-to-PHM cable connector contacts. Clean as required.
502:xxx:xxx:xxxx	Software	Invalid battery voltage or current data	Cycle power to the pump and check the event history after the pump has been powered on for at least an hour. • If the error recurs periodically, replace the UIM Slave PROM (U65). • If the error recurs after power on, during performance testing, and final testing replace the UIM PCB.
503:xxx:xxx:xxxx	Power On/Off circuit	Beep Enable lines are the same. Improper power down sequence.	Troubleshoot and replace UIM PCB.
507:xxx:xxx:xxxx	Keypad Circuit	General keypad read failure	Troubleshoot/replace keypad interconnections and pump module cable connections.
511:xxx:xxx:xxxx	Main Power Supply	V_{Key} power supply failure	Troubleshoot and replace UIM PCB.
512:xxx:xxx:xxxx	Main Power Supply	Slave Main Power Supply or the main batteries are out of range	Troubleshoot and replace the power supply, main batteries, or UIM PCB as required.
513:xxx:xxx:xxxx	Main Power Supply	Main Power Supply voltage too high	Troubleshoot, replace, and/or calibrate Power Supply; replace UIM PCB.
514:xxx:xxx:xxxx	Battery Charge Level Indicator	A/D, Low True RMS current readings are bad	Troubleshoot, replace, and/or calibrate UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
515:xxx:xxx:xxxx	Battery Charge Level Indicator	A/D, High True RMS current readings are bad	Troubleshoot, replace, and/or calibrate UIM PCB.
516:xxx:xxx:xxxx	Battery Charge Level Indicator	A/D, High True RMS voltage readings are bad	Troubleshoot, replace, and/or calibrate UIM PCB.
517:xxx:xxx:xxxx	Battery Charge Level Indicator	A/D, Low True RMS voltage readings are bad. Pump was repeatedly switched between AC and battery power (check event history to verify).	Check battery condition per "Battery Check," 10-8. Troubleshoot, replace, and/or calibrate UIM PCB.
522:xxx:xxx:xxxx	Audio Circuits	Speaker and/or Speaker Circuit failure	Check speaker wiring harness and rear housing harness, troubleshoot and replace UIM PCB.
526:xxx:xxx:xxxx	Software	Memory has been corrupted or the number of channels does not match that in the power up notification message.	Cycle power to pump. If error recurs replace the UIM PCB.
528:xxx:xxx:xxxx	Power Supply, CPU	Could not obtain valid readings	Troubleshoot and replace power supply, UIM PCB.
529:xxx:xxx:xxxx	Noise, Master/ Slave Comm	Three or more errors communicating with UIM Master	Replace UIM PCB.
530:xxx:xxx:xxxx	Audio Circuits	Speaker and/or Speaker Circuit noisy	Check speaker wiring harness and rear housing harness, troubleshoot and replace UIM PCB.
531:xxx:xxx:xxxx	Report Slave Memory	Slave Memory corrupted; cascade failure from failure codes 401 and 403, or DC power was disconnected while the pump is plugged into AC.	Power the pump off and back on. If failure recurs, replace the UIM PCB.
532:xxx:xxx:xxxx	Noise, M/S Comm	No response from Master after message sent	If failure code recurs, replace UIM PCB.
533:xxx:xxx:xxxx	Noise, M/S Comm	Excessive Nak's from Master	If UIM master software is 3.03.00 or earlier, upgrade the software. If failure code recurs, replace UIM PCB.
534:xxx:xxx:xxxx	Noise, M/S Comm	Slave timed out while waiting for message from Master	If failure code recurs, replace UIM PCB.
535:xxx:xxx:xxxx	Noise, M/S Comm	Nak received on status packet	If failure code recurs, replace UIM PCB.
536:xxx:xxx:xxxx	ROM	SC Bad Image CRC	Check PROM U65 and replace if necessary. Replace UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
537:xxx:xxx:xxxx	Power Supply, Main	Coarse Voltage reading bad	Calibrate/replace Power Supply. Replace UIM PCB.
538:xxx:xxx:xxxx	Audio Circuits	Successive bad A/D readings from audio circuit	Troubleshoot UIM PCB/audio harness or speaker.
539:xxx:xxx:xxxx	Power Supply, Main	Bad readings from Slave Power Supply A/D channel	Troubleshoot UIM PCB/power supply.
540:xxx:xxx:xxxx	Power Supply, Main	A/D, invalid V_{Mem} readings	Troubleshoot UIM PCB/power supply.
541:xxx:xxx:xxxx	Power Supply, Main	A/D, V_{Key} readings are bad	Troubleshoot UIM PCB/power supply.
542:xxx:xxx:xxxx	Power Supply, CPU	Could not obtain valid readings	Troubleshoot UIM PCB/power supply.
543:xxx:xxx:xxxx	Battery Charge Level Indicator	True RMS and Coarse Voltage readings are out of range	Troubleshoot/check batteries. Calibrate Battery Charge Level Indicator or replace UIM PCB.
545:xxx:xxx:xxxx	Battery Charge Level Indicator	High True RMS voltages are out of range	Calibrate Battery Charge Level Indicator, replace DC Power Supply, or replace UIM PCB.
546:xxx:xxx:xxxx	Power On/Off circuit.	Software versions 1.xx to x.xx Software check on ***ON/OFF CHARGE*** Key processing	Troubleshoot/replace keypad or UIM PCB.
546:xxx:xxx:xxxx	Communications circuit.	Software versions x.xx to 5.xx Master/slave communication failure. Invalid transmit state due to noise.	Troubleshoot/replace UIM PCB.
548:xxx:xxx:xxxx	Power On/Off circuit	On/Off switch low at power down indicating faulty On/Off circuits	Troubleshoot/replace keypad interconnections or UIM PCB.
549:xxx:xxx:xxxx	Audio Circuits	Batteries were discharged to less than 10.4 V Speaker and/or circuit failure	Test batteries as described in "Verifying Battery Operation," 6-8. Ensure batteries are fully charged. Replace batteries if they have been damaged by deep discharge or if Battery Charge Level Indicator indicates they cannot be fully charged. Troubleshoot/replace Volume Control harness, speaker, wiring harness, or UIM PCB. If failure code recurs, replace UIM PCB.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
550:xxx:xxx:xxxx	Audio Circuits	Speaker voltage too low during an audible period	Troubleshoot/replace speaker, wiring harness, or UIM PCB. If this occurs and there is no backlight, check F3 on the UIM PCB.
		Loose connection between UIM PCB P12 and the cable connector.	Reseat the cable connector in P12.
		Open or intermittent connections in the cable to UIM PCB P12.	Repair or replace the cable.
		Poor UIM PCB P12 solder connections.	Resolder P12 to the UIM PCB.
			Replace the UIM PCB.
551:xxx:xxx:xxxx	Power On/Off circuit	On/Off circuit power switch monitor line is high at the wrong time	Troubleshoot/replace keypad interconnections, keypad, or UIM PCB.
552:xxx:xxx:xxxx	Power On/Off circuit	Indicates stuck key or faulty on/off charge circuit	Troubleshoot/replace keypad or UIM PCB.
559:xxx:xxx:xxxx	Keypad Circuit	Open keys cannot be read	Troubleshoot/replace keypad interconnections and pump module cable connections.
567:xxx:xxx:xxxx	Power On/Off circuit	Failure to complete power up Manual Tube Release test	Troubleshoot/replace UIM PCB.
568:xxx:xxx:xxxx	Audio Circuit	Speaker voltage low during an alert	Troubleshoot/replace speaker, wiring harness, or UIM PCB.
570:xxx:xxx:xxxx	Low Battery Voltage	Batteries discharged to a potentially damaging level	Perform a “Battery Check” or “Battery Discharge Test” per Chapter 10 and/or replace the batteries.
599:xxx:xxx:xxxx	Slave Error	Master was not provided with a valid service code from the slave processor.	Troubleshoot/replace slave EPROM or UIM PCB.
701:xx	PHM Communications	PHM Communication Initiate Fail	Troubleshoot/replace F2 on PHM PCB.
			Troubleshoot/replace Comm harness, UIM PCB, or pump module.
			Check that U12 PROM is inserted correctly.
			Verify that there is no corrosion on the UIM to PHM cable connector contacts. Clean as required.
702:xx	PHM Communications	PHM Comm Nak Fail	Troubleshoot/replace Comm harness, UIM PCB, pump module.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
703:xx	PHM Communications	PHM Comm Time-out Fail	Troubleshoot/replace Comm harness, UIM PCB, pump module. Check that U12 PROM is inserted correctly.
		Excessive noise from 12V power supply to U25 pin 8	Check PHM PCB part number. If not Rev 9 or above replace the PHM PCB with Rev 9 or greater. Otherwise verify the power supply's operation. Repair/replace as required.
		Cold solder connection at P3 of the UIM PCB.	Resolder P3 to the UIM PCB. Replace the UIM PCB.
		Poor connection between cable and P3 of UIM PCB.	Reseat the cable connector in P3.
		Cable has open or intermittent connections.	Repair or replace the UIM PCB-to-PHM PCB cable.
704:xx	PHM Communications	PHM Comm Transmit Queue Overrun	If failure code recurs, troubleshoot and/or replace UIM PCB.
705:xx	PHM Communications	PHM Rate Mismatch	If failure code recurs, troubleshoot and/or replace UIM PCB.
706:00	UIM software	PHM invalid switch over.	Cycle power to the pump.
712:xx	UIM/PHM software	No ack received from the PHM after START is pressed on the pump.	Check continuity of UIM-to-PHM cable. Repair/replace as required. If the error recurs, either the PHM PCB or UIM PCB may be faulty. Replace one or the other, then verify operation. If the error recurs, reinstall the PCB you replaced and then replace the other PCB.
714:xx	UIM master, PHM Software Communications	Jaws Open Denied	If this code occurs at power on after a previous failure, disregard if it does not occur at next power on. Troubleshoot Comm harness, UIM PCB, or PHM.

Table 7-6 User Interface Module Failure Codes — continued

Code	Failure Focus	Error Name/Condition	Corrective Action
715:xx	UIM Master, PHM Software Communications	Manual Tube Release Reset Time-out. May be caused by: • An overdrilled camshaft • The point of the MTR knob set screw is binding the plunger • A broken encoder flag on the Tube Load motor • LED/Sensor on tube load motor encoder PCB is not working because wires are pinched between the encoder PCB and the subplate. • Tube Load motor is not running.	Check that tab on the manual tube release is fully closed after resetting the manual tube release. Check that MTR knob set screw is installed properly. Check the UIM Slave EPROM. At next power on, enter the Configuration/Service screen. Select Service Features/Voltage Sensor Data and check the channel voltage. If it is zero, troubleshoot the UIM/PHM ribbon cable and power cable. Replace as necessary. Check that wires to the tube load motor are routed correctly. Check the Tube Load motor encoder PCB. Check the UIM PCB.
718:xx	Manual tube release	Pumps with UIM master software version 4.XX only: PHM stop time out	Check if UIM to PHM ribbon cable is seated properly at UIM PCB. Reset manual tube release several times. If failure recurs, replace the pump mechanism.
719:xx	Manual tube release	UIM check of manual tube release switch indicates manual tube release is not fully closed during power-up	Check if UIM to PHM ribbon cable is seated properly at UIM PCB. Reset manual tube release several times. If failure recurs, replace the pump mechanism.
719:00	Manual tube release	UIM master software determined that the UIM PIU and PHM PIU software do not match. MTR activated during pump head activity or MTR fault.	Verify that the PHM-to-UIM cable is securely seated and continuity exists end-to-end. Repair/replace as required. Replace the UIM PCB. Verify operation of MTR switch. Replace the PHM if the MTR switch is defective.
720:xx	Software	The UIM master software did not receive a response from the PHM to its failure message query and timed-out.	Verify that there is no corrosion on the UIM to PHM cable connector contacts. Clean as required. If there is no corrosion on the UIM to PHM cable connector contacts replace the PHM. If replacing the PHM did not correct the error condition, replace the original PHM and replace the UIM PCB.

Table 7-7 Pump Module Failure Codes

Code	Description	Corrective Action
Note: If your pump displays a failure code not listed in Table 7-6 or Table 7-7, record the failure code and contact your local Baxter authorized service center for additional troubleshooting information. Unlisted failure codes are indicated as xx in the following table.		
800 Series: System Error (System test RAM, EPROM, etc.)		
800:01	System Error, CRC EEPROM check error	Replace pump mechanism.
800:03	System Error, Display Test Err	Replace pump mechanism. Troubleshoot/replace interconnections, display.
801 Series: Pump Mechanical Errors		
801:04	Close Failed	Replace pump mechanism.
801:05	Power down state time out	Replace pump mechanism.
801:06	Start without tube or keyed On/Off clamp	Replace pump mechanism.
801:07*	REGNO: Infusion register out of range	Replace pump mechanism.
801:08*	VOLUMEZERO: Infusion register 0 VTBI	Replace pump mechanism.
801:09	Proximal or distal time out	Replace pump mechanism.
801:10	Pressure sensor nulling state error	Replace pump mechanism.
801:12*	Reached infuse state without start command	Replace pump mechanism.
801:13*	Simultaneous Open and Start command	Replace pump mechanism.
801:14	Manual tube release switch state error (**User:** Tab out at ***Open*** key press)	***Note:*** If failure cannot be duplicated during troubleshooting, pump can be returned to use. Replace pump mechanism.
801:15*	Attempted start with alarm state	Replace pump mechanism.
801:16	Local index failed with a tube in place	May be a cascade error caused by a failure that occurred previously. Check Event History for occurrence of other failure codes; troubleshoot and repair accordingly.
801:17	Pump Module key stuck open	Troubleshoot/replace: • keypad assembly/keypad circuit, • pump mechanism.
*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.		

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
801:18*	Too long in pre-infusion state	Replace pump mechanism.
801:19*	KVO setting out of range	Replace pump mechanism.
801:20	Too long in stop infusion state	Replace pump mechanism.
801:41*	Pump Module state variable corrupted	Replace pump mechanism.
801:42*	Pump Module events 1 corrupted	Replace pump mechanism.
801:43*	Pump Module events 2 corrupted	Replace pump mechanism.
801:44	Auto Tube Load disable corrupted	Replace pump mechanism.
801:45*	UIM Start Register Number corrupted	Replace pump mechanism.
801:46*	KVO Rate corrupted	Replace pump mechanism.
801:47*	Pump module state variable corrupted	Replace pump mechanism.
801:48*	New Pump module state variable out of range	Replace pump mechanism.
802 Series - Shuttle Motor Mechanical Error		
802:04	Shuttle failed to center after infusion	Replace shuttle motor or pump mechanism.
802:05	Shuttle failed to center after tube load	Replace shuttle motor or pump mechanism.
802:06	Shuttle failed to move to tube load position	Replace shuttle motor or pump mechanism.
802:07*	REGNO: Start register number out of range	Replace pump mechanism.
802:08*	Attempt to start without Start command	Replace pump mechanism.
802:09	Shuttle failed to recover local index	Replace pump mechanism.
802:10	Move to center from fill failed (CE Mark software only)	Replace shuttle motor or pump mechanism.
802:11*	Variable 1: State variable corrupted	Replace pump mechanism.
802:12*	Variable 2: Event flag variable corrupted	Replace pump mechanism.
802:13*	Variable 3: Start register number corrupted	Replace pump mechanism.
802:14	Shuttle move failure during tube recovery	Replace shuttle motor or pump mechanism.
802:15	Shuttle Joggle incorrect state error	Replace shuttle motor or pump mechanism.
802:16	Shuttle Joggle movement failure	Replace shuttle motor or pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
802:20	No tube valve closed test failed	Inspect inlet and outlet valves for foreign matter. Clean or replace pump mechanism.
802:99*	State: State machine incorrect state error	Replace pump mechanism.
803 Series - Tube Load Mechanical Error		
803:01	Tubing channel not closed	Replace pump mechanism.
803:02	Slide clamp has not moved to open position (**User-induced:** manual tube release tab out while loading administration set)	Load and unload tubing several times. If failure cannot be duplicated during troubleshooting, pump can be returned to use. Check that tube load motor is securely mounted using "Tube Loading Motor Mounting Inspection/Gear Tightening Procedure," 8-78. Replace pump mechanism.
803:03	Slide Clamp not closed (**User-induced**: Proximal tubing pulled while unloading administration set) Occurs only with PHM software version 1.04.00 and lower.	Load and unload tubing several times. If failure cannot be duplicated during troubleshooting, pump can be returned to use. Check slot and tubing channel and clear if necessary. Check that tube load motor is securely mounted using "Tube Loading Motor Mounting Inspection/Gear Tightening Procedure," 8-78. Replace pump mechanism.
803:04	Load Motor Overload (**User-induced**: Proximal tubing pulled while unloading administration set, or manual tube release tab out while loading administration set.) Occurs only with PHM software version 1.04.00 and lower.	If 1.04 or lower, upgrade PHM software.
803:05	Load Motor index time out (**User-induced:** manual tube release tab out at power up) Occurs only with PHM software version 1.04.00 and lower.	Power the pump on and off several times with the manual tube release tab fully closed. If failure cannot be duplicated during troubleshooting, pump can be returned to use. Test operation, replace pump mechanism per "Pump Mechanism," 8-66.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
803:07	Invalid Slide Clamp Position/Sensor error	Inspect flex cable at J4 on PHM PCB and verify conductor continuity from contacts to solder terminals. Verify proper flex cable seating in J4 and re-insert/adjust PCBA to allow correct insertion. See "Upstream Under Platen Flex Connector Insertion Procedure," 8-93. Clean the prism in the tubing channel per "Cleaning the Pump Assembly Prisms," 6-4. If the PHM software is 1.xx, 3.xx, 2.03, or 2.04, upgrade the PHM PCB software to the current version. If the PHM software is 2.05 or 2.06, perform the procedure in "Slide Clamp Prism Replacement Procedure," 8-94. Repair or replace as directed. Test operation per Chapter 10 and, if failure code recurs replace the prisms per "Slide Clamp Prism Replacement Procedure," 8-94. Test operation per Chapter 10 and, if failure code recurs replace pump mechanism per "Pump Mechanism," 8-66.
803:08	Slide Clamp Sensor error at power up: No tubing channel closed test	Test operation, replace pump mechanism per "Pump Mechanism," 8-66.
803:09	Misload Sensor value out of range (open) (**User:** manual tube release tab out at ***Open*** key press) Occurs only with pump module software version 3.01 and earlier. Does not occur in version 3.02 and later.	Load and unload tubing several times. If failure cannot be duplicated during troubleshooting, pump can be returned to use. Inspect tubing channel and clean if necessary. Check that tube load motor is securely mounted using "Tube Loading Motor Mounting Inspection/Gear Tightening Procedure," 8-78. Test operation, upgrade PHM software to most current version.
803:11*	State variable corrupted	Replace pump mechanism.
803:12*	Event flag variable corrupted.	Replace pump mechanism.
803:20	Erroneous movement in tube loading mechanism	***Note:*** It is acceptable if this failure code occurs during performance of the Emergency Open test. Check Event History for "soft key #3 press" just before the failure code occurred. Replace pump mechanism if failure code is not associated with performance of Emergency Open test.
803:21	Overload Impossible	Replace pump mechanism per "Pump Mechanism," 8-66.
803:99*	State: State machine incorrect state error	Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
804 Series - Communications Error between User Interface Module and Pump Module		
804:21	COMM ERR: 10 consecutive NAK's	Check Comm harness and replace if necessary. Replace pump mechanism per “Pump Mechanism,” 8-66.
804:22	COMM ERR: Packet without ACK or NAK	Check Comm harness and replace if necessary. Replace pump mechanism.
804:23	COMM ERR: Packet larger than limit	Check Comm harness and replace if necessary. Replace pump mechanism.
804:24	COMM ERR: Packet retry CRC err	Check Comm harness and replace if necessary. Replace pump mechanism.
804:25	COMM ERR: Incorrect pump module number	Check Comm harness and replace if necessary. Replace pump mechanism.
804:26	COMM ERR: Packet retry sequence err	Check Comm harness and replace if necessary. Replace pump mechanism.
804:27	COMM ERR: Packet retry data size err	Check Comm harness and replace if necessary. Replace pump mechanism.
804:28	COMM ERR: Packet max data size exceeded	Check Comm harness and replace if necessary. Replace pump mechanism.
804:29	COMM ERR: No ACK/NAK within 2 seconds	Check Comm harness and replace if necessary. Replace pump mechanism.
804:30	COMM ERR: Received illegal command	Check Comm harness and replace if necessary. Replace pump mechanism.
804:31	COMM ERR: No space to build buffer	Check Comm harness and replace if necessary. Replace pump mechanism.
804:32	COMM ERR: Transmit buffer out of space	Check Comm harness and replace if necessary. Replace pump mechanism.
804:33	COMM ERR: Power up UIM CRC incorrect	Check Comm harness and replace if necessary. Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
804:34	COMM ERR: Failed Watchdog Timer Test	If pump module software version 2.03 is used with UIM master software version 4.XX, upgrade the pump module software in all pump modules to version 2.04 or higher. Check Comm harness and replace if necessary. Replace pump mechanism.
804:52	COMM ERR: Serial comm frame error	Check Comm harness and replace if necessary. Replace pump mechanism.
804:54	COMM ERR: Serial comm noise error flag	Check Comm harness and replace if necessary. Replace pump mechanism.
804:56	COMM ERR: Serial comm overrun error	Check Comm harness and replace if necessary. Replace pump mechanism.
805 Series - Distal Pressure Error		
805:01	No bits left in nulling	Replace pump mechanism.
805:02	Sensor did not settle in band	Replace pump mechanism.
805:03	Offset amplifier test failure	Replace pump mechanism.
805:04	Call to null while renulling	Replace pump mechanism.
805:05*	Backup data corruption: Base pressure	Replace pump mechanism.
805:06*	Backup data corruption: Alarm	Replace pump mechanism.
805:07*	Backup data corruption: Pressure	Replace pump mechanism.
805:08*	Backup data corruption: Threshold range	Replace pump mechanism.
805:09	Pulse Width expired	Replace pump mechanism.
805:10	Gain slope garbage	Replace pump mechanism.
805:11	Matrix CRC failure	Replace pump mechanism.
805:12	Failure during renull	Replace pump mechanism.
805:14	Temperature compensation slope beyond limits	Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
805:15	Occlusion sensor failure	Power the pump on and view the Channel Raw Sensor Data screen. Load a piece of tubing and monitor the displayed value. It should be between 20 and 100, inclusive, during loading. If it is not within that range or if the value does not change when the tubing is loaded, replace pump mechanism. If the failure code recurs replace the pump mechanism.
805:16	Threshold set out of range	Replace pump mechanism.
805:17	Argument: Read distal matrix element	Replace pump mechanism.
806 Series - Proximal Pressure Sensor Error		
806:01	No bits left to adjust offset during nulling	Replace pump mechanism.
806:02	Sensor did not settle in band	Replace pump mechanism.
806:03	Offset amplifier test failure	Replace pump mechanism.
806:04	No bits left to adjust offset during tracking	Replace pump mechanism.
806:05*	Backup data corruption: alarm	Replace pump mechanism.
806:06*	Backup data corruption: threshold setting	Replace pump mechanism.
806:07	Backup data corruption: alarm threshold	Replace pump mechanism.
806:08*	Backup data corruption: cumulative alarm threshold	Replace pump mechanism.
806:10	Proximal null failure	Power the pump on and view the Channel Raw Sensor Data screen. Load a piece of tubing and monitor the displayed value. It should be between 20 and 100, inclusive, during loading. If it is not within that range or if the value does not change when the tubing is loaded, replace pump mechanism. If the failure code recurs replace the pump mechanism,
806:11*	Illegal threshold from UIM	Replace pump mechanism.
806:12*	More data corruption	Replace pump mechanism.
807 Series - Gross Position Sensor Error		
807:xx	Intermittent/damaged flex-circuit connections	Verify that the flex-circuit contacts inserted into J12 and J13 are not punctured, rubbed through to the backing material, or otherwise damaged. If damaged, replace the pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
807:00	Trend monitor error inside 0 pump phase	***Note:*** On Colleague 3 pumps, and Colleague pumps with UIM master software version 4.00.00 and higher, this failure code may occur in Functional Test mode when changing rates. Power pump off and back on. If failure code recurs, replace pump mechanism.
807:01	Trend monitor error inside 1 pump phase	Replace pump mechanism.
807:02	Position monitor error at midpoint (Valve 2) side 0	Replace pump mechanism.
807:03	Position monitor error at midpoint (Valve 2) side 1	Replace pump mechanism.
807:04	Position monitor error at valve 1 side 0	Replace pump mechanism.
807:05	Position monitor error at valve 1 side 1	Replace pump mechanism.
807:06*	Data corruption	Replace pump mechanism.
807:07	Excessive movement while indexing	Replace pump mechanism.
808 Series - Valve Sensor Error		
808:xx	Intermittent/damaged flex-circuit connections.	Verify that the flex-circuit contacts inserted into J12 and J13 are not punctured, rubbed through to the backing material, or otherwise damaged. If damaged, replace the pump mechanism.
808:01	Outlet valve not open, position 1	Replace pump mechanism.
808:02	Inlet valve not open position 1	Replace pump mechanism.
808:03	Valve Sensors: One valve not closed	Check tubing channel for dirt or other obstruction and clean as required. If no obstruction is present or if failure recurs after cleaning, replace pump mechanism.
808:04	Inlet valve faulty	Remove keyed On/Off Clamp from slot. Check tubing channel for dirt or other obstruction and clean as required. If no obstruction is present or if failure code recurs after cleaning, replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
808:05	Outlet valve faulty	Remove keyed On/Off Clamp from slot. Check tubing channel for dirt or other obstruction and clean as required. If no obstruction is present or if failure code recurs after cleaning, replace pump mechanism.
808:06	Outlet valve not open, position 2 (slide clamp)	Replace pump mechanism.
808:07	Inlet valve not open, position 2 (slide clamp)	Replace pump mechanism.
808:08	Inlet valve open low test fault	Replace pump mechanism.
808:09	Outlet valve open low test fault	Replace pump mechanism.
809 Series - Temperature Sensor Error		
809:00	Temperature comparison failure: T1/T2	Replace pump mechanism.
809:01*	Data corruption tube temperature bit (verify)	Replace pump mechanism.
809:02*	Data corruption tube temperature (Temp 1)	Replace pump mechanism.
809:03*	Data corruption tube temperature (Temp 2)	Replace pump mechanism.
809:04*	Data corruption tube temperature bit (enable)	Replace pump mechanism.
809:05*	Data corruption tube temperature bit (alarm)	Replace pump mechanism.
809:06*	Data corruption temperature bit (alarm switch)	Replace pump mechanism.
809:07*	Attempted to modify limit out of range	Replace pump mechanism.
809:08*	Array bounds check on calculated tube temperature	Replace pump mechanism.
810 Series - Air Sensor Error		
810:00	Advance Max Override volume exceeded	Replace AIL PCB per “Air in Line PCB,” 8-89. Replace pump mechanism.
810:01	Prime Max Override volume exceeded	Replace AIL PCB. Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
810:02	Sensor no tube test failure	Check for moisture and clean and dry tubing channel as required. Check calibration and recalibrate AIL PCB if necessary as described in "AIL PCB Calibration" on page 9-10. Replace AIL PCB if it cannot be calibrated. Replace pump mechanism.
810:03	Sensor -15 dB test failure	Replace AIL PCB. Replace pump mechanism.
810:04	Air sensor base line too high	Check for moisture and clean and dry tubing channel as required. Check calibration and recalibrate AIL PCB if necessary as described in "AIL PCB Calibration" on page 9-10. Replace AIL PCB if it cannot be calibrated. Replace pump mechanism.
810:05*	Backup data corruption: baseline	Replace pump mechanism.
810:06*	Backup data corruption: threshold sum	Replace pump mechanism.
810:07*	Backup data corruption: override active	Replace pump mechanism.
810:08*	Backup data corruption: alarm disable	Replace pump mechanism.
810:09*	Backup data corruption: air detection threshold	Replace pump mechanism.
810:10	Argument passed to AIL Override state set	Replace pump mechanism.
810:11	Air sensor / circuits saturated	Check for moisture and clean and dry tubing channel as required. Check calibration and recalibrate AIL PCB if necessary as described in "AIL PCB Calibration" on page 9-10. Replace AIL PCB if it cannot be calibrated.
810:12*	AIL check illegal state error	Replace pump mechanism.
810:13	Primary AIL failure 500ml air detected	Replace pump mechanism.
811 Series - Shuttle Motor Index Error		
811:01*	Internal consistency failure: local motor index	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
811:02	Timing error w/slot (ADC's starting)	Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
811:03*	Internal consistency failure: local motor index	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace pump mechanism.
811:04	Slot edge not found (clockwise)	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
811:05*	Internal consistency failure: local motor index	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace pump mechanism.
811:06	Slot not found (after clockwise edge found)	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
811:07*	Internal consistency failure: local motor index	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace pump mechanism.
811:08	Slot illegal width	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
811:09	In slot edge not found (counterclockwise)	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
811:10*	Internal consistency failure: local motor index	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace pump mechanism.
811:11*	Internal consistency failure: local motor index	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace pump mechanism.
811:12	No slot found over 360 degree search	Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
811:13	Found anomalous slot (second slot not found).	Replace shuttle motor per "Shuttle Motor," 8-69 or pump mechanism per "Pump Mechanism," 8-66.
811:14	Wrong slot(s) found	Replace shuttle motor per "Shuttle Motor," 8-69 or pump mechanism per "Pump Mechanism," 8-66.
811:15	Time out going to center of slot	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace shuttle motor per "Shuttle Motor," 8-69 or pump mechanism per "Pump Mechanism," 8-66.
811:16*	Internal consistency failure: local motor index	Replace pump mechanism.
811:17	Illegal global index with tube present Occurs only with pump module software versions less than 3.02 and CE 2.01.	Upgrade pump module software to most current version.
811:18	Argument to set motor position out of range	Replace pump mechanism.
811:21* 811:22* 811:23* 811:24* 811:25* 811:26* 811:27* 811:28*	Internal consistency failure: local motor index error Intermittent flex-circuit connections.	If pump module software is version 3.02 or older, replace the software with the most up-to-date release. Replace pump mechanism. Verify that the flex-circuit contacts inserted into J12 and J13 are not punctured, rubbed through to the backing material, or otherwise damaged. If damaged, replace the pump mechanism.
812 Series - Index Pulse Failure		
812:xx	Intermittent/damaged flex-circuit connections.	Verify that the flex-circuit contacts inserted into J12 and J13 are not punctured, rubbed through to the backing material, or otherwise damaged. If damaged, replace the pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
812:00	Pump module software version 2.03, 3.02, 3.03 and greater: Shuttle Index error	Power pump off and on again; contact your local Baxter authorized service center to report. If failure recurs troubleshoot or replace the following assemblies in the order listed until the problem is corrected: • Power Supply Assembly, p. 8-40 • Main Batteries, p. 8-34 • Shuttle Motor, p. 8-69 • Pump Mechanism, p. 8-66.
	Pump module software versions 1.02 to 1.04 and 3.01: Motor Index pulse timing error	Replace PHM software with current version. Power pump off and back on again. If failure recurs troubleshoot or replace the following assemblies in the order listed until the problem is corrected: • Power Supply Assembly, p. 8-40 • Main Batteries, p. 8-34 • Shuttle Motor, p. 8-69 • Pump Mechanism, p. 8-66.
812:01	Cycle time error	Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
812:02	Motor excessive servo error	Replace the gears in the shuttle motor gear box. Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
812:03*	State index monitor enable corrupted	Replace pump mechanism.
812:04	Shuttle index error	Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
812:05	Movement when stopped	For Colleague 3 pumps with pump module software version 3.02, upgrade to pump module software version 3.03 or to the global software package. If the PHM software is 1.xx, 3.xx, 2.03, or 2.04, upgrade the PHM PCB software to the current revision. May be cascade error after PHM software is upgraded. If the error does not recur repair is not necessary. Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
813 Series - Shuttle Shaft Encoder Monitor Error		
813:xx	Intermittent/damaged flex-circuit connections.	Verify that the flex-circuit contacts inserted into J12 and J13 are not punctured, rubbed through to the backing material, or otherwise damaged. If damaged, replace the pump mechanism.
813:00	Argument to encoder monitor status	Replace pump mechanism.
813:01	Erroneous movement	May be cascade error after occurrence of another failure code or after PHM software is upgraded. If the error does not recur repair is not necessary. If failure recurs or does not appear to be related to the occurrence of any other failure codes, replace shuttle motor or pump mechanism.
	Intermittent flex-circuit connections.	Verify that the flex-circuit contacts inserted into J12 and J13 are not punctured, rubbed through to the backing material, or other wise damaged. If damaged, replace the pump mechanism.
813:02	Movement when stopped	Replace pump mechanism.
813:03	No movement detected while waiting to stop	Replace shuttle motor per “Shuttle Motor,” 8-69 or pump mechanism per “Pump Mechanism,” 8-66.
814 Series - Miscellaneous Sensor Errors		
814:00	PHM power supply too high	Replace pump mechanism.
814:01	PHM power supply too low. Can be caused when pump is left in Battery Depleted alarm for extended period.	Check Event History screen for evidence of ignored Battery Depleted alarm (see “Check Event History,” 10-7). Check battery operation (see “Battery Check,” 10-8). Troubleshoot wiring from power supply to pump mechanism and repair as required. Replace pump mechanism.
814:02	Reference input outside tolerance	Replace pump mechanism.
814:03	Shuttle Motor temperature too high Occurs only with pump module software versions older than 3.02 or PHM CE 2.01.	Upgrade PHM software to most current version.
814:04	Time Base Error: 4.5 MHz outside tolerance	Replace AIL PCB. Replace pump mechanism.
814:05	Time Base Error: Accumulator overflow	Replace AIL PCB. Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
814:06	Pump module software version 1.04 and lower: Pump senses that keyed On/Off Clamp is not open during infusion.	Check for bright light shining directly into the keyed On/Off Clamp slot; relocate pump and/or light source. Power pump off and back on; if failure recurs, replace pump mechanism or upgrade PHM software.
814:07	ADC Failure: 5 volt calculation	Replace pump mechanism.
814:08	Occlusion sensor failure	Power the pump on and view the Channel Raw Sensor data screen. Load a piece of tubing and monitor the displayed value. It should be between 20 and 100, inclusive, during loading. If it is not within that range or if the value does not change when the tubing is loaded, replace pump mechanism. If the failure code recurs replace the pump mechanism.
814:09	Occlusion sensor failure	Power the pump on and view the Channel Raw Sensor data screen. Load a piece of tubing and monitor the displayed value. It should be between 20 and 100, inclusive, during loading. If it is not within that range or if the value does not change when the tubing is loaded, replace pump mechanism. If the failure code recurs replace the pump mechanism.
814:10	Amplitude gain test: Distal high side failure	Replace pump mechanism.
814:11	Amplitude gain test: Proximal high side failure	Replace pump mechanism.
814:12	ADC Failure: Conversion not completed	Replace pump mechanism.
814:13*	VAR1 Corrupted: Slide clamp open error	Replace pump mechanism.
814:14*	VAR2 Corrupted: Gain test error	Replace pump mechanism.
815 Series - Volume Monitoring (Infused) Error		
815:00	VOL MON: Exceeded upper volume limit	Replace pump mechanism.
815:01	VOL MON: Did not reach lower volume limit	Replace pump mechanism.
815:02	VOL MON: Ramp expunged	Replace pump mechanism.
815:03	VOL MON: Volume monitor action illegal	Replace pump mechanism.
816 Series - Watchdog Timer Errors		
816:00*	Illegal argument with watchdog Status	Replace pump mechanism.
816:01*	Fast dog alarm	Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
816:02*	Slow dog alarm	Replace pump mechanism.
816:03*	No COP Service	Replace pump mechanism.
817 Series - Infusion Register Alarms		
817:00*	Infusion Register: mismatch, state corruption	Replace pump mechanism.
817:01*	Infusion Register: STATE illegal value	Replace pump mechanism.
817:02*	Infusion Register: STPTR illegal value	Replace pump mechanism.
817:03*	Infusion Register: flow rate corrupted	Replace pump mechanism.
817:04*	Infusion Register: time out in prep state	Replace pump mechanism.
817:05*	Infusion Register: change while in prep state	Replace pump mechanism.
817:06*	Running while running bit not set	Replace pump mechanism.
817:07*	Last register mismatch	Replace pump mechanism.
818 Series - Status Bit Copy Errors		
818:01*	Pump status bit(s) have changed (Low 1)	Replace pump mechanism.
818:02*	Pump status bit(s) have changed (High 2)	Replace pump mechanism.
821 Series - Pump Error		
821:00*	Relocate error (relocate movement too far)	Replace pump mechanism.
821:01*	Illegal build state (building Cycle Table)	Replace pump mechanism.
860 Series - Pump Module State mechanical error		
861:xx**	Signal error: UIM Command “open channel”	Replace pump mechanism.
862:xx*	Signal error: load mechanism “fully open”	Replace pump mechanism.
863:xx*	Signal error: load mechanism “tube loaded”	Replace pump mechanism.
864:02*	Signal error: UIM Command “close channel”	If the PHM software is 1.xx, 3.xx, 2.03, or 2.04 upgrade the PHM PCB software to the current revision. If the problem recurs replace pump mechanism.
865:xx*	Signal error: load mechanism “tube misloaded”	Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
865:01	Signal Error: load mechanism “tube misloaded”	Inspect flex cable at J4 on PHM PCB and verify conductor continuity from contacts to solder terminals. Verify proper flex cable seating in J4 and re-insert/adjust PCBA to allow correct insertion. See “Upstream Under Platen Flex Connector Insertion Procedure” on page 8-93. Clean the prism in the tubing channel per “Cleaning the Pump Assembly Prisms,” 6-4. If the PHM software is 1.xx, 3.xx, 2.03, or 2.04 upgrade the PHM PCB software to the current version. Test operation per Chapter 10 and, if required, replace pump mechanism per “Pump Mechanism,” 8-66.
865:02	Signal Error: load mechanism “tube misloaded”.	If the PHM software is 1.xx, 3.xx, 2.03, or 2.04 upgrade the PHM PCB software to the current version.
865:19	Signal Error: load mechanism “tube misloaded”.	Inspect flex cable at J4 on PHM PCB and verify conductor continuity from contacts to solder terminals. Verify proper flex cable seating in J4 and re-insert/adjust PCBA to allow correct insertion. See “Upstream Under Platen Flex Connector Insertion Procedure” on page 8-93. Clean the prism in the tubing channel per “Cleaning the Pump Assembly Prisms,” 6-4. If the PHM software is 1.xx, 3.xx, 2.03, or 2.04 upgrade the PHM PCB software to the current version. Test operation per Chapter 10 and, if required, replace pump mechanism per “Pump Mechanism,” 8-66.
866:xx*	Signal error: load mechanism “fully closed”	Upgrade pump module software to version 2.06 or higher. Replace pump mechanism.
867:xx*	Signal error: UIM Command “start pumping”	Replace pump mechanism.
868:xx*	Signal error: UIM Command “resume pumping”	Replace pump mechanism.
869:xx*	Signal error: UIM Command “stop pumping”	Replace pump mechanism.
870:xx*	Signal error: UIM Command “power off”	Replace pump mechanism.
871:xx*	Signal error: PHM volume = 0 “infusion complete”	Replace pump mechanism.
873:xx*	Signal error: load mechanism “close w/o tube”	Replace pump mechanism.
874:xx*	Signal error: load mechanism “index done”	Replace pump mechanism.
875:xx*	Signal: shuttle “local index failed”	Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
876:xx*	Signal: Air “AIL alarm”	Replace pump mechanism.
877:xx*	Signal: Occlusion “Distal occlusion alarm”	Replace pump mechanism.
878:xx*	Signal: Occlusion “Proximal occlusion alarm”	Replace pump mechanism.
879:xx*	Signal: Drop Sensor “no drops alarm”	Replace pump mechanism.
880:xx*	Signal: Temperature “tube temperature alarm”	Replace pump mechanism.
881:xx*	Signal: UIM Command “test enable mode”	Replace pump mechanism.
881:10	Signal: UIM Command “test enable mode”	May occur when accessing Service Features screen. If failure code recurs consistently, replace pump mechanism.
882:xx*	Signal: UIM Command “power on with data”	Replace pump mechanism.
882:15	Pump shuttle index failure without tube	Check Event History for occurrence of other failure codes (see “Check Event History,” 10-7); troubleshoot and repair accordingly. Replace pump mechanism.
883:xx*	Signal: UIM Command “MTR hold clear”	Replace pump mechanism.
884:02*	Signal: PHM “MTR alarm set”	If the PHM software is 1.xx, 3.xx, 2.03, or 2.04 upgrade the PHM PCB software to the current version. If the problem recurs replace pump mechanism.
884:14*	Signal: PHM “MTR alarm set”	If the PHM software is 1.xx, 3.xx, 2.03, or 2.04 upgrade the PHM PCB software to the current version. If the problem recurs replace pump mechanism.
890 Series - Shuttle Motor State Mechanical Errors		
891:xx*	Motor Command: “index to center” error	Replace pump mechanism.
892:xx*	Motor Command: “start pumping” error	Replace pump mechanism.
893:xx*	Motor Command: “resume pumping” error	Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-7 Pump Module Failure Codes — continued

Code	Description	Corrective Action
894:xx*	Motor Command: “tube load position” error	Replace pump mechanism.
896:01	Motor Command: “center position” error	If a keyed On/Off clamp and/or tubing is left in the pump, remove the clamp and tubing and verify that the channel is clean. Reset the manual tube release and cycle pump power. No repairs are necessary.
896:xx*	Motor Command: “center position” error	Replace pump mechanism.
897:xx*	Motor Command: “stop & hold position” error	Replace pump mechanism.
898:xx*	Motor Command: “Index not required” error	Replace pump mechanism.

*Failure code may be recoverable. If code occurs, record the failure code and power the pump off and back on. If failure code does not recur, check the Event History for evidence of other failures. If none are found, pump can be returned to use. Contact your local service center to report the failure code. If failure recurs, repair as described in this table.

Table 7-8 Battery-Related Alerts and Alarms

Battery	Voltage	Alert/Alarm
Main Batteries	> 11.8 VDC	None, normal battery operation
	< 11.8 VDC	Battery Low alert
	< 10.8 VDC	Battery Depleted alarm
	< 10.4 VDC	# of Discharges <Alrm Thrshld on Battery and Pump History screen increments by 1
	<= 10.0 VDC	570: failure code can occur."
Lithium Battery	< 6.35 VDC	Lithium Battery Low alert.

Chapter 8

Removal/Replacement Procedures

Overview

This chapter describes how to replace pump components. The following information is provided:

Any calibration procedures required following a repair are listed at the end of the procedure. See Chapter 9,"Calibration" for calibration procedures. The post-repair tests shown in Table 8-5 are the minimum testing required to verify the effectiveness of the repair. Before returning the pump to use, check the pump's Event History for evidence of any additional problems, and correct them. Perform the appropriate portions of the Operational Checkout in Chapter 10 after a repair to verify that a pump is operating properly and within specifications.

Figure and item numbers are provided for Colleague and Colleague 3 foldout drawings included in Chapter 11. The Colleague figure numbers are shown first, then the Colleague 3 figure numbers.

Note: Refer to the exploded parts drawings in Chapter 11. They show the parts available from Baxter and provide important compatibility information.

When disassembling the pump, note the routing of wiring harnesses, placement of connectors, and location of tie wraps and cable clips. Installing these items in their original position simplifies reassembly of the pump.

Caution

Wear a grounding wrist strap when assembling and disassembling the pump.

Do not lay the pump face down on components or tools that could scratch or damage the keypad.

Ensure that wires are not pinched or overstressed.

Tools and Materials

Required Tools

Table 8-1 lists tools required to perform the procedures in this chapter.

Table 8-1 Tools Required for Repair Procedures

Tool	Purpose
Anti-static mat	Preventing electrostatic discharge damage to components during repair
Grounding wrist strap	Preventing electrostatic discharge damage to components during repair
Chisel tip razor knife	Removing pump feet
Torque screwdriver, preset to 1 kgf-cm (0.87 lb-in) Also available from Baxter, part number 81007	Tightening toroid filter securing screws and power supply securing screws
Torque screwdriver 1 to 35 kgf-cm (0.5 to 30 in-lb) including the following bits: 1.5 mm hex bit* ***Note:*** 1.5 mm hex bit also available from Baxter, part number CRAM1.5 2 mm ball hex bit, long* 2.5 mm ball hex bit, long* 3 mm ball hex bit* #1 crosstip bit* #2 crosstip bit*	Disassembling/reassembling pump
Long angled needle-nose pliers*	Disconnecting grounding lugs/routing wiring
5.5 mm deep socket*	Removing/replacing lithium backup battery, AC plug, LED bar assembly, and ground nut on front bezel

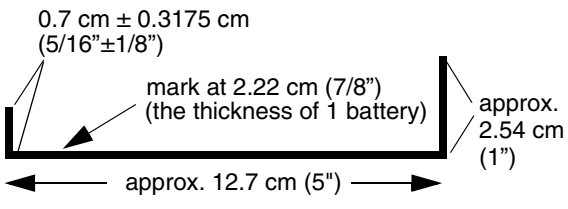
Table 8-1 Tools Required for Repair Procedures — continued

Tool	Purpose
8 mm deep socket*	Removing/replacing PANEL LOCKOUT switch
90° offset crosstip screwdriver	Removing V-block securing screws
8 mm open end wrench*	Removing/replacing contrast and volume controls
Integrated circuit extractor tool	Replacing software
Low-temperature soldering pencil	Replacing AIL PCB
Combination pick	Replacing prisms in slide clamp
0.5 mm feeler gauge	
1.5 mm feeler gauge	
Note: *Tool available in Baxter tool kit, part number DAK-DADE	

Optional Tools

Table 8-2 lists optional tools available from Baxter.

Table 8-2 Optional Tools Required for Repair Procedures

Part Number	Description
DAK-DADE	Tool Kit, Colleague Pump
F069720001	Top, Insert
8219801	Extractor, Software, 32 pin
8219811	Extractor, Software, 44 pin
8221541	Extractor, Software, Universal
STMMD11BAX	11 mm Flare Nut Socket, Special ***Note:*** Required only for replacing the 12 VDC connector on older pumps.
Fabricate as required from an IV bag hanger or other 12-gauge wire	Battery Removal Tool 
8554A26	Torque Screwdriver preset to 0.87 lb-in

Consumable Materials

Table 8-3 lists consumable materials required to perform the procedures in this chapter. You may order these materials from Baxter.

Table 8-3 Consumable Materials Required for Replacement Procedures

Part Number	Description
10-9002	Potentiometer Adhesive, Red Glpt
1401B	Adhesive, thread-locking, Three-Bond Ltd.
3009035001	Cable ties
40000260	Whisk Adhesive Remover
722009310	Dow Corning 732, Silicone Adhesive/ Sealant (packaged in 90 mL tube)
CW-606-B	Lubricant, Lubriko
LP411	Adhesive, LOCTITE PRISM 411
3009031101	Dow Corning EM-30L, Grease
LP414	Adhesive, LOCTITE PRISM 414
LPP770	Primer, LOCTITE PRISM 770
TWTX 740	TEXWIPE foam-tipped applicators
3M 44	Insulating tape

Torque Specifications

Table 8-4 lists the torque specifications for the fasteners that secure replaceable assemblies. The tables also lists the figure and item number of each fastener. Use the torque screwdriver, equipped with the bit listed in the table, unless otherwise specified.

Table 8-4 Torque Specifications

Fastener	Shown in...	Torque to...	Using Tool...
Shim thread forming screw (3mm)	Figure 11-3, item 22	None, snug fit	#2 crosstip bit
Inverter PCB securing screws (6mm)	Figure 11-3, item 16	4 kgf-cm (3.5 lb-in)	#2 crosstip bit
Lithium battery securing nuts (5.5 mm)	Figure 11-3, item 7	7 kgf-cm (6 lb-in)	5.5 mm deep socket
LED PCB securing nuts (5.5 mm)	Figure 11-3, item 7	3 kgf-cm (2.6 lb-in)	5.5 mm deep socket
EMI Shield securing screws	Figure 11-3, items 19	7 kgf-cm (6 lb-in)	#2 crosstip bit
UIM PCB securing screws	Figure 11-3, item 16	5 kgf-cm (4.3 lb-in)	#2 crosstip bit
Front bezel ground wire securing nut	Figure 11-3, item 7	5 kgf-cm (4.3 lb-in)	5.5 mm deep socket
Front bezel hex screws	Figure 11-2, item 8 Figure 11-9, item 8	9 kgf-cm (7.8 lb-in)	2.5 mm hex bit
Battery bracket screw	Figure 11-2, item 20 Figure 11-9, item 23	9 kgf-cm (7.8 lb-in)	2.5 mm hex bit
V-block securing screws	Figure 11-4, item 12 Figure 11-10, item 12	9 kgf-cm (7.8 lb-in)	#2 crosstip bit on 90° offset screwdriver
Clamp VB-Plate securing screws	Figure 11-4, item 7 Figure 11-10, item 7	30 kgf-cm (26.1 lb-in)	#2 crosstip bit
Center housing securing screws	Figure 11-4, item 13 Figure 11-10, item 13	9 kgf-cm (7.8 lb-in)	#2 crosstip bit
Rear housing ground wire securing screw	Figure 11-2, item 10 Figure 11-9, item 10	5 kgf-cm (4.3 lb-in)	#2 crosstip bit
Power Cord Retainer screws	Figure 11-1, item 9 Figure 11-8, item 9	9 kgf-cm (7.8 lb-in)	2 mm hex bit
Fuse Holder securing hex nuts	not shown, for items 16 on Figure 11-5 and Figure 11-11	5 kgf-cm (4.3 lb-in)	14 mm
12 VDC connector hex nut	not shown	5 kgf-cm (4.3 lb-in)	11 mm flare nut socket, specially modified
Rear housing securing screws	Figure 11-5, item 19 Figure 11-11, item 19	9 kgf-cm (7.8 lb-in)	2.5 mm hex bit
PANEL LOCKOUT switch hex nut	not shown, for item 6 on Figure 11-5 and Figure 11-11	5 kgf-cm (4.3 lb-in)	8 mm deep socket

Table 8-4 Torque Specifications — continued

Fastener	Shown in...	Torque to...	Using Tool...
AC Connector hex nut	Figure 11-5, item 23 Figure 11-11, item 23	4 kgf-cm (3.5 lb-in)	5.5 mm deep socket
Toroid filter securing screw	Figure 11-5, item 19 Figure 11-11, item 19	1 kgf-cm (0.87 lb-in)	Torque screwdriver preset to 1 kgf-cm (0.87 lb-in) with #2 crosstip bit
Power supply standoffs	Figure 11-5, item 3 and 39 Figure 11-11, item 3 and 39	1 kgf-cm (0.87 lb-in)	Torque screwdriver preset to 1 kgf-cm (0.87 lb-in) with #2 crosstip bit
Power supply securing screws	Figure 11-5, item 19 Figure 11-11, item 19	1 kgf-cm (0.87 lb-in)	Torque screwdriver preset to 1 kgf-cm (0.87 lb-in) with #2 crosstip bit
RS232 Connector securing screws	Figure 11-5, item 4	3 kgf-cm (2.6 lb-in)	#1 crosstip bit
Cable Clip screw	Figure 11-5, item 37	5 kgf-cm (4.3 lb-in)	#2 crosstip bit
Pump Mechanism top screws	Figure 11-7, item 11	7 kgf-cm (6 lb-in)	#2 crosstip bit
Pump Module Display PCB securing screws	Figure 11-7, item 7	5 kgf-cm (4.3 lb-in)	#2 crosstip bit
Tube Loading Motor securing screws	Figure 8-14	4.6 kgf-cm (4.1 lb-in)	#2 crosstip bit
Tube Loading Motor shaft setscrews	Not shown	4.65 kgf (4 lb-in)	1.5 mm hex bit
Pump Mechanism bottom screws	Figure 11-7, item 5	7 kgf-cm (6 lb-in)	#2 crosstip bit
Pump Module Securing Screws	Figure 11-1, item 5 Figure 11-8, item 5	9 kgf-cm (7.8 lb-in)	3 mm hex bit
Manual Tube Release Knob setscrew	Not shown, part of Figure 11-7, item 3	3 kgf-cm (2.6 lb-in)	1.5 mm hex bit
Sensor Assembly mounting screw	Not shown	4.75 kgf-cm (4.1 lb-in)	#2 crosstip bit

Post-Repair Testing and Inspection

After replacing an assembly, perform the tests checked in Table 8-5 for that assembly. Record the result on a copy of the Operational Checkout data sheet located at the back of this manual.

Note: Test titles marked with an asterisk (*) are for Colleague 3 pumps only.

Table 8-5 Post-Repair Tests

Replaced/Opened Assembly	Mounting Clamp Check, p. 10-3	IInternal Fan Check, p. 10-4*	Self-Test, p. 10-5	Check Software Version, p. 10-6	Check Event History, p. 10-7	Keypad and PANEL LOCKOUT Switch Test, p. 10-8	Check Voltage Sensor Data, p. 10-9	Nurse Call Relay Test, p. 10-10	PHM to Pumphead Housing Alignment Test, p. 10-11	Air In Line Test, p. 10-12	Channel Emergency Open Test, p. 10-13	Tube Misload Sensor Test, p. 10-14	Upstream Occlusion Test, p. 10-16	Volume Delivery Accuracy Test, p. 10-16	Downstream Occlusion Pressure Test, p. 10-18	Short Downstream Occlusion Pressure Test, p. 10-21	Manual Tube Release Test, p. 10-21	Electrical Safety Tests, p. 10-22	Pump Mechanism Sensor Check, p. 10-14	Transferring Device Configuration Data, p. 5-51
12 VDC Connector Assembly, p. 8-46			✓	✓	✓	✓		✓										✓		✓
AC Connector, p. 8-53			✓	✓	✓	✓		✓										✓		✓
AC Fuse Holder(s), p. 8-51			✓	✓	✓	✓		✓										✓		✓
AC Toroid Filter Assembly, p. 8-52			✓	✓	✓	✓		✓										✓		✓
Accessory Connector Assembly, p. 8-64			✓							✓	✓	✓	✓			✓	✓	✓		✓
Air in Line PCB, p. 8-89			✓							✓	✓	✓	✓			✓	✓	✓		
Backup Battery Assembly, p. 8-20			✓	✓	✓		✓			✓			✓	✓		✓		✓		✓
Backup Beeper, p. 8-44		✓	✓	✓	✓	✓		✓										✓		✓
Bottom Panel, p. 8-59			No Testing Required																	
Center Housing, p. 8-55		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓		✓		✓
COMM. Port Connector, p. 8-49		✓	✓	✓	✓	✓		✓										✓		✓
Contrast Control, p. 8-23			✓	✓	✓		✓											✓		✓

Table 8-5 Post-Repair Tests — continued

Replaced/Opened Assembly	Mounting Clamp Check, p. 10-3	Internal Fan Check, p. 10-4*	Self-Test, p. 10-5	Check Software Version, p. 10-6	Check Event History, p. 10-7	Keypad and PANEL LOCKOUT Switch Test, p. 10-8	Check Voltage Sensor Data, p. 10-9	Nurse Call Relay Test, p. 10-10	PHM to Pumphead Housing Alignment Test, p. 10-11	Air In Line Test, p. 10-12	Channel Emergency Open Test, p. 10-13	Tube Misload Sensor Test, p. 10-14	Upstream Occlusion Test, p. 10-16	Volume Delivery Accuracy Test, p. 10-16	Downstream Occlusion Pressure Test, p. 10-18	Short Downstream Occlusion Pressure Test, p. 10-21	Manual Tube Release Test, p. 10-21	Electrical Safety Tests, p. 10-22	Pump Mechanism Sensor Check, p. 10-14	Transferring Device Configuration Data, p. 5-51
Fan Assembly (Colleague 3 Pumps Only), p. 8-42		✓	✓	✓	✓	✓		✓										✓		✓
Front Bezel and Keypad, p. 8-26			✓	✓	✓	✓	✓	✓		✓			✓	✓		✓		✓		✓
Front Bezel Assembly, p. 8-10		✓	✓	✓	✓	✓	✓	✓		✓			✓	✓		✓		✓		✓
Fuses and Circuit Breaker, p. 8-29		✓	✓	✓	✓		✓			✓			✓	✓		✓		✓		✓
Inverter PCB Module, p. 8-22			✓	✓	✓		✓			✓			✓	✓		✓		✓		✓
LED PCB Assembly, p. 8-21			✓	✓	✓		✓			✓			✓	✓		✓		✓		✓
Rear Case, Open/Close, Inspection Only			✓			✓		✓												✓
Front Bezel, Open/Close, Inspection Only			✓															✓		✓
PHM, Open/Close, Inspection Only			✓							✓	✓	✓	✓			✓		✓		
Main Batteries, p. 8-34			✓	✓	✓	✓		✓										✓		✓
Main Display Assembly, p. 8-16			✓	✓	✓		✓			✓			✓	✓		✓		✓		✓
Main Speaker, p. 8-43		✓	✓	✓	✓	✓		✓										✓		✓
Manual Tube Release Assembly, p. 8-65											✓	✓					✓	✓		
Master and/or Slave Software, p. 8-27			✓	✓	✓		✓			✓			✓	✓		✓		✓		✓
Mounting Clamp, p. 8-28	✓																			
PANEL LOCKOUT Switch, p. 8-48		✓	✓	✓	✓	✓		✓										✓		✓
Pole Clamp Friction Pad, p. 8-58	✓																			
Power Cord, p. 8-30			✓		✓													✓		

Table 8-5 Post-Repair Tests — continued

Replaced/Opened Assembly	Mounting Clamp Check, p. 10-3	Internal Fan Check, p. 10-4*	Self-Test, p. 10-5	Check Software Version, p. 10-6	Check Event History, p. 10-7	Keypad and PANEL LOCKOUT Switch Test, p. 10-8	Check Voltage Sensor Data, p. 10-9	Nurse Call Relay Test, p. 10-10	PHM to Pumphead Housing Alignment Test, p. 10-11	Air In Line Test, p. 10-12	Channel Emergency Open Test, p. 10-13	Tube Misload Sensor Test, p. 10-14	Upstream Occlusion Test, p. 10-16	Volume Delivery Accuracy Test, p. 10-16	Downstream Occlusion Pressure Test, p. 10-18	Short Downstream Occlusion Pressure Test, p. 10-21	Manual Tube Release Test, p. 10-21	Electrical Safety Tests, p. 10-22	Pump Mechanism Sensor Check, p. 10-14	Transferring Device Configuration Data, p. 5-51
Power Supply Assembly, p. 8-40		✓	✓	✓	✓	✓		✓										✓		✓
Pump Module, p. 8-60			✓	✓					✓	✓	✓	✓	✓	✓	✓		✓	✓		
Pump Module Keypad, p. 8-87			✓							✓	✓	✓	✓			✓	✓	✓		
Pump Feet, p. 8-92	No Testing Required																			
Pump Mechanism, p. 8-66			✓							✓	✓	✓	✓	✓	✓		✓	✓		
Pump Display PCB Assembly, p. 8-86			✓	✓						✓	✓	✓	✓		✓		✓	✓		
Pump Housing, p. 8-90			✓							✓	✓	✓	✓	✓	✓		✓	✓		
Pump Module Software, p. 8-91			✓							✓	✓	✓	✓	✓	✓		✓	✓		
Rear Housing, p. 8-32			✓	✓	✓	✓		✓										✓		✓
Removal of the User Interface Main PCB (UIM PCB) Assembly, p. 8-12			✓	✓	✓		✓			✓			✓	✓		✓		✓		✓
Replacement of the User Interface Main PCB Assembly, p. 8-14			✓	✓	✓		✓			✓			✓	✓		✓		✓		✓
Shuttle Motor, p. 8-69			✓							✓	✓	✓	✓	✓	✓		✓	✓		
Slide Clamp Prism Replacement Procedure, p. 8-94			✓							✓	✓	✓	✓	✓	✓		✓	✓	✓	
Tube Loading Motor Mounting Inspection/Gear Tightening Procedure, p. 8-78			✓							✓	✓	✓	✓	✓	✓		✓	✓		
V-Block, p. 8-57			✓	✓	✓	✓		✓										✓		
Volume Control, p. 8-24			✓	✓	✓		✓											✓		✓

Front Bezel Assembly

Removal

1. Power the pump off and disconnect it from AC power.
2. Place the pump on an anti-static mat.
3. Use a 2.5 mm hex driver to remove the six screws (Figure 11-2 or 11-9, item 8) that secure the front bezel assembly. **Colleague 3 pumps:** Remove the long securing screw and tubing guide.
4. Separate the front bezel from the center housing by slowly pulling it forward far enough to access the connectors of the UIM PCB.

Note: If the gasket comes out, put it back on the center housing.

5. Disconnect the connector from P2 (6-wire DC power connector) on the UIM PCB. Remove the connectors listed below. Figure 8-1 shows the location of the UIM PCB connectors.
   - P14: 2-wire header connector (aux power; older pumps only)
   - P8: 4-wire header connector (pump module power)
   - P3: ribbon cable connector from pump modules
   - P12 (rear connector harness)
   - CON1: 3-wire header connector (part of P12 wiring harness; connects to the inverter PCB located under the UIM PCB)

Note: CON1 is not keyed; the innermost pin is not used.

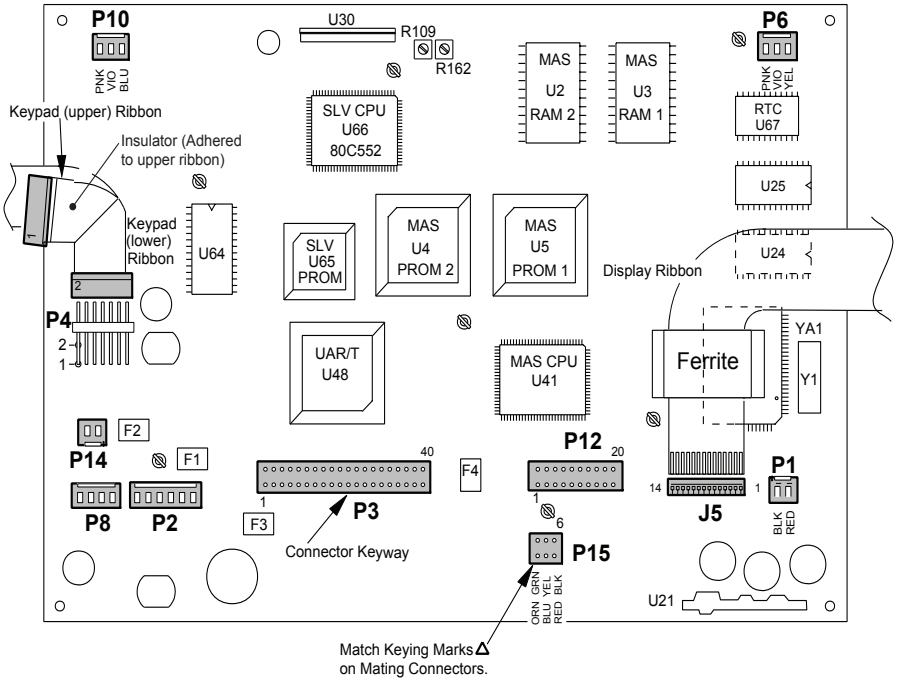


Figure 8-1 Location of UIM PCB Connectors

6. Use a 5.5 mm socket to remove the nut, washer, and tooth washer (Figure 11-2 or 11-9, items 10, 12, and 13) that secure the front bezel ground lead.

Caution **Check the bezel for broken alignment tabs. You may remove damaged tabs by cutting or breaking them off. After inspecting the interior of the pump to verify that no broken pieces remain, mark the broken tab(s) with indelible ink to indicate that the broken pieces have been accounted for.**

7. Remove the front bezel assembly.

Installation

Caution **Tighten the nut, flat washer, and tooth washer that secure the ground lead to 5 kgf-cm (4.3 lb-in). Ensure that the tooth washer is placed between front bezel chassis and the ring terminal.**

Ensure that wiring is not pinched and that the ring terminal is parallel to the case edge.

Ensure that connectors are mated correctly. Failure to correctly orient connector P8 can cause a blown fuse.

1. Place the tooth washer and ground lead over the stud on front bezel chassis. Secure the ground lead using one nut and flat washer.

2. Connect the wiring harnesses to the UIM PCB as outlined below. Figure 8-1 shows the location of the UIM PCB connectors.

Note: CON1 is not keyed; the innermost pin is not used.

Note: The wiring harnesses are short. If necessary, use needlenose pliers to prevent connectors from unfastening while you are attaching other connectors. Verify that all connections are properly mated.

- CON1: 3-wire header connector (part of P12 wiring harness; connects to the inverter PCB located under the UIM PCB)
- P12 (rear connector harness)
- P3: ribbon cable connector from pump modules
- P8: 4-wire header connector (pump module power)
- P14: 2-wire header connector (aux power; older pumps only)

3. Connect the 6-wire DC power connector to P2 of the UIM PCB.

Note: Ensure that the gasket on the front bezel mounting surface fits properly within the channel.

4. Using finger pressure, fully mate the front bezel with the pump chassis. Inspect the mating surface between the front bezel and the pump chassis. There should be a uniform gap between the front bezel and the pump chassis.

5. **(Colleague 3 Pump only.)** Install the tubing guide as described in "Tubing Guide (Colleague 3 Pumps Only)," 8-12.

6. Start and fully tighten all six front bezel screws in a criss-cross pattern.

7. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Tubing Guide (Colleague 3 Pumps Only)

The tubing guide is mounted on the center housing assembly on the Colleague 3 Pump left side (as viewed from front). The tubing guide securing screw is slightly longer than the other front bezel securing screws.

1. Use a 2.5 mm hex driver to remove one screw (Figure 11-9, item 26) and remove the tubing guide (Figure 11-9, item 25).

2. To install the guide, use one screw to secure it to the center housing. No testing is required.

Removal of the User Interface Main PCB (UIM PCB) Assembly

Use this procedure to remove the UIM PCB in order to access other assemblies. This procedure retains the information stored in the pump's memory by allowing you to remove the UIM PCB without disconnecting the backup battery.

Note: Use the procedure "Replacement of the User Interface Main PCB Assembly," 8-14 to replace the UIM PCB.

Removal

Note: When you remove the UIM PCB, **do not disconnect the Lithium Backup Battery connector P1**. Doing so when the Main Batteries are disconnected will cause loss of all configuration and history data.

1. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10 (you may not have to remove the ground wire).

2. Disconnect the following connectors from the UIM PCB (see Figure 8-1):

Caution **Unlock locking connectors before attempting to disconnect them.**

Note: On pumps using later-version Main Display Assembly (F069550203), contrast control connection to P6 is not used.

- P6: Locking 3-wire header connector from contrast control
- P10: Locking 3-wire header connector from volume control

- P4: Two 6-conductor flat ribbon harnesses from keypad
- P15: 6-wire header connector from the LED and icon PCB

3. Use a #2 crosstip driver to remove the four screws and plastic washers that secure the UIM PCB (Figure 11-3, items 16 and 6).

Caution **Ensure that the locking flange on connector J5 is unlocked before removing the flat ribbon cable.**

4. Note the flat ribbon cable connected to UIM PCB connector J5. On connector J5, use a small flat-blade screwdriver to lift the locking flange alternately from each end.

5. With the locking flange fully raised, carefully withdraw the flat ribbon cable from the connector. Carefully remove the flat ribbon cable from the ferrite ring. Adjust the position of the PCB, as required, to reduce any stress on the cable while removing the cable from the ferrite ring.

6. Position the UIM PCB next to the front bezel assembly to gain access to the lithium backup battery (Figure 11-3, item 21).

7. Use a 5.5 mm socket to remove the two nuts and washers (Figure 11-3, items 11 and 7) that secure the backup battery to the front bezel assembly.

8. Remove the UIM PCB, along with the backup battery, from the front bezel assembly.

Installation

1. Place the backup battery (Figure 11-3, item 21) in the mounting position.

Caution **Tighten the four UIM PCB securing screws and washers to 5 kgf-cm (4.3 lb-in). Ensure that connectors are mated and observe the correct orientation. Tighten the two backup battery nuts and washers to 7 kgf-cm (6 lb-in.)**

2. Secure the backup battery using two nuts and washers (Figure 11-3, items 11 and 7).

3. Place the UIM PCB in the mounting position. Carefully insert the flat ribbon cable through the ferrite ring. Adjust the position of the PCB, as required, to reduce any stress on the cable while inserting the cable through the ferrite ring.

4. With the locking flange on connector J5 in the unlocked position, carefully insert the flat ribbon cable into the connector. While holding the flat ribbon cable fully engaged and squarely seated into the connector, lock the flange on the connector.

Note: Make certain that the VOL. control wiring harness is positioned under the UIM PCB mounting tab.

5. Secure the UIM PCB using four screws and plastic washers (Figure 11-3, items 6 and 16).

Caution **LED/icon PCB harness connector P15 is not keyed. Make certain that the connector is correctly oriented before connecting. The connector is correctly oriented when the black, yellow, and green leads face toward the handle (top) of the front bezel housing.**

6. See Figure 8-1 for the location of UIM PCB connectors. Connect the wiring harness connectors in the following order:

Note: On pumps using later-version Main Display Assembly (F069550203), contrast control connection to P6 is not used.

Note: If the keypad ribbon insulator (PN: 72-20-26-626) is missing (see Figure 8-1 for placement), install it prior to inserting the ribbon cable into P4. Peel the backing from the insulator and adhere the insulator to the inside surface of the upper ribbon cable so that all traces are covered to prevent shorting between the cables. Mark "6" on the pump's service upgrade label to indicate that the insulator has been installed.

- P15: 6-wire header connector from LED and icon PCB
- P6: Locking 3-wire header connector from CONT. control
- P10: Locking 3-wire header connector from VOL. control
- P4: Two 6-conductor flat ribbon harnesses from keypad

7. Install the front bezel assembly as described in "Front Bezel Assembly," 8-10.

Note: You may use the full Operational Checkout procedures in Chapter 10 after a repair to verify that a pump is operating properly and within specifications.

8. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Replacement of the User Interface Main PCB Assembly

Use this procedure to remove and replace the UIM PCB.

Note: To remove the UIM PCB without losing information stored in the pump's memory, use the procedure "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.

Note: When you replace the UIM PCB, you are also replacing the pump's memory. You will lose all configuration and history data stored in the memory, including Main Battery information.

Note: See Figure 11-3 for important display and contrast control compatibility information. When replacing the UIM PCB you must ensure that the correct display is used. If required, replace the display as described in "Main Display Assembly," 8-16 or install the appropriate UIM PCB for the display currently installed in your pump.

Removal

1. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10 (you may not need to remove the ground wire).
2. Remove the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.
3. Disconnect the 2-wire header connector P1 (backup battery) from the UIM PCB.
4. Use the 44-pin software extractor (P/N 8219811) to remove the PROM ICs (Figure 11-2 or 11-9, items 9, 14, and 15) and DUART IC U48 (Colleague 3 only: Figure 11-9, item 20). Save these ICs for reuse in the new UIM PCB, and note the IC-to-socket correlation.
5. Use the 32-pin Software Extractor (P/N 8219801) to remove slave microprocessor (U66). Save for reuse in the new UIM PCB.

Installation

Caution **Tighten the four UIM PCB screws to 5 kgf-cm (4.3 lb-in).**

1. Install slave microprocessor U66 PROM IC in the new UIM PCB.
2. Install the PROM ICs (Figure 11-2 or 11-9, items 9, 14, and 15) and DUART IC U48 (Colleague 3 only: Figure 11-9, item 20) with the proper IC-to-socket correlation.
3. Install the new UIM PCB into the front bezel assembly (see steps 2 through 5 of "Removal of the User Interface Main PCB (UIM PCB) Assembly" on page 8-12).
4. Install the front bezel assembly as described in "Front Bezel Assembly," 8-10.
5. Reprogram the pump's configuration and time and date settings as described in Chapter 5.
6. Charge the batteries for 16 hours (minimum).
7. Perform "Battery Charge Level Indicator Calibration," 9-5.
8. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Main Display Assembly

Note: This procedure is applicable for main display, part no. F069550201 and superseding main display, part no. F069550203. The assemblies vary regarding flat ribbon cable and contrast control cable connections. Where differences exist, this procedure separately describes steps for the respective main displays.

Note: See Figure 11-3 for important display and contrast control compatibility information. When replacing the display you must ensure that the correct contrast control assembly is used and that the UIM PCB installed supports the new display. If required, replace the contrast control assembly as described in "Contrast Control," 8-23 and replace the UIM PBC "Replacement of the User Interface Main PCB Assembly," 8-14.

Removal

Note: When you remove the UIM PCB, keep the backup battery (UIM PCB connector P1) connected so that battery history and configuration information are not lost.

1. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10.
2. Remove the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.
3. Use a #2 crosstip driver to remove the three screws and washers (Figure 11-3, items 11 and 22) that secure the left retaining clip adjacent to the main display PCB. Remove the retaining clip.
4. Use a #2 crosstip driver to remove the four screws and washers (Figure 11-3, items 11, 12, and 17) that secure the EMI shield (Figure 11-3, item 13). Remove the EMI shield.

Caution **Unlock the flat ribbon connector flange for CN1 before removing the flat ribbon cable.**

5. **(F069550201 (earlier) display only.)** Carefully disconnect the flat ribbon connector CN1.
6. **(F069550203 (later) display only.)** Disconnect contrast control locking pigtail connector from contrast control wiring harness.
7. Disconnect the 2-wire header connector from connector CON2 on the inverter PCB.
8. Remove the contrast control wiring harness from behind the UIM PCB mounting tab.

9. Using a flat-blade screwdriver, remove the display assembly by gradually prying between the main display assembly and backing plate at several points (see Figure 8-2). If the display assembly is difficult to remove, use a single edge razor blade to cut the foam tape.

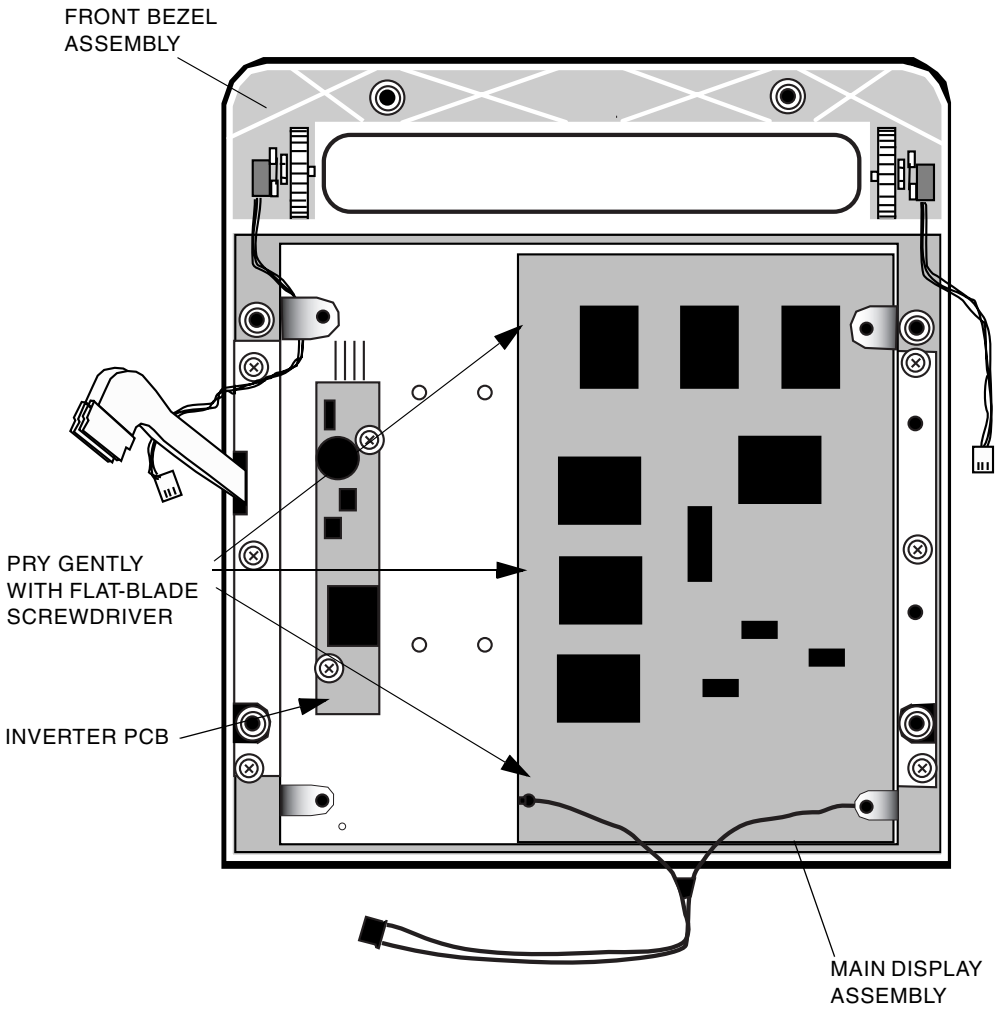


Figure 8-2 Removing the Main Display Assembly from the Front Bezel

10. Remove foam tape residue from the front bezel using a Whisk Adhesive Remover Pad or isopropyl alcohol. Allow to dry.

Installation

1. Carefully apply a piece of single-backed foam tape (Figure 11-3, item 30) to the top and bottom edges of the display assembly.

2. Carefully apply a piece of double-backed foam tape (Figure 11-3, item 8) to the left and right edges of the display, ensuring that the ends of the tape meet at the corners but do not overlap. The foam tape prevents foreign matter from entering the main display.

3. Blow out any lint or foreign matter from the back of the front bezel.

4. Hold the main display assembly above the mounting position. When properly positioned, lower the main display onto the backing plate which is attached to the inner side of the bezel (Figure 11-3, item 1).

5. Press the main display assembly onto the taped surface.

6. **(F069550203 (later) display only.)** Prepare integral flat ribbon cable on main display as shown in Figure 8-3.
Fold the cable in the four sequential steps shown, making certain of the following:
   - Cable end is aligned with connector P5 on UIM PCB.
   - Conductors on cable end face upward.

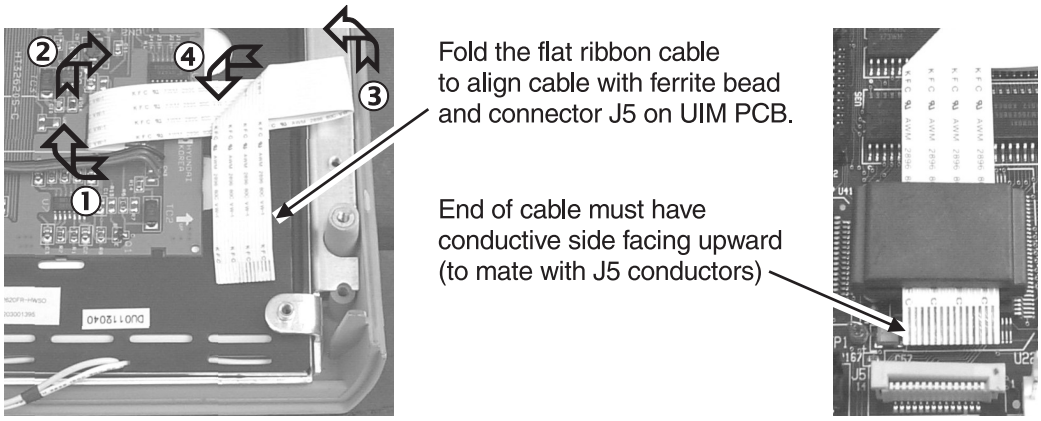


Figure 8-3 Main Display F069550203 Ribbon Cable Preparation

7. **(F069550201 (earlier) display only.)** Carefully insert the flat ribbon cable into connector CN1 on the main display PCB. While holding the flat ribbon cable fully engaged and securely seated into the connector, lock the flange on the connector.

Note: To ensure correct reassembly, note that two of the EMI shield securing screws (Figure 11-3, item 17) are 10 mm long, and the other two screws (Figure 11-3, item 12) are 6 mm long.

8. **(F069550203 (later) display only.)** Route the contrast control pigtail such that wiring is flat against display PCB, and no interference exists between EMI shield (Figure 11-3, item 13).

Note: Make certain that the contrast control wiring harness is positioned under the UIM PCB mounting tab.

Caution

Tighten the four EMI shield securing screws and washers to 7 kgf-cm (6 lb-in).

Tighten the retaining clip screws and washers to 7 kgf-cm (6 lb-in). Make certain that the retaining clip screws engage the existing threads in the housing. Misthreading the screws can damage the housing.

9. Place the EMI shield (Figure 11-3, item 13) into position, making certain that EMI shield is flush against mounting standoffs and no wiring is pinched by shield edges. Make certain contrast control wiring harness is under the shield and not pinched by shield. Secure shield using four screws and washers (Figure 11-3, items 11, 12, and 17).

10. **(F069550203 (later) display only.)** Connect the contrast control locking pigtail connector to contrast control wiring harness. Route the pigtail and harness as shown in Figure 8-4.

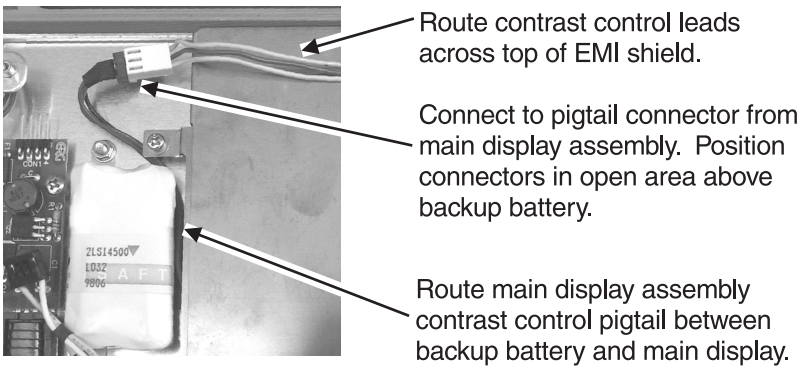


Figure 8-4 Contrast Control Harness Routing (F069550203 (later) display)

11. Noting the correct orientation of the retaining clip, place the retaining clip in the mounting position, and secure it with three screws and washers (Figure 11-3, items 11 and 22).

12. Connect the 2-wire header connector to connector CON2 on the inverter PCB.

13. Install the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.

14. Install the front bezel assembly as described in "Front Bezel Assembly," 8-10.

15. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Backup Battery Assembly

Note: When you replace the backup battery, keep main battery power connected to the UIM PCB (P2) so that battery history and configuration information are not lost.

Removal

1. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10. Do not disconnect P2, the connector that supplies battery power to the UIM PCB.
2. Remove the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12, except disconnect P1 instead of P2.
3. Use a 5.5 mm socket to remove the lithium battery assembly (Figure 11-3, item 21) by removing two nuts and washers (items 7 and 11).

Installation

1. Install the lithium battery assembly.

Caution

Tighten the two backup battery hex nuts to 7 kgf-cm (6 lb-in).
Tighten the four UIM PCB screws to 5 kgf-cm (4.3 lb-in).
Tighten the ground wire securing hex nut to 5 kgf-cm (4.3 lb-in).

2. Secure the battery using two nuts and washers (Figure 11-3, items 7 and 11).
3. Connect the battery harness to connector P1 on the UIM PCB.
4. Install the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.
5. Install the front bezel assembly as described in "Front Bezel Assembly," 8-10.
6. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

LED PCB Assembly

Note: When you replace the LED PCB assembly, keep the backup battery (UIM connector P1) connected to the UIM PCB so that battery history and configuration information are not lost.

Removal

1. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10.
2. Remove the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.
3. Disconnect the 6-wire header connector from connector P109 on the LED PCB (Figure 11-3, item 5).
4. Use a 5.5 mm socket to remove the two hex nuts and washers (Figure 11-3, items 6 and 7) that secure the LED PCB. Remove the LED PCB.

Note: Ensure that the spacers remain on the mounting studs (Figure 11-3, item 4).

Installation

1. Place the LED PCB (Figure 11-3, item 5) in the mounting position. Ensure that spacers (item 4) are in place.

Caution

Ensure that connectors are mated and observe the correct orientation.
Tighten the two LED PCB hex nuts to 3 kgf-cm (2.6 lb-in).
Tighten the two backup battery hex nuts to 7 kgf-cm (6 lb-in).
Tighten the ground wire securing hex nut to 5 kgf-cm (4.3 lb-in).

2. Secure the LED PCB using two hex nuts and washers (Figure 11-3, item 6 and 7).

Caution

P109 connector harness is not keyed. Ensure that the connector is oriented so that the green, yellow, and black leads face away from the PCB surface when it is connected.

3. Connect the 6-wire header connector to connector P109 on the LED PCB.
4. Install the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.
5. Install the front bezel assembly as described in "Front Bezel Assembly," 8-10.
6. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Inverter PCB Module

Note: When you replace the inverter PCB module, keep the backup battery (UIM connector P1) connected to the UIM PCB so that battery history and configuration information are not lost.

Removal

1. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10.
2. Remove the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.
3. Use a #2 crosstip driver to remove the two screws and washers (Figure 11-3, items 6 and 16) that secure the inverter PCB (item 20) to the front bezel (item 1). Remove the inverter PCB.
4. Disconnect back light connector J104 from inverter PCB connector CON2.

Installation

Caution

Tighten the two inverter PCB securing screws to 4 kgf-cm (3.5 lb-in).
Tighten the two backup battery hex nuts to 7 kgf-cm (6 lb-in).
Tighten the ground wire securing hex nut to 5 kgf-cm (4.3 lb-in).

1. Place the inverter PCB in the mounting position.
2. Secure the inverter PCB using two screws and washers (Figure 11-3, items 6 and 16).
3. Connect back light connector J104 to inverter PCB connector CON2.
4. Install the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.
5. Install the front bezel assembly as described in "Front Bezel Assembly," 8-10.
6. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Contrast Control

Removal

Note: When you replace the Contrast Control, keep the backup battery (UIM connector P1) connected to the UIM PCB so that battery history and configuration information are not lost.

1. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10.
2. Remove the UIM PCB as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.
3. Use a #2 crosstip driver to remove the three screws and washers (Figure 11-3, items 11 and 22) that secure the retaining clip (item 3). Remove the retaining clip.
4. Use a #2 crosstip driver to remove the four screws and washers (Figure 11-3, items 11, 12, and 17) that secure the EMI shield (item 13). Lift the shield, and remove the contrast control wiring harness from beneath the EMI shield.
5. Working from the rear of the front housing, use an 8 mm open end wrench to completely loosen the nut that secures the contrast control (Figure 11-3, item 27) to the front housing.
6. Free the contrast control from its mounting tab while carefully extracting the wiring harness from the housing slot.
7. Remove the silicone sealant from the wiring slot in the housing.

Installation

Caution

Do not overtighten the hex nuts that secure the controls to the front housing.

Tighten the retaining clip screws and washers to 7 kgf-cm (6 lb-in). Make certain that the retaining clip screws engage the existing threads in the housing. Misthreading the screws can damage the housing.

Tighten the four EMI shield securing screws and washers to 7 kgf-cm (6 lb-in).

1. Install the contrast control in the mounting tab. Make certain that the wiring harness is properly placed through the housing slot.
2. Hold the contrast control fully flush in the mounting tab and make certain that the pin at the front of the knob is resting flush in support. Tighten the shaft nut and washer using an 8 mm open end wrench.

   When the nut is fully flush against the mounting tab and any slack is eliminated, fully tighten the nut by tightening it an additional 1/8-turn.

3. Apply white silicone sealant to secure the control wiring harness in the housing slot.

Caution **Make certain that the contrast control wiring harness is routed under the EMI shield when routing wiring harness under adjacent UIM PCB mounting tab.**

4. Lift the EMI shield (Figure 11-3, item 13) and place the contrast control wiring harness underneath the UIM PCB mounting tab adjacent to the contrast control.

5. Place the EMI shield (Figure 11-3, item 13) into mounting position, making certain that EMI shield is flush against mounting standoffs and no wiring is pinched by shield edges. Make certain contrast control wiring harness is under the shield and not pinched by shield. Secure shield using four screws and washers (Figure 11-3, items 12 and 17).

6. Install the User Interface Main PCB (UIM PCB) as described in "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12.

7. Install the front bezel assembly as described in "Front Bezel Assembly," 8-10.

8. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Volume Control

Removal

Note: When you replace the Volume Control, keep the backup battery (UIM connector P1) connected to the UIM PCB so that battery history and configuration information are not lost.

1. Perform steps 1 through 8 of "Front Bezel Assembly," 8-10.

Caution **Unlock the volume control header connector before disconnecting the connector.**

2. Disconnect the volume control wiring harness from P10 on the UIM PCB.

3. Use a #2 crosstip driver to loosen the four screws (Figure 11-3, items 6 and 16) that secure the UIM PCB (item 15). Remove the screw and plastic washer located closest to the volume control.

4. Working from the rear of the front housing, use an 8 mm open end wrench to completely loosen the hex nut that secures the volume control (Figure 11-3, item 26) to the front housing.

5. Withdraw the volume control wiring harness from beneath the UIM PCB by carefully lifting the UIM PCB at the edge nearest the volume control while extracting the wiring harness.

6. Free the volume control from its mounting tab while carefully extracting the wiring harness from the housing slot.

7. Remove silicone sealant residue from the wiring slot in the housing.

Installation

1. Install the volume control. Make certain that the wiring harness is properly placed through the housing slot.

Caution **Do not overtighten the hex nut that secures the control to the front housing. Tighten the four UIM PCB securing screws to 5 kgf-cm (4.3 lb-in).**

2. Hold the volume control fully flush in the mounting tab. Making certain that the pin at the front of the knob is resting flush in the support, tighten the shaft nut and washer using an 8 mm open end wrench.

3. When the nut is fully flush against the mounting tab and any slack is eliminated, fully tighten the nut by tightening it an additional 1/8 turn.

4. Apply white silicone sealant to secure the control wiring harness in housing slot.

5. Place the volume control wiring harness beneath the UIM PCB by carefully lifting the UIM PCB at the edge nearest the volume control while placing leads under the PCB and mounting tab.

6. Install the UIM PCB securing screw and plastic washer. Tighten all four UIM PCB securing screws.

7. Connect the volume control wiring harness to P10 on UIM PCB.

8. Install the front bezel assembly as described in “Front Bezel Assembly,” 8-10.

9. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Front Bezel and Keypad

The keypad and front bezel are a single assembly and are replaced together.

Removal

Note: When you remove the UIM PCB, keep the backup battery (UIM connector P1) connected so that battery history and configuration information are not lost.

1. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10.
2. Use a 5.5 mm socket to remove the ground wire securing nut, ground wire, and tooth washer (Figure 11-2, items 11, 12, and 13) from the keypad backing plate.
3. Remove all components attached to the keypad backing plate as described in the following procedures:
   - "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12
   - "Main Display Assembly," 8-16
   - "LED PCB Assembly," 8-21
   - "Inverter PCB Module," 8-22
   - "Contrast Control," 8-23
   - "Volume Control," 8-24
4. Install all components to the new bezel with keypad and plate.
5. Tighten all screws and nuts as specified in each section.

Installation

1. Assemble the pump as described in the following procedures:
   - "Volume Control," 8-24
   - "Contrast Control," 8-23
   - "Inverter PCB Module," 8-22
   - "LED PCB Assembly," 8-21
   - "Main Display Assembly," 8-16
   - "Removal of the User Interface Main PCB (UIM PCB) Assembly," 8-12
   - "Front Bezel Assembly," 8-10
2. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Master and/or Slave Software

Removal

1. Have on hand either a pump with identical Personality feature sets or a record of the pump's Personality feature sets. If neither is available, record all Personality feature sets before changing software.

2. Remove the front bezel assembly as described in "Front Bezel Assembly," 8-10. (You do not need to remove the ground wire and all connections.)

3. Use the 44-pin Software Extractor (P/N 8219811) to remove:

   - Master PROMs (U4 and U5)

     Colleague: Figure 11-3, items 9 and 15
     Colleague 3: Figure 11-9, items 9 and 15

4. Use the 32-pin Software Extractor (P/N 8219801) to remove:

   - Slave PROM (U65)

     Colleague: Figure 11-3, item 14
     Colleague 3: Figure 11-9, item 14

5. **Colleague 3 pumps only:** Use the 44-pin Software Extractor (P/N 8219811) to remove the Slave DUART IC (Figure 11-9, item 20).

Installation

1. Install new software PROMs.Verify that the chips are oriented properly in the sockets.

2. Install the front bezel assembly as described under "Front Bezel Assembly," 8-10.

3. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Mounting Clamp

Colleague Pump mounting clamps can be installed for IV pole or headboard use, depending on clinical needs. Colleague 3 mounting clamps can be used on IV poles only. See Figure 11-1 or 11-8, item 4.

Removal

Note: Older Colleague pumps may have a protective cover over the unused mounting clamp position. Remove the protective cover before removing the mounting clamp.

To remove the mounting clamp when it is installed for IV pole use, press the release tab and slide the mounting clamp to the right.

To remove the mounting clamp when it is installed for headboard use, press the release tab and slide the mounting clamp down.

Installation

1. To install the mounting clamp for headboard use, slide it upward, with the release tab up, until it locks into place.

   To install the mounting clamp for IV pole use, slide it to the left, with the release tab to the right, until it locks into place.

2. Install the protective cover (if present) over the unused mounting position by sliding it into place.

3. Check that the mounting clamp knob turns smoothly throughout its full range of motion without catching or binding.

4. Check that the mounting clamp pads are in place and adhere fully to the mounting surface.

5. Check that no cracks exist adjacent to the clamp pivot point. Replace the mounting clamp if cracks are present.

6. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Fuses and Circuit Breaker

Caution **Overtightening the fuse caps may cause the fuse holder to break.**

Table 8-6 *Replaceable Fuses*

Location	Quantity	Description
Replaceable fuses accessible from the outside of the pump		
AC Power	2	F101, F102: 1.6 A, type T
Replaceable fuses accessible inside the pump		
Power Supply PCB	1	2.5 A type F (in fuse holder)
UIM PCB ***Note:*** UIM PCB fuses are non-replaceable. Replace the UIM PCB if a fuse(s) blows.	1 1 1 1	F1: 2.0 A ($V_{unregulated}$) F2: 375 mA (12 VDC for memory voltage) F3: 500 mA (inverter and main speaker) F4: 375 mA (Backup beeper)
Pump Module PCB ***Note:*** Pump Module PCB fuse is non-replaceable. Replace the Pump Mechanism if the Pump Module PCB fuse blows.	1 1	F1: circuit breaker (self-resetting poly fuse trips when overheating occurs) F2: 5A (12 VDC input power)
Main Battery	1	F103: 4 A in-line

After replacing the AC power fuses, perform the "Self-Test," 10-5. Verify that the Plug icon is lit when the pump is connected to AC power.

After replacing any internal fuses, perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Power Cord

Note: Pumps are equipped with a power cord appropriate for use in the country in which they will be sold. Refer to Chapter 11 for part numbers of replacement power cords available for use with the pump. If you are unsure which power cord to order, contact your local Baxter-authorized service center.

Note: Before ordering a replacement power cord, look at the currently installed cord retainer (Figure 11-1 or 11-8, item 8). It is suggested that if the retainer is not slotted, you should order a new one. The older (unslotted) design requires that you remove both screws to remove the retainer. New cord retainers require only one screw to be removed, and are easier to install. The other screw is a shoulder screw that allows the retainer to slide on and off. If you order a slotted retainer, you must also order the screw (part no. 4009330115, quantity 1).

Removal

1. If you are removing an unslotted retainer: Use a 2 mm hex driver to remove the two button socket head screws and washers that secure the power cord retainer (Figure 11-1 or 11-8, items 9 and 10).

   If you are removing a slotted retainer: remove only the top screw and slide the retainer up off the shoulder screw while detaching the power cord from the pump. The shoulder screw remains in place.

2. Disconnect the power cord.

Installation

Caution **Tighten the power cord retainer screws to 9 kgf-cm (7.8 lb-in).**

1. With the front of pump supported by the pump's packing insert, position the rear of pump facing up.

2. Place the securing screws and washers in the power cord retainer.

3. If you are installing an unslotted retainer:

   3.1 Mate the cord to the pump AC connector just far enough to engage the lower cord retainer screw into the case.

   3.2 Start both retainer screws and washers.

   3.3 Fully tighten the lower screw.

   3.4 Push the cord fully into the pump AC connector.

   3.5 Fully tighten the upper retainer screw and proceed to the next step.

If you are installing a slotted retainer:

3.1 Assemble the pan head screw with a flat washer, then insert the screw into the shoulder washer such that the threaded end of the screw is protruding from the narrow end of the shoulder washer.

3.2 Install the assembly into the lower cord cover mounting hole on the rear case and tighten to 9 kgf-cm (7.8 in-lb).

3.3 Slide the new retainer onto the power cord.

3.4 Slide the slotted end of the cord cover onto the shoulder washer.

3.5 Position the cover against the rear case while completing the insertion of the power cord into the pump's AC receptacle.

3.6 Install the remaining pan head screw and washer into the top hole of the new retainer and tighten to 9 kgf-cm (7.8 in-lb).

4. Plug the cord into a hospital-grade AC outlet, and verify that the plug icon lights.

5. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Rear Housing

Removal

1. Power the pump off and disconnect it from AC power.
2. Place the pump on an anti-static mat.
3. Use a 2.5 mm hex driver to remove the four screws that secure the rear housing (Figure 11-5, item 19).
4. Separate the rear housing from the center housing by pulling the rear housing out slightly, breaking the seal.
5. Raise the rear housing approximately 3.75 cm (1.5 in.) and rotate the rear housing clockwise upward over the V-block for the mounting clamp. The center of rotation should be the lower right corner.
6. (Optional) To provide slack in wiring if necessary, remove the front bezel by performing steps 1 through 5 of the “Front Bezel Assembly,” 8-10. Then remove the cable tie from the wire bundle on the lower left of the center housing. Manipulate the wires leading to the rear housing to provide slack.
7. Invert the rear housing and rest it on the top half of the pump’s packing insert or similar support as shown in Figure 8-5.

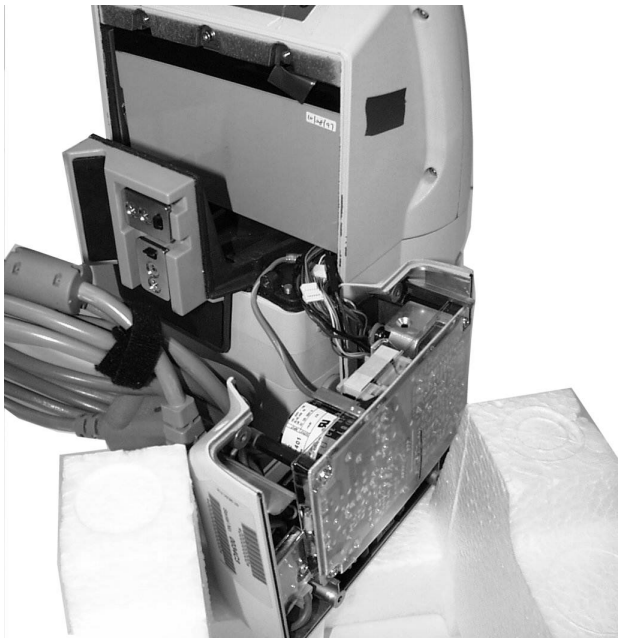


Figure 8-5 Supporting the Rear Housing of the Colleague 3 Pump during Disassembly

8. Use the battery extraction tool (or equivalent) described in "Optional Tools Required for Repair Procedures," 8-3 to partially remove the rear battery to gain access to the green ground lead attached to the subplate.

9. Use a #2 crosstip driver to disconnect the rear housing ground lead from the subplate by removing one screw, flat washer, and tooth washer.

Caution **Where connectors are identified as "locking," unlock the connectors before removing cables.**

10. Disconnect the interconnecting harnesses listed below to fully separate the rear housing:

Note: You may have to remove the front battery to access all four harness connections. If required, remove the front battery as described in "Main Batteries," 8-34.

- 2-wire locking harness connector (female end with lock at rear housing)
- 2-wire locking harness connector (female end with lock at pump chassis)
- 6-wire harness connector
- 8-wire harness connector

Installation

Note: Reconnecting the harness may be easier with both batteries removed. If required, remove the batteries as described in "Main Batteries," 8-34.

1. Place the rear housing assembly adjacent to the pump to facilitate reconnecting the harnesses.

Caution **Tighten the screw, flat washer, and tooth washer securing the ground lead to 5 kgf-cm (4.3 lb-in). Ensure that the tooth washer is placed between the subplate and the ring terminal.**

Tighten the four screws and washers that secure the rear housing to 9 kgf-cm (7.8 lb-in).

2. Secure the rear harness ground lead to the subplate using the screw, flat washer, and tooth washer.

3. Connect the four wiring harnesses that connect the rear housing to the pump chassis:

- 2-wire locking harness connector (female end with lock at rear housing)
- 2-wire locking harness connector (female end with lock at pump chassis)
- 6-wire harness connector
- 8-wire harness connector

Note: If applicable, re-install the batteries as described in steps 1 through 6 of "Main Batteries," 8-34.

4. Place the rear housing over the V-block, keeping the lower right corner as close to the mounting position as possible.

5. Partially lower the rear housing into the mounting position. Make certain that all harnesses and the ground lead are pushed into the rear housing cavity and do not extend into the housing mating surface.

6. Using finger pressure, fully mate the rear housing with the pump chassis. Inspect the mating surface between rear housing and pump chassis. There should be a uniform gap between the rear housing and the pump chassis.

7. Start the four screws (Figure 11-5, item 19) that secure rear housing to pump.

8. Fully tighten the four rear housing securing screws in a criss-cross pattern.

9. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Main Batteries

Note: Always replace both batteries at the same time. Always use Yuasa batteries manufactured within three months of each other.

Note: If the pump contains Ray-O-Vac batteries, replace them with Yuasa batteries (factory part number 5009480001; service replacement part number UBAT1010.A).

Note: Colleague pumps with software versions older than 4.00.00 may have only one main battery. **These single-battery pumps must be upgraded to the standard dual-battery configuration.** See “Adding a Second Battery (Colleague Pumps Only),” 8-38 for the upgrade procedure or contact Baxter Product Service for more information.

Note: During battery replacement it is recommended that battery harness (F069140020) be replaced with battery harness with protection circuit (F069180620). The protection circuit provides integral fuses and diodes to protect the batteries from overcurrent damage during charging.

Removal

1. Remove the rear housing assembly as described in steps 1 through 8 of “Rear Housing,” 8-32. You do not need to remove the ground wire.

2. Remove the rear main battery (Figure 11-2, item 4) by placing your fingers under it and working it out of the center housing as shown in Figure 8-6.

Figure 8-6 Removing the Rear Battery Using Your Hand

3. If your hand will not fit, or if you have difficulty removing the battery because the wiring harness connectors are in the way, fabricate a tool as shown in Table 8-2.

    3.1 Place your left thumb on the upper left corner of the battery.

    3.2 Holding the longer end of the tool in your right hand, insert the shorter hook under the right side of the battery, with the hook horizontal and pointing to the right.

    3.3 With your left thumb, force the battery in and to the left while rotating the hooked end of the tool 90° counterclockwise to position it between the rear battery and the battery bracket.

    3.4 Use the tool to carefully pull the rear battery out of the center housing.

4. Note the battery harness PCB at the left side of battery. Disconnect the battery harness PCB by sliding the PCB downward while supporting the battery. Figure 8-7 shows the battery harness PCB for the rear battery.

5. Remove the rear battery.

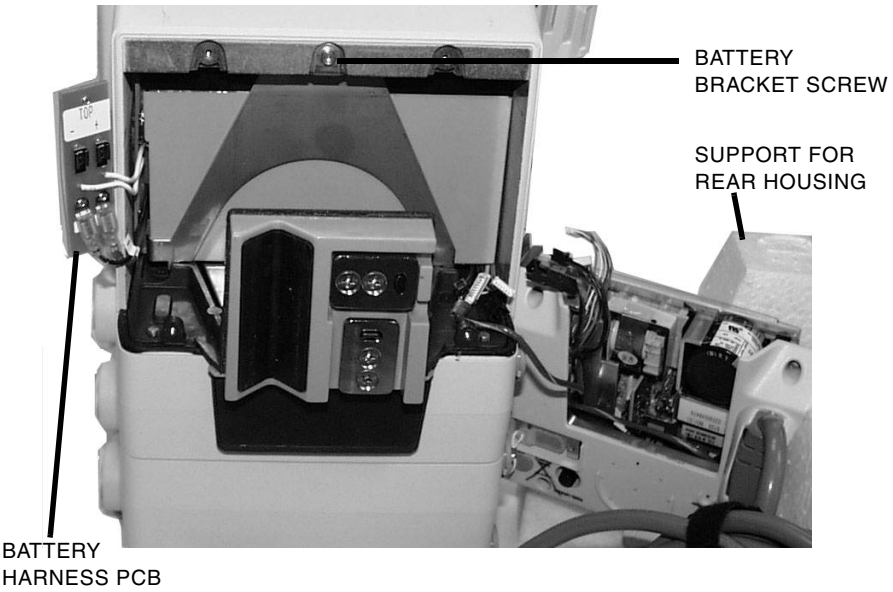


Figure 8-7 Rear View of Pump with Rear Housing and Rear Battery Removed

6. Use a 2.5 mm hex driver to remove the screw and washer that secure the battery bracket (Figure 11-2, items 5, 12, and 20). Remove the bracket.

7. Remove the front battery from the chassis by pulling the rear battery harness until you gain access to the battery.

8. Disconnect the battery harness PCB on the front battery by sliding the PCB downward while supporting the battery.

Installation

Note: During battery replacement, replace battery harness (F069140020) with battery harness with protection circuit (F069180620). The protection circuit provides integral fuses and diodes to protect the batteries from overcurrent damage during charging.

1. On the front battery, connect the front battery harness with protection circuit to the battery. Make certain that "+" and "-" on the battery harness with protection circuit mate with "+" and "-" terminals on the battery.

Caution

Ensure that the battery bracket lower mounting tabs are correctly engaged in the housing.

Ensure that the wiring harnesses beneath the batteries are not pinched, and that all four harnesses protrude away from the batteries.

Note: If the pump contains Ray-O-Vac batteries, replace them with Yuasa batteries (factory part number 5009480001; service replacement part number UBAT1010.A).

Note: Do not install batteries from two different manufacturers into the same pump, and do not install batteries with manufacturing date codes that differ by more than three months. Seven-digit date codes are stamped on Yuasa batteries. Date of manufacture is encoded as follows:

Mfg. location	Year	Month	Day	Factory code
U.S, U.K.	first digit: last digit of year	Digits 2 and 3	Digits 4 and 5	last two digits
Other	first 2 digits: last two digits of year	Digits 3 and 4	Digits 5 and 6	last digit

2. While holding all four wiring harnesses beneath the batteries toward the rear of the pump, slide the front battery fully into the chassis.

3. Place the battery bracket (Figure 11-2, item 5) into the mounting position. Ensure that the battery bracket lower mounting tabs are correctly engaged in the housing.

4. Use one screw and washer (Figure 11-2, item 12 and 20) to secure the battery bracket.

5. Connect battery harness F069180620 to the rear battery. Ensure that "+" and "-" on the battery harness mate with "+" and "-" terminals on the battery.

6. Slide the rear battery fully into the chassis, ensuring that all four wiring harnesses beneath the batteries are freely protruding away from the batteries.

7. Install the rear housing assembly as described in "Rear Housing," 8-32.

Note: Perform steps 8 through 11 *only* if you installed new batteries.

8. After the pump is fully reassembled, access the Battery and Pump History screen as described on page 5-45.

9. Press the **New Battery** soft key to reset the battery information on the Battery and Pump History screen.

10. Charge the pump until all boxes on the Battery Charge Level Indicator are filled.

11. Exit the Configuration/Service Menu by powering the pump off and back on again.

Note: You may use the full Operational Checkout procedures in Chapter 10 after a repair to verify that a pump is operating properly and within specifications.

12. Perform the tests in Table 8-5 on page 8-7. Record the test results on a copy of the "Rear Housing Data Sheet" at the back of this manual.

Adding a Second Battery (Colleague Pumps Only)

If your pump has only one main battery, you must upgrade it to the current dual battery configuration, including upgrading the battery harness (see Figures 11-2 or 11-9, item number 21), using this procedure. Perform this procedure to convert Colleague pumps with a single main battery to use two main batteries. Always install two new batteries when performing this procedure and recycle or discard the used battery in accordance with local regulations. Contact your Baxter customer service center for information on obtaining new batteries.

Note: Pumps with ratings label part number 07-26-01-903 already have two batteries installed.

Note: Pumps with dual batteries still require adequate charging to properly maintain the batteries. See “Battery Care Information” on page 6-5 for more information.

Note: Before performing this procedure, Baxter suggests that the pump configuration and history be saved to another pump for retrieval when the upgrade is complete. If this is not done you will have to reprogram the pump.

1. Power the pump off and disconnect it from AC power.
2. Place the pump on the anti-static mat.
3. Remove four screws securing the rear housing (Figure 11-5, item 19).

Note: Avoid overstressing the wiring harnesses

4. Separate the rear housing from the center housing by pulling the rear housing out slightly, breaking the seal. Raise the rear housing approximately 1.5 inches and rotate it clockwise upward over the V-block for the mounting clamp. The center of rotation should be the lower right corner.

Note: (Optional) To provide slack in wiring, if necessary, remove the front bezel by performing steps 1-4 of “Front Bezel and Keypad,” 8-26. Then remove the cable tie from the wire bundle on lower left of center housing. Manipulate wires leading to rear housing to provide slack.

5. Invert the rear housing and place it on the work surface with the ground wires still connected.
6. Disconnect the interconnecting cables to separate the rear housing.
7. Remove the allen head screw and washer securing the battery bracket (Figure 11-2, items 5, 12, and 20), then remove the bracket.
8. Remove the battery (Figure 11-2, item 4) by tipping the pump backward, placing your fingers under the battery, and working it out of the center housing.
9. Disconnect the + and – battery leads from the battery and clip them to the battery harness making sure that the + and – leads are properly connected.

10. Perform this step only when upgrading the pump to use two main batteries and upgrading the software to version 4.XX or greater. Disconnect all power from the UIM PCB by removing the plugs from P1 and P2 for a minimum of one minute to reset the slave memory (all configurations and histories will be erased and will have to be reprogrammed or retrieved from another pump).
11. Using a permanent marker, mark an "X" through the existing Battery Disposal label inside the battery compartment.
12. Install a new Battery Disposal label (part no. 07-26-X1-727) next to the existing Battery Disposal label.

Note: Do not install batteries from two different manufacturers into the same pump, and do not install batteries with manufacturing date codes that differ by more than three months. Seven-digit date codes are stamped on Yuasa batteries. Date of manufacture is encoded as follows:

Mfg. location	Year	Month	Day	Factory code
U.S, U.K.	first digit: last digit of year	Digits 2 and 3	Digits 4 and 5	last two digits
Other	first 2 digits: last two digits of year	Digits 3 and 4	Digits 5 and 6	last digit

13. Install the two new batteries onto the battery harness, ensuring that the + and – leads are properly connected.
14. Install one battery into the compartment, then install the battery bracket and secure it with the allen head screw and washer. Ensure that tabs on bracket are inserted into the slots properly so bracket is secured at the bottom. Then install the second battery.
15. Connect the interconnecting cables between the two housings.
16. Put two housings together. Do not pinch or kink wires or misalign gaskets.
17. Install the four screws securing the rear housing.
18. After the pump is fully reassembled, access the Battery and Pump History screen as described on page 5-45.
19. Press the **New Battery** soft key to reset the battery information displayed on the Battery and Pump History screen.
20. Exit the Configuration/Service Menu by powering pump off and back on again.
21. Perform the tests listed for "Main Battery" assembly and record the results on a copy of the Operational Checkout Data Sheet.
22. Note the location of the Ratings label on the pump. Use a heat gun to soften the label and adhesive, remove the label, and remove any remaining adhesive with alcohol or Whisk adhesive remover.
23. Attach the new Ratings label (07-26-X1-903) to the pump in the same place as the original label.
24. Plug the pump into AC power and charge the batteries until all boxes on the Battery Charge Level Indicator are filled (12 hours minimum).

Power Supply Assembly

Older pumps were manufactured with power supplies made by Astec. All pumps are currently being manufactured with power supplies made by Condor. Both supplies are functionally equivalent. The Astec power supply is no longer available as a replacement part and must be replaced by the Condor power supply if it fails. When replacing the Astec power supply with a Condor power supply, you must also replace the shield. Power supply and shield model information is shown below.

Note: Do not attempt to replace a Condor power supply with an Astec power supply.

Table 8-7 Power Supply Information

Manufacturer	Model	Part No.	Shield Part No.
Astec	LPS44-401	F069110523 (no longer available)	F069610006
Condor	GLM65-15	F069110522	F069120526

Note: All part numbers listed here are factory pre-calibrated assemblies.

! WARNING ! **Ensure that the pump is powered off and unplugged from the AC receptacle before performing this procedure.**

Removal

1. Remove the rear housing assembly as described in “Rear Housing,” 8-32.
2. Use a #2 crosstip driver to remove the four screws and plastic washers (Figure 11-5, items 19 and 28) that secure the power supply assembly and vacuum shield (Figure 11-5, items 1 and 2) to the rear housing standoffs. Separate the insulator shield from the power supply assembly, if necessary.
3. Slightly lift the power supply assembly to gain access to the connectors.

Note: Tag the disconnected wires to help ensure correct installation.

Note: Connector SK2 in Astec power supplies attaches very firmly. Disconnect it by firmly grasping the sides of connector shell to separate it enough to get a flat-blade screwdriver between the connector halves. Fully separate the connector halves by rotating the screwdriver until the connection breaks free.

4. Disconnect the following connectors in order:
   - 2-wire AC input harness connector J1 (SK1 on Astec supplies)
   - Green ground wire
   - 4-wire (Colleague 3) or 2-wire (Colleague) DC output harness connector J2 (SK2 on Astec supplies)
5. Remove the power supply assembly.

Installation

1. Place the power supply assembly in the mounting position.
2. Connect the following connectors to the power supply:
   - 2-wire AC input harness connector J1 (SK1 on Astec supplies)
   - Green ground wire
3. Check the calibration of the power supply as described in "Power Supply Calibration," 9-2.

! WARNING ! **Ensure that the pump is powered off and unplugged from the AC receptacle before performing this procedure.**

Caution **Ensure that the DC output harness connector is oriented on the power supply connector such that the lock on the harness connector engages the lock on the PCB connector.**

Tighten the four screws and plastic washers that secure the power supply and insulator shield to 1 kgf-cm (0.87 lb-in).

4. Following calibration, connect the DC output harness connector to Condor power supply connector J2.
5. Place the power supply in the mounting position on the rear housing standoffs. Make certain that the power supply PCB rests flush against all four housing standoffs.
6. Install the shield so that the portion of the shield that protrudes outward from the base covers the Q1 heat sink on the top and side.

7. Press the insulator shield over the power supply, making certain that the shield clears the housing side and bosses, connectors, fan mounting studs, and toroid filter assembly (Figure 11-5, items 25 and 27).

8. Secure the power supply and shield to the rear housing using four screws and plastic washers (Figure 11-5, item 19 and 28).

9. Install the rear housing assembly as described in "Rear Housing," 8-32.

10. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Fan Assembly (Colleague 3 Pumps Only)

Removal

1. Remove the rear housing assembly as described in "Rear Housing," 8-32.

2. Remove the power supply assembly as described in "Power Supply Assembly," 8-40.

Note: Note the fan lead orientation within the connector SK2 harness before removing the fan leads.

3. Note the fan leads (BLK/RED and RED) that are installed in the DC output harness connector. Use a small flat-blade screwdriver to press the fan terminal release tabs while extracting the fan leads from the connector shell.

4. Slide the fan mounting bracket (Figure 11-11, item 41), along with the fan (item 40), out of the rear housing.

Installation

Caution **Ensure that fan leads are correctly oriented within the connector SK2 harness.**

1. Insert the fan leads of the replacement fan into the connector SK2 harness connector shell.

2. Install the fan mounting bracket (Figure 11-11, item 41) and fan (item 40) into the rear housing.

3. Install the power supply assembly as described in "Power Supply Assembly," 8-40.

4. Install the rear housing assembly as described in "Rear Housing," 8-32.

5. Plug the pump into an AC outlet and verify that you can hear the fan. The fan should operate whenever the pump is plugged in.

6. Perform the tests in Table 8-5 on page 8-7. Record the test results on a copy of the Operational Checkout Data Sheet.

Main Speaker

Removal

1. Remove the rear housing assembly as described in “Rear Housing,” 8-32, steps 1 through 5.
2. Remove the power supply assembly as described in “Power Supply Assembly,” 8-40.
3. **Colleague 3 pumps only:** remove the fan mounting bracket and fan (Figure 11-11, items 40 and 41).
4. Using cushion-tipped pliers, carefully remove the button on the PANEL LOCKOUT switch.
5. Using an 8 mm deep socket, remove the nut and tooth washer that secure the PANEL LOCKOUT switch and ground wire.
6. To gain access to the main speaker, reposition the ground wire connected to the COMM. PORT connector if necessary by loosening screw using a #1 crosstip screwdriver.

Note: Two additional posts are available for installing the self-locking nuts that secure the speaker in place on the rear housing, if one of the posts breaks off. If at least two posts are not available for installing the speaker, replace the rear housing.

7. Unsolder the speaker wires and remove the two push nuts (Figure 11-5, item 8) that hold the speaker (Figure 11-5, item 29) to the rear housing (item 10).
8. Pry the speaker from the housing. (It is held in place with double-sided foam tape.)
9. Remove adhesive residue from the rear case using a Whisk Adhesive Remover Pad.
10. Clean excess adhesive remover with isopropyl alcohol.

Installation

1. Install a new foam tape gasket.
2. Install a new speaker. Solder the speaker wires.
3. Install push nuts on the remaining two posts.
4. **Colleague 3 pumps only:** slide the fan mounting bracket and fan into the rear housing.

Caution **Tighten the ground wire securing screw on the COMM. PORT connector to 5 kgf-cm (4.3 lb-in).**

Tighten the PANEL LOCKOUT switch hex nut to 5 kgf-cm (4.3 lb-in).

5. Place the ground lead and ***PANEL LOCKOUT*** switch in the mounting position. Secure the ***PANEL LOCKOUT*** switch using a hex nut and tooth washer.
6. Press the plastic button on the ***PANEL LOCKOUT*** switch.
7. Tighten the ground wire securing screw on the COMM. PORT connector.
8. Install the power supply assembly as described in "Power Supply Assembly," 8-40.
9. Install the rear housing assembly as described in "Rear Housing," 8-32.
10. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Backup Beeper

Removal

1. Remove the rear housing assembly as described in "Rear Housing," 8-32, steps 1 through 5.
2. Remove the power supply assembly as described in "Power Supply Assembly," 8-40.
3. **Colleague 3 pumps only:** slide the fan mounting bracket (Figure 11-11, item 40 and 41) and fan out of the rear housing.
4. Using pliers, carefully remove the button on the PANEL LOCKOUT switch (Figure 11-5, item 6).
5. Using an 8 mm deep socket, remove the nut and tooth washer that secure the PANEL LOCKOUT switch and ground wire.
6. Unsolder the backup beeper wires and carefully remove the push nuts or clip (Figure 11-5, item 40) securing the backup beeper to the rear case.

Caution **If the backup beeper is secured in place with push nuts and they are loose, or a standoff breaks, you must replace the rear housing. Ensure that no loose parts remain inside the pump. A broken standoff or loose backup beeper could cause the pump to malfunction.**

7. Remove any remaining pushnuts and/or the plastic backup beeper cover plate, if present.

8. Remove the gasket and any residue from rear housing using a Whisk Adhesive Remover Pad.

9. Clean excess adhesive remover with isopropyl alcohol.

Installation

10. Carefully remove the power supply mounting stand-off (Figure 11-5 item 3) nearest to the backup beeper (Figure 11-5, item 40). The standoff may have Loctite applied on the screw portion that mounts to the mounting boss on the rear case. Remove any excess Loctite residue from the threaded areas.

Note: Older pumps had four power supply standoffs (PN F069390002) with a male threaded portion that screws into mounting bosses on the rear case. PN F069390002 is now obsolete. Newer pumps have power supply standoffs (PN 4009620001) with two female ends and a metal threaded insert (PN 4009310121) that screws first into the standoff, then into the rear case mounting boss.

11. If a F069390002 standoff is damaged when you remove it, you must replace it with the two current "400" number components as listed above.

Note: Because the old standoffs had a male end, this part may break off and lodge inside the brass insert in the mounting boss. Extracting the broken piece may damage the brass insert. If damage to the rear case prevents insertion of a threaded insert, you must replace the entire rear case.

Note: The backup beepers in older pumps were secured with pushnuts and a plastic cover. Newer pumps use a clip secured with a screw.

12. If necessary, relocate or remove wiring harnesses to gain access to the backup beeper area.

13. Remove any remaining push nuts from around the back up beeper mounting slot or remove the plastic backup beeper cover plate.

14. Install the replacement beeper into its mounting slot.

15. Orient the clip as shown in Figure 11-5, item 40 and place it over the installed beeper. The mounting hole in the clip must rest over the rear case standoff where the power supply stand-off was previously removed.

Caution **Keep the electrical connections on the beeper away from the clip's center tab even though the connections are insulated.**

16. Relocate or reinstall wiring harnesses previously moved or removed.

17. Perform this step only if installing a new standoff and threaded insert. Apply Loctite 425 onto half of the insert and install that half into one end of the new standoff. Continue when the Loctite has set.

18. With the clip mounting hole over the mounting boss hole, install the standoff by first applying Loctite 425 over the threaded area of the exposed portion of threaded insert. Hand-tighten the standoff through the clip's mounting hole into the rear case mounting boss.

Caution **Overtightening the standoff can damage it.**

Note: It is acceptable for the power supply to be slightly out of level due to the thickness of the beeper clip.

19. Install the power supply per "Power Supply Assembly," 8-40.

20. Install the rear housing assembly as described in "Rear Housing," 8-32.

21. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

12 VDC Connector Assembly

Note: This procedure applies to older pumps only. New pumps do not have a 12 VDC connector. If you wish to remove the 12 VDC connector assembly permanently, a plastic plug is available from Baxter to plug the hole in the rear housing.

Removal

1. Remove the rear housing assembly as described in "Rear Housing," 8-32, steps 1 through 9.

2. Remove the power supply assembly as described in "Power Supply Assembly," 8-40.

3. **Colleague 3 pumps only:** Remove the fan mounting bracket (Figure 11-11, item 40 and 41) with the fan attached.

4. Using a #2 crosstip driver, remove one screw and washer (Figure 11-5, items 37 and 38) that secure the cable clip (item 36).

5. Remove the cable clip from the rear housing wiring harness.

6. Reposition the wiring harness to gain access to the 12 VDC connector.

7. Separate the 12 VDC connector wiring from the other harness wires.

Caution **When removing the 12 VDC connector nut, use care to ensure that the 12 VDC connector wiring is not caught in the flare nut socket.**

8. Using the modified flare nut socket, remove the nut on the 12 VDC connector from the inside of the rear housing.

9. Pull the connector nut and ground lead ring terminal over the 12 VDC connector leads, ferrite rings, and junction connector.

10. Remove the connector from the housing.

11. Remove the PS earth harness from the AC connector earth ground pin.

12. Remove the accessory label (07-26-X1-708) if permanently removing the 12 VDC connector and replacing it with a plug.

Installation

The 12 VDC connector is replaced with a plug. Figure 8-8 shows the assembly of the replacement plug. The item numbers and part numbers shown in the figure correspond to the item numbers on figures 11-5 and 11-1. To install the replacement plug do the following:

1. Insert the head of the M3x10 hex bolt into the slot of the rear plug. See Figure 8-8.

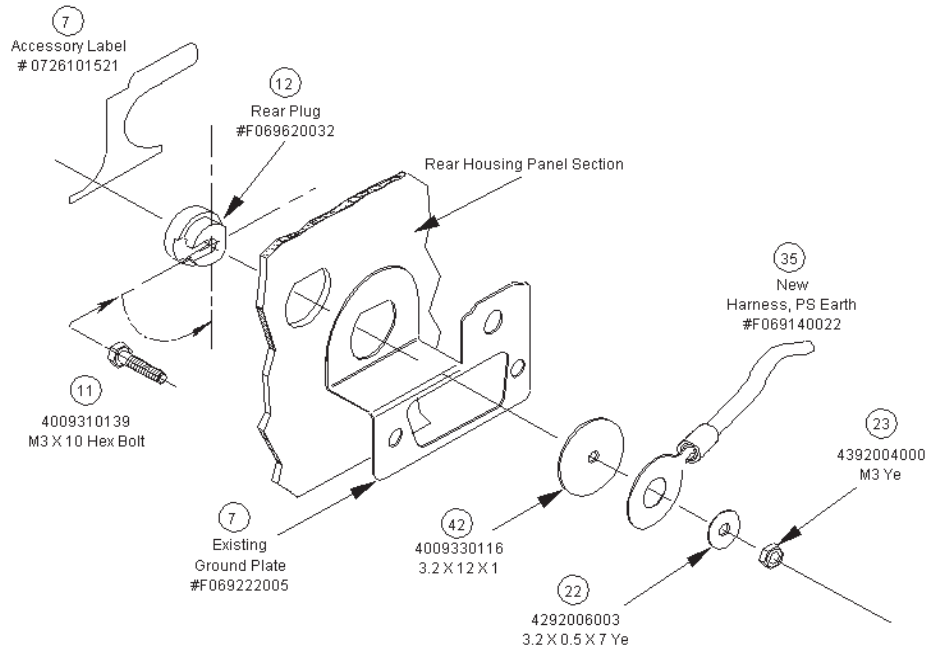


Figure 8-8 Plug Installation Drawing

2. Insert the bolt and plug through the empty connector hole in the rear housing panel.

3. Install the 3.2 x 12 x 1 washer, the ring terminal of the new PS earth harness, the 3.2 x 0.5 x 7 washer, and then the M3 nut onto the bolt.

4. Torque the nut to 5 kgf-cm (4.3 lb-in).

5. Place the heatshrink tubing over the PS earth harness.

6. Solder the PS earth harness to the ground pin of the AC power connector.
7. Slide the heatshrink over the soldered terminal and use the soldering iron to shrink it to insulate the terminal.
8. Install the new accessory label.

PANEL LOCKOUT Switch

Caution **To avoid cracking the PANEL LOCKOUT button, do not squeeze it with pliers or pry it sideways off of the shaft.**

Removal

1. Remove the rear housing assembly as described in "Rear Housing," 8-32, steps 1 through 5.
2. Remove the power supply assembly as described in "Power Supply Assembly," 8-40.
3. Using a #2 crosstip driver, remove one screw and washer (Figure 11-5, items 37 and 38) that secure the cable clip (item 36).
4. Remove the cable clip from the rear housing wiring harness.
5. Reposition the wiring harnesses to gain access to the ***PANEL LOCKOUT*** switch.
6. Using cushion-tipped pliers, carefully remove the button on ***PANEL LOCKOUT*** switch (Figure 11-5, item 6).
7. Using an 8 mm deep socket, remove the nut and tooth washer that secure the ***PANEL LOCKOUT*** switch and ground wire. Remove the switch.
8. Disconnect the switch by doing one of the following:
   - Unsolder the wires at the switch.
   - Remove the contacts at the connector body.
   - Cut and splice the wires.

Installation

1. Connect wiring to the switch, as appropriate.

Caution **Tighten the PANEL LOCKOUT switch hex nut to 5 kgf-cm (4.3 lb-in).**
Tighten the cable clip screw to 5 kgf-cm (4.3 lb-in).
Tighten the ground wire securing screw to 5 kgf-cm (4.3 lb-in).

2. Place the ground lead and ***PANEL LOCKOUT*** switch in the mounting position. Secure the ***PANEL LOCKOUT*** switch using hex nut and tooth washer.

3. Press the plastic button onto the ***PANEL LOCKOUT*** switch.

4. Place the cable clip (Figure 11-5, item 36) around the rear housing wiring harness that connects to the remainder of pump. Verify that the following harnesses are present within the clip:
   - 2-wire locking connector (male)
   - 2-wire locking connector (female)
   - 6-wire connector
   - 8-wire connector

5. Secure the cable clip using one screw and washer (Figure 11-5, items 37 and 38).

6. Install the power supply assembly as described in "Power Supply Assembly," 8-40.

7. Install the rear housing assembly as described in "Rear Housing," 8-32.

8. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

COMM. Port Connector

Note: Pumps prior to UIM master software version 4.XX had an RS232 COMM port. Newer pumps have an RS232/RS423 COMM port, which has a small circuit board associated with it. Figure 11-5 shows the older type (item 13). The new COMM port printed circuit board is shown in Figure 11-11, item 32. See Table 2-5 for a chart showing applicability of the RS232/RS423 design.

Removal

1. Remove the rear housing assembly as described in "Rear Housing," 8-32.

2. Remove the power supply assembly as described in "Power Supply Assembly," 8-40.

3. **Colleague 3 pumps only:** Slide the fan mounting bracket (Figure 11-11, item 41) and fan (item 40) out of the rear housing.

4. **Older Pumps with RS232 COMM port:** Using a #2 crosstip driver, remove one screw and washer (Figure 11-5, items 37 and 38) that secure cable clip (item 36).

5. Remove the cable clip from the rear housing wiring harness.

6. Reposition the wiring to gain access to the ***COMM. PORT*** connector.

7. Separate the ***COMM. PORT*** connector wiring from other harness wires.

8. Using a #1 crosstip driver, remove the two screws and washers (Figure 11-5 or 11-11, items 30 and 31) that secure the ***COMM. PORT*** connector, two ground leads, and two rectangular blocks (item 15). Remove the ***COMM. PORT*** connector and rectangular blocks.

9. **Pumps with RS232/RS423 COMM ports:** From the inside of the rear housing, remove the screw and washer (Figure 11-11, item 37 and 38) securing the COMM board (item 32).

10. From the inside of the rear housing, guide the ferrite ring and wiring harness connector on the ***COMM. PORT*** harness out of the rear housing.

11. From the outside of the rear housing, remove the ***COMM. PORT*** connector by guiding the ***COMM. PORT*** harness, ferrite ring, and harness connector through the ***COMM. PORT*** connector opening.

Installation

1. From the outside of the rear housing, insert the ***COMM. PORT*** connector wiring harness and ferrite ring through the ***COMM. PORT*** connector opening.

Note: The stepped surface of the rectangular connector blocks mates with connector mounting flanges. The flat surface faces away from the rear housing.

2. Place one rectangular block (removed during disassembly) over the connector mounting flange.

T

Caution

Tighten the COMM. PORT securing screws to 3 kgf-cm (2.6 lb-in).

Tighten the cable clip screw and washer to 5 kgf-cm (4.3 lb-in). Make certain that the cable clip screws engage the existing threads in the housing. Misthreading the screws can damage the housing.

Tighten the ground wire securing screw to 5 kgf-cm (4.3 lb-in).

Wiring must be routed clear of standoffs and not pulled around standoffs.

3. Invert the rear housing. While holding the rectangular block and connector, start one screw and washer (along with ground lead) that secures the connector. Do not tighten the screw at this time.

4. Repeat step 3 for the remaining connector securing screw and washer (along with remaining ground lead).

5. Using two fingers to make certain that the rectangular blocks are held correctly engaged and flush with connector flanges, fully tighten the connector securing screws.

6. Place the cable clip (Figure 11-5, item 36) around the rear housing wiring harness that connects to the remainder of pump. Verify that the following harnesses are present within the clip:
   - 2-wire locking connector (male)
   - 2-wire locking connector (female)
   - 6-wire connector
   - 8-wire connector

Caution **Improper positioning of ferrite rings can result in short circuits.**

7. Position the ferrite rings on the ***COMM. PORT*** and 12 VDC CONN connectors.
8. **Pumps with RS232/RS423 COMM ports:** From the inside of the rear housing, install the screw and washer (Figure 11-11, item 37 and 38) securing the COMM board (item 32).
9. Start the screw and washer (items 37 and 38) that secure the cable clip.
10. Verify that the ferrite rings do not contact the power supply assembly components by temporarily placing the power supply in the mounting position. Observe that no components make contact with the ferrite rings.
11. Fully tighten the screw that secures the cable clip.
12. **Colleague 3 pumps only:** Slide the fan mounting bracket and fan into the rear housing.
13. Install the power supply assembly as described in "Power Supply Assembly," 8-40.
14. Install the rear housing assembly as described in "Rear Housing," 8-32.
15. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

AC Fuse Holder(s)

Removal

1. Remove the rear housing assembly as described in "Rear Housing," 8-32.
2. Remove the power supply assembly as described in "Power Supply Assembly," 8-40.

Caution **To ensure correct reassembly, note the routing and connecting points of AC fuse holder wiring before removing AC fuse holder(s).**

Note: On the outermost AC fuse holder, you may need to remove the AC toroid filter assembly (Figure 11-5 or 11-11, item 25) and insulator shield (item 27) to gain access to the fuse holder hex nut. Remove the toroid filter and position aside by removing one screw and plastic washer (items 19 and 28).

3. Disconnect the wiring from the AC fuse holder(s) being replaced, noting the routing and connecting points.

4. Using a 14 mm deep socket, remove the nut and washer that secure the AC fuse holder(s) to the rear housing. Remove the AC fuse holder(s).

Installation

1. Install the AC fuse holder(s) in the mounting position.

Caution **If removed, tighten the AC toroid filter/insulator securing screw and washer to 1 kgf-cm (0.87 lb-in).**

Tighten the fuse holder hex nut to 5 kgf-cm (4.3 lb-in).

Tighten the ground wire securing screw to 5 kgf-cm (4.3 lb-in).

Ensure that the AC leads that connect to the fuse holders are not touching the fan blades.

2. Connect the wiring to the AC fuse holder(s).

3. Install the power supply assembly as described in "Power Supply Assembly," 8-40.

4. Install the rear housing assembly as described in "Rear Housing," 8-32.

5. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

AC Toroid Filter Assembly

Removal

1. Remove the rear housing assembly as described in "Rear Housing," 8-32.

2. Remove the power supply assembly as described in "Power Supply Assembly," 8-40.

Caution **Note the routing of the wires before removing them.**

3. Using a #2 crosstip screwdriver, remove one screw and plastic washer (Figure 11-5 or 11-11, items 19 and 28) that secures the shield and AC toroid filter assembly (items 25 and 27).

4. Disconnect the AC wires from the toroid filter assembly to the fuse holders. Remove the AC toroid filter assembly.

Installation

1. Place the AC toroid filter assembly in the mounting position.

Caution

Tighten the AC toroid filter assembly securing screw to 1 kgf-cm (0.87 lb-in) using the preset torque screwdriver.

Tighten the ground wire securing screw to 5 kgf-cm (4.3 lb-in).

2. Noting the correct routing and connecting points, connect the filter wiring to the fuse holders and power supply assembly.

3. Secure the AC toroid filter and shield using one screw and plastic washer (Figure 11-5 or 11-11, items 19 and 28).

4. Install the power supply assembly as described in "Power Supply Assembly," 8-40.

5. Install the rear housing assembly as described in "Rear Housing," 8-32.

6. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

AC Connector

Note: Tag the disconnected wires to help ensure correct installation.

1. Remove the power cord as described in "Power Cord," 8-30.

2. Remove the rear housing assembly as described in "Rear Housing," 8-32.

3. Remove the power supply assembly as described in "Power Supply Assembly," 8-40.

4. **Colleague 3 pumps only:** Slide the fan mounting bracket (Figure 11-11, item 41) and fan (item 40) out of the rear housing.

5. Using a #2 crosstip driver, remove one screw and plastic washer (Figure 11-5 or 11-11, items 19 and 28) that secure the shield and toroid filter assembly (items 27 and 25). Position the toroid filter away from the AC connector.

6. The ground lead on the AC connector attaches to the ***PANEL LOCKOUT*** switch. Remove the ground lead by removing the ***PANEL LOCKOUT*** switch (Figure 11-5 or 11-11, item 6) as follows:

6.1 Reposition the wiring adjacent to the ***PANEL LOCKOUT*** switch.

6.2 Pull off the plastic button on the ***PANEL LOCKOUT*** switch. Use an 8 mm socket to remove the nut and tooth washer securing the switch to the rear housing.

7. Using a 5.5 mm deep socket, remove two nuts and washers (Figure 11-5 or 11-11, items 22 and 23) and two screws that secure the AC connector and ground lead.

Caution **Note the routing and connecting points of the AC Connector wiring before removing the wiring.**

8. Disconnect one brown and one blue AC connector wire from the fuse holders.

9. Remove the AC connector.

Installation

1. Place the AC connector in the mounting position in the housing.

Caution **Tighten the AC toroid filter assembly securing screw to 1 kgf-cm (0.87 lb-in) using the preset torque screwdriver.**

Tighten the ground wire securing screw to 5 kgf-cm (4.3 lb-in).

2. Adjacent to the fuse holders, start one screw, washer, and nut that secure the AC connector.

3. Place the ground lead in the mounting position on the AC connector flange. Start one screw, washer, and nut that secure the AC connector and ground lead.

4. Fully tighten both AC connector mounting nuts.

5. Noting proper routing and connecting points, connect the AC connector wires to their respective fuse holder terminals as shown in Figure 13-5.

6. **Colleague 3 pumps only:** Slide the fan mounting bracket and fan into the rear housing.

7. Install the power supply assembly as described in “Power Supply Assembly,” 8-40.

8. Install the rear housing assembly as described in “Rear Housing,” 8-32.

9. Install the power cord as described in “Power Cord,” 8-30.

10. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Center Housing

Caution

This procedure involves removing the screws that secure the pump modules to the user interface module. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

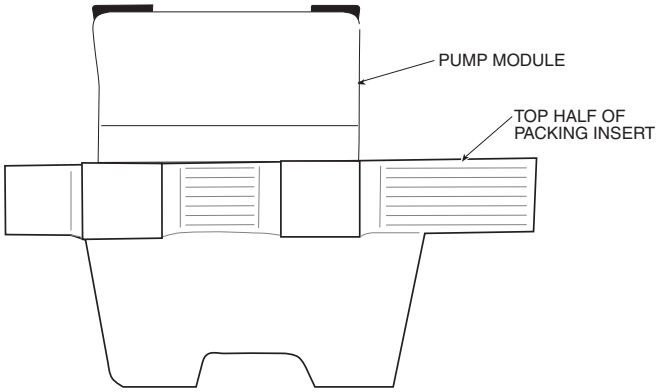


Figure 8-9 Using the Packing Insert as a Holding Fixture

Removal

1. Remove the pump module(s) as described in “Pump Module,” 8-60 or “Assembly,” 8-61.
2. Remove the front bezel assembly as described in “Front Bezel Assembly,” 8-10.
3. Remove the rear housing assembly as described in “Rear Housing,” 8-32.
4. Remove the battery as described in “Main Batteries,” 8-34.
5. Note the screw and washer (Figure 11-4 or 11-10, items 13 and 14) on the right-hand side of the inside of the center housing. Using a #2 crosstip driver, remove the screw and washer that secure the center housing to the subplate assembly (item 2).
6. Note the screw and washer (Figure 11-4 or 11-10, items 13 and 14) on the left-hand side of the inside of the center housing. Remove the wire from the wire bundle located on the left side of the housing.
7. Using a #2 crosstip driver, remove the screw and washer that secure the center housing and ground (earth) lead to the subplate assembly.
8. Remove the center housing.

9. Remove the wiring from the two plastic clips inside the top of the center housing.

10. Route the wiring that protrudes from the left rear case access hole.

11. Remove the wiring that connects to the pump module. You may have to remove the cover over the pump module to allow connectors to pass through.

Installation

Caution

Tighten the two screws that secure the center housing to 9 kgf-cm (7.8 lb-in).
Tighten the cable clip securing screw to 9 kgf-cm (7.8 lb-in).
Tighten the ground wire securing hex nut to 5 kgf-cm (4.3 lb-in).

1. Note the triple ribbon cable harness and 4-wire power harness on the subplate assembly. Route the harnesses through the right-hand side cutout (as viewed from the chassis interior) on the center housing. If previously removed, re-install the cover.

2. Install the rear case wiring as shown in Figure 11-12.

3. Align the center housing mounting holes with the mating threaded holes in the subplate assembly.

4. Inspect the gasket fit between the center housing and subplate. There should be a uniform gap between the center housing and the subplate.

5. As viewed from the chassis interior, start one screw and washer (Figure 11-4 or 11-11, items 13 and 14) in the right-hand side hole that secures the center housing to the subplate assembly.

6. As viewed from the chassis interior, start one screw and washer (items 13 and 14) in the left-hand side hole that secures the center housing to the subplate assembly, along with the ground lead.

7. Fully tighten both center housing securing screws.

8. Install the pump module(s) as described in “Pump Module,” 8-60 or “Assembly” on page 8-61.

Note: When installing the rear housing assembly, attach the interconnecting cables before installing the battery.

9. Install the main batteries as described in “Main Batteries,” 8-34.

10. Install the rear housing assembly as described in “Rear Housing,” 8-32.

11. Install the front bezel assembly as described in “Front Bezel Assembly,” 8-10.

12. Perform the complete Operational Checkout procedure provided in Chapter 10. Record the results of all test procedures on a copy of the Operational Checkout Data Sheet located in Appendix A.

V-Block

Removal

1. Remove the mounting clamp as described in "Mounting Clamp," 8-28.

2. Remove the rear housing assembly as described in "Rear Housing," 8-32, steps 1 through 5.

Note: Colleague 3 pumps have only one Clamp VB Plate, Clamp VB Tab, and Clamp VB Spring.

3. Using a #2 crosstip screwdriver, remove two screws (Figure 11-4 or 11-10, item 7) that secure each Clamp VB Plate (item 8). Remove the Clamp VB Plate(s).

4. Remove the Clamp VB Tab(s) (Figure 11-4 or 11-10, item 6) and the Clamp VB Spring(s) (item 5).

5. Using a 90° offset #2 crosstip screwdriver, loosen the four screws and washers (Figure 11-4 or 11-10, items 11 and 12) that secure the V-block (item 4).

Note: After loosening each screw with the offset screwdriver, you can quickly remove them using a #1 crosstip bit and 1/4" adapter held in your fingers.

6. When the screws are removed, remove the V-block by carefully prying it from the pump.

Installation

1. Apply Loctite PRISM PRIMER 770 on the rear surface of the new friction pad, and allow it to dry.

2. Apply Loctite PRISM 411 adhesive to the "V" portion of the new V-block and immediately press the pad on, aligning it in the holes in the V-block. Maintain pressure for at least 30 seconds.

Caution

Tighten the V-block securing screws to 9 kgf-cm (7.8 lb-in).

Tighten the Clamp VB Plate securing screws to 30 kgf-cm (26.1 lb-in).

Tighten the ground wire securing hex nut to 5 kgf-cm (4.3 lb-in).

The clamp VB locking tab must be installed with the beveled surface facing away from the "V" portion.

3. With the beveled surface facing away from "V" portion of the clamp, secure the VB Clamp and Spring and Clamp VB Plate(s) using two screws (Figure 11-4 or 11-10, item 7).

4. Install the new V-block and secure with four screws and washers (items 11 and 12).

5. Install the rear housing assembly as described in "Rear Housing," 8-32.

6. Install the mounting clamp as described in "Mounting Clamp," 8-28.

7. Perform the tests listed in Table 8-5 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Pole Clamp Friction Pad

Removal

1. Remove the mounting clamp (Figure 11-1 or Figure 11-8, item 4).

2. Use a chisel tip razor knife to remove the worn pad (Figure 11-4 or 11-10, item 9) and all rubber residue.

3. Clean the residue with Whisk adhesive remover.

4. Clean excess adhesive remover with isopropyl alcohol or soap and water.

Installation

1. Apply Loctite PRISM PRIMER 770 on the rear surface of the new friction pad. Allow it to dry.

2. Apply Loctite PRISM 411 adhesive to the "V" portion of the V-block and immediately press the pad on, aligning it in the holes in the V-block. Maintain pressure for at least 30 seconds.

3. Allow the adhesive to dry as described in the instructions that accompany the product.

4. Install the mounting clamp.

5. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

V-Plate

Note: The V-plate is installed on the bottom cover of Colleague 3 Pumps to help stabilize the pump when it is mounted on an IV pole. Colleague pumps do not have a V-plate.

1. Turn the pump upside-down or place it on its side. Use a #2 crosstip screwdriver to remove the two screws that secure the V-plate (Figure 11-8, item 17) to the bottom panel.

Caution **Tighten the V-plate securing screws to 9 kgf-cm (7.8 lb-in).**

2. Secure the replacement V-plate with two screws. No testing is required.

Bottom Panel

Caution **This procedure involves removing the screws that secure the pump module(s) to the user interface module. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).**

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Removal

1. Power the pump off and disconnect it from AC power.
2. Place the pump upside-down into the top half of the shipping carton packing insert, as shown in Figure 8-9 on page 8-55.
3. Using a 3 mm hex driver, remove the bottom panel (Figure 11-1 or 11-8, item 3) by removing four screws and washers (items 5 and 6).
4. Remove the bottom panel and gasket (Figure 11-1 or 11-8, items 3 and 11).

Installation

Caution **Tighten the securing screws to 9 kgf-cm (7.8 lb-in).**

Note: Bottom panels are supplied with the rubber feet attached.

1. Place the bottom panel and gasket on the pump. Inspect the gasket fit between the pump module and the bottom plate (if required trim gasket to fit around the 100 µF electrolytic capacitor so it lays flat).
2. Start four screws and washers (Figure 11-1 or 11-8, items 5 and 6) that secure the pump module and bottom panel to the center section.
3. Fully tighten the four screws in a criss-cross pattern. No additional testing is required.

4. Apply new configuration label (07-26-X1-047). Using an indelible marker or a punch, mark the new label to match the label on the discarded bottom panel.

Pump Module

Use the following procedure for all pumps. The Colleague 3 Pump has three pump modules labeled A through C. Each contains identical subassemblies. Before you can replace any of the subassemblies within a pump module, you must first remove the appropriate pump module as described in the following procedure.

The pump modules are arranged C-B-A, from bottom to top. To gain access to pump module A, you must first remove pump modules C and B. To remove pump module B, you must first remove pump module C.

Removal

Caution

This procedure involves removing the screws that secure the pump modules to the user interface module. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

1. Remove the bottom panel as described in "Bottom Panel," 8-59.

Caution

Do not attempt to separate the pump module(s) fully from the pump at this time.

2. Disconnect 4-wire power harness connector J102 from the PCB connector on pump module.

3. On the signal harness ribbon cable J103 connection at pump module, use a small, flat-blade screwdriver to unlock the connector by pushing the locking tabs away from the center of the connector. When both tabs are unlocked, the ribbon cable will eject from the PCB connector.

4. While keeping the J102 and J103 wiring harnesses within the cable opening in the pump module, remove the pump module.

5. Install the new or existing pump module(s).

Caution

Tighten the securing screws to 9 kgf-cm (7.8 lb-in).

6. Assemble in reverse order.

7. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Assembly

Note: Pump module software is not included with the pump module. Remove the software chip as described in "Pump Module Software," 8-91, and install it into the replacement pump module before installing the pump module in the pump. If your pump module software is version 3:00:00, check with your local Baxter-authorized Service Center about obtaining an upgrade.

Note: To simplify threading the wiring harnesses through pump modules A and B, roll a piece of paper around the cables, then use the rolled paper to guide the wiring harnesses through the cable openings in the pump modules.

New channel designator labels (A, B, and C) are supplied with each Colleague 3 replacement pump module. Attach the appropriate label to the new pump module.

1. On pump module A, make certain that the ribbon cable connector locking tabs are in the unlocked (outward) position.

2. Carefully pull the three signal harness ribbon cables and the multi-connector 4-wire harness from the subplate through the cable opening in pump module A.

3. Place pump module A near the mounting position. Align and mate the shortest ribbon harness connector to the PCB connector on pump module A.

4. Gently push the harness connector into the connector on the PCB until it is fully mated. The connector is properly and fully mated when **both** locking tabs close onto connector.

5. Mate the innermost connector on multi-connector, 4-wire power harness from the subplate to the respective PCB connector on pump module A.

6. Inspect the mounting of the gasket (Figure 11-1 or 11-8, item 11) on the bottom of the subplate. Ensure that the four through-holes on the gasket are properly positioned over the respective mounting hole bosses in the subplate.

   Ensure that the gasket is uniformly flush over the entire subplate surface.

Caution **Ensure that the wiring harnesses are clear of the module mounting surfaces before mating the module to the mounting surface.**

7. While gently pulling the ribbon harnesses through the cable opening, mate pump module A with the subplate. Ensure that pump module A rests evenly on the subplate gasket. There should be a uniform gap between pump module A and the subplate.

8. If you are replacing the pump module on a Colleague pump, install the bottom cover, perform the tests indicated in Table 8-5, and record the test results on a copy of the data sheet included in Appendix A.

   If you are replacing a Colleague 3 pump module, continue with the assembly procedures for pump modules B and C.

Pump Module B Installation

9. On pump module B, ensure that the ribbon cable connector locking tabs are in the unlocked (outward) position.

10. Pull the remaining two ribbon cables and multi-connector 4-wire harness through the cable opening in Pump Module B.

11. Place pump module B near the mounting position. Align and mate the shortest ribbon harness connector to the PCB connector on pump module B.

12. Gently push the ribbon harness connector into the connector on the PCB until it is fully mated. The connector is properly and fully mated when **both** locking tabs close onto the connector.

13. Carefully route the remaining ribbon harness through the cable opening in pump module B.

14. Pull the multi-connector, 4-wire power harness through the cable opening in pump module B.

15. Mate the second connector on the power harness to the respective PCB connector on pump module B.

16. Inspect the mounting of the gasket on the bottom of pump module A. Ensure that the four through-holes on the gasket are properly positioned over the respective mounting hole bosses in pump module A. Ensure that the gasket is uniformly flush over the entire module surface (if required trim gasket to fit around the 100 µF electrolytic capacitor so it lays flat).

Caution **Ensure that the wiring harnesses are clear of the pump module mounting surfaces before mating the pump module to the mounting surface.**

17. While gently drawing the ribbon harness through the cable opening, mate pump module B with pump module A. Make certain that pump module B rests uniformly on the pump module A gasket. There should be a uniform gap between pump module B and pump module A.

Pump Module C Installation

18. On pump module C, ensure that the ribbon cable connector locking tabs are in the unlocked (outward) position.

19. Pull the remaining ribbon harness and 4-wire harness through the cable opening in pump module C.

20. Place pump module C near the mounting position. Align and mate the ribbon harness connector to the PCB connector on pump module C.

21. Gently push the ribbon harness connector into the connector on the PCB until it is fully mated. The connector is properly and fully mated when **both** locking tabs close onto the connector.

22. Pull the multi-connector, 4-wire power harness through the cable opening in pump module C.

23. Mate the harness connector to the respective connector on pump module C.

24. Inspect the mounting of the gasket on the bottom of pump module B. Make certain that the four through-holes on the gasket are properly positioned over the respective mounting hole bosses in pump module B.

    Ensure that the gasket is uniformly flush over the entire module surface.

Caution **Ensure that the wiring harnesses are clear of the pump module mounting surfaces before mating the pump module to the mounting surface.**

25. Mate pump module C with pump module B. Ensure pump module C rests uniformly flush on the pump module B gasket. There should be a uniform gap between pump module C and pump module B.

26. Inspect the mounting of the gasket on the bottom of pump module C. Ensure that the four through-holes on the gasket are properly positioned over the respective mounting hole bosses in pump module C. Ensure that the gasket is uniformly flush over the entire pump module surface.

27. Mate the bottom panel with pump module C. Ensure that the bottom panel rests uniformly on the pump module C gasket. There should be a uniform gap between the bottom panel and pump module C (if required trim gasket to fit around the 100 µF electrolytic capacitor so it lays flat).

28. Again inspect the gasket fit between all three pump modules, the center housing, and the bottom plate. Lift and reposition the assemblies, as required, to ensure uniform gasket sealing.

29. Start the four screws and washers (Figure 11-8, items 10 and 11) that secure the pump modules and bottom panel to the center section.

30. Tighten the four pump module/bottom panel screws to 9 kgf-cm (7.8 lb-in).

31. Fully tighten the four screws in a criss-cross pattern.

32. Apply the appropriate label (A, B, or C) to the replacement pump module.

Note: You may use the full Operational Checkout procedures in Chapter 10 after a repair to verify that a pump is operating properly and within specifications.

33. Perform the tests in Table 8-5 on page 8-7. Record the test results on a copy of the Operational Checkout Data Sheet located in Appendix A.

Accessory Connector Assembly

Caution

This procedure involves removing the screws that secure the pump module to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Note: Not all pump modules have an accessory connector.

Removal

Note: If you are replacing the accessory connector assembly from a pump module of a Colleague 3 Pump it is suggested that all accessory connectors be replaced in the other two pump modules.

1. Remove the bottom panel and the pump module as described in "Pump Module," 8-60, or "Assembly," 8-61.

2. Disconnect harness connector J8 from the pump PCB.

3. Using a 14 mm open-end wrench, remove the accessory connector and cover by removing the hex nut.

Installation

The accessory connector is replaced with a plug. Install this plug by snapping the replacement plug into the empty hole in the pump module.

Manual Tube Release Assembly

Caution

This procedure involves removing the screws that secure the pump module to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Note: Newer manual tube release knobs are spring loaded. When replacing a manual tube release knob on a Colleague 3 pump, order enough spring-loaded knobs to replace all three manual tube release knobs on the pump at the same time.

Removal

1. Remove the bottom panel and the pump module as described in "Pump Module," 8-60 or "Assembly" on page 8-61.
2. Working from the top of the pump module, rotate the manual tube release knob (Figure 11-7, item 3) counterclockwise to gain access to the setscrew. Use a 1.5 mm hex bit to loosen the setscrew so that it is flush with the top of the screw hole.
3. Pull the manual tube release knob off of the shaft.

Installation

1. Align the key on the knob with the key on the shaft.
2. While pressing the knob firmly toward the pump housing, rotate the knob to gain access to the setscrew.
3. With the manual tube release flap open, press the knob firmly toward the pump housing and start the setscrew.

Caution

Tightening torque for the setscrew is 3 kgf-cm (2.6 lb-in).

4. Fully tighten the setscrew.
5. Pull out and push in the knob several times, then rotate it to make certain it is firmly attached.
6. Install the pump module and the bottom panel as described in "Pump Module," 8-60 or "Assembly" on page 8-61 (for a Colleague 3 pump).
7. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Pump Mechanism

Caution **This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).**

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Note: Pump module software is not included with the pump mechanism. Remove the software chip as described in "Pump Module Software," 8-91, and install it into the replacement pump mechanism before installing the mechanism in the pump. If your pump module software is version 3:00:00, check with your local Baxter-authorized Service Center about obtaining an upgrade.

Removal

1. Remove the bottom panel and the pump module as described in "Pump Module," 8-60.
2. Remove the manual tube release knob as described in "Manual Tube Release Assembly," 8-65.
3. Invert the pump module and remove the gasket (Figure 11-1 or 11-8, item 4).
4. Using a #2 crosstip bit, remove two screws and captive washers (Figure 11-7, items 5, 9, and 10) from the bottom of the pump module that secure the pump mechanism chassis to the housing.
5. Return the pump module to its normal upright position.

Note: Refer to Figure 8-11 for PHM PCB connector locations.

Caution **Unlock the flat ribbon cable connector flange on J7 before removing the keypad flat ribbon cable.**

6. Using angled needlenose pliers, gently unlock the J7 connector flange connecting the blue flat ribbon cable from the keypad to the PCB by grasping the flange and lifting it up in a rocking motion.
7. Carefully pull the flat ribbon cable from the PCB connector.
8. Using angled needlenose pliers, disconnect the J6 connector securing the 10-wire gray ribbon cable to the mechanism PCB, using a rocking motion.
9. If the pump module has an accessory connector, disconnect the accessory connector harness from J8 on the mechanism PCB.

10. Using a #2 crosstip bit, remove two screws and captive washers (Figure 11-7, items 9, 10, and 11) and two screws and captive washers (Figure 11-7, items 9, 10, and 13) that secure the pump mechanism to the housing.

11. Remove the pump mechanism from the housing as follows:

    11.1 Temporarily insert the manual tube release knob on the shaft. Rotate the manual tubing release knob so that the tubing jaws are ¾ of the way open (blue tubing clamp visor is even with top of channel slot; see Figure 8-10).

    11.2 Remove the manual tube release knob.

Caution **Forcing the housing off of the pump mechanism can damage the mechanism. If you have difficulty removing the housing, recheck the jaw opening, and repeat the procedure.**

    11.3 Lift the housing off of the pump mechanism while guiding the housing forward to clear the blue tubing clamp visor from the mechanism.

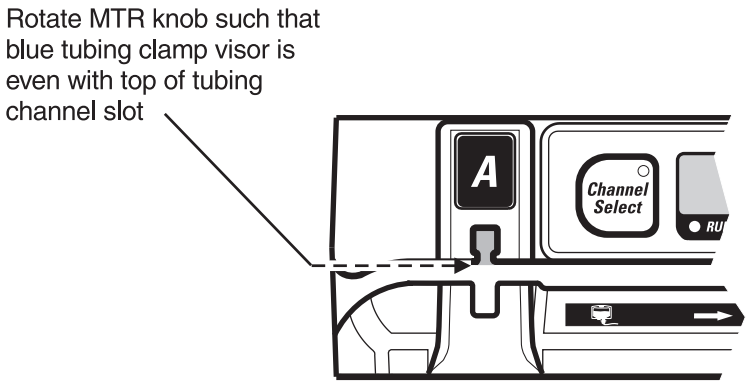


Figure 8-10 Tubing Jaw Position for Housing Removal

Installation

1. Temporarily install the manual tube release knob on the shaft. Rotate the knob so that the tubing jaws are open ¾ of the way (blue tubing clamp visor is even with top of channel slot; see Figure 8-10).

2. Remove the manual tube release knob.

3. While holding the housing over the pump mechanism, mate and connect the gray ribbon cable connector to connector J6 on the mechanism PCB.

Caution **Forcing the mechanism into place can damage it.**

4. Carefully guide the housing over the pump mechanism as follows:
   - Clear the blue tubing clamp visor by lowering the housing over the mechanism with the rear tilted up.
   - While holding the housing to clear the AIL PCB at the rear of the mechanism PCB, lower the housing onto the mechanism chassis.
5. Verify that the housing rests flush against the pump mechanism PCB standoffs.
6. From the bottom of the pump mechanism, start two screws and captive washers (Figure 11-7, item 5) that secure the pump mechanism chassis to the housing.
7. Start two long screws and captive washers (Figure 11-7, item 11) that secure the front of the housing to the pump mechanism. Start two short screws and captive washers (Figure 11-7, item 13) that secure the rear of the housing to the pump mechanism.

Caution

Tighten the four top screws to 7 kgf-cm (6 lb-in).

Tighten the two bottom screws to 7 kgf-cm (6 lb-in).

8. Fully tighten all four screws that secure the housing to the pump mechanism.
9. Ensure the J7 connector flange on the mechanism PCB is unlocked, then carefully insert the blue flat ribbon cable into the connector flange.
10. While holding the flat ribbon cable fully engaged and squarely seated into the connector, lock the flange on the cable by pressing the flange lock using a small flat-blade screwdriver.

Caution

The accessory harness connector is not keyed. The connector is correctly oriented when the violet and blue leads on the harness face toward the accessory connector on the housing.

11. If the pump has an accessory connector, verify connector orientation and connect the accessory connector harness to J8 on the mechanism PCB.
12. Mate the gasket (Figure 11-1 or 11-8, item 11) to the pump lower surface. The gasket is correctly installed when the gasket holes mate with the mounting bosses on the chassis. The flat surface of the gasket must mate with the pump housing. The relieved surface must mate with the bottom panel.
13. Install the manual tube release knob on the pump module as described in “Manual Tube Release Assembly,” 8-65.
14. Install the pump module and bottom panel as described in “Pump Module,” 8-60 or “Assembly,” 8-61.
15. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet located in Appendix A.

Shuttle Motor

Caution **This procedure is intended to be performed by Baxter-trained, qualified personnel only.**

Caution **This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).**

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

This procedure provides instructions for replacing the Shuttle Motor (Figure 11-13, item 15).

Figure 8-11 shows the locations of PHM PCB connectors that will require disconnection and reconnection during shuttle motor removal and installation.

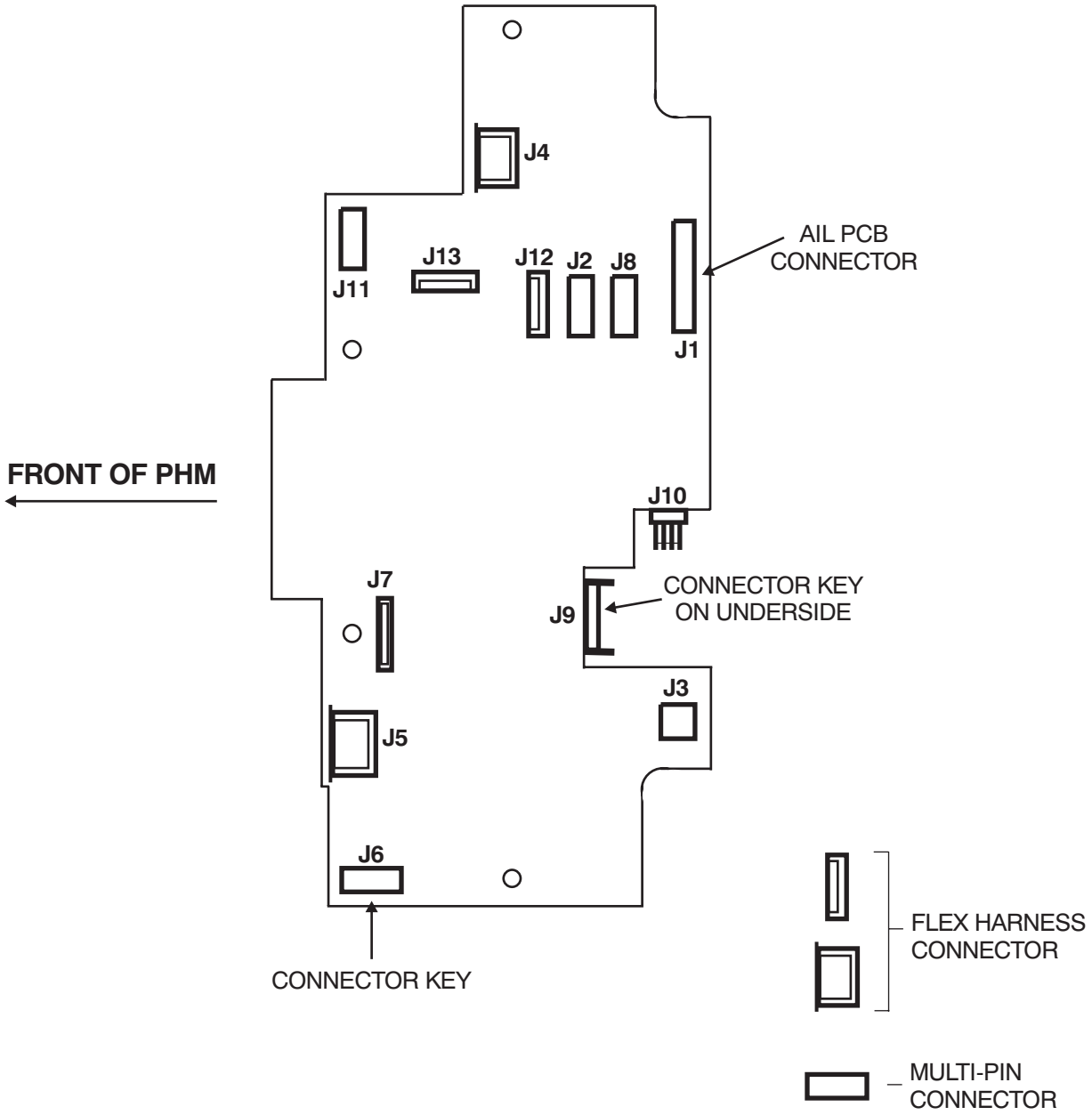


Figure 8-11 PHM PCB Connector Locations

Removal

1. Remove the pump mechanism from pump module as described in "Pump Mechanism," 8-66.

2. Disconnect motor power harness from connector J3.

3. Note the shuttle motor wires inserted into connector J3 shell along with tube loading motor wires. Figure 8-12 identifies and shows the orientation of the shuttle motor wires.

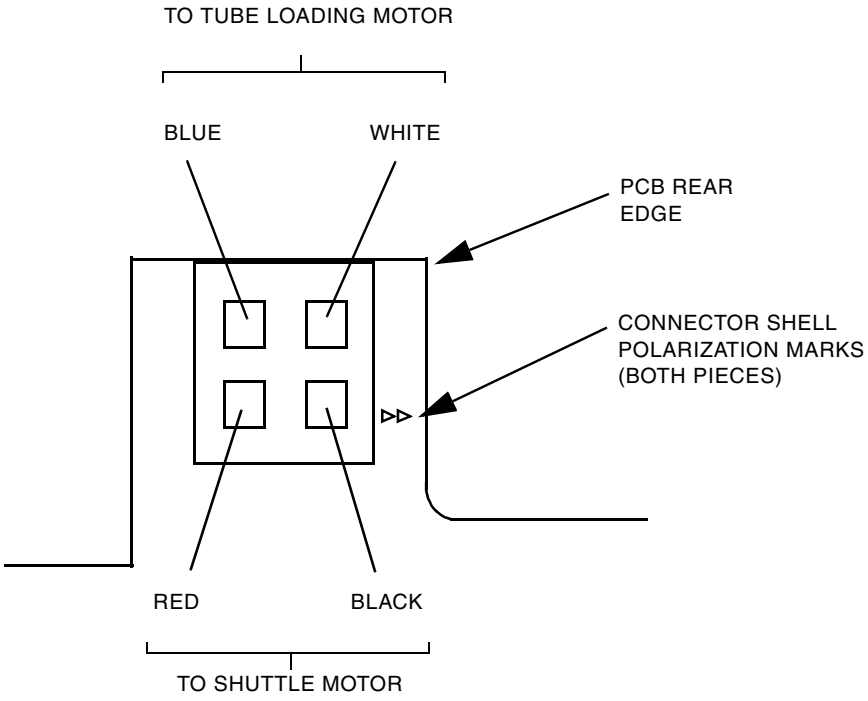


Figure 8-12 Motor Connector Shell Wiring

4. Remove the shuttle motor wires from the connector shell as follows:

   4.1 Using a fine-point punch or paperclip, lift up on locking tab.

   4.2 While holding tab up, gently pull wire and terminal from connector shell.

5. Disconnect motor encoder cable from connector J2.

6. Using a #1 crosstip bit, remove the four screws and plastic washers (Figure 11-13, items 16 and 17) that secure motor encoder PCB/cable assembly (Figure 11-7, item 18) to shuttle motor encoder collar (Figure 11-13 item 19) and tube loading motor encoder collar (Figure 11-13, item 20). Remove motor encoder PCB/cable assembly and save for reuse.

Caution **Unlock flat ribbon cable connector flange before removing cable.**

7. Open flat ribbon cable connector J12 with a long needlenose pliers or similar tool by placing the plier tips behind the ends of the white flanged area of the connector. Pull the connector lock away from PCB using a gentle rocking motion. When the flange has stopped, remove the flat ribbon cable. Leave the flange in the open position for reinsertion later.

8. Open flat ribbon cable connector J13 with a long needlenose pliers or similar tool by placing the plier tips behind the ends of the white flanged area of the connector. Pull the connector lock away from PCB using a gentle rocking motion. When the flange has stopped, remove the flat ribbon cable. Leave the flange in the open position for reinsertion later.

9. Disconnect multi-conductor harness connector from connector J11.

10. On both motor encoder collars, remove screw and captive washer (Figure 11-13, items 19 and 20) using a #1 crosstip bit.

Caution **Use caution to avoid damaging wires or encoder wheel when removing encoder collars from motors.**

11. Gradually remove the shuttle motor encoder collar (Figure 11-13, item 19) by sliding the collar from the motor. While sliding collar from motor, make certain that the motor wires pass through gap in collar (spread gap with flat-blade screwdriver if necessary).

12. Gradually remove the tube loading motor encoder collar (Figure 11-13, item 20) by sliding the collar from the motor. While sliding collar from motor, make certain motor wires pass through gap in collar (spread gap with flat-blade screwdriver if necessary).

13. Disconnect the AIL PCB (Figure 11-7, item 15) from PHM PCB and position aside.

Note: Note the positioning and dress of the AIL sensor wires. This placement must be replicated during assembly.

14. On the motor bracket (Figure 11-13, item 22), remove the brown fabric tape piece from the motor bracket only.

15. Remove the four screws and plastic washers (Figure 11-13, items 23 and 24) that secure the PCB to the motor bracket and mechanism.

16. Lift the PCB to gain access to flat ribbon cable connectors J4 and J5.

Caution **Unlock flat ribbon cable connector flange before removing cable.**

17. Open flat ribbon cable connectors J4 and J5 with a long needlenose pliers or similar tool by placing the plier tips behind the ends of the white flanged area of the connector. Pull the connector locks away from PCB using a gentle rocking motion. When the flange has stopped, remove the flat ribbon cables. Leave the flange in the open position for reinsertion later.

18. Remove PCB from mechanism and place aside.

Caution **Use caution to avoid damaging wires or encoder wheels when removing motor bracket from motors.**

19. Remove the motor bracket from both motors by sliding bracket away from motors while making certain motor wires pass through cutouts in grommets.

20. Remove shuttle motor from mechanism gear case by removing four screws (Figure 11-13, item 15) using a #1 crosstip bit. Draw motor from gear case and remove.

Caution **Ensure dust and other particulate matter does not enter the open gearbox assembly or adhere to the pinion gear on the motor. Cover each if leaving unattended for any period of time.**

Note: If necessary, check the tube loading motor screws by performing "Tube Loading Motor Mounting Inspection/Gear Tightening Procedure," 8-78 while you have the pump motors disassembled from the pump mechanism.

Installation

Caution **Remove motor from shipping carton only when motor is to be installed. Pinion gear must be kept free of dust or other contamination.**

Do not touch pinion gear to avoid disturbing special pre-applied grease.

1. On motor being installed, remove gear protection cover and encoder wheel protection cover.

2. Place mechanism in vertical position, with motor mounting surface facing up.

3. Install shuttle motor (Figure 11-13, item 15) into mechanism as follows:

   3.1 Place shuttle motor in mounting position on gear case with motor wires facing toward manual release shaft. If motor mounting flange is not flush with gear case mounting flange, rotate encoder wheel ¼-turn until gears mesh and allow flush mounting.

Caution **Motor must rest flush on mechanism gear case mounting surface with no force. Lack of flush mounting indicates gears are not meshed. Attempting to force motor into mounting position will damage motor and gear case.**

3.2 Ensure proper gear meshing by gently rotating encoder wheel with finger for a few revolutions.

3.3 Start four screws (Figure 11-13, item 25) that secure motor to gear case using a #1 crosstip bit.

Caution **Tighten the motor securing screws to a torque of 3.5 kgf-cm (3 lb-in).**

3.4 Fully tighten the four securing screws in a criss-cross pattern.

3.5 Apply one drop of Three Bond 1401B adhesive around the edge of each screw.

4. Record replacement motor manufacturer and serial number.

5. On motor bracket (Figure 11-13, item 22), align cutouts in grommets with corresponding motor wires.

Caution **Use caution to avoid damaging wires or encoder wheels when placing motor bracket over motors.**

Note: Make certain both AIL sensor wires are routed beneath the tube loading motor and the shuttle motor. Make certain AIL sensor wire adjacent to tube loading motor is inserted into cutout on pump chassis.

6. Place the motor bracket over both motors and wire harnesses. Make certain of the following:
- Motor wires are inserted through motor holes in bracket.
- Gaps in grommets on motor bracket align with motor wiring.
- Threaded inserts on bottom of motor bracket face the PHM PCB.

7. Gradually slide the motor bracket toward mechanism until the motor bracket edge is flush with the edge of the brown fabric tape.

8. Re-affix the tape to motor bracket.

9. Place PHM PCB on mechanism underside (mounting surface).

Note: Refer to Figure 8-11 for PHM PCB connector locations.

10. Bend the flat ribbon cable that connects to J4 so the cable properly aligns with connector. Insert flat ribbon cable into connector.

While holding harness fully seated in connector, lock the connector lock. Check secureness of the connection by gently pulling on harness.

11. Bend the flat ribbon cable that connects to J5 so the cable properly aligns with connector. Insert flat ribbon cable into connector.

While holding harness fully seated in connector, lock the connector lock. Check secureness of the connection by gently pulling on harness.

12. Position the AIL sensor cables as shown in Figure 8-13.

13. Without causing stress on flat ribbon cables, flip the PCB over into its mounting position, ensuring the AIL sensor cables remain positioned as shown in Figure 8-13. The two mounting holes closest to the center of the PCB should align with the mating holes in mechanism.

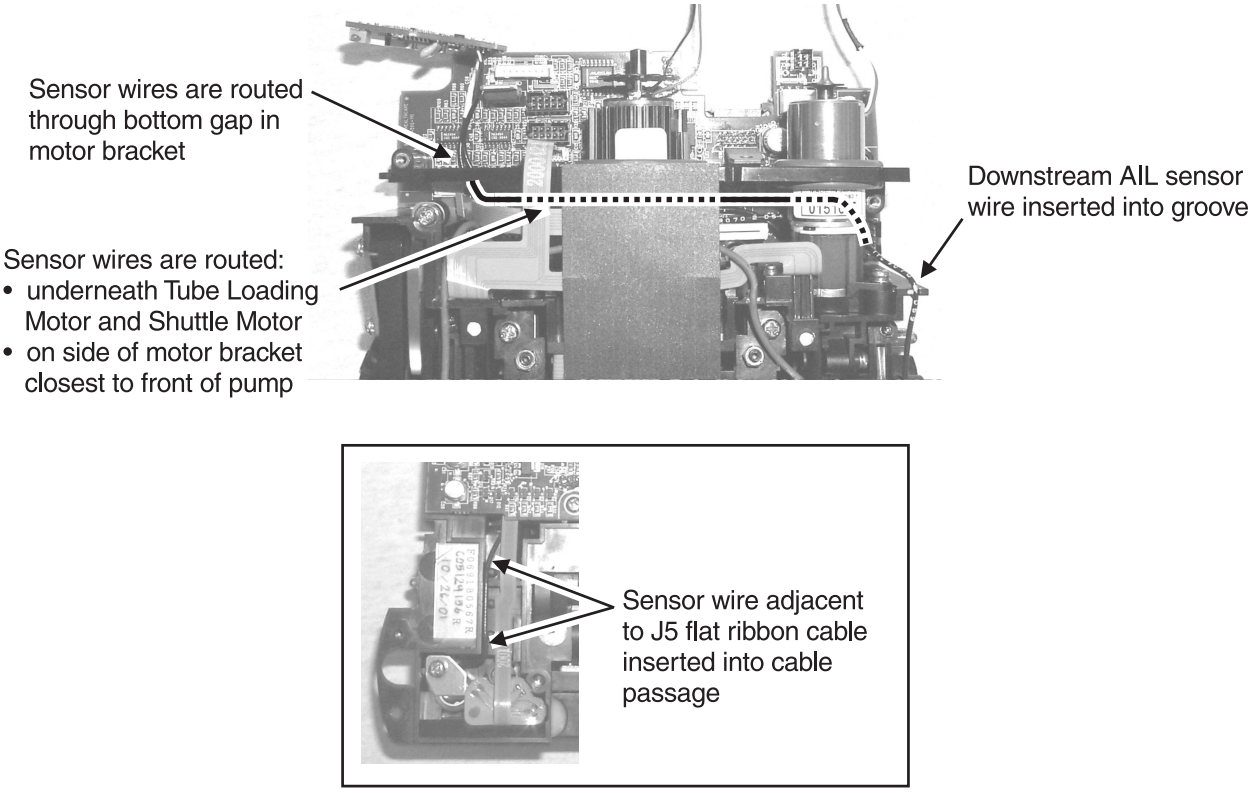


Figure 8-13 AIL Sensor Wire Routing

Caution **Make certain disconnected flat ribbon cables are positioned away from mounting surface between mechanism and PCB.**

14. Using a #1 crosstip bit, start two of four screws and plastic washers (Figure 11-13, items 23 and 24) that secure the PCB to the mechanism.

15. Align the motor bracket so the two mounting holes align with mating holes in the PCB.

16. Using a #1 crosstip bit, start remaining two screws and plastic washers (Figure 11-13, items 23 and 24) that secure the PCB to the motor bracket.

Caution **Tighten the PCB securing screws to a torque of 3.7 kgf-cm (3.2 lb-in).**

17. Tighten all four PCB securing screws.

18. Align AIL PCB with connector on PHM PCB. Seat AIL into connector.

Caution **Use caution to avoid damaging wires or encoder wheel when positioning encoder collar on motor.**

19. Align the tube loading motor encoder collar (Figure 11-13, item 20) in mounting position on the tube loading motor. Collar is properly aligned when gap is aligned with motor wires and encoder PCB mounting area is oriented with encoder wheel.

20. Gradually slide the tube loading motor encoder collar onto the motor. While sliding collar onto motor, make certain motor wires pass through gap in collar (spread gap with flat-blade screwdriver if necessary).

21. Press the collar onto motor until collar stop ring is flush with rear of motor. Make certain collar encoder PCB mounting surface is parallel with top of motor bracket.

22. Using a #1 crosstip bit, start one screw and captive washer (Figure 11-13, item 21) that secures the collar to the motor.

Caution **Tighten the collar securing screw to a torque of 4.7 kgf-cm (4.1 lb-in).**

23. Tighten the collar securing screw.

Caution **Use caution to avoid damaging wires or encoder wheel when positioning encoder collar on motor.**

24. Align the shuttle motor encoder collar (Figure 11-13, item 19) in mounting position on the shuttle motor. Collar is properly aligned when gap is aligned with motor wires and encoder PCB mounting area is oriented with encoder wheel.

25. Gradually slide the shuttle motor encoder collar onto the motor. While sliding collar onto motor, make certain motor wires pass through gap in collar (spread gap with flat-blade screwdriver if necessary).

26. Press the collar onto motor until collar stop ring is flush with rear of motor. Make certain collar encoder PCB mounting surface is parallel with top of motor bracket.

27. Using a #1 crosstip bit, start one screw and captive washer (Figure 11-13, item 21) that secures the collar to the motor.

Caution **Tighten the collar securing screw to a torque of 4.7 kgf-cm (4.1 lb-in).**

28. Tighten the collar securing screw.

29. Place the motor encoder PCB/cable assembly (Figure 11-13, item 18) into mounting position over the tube loading motor and shuttle motor. Motor encoder PCB/cable assembly is properly oriented when smaller PCB is over tube loading motor and assembly connector is adjacent to PHM PCB connector J2.

30. Using a #1 crosstip bit, start (but do not tighten) four screws (Figure 11-13, item 16) and plastic washers (Figure 11-13, item 17) that secure motor encoder PCB/cable assembly (Figure 11-13, item 18) to encoder collars (Figure 11-13, items 19 and 20).

31. While holding tube loading motor encoder PCB flush against mounting position, gently rotate encoder wheel one full revolution making certain wheel does not contact encoder opto-sensors.

Caution **Tighten the encoder PCB securing screws to a torque of 1.1 kgf-cm (0.9 lb-in).**

32. Tighten the encoder PCB securing screws. Recheck for free encoder wheel rotation.

33. Connect multi-conductor harness connector to connector J11.

34. Insert mating flat ribbon cable into connector J13. While holding harness fully seated in connector, lock the connector lock. Check secureness of the connection by gently pulling on harness.

35. Insert mating flat ribbon cable into connector J12. While holding harness fully seated in connector, lock the connector lock. Check secureness of the connection by gently pulling on harness.

36. Connect motor encoder ribbon cable to connector J2.

37. Note the motor wires removed from connector J3 shell. Insert the wires and terminals into connector J3 shell oriented as shown in Figure 8-12. Terminals are properly inserted into connector shell when terminal “clicks” and is retained by connector shell.

Note: If any connector tabs break during reinsertion of terminal, replace the connector shell.

Caution **Make certain all four motor wires are routed well beneath tube loading motor and free from encoder wheel area. Tube loading motor wires should be routed in direction of tube loading motor; shuttle motor wires should be routed in direction of shuttle motor.**

38. Connect motor wire harness to connector J3, noting the orientation shown in Figure 8-12.

39. If not already present, attach the Pump Service Upgrade Label to the bottom, right-rear quadrant of the pump, such that it may be read while holding the pump upside down by its handle. Using the black permanent marker, circle the box numbered "4". If the work has been done on a PHM, write N/A in the "Write In" column for this step.

40. Install the pump mechanism into pump module as described in "Pump Mechanism," 8-66.

41. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Tube Loading Motor Mounting Inspection/Gear Tightening Procedure

If a pump module repeatedly experiences failure codes 803:02, 803:03, or 803:09 the following defects may exist:

- Tube loading motor drive gear is loose
- Tube loading motor-to-gearbox fastening is loose

Use this procedure to inspect for and correct these defects where applicable.

Caution

This procedure is intended to be performed by Baxter-trained, qualified personnel only.

This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Note: Refer to Figure 8-11 for PHM PCB connector locations.

Removal and Inspection

1. Remove the pump mechanism from the housing as described in "Pump Mechanism," 8-66.

2. Disconnect motor power harness from connector J3.

3. Note the tube loading motor wires inserted into connector J3 shell along with shuttle motor wires. Figure 8-12 identifies and shows the orientation of the tube loading motor wires.

4. Remove the tube loading motor wires from the connector shell as follows:

4.1 Using a fine-point punch or paperclip, lift up on locking tab.

4.2 While holding tab up, gently pull wire and terminal from connector shell.

5. Disconnect motor encoder cable from connector J2.

6. Using a #1 crosstip bit, remove the four screws and plastic washers (Figure 11-13, items 16 and 17) that secure motor encoder PCB/cable assembly (Figure 11-7, item 18) to shuttle motor encoder collar (Figure 11-13 item 19) and tube loading motor encoder collar (Figure 11-13, item 20). Remove motor encoder PCB/cable assembly and save for reuse.

Caution **Unlock flat ribbon cable connector flange before removing cable.**

7. Open flat ribbon cable connector J12 with a long needlenose pliers or similar tool by placing the plier tips behind the ends of the white flanged area of the connector. Pull the connector lock away from PCB using a gentle rocking motion. When the flange has stopped, remove the flat ribbon cable. Leave the flange in the open position for reinsertion later.

8. Open flat ribbon cable connector J13 with a long needlenose pliers or similar tool by placing the plier tips behind the ends of the white flanged area of the connector. Pull the connector lock away from PCB using a gentle rocking motion. When the flange has stopped, remove the flat ribbon cable. Leave the flange in the open position for reinsertion later.

9. Disconnect multi-conductor harness connector from connector J11.

10. On both motor encoder collars, remove screw and captive washer (Figure 11-13, items 19 and 20) using a #1 crosstip bit.

Caution **Use caution to avoid damaging wires or encoder wheel when removing encoder collars from motors.**

11. Gradually remove the shuttle motor encoder collar (Figure 11-13, item 19) by sliding the collar from the motor. While sliding collar from motor, make certain that the motor wires pass through gap in collar (spread gap with flat-blade screwdriver if necessary).

12. Gradually remove the tube loading motor encoder collar (Figure 11-13, item 20) by sliding the collar from the motor. While sliding collar from motor, make certain motor wires pass through gap in collar (spread gap with flat-blade screwdriver if necessary).

13. Disconnect the AIL PCB (Figure 11-7, item 15) from PHM PCB and position aside.

Note: Note the positioning and dress of the AIL sensor wires. This placement must be replicated during assembly.

14. On the motor bracket (Figure 11-13, item 22), remove the brown fabric tape piece from the motor bracket only.

15. Remove the four screws and plastic washers (Figure 11-13, items 23 and 24) that secure the PCB to the motor bracket and mechanism.

16. Lift the PCB to gain access to flat ribbon cable connectors J4 and J5.

Caution **Unlock flat ribbon cable connector flange before removing cable.**

17. Open flat ribbon cable connectors J4 and J5 with a long needlenose pliers or similar tool by placing the plier tips behind the ends of the white flanged area of the connector. Pull the connector locks away from PCB using a gentle rocking motion. When the flange has stopped, remove the flat ribbon cables. Leave the flange in the open position for reinsertion later.

18. Remove PCB from mechanism and place aside.

Caution **Use caution to avoid damaging wires or encoder wheels when removing motor bracket from motors.**

19. Remove the motor bracket from both motors by sliding bracket away from motors while making certain motor wires pass through cutouts in grommets.

20. Remove the two screws that secure the tube loading motor mounting flange to the chassis.

21. Temporarily install the manual tube release knob onto release shaft.

22. While holding release flap open, remove the tube loading motor.

Caution **Ensure that dust and other particulate matter does not adhere to the gear on the motor. Cover each if leaving unattended for any period of time.**

23. Inspect the tube loading motor for loose items as follows:

    23.1 Check if tube loading motor drive gear is loose.

    23.2 Check if tube loading motor-to-gearbox fastening is loose.

- If **either** condition is found, **or** the motor does not already have thread-locking adhesive on the setscrews, perform the steps below.
- If **neither** condition is found, **and** the motor does have thread-locking adhesive on the setscrews, proceed to Installation. In this case, any failure codes were not due to a loose drive gear or looseness of motor subassemblies.

24. Gently grasp the rear of the motor and the mounting flange. Verify that no free play exists between the motor, gearbox, or mounting flange; all three subassemblies must be rigidly secured as a unit.

25. Loosen the two 1.5 mm setscrews that secure the drive gear to the motor shaft. Without prying, remove the gear by grasping the gear (using a clean, lint-free cloth) and pulling it from the motor shaft.

Note: If gear cannot be removed as described above, the tube loading motor assembly must be replaced.

26. See Figure 8-14. Using a #1 crosstip bit, remove the four screws that secure the mounting flange to the gearbox.

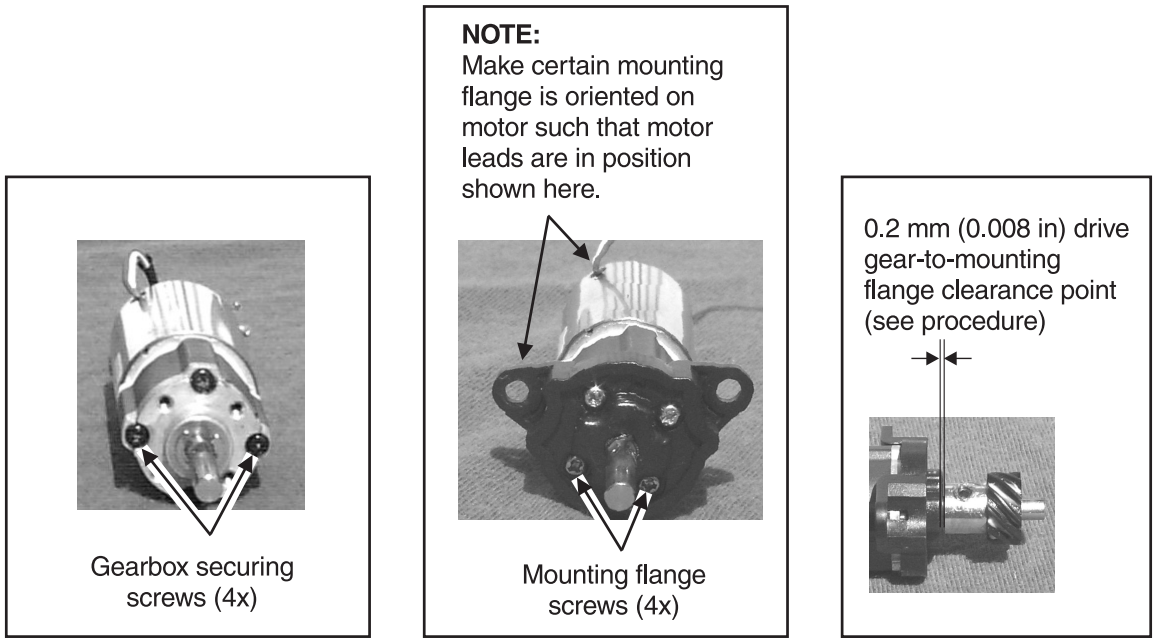


Figure 8-14 Tube Loading Motor Assembly

27. Using a #1 crosstip bit, tighten all four gearbox securing screws to 2 kgf-cm (1.7 lb-in).

28. On each screw head, apply a small drop of Three Bond 1401B adhesive on the side of each screw head such that it flows in the gap between the screw head and gearbox.

29. Noting the orientation shown in Figure 8-14, place the mounting flange in mounting position on the motor-gearbox assembly. Start four screws that secure the mounting flange to the gearbox.

30. Using a #1 crosstip bit, tighten the four securing screws to 2 kgf-cm (1.7 lb-in).

31. Noting the two flats on the motor shaft, align the gear with the flats and place it on the motor shaft.

32. Apply a small drop of Three Bond 1401B adhesive to the threads of each setscrew.

33. Lightly seat each setscrew to ensure gear is fully aligned with flats on shaft.

34. Back out each setscrew ¼-turn (but do not remove).

35. Push the gear fully against the mounting flange face.

36. See Figure 8-14. Gradually draw the gear away from the mounting flange face until a tight 0.2 mm (0.008 in) clearance exists between the mounting flange face and the base of the drive gear (as verified using a 0.2 mm (0.008 in) feeler gauge).

37. Using a 1.5 mm hex key, lightly tighten each setscrew. Final tighten each setscrew to 4.6 kgf-cm (4.0 lb-in).

38. Verify that a tight 0.2 mm (0.008 in) clearance exists between the mounting flange face and the base of the drive gear. If clearance is excessive, repeat steps 34 through 37.

39. If necessary, clean the gear and re-apply a light coat of Dow Corning Grease, EM-30L to the gear.

Installation

1. While holding manual release flap open, install the tube loading motor onto its mounting position.

2. Gently place the tube loading motor onto its mounting position, verifying that motor is flush with mounting position.

Caution **Do not start or tighten motor screws until it is verified that motor is fully flush with mounting position.**

3. Verify that both mounting points of the mounting flange are flush with the pump mechanism.

4. While making certain motor stays flush with mounting position, fully install (but do not tighten) two screws that secure the motor.

5. Alternately tighten the motor securing screws to 4.6 kgf-cm (4.0 lb-in).

6. On motor bracket (Figure 11-13, item 22), align cutouts in grommets with corresponding motor wires.

Caution **Use caution to avoid damaging wires or encoder wheels when placing motor bracket over motors.**

Note: Make certain both AIL sensor cables are routed beneath the tube loading motor and the shuttle motor. Make certain AIL sensor wire adjacent to tube loading motor is inserted into cutout on pump chassis.

7. Place the motor bracket over both motors and wire harnesses. Make certain of the following:
   - Motor wires are inserted through motor holes on bracket.
   - Gaps in grommets on motor bracket align with motor wiring.
   - Threaded inserts on bottom of motor bracket face the PHM PCB.

8. Gradually slide the motor bracket toward mechanism until the motor bracket edge is flush with the edge of the brown fabric tape.

9. Re-affix the tape to motor bracket.

10. Place PHM PCB on mechanism underside (mounting surface).

Note: Refer to Figure 8-11 for PHM PCB connector locations.

11. Bend the flat ribbon cable that connects to J4 so the cable properly aligns with connector. Insert flat ribbon cable into connector.

    While holding harness fully seated in connector, lock the connector lock. Check secureness of the connection by gently pulling on harness.

12. Bend the flat ribbon cable that connects to J5 so the cable properly aligns with connector. Insert flat ribbon cable into connector.

    While holding harness fully seated in connector, lock the connector lock. Check secureness of the connection by gently pulling on harness.

13. Position the AIL sensor cables as shown in Figure 8-13.

14. Without causing stress on flat ribbon cables, flip the PCB over into its mounting position, ensuring the AIL sensor cables remain positioned as shown in Figure 8-13. The two mounting holes closest to the center of the PCB should align with the mating holes in mechanism.

15. Using a #1 crosstip bit, start two of four screws and plastic washers (Figure 11-13, items 23 and 24) that secure the PCB to the mechanism.

16. Align the motor bracket so the two mounting holes align with mating holes in the PCB.

17. Using a #1 crosstip bit, start remaining two screws and plastic washers (Figure 11-13, items 23 and 24) that secure the PCB to the motor bracket.

Caution **Tighten the PCB securing screws to a torque of 3.7 kgf-cm (3.2 lb-in).**

18. Tighten all four PCB securing screws.

19. Align AIL PCB with connector on PHM PCB. Seat AIL into connector.

Caution **Use caution to avoid damaging wires or encoder wheel when positioning encoder collar on motor.**

20. Align the tube loading motor encoder collar (Figure 11-13, item 20) in mounting position on the tube loading motor. Collar is properly aligned when gap is aligned with motor wires and encoder PCB mounting area is oriented with encoder wheel.

21. Gradually slide the tube loading motor encoder collar onto the motor. While sliding collar onto motor, make certain motor wires pass through gap in collar (spread gap with flat-blade screwdriver if necessary).

22. Press the collar onto motor until collar stop ring is flush with rear of motor. Make certain collar encoder PCB mounting surface is parallel with top of motor bracket.

23. Using a #1 crosstip bit, start one screw and captive washer (Figure 11-13, item 21) that secures the collar to the motor.

Caution **Tighten the collar securing screw to a torque of 4.7 kgf-cm (4.1 lb-in).**

24. Tighten the collar securing screw.

Caution **Use caution to avoid damaging wires or encoder wheel when positioning encoder collar on motor.**

25. Align the shuttle motor encoder collar (Figure 11-13, item 19) in mounting position on the shuttle motor. Collar is properly aligned when gap is aligned with motor wires and encoder PCB mounting area is oriented with encoder wheel.

26. Gradually slide the shuttle motor encoder collar onto the motor. While sliding collar onto motor, make certain motor wires pass through gap in collar (spread gap with flat-blade screwdriver if necessary).

27. Press the collar onto motor until collar stop ring is flush with rear of motor. Make certain collar encoder PCB mounting surface is parallel with top of motor bracket.

28. Using a #1 crosstip bit, start one screw and captive washer (Figure 11-13, item 21) that secures the collar to the motor.

Caution **Tighten the collar securing screw to a torque of 4.7 kgf-cm (4.1 lb-in).**

29. Tighten the collar securing screw.

30. Place the motor encoder PCB/cable assembly (Figure 11-13, item 18) into mounting position over the tube loading motor and shuttle motor. Motor encoder PCB/cable assembly is properly oriented when smaller PCB is over tube loading motor and assembly connector is adjacent to PHM PCB connector J2.

31. Using a #1 crosstip bit, start (but do not tighten) four screws (Figure 11-13, item 16) and plastic washers (Figure 11-13, item 17) that secure motor encoder PCB/cable assembly (Figure 11-13, item 18) to encoder collars (Figure 11-13, items 19 and 20).

32. While holding tube loading motor encoder PCB flush against mounting position, gently rotate encoder wheel one full revolution making certain wheel does not contact encoder opto-sensors.

Caution **Tighten the encoder PCB securing screws to a torque of 1.1 kgf-cm (0.9 lb-in).**

33. Tighten the encoder PCB securing screws. Recheck for free encoder wheel rotation.

34. Connect multi-conductor harness connector to connector J11.

35. Insert mating flat ribbon cable into connector J13. While holding cable fully seated in connector, lock the connector lock. Check secureness of the connection by gently pulling on cable.

36. Insert mating flat ribbon cable into connector J12. While holding cable fully seated in connector, lock the connector lock. Check secureness of the connection by gently pulling on cable.

37. Connect motor encoder ribbon cable to connector J2.

38. Note the motor wires removed from connector J3 shell. Insert the wires and terminals into connector J3 shell oriented as shown in Figure 8-12. Terminals are properly inserted into connector shell when terminal “clicks” and is retained by connector shell.

Note: If any connector tabs break during reinsertion of terminal, replace the connector shell.

Caution **Make certain all four motor wires are routed well beneath tube loading motor and free from encoder wheel area. Tube loading motor wires should be routed in direction of tube loading motor; shuttle motor wires should be routed in direction of shuttle motor.**

39. Connect motor wire harness to connector J3, noting the orientation shown in Figure 8-12.

40. Install the pump mechanism into pump module as described in “Pump Mechanism,” 8-66.

41. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Pump Display PCB Assembly

Caution

This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Removal

1. Remove the bottom panel and the pump module as described in "Pump Module," 8-60 or "Assembly," 8-61.

Note: Note the routing of the display ribbon cable through the case. You must use the same routing during reassembly.

2. Remove the manual tube release knob on the pump module that requires service as described in "Manual Tube Release Assembly," 8-65.
3. Carefully peel the flat ribbon ground strap from the housing mounting boss.
4. Using a #2 crosstip screwdriver, remove the two screws and plastic washers (Figure 11-7, items 6 and 7) that secure the display PCB assembly (item 8) to the housing.
5. Disconnect the ribbon cable from the display PCB and save for reuse.

Installation

1. Connect the ribbon cable (saved during removal) to the replacement display PCB.
2. Place the pump display PCB into mounting position.
3. Route the ribbon cable between the housing mounting boss and the housing wall.
4. Re-apply the flat ribbon ground strap to the mounting boss on the housing.

Caution

Tighten the two display PCB screws to 5 kgf-cm (4.3 lb-in).

Tighten the four top screws to 7 kgf-cm (6 lb-in).

Tighten the two bottom screws to 7 kgf-cm (6 lb-in).

5. Secure the display PCB using two screws and plastic washers (Figure 11-7, items 6 and 7).

6. Install the manual tube release knob on the pump module as described in "Manual Tube Release Assembly," 8-65.

7. Install the pump module and the bottom panel as described in "Pump Module," 8-60 or "Assembly," 8-61.

8. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Pump Module Keypad

Caution

This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Removal

1. Remove the bottom panel and the pump module that requires service as described in "Pump Module," 8-60 or "Assembly," 8-61.

2. Using angled needlenose pliers, gently unlock the flat ribbon connector flange for connector J7 by grasping the flange and lifting it up in a rocking motion.

3. Disconnect the flat ribbon cable on the pump channel keypad, and lift the ESD shield on the flat ribbon cable off of the screw boss.

4. Use a blunt tool to remove the silicone around the pump channel keypad.

5. Peel the pump channel keypad off of the case and discard it.

6. Clean excess silicone from the pump module housing.

Installation

1. With the keypad inverted, insert the ESD shield of the replacement keypad completely through the slot in the pump module housing, then insert the flat ribbon cable.

2. Apply RTV silicone sealant just above the slot in the recessed area.

3. Remove the peel-away backing from the keypad, align it with the opening in the housing, and press it into place.

4. From the inside of the housing, apply silicone at the bottom of the slot, between the ribbon cable and the ESD shield, and at the top of the ESD shield, to seal the slot completely.

5. Insert the flat ribbon connector into J7, ensuring that the cable is fully inserted and seated squarely.

6. Lock the connector flange for J7.

7. Remove the release paper from the adhesive and press the EMI shield onto the screw boss.

8. Apply silicone adhesive 744 sealant around the exterior edge and case of the keypad. Wipe off excess silicone.

Note: Make certain the silicone does not extend beyond the top of the "U" notches.

9. Ensure that the black Air in Line leads and both gray pressure sensor leads are seated onto their respective "U" notches on the downstream and upstream platens.

10. Allow the silicone to set for at least 6 hours, overnight if possible.

11. Check the appearance of the silicone after it has set and verify that there is a complete silicone seal around the exterior edge of the keypad. Touch up if necessary.

12. Cut pieces of tape from the 3M 44 insulating tape roll approximately 1 in or 25 mm long and apply to the ESD shield and to the flex ribbon as shown in Figure 8-15.

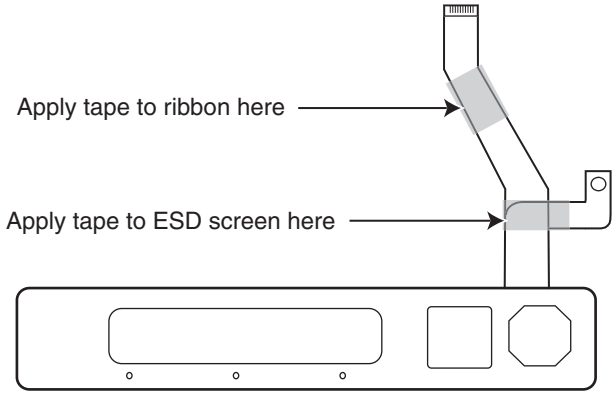


Figure 8-15 Pump Module Keypad Insulation Tape Installation

13. Mark box 7 of the service upgrade label.

14. Install the pump module and the bottom panel as described in "Pump Module," 8-60 or "Assembly," 8-61.

15. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Air in Line PCB

Caution

This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Removal

1. Remove the bottom panel and the pump module as described in "Pump Module," 8-60 or "Assembly," 8-61.
2. Remove the AIL PCB (Figure 11-7, item 15) by lifting and gently rocking it side-to-side.
3. Diagram the location of the receiver and transmitter coaxial leads soldered to the AIL PCB.

Caution

Maintain a soldering pencil tip temperature of 536° to 662° F (280° to 350° C) to avoid damaging the insulation.

Tip the pump module on its side to avoid solder splashes.

4. Using a low-wattage, temperature-controlled soldering pencil, carefully unsolder the receiver and transmitter coaxial leads from the AIL PCB.

Installation

1. On AIL PCB, insert leads and solder each connection as shown in the diagram prepared in step 3.
2. Carefully mate the header connector on the AIL PCB with connector on mechanism PCB. Gently press AIL PCB into mechanism connector until connector is fully seated (as verified by audible click).
3. Calibrate the AIL PCB as described in "AIL PCB Calibration," 9-10.
4. Install the pump module and the bottom panel as described in "Pump Module," 8-60 or "Assembly," 8-61.
5. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Pump Housing

Caution

This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Note: You must order replacement pump designator labels to identify the housing you are replacing when it is installed on the pump. See Figure 11-6, items 14, 15, and 16 for label part numbers.

Removal

1. Remove the bottom panel and the pump module as described in "Pump Module," 8-60 or "Assembly," 8-61.
2. Remove the accessory connector from the pump module as described in "Accessory Connector Assembly," 8-64.
3. Remove the manual tube release knob, the pump mechanism, and the display PCB assembly from the pump module as described in "Pump Display PCB Assembly," 8-86.

Installation

1. Install a new piece of insulation (Figure 11-7, item 14) on the inner rear of the new housing to prevent the AIL PCB from contacting the housing.
2. Install the manual tube release knob, the pump mechanism, and the display PCB assembly into the pump module as described under "Pump Display PCB Assembly," 8-86.

Caution

Tighten the accessory connector nut to 13 kgf-cm (11.3 lb-in).

Tighten the two display PCB screws to 5 kgf-cm (4.3 lb-in).

Tighten the four top screws to 7 kgf-cm (6 lb-in).

Tighten the two bottom screws to 7 kgf-cm (6 lb-in).

3. Install the accessory connector in the pump module as described under "Accessory Connector Assembly," 8-64.
4. Install the pump module and the bottom panel as described in "Pump Module," 8-60 or "Assembly," 8-61.

5. Attach the appropriate channel designator label (A, B, or C) to the pump housing.

6. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Pump Module Software

Caution

This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Removal

1. Remove the bottom panel and the pump module(s) as described in "Pump Module," 8-60 or "Assembly" on page 8-61.

2. Remove PROM U12 using the IC extractor (P/N 8219801).

Installation

1. **Colleague pumps:** Install the new PROM in the pump module.
   Colleague 3 pumps:

   1.1 Install the new software PROM chip in pump module A.

   1.2 Install the new software PROM chip in pump module B.

   1.3 Install the new software PROM chip in pump module C.

2. Install pump module(s) and the bottom panel as described in "Pump Module," 8-60.

3. Perform the tests listed in the table on page 8-7 for this assembly and record the results on a copy of the Operational Checkout Data Sheet.

Pump Feet

Caution **This procedure involves removing the screws that secure the pump module(s) to the UIM. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).**

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

Removal

1. Unplug the pump and verify that it is powered off.
2. Carefully place the pump upside-down in the top half of the packing insert (see Figure 8-9).
3. Using a 3 mm hex driver, remove the screw(s) (Figure 11-1 or 11-8, item 5) through the foot (feet) (Figure 11-1 or 11-8, items 12, 13, 14, and 15) to be replaced. (The left rear foot is not shown in the figures.) Remove the foot (feet).

Note: Do not scrape plating material from the casing.

4. Remove all rubber residue using a chisel tip razor knife.
5. Clean any residue with Whisk adhesive remover.
6. Clean excess adhesive remover with isopropyl alcohol or soap and water.

Installation

1. Apply Loctite PRISM PRIMER 770 on the replacement foot (feet) and allow it to dry.
2. Apply Loctite PRISM 411 to the bottom panel of the pump and immediately press the foot on. Maintain pressure for at least 30 seconds.
3. Repeat steps 1 and 2 for other feet, if necessary.

Caution **Tighten the bottom panel screws to 9 kgf-cm (7.8 lb-in).**

4. Install the bottom panel (Figure 11-6, item 14). No testing is required.

Upstream Under Platen Flex Connector Insertion Procedure

Perform this procedure only on pumps that have failed with failure code 803:07, 865:01 or 865:19. Perform this procedure to correctly reinsert the upstream under platen flex connector into J4 on a PHM PCB.

1. Remove the pump module as described in "Pump Module," 8-60 or "Assembly," 8-61 depending on which pump you are working on.

Note: Do not touch the connector contacts.

2. Open connector J4 (upstream under platen flex connector) with a long needlenose pliers or similar tool by placing the plier tips behind the ends of the white flanged area of the connector. Pull the connector towards the front of the PHM using a gentle rocking motion. When the flange has stopped, remove the flex connector. Leave the flange in the open position for reinsertion later.

3. Turn the pump module over so the four main PCB mounting screws are visible.

4. Using a #2 crosstip screwdriver, loosen all four of the screws securing the main PCB by one or two turns, so the PCB can slide back and forth.

5. Push the upstream end of the PCB towards the slide clamp portion (front) of the pump mechanism as far as it will go.

6. While holding the PCB in position, tighten the 4 PCB securing screws to 3 to 3.5 kgf-cm (2.6 to 3.0 lb-in), starting with the two screws on the upstream side of the pump module.

7. Turn the pump module over, and hold it so your left index finger is located on the tail of the upstream under platen flex ribbon. This allows you to push the flex ribbon towards connector J4 while manipulating the flex tail and connector using a suitable tool in your right hand.

8. Ensure that the connector flange is still open. Insert the flex ribbon straight into J4. Push the flange completely closed with the needlenose pliers after inserting the flex ribbon.

9. Pull gently but firmly on the flex ribbon to verify it stays in the connector.

Caution **Do not damage the flex ribbon by pulling it too hard.**

10. Install a software PROM if necessary. Connect the pump module to a UIM and power on the pump.

11. Proceed as follows:
    - If the repair was successful, there should be no failures on power up (other than cascade errors such as 812:05 and 813:01 which can be ignored if they do not occur when pump is powered on again).
    - If device failure 803:07, 865:01, or 865:19 occurs, then the repair was not successful or the foiled end of the flat ribbon cable has been damaged. Perform this procedure again in case the connector was not positioned correctly.
    - If device failure 803:07, 865:01, or 865:19 occurs again (even after performing this procedure again) the slide clamp prisms may be defective. Inspect and replace (as required) the slide clamp prisms as described in "Slide Clamp Prism Replacement Procedure," 8-94.
12. To ensure that the upstream under platen flex assembly sensors are functioning correctly, attempt to load an administration set three times. If the loading process is successful, the slide clamp sensors and inlet valve sensors are operating properly.
13. Install pump module(s) and the bottom panel as described in "Pump Module," 8-60.
14. Perform the tests listed in the table on page 8-7 for the pump module and record the results on a copy of the Operational Checkout Data Sheet.

Slide Clamp Prism Replacement Procedure

Perform this procedure only on pumps that have failed with failure code 803:07, 865:01, 865:19, or 896:01. Additionally, only perform this procedure if "Upstream Under Platen Flex Connector Insertion Procedure," 8-93 has been performed and the pump still fails. If the J4 flat ribbon connector checks out OK, the cause of this failure may be dirty or cloudy prisms in the slide clamp assembly (typically contaminated by improper application of cleaning solutions).

1. Follow the pop-up screen instructions to reset the MTR. Power the pump off.

Note: If you are servicing a Colleague 3 pump, rearrange the PHMs as necessary so that the failed PHM is in the channel "C" (bottom) location. This will be the only channel that can be serviced at this time. Place any other failing channels in "out of service" mode while this procedure is being performed.

2. Remove the PHM as described in "Pump Module," 8-60 or "Assembly," 8-61, but do not disconnect connections to the UIM.
3. Place the PHM upside-down.

4. Figure 8-16 shows the location of the sensor flat ribbon cable. On the sensor cable, place a jumper (using a paper clip or conductive tape) across all four phototransistor solder joints (circled areas in Figure 8-16).

Caution **Do not short across any other solder joints other than those shown.**

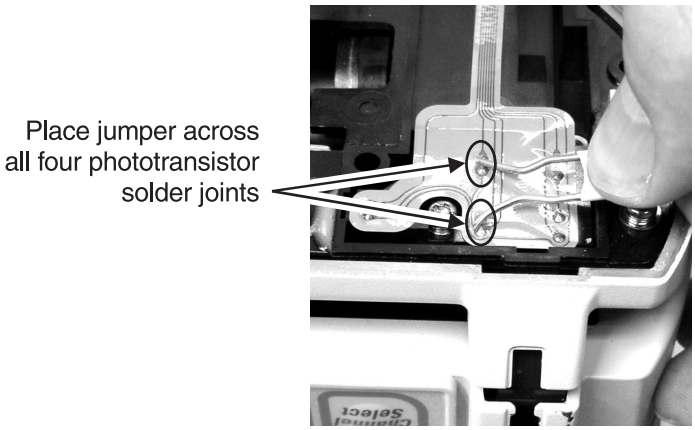


Figure 8-16 Phototransistor Location and Jumpering

5. Power up the pump and check for failure codes.
   - If the failure stills appears, replace the PHM.
   - If the failure does not appear, proceed to the steps below to replace the prisms.

Note: Make certain Channel C is being accessed. This is the channel the PHM under test is connected to.

6. From the Service Feature Menu screen, record and retain the Valve Positions: Upstream value. This value will be needed later in this procedure.

7. Remove the jumper from the phototransistor solder joints.

8. Verify that prisms may be contaminated by accessing the Channel Raw Sensor Data from the Service Features Menu screens of Channel C. (Refer to Accessing the Configuration/Service Menu, p. 5-7, for instructions.) Press the ***Open*** key of the PHM under test and view Forward and Rear slide clamp sensor readings.
   - If either value is greater than 45, wait for the jaws to close (1 minute timeout) and perform the steps below to replace the prisms.
   - If all values are less than 45, the prisms are not defective. Do not perform this procedure.

9. Using a #2 crosstip screwdriver, remove the screw that secures the upstream sensor assembly to the PHM.

Caution **Use care to avoid stressing the flat ribbon cable when removing the sensor assembly from mounting position.**

10. Using a pick or appropriate needle-nose pliers, carefully lift the upstream sensor assembly away from its mounting position. Use tape to hold the sensor assembly away from its mounting position.

11. Press the ***Open*** key and verify that the LEDs on the sensor assembly turn on.
    - If both LEDs are lit, proceed to next step.
    - If either LED is not lit, check for loose or disconnected flat ribbon cable connection at connector J4 of the PHM PCB. Check also for damage to the flat ribbon cable. Reseat the cable and check again. If the LED(s) still do not light or flat ribbon cable/connector is damaged, replace the PHM.

12. Power the pump off.

13. Refer to Figure 8-17. Using a pick, remove each of the four prisms. Prisms must be totally clear (contaminated prisms have a yellowish or brown hue).

14. Check each prism cavity for debris. Carefully remove any debris.

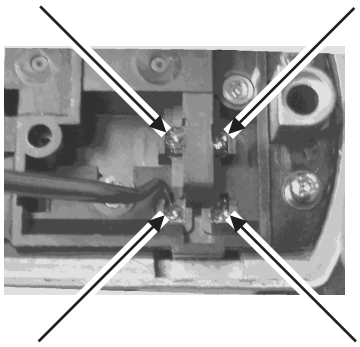


Figure 8-17 Prism Removal

Caution **Do not touch prisms. Handle prisms using tweezers or latex gloves (or equivalent).**

15. Install four new prisms (part no. 4009390104) into the mounting cavities by orienting the prisms as shown in Figure 8-18 and placing each prism into mounting position.

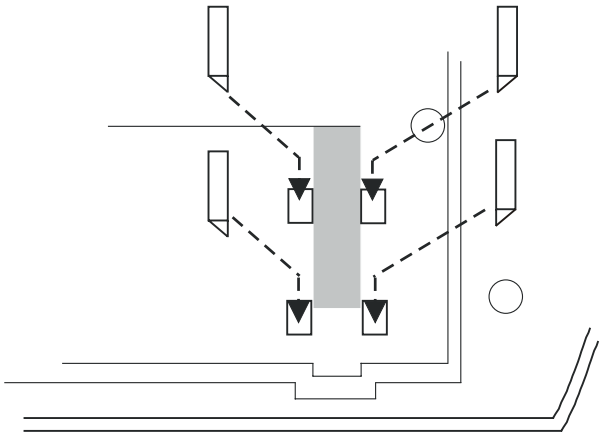


Figure 8-18 Prism Installation

16. Using a pick, press down on each prism until it is locked (snapped) into mounting position. When locked into position, top of prism should be flush with slide clamp chassis.

Note: Replacement prisms are snap-in fit and do not require adhesive.

17. Remove the tape holding the sensor assembly out of way.

18. Carefully guide the sensor assembly into its mounting position. Start (but do not tighten) the screw removed in step 9.

19. Refer to Figure 8-19. Align the sensor assembly in its mounting position using an 0.5 mm and 1.5 mm feeler gauge. (The 1.5 mm feeler gauge can be built-up from several thinner feeler gauges if necessary.)

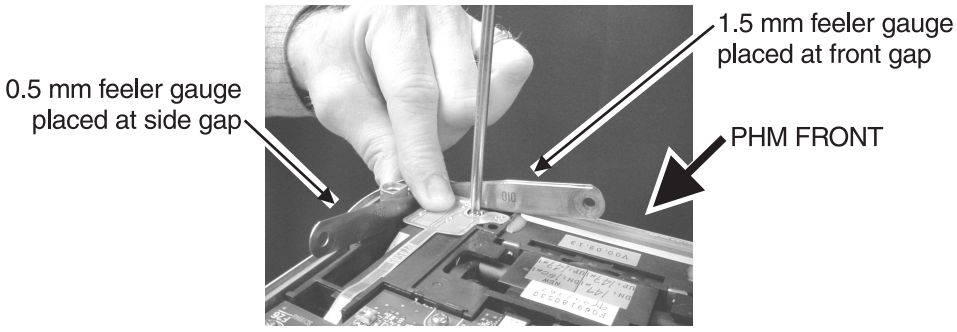


Figure 8-19 Positioning the Sensor Assembly

20. While holding the sensor assembly toward the corner against both feeler gauges, tighten the securing screw to 4.75 kgf-cm (4.1 lb-in).

21. Remove the feeler gauges. Recheck alignment of secured assembly by inserting feeler gauges as shown in Figure 8-19.

22. Power up the pump. Access the Channel Raw Sensor Data from the Service Features Menu screens of the PHM being repaired. Press the ***Open*** key of the PHM being repaired and view the Forward and Rear slide clamp sensor readings.

    - If the valve position counts are within 3 counts of the values recorded in step 6, the PHM has been repaired successfully.
    - If the valve position counts are greater than 3 counts of the values recorded in step 6, replace the PHM.

23. Install pump module(s) in the original order and install the bottom panel as described in “Pump Module,” 8-60.

24. Perform the tests listed in the table on page 8-7 for the pump module and record the results on a copy of the Operational Checkout Data Sheet.

Chapter 9

Calibration

Overview

This chapter provides the following calibration instructions:

Caution

Wear a grounding wrist strap when assembling and disassembling the pump.

Do not lay the pump face down on components or tools that could scratch or damage the keypad.

Ensure that wires are not pinched or overstressed.

Tools and Test Equipment

- 100 ohm, 5%, 5 watt load resistor
- Timer or stopwatch
- Digital multimeter

Power Supply Calibration

Note: Replacement power supplies are factory pre-calibrated and should not require field calibration. Change calibration adjustments only if the power supply does not meet specification in this procedure.

Power Supply calibration should be checked or performed as follows:

- Check the calibration of the power supply if the power supply has been replaced.
- Calibrate the power supply module (located in the rear housing) when troubleshooting procedures indicate that the output of the Power Supply is no longer within tolerance.

The data sheet for this procedure is included in Appendix A. If you must repeat the procedure, use a new calibration data sheet for each repetition.

Note: This procedure can be used for Astec or Condor power supplies.

1. Power the pump off and disconnect it from AC power.
2. Place the pump on an anti-static mat.
3. Use a 2.5 mm hex driver to remove the four screws that secure the rear housing.
4. Separate the rear housing from the center housing by pulling the rear housing out slightly, breaking the seal.

Note: View the pump from the rear when performing the following steps.

5. Raise the rear housing approximately 3.8 cm (1.5 in.) and rotate it clockwise upward over the V-block for the mounting clamp. The center of rotation should be the lower right corner.
6. (Optional) To provide slack in wiring if necessary, remove the front bezel by performing steps 1 through 4 of “Front Bezel Assembly,” 8-10. Then remove the cable tie from the wire bundle on the lower left of the center housing. Manipulate the wires that lead to the rear housing to provide slack.
7. Invert the rear housing, and rest it on the top half of the pump’s packing insert or similar support, as shown in Figure 8-9.

8. Using a #2 crosstip driver, remove four screws and plastic washers (Figure 11-5 or 11-11, items 19 and 28) that secure the power supply assembly (item 2) and insulator shield (item 1) to the rear housing standoffs.

9. Remove the power supply assembly far enough to gain access to the 4-wire harness connector SK2 (Astec) or J2 (Condor).

! WARNING ! **Do not remove the insulator shield from the power supply assembly.**

10. Disconnect DC harness connector J107 from SK2 (Astec) or J2 (Condor).

11. Temporarily secure the insulator shield to the power supply using a rubber band.

12. Using suitable test clip leads, connect a 100 ohm, 5 watt, 5% load resistor across pins 3 and 4 of connector SK2 (J2 on Condor power supplies).

! WARNING ! **To avoid the possibility of electric shock, use caution when the power supply is connected to the AC input during calibration. Power supply line input is energized whenever the pump is connected to an AC outlet.**

! WARNING ! **Before connecting the pump to an AC outlet, make certain that the plastic insulator shield is in place over the power supply assembly.**

! WARNING ! **During the power-up test, do not wear a grounding wrist strap. Put the wrist strap back on only when the pump is disconnected from the AC outlet.**

13. Refer to Figure 9-1 for the location of the components on the Astec Power Supply PCB. Figure 9-2 shows Condor power supply components.

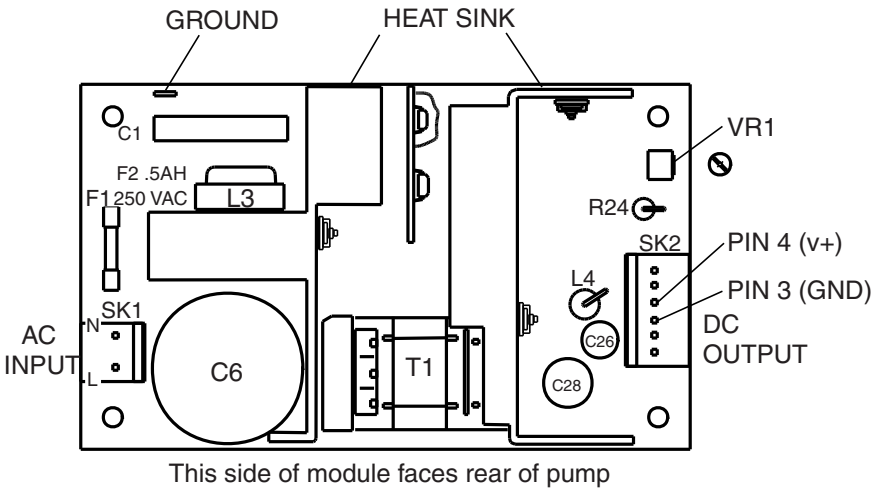


Figure 9-1 Location of Calibration Adjustments on Astec Power Supply

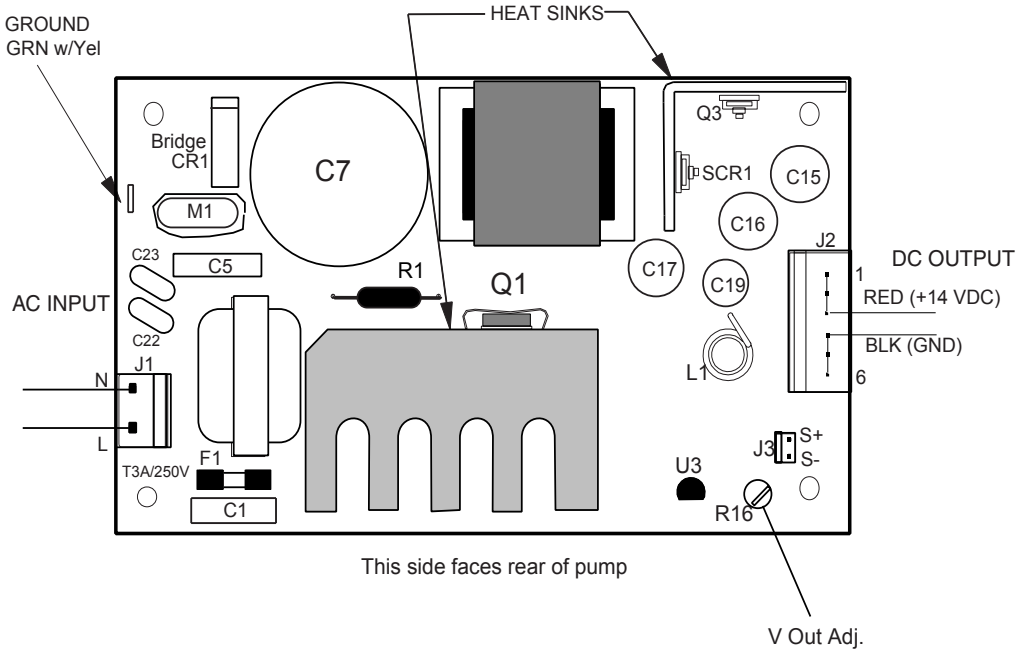


Figure 9-2 Location of Calibration Adjustments on Condor Power Supply

14. Connect a multimeter set for measuring DC voltage across the load resistor.

15. Plug the power cord into a grounded outlet.

16. Measure the voltage across the load resistor. The voltage should be 14.00 ±0.1 Vdc.

17. If necessary, adjust VR1 (Astec) or R16 (Condor) until the voltage measured across the load resistor is 14.00 ±0.1 Vdc. Record the adjusted value on a copy of the Calibration Data Sheet located in Appendix A.

    If you cannot calibrate the power supply, replace the power supply module as described in "Power Supply Assembly," 8-40.

18. Unplug the pump when the power supply output voltage is within tolerance.

19. If adjustment was required, apply Red Glpt varnish to VR1(Astec) or to the side of R16 (Condor) to lock it into place.

20. Disconnect the multimeter and the load resistor.

21. Connect the DC output harness connector J107 to SK2 (Astec) or J2 (Condor).

22. Remove the rubber band from the insulator shield.

23. Install the power supply assembly as described in "Power Supply Assembly," 8-40.

24. Install the rear housing assembly as described in "Rear Housing," 8-32.

25. Perform the Operational Checkout procedure provided in Chapter 10. Record the test results on a copy of the Operational Checkout Data Sheet located in Appendix A.

Battery Charge Level Indicator Calibration

Perform this procedure if the Battery Charge Level Indicator (BCLI) appears incorrect or if the UIM PCB has been replaced.

The data sheet for this procedure is included in Appendix A. If you must repeat a section or sections of this procedure, use a new calibration data sheet for each repetition.

Setup and Battery Preparation

Note: Do not move or unplug the pump during the charging period.

Note: Older pumps equipped with one battery must be upgraded to two battery operation as described in "Adding a Second Battery (Colleague Pumps Only)," 8-38.

1. Record the pump model number on the data sheet.

2. Charge the batteries for 36 hours or until the Battery Current Low Range value, as displayed in the Battery and Pump History screen, is less than or equal to 0.025 (25 mA).

3. If the charging current is still greater than 0.025 at the end of the charging period, replace the batteries and repeat step 2. Power the pump off and record on the data sheet that the batteries were charged.

4. Power the pump on and check the BCLI. If all 10 boxes are filled (darkened), calibration is not necessary.

Note: On Colleague 3 pumps or Colleague pumps with two batteries, only half of the BCLI boxes may be full and the Ah value is 1.9 instead of 3.8 when the charging current is less than 0.025 A. If this occurs, the BCLI may still be within calibration. This may occur only during the initial power up after installing new UIM software or a new UIM PCB. To clear this condition, first record configuration and history information because all configuration and history information will be lost during this process. Disconnect all power to the UIM, including the lithium backup battery, for approximately 30 seconds. After reconnection, power the pump on under AC power and repeat step 2.

5. Power the pump off and continue.

Charge Current Diagnostics

If, when testing a pump with known good batteries that is powered by AC, the charging current value shown in the Battery and Pump History screen is less than 25 mA or negative after the required charging time, the BCLI may be out of calibration. Perform this procedure to determine if calibration is necessary.

1. Open the front bezel, remove the battery fuse, and measure the current at the fuse holder terminals with an ammeter. Connect the ammeter's positive test probe to the fuse holder terminal going to the UIM PCB. Connect the ammeter's negative test probe to the fuse holder terminal that goes to the battery.

2. Verify that the pump is plugged into AC power, then power it on.

3. View the Battery and Pump History screen.
   - If the value shown for Charging Current is negative but the ammeter measures a positive charging current, the BCLI is out of calibration.
   - If the value shown for Charging Current is positive but is not within ±25 mA of the value shown on the ammeter, the BCLI is out of calibration.

   Record the results on the data sheet and perform the following calibration procedure.

BCLI Calibration Procedure

Review the entire BCLI calibration procedure carefully before performing. The timing in certain steps is critical.

If a calibration attempt fails, up to three attempts are allowed. Use a new data sheet for each attempt. If unable to calibrate the third time, replace the UIM PCB and repeat the entire procedure. If attempting a calibration after performing "BCLI Closed Bezel Calibration Check," 9-9, this calibration attempt is also considered a repeat. Record the calibration attempt number on the data sheet.

Caution

Do not disconnect the lithium backup battery at any time during the calibration procedure. The pump's Battery and Pump History will be erased if you disconnect the backup battery.

The potentiometers are held in adjustment with Red Glpt varnish. If adjustments are necessary, use a stylus to carefully remove the varnish without damaging the potentiometer. Rotate the pot fully clockwise and then counterclockwise once before making the final adjustment.

1. The pump must be powered off (whether plugged into AC or unplugged) for a minimum of **2 hours** before continuing to allow the circuitry to cool. Record on the data sheet that this has been accomplished.

2. With the pump unplugged from AC power, carefully lower the front bezel and disconnect the battery fuse located inside the front/top of the UIM center section.

Note: Before lowering the front bezel, you may have to loosen the pump module(s), especially on Colleague 3 pumps, to allow the ribbon cable to slide through the opening in the center housing without accidentally disconnecting connector P3.

Note: To simplify reassembly, observe the wiring and fuse holder positioning before removing the battery fuse.

3. Plug the pump into AC power. Simultaneously power the pump on and start a timer.

Note: The total time allowed to perform the following steps is **6 minutes** from when the pump was powered on.

4. View the Battery and Pump History screen.

5. Press the **Cal High** soft key. The Battery Current High Range is highlighted and the count value should be 505 to 507. If the value is outside this range, adjust R109 on the UIM PCB (see Figure 9-3), so that the value is within range. Continue to adjust R109 as necessary so that the count value is within range at **exactly the 5th minute** from when the pump was powered on. The timing is important because the count rises as the circuits warm up. Do not make adjustments after the time has elapsed. **Record** the 5th minute Battery Current High Range value.

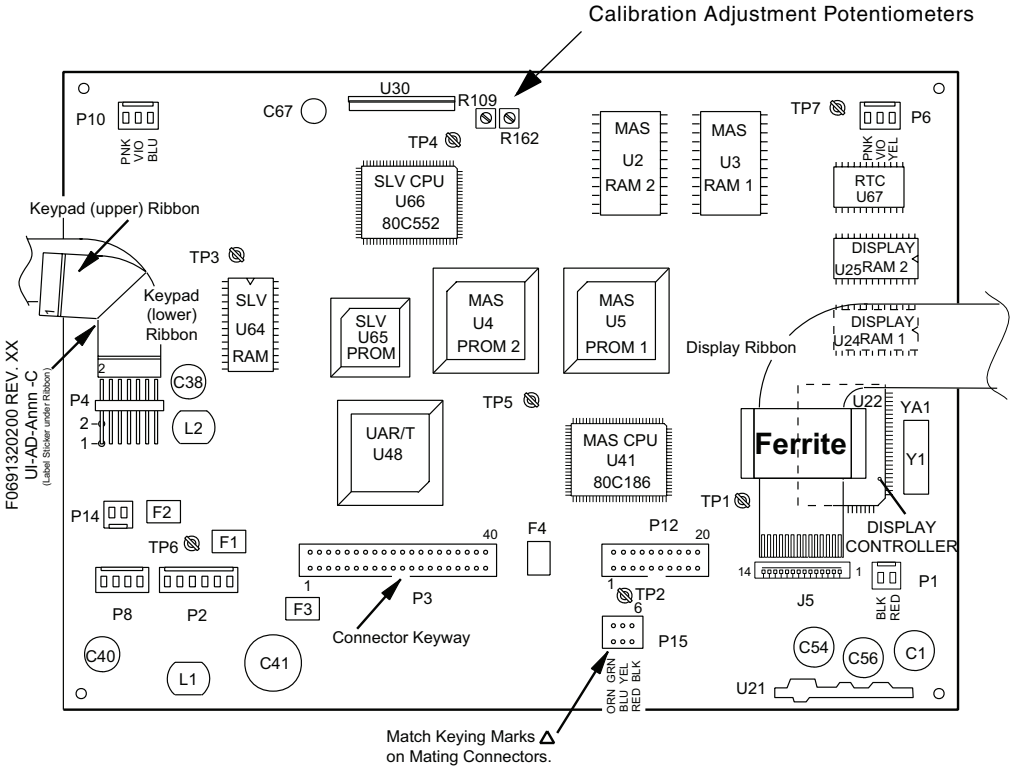


Figure 9-3 Location of BCLI Calibration Adjustments on UIM PCB

6. If the count value is not within range at exactly 5 minutes, power the pump off and repeat the calibration (3 attempts maximum) starting with step 1. Record the results of each attempt on the calibration data sheet.

7. Press the **Done** soft key, then press the **Cal Low** soft key. **Timing still continues from the power on starting time**.

8. The Battery Current Low Range is highlighted and the count value should be 498 to 502. If the value is out of range, adjust R162 on the UIM PCB until the value is within range. Continue to adjust R162 as necessary so that the count value is within range at **exactly the 6th minute** after the pump was powered on. The timing is important because the count rises as the circuits warm up. **Do not make adjustments after the time has elapsed**. **Record** the 6th minute Battery Current Low Range value.

9. If the count value is not within the specified range at exactly 6 minutes, power the pump off and repeat the calibration (3 attempts maximum) starting with step 1. **Record** the results on the data sheet.

If unable to calibrate the BCLI after three attempts, replace the UIM PCB and repeat the entire procedure using new data sheets.

10. Apply Glpt to adjusted potentiometers. Do not cover the entire adjustment slot. If neither potentiometer required adjustment, no further BCLI testing is necessary.

11. Press the **Done** soft key twice, then press the ***ON/OFF CHARGE*** key but leave the pump plugged in. Stop the timer.

Caution Correct placement of the wiring and fuse holders is critical; incorrect placement can damage the elevated IC heat sink on the UIM PCB.

12. Install the battery fuse into its holder, dress the wiring and fuse holders, and then reinstall the front bezel.

BCLI Closed Bezel Calibration Check

Use this procedure to check the BCLI calibration with the front bezel closed. Calibrate the BCLI if, after performing this procedure three consecutive times, the pump does not pass. Do not move or unplug the pump during this procedure.

1. The pump must be powered on for at least two hours immediately to allow the UIM PCB to warm up.

2. View the Battery and Pump History screen.

3. Press the **Cal Low** soft key and start a timer. Battery Current Low Range is highlighted followed by a value (initially updates within 6 seconds).

4. Verify that the value is 480 to 547 and does not change by more than one count during any 15-minute period within a one-hour time frame. Record the stabilized value on the data sheet, then press the **Done** soft key.

5. If the value does not stabilize, or stabilizes at a value that is out of range, start this procedure over at step 2 (three attempts maximum).

6. Press the **Cal High** soft key. Battery Current High Range is highlighted followed by a value that initially updates within 6 seconds. **Record** this value on the data sheet, then press the **Done** soft key.

7. The value recorded should be 501 to 522. If the value is **outside** of this range, repeat this procedure starting at step 2 (three attempts maximum).

Note: If the BCLI calibration procedure was unsuccessfully performed three times before performing this procedure, replace the UIM PCB as described in “Replacement of the User Interface Main PCB Assembly,” 8-14.

8. Press the **Done** soft key again, then power the pump off. The pump can now be unplugged.

AIL PCB Calibration

Perform this procedure after replacing the AIL PCB, or to recalibrate the AIL PCB. Perform the AIL PCB calibration verification procedure after calibrating the AIL PCB or if you suspect that it is out of calibration.

Setup

Because the AIL PCB is located at the back of each pump module, you must separate the pump module from the UIM (or upper PHM) as described in Chapter 8 in order to access the adjustments on the AIL PCB. To support the UIM, tilt it back and support it on the mounting clamp, or rotate the UIM to the right and support the bottom pump module with an insulated object.

Required equipment:

- Baxter standard tubing segments (part no. PPD-01-202), referred to as "spec tubing" in the following procedures. Use a new tubing segment for each pump that you calibrate.
- Dark blue keyed On/Off Clamp (part no. 030101011)
- Syringe, pressure vessel, or other method of providing at least 25.0 psig ± 0.5 psig fluid back pressure to the pump
- Pressure-measuring instrument capable of reading up to 25 psig (minimum full scale) with 1% or better accuracy
- Pressure regulator valve
- 3-way or 4-way valve to control the pressurization system; tubing in-line (splice) connectors are recommended

1. Set up the test equipment as shown in Figure 9-4.

Note: The setup shows a syringe being used as the pressure source. Other constant pressure sources can be used.

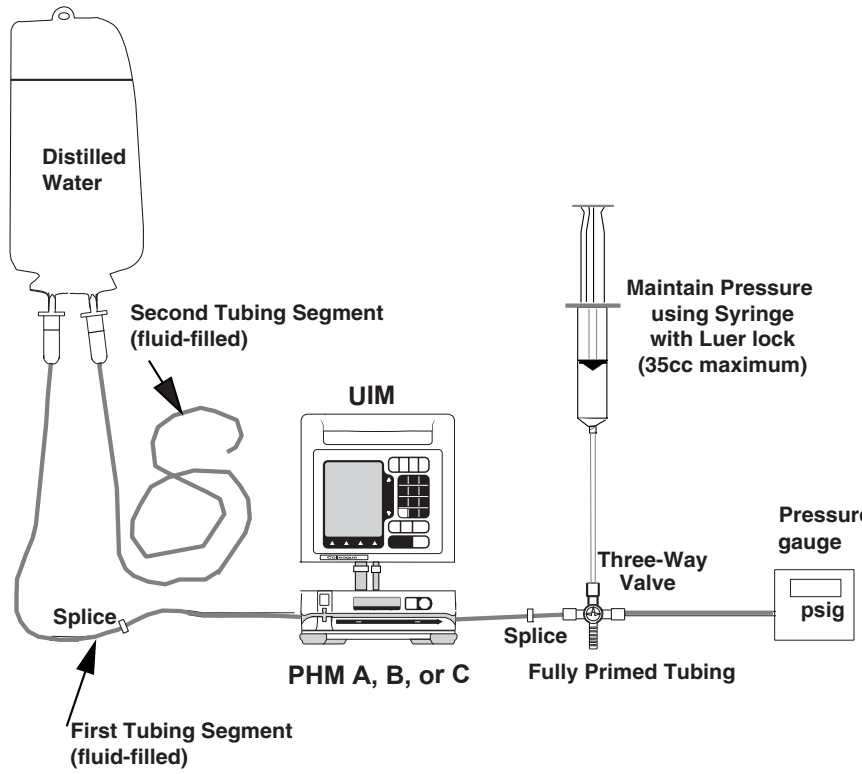


Figure 9-4 Air In Line Calibration Setup

2. Prepare two fluid-filled tubing segments and one empty segment, each with a dark blue keyed On-Off Clamp.

3. Completely prime the two fluid-filled segments.

4. Ensure that the pressure meter is zeroed before pressurizing the system.

5. Use the 3-or 4-way valves to isolate parts of the test setup while making the downstream interconnections. Keep the downstream tubing segments as short as practical.

6. Use the On/Off clamp or hemostats to isolate the segments while making the upstream connections.

7. If manually regulated pressurization is used, close the line from the pressure source to maintain back pressure during the wait periods.

Caution

This procedure involves removing the screws that secure the pump modules to the user interface module. The pump can suddenly separate and be damaged if it is not adequately supported when the securing screws are removed. To support the pump while it is upside-down, use the top half of the shipping carton packing insert as a holding fixture (see Figure 8-9).

Motor magnets may attract metal debris to motors or PCBs. To prevent debris from entering the pump mechanism, always maintain a clean work area when performing procedures involving pump modules.

8. Remove the bottom panel of the pump module as described in "Bottom Panel," 8-59.

9. Separate the pump module from the UIM, but do not disconnect the wiring harness connectors, so that you can operate the UIM while adjusting the potentiometer VR1 on the AIL PCB.

   To support the UIM, carefully tip it back until it is resting on the mounting clamp as shown in Figure 9-5. See Figure 9-6 for the location of VR1.

10. Place the pump module on the bottom panel to stabilize it during testing.

Figure 9-5 Supporting the UIM During AIL PCB Calibration

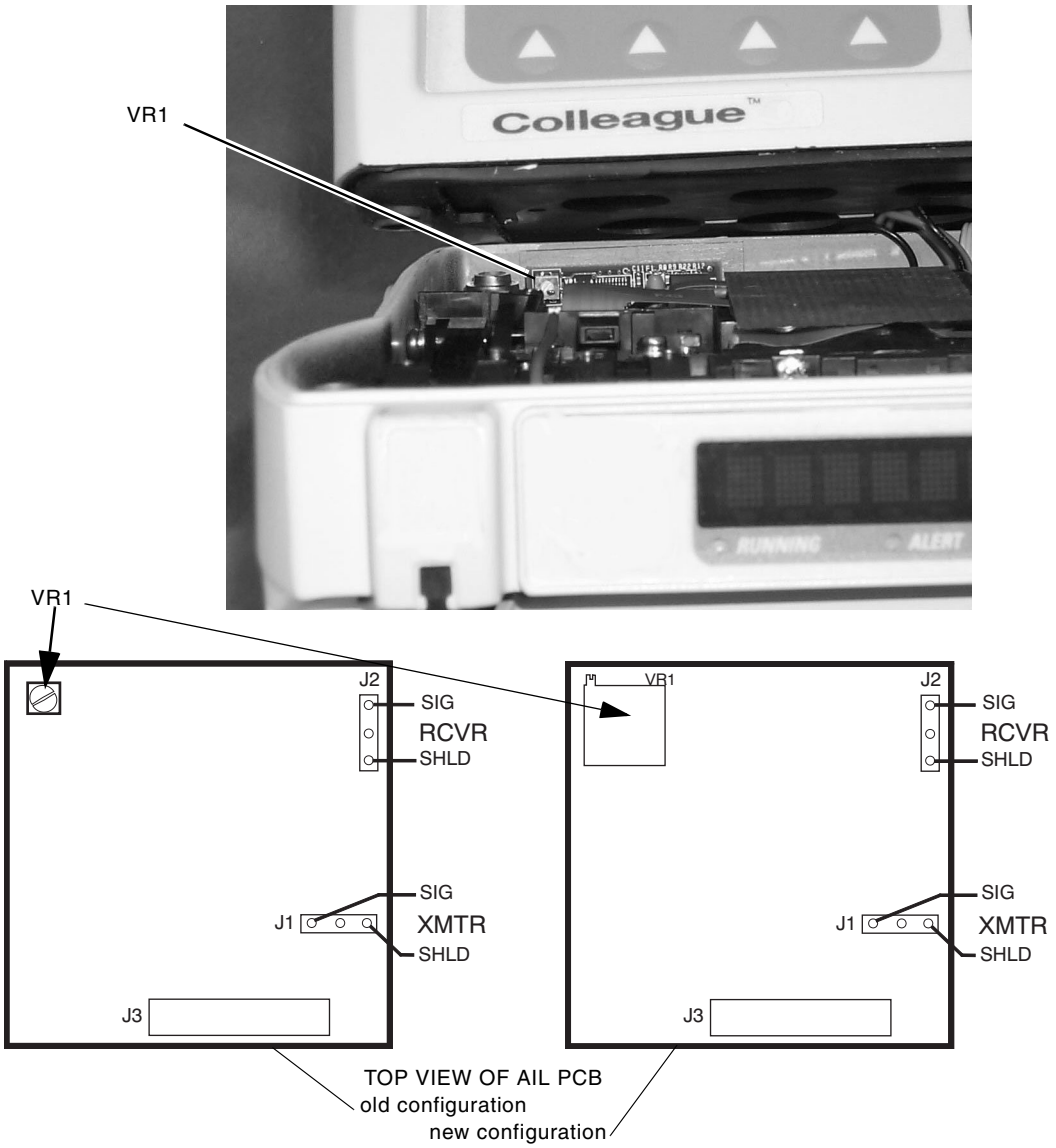


Figure 9-6 Location of Potentiometer VR1 on AIL PCB

Procedure

Caution **Do not damage or change the setting of VR1 while removing the varnish.**

1. Using a stylus or equivalent tool, carefully remove any varnish present on VR1.

2. Connect the power cord on the UIM to an AC outlet.

3. Power the pump on by pressing the ***ON-OFF/CHARGE*** key. Press the ***Main Display*** key and then the **Options** soft key.

   An alarm will occur because the pump module is not connected to the UIM in the normal configuration. Ignore the alarm.

4. Use the ⇧⇩ keys to highlight Configuration/Service on the Options menu.

5. Press the **Select** soft key.

   The Passcode Entry screen is displayed.

Note: If you enter the wrong passcode, press the **Cancel** soft key and try again.

6. Use the keypad to enter the passcode (***8151***).

7. Press the **Enter Passcode** soft key.

   The Configuration/Service Menu is displayed.

8. Use the ⇧⇩ keys to highlight Service Features and press the **Select** soft key.

   The Service Features Menu is displayed.

9. Use the ⇧⇩ keys to highlight Channel Raw Sensor Data and press the **Select** soft key.

10. Load the first segment of fluid-filled spec tubing.

11. Pressurize the loaded tubing to 25.0 psig ± 1 psig. When the pressure gauge reads 25.0 psig ± 1 psig, start the stopwatch or timer.

12. Adjust VR1 **very gradually** so that the Air In Line Sensor value displayed goes just above **245**, then stop. Clockwise rotation increases the value, counterclockwise rotation decreases the value.

13. After at least 60 seconds, reduce the loaded tubing pressure to 14.5 ± 0.2 psig. Allow the Air In Line Sensor value to stabilize.

Note: In step 13, if the pump module displays FAILURE, it means that VR1 was rotated into an out-of-spec position. Set VR1 1/8 turn counterclockwise, and repeat the procedure from step 11.

14. When at 14.5 psig ± 0.2 psig, wait at least 30 seconds, then adjust VR1 so that the Air In Line Sensor value is **230 ± 1 count**.

Note: If you cannot obtain readings within tolerance when attempting to calibrate the AIL PCB, contact your local Baxter authorized service center for technical support.

   Ensure that the value remains as set. Record the value displayed.

15. Depressurize the tubing and unload it from the pump. Stop and zero the stopwatch.

16. Move the On-Off clamp on the tubing approximately 25 mm (1 inch) downstream, and reload the fluid filled tubing.

    Wait until the pump module displays STOPPED.

17. Record the primed, 0 psig Air In Line Sensor value. The value must be **greater than 189**.

18. Pressurize the fluid-filled tubing to 14.5 psig $\pm$ 0.2 psig, then start the stopwatch. Maintain this pressure for 90 seconds, then record the Air In Line Sensor value. The value must be **less than 238**.

Note: If you cannot obtain readings within tolerance when attempting to calibrate the AIL PCB, contact your local Baxter authorized service center for technical support.

19. Depressurize the tubing and unload it from the pump. Stop and zero the stopwatch.

20. Load an empty segment of spec tubing into the pump.

21. With the stopwatch ready, time 10 seconds after STOPPED is displayed on the Pump Module display. Record the Air In Line Sensor value. The value must be **less than 129**.

Note: If you cannot obtain readings within tolerance when attempting to calibrate the AIL PCB, contact your local Baxter authorized service center for technical support.

22. Subtract the value recorded in step 17 from the value recorded in step 18.

    (step 18) - (step 17)

    Verify that the difference is **greater than 4**.

23. Depressurize the tubing and unload it from the pump.

24. Press the **Done** soft key and then press the ***ON/OFF CHARGE*** key to power off the pump.

25. Apply Red Glpt to VR1.

26. Install the pump module as described in "Pump Module," 8-60 or "Assembly," 8-61.

27. Install the bottom panel as described in "Bottom Panel," 8-59.

AIL PCB Calibration Verification

1. Load the empty segment of tubing into the pump. Wait 10 seconds after the pump module displays STOPPED.

Note: If you cannot obtain readings within tolerance when attempting to calibrate the AIL PCB, contact your local Baxter authorized service center for technical support.

2. Record the Air In Line Sensor value on a copy of the Calibration Data Sheet located in Appendix A. The value should be **less than or equal to 128**.

   If the value is greater than 128, replace the AIL PCB and restart the calibration procedure starting at step 3 on page 9-11.

3. Remove the tubing from the pump.

4. Load the second segment of fluid-filled tubing. Wait 10 seconds after the pump module displays STOPPED.

5. Record the Air In Line Sensor value on a copy of the Calibration Data Sheet located in Appendix A. The value should be **greater than 189**.

   If the value is less than 189, replace the AIL PCB and restart the calibration procedure starting at step 3 on page 9-11.

6. Pressurize the second segment of fluid-filled tubing to 14.5 psig ± 1 psig. Maintain this pressure for 60 seconds.

7. Record the Air In Line Sensor value. It should be **less than or equal to 243**.

   If the value is greater than 243, replace the AIL PCB. Restart the calibration procedure starting at step 3 on page 9-11.

8. Depressurize and remove the tubing from the pump.

9. Deactivate and disconnect all test equipment.

10. Power the pump off and unplug it if necessary.

11. Reassemble the pump module to the UIM as described in “Pump Module,” 8-60 or “Assembly,” 8-61.

12. Perform the Operational Checkout procedure provided in Chapter 10. Record the test results on a copy of the Operational Checkout Data Sheet located in Appendix A.

Chapter 10

Operational Checkout

Overview

This chapter contains checkout procedures that verify that the pump is operating properly and within specifications. The following information is provided:

- "Tools and Materials Required for Operational Checkout," 10-2
- "Exterior Inspection Procedures," 10-3, to ensure that the pump has no physical damage or missing components
- "Diagnostic Tests," 10-4, which make use of the pump's built-in diagnostics to verify that the pump is not reporting any out-of-tolerance conditions
- "Functional Tests," 10-14, to ensure that the pump performs its functions within specifications

Perform the procedures in this chapter as part of your institution's periodic maintenance and to fulfill JCAHO testing requirements; and as directed by the troubleshooting procedures in Chapter 7 and the repair procedures in Chapter 8.

Photocopy the Operational Checkout data sheets in Appendix A and use them to record the results of the operational checkout.

Note: All tests except the internal fan check are applicable to all pumps.

Tools and Materials Required for Operational Checkout

Table 10-1 lists the tools, equipment, and materials required to perform the operational checkout.

Table 10-1 Equipment Required for Operational Checkout

Material/Tool	Purpose
Balance or scale with resolution of 0.1 g, calibrated to a range of at least 0 to 100 g, or an ASTM graduated cylinder of at least 25 mL capacity and 0.2 mL resolution.	Measuring pumped solution in volume delivery accuracy tests
Calibrated digital multimeter	Measuring resistance and voltage
Colleague Pump tool kit (Part no. DAK-DADE)	Disassembling/reassembling pump
Container of known weight	Collecting pumped solution during volume delivery accuracy tests
Digital pressure gauge (minimum 0 to 20 psi, 0.01 resolution)	Measuring downstream occlusion pressure
Four-way valve, three-way valve, or T connector	Testing downstream occlusion pressure
Hemostat (Optional)	Occluding tubing segments during pressure tests
Oil-free air source	Providing air pressure during testing
Solution container (distilled water)	Solution for pumping during tests
Ruler or tape measure	Measuring length of tubing in test setups
Pencil with a flat eraser tip	Pressing keys during keypad test
Stopwatch or timer calibrated to range of 0-15 min. with a resolution of at least 1 second	Timing accuracy tests
Baxter standard administration sets (refer to Operator's Manual for a list of all administration sets suitable for use with this pump)	Testing
Baxter precision tubing segments (Part no. PPD-01-202)	Air in line testing, tube misload testing, and others testing
Tubing connectors to splice tubing segments into administration sets	Testing for Air in Line
Syringe (35 cc minimum), pressure tank or other source of fluid pressure with a calibrated 0 – 30 psi gauge and a 0 – 30 psi regulator	Checking air sensor
Safety analyzer	Testing electrical safety
Foam-tipped swabs (mfg. Part no. TWTX740, TEXWIPE)	Cleaning the tubing channel as required
Distilled water	Cleaning the tubing channel as required
Food machinery grease (Lubriko part no. CW-606-B)	Lubricating the mounting clamp threaded shaft
Keyed On/Off clamp (Part no. 03-08-01-011)	Testing the loading mechanism
Marker/pen with indelible ink	Marking tubing segments during testing

Exterior Inspection Procedures

Inspection

1. Clean the pump in accordance with the procedures in Chapter 6 while checking for damage. Inspect the pump for:
   - Cracks or damage to the case, handle, display, labels, feet, power cord, accessory cords (if present), and volume and contrast controls
   - Damage (including print flaking or cracks) or dents on the keypad or keypad domes
   - Damaged or dirty connectors
   - Damaged, peeling, or illegible labels
2. Replace damaged parts as described in the procedures in Chapter 8.
3. Power the pump on and check for intermittent power, indicated by panel flickering, by flexing the cable near the plugs. Replace the line cord if flickering occurs during flexure.

RTV Seal Check

Verify that an RTV seal is present and evenly applied around the pump module keypad. If the RTV seal is missing or damaged, replace the keypad as described in “Pump Module Keypad,” 8-87.

Mounting Clamp Check

Note: Annually or as necessary, lubricate the threaded shaft with a 3 mm (1/8 inch) bead of Lubriko CW-606-B food machinery grease, then turn the mounting clamp knob to its stops (open and closed) for the length of the shaft.

1. Verify that the pump has a mounting clamp, that the mounting clamp moves smoothly when the knob is turned, and that the arm opens and closes. If required, lubricate the mounting clamp as indicated in Table 6-1 on page 6-2. Replace the clamp if necessary.

Note: The Colleague 3 Pump can be mounted on an IV pole only, so it does not have headboard-mounting capability.

2. Check that the IV pole and head board friction pads are present, in good condition, and fully adhere to the mounting surface. Replace pad(s) if necessary.

3. Check that the V-block clamp plate is secure. If the screws are loose, remove each screw, apply Loctite 425 threadlocker to the screw threads, and torque each screw to 30 kgf-cm (26 lb-in).

4. Verify that the clamp is easily removed using the release tab, and that the lock pins spring in and out freely.

5. Slide the dust cover (if present) back onto the head board V-block clamp plate, then install the clamp arm in the IV pole position.

Internal Fan Check

Note: Applies to Colleague 3 pumps only.

Verify that the internal cooling fan is functioning by listening for the sound of the fan when the pump is plugged into an AC outlet.

External Check and Shake Test

1. Hold the pump by the handle and the mounting clamp knob. Turn it upside down and shake it, listening for noises, rattling, or other evidence of loose components. (Some battery movement is normal.)

2. If loose components are present, disassemble the pump and repair as described in Chapter 8. Refer to Chapter 11,"Illustrated Parts Breakdown" for the location of the internal components of the pump.

Diagnostic Tests

Know how to operate the pump before attempting to perform this part of the Operational Checkout. Read the Operator's Manual if you are unfamiliar with pump operation.

If the pump fails to perform as described in the test procedures, or stops with a failure code alarm, troubleshoot and repair it. Perform the Operational Checkout again to verify the effectiveness of the repair before placing the pump back into service.

Setup

Note: If the pump has been exposed to extreme temperatures just before testing, allow it to stabilize at room temperature for three to four hours before performing the diagnostic tests.

1. Prepare a test infusion using a Baxter standard administration set with keyed On/Off clamp and a distilled water container.

2. Follow the directions on the administration set packaging to prime the administration set.

Note: Ensure that the tubing is clean and dry before loading it into the pump. Use a new segment of tubing in the tubing channel when performing the diagnostic tests.

3. Hang the solution container so that the fluid level is between 45.7 cm and 55.9 cm (18 and 22 inches) above the height of the tubing channel you are testing.

Self-Test

Perform the self-test with the pump unplugged.

Note: Allow the pump to stabilize at operating temperature (15^{o} – 38^{o} C (59^{o} – 100^{o}F)), and perform the initial battery charge before performing this self-test.

Note: If you miss any of the indications listed below during the self test, repeat the self test as many times as required to observe all the indications. To repeat the self test power the pump off and back on.

Note: **Colleague 3 pumps only**: If any of the three ***Channel Select*** key LEDs do not light during the self-test, press the corresponding ***Channel Select*** key and verify that the LED lights.

1. Press the ***ON/OFF CHARGE*** key. The pump executes its self-test. Verify that all of the following indications occur:

   - The Main Display is completely lit, then becomes completely dark, then displays the copyright screen.
   - Colleague pumps: All eight digits of the pump module display fully light, fully extinguish, and then display the word CLOSED.
   - Colleague 3 pumps: PATIENT is momentarily displayed in all channel displays, but only channel A displays CLOSED. The others go blank. Standby will be shown in the UIM Main Display screen for the blank channels.
   - All LEDs and icons, except the Plug icon, light momentarily, and the Battery icon lights continuously.
   - The backup beeper sounds two distinct times.
   - The COMPUTER MONITOR icon lights at the second beep and extinguishes at the third beep.
   - The alarm tone sounds once.

Do not place the pump in service if any of the following occur during self-test:

- Dark spots or lines appear on the main display while it is supposed to be completely lit.
- Light spots or lines appear on the main display while it is supposed to be completely dark.
- One or more segments on the pump module display do not light fully.
- One or more LEDs and/or icons (except the Plug icon) do not light.
- The backup beeper is not heard two distinct times.
- The alarm tone is not heard.
- A pump or pump channel failure occurs.

2. Plug the cord into a hospital-grade, properly grounded AC outlet.

3. Verify that the Plug icon lights as soon as the pump is plugged in, and the Battery icon turns off.

4. If the Plug icon fails to light or any other part of the self-test fails, troubleshoot as described in Chapter 7, and repair as described in Chapter 8.

Note: The contrast control may slip on its shaft at the ends of travel. This is acceptable as long as the control properly rotates throughout the range.

5. Adjust the contrast control and verify that the text areas on the screen vary between light and dark. The range of the contrast change, compared with the mechanical range of the control, does not need to be proportional.

6. If necessary, repeat the self-test to verify that all indications occur as described.

   If a (main) Battery Depleted alarm or a (backup) Lithium Battery Low alarm occurs, perform the Battery Discharge Test in this chapter. If the battery(ies) are replaced repeat the Self-Test, then continue with the remainder of the operational checkout.

From this point on, leave the pump plugged into the AC outlet unless otherwise instructed.

Check Software Version

Caution **Before attempting to transfer configuration data between pumps see Table 5-9 on page 5-51. If you do not follow the guidelines you could corrupt the target pump's configuration data.**

1. Press the ***Main Display*** key, then press the **Options** soft key.

2. Use the ⇧⇩ keys to highlight Configuration/Service, then press the **Select** soft key to access the Configuration/Service Pass code Entry screen, which also displays the pump's software versions.

3. Record the version numbers on the data sheet for:
   - UI Master
   - UI Peripheral
   - Pump Module(s)

4. Enter the passcode (8151), then press the **Enter Passcode** soft key to access the Configuration/Service Menu.

Check Event History

This procedure is optional and should only be performed if the failure is unknown or if the test is part of a preventive maintenance procedure.

1. Press the ⇩ key once to highlight Event History and press the **Select** soft key.

2. (**Colleague 3 pumps only**) Select Detailed Report Type, and select All channels. Press the **Show Report** soft key.

   The entire event history for all three channels is displayed.

3. Use the **Page Up** and **Page Down** soft keys to view the entire event history. Check for failures. Troubleshoot and repair as necessary.

4. Press the **Done** soft key to return to the Configuration/Service Menu.

   Failures without obvious causes, or failures not described in this manual or other service documentation authorized by Baxter, require replacement of UIM or pump module components. If you cannot troubleshoot and repair the pump as described in the procedures in chapters 7 and 8, or if you have questions regarding replacements, contact your local service center for assistance.

Check Time and Date

This procedure is optional.

1. Use the ⇧⇩ keys to highlight and select Time and Date from the menu.

2. Press the **Select** soft key to access the Time, Month, Day, and Year fields.

3. Use the soft keys to set the date and/or the time if either is not correct.

4. Press the **Done** soft key to return to the Configuration/Service Menu.

Battery Check

1. Use the ⇧⇩ keys to highlight Service Features on the Configuration/Service Menu and press the **Select** soft key.

   The Service Features screen is displayed.

Note: The soft key changes to **New Battery** after you press it. Be careful not to press the **New Battery** soft key by mistake.

2. Use the ⇧⇩ keys to highlight Battery and Pump History, then press the **Select** soft key. The Battery and Pump History screen is displayed.

3. Baxter recommends that you perform the "Battery Discharge Test," 10-16 or replace the batteries as described in "Main Batteries," 8-34, if one of the following conditions exists:
   - The Battery Current Low Range value is still greater than 0.025A after the battery has been charged 36 hours and the Battery Charge Level Indicator is correctly calibrated.
   - The number of charge/discharge cycles is greater than 68.
   - The batteries have15
   - had multiple discharges below the alarm threshold.

4. Press the **Done** soft key to return to the Service Features screen.

Keypad and PANEL LOCKOUT Switch Test

1. Use the ⇧⇩ keys to highlight Keypad Test from the Service Features screen and press the **Select** soft key.

   The Keypad Test screen is displayed.

Note: If only the rear housing was serviced skip step 2 and proceed to step 3.

2. Using a flat-tipped pencil eraser, press the center of each key on all keypads except the ***ON/OFF CHARGE*** key and the **Done** soft key. As you press each key, verify that its name is displayed at the top of the list in the Keypad Test screen. Test the ***STOP*** and ***Open*** keys on each pump at least three times.

3. Press the ***PANEL LOCKOUT*** button on the rear of the pump and verify that "Lock" is displayed on the screen.

Note: The key names of the last 8 keys tested remain on the test screen.

4. Press the **Done** soft key with the pencil eraser to return to the Service Features screen. This also tests the functionality of the **Done** soft key. (You will test the ***ON/OFF CHARGE*** key later.)

Check Voltage Sensor Data

Access the Voltage Sensor Data screen and press the **Select** soft key to verify that the displayed values are within the ranges shown in Table 10-2.

Note: Ensure that the pump is plugged into AC power.

Table 10-2 *Voltage Sensor Data*

Voltage	Range
Channel Supply Chn. A Supply Chn. B Supply Chn. C Supply (Colleague 3 Pumps)	12.581 to 15.204 Vdc
V_{key}	4.5 to 5.5 Vdc
V_{mas}	4.5 to 5.5 Vdc
Lithium battery	7.00 to 7.60 Vdc
V_{slv}	4.5 to 5.5 Vdc
Coarse Voltage	13.5 to 14.2 Vdc
V_{audio}	0.4 to 5.0 Vdc

Speaker and Backup Beeper Test

1. Press the **Test Tone On** soft key and verify that the displayed value of V_{audio} changes and that the alarm tone sounds.

Note: The volume control may slip on its shaft at the ends of travel. This is acceptable as long as the control properly rotates throughout the range.

2. With the test tone on, vary the volume control on the rear of the pump handle. Verify that the alarm tone volume decreases and increases.

3. Turn the volume control to its lowest position. Verify that the alarm can still be heard.

4. Verify that the highest reading obtained for V_{audio} is within the range of 0.4 Vdc to 5.0 Vdc.

5. Turn the volume control to its loudest position, and press the **Tone Off** soft key.

6. Press the **Buzzer On** soft key, and verify that the backup beeper tone sounds.

7. Press the **Buzzer Off** soft key to silence the backup beeper.

8. Perform the "Nurse Call Relay Test," 10-10 or press the **Done** soft key to return to the Service Features screen.

Nurse Call Relay Test

This procedure is optional and should only be performed if you suspect a failure or as part of a preventive maintenance procedure. Do not perform this procedure if your institution does not use Nurse Call.

1. Set the multimeter to measure resistance.

2. See Figure 10-1. Connect the multimeter leads to the normally closed (N/C) pin and the COMMON pin of the COMM. PORT connector on rear of pump.

Note: ISOCOM and non-ISOCOM pumps have different COMM. PORT pin assignments for N/C and N/O connections. See Figure 10-1.

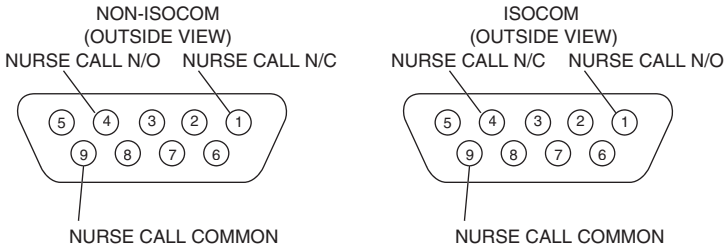


Figure 10-1 COMM. PORT Nurse Call Connection Pin-Out

3. Press the **Nurse Call** soft key to toggle between an open and closed nurse call relay. Verify that the measured resistance is less than 10 Ω with the soft key displaying **Nurse Call ON** and greater than 1 MΩ with the soft key displaying **Nurse Call OFF**.

4. Connect the multimeter leads to the normally open (N/O) pin and the COMMON pin of the COMM. PORT connector.

5. Press the **Nurse Call** soft key to toggle between a closed and open nurse call relay. Verify that the measured resistance is greater than 1 MΩ with the soft key displaying **Nurse Call ON** and less than 10 Ω with **Nurse Call OFF**.

6. Disconnect the multimeter.

7. Press the **Done** soft key to return to the Service Features screen.

PHM to Pumphead Housing Alignment Test

If the slide clamp slots in the pumphead housing and the mechanism are not aligned correctly, the tubing unloads satisfactorily but the slide clamp may snag momentarily during its exit from the slot if the tubing is removed while being pulled to the right. This test should be performed after the self-test and software version check but before the other required tests.

1. Load a tubing segment with slide clamp via the ***Open*** key and allow the auto-loading process to complete.

2. Press the ***Open*** key again, then begin to remove the tubing normally with both hands. Before the slide clamp starts to move and exit the slot, pull the entire segment to the right, then continue with the unloading and observe whether or not the slide clamp momentarily snags against the slot in the housing.

   - If there is no snagging, reload the tubing and repeat this removal activity two more times then proceed to the next step.
   - If snagging occurs, proceed to step 4.

3. Repeat step 2, but pull the tubing to the left.

4. PHM-to-housing alignment is considered acceptable if no snagging occurs during these six trials.

   - If no snagging occurs, the test is completed. Proceed to the next required test.
   - If snagging occurs at any time, loosen the mounting screws, attempt to realign the pumphead housing with the PHM, tighten the mounting screws, and then perform this procedure again. If snagging still occurs after the realignment attempt, replace the pumphead housing, then repeat this procedure.

Air In Line Test

Note: Keep downstream tubing segments as short as practical.

1. Set up the pump and test equipment as shown in Figure 10-2. The syringe or alternate fluid pressure source is used to ensure that there is no air in the fluid-filled tubing.

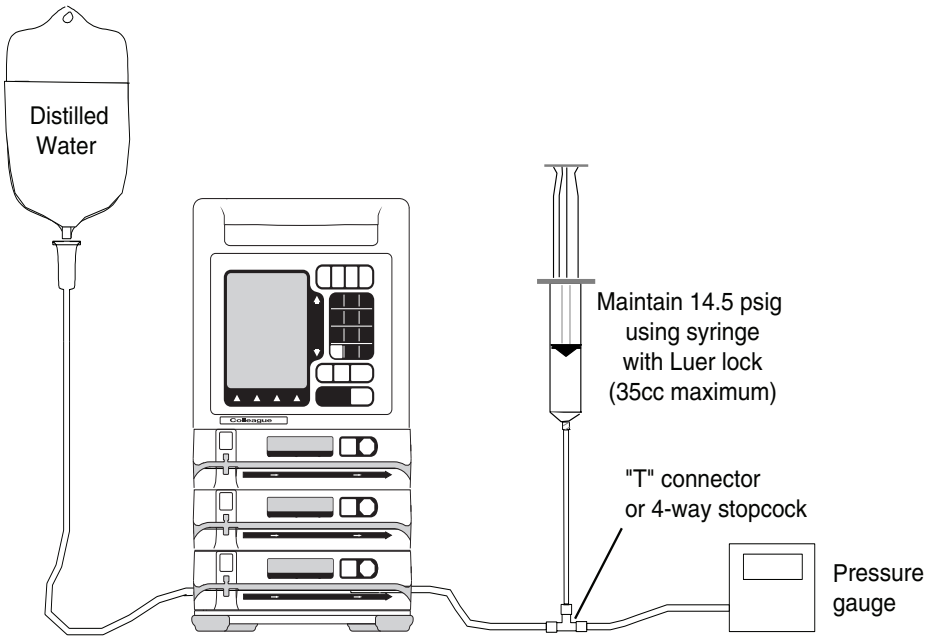


Figure 10-2 Air In Line Test

2. Load tubing in the pump module under test.
3. Verify that the tubing is fully primed, then access the Service Features screen.
4. Use the ⇧⇩ keys to highlight Channel Raw Sensor Data and press the **Select** soft key.
5. Load the fluid-filled unpressurized administration set, ensuring that an unused tubing segment is in the pump channel.
6. When STOPPED is displayed on the pump module, read the Air in Line Sensor value displayed on the Channel Raw Sensor Data screen. Wait until the display updates three or four times, then verify that the value is **greater than or equal to 187**. **Record** the value.
7. Pressurize the downstream end of the tubing to 14.50 ± 0.20 psig with a regulated pressure source. Start the stopwatch or timer.
8. After 60 seconds, verify that no failure codes occur. **Record** the result.
9. Vent the pressure, and unload the fluid-filled tubing.

10. Load an air-filled unpressurized tubing segment and wait for STOPPED to be displayed on the pump module under test. Verify that the highest Air In Line Sensor value displayed is **less than or equal to 128**. **Record** the value.

11. Leave the air-filled tubing in the pump, and exit the Service Features screen by powering the pump off and back on again.

12. After the pump completes its self-test, press the ***Main Display*** key.

13. Press the **Primary** soft key.

14. Enter any rate and volume, and press the ***START*** key. Verify that an Air In Line alarm occurs after the ***START*** key is pressed. **Record** the result.

15. **(Colleague 3 only)** Repeat the test procedure for the remaining two pump modules.

16. Disconnect the test equipment.

Channel Emergency Open Test

Note: Move the keyed On/Off clamp approximately 25 mm (1 inch) upstream on the tubing segment for every pump module you test. Do not use the same clamp for more than 30 insertions. Change the tubing segment when no unused portion remains.

Note: On some older software versions, the occurrence of failure code 803:20 is normal during the performance of this test.

1. Press the ***Open*** key and load an administration set into the pump module under test.

2. From the Service Features screen, use the ⇧⇩ keys to highlight Channel Raw Sensor Data and press the **Select** soft key.

3. Press the **Emergency Open** soft key to open the tubing channel under test.

4. Remove the administration set. Verify that the keyed On/Off clamp completely occludes the tubing.

   The Manual Tube Release pop-up is displayed. You cannot power off the pump until you reset the Manual Tube Release.

5. Reset the Manual Tube Release. If the channel opens again and failure code 803:20 occurs (this happens on Colleague pumps with UIM software versions older than 4.00.00 only), power the pump off using the tip of a pencil eraser to test the ***ON/OFF CHARGE*** key.

6. **Colleague 3 Pumps only:** Repeat the test procedure for the remaining two pump modules.

7. Power the pump off using the tip of a pencil eraser to test the ***ON/OFF CHARGE*** key.

Functional Tests

Pump Mechanism Sensor Check

This check should be performed after the pump sensor prisms have been cleaned as outlined in "Cleaning the Pump Assembly Prisms," 6-4, the pump mechanism was replaced, or the prisms were replaced.

1. Power the pump on.
2. Enter the Channel Raw Sensor Data screen from the Configuration/Service and Service Features screen.
3. Press the ***Open*** key to open the pump jaws and observe the Forward and Rear values for Slide Clamps. The value should be less than 45 (8 to 10 is a typical range). The closer the value is to 45, the greater the chance of failure in the near future.

If the value is within the acceptable range, the procedure is complete. If a failure code is displayed, do either of the following:

- If this check was performed after cleaning the prisms, the prisms may still be wet. Allow the pump to dry completely and perform this check again.
- See Table 7-7 on page 7-44 for the failure code displayed.

Tube Misload Sensor Test

1. Double a tubing segment and feed both ends through a keyed On/Off clamp as shown in Figure 10-3.
2. Power the pump on. Press the ***Open*** key on the pump module under test.

3. Deliberately load the doubled tubing as shown in Figure 10-3. Be sure to insert the keyed On/Off clamp into the slot.

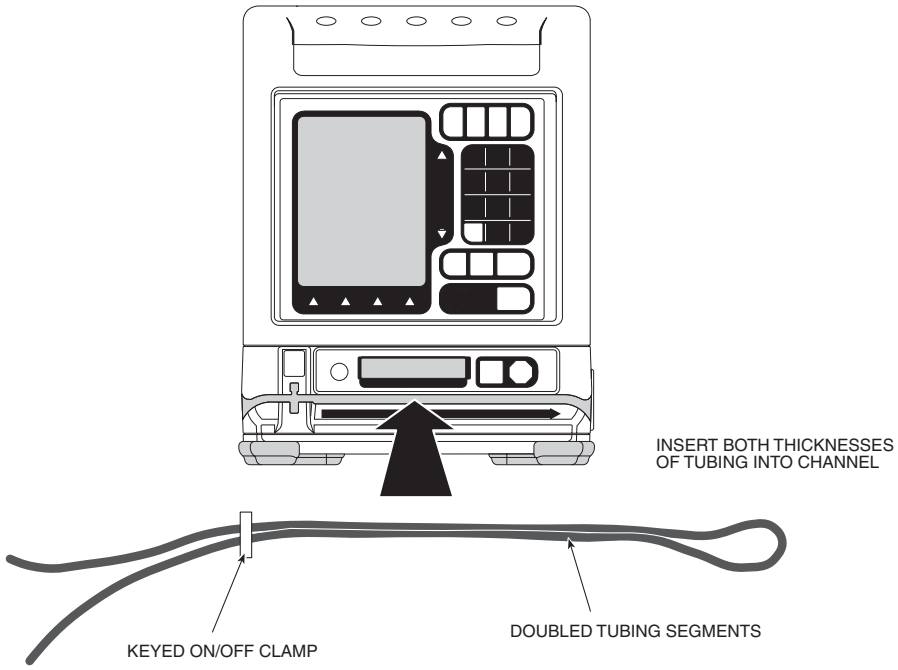


Figure 10-3 Misloading the Tubing

4. Verify that a Tube Misloaded alarm occurs.

5. Unload the doubled tubing. (The Tube Misloaded alarm will still be active.)

6. Using a standard administration set with keyed On/Off clamp, open the On/Off clamp and load the administration set into the pump module under test.

7. Allow the pump mechanism to complete the loading sequence. Verify that no alarms sound and that the pump module under test displays STOPPED after the tube loading sequence has completed.

Note: A Channel Stopped alert may occur if too much time elapses before step 8 is performed. This alert does not affect the test.

8. Press the ***Open*** key on the pump module again to allow the automatic tube loading mechanism to fully open.

9. Remove the administration set from the tubing channel. Verify that no alarms occur, and that the keyed On/Off clamp is closed when the administration set is removed from the pump module under test.

10. **Colleague 3 Pumps only:** Repeat the test procedure for the remaining two pump modules.

Battery Discharge Test

This procedure is optional. Perform this test only if you need to verify battery performance.

Note: Charge the batteries for at least 12 hours before this test.

1. Unplug the pump and load a primed administration set into the pump.

Note: If you are testing a Colleague 3 pump, set all three pump modules to the rate and VTBI shown in step 2.

2. Set the rate to 100 mL/hr and the VTBI to 300 mL, then press the ***START*** key.
3. Verify that within a 2.5 hour period (2 hour period for Colleague 3), the pump does not experience a Battery Depleted alarm.
4. If the pump fails this test, replace the battery(ies).
5. Plug the pump into AC power to recharge the battery(ies).

Upstream Occlusion Test

1. Power the pump on and load an unused segment of fully primed tubing into the pump.
2. Program the pump for a rate of 100 mL/hr and a VTBI of 20 mL.
3. Occlude the tubing approximately 25 cm (10 in.) upstream from the pump.
4. Press the ***START*** key and start the stopwatch.
5. Stop the stopwatch when the Upstream Occlusion alarm occurs and the pump stops. Verify that the alarm occurred within 30 seconds of the initiation of the occlusion.
6. **Colleague 3 Pumps only:** Repeat the test procedure for the remaining two pump modules.

Volume Delivery Accuracy Test

Note: Use the pump's Functional Test mode when performing this procedure. The Functional Test mode causes the pump to stop as soon as the programmed volume has been delivered, without entering KVO mode.

Note: "Volume Delivery Accuracy Test" on page 3-5 offers an alternate method of performing this test using the pump's normal operating mode.

Note: You can also use an ASTM Type TC graduated cylinder, 0.2 mL resolution, to collect and measure the pumped solution, eliminating the need to weigh the container.

Note: The performance of commercially available automated rate testing equipment has not been evaluated by Baxter for use on Colleague pumps.

! WARNING ! **NEVER USE THE PUMP'S FUNCTIONAL TEST MODE ON PATIENTS.**

Accuracy Test

1. **Skip this step if using a graduated cylinder.** Obtain a container of at least 30 mL capacity. Weigh the empty container and record the weight.
2. Load an unused segment of tubing from an administration set fully primed with distilled water into the pump module under test.
3. Place the distal end of the tubing into the collection container or cylinder.
4. Program a primary rate of **100 mL/hr** and a volume of **20 mL**.
5. Press the ***START*** key. Verify that solution is delivered into the collection container without interruption. The pump stops when it has delivered 20 mL.
6. **Skip this step if using a graduated cylinder.** Weigh the container and record the weight. Determine the volume delivered by subtracting the weight of the container from the total weight of the solution and the container. The fluid weight of distilled water in grams is equal to the volume pumped in mL.
7. If the amount of fluid delivered measures within 19.0 and 21.0 grams (19.0 and 21.0 mL), the pump has passed the test. Record the net (fluid) weight obtained.
8. **Colleague 3 Pumps only:** Repeat the test procedure for the remaining two pump modules.

If the pump module passes the accuracy test, perform the "Downstream Occlusion Pressure Test," 10-18. If the pump module fails the accuracy test, perform the "Test Method Evaluation Procedure," 10-17.

Test Method Evaluation Procedure

Perform this procedure only if the pump failed the accuracy test.

1. Repeat the accuracy test five additional times.
2. For each successful attempt, record "Pass" and the volumes collected on the data sheet. Continue with the remainder of the operational checkout if the pump passes all five retests.

   If the pump fails any of the attempts, record the volume collected during the failed attempt, check **Fail** in the appropriate space on the data sheet, write

N/A for the remainder of the tests, and discontinue testing. Troubleshoot as described in Chapter 7, Troubleshooting. Contact your local Service Center for assistance.

Downstream Occlusion Pressure Test

Setup

To obtain accurate readings, you must keep the entire downstream tubing setup horizontal so that it is not above the tubing channel you are testing or below the bottom of the pump.

Note: Use a pressure gauge with resolution of 0.01 psi or 0.5 mmHg (minimum full scale of 20 psi or 750 mmHg).

1. Set up the pump and test equipment as shown in Figure 10-4. The overflow tubing is shown for clarity and does not have to be vertical. The three-way valve should be approximately 30 cm (12 in.) from the pressure gauge, and at least 1 m (39 in.) from the end of the overflow tubing.

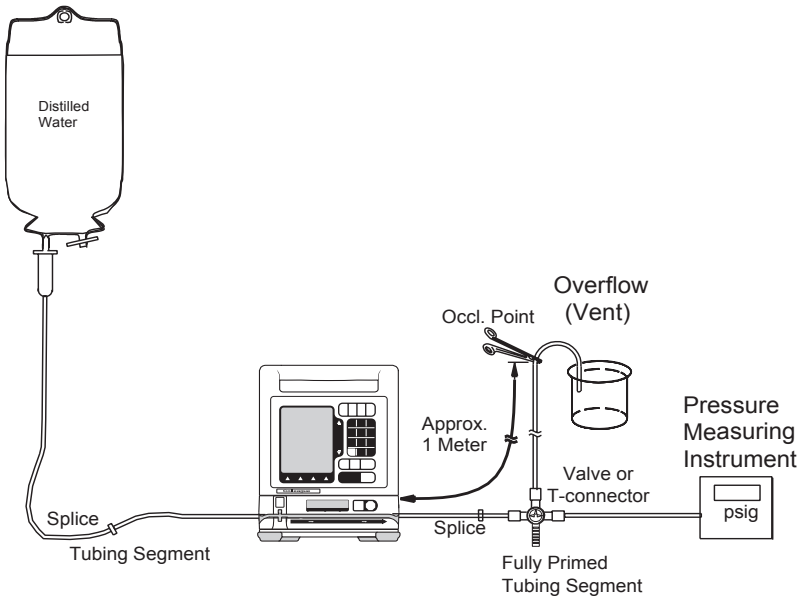


Figure 10-4 Pressure Test Setup

Note: The following test sequence allows you to use one tubing segment for four pressure measurements on a single pump module. Use a new tubing segment for each pump module you test.

2. Fully prime the administration set, including the overflow tubing and the tubing segment leading to the pressure gauge. Remove as many air bubbles as possible.

3. Press the ***Open*** key and load the tubing into the pump module under test so that the three-way valve is approximately 20 cm (8 in.) from the pump.

4. When the pump module displays STOPPED, start a stopwatch and wait for three minutes for the tubing to stabilize.

Note: Do not power off the pump during these four tests because the occlusion setting will revert to the Moderate setting when the pump is powered on. Complete all four tests before removing the administration set. If you remove the administration set before the pressure tests are completed, you must start the pressure testing over from the beginning.

Note: All Colleague 3 pumps, and Colleague pumps with 4.XX and higher software have Functional Test mode, which causes the pump to stop as soon as the programmed volume has been delivered without entering KVO mode. Functional Test mode makes this test easier to perform, but its use is not mandatory. If your pump has Functional Test mode, use it when performing this procedure.

If your Colleague pump does not have Functional Test Mode, program the pump normally when performing this test.

5. (Optional) Access the pump's Functional Test mode:

   5.1 Enter the Configuration/Service Features menu.

   5.2 Highlight Service Features, and press the **Select** soft key.

   5.3 Highlight Functional Test, and press the **Select** soft key. The Functional Test screen is displayed.

6. **(Colleague 3 only)** If you have not already done so, select the pump module to test by pressing its ***Channel Select*** key.

7. Program the pump for a primary rate of **100 mL/hr** and a volume of **20 mL**. Use the Functional Test screen if your pump has Functional Test mode.

! WARNING ! **NEVER USE THE FUNCTIONAL TEST MODE ON PATIENTS.**

Testing at 2 psi (Minimum) Pressure

8. Press the **Options** soft key. Select Downstream Occlusion Values, then Minimum, and press the **Done** soft key.

9. Program the pump module to deliver at least **10 mL at 20 mL/hr.**

10. Press the ***START*** key and allow the pump to run for a few seconds.

11. Occlude the overflow tubing approximately 1 m (39 in.) downstream from the pump module you are testing.

12. When the occlusion alarm occurs, wait approximately two seconds. Record the pressure reading from the gauge.
    The value must be **between 0.29 and 4.79** psi at room temperature.

13. Remove the occlusion. If necessary, press the ***STOP*** key to stop the pump.

Testing at 4 psi (Minimum) Pressure

14. Program the pump module to deliver **10 mL at 100 mL/hr.**

15. Press the ***START*** key and allow the pump to run for a few seconds.

16. Occlude the overflow tubing approximately 1 m (39 in.) downstream of the pump module you are testing.

17. When the occlusion alarm occurs, wait approximately two seconds. Record the pressure reading from the gauge.
The value must be **between 1.52 and 7.83 psi** at room temperature.

18. Remove the occlusion. If necessary, press the ***STOP*** key to stop the pump.

Testing at 8 psi (Moderate) Pressure

19. Press the ***MAIN DISPLAY*** key. Press the **Options** soft key. Select Downstream Occlusion Values, then Moderate, and press the **Done** soft key.

20. Program the pump module to deliver at least **10 mL at 100 mL/hr**.

21. Press the ***START*** key and allow the pump to run for a few seconds.

22. Occlude the overflow tubing approximately 1 m (39 in.) downstream of the pump module you are testing.

23. When the occlusion alarm occurs, wait approximately two seconds. Record the pressure reading from the gauge.
The value must be **between 4.24 and 12.83 psi** at room temperature.

24. Remove the occlusion. If necessary, press the ***STOP*** key to stop the pump.

Testing at 12 psi (Maximum) Pressure

25. Press the ***MAIN DISPLAY*** key. Select **Options**, Downstream Occlusion Values, and Maximum, then press the **Done** soft key.

26. Program the pump module to deliver **10 mL at 100 mL/hr**.

27. Press the ***START*** key and allow the pump to run for a few seconds.

28. Occlude the overflow tubing approximately 1 m (39 in.) downstream from the pump module you are testing.

29. When the occlusion alarm occurs, wait approximately two seconds. Record the pressure reading from the gauge.
The value must be **between 6.96 and 17.84 psi** at room temperature.

30. Remove the occlusion. If necessary, press the ***STOP*** key to stop the pump.

31. Repeat the entire procedure for the remaining two pump modules.

Short Downstream Occlusion Pressure Test

This procedure is optional and should be performed if you suspect a failure or if you replaced the Front Bezel Assembly, the pump module, accessory connector, or pump software.

1. Power on the pump and load an unused segment of fully primed tubing.
2. Program the pump for a rate of **100 mL/hr** and a VTBI of **20 mL**.
3. Start the pump and allow it to pump fluid into a collection container.
4. Occlude the tubing at least 25 cm (10 in.) downstream of the pump module you are testing. Verify that a downstream occlusion alarm occurs and that the pump module stops.
5. **Colleague 3 Pumps only:** Repeat the test procedure for the remaining two pump modules.

Manual Tube Release Test

Note: For Colleague 3 Pumps, perform this procedure on each pump module, one at a time.

Note: Move the keyed On/Off clamp approximately 2.54 cm (1 in.) upstream on the tubing segment for every pump module you test. Do not use the same clamp for more than 30 insertions. Change the tubing segment when no unused portion remains.

1. Load a fully primed administration set. Power the pump off.
2. Pull out the tab on the manual tube release until it is perpendicular to the pump. Turn the tab counterclockwise until the tubing channel is fully open.
3. Remove the administration set. Verify that the keyed On/Off clamp is closed and that the Reset Manual Tube Release pop-up is displayed. This indicates that the manual tube release was activated.
4. Verify that you cannot power the pump off without resetting the Manual Tube Release.
5. Reset the manual tube release by turning the tab fully clockwise and then pushing it back into its socket.
6. Press the **Done** soft key to clear the alarm. All 8 digits of the pump module fully illuminate and the pump turns off.
7. **Colleague 3 Pumps only:** Repeat the test procedure for the remaining two pump modules.

Electrical Safety Tests

Ground Impedance

The ground impedance must **not exceed 0.5** Ω using the NFPA-99 test method. Measure the impedance between the AC plug ground and the screw holes on the **COMM. PORT** block located on the rear of the pump. Ensure that the test leads make good contact.

Leakage Current

The leakage current must **not exceed 100 µA with ground intact** and **300 µA with ground open**. Using the NFPA-99 test method, measure leakage current with ground intact and ground open.

Chapter 11

Illustrated Parts Breakdown

Overview

This chapter identifies all replaceable parts for the Colleague and Colleague 3 Pumps. It contains figures and parts tables that provide information on parts or subassemblies available to repair the pump. Note that not all parts used in the pump are available as individual replacement parts.

The figures show exploded views of major assemblies. Numbered callouts identify the specific part or assembly. The numbered callouts correspond to items in the table adjacent to the figure.

Some callouts identify multiple parts using a single item number. These callouts fall into two categories:

- **Parts**: Identical parts identified by a single item number for convenience. These parts are supplied individually.
- **Subassemblies**: Multiple parts identified by a single item number available only as a subassembly. Subassemblies are supplied pre-assembled. The individual parts are not available separately.

Table 11-1 provides a cross-reference between the major pump assemblies and the drawings included in this chapter. Note that the front bezel and the pump module drawings are common to both pumps.

Table 11-1 Guide to Foldout Parts List Diagrams

To find the illustration and parts list of...	For Colleague Pumps, see....	For Colleague 3 Pumps, see....
Top-level pump assembly	Figure 11-1	Figure 11-8
User Interface Module Assembly	Figure 11-2	Figure 11-9
Front Bezel Assembly	Figure 11-3	Figure 11-3
Center Housing Assembly	Figure 11-4	Figure 11-10
Rear Housing Assembly	Figure 11-5	Figure 11-11
Pump Module Assembly	Figure 11-7	Figure 11-7
Shuttle Motor Assembly Details	Figure 11-13	Figure 11-13
Exterior Labels	Figure 11-6	Figure 11-6

Accessories and Options

Note: For Baxter label copy only, the “X” in the part number is replaced with the most current version identifier at the time of order.

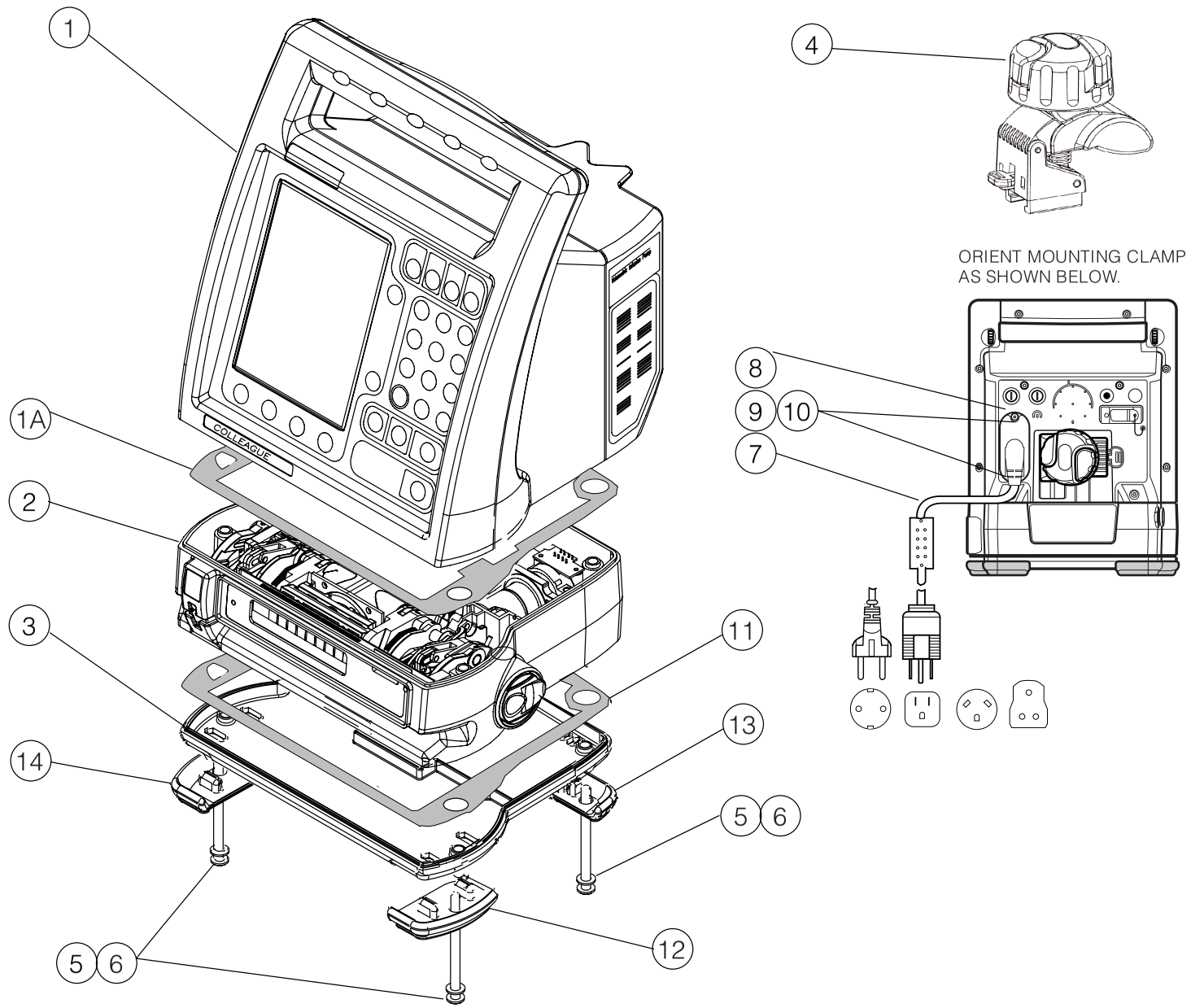
Table 11-2 Accessories and Options

Part Number	Description	Quantity
1401B	Adhesive, thread-locking, Three Bond	200 g
LP411	Adhesive, LOCTITE PRISM 411	1 tube
LP414	Adhesive, LOCTITE PRISM 414	1 oz
40000260	Adhesive Remover, Whisk	1 box
3004035003	Bag, Polyethylene	1
PPD-01-202	Baxter Precision Tubing segments	1
0705X2709 (C1) 0705X2710 (C3)	Box, Carton	1
2M8155	Configuration Transfer Cable	1
F069090001	Cord Wrap	1
2M8317	Event History Download Software Application	1
8219801	Extractor, Software, 32 pin	1
8219811	Extractor, Software, 44 pin	1
8221541	Extractor, Software, Universal	1
STMMD11BAX	Flare Nut Socket, 11 mm, Special	1
3009031101	Grease, Dow Corning EM-30L	1
F069720002 (C1) F069720005 (C3)	Insert, Bottom	1
F069720001 (C1) F069720004 (C3)	Insert, Top	1
030801011	Keyed On/Off Clamp	1
CW-606-B	Lubricant, Lubriko	1 can, 16 oz.
LPP770	Primer, LOCTITE PRISM 770	2 oz
10-9002	Red Glpt, Potentiometer Varnish	1

Table 11-2 Accessories and Options — continued

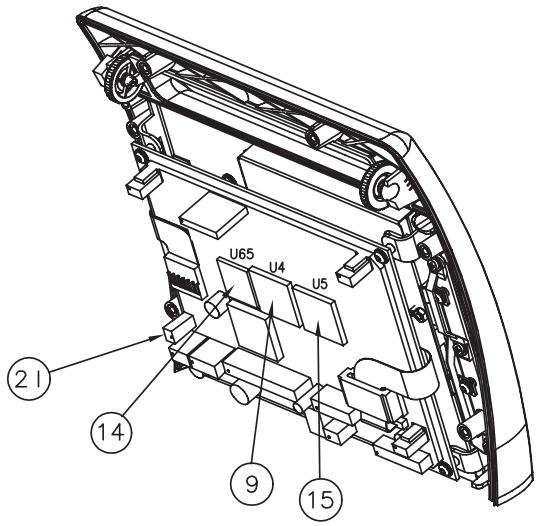
Part Number	Description	Quantity
722009310	Silicone Adhesive/Sealant, Dow Corning 732	90 mL tube
RTV744	Silicone Adhesive/Sealant	90 mL tube
TWTX 740B	Swabs, foam-tipped, TEXWIPE	1 pkg of 500
2D0300	Syringe Adapter	1
3M44	Tape	1 roll
DAK-DADE	Tool Kit, Colleague Pump	1
8554A26	Torque Screwdriver 0.87 in-lb	1

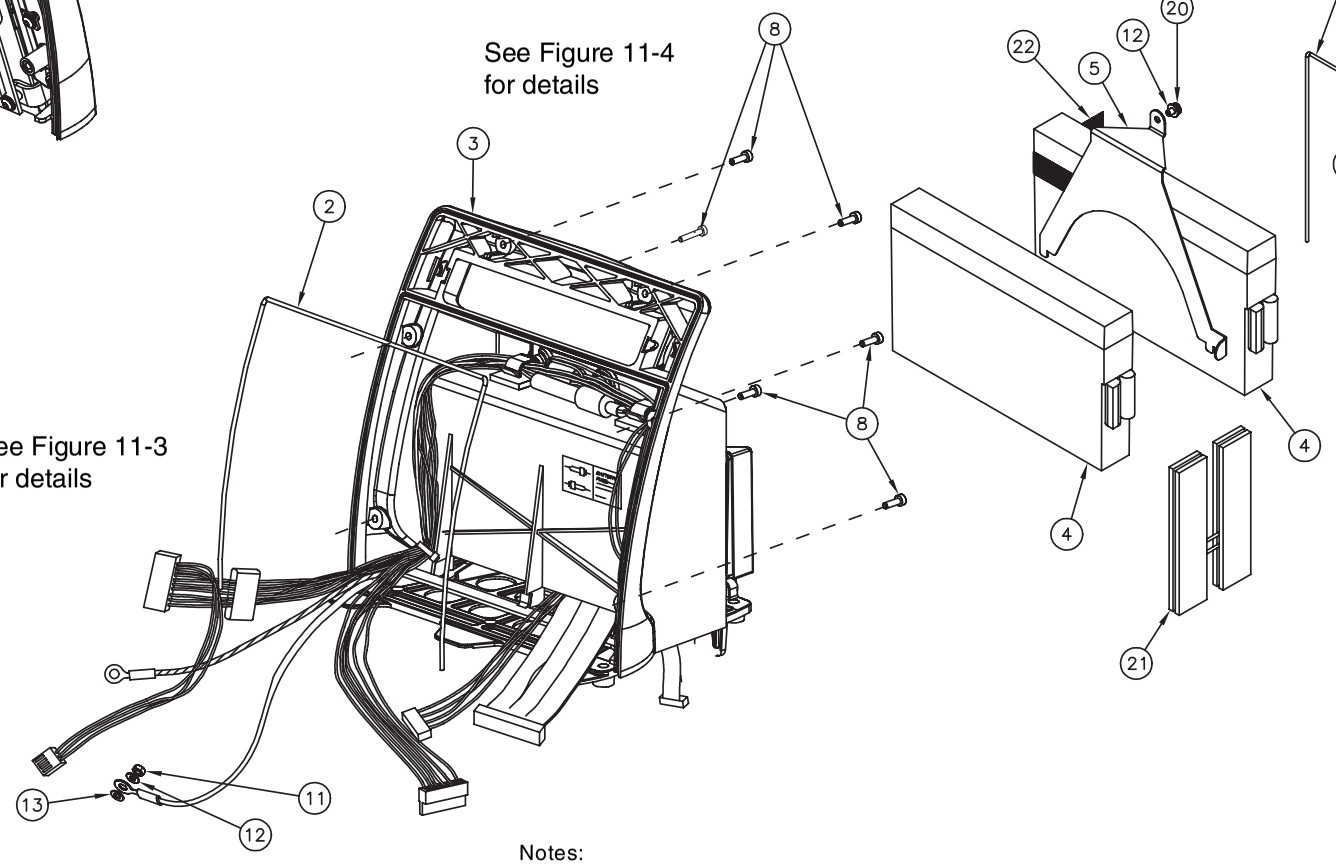
Colleague Pump Assembly Drawings

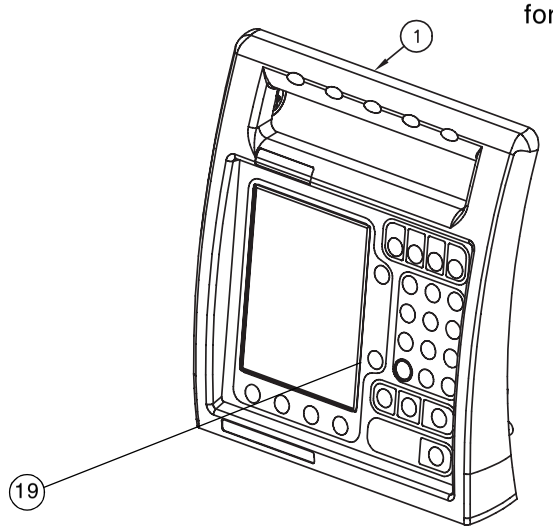


Item	Part No.	Description	Quantity
1	See Figure 11-2	User Interface Module	1
1A	F069630001	Gasket	1
2	See Figure 11-7	Pump Module	1
3	F069120518	Bottom Cover	1
4	F069120521	Clamp	1
5	4009310122	Screw, Pump Module Securing	4
6	4292015001	Washer, M5	4
7	5009415146	Power Cord, Left Angle	1
8	F069610001	Power Cord Retainer	1
9	4192014110	Screw, M3x8, Socket, Button Head	2
10	4292011001	Washer, CH M3	2
11	F069630502	Gasket	1
12	F069690001	Foot, Left Front	1
13	F069690002	Foot, Left Rear	1
14	F069690003	Foot, Right Front	1
15	F069690004	Foot, Right Rear (not shown)	1

Figure 11-1 Colleague Pump Assembly







Notes:
1. Item 17 comes in a pair, to be pasted separately on rear case and sub-plate at location indicated.
2. Contact Baxter product service for software part numbers appropriate for each product code.
3. Part no. F069180568 is assy, bezel with isocom.
   Part no. F069180200 is assy, bezel without isocom.
4. For Colleague pumps with a serial number prior to 13110181CC the battery harness installed may be part number F069140020. This harness does not include the protection circuitry and should be replaced with the battery harness with the protection circuit listed in the table (item 21).

	ITEM	PART NO.	DESCRIPTION	QTY	UOM
SEE NOTE 4	21	F069180620	Battery Harness with Protection Circuit	1	EA
	20	4009310127	SCREW, M3 X 10 BUT SOC YE	1	EA
	23	NOT SHOWN	INSULATION TAPE	80	MM
	22	F069140020	BATTERY HARNESS ASSY	1	EA
	19	SEE LABEL LIST	LABEL, COLLEAGUE LOGO	1	EA
	18	SEE LABEL LIST	LABEL, SERIAL NUMBER OVERLAY	1	EA
SEE NOTE 1	17	SEE LABEL LIST	LABEL, SERIAL NUMBER	1	EA
	16	SEE LABEL LIST	LABEL, SIGNATURE/RATINGS	1	EA
	15	SEE NOTE 2	EPROM, UIM MASTER U5	1	EA
	14	SEE NOTE 2	EPROM, UIM SLAVE U65	1	EA
	13	4009330110	WASHER, M3 INTERNAL TOOTH	2	EA
	12	4292006003	WASHER, M3X0.5X7 YE	3	EA
	11	4392004000	NUT, M3 YELLOW	1	EA
	10	4192033110	SCREW, M3X6 PAN PH YE	1	EA
	9	SEE NOTE 2	EPROM, UIM MASTER U4	1	EA
	8	4009310113	SCREW, M3X10 CAP SOC YE	10	EA
	7	F069180569	ASSY, REAR CASE	1	EA
	6	F069630003	GASKET, REAR/MAIN	1	EA
	5	F069610002	BATTERY BRACKET	1	EA
	4	5009480001	BATTERY, YUASA NP2–12	2	EA
	3	F069120525	ASSY, MAIN HOUSING	1	EA
	2	F069630002	GASKET, BEZEL/MAIN	1	EA
SEE NOTE 3	1	F069180200	ASSY, BEZEL	1	EA
SEE NOTE 3	1	F069180568	ASSY, BEZEL	1	EA

Figure 11-2 Colleague Pump User Interface Module Assembly

NOTE 1. ASSY BEZEL W/ KEYPAD AND PLATE PART NUMBERS FOR VARIOUS LANGUAGE VERSIONS ARE LISTED BELOW.

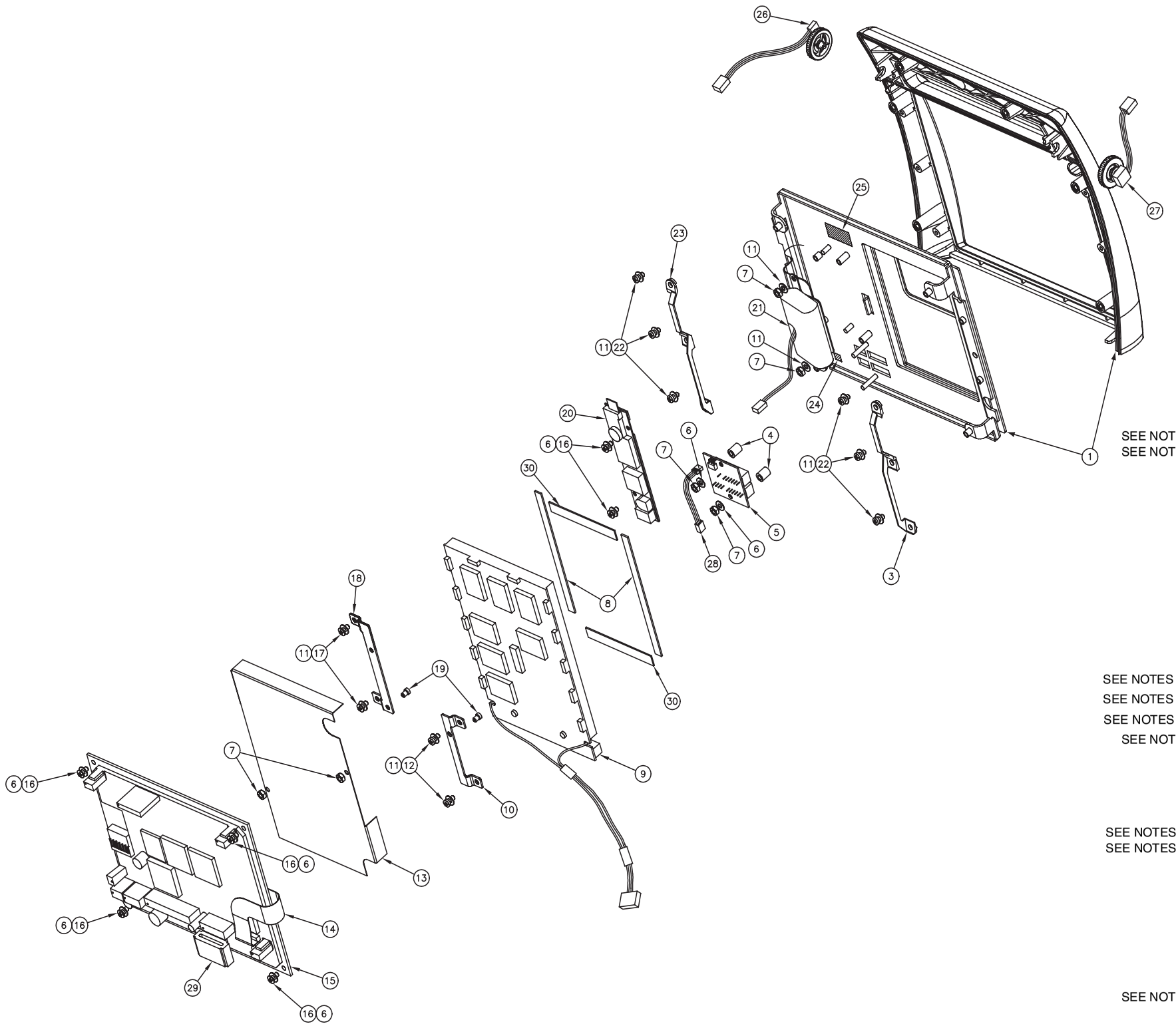
PUMP LANGUAGE VERSION	BEZEL PART NO.
2M815X (U.S. English)	F069120012S
2M815XK (U.K. English)	F069120012S
BRM815X (Brazilian Portuguese)	F069120534S
CNM815X (Swedish)	F069120538S
DNM815X (French)	F069120539S
GNM815X (Danish)	F069120537S
HNM815X (German)	F079120001S
PNM815X (Spanish)	F069120540S
TRM815X (Turkish)	F069120535S
WNM815X (Dutch)	F069120536S

NOTE 2. PART NO.s F069130517 AND F069120524, PCBA, USER INTERFACE, ARE FOR PUMPS WITH ISOCOM.
PART NO. F069130511 IS FOR PUMPS WITHOUT ISOCOM.

NOTE 3. ITEM 9 F069550203 SUPERSEDES F069550201. WHEN USING F069550201 ITEM 27 F069180202 MUST BE USED.
WHEN USING F069550203 ITEM 27 F069140030 MUST BE USED.

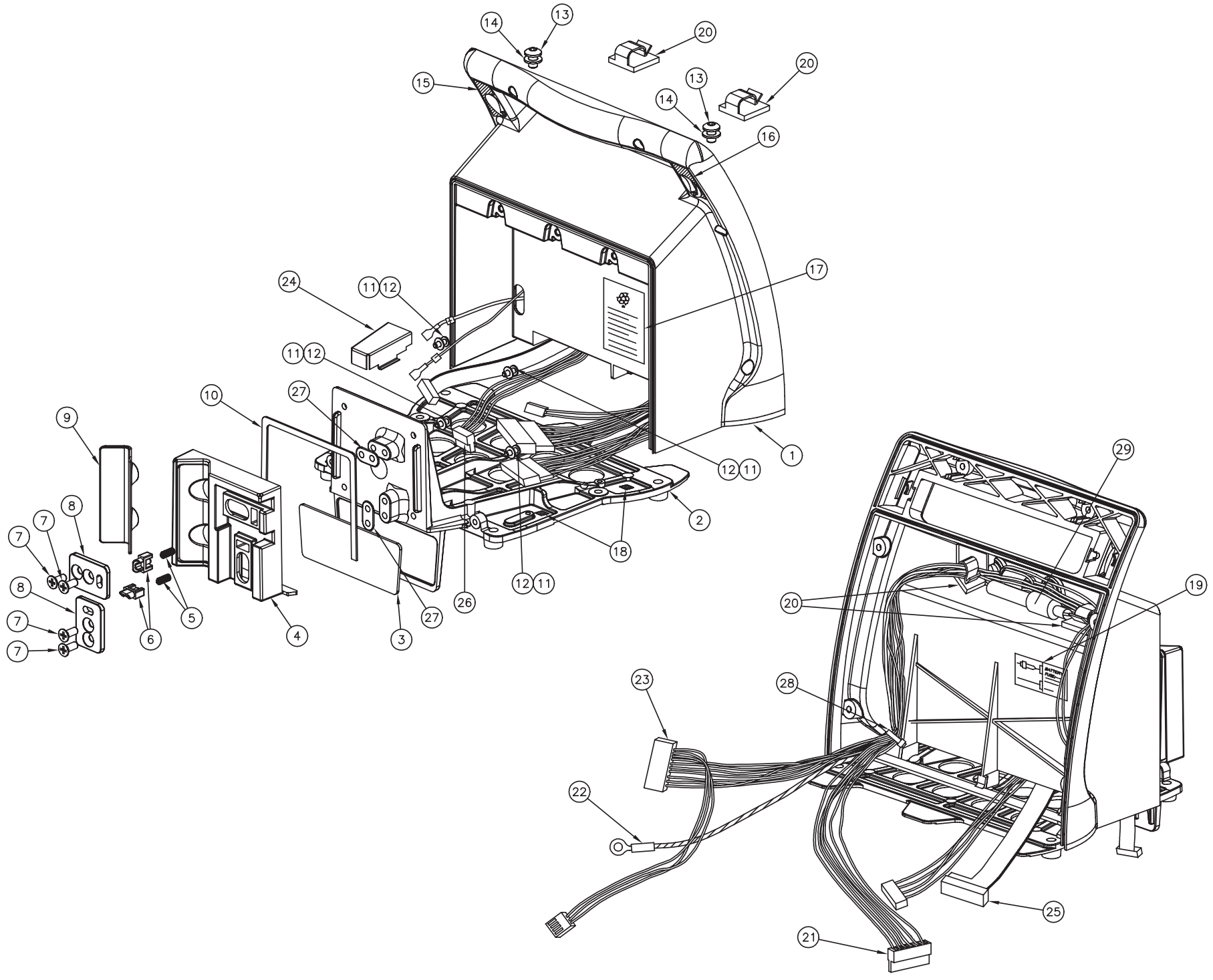
NOTE 4. ITEM 14 IS NOT USED WHERE ITEM 9 IS PART NO. F069550203. (FLEX CABLE IS INTEGRAL ON PART NO. F069550203.)

NOTE 5. UIM PCBA PART NO. F069130511 CAN SUPPORT DISPLAY PART NO. F069550201 ONLY.
UIM PCBA PART NO.s F069130517 AND F069120524 SUPPORT DISPLAYS PART NO.s F069550203 AND F069550201.



	ITEM	PART NO.	DESCRIPTION	QTY	UOM
	30	F069010003	FOAM TAPE, 82mm	2	EA
	29	5009430110	FERRITE CORE, RECTANGULAR TYPE	1	EA
	28	F069140007	HARNESS, LED	1	EA
SEE NOTE 3	27	F069140030	ASSY, CONTRAST POT	1	EA
SEE NOTE 3	27	F069180202	ASSY, CONTRAST POT	1	EA
	26	F069180201	ASSY, VOLUME POT	1	EA
	25	SEE LABEL LIST	LABEL, LITHIUM BATTERY	1	EA
	24	SEE LABEL LIST	LABEL, EARTH GROUND	1	EA
	23	F069610004	BEVEL, SHIM LEFT	1	EA
	22	4192018114	SCREW, M3x10 PAN PH YE B	6	EA
	21	F069110001	ASSY, BACK-UP BATTERY	1	EA
	20	6009590108	CCFT INVERTER ERG 8M131797	1	EA
	19	4192031110	SCREW, M3x4 PAN PH YE	2	EA
	18	F069222001	LARGE CLIP	1	EA
	17	4192035110	SCREW, M3x10 PAN PH YE	2	EA
	16	4009310114	SCREW, M3x6 BIND PH YE	6	EA
SEE NOTES 2,5	15	F069130511	PCBA, USER INTERFACE	1	EA
SEE NOTES 2,5	15	F069130517	PCBA, USER INTERFACE	1	EA
SEE NOTES 2,5	15	F069130524	PCBA, USER INTERFACE	1	EA
SEE NOTE 4	14	F069415002	FPC, UI DISPLAY 14W	1	EA
	13	F069222006	EMI SHIELD	1	EA
	12	4192033110	SCREW, M3x6 PAN PH YE	2	EA
	11	4292006003	WASHER, M3.2x0.5x7 YE	12	EA
	10	F069222002	SMALL CLIP	1	EA
SEE NOTES 3,5	9	F069550203	ASSY,DISPLAY,UIM	1	EA
SEE NOTES 3,5	9	F069550201	LCD, QTR VGA 320x240	1	EA
	8	F069010001	FOAM TAPE, 118mm	2	EA
	7	4392004000	NUT, M3 YELLOW	6	EA
	6	4009330107	WASHER, 3.2x0.5x7 PLASTIC	8	EA
	5	F069130201	PCBA, LED	1	EA
	4	F069340001	SPACER, 3.2x7.5x6 PLASTIC	2	EA
	3	F069610005	BEVEL SHIM RIGHT	1	EA
	2	NOT USED			
SEE NOTE 1	1	SEE NOTE 1	ASSY BEZEL W/ KEYPAD AND PLATE	1	EA

Figure 11-3 Front Bezel Assembly, All Pumps



ITEM	PART NO.	DESCRIPTION	QTY	UOM
29	5009425110	FUSE, 4A, 250V (F103)	1	EA
28	5009499106	CABLE TIE	1	EA
27	F069690006	CLAMP–VB–SPACER	2	EA
26	F069140202	HARNESS, UI/PH POWER	1	EA
25	F069140201	HARNESS, UI/PH SIGNAL	1	EA
24	F069222007	SUB–PLATE SHIELD	1	EA
23	F069140005	HARNESS, REAR/INVERTER	1	EA
22	F069140006	HARNESS, UI MEMBRANE/SP	1	EA
21	F069140028	HARNESS, DC CABLE	1	EA
20	3009035104	CABLE FASTENER	2	EA
19	SEE LABEL LIST	LABEL, INTERNAL FUSES	1	EA
SEE NOTE 1 * 18	SEE LABEL LIST	LABEL, EARTH GROUND	2	EA
17	SEE LABEL LIST	LABEL, BATTERY DISPOSE/REPLACE	1	EA
16	SEE LABEL LIST	LABEL, CONTRAST CONTROL	1	EA
15	SEE LABEL LIST	LABEL, VOLUME CONTROL	1	EA
14	4292015001	WASHER, 5.3X1X10 YE	2	EA
13	4192066110	SCREW, M5X8 PAN PH YE	2	EA
12	4192034110	SCREW, M3X8 PAN PH YE	4	EA
11	4292006003	WASHER, 3.2X0.5X7 YE	4	EA
10	F069630005	GASKET, REAR	1	EA
9	F069620002	POLE CLAMP PAD	1	EA
8	F069222003	CLAMP VB PLATE	2	EA
7	4009310117	SCREW, M4X10 CSK PH S.S.	4	EA
6	F069620020	CLAMP VB TAB	2	EA
5	F069222004	CLAMP VB SPRING	2	EA
4	F069620014	CLAMP–V–BLOCK	1	EA
3	F069690005	HEAD BOARD PAD	1	EA
2	F069212501	SUB–PLATE	1	EA
1	F069620501	MAIN HOUSING	1	EA

NOTES :

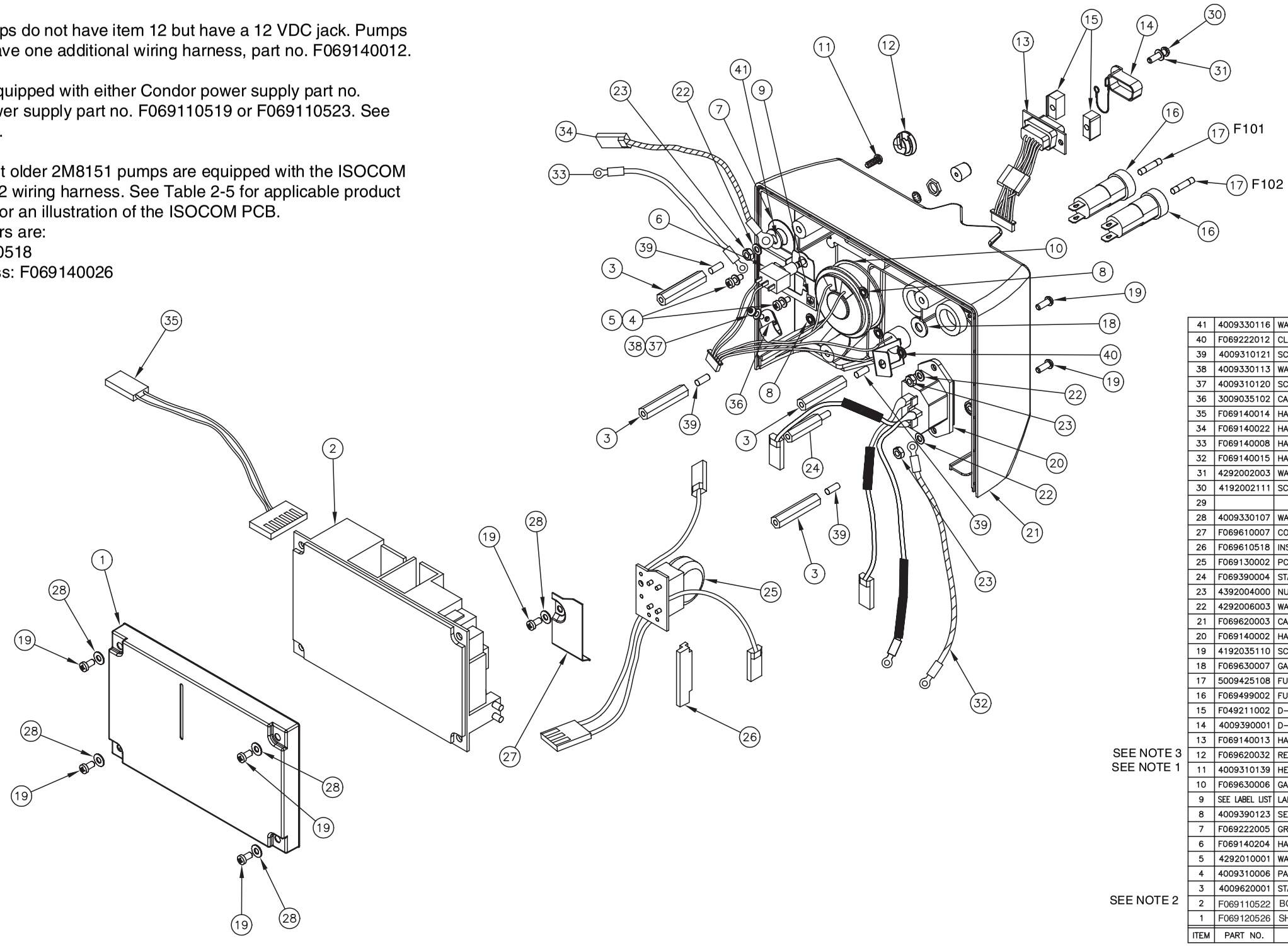
1. THE LABEL, BONDING GROUND 0726A1714 IS NOT NEEDED IF THE SUB–PLATE F069212501 IS PRECASTED WITH THE ⏚ LOGO.

Figure 11-4 Colleague Pump Center Housing Subassembly

NOTE 1: Some older pumps do not have item 12 but have a 12 VDC jack. Pumps with 12 VDC jacks also have one additional wiring harness, part no. F069140012.

NOTE 2: Pump may be equipped with either Condor power supply part no. F069110522 or Astec power supply part no. F069110519 or F069110523. See page 8-40 for applicability.

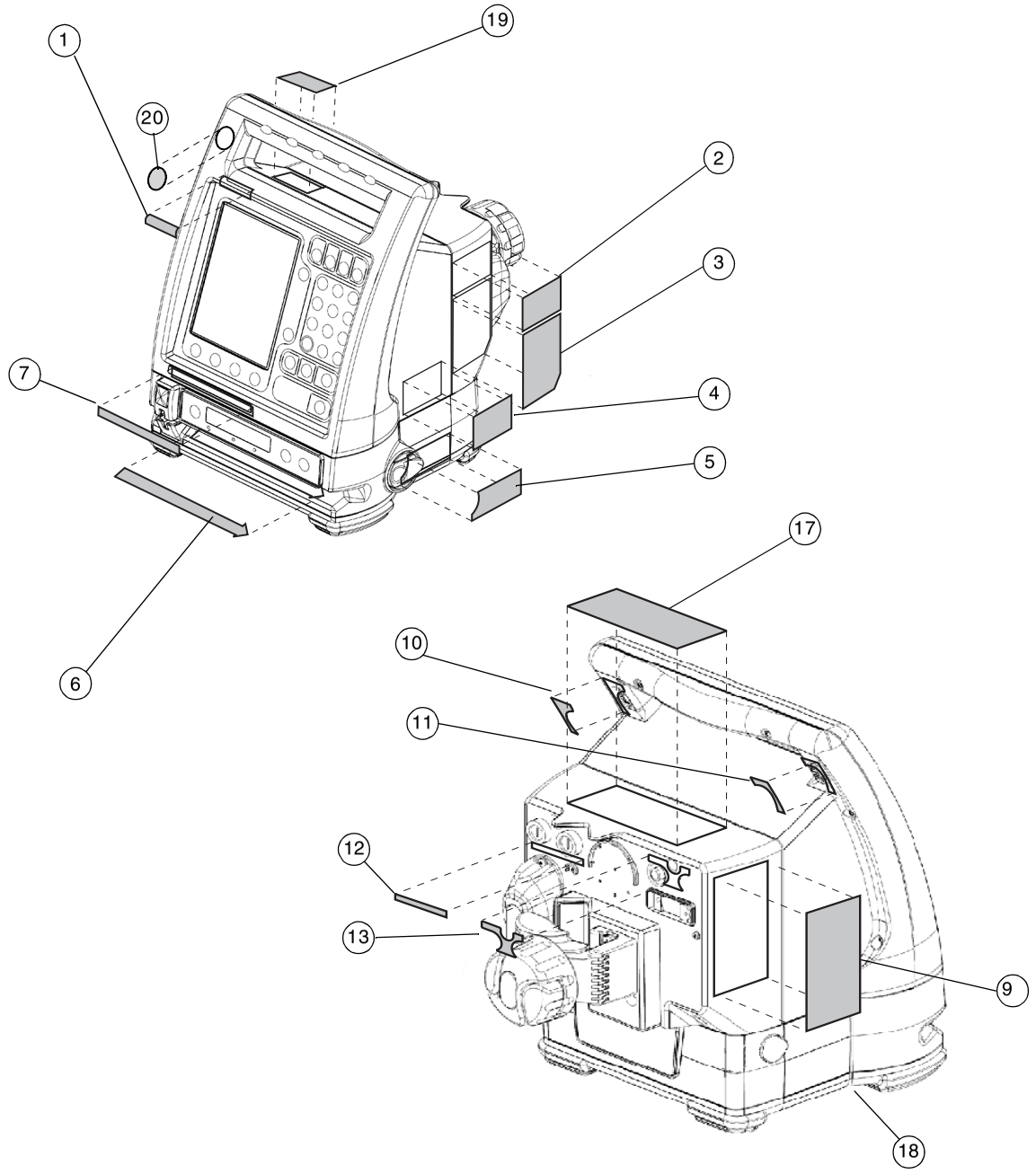
NOTE 3: All pumps except older 2M8151 pumps are equipped with the ISOCOM PCB in place of the RS232 wiring harness. See Table 2-5 for applicable product codes and Figure 11-12 for an illustration of the ISOCOM PCB.
The ISOCOM part numbers are:
ISOCOM PCB: F069130518
ISOCOM RS232 harness: F069140026



	ITEM	PART NO.	DESCRIPTION	QTY	UOM
	41	4009330116	WASHER, FLAT 3.2x12x1	1	EA
	40	F069222012	CLIP, BUZZER	1	EA
	39	4009310121	SCREW, M3 X 20 SOC FLAT	4	EA
	38	4009330113	WASHER, 3.8 X 9.3 X 0.8 YE	1	EA
	37	4009310120	SCREW, 3.5 X 8 PAN PH B	1	EA
	36	3009035102	CABLE CLIP, 1/4" X 3/8" X 0.140"	1	EA
	35	F069140014	HARNESS, POWER SUPPLY	1	EA
	34	F069140022	HARNESS, PS/EARTH	1	EA
	33	F069140008	HARNESS, RS232/SP EARTH	1	EA
	32	F069140015	HARNESS, RS232/IEC EARTH	1	EA
	31	4292002003	WASHER, 2.4 X 0.5 X 6.5 YE	1	EA
	30	4192002111	SCREW, 2.2 X 6.5 PAN PH YE B	1	EA
	29				
	28	4009330107	WASHER, 3.2 X 0.5 X 7 PLASTIC	5	EA
	27	F069610007	COVER, CHOKE	1	EA
	26	F069610518	INSULATOR	1	EA
	25	F069130002	PCBA, CHOKE	1	EA
	24	F069390004	STANDOFF, M3 X 20 M/F NYLON	1	EA
	23	4392004000	NUT, M3 YELLOW	2	EA
	22	4292006003	WASHER, 3.2 X 0.5 X 7 YE	2	EA
	21	F069620003	CASE, REAR	1	EA
	20	F069140002	HARNESS, AC	1	EA
	19	4192035110	SCREW, M3 X 10 PAN PH YE	7	EA
	18	F069630007	GASKET, BEEPER	1	EA
	17	5009425108	FUSE, 1.6A 250V SLOBLO	2	EA
	16	F069499002	FUSE HOLDER SCHURTER 3101.0110	2	EA
	15	F049211002	D-SUB NUT D20418-J2F	2	EA
	14	4009390001	D-SUB DUST CAP & STRING	1	EA
	13	F069140013	HARNESS, RS232	1	EA
SEE NOTE 3	12	F069620032	REAR PLUG	1	EA
SEE NOTE 1	11	4009310139	HEX BOLT M3 X 10	1	EA
	10	F069630006	GASKET, SPEAKER	1	EA
	9	SEE LABEL LIST	LABEL, EARTH GROUND	2	EA
	8	4009390123	SELF-LOCKING EXERNAL NUT, 2MM	2	EA
	7	F069222005	GROUND PLATE	1	EA
	6	F069140204	HARNESS, REAR	1	EA
	5	4292010001	WASHER, 2.8 X 0.5 X 5 YE	2	EA
	4	4009310006	PAN HEAD SCREW, M2.6 X 8	2	EA
	3	4009620001	STANDOFF, M3 X 30 F/F NYLON	4	EA
SEE NOTE 2	2	F069110522	BOARD, CONDOR	1	EA
	1	F069120526	SHIELD ASSY,POWER SUPPLY	1	EA

Figure 11-5 Colleague Pump Rear Housing Subassembly

Labeling and Documentation



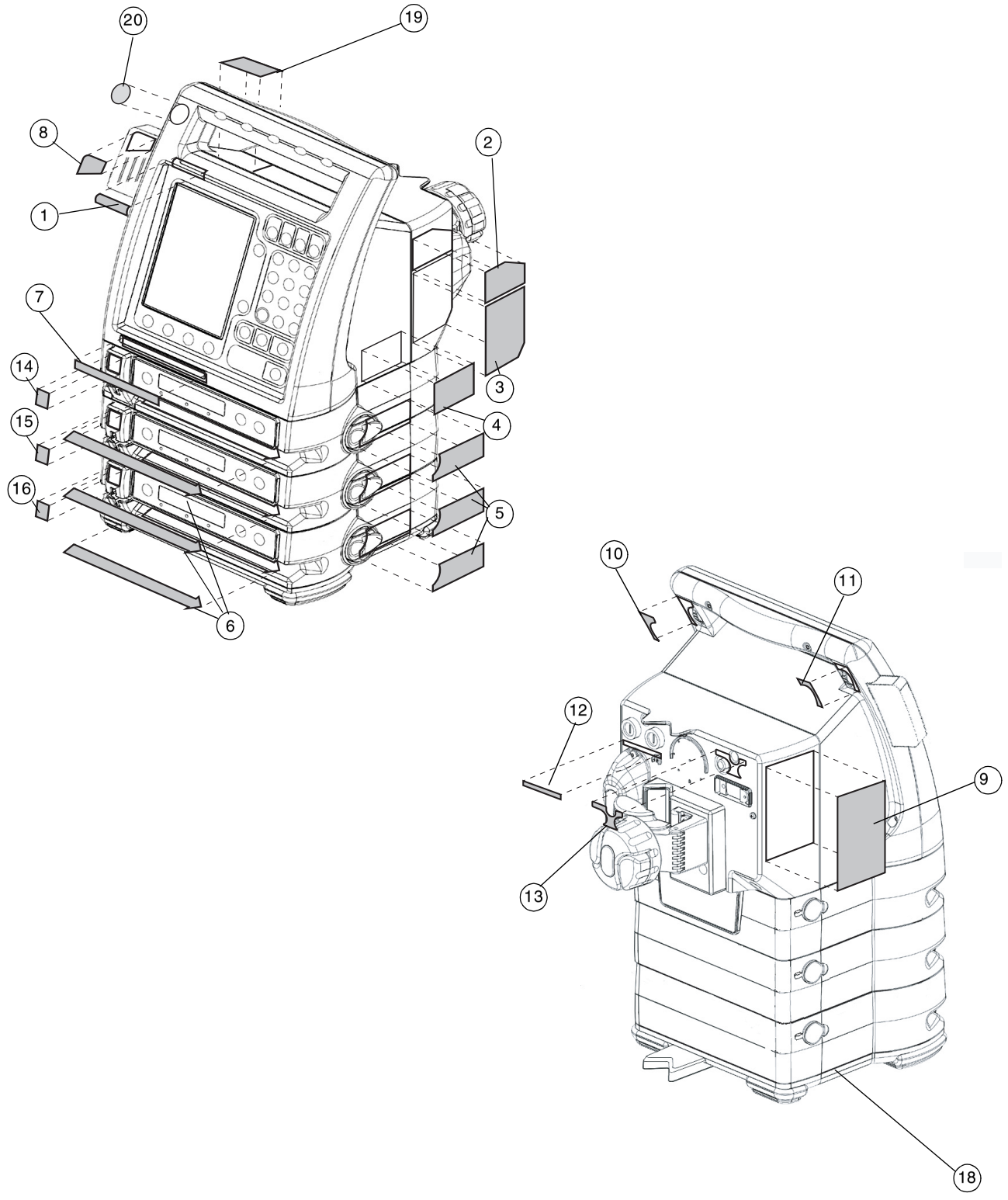


Figure 11-6 Exterior Labeling Locations

Exterior labels are shown in Figure 11-6 and as part of each assembly drawing. Labels available as replacement parts are listed in Table 11-3 (for Colleague pump) and Table 11-4 (for Colleague 3 pump) according to product code. The “X” in the part number is replaced with the most current version identifier at the time of order.

Table 11-3 *Labeling Part Numbers (Colleague Pump)*

Description	Figure, item no.	Quantity	Colleague Pump Product Codes									
			2M8151 (US English)	2M8151K (U.K./CE English)	CNM8151 (Swedish)	DNM8151 (French)	GNM8151 (Danish)	HNM8151 (German)	PNM8151 (Spanish)	WNM8151 (Dutch)	BRM8151 (Brazilian Portuguese)	TRM8151 (Turkish)
External Labels												
Baxter wordmark label	11-6, item 1	1	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519
Signature/Rating Label, 1.0 Ampere	11-6, item 2	1	0726X1903	0719X1903	0726X0893	0726X0105	0726X0894	0726X1919	0726X0097	0726X0895	0726X8202	0726X8201
Signature/Rating Label, 500 mA ***Note:*** For use only with pumps equipped with a single main battery. For dual-battery English Colleague Pumps, use 0726X1903.	11-6, item 2	1	0726X1719	0726X1719	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Serial Number Bar Code, no CE Mark ***Note:*** Not available for reorder by customer. Contact your local authorized service center for assistance.	11-6, item 3	1	0726X1822	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Serial Number Bar Code, CE Mark ***Note:*** Not available for reorder by customer. Contact your local authorized service center for assistance.	11-6, item 3	1	N/A	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905
Attention (Voltage Warning) Label	11-6, item 4	1	0726X1516	0726X1516	0726X0899	0726X0106	0726X0900	0726X1917	0726X0098	0726X0901	0726X8207	0726X8206
Manual Tube Release Label	11-6, item 5	1 per pump module	0726X1710	0726X1710	0726X0896	0726X0109	0726X0897	0726X1918	0726X0101	0726X0898	0726X8204	0726X8205
Fluid Flow Label	11-6, item 6	1 per pump module	0726X1718	0726X1718	0726X0926	0726X0110	0726X0927	0726X1920	0726X0102	0726X0928	0726X8214	0726X8215
Colleague Logo Label	11-6, item 7	1	0726X1711	0726X1711	0726X1711	0726X1711	0726X1711	0726X1711	0726X1711	0726X1711	0726X1711	0726X1711
UL/CSA Label, CUL Mark only	11-6, item 9	1	N/A	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755
UL/CSA Label, w/ Service Info	11-6, item 9	1	0726X1717	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Volume Control Label	11-6, item 10	1	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X8497
Contrast Control Label	11-6, item 11	1	0726X1712	0726X1712	0726X1923	0726X1712	0726X0906	0726X1923	0726X1712	0726X0907	0726X1712	0726X0906
External Fuse Label	11-6, item 12	1	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515
Accessories Label, 12V Jack	(not shown)	1 (older pumps only)	0726X1825	0726X1708	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Accessories Label, no 12V Jack	11-6, item 13	1	0726X1521	0726X1521	0726X0923	0726X0108	0726X0924	0726X1924	0726X0100	0726X0925	0726X8213	0726X8212
Service Information Label	(not shown)	1	N/A	N/A	0726X0884	0726X0111	0726X0885	0726X1925	0726X0103	0726X0886	0726X8196	0726X8198
Mounting Clamp Label	11-6, item 17	1	0726X1734	0726X1734	0726X0887	0726X0107	0726X0888	0726X1921	0726X0099	0726X0889	0726X8218	0726X8219
Patent Label	11-6, item 18	1	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902
Maintain Battery Charge Label	11-6, item 19	1	0727X1505	0727X1505	0726X0932	0726X0339	0726X0933	0726X0316	0726X0338	0726X0934	0726X8217	0726X8216
Colleague Guardian Label (optional feature)	11-6, item 20	1	072639263	072639263	NA	NA	NA	NA	NA	NA	NA	NA

Table 11-3 *Labeling Part Numbers (Colleague Pump) — continued*

Description	Figure, item no.	Quantity	Colleague Pump Product Codes									
			2M8151 (US English)	2M8151K (U.K./CE English)	CNM8151 (Swedish)	DNM8151 (French)	GNM8151 (Danish)	HNM8151 (German)	PNM8151 (Spanish)	WNM8151 (Dutch)	BRM8151 (Brazilian Portuguese)	TRM8151 (Turkish)
Internal Labels												
Earth Ground Label, internal	11-3, item 24 11-4, item 18 11-5, item 9	4 per pump	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714
Lithium Battery Label, Internal	11-3, item 25	1	0726X1715	0726X1715	0726X0920	0726X0319	0726X0921	0726X1715	0726X0320	0726X0922	0726X8210	0726X8211
Fuse Label, Internal	11-4, item 19	1	0726X1514	0726X0315	0726X0902	0726X0315	0726X0902	0726X0315	0726X0315	0726X0902	0726X8208	0726X8208
Battery Disposal/Replacement Label, Internal	11-4, item 17	1	0727X0317	0727X0317	0727X0908	0727X0317	0727X0908	0727X0317	0727X0317	0727X0908	0726X8209	0726X8209
Other Documents												
Battery Recharge Notice Label	(not shown)	1	0726X1722	0726X1722	0726X0881	0726X0112	0726X0882	0726X1929	0726X0104	0726X0883	0726X8139	0726X8141
Carton Bar Code	(not shown)	1	0726X1721	0726X1901	0726X1721	0726X1901	0726X1721	0726X1901	0726X1721	0726X1721	0726X1721	0726X1721
Operator's Manual	(not shown)	1	0719X4764	0719X4764	0719X1943	0719X0461	0719X1942	0719X4767	0719X0460	0719X1941	0719X8067	0719X8069
Computer Monitoring Interface Manual (English)	(not shown)	Optional	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765
Service Manual (English)	(not shown)	Optional	712101975	712101975 1IB640002X	712101975	712101975	712101975	712101975	712101975	712101975	712101975	712101975
Addendum to Colleague Operator's Manual Colleague Guardian Feature	(not shown)	Optional	0719X8973	0719X8973	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Installation Instructions, Colleague Guardian Feature Kit, product code 2M8378	(not shown)	Optional	0719X9264	0719X9264	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Operator's Manual Addendum, Maintenance and Storage	(not shown)	1	0719X4083	0719X4083	0719X8291	0719X8287	0719X8290	0719X8288	0719X8286	0719X8289	0719X8293	0719X8292
Operator's Manual Addendum, Label Library and Manual Tube Release Pop-up Changes Uim Master Software Versions 5.03.00, 5.05.00, 5.25.00 and 5.45.00	(not shown)	1	0719X4801	0719X44801	0719X4808	0719X4803	0719X4802	0719X4804	0719X4809	0719X4805	0719X4806	0719X4807
Operator's Manual Addendum, Electromagnetic Compatibility (EMC) Compliance Tables	(not shown)	1	0719X4861	0719X4861	0719X4868	0719X4862	0719X4864	0719X4863	0719X4869	0719X4867	0719X4866	0719x4865

Table 11-4 *Labeling Part Numbers (Colleague 3 Pump)*

Description	Figure, item number	Quantity	Colleague 3 Pump Product Codes									
			2M8153 (US English)	2M8153K (U.K./CE English)	CNM8153 (Swedish)	DNM8153 (French)	GNM8153 (Danish)	HNM8153 (German)	PNM8153 (Spanish)	WNM8153 (Dutch)	BRM8153 (Brazilian Portuguese)	TRM8153 (Turkish)
External Labels												
Baxter wordmark label	11-6, item 1	1	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519	0726X1519
Signature/Rating Label, 1.0 Ampere	11-6, item 2	1	0726X4745	0719X4745	0726X0890	0726X4971	0726X0891	0726X4972	0726X4973	0726X0892	0726X8203	0726X8200
Serial Number Bar Code, no CE Mark ***Note:*** Not available for reorder by customer. Contact your local authorized service center for assistance.	11-6, item 3	1	0726X1822	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Serial Number Bar Code, CE Mark ***Note:*** Not available for reorder by customer. Contact your local authorized service center for assistance.	11-6, item 3	1	N/A	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905	0726X1905
Attention (Voltage Warning) Label	11-6, item 4	1	0726X1516	0726X1516	0726X0899	0726X0106	0726X0900	0726X1917	0726X0098	0726X0901	0726X8207	0726X8206
Manual Tube Release Label	11-6, item 5	1 per pump module	0726X1710	0726X1710	0726X0896	0726X0109	0726X0897	0726X1918	0726X0101	0726X0898	0726X8204	0726X8205
Fluid Flow Label	11-6, item 6	1 per pump module	0726X1718	0726X1718	0726X0926	0726X0110	0726X0927	0726X1920	0726X0102	0726X0928	0726X8214	0726X8215
Colleague 3 Logo Label	11-6, item 7	1	0726X1520	0726X1520	0726X1520	0726X1520	0726X1520	0726X1520	0726X1520	0726X1520	0726X1520	0726X1520
Tubing Guide Label	11-6, item 8		0726X1824	0726X1824	0726X1824	0726X1824	0726X1824	0726X1824	0726X1824	0726X1824	0726X1824	0726X1824
UL/CSA Label, CUL Mark only	11-6, item 9	1	N/A	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755	0726X4755
UL/CSA Label, w/ Service Info	11-6, item 9	1	0726X1717	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Volume Control Label	11-6, item 10	1	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X1709	0726X8497
Contrast Control Label	11-6, item 11	1	0726X1712	0726X1712	0726X1923	0726X1712	0726X0906	0726X1923	0726X1712	0726X0907	0726X1712	0726X0906
External Fuse Label	11-6, item 12	1	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515	0726X1515
Accessories Label, 12V Jack	Not shown	1 (older pumps only)	0726X1825	0726X1708	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Accessories Label, no 12V Jack	11-6, item 13	1	0726X1521	0726X1521	0726X0923	0726X0108	0726X0924	0726X1924	0726X0100	0726X0925	0726X8213	0726X8212
Channel A Label	11-6, item 14	1	0726X1731	0726X1731	0726X1731	0726X1731	0726X1731	0726X1731	0726X1731	0726X1731	0726X1731	0726X1731
Channel B Label	11-6, item 15	1	0726X1818	0726X1818	0726X1818	0726X1818	0726X1818	0726X1818	0726X1818	0726X1818	0726X1818	0726X1818
Channel C Label	11-6, item 16	1	0726X1819	0726X1819	0726X1819	0726X1819	0726X1819	0726X1819	0726X1819	0726X1819	0726X1819	0726X1819
Service Information Label	(not shown)	1	N/A	N/A	0726X0884	0726X0111	0726X0885	0726X1925	0726X0103	0726X0886	0726X8196	0726X8198
Patent Label	11-6, item 18	1	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902	0726X1902
Maintain Battery Charge Label	11-6, item 19	1	0727X1505	0727X1505	0726X0932	0726X0339	0726X0933	0726X0316	0726X0338	0726X0934	0726X8217	0726X8216
Colleague Guardian Label (optional feature)	11-6, item 20	1	072639263	072639263	NA	NA	NA	NA	NA	NA	NA	NA

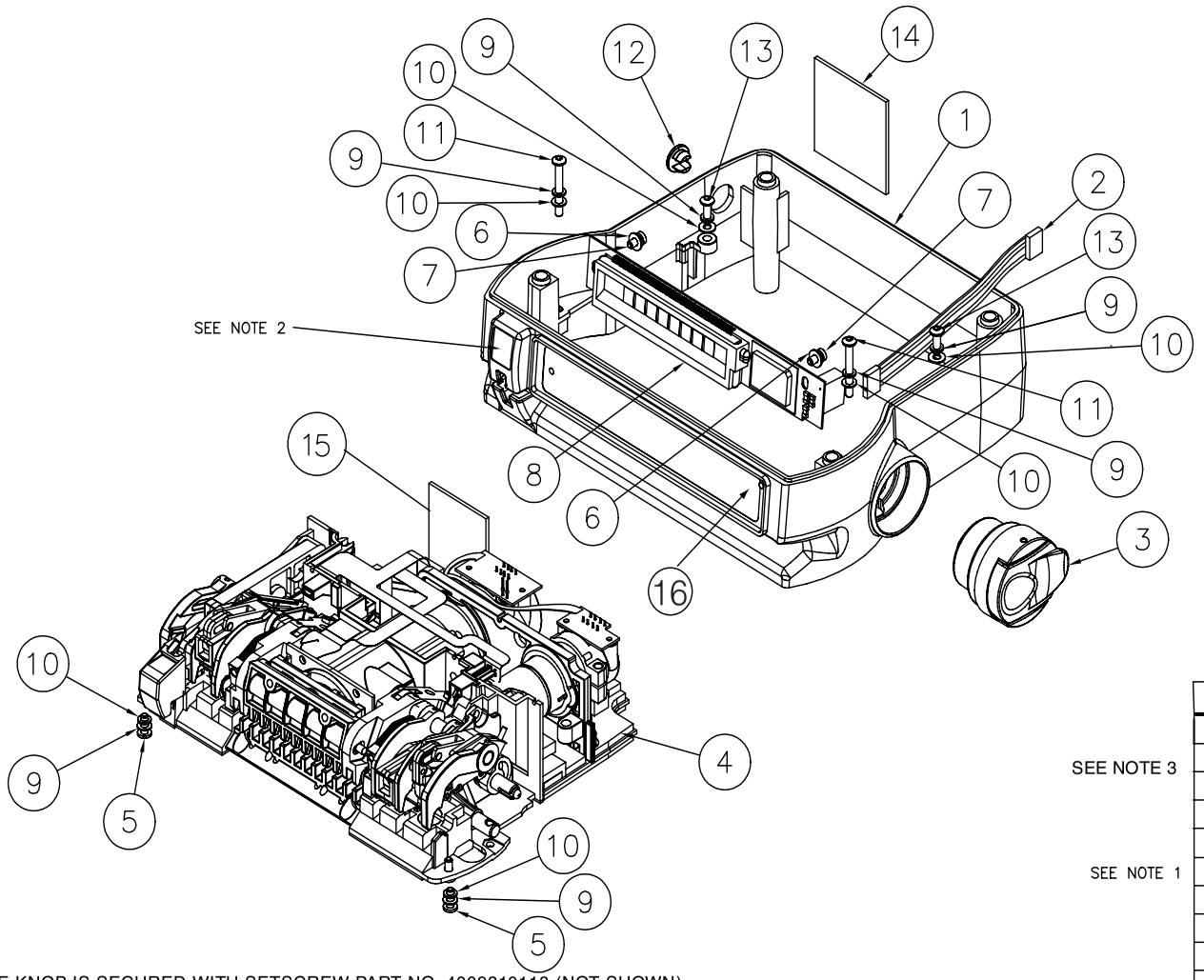
Table 11-4 *Labeling Part Numbers (Colleague 3 Pump) — continued*

Description	Figure, item number	Quantity	Colleague 3 Pump Product Codes									
			2M8153 (US English)	2M8153K (U.K./CE English)	CNM8153 (Swedish)	DNM8153 (French)	GNM8153 (Danish)	HNM8153 (German)	PNM8153 (Spanish)	WNM8153 (Dutch)	BRM8153 (Brazilian Portuguese)	TRM8153 (Turkish)
Internal Labels												
Earth Ground Label, internal	11-3, item 24 11-5, item 9 11-10, item 18	4 per pump	0726X1514	0726X0315	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714	0726X1714
Lithium Battery Label, Internal	11-3, item 25	1	0727X1715	0727X1715	0726X0920	0726X0319	0726X0921	0726X0318	0726X0320	0726X0922	0726X8210	0726X8211
Fuse Label, Internal	11-10, item 19	1	0727X1514	0726X0315	0726X0902	0726X0315	0726X0902	0726X1514	0726X0315	0726X0902	0726X8208	0726X8208
Battery Disposal/Replacement Label, Internal	11-10, item 17	1	0726X0317	0726X0317	0726X0908	0726X0317	0726X0908	0726X0317	0726X0317	0726X0908	0726X8209	0726X8209
Other Documents												
Battery Recharge Notice Label	(not shown)	1	0726X1722	0726X6030	0726X0881	0726X0112	0726X0882	0726X4974	0726X0104	0726X0883	0726X8139	0726X8141
Carton Bar Code	(not shown)	1	0726X1721	0726X1721	0726X1721	0726X1721	0726X1721	0726X1721	0726X1721	0726X1721	0726X1721	0726X1721
Operator's Manual	(not shown)	1	0719X3724	712101975 1IB640002X	0719X1940	0719X4696	0719X1939	0719X4697	0719X4698	0719X7063	0719X8068	0719X8070
Computer Monitoring Interface Manual (English)	(not shown)	Optional	0719X9264	0719X9264	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765	0719X4765
Service Manual (English)	(not shown)	Optional	712101975	712101975 1IB640002X	712101975	712101975	712101975	712101975	712101975	712101975	712101975	712101975
Addendum to Colleague Operator's Manual Colleague Guardian Feature	(not shown)	1	0719X8973	0719X8973	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Installation Instructions, Colleague Guardian Feature Kit, product code 2M8378	(not shown)	1	0719X9264	0719X9264	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Operator's Manual Addendum, Maintenance and Storage	(not shown)	1	0719X4083	0719X4083	0719X8291	0719X8287	0719X8290	0719X8288	0719X8286	0719X8289	0719X8293	0719X8292
Operator's Manual Addendum, Label Library and Manual Tube Release Pop-up Changes Uim Master Software Versions 5.03.00, 5.05.00, 5.25.00 and 5.45.00	(not shown)	1	0719X4801	0719X44801	0719X4808	0719X4803	0719X4802	0719X4804	0719X4809	0719X4805	0719X4806	0719X4807
Operator's Manual Addendum, EMC Compliance	(not shown)	1	0719X4870	0719X4870	0719X4877	0719X4871	0719X4873	0719X4872	0719X4878	0719X4876	0719X4875	0719X4874

Pump Module

NOTE 5. KEYPAD, PUMPHEAD PART NUMBERS FOR VARIOUS LANGUAGE VERSIONS ARE AS FOLLOWS:

PUMP LANGUAGE VERSION	HOUSING, PUMPHEAD PART NO.
2M8151 (U.S. English)	F069474501
2M8151K (U.K. English)	F069474501
BRM8151 (Brazilian Portuguese)	F069474518
CNM8151 (Swedish)	F069474515
DNM8151 (French)	F069474503
GNM8151 (Danish)	F069474512
HNM8151 (German)	F069474002
PNM8151 (Spanish)	F069474504
TRM8151 (Turkish)	F069474520
WNM8151 Dutch	F069474509
2M8153 (U.S. English)	F069474502
2M8153K (U.K. English)	F069474502
BRM8153 (Brazilian Portuguese)	F069474517
CNM8153 (Swedish)	F069474514
DNM8153 (French)	F069474507
GNM8153 (Danish)	F069474511
HNM8153 (German)	F069474000
PNM8153 (Spanish)	F069474506
TRM8153 (Turkish)	F069474519
WNM8153 (Dutch)	F069474508



4. MANUAL TUBE RELEASE KNOB IS SECURED WITH SETSCREW PART NO. 4009310118 (NOT SHOWN)
3. SOME OLDER PUMPS MAY HAVE AN SDI CONNECTOR IN PLACE OF ITEM 12.

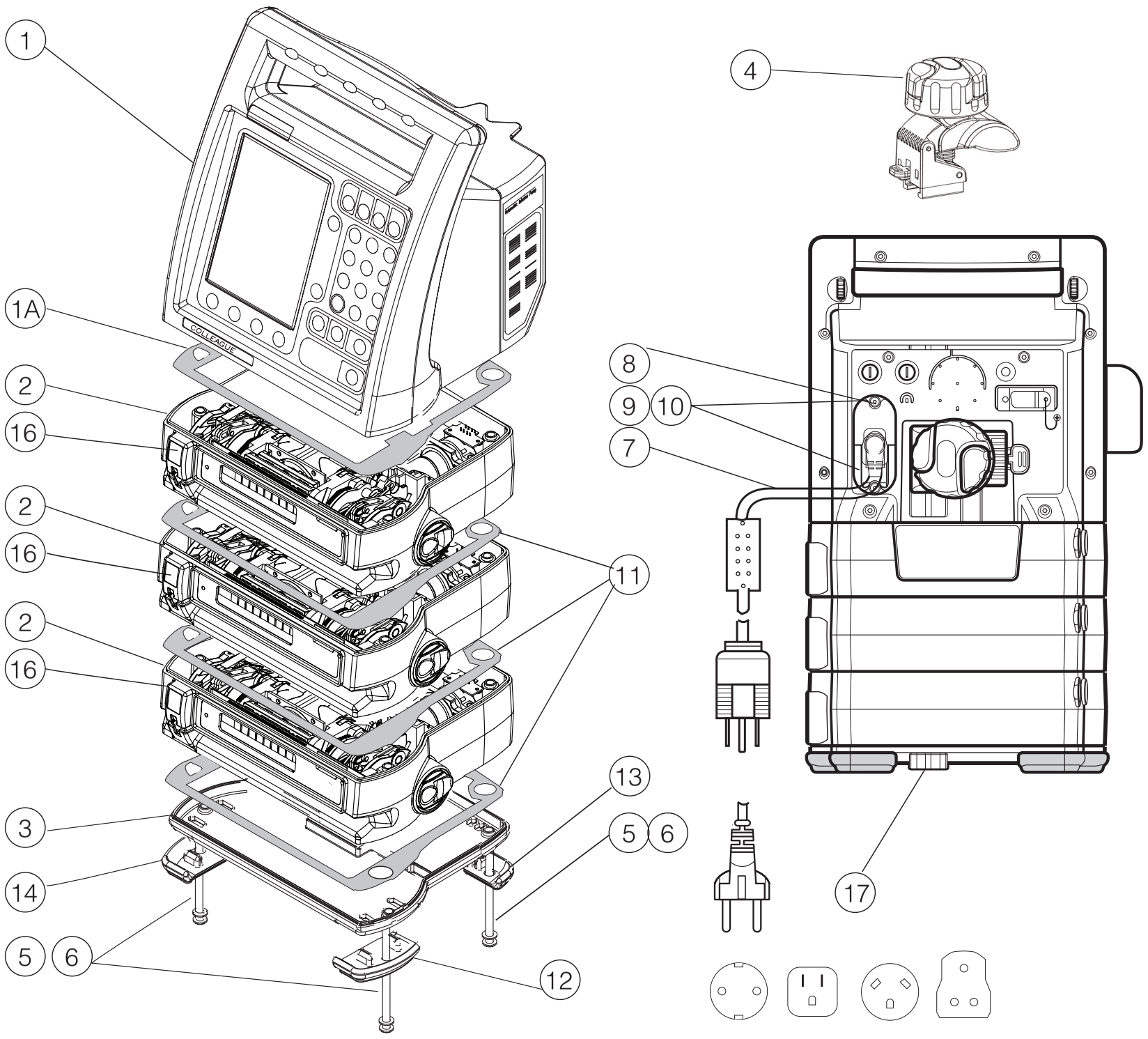
2. SEE LABEL LIST FOR PART NUMBER.
1. ALTERNATIVE PART FOR ITEM 10, 4292006003 WASHER, 3.2X0.5X7 YE

NOTES:

	ITEM	PART NO.	DESCRIPTION	QTY	UOM
	16	SEE NOTE 5	KEYPAD, PUMPHEAD	1	EA
	15	F069130512	PCBA, AIR IN LINE	1	EA
SEE NOTE 3	14	F069610517	INSULATION, AIL PCBA	1	EA
	13	4192035110	SCREW, M3X10 PAN PH YE	2	EA
	12	F069620033	PUMP PLUG	1	EA
	11	4192039110	SCREW, M3X20 PAN PH YE	2	EA
SEE NOTE 1	10	4292011001	WASHER, 3.2X0.5X6 YE	6	EA
	9	4292003002	WASHER, M3 SPLIT	6	EA
	8	F069130500	PCBA, PH DISPLAY	1	EA
	7	4192016114	SCREW, 3X6 PAN PH B YE	2	EA
	6	4009330107	WASHER, 3.2X0.5X7 PLASTIC	2	EA
SEE NOTE 4	5	4192034110	SCREW, M3X8MM PAN PH YE	2	EA
	4	F069180531	ASSY, PUMP W/PCBA	1	EA
	3	F069120514	ASSY, MANUAL RELEASE KNOB	1	EA
	2	F069140503	ASSY, DISPLAY PCBA CABLE	1	EA
	1	F069670506	HOUSING, PUMPHEAD	1	EA

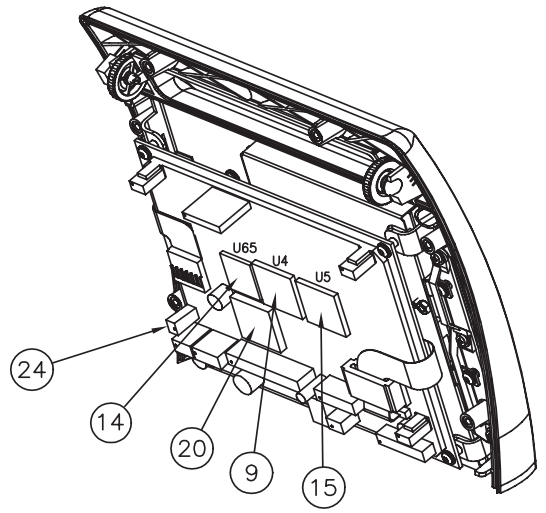
Figure 11-7 Pump Module, All Pumps

Colleague 3 Pump Assembly Drawings

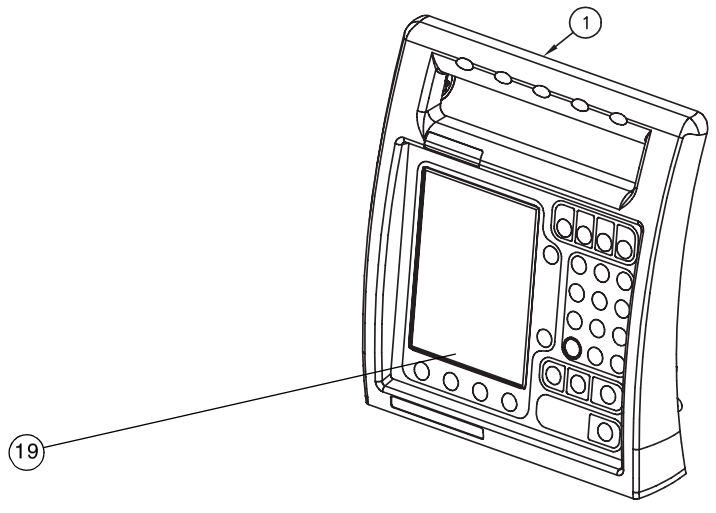


Item	Part No.	Description	Quantity
1	See Figure 11-2	User Interface Module	1
1A	F069630001	Gasket	1
2	See Figure 11-7	Pump Module	1
3	F069120518	Bottom Cover	1
4	F069120521	Clamp	1
5	4009310122	Screw, Pump Module Securing	4
6	4292015001	Washer, M5	4
7	5009415146	Power Cord, Left Angle	1
8	F069610001	Power Cord Retainer	1
9	4192034110	Screw, M3x8, Pan PH YE	2
10	4292011001	Washer, 3.2x0.5x6 YE	2
11	F069630502	Gasket	3
12	F069690001	Foot, Left Front	1
13	F069690002	Foot, Left Rear	1
14	F069690003	Foot, Right Front	1
15	F069690004	Foot, Right Rear (not shown)	1
16	See Label List	Labels, Pump Module Identifiers	
17	F069620028	V-Plate	1

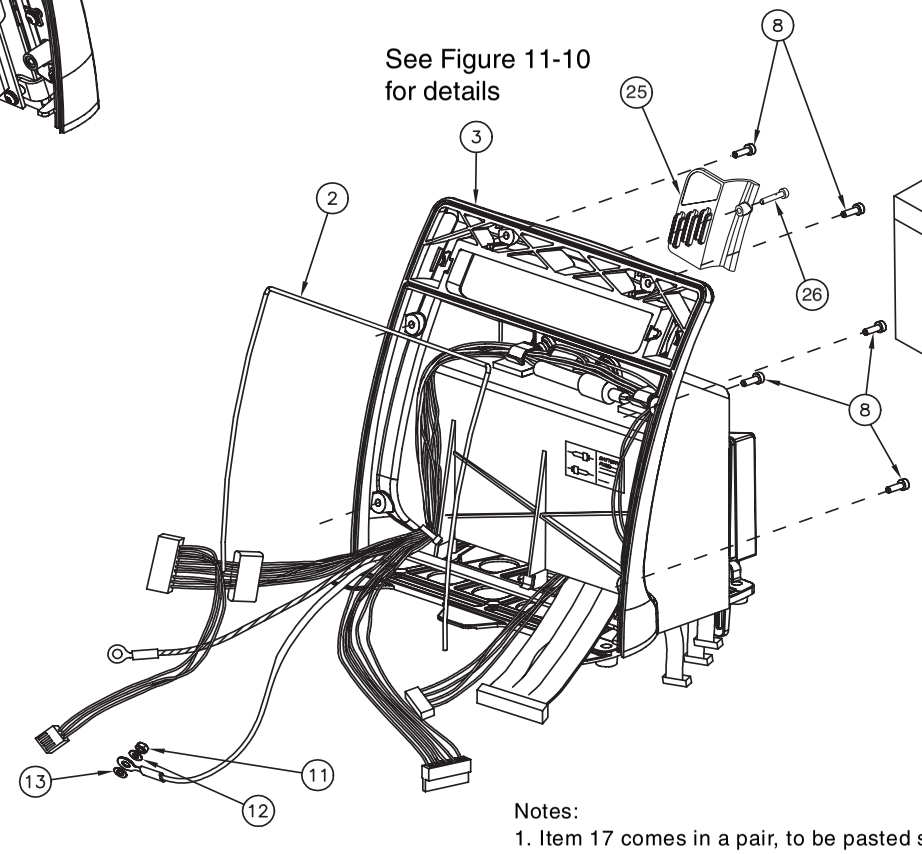
Figure 11-8 Colleague 3 Pump Assembly

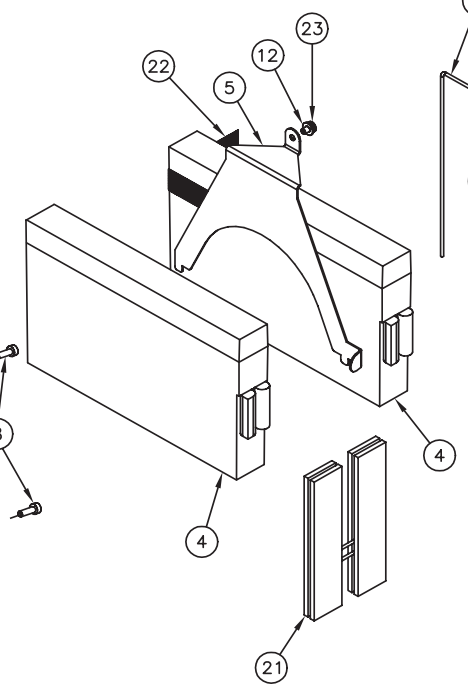


See Figure 11-3
for details

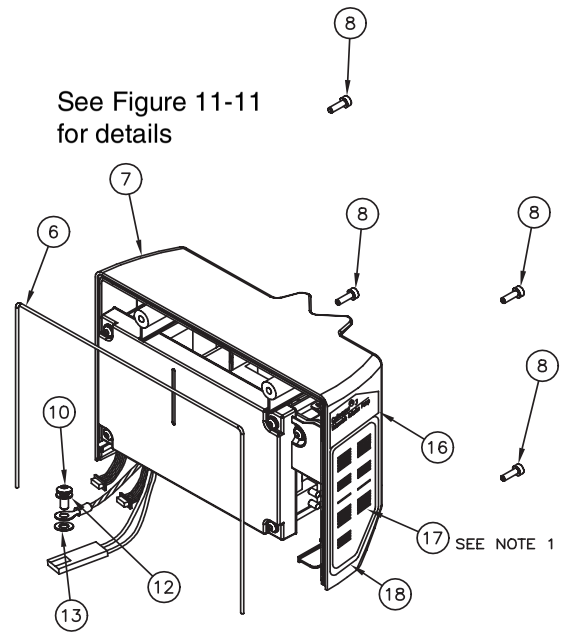


See Figure 11-10
for details





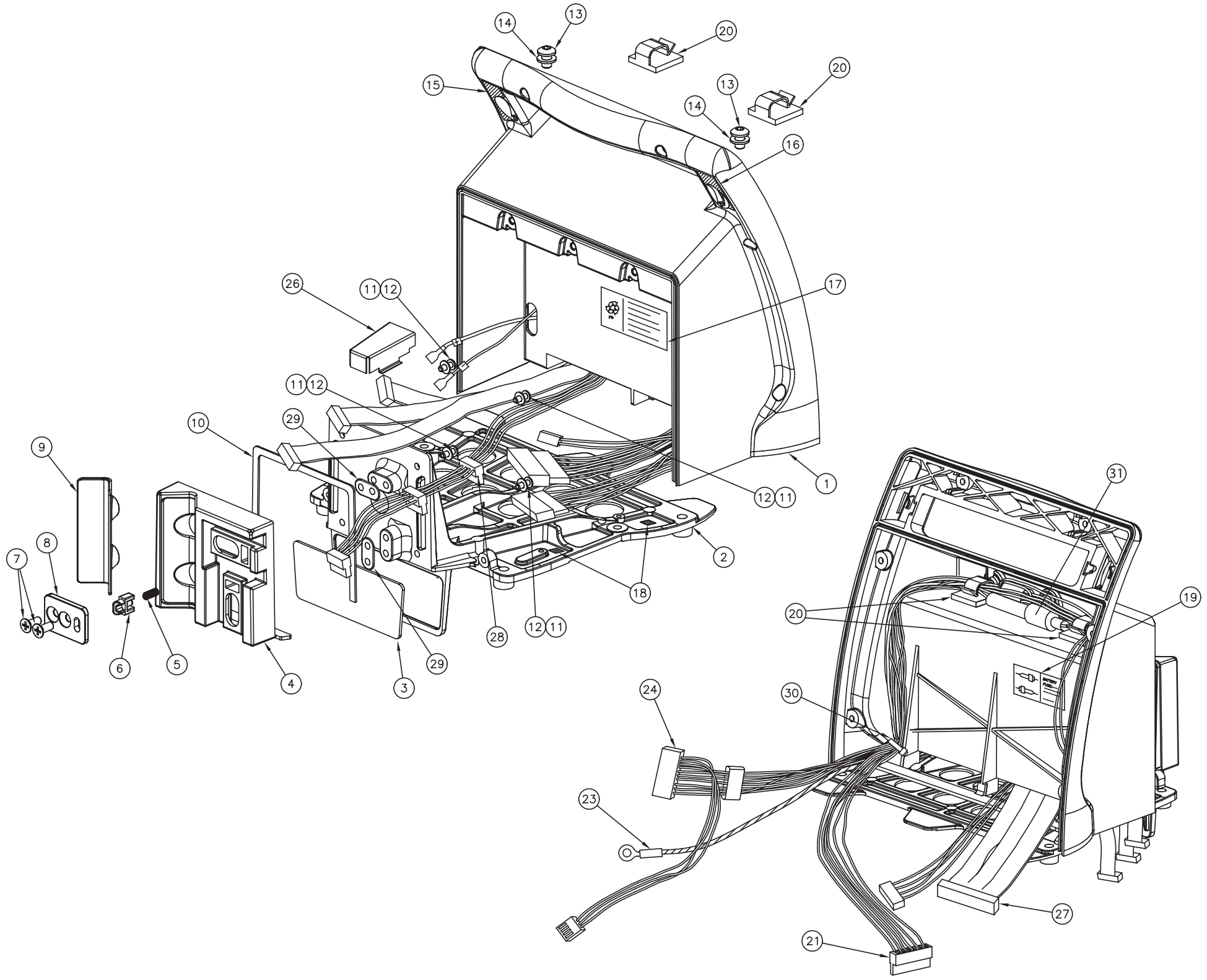
See Figure 11-11
for details



Notes:
1. Item 17 comes in a pair, to be pasted separately on rear case and sub-plate at location indicated.
2. Contact Baxter product service for software part numbers appropriate for each product code.
3. Part no. F069180568 is assy, bezel with isocom.
   Part no. F069180200 is assy, bezel without isocom.
4. For Colleague 3 pumps with a serial number prior to 13110338TC the battery harness installed may be part number F069140020. This harness does not include the protection circuitry and should be replaced with the battery harness with the protection circuit listed in the table (item 21).

	ITEM	PART NO.	DESCRIPTION	QTY	UOM
	26	4009310125	SCREW, M3X10 CAP SOC YE	1	EA
	25	F069620031	TUBING GUIDE	1	EA
	24	5009410163	CONN AMP MTA 10002W	1	EA
	23	4009310127	SCREW, M3 X 10 BUT SOC YE	1	EA
	22	--	INSULATION TAPE	80	MM
SEE NOTE 4	21	F069180620	Battery harness with Protection Circuit	1	EA
	20	6009501124	IC, PLCC PC16552 DUAL RRC/TRAN	1	EA
	19	SEE LABEL LIST	LABEL, COLLEAGUE 3 LOGO	1	EA
	18	SEE LABEL LIST	LABEL, SERIAL NUMBER OVERLAY	1	EA
SEE NOTE 1	17	SEE LABEL LIST	LABEL, SERIAL NUMBER	1	EA
	16	SEE LABEL LIST	LABEL, SIGNATURE/RATINGS	1	EA
	15	SEE NOTE 2	EPROM, UIM MASTER U5	1	EA
	14	SEE NOTE 2	EPROM, UIM SLAVE U65	1	EA
	13	4009330110	WASHER, M3 INTERNAL TOOTH	2	EA
	12	4292006003	WASHER, M3X0.5X7 YE	3	EA
	11	4392004000	NUT, M3 YELLOW	1	EA
	10	4192033110	SCREW, M3X6 PAN PH YE	1	EA
	9	SEE NOTE 2	EPROM, UIM MASTER U4		-
	8	4009310113	SCREW, M3X10 CAP SOC YE	9	EA
	7	F069180569	ASSY, REAR CASE	1	EA
	6	F069630003	GASKET, REAR/MAIN	1	EA
	5	F069610002	BATTERY BRACKET	1	EA
	4	5009480001	BATTERY, YUASA NP2-12	2	EA
	3	F069120525	ASSY, MAIN HOUSING	1	EA
	2	F069630002	GASKET, BEZEL/MAIN	1	EA
SEE NOTE 3	1	F069180200	ASSY, BEZEL	1	EA
SEE NOTE 3	1	F069180568	ASSY, BEZEL	1	EA

Figure 11-9 Colleague 3 Pump User Interface Module Assembly



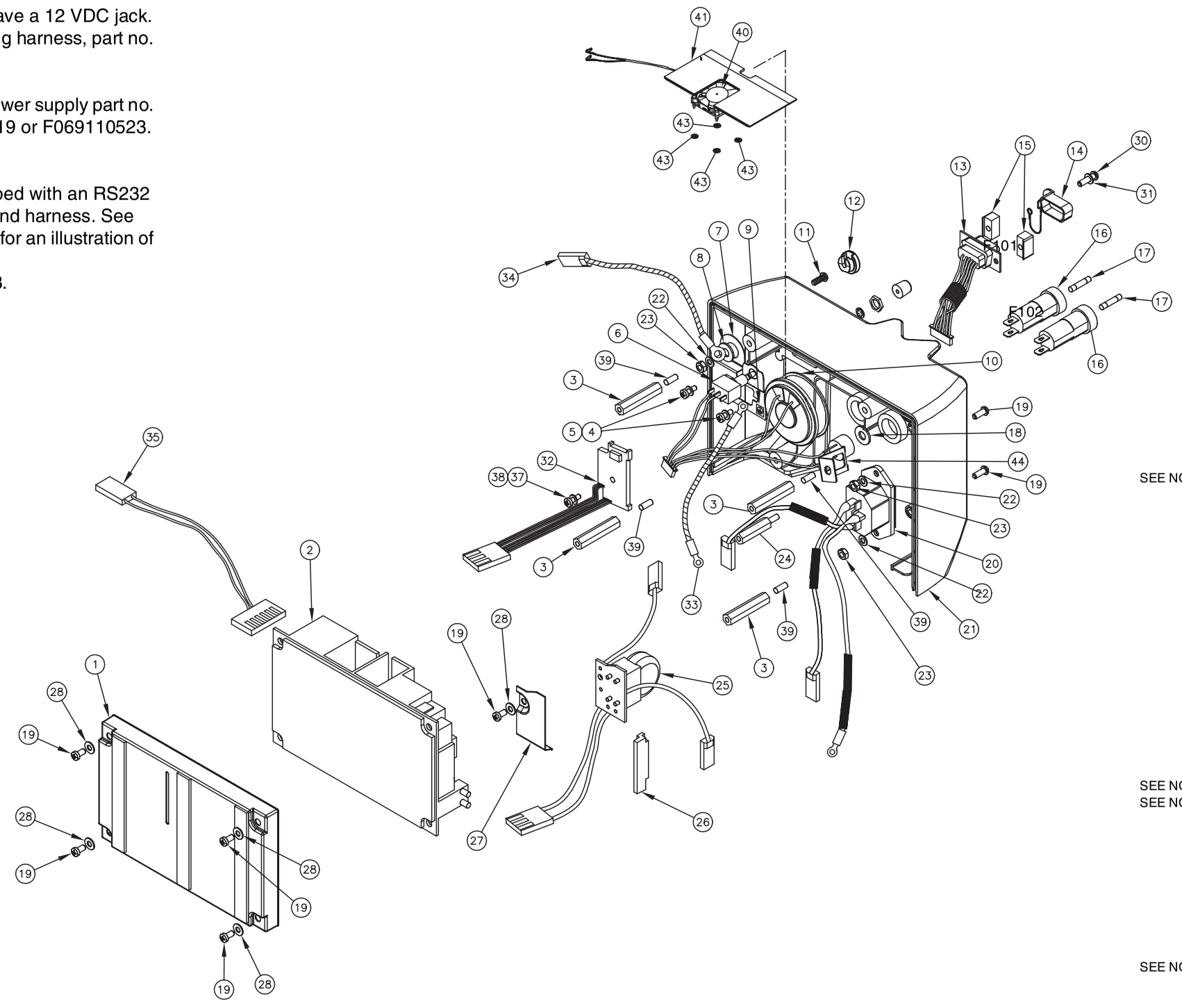
ITEM	PART NO.	DESCRIPTION	QTY	UOM
31	5009425110	FUSE, 4A, 250V (F103)	1	EA
30	5009499106	CABLE TIE	1	EA
29	F069690006	CLAMP–VB–SPACER	2	EA
28	F069140017	HARNESS, UI/PH POWER	1	EA
27	F069140016	HARNESS, UI/PH SIGNAL	1	EA
26	F069222007	SUB–PLATE SHIELD	1	EA
25	NOT USED			
24	F069140021	HARNESS, REAR/INVERTER W/FERRITE	1	EA
23	F069140006	HARNESS, UI MEMBRANE/SP	1	EA
22	NOT USED			
21	F069140028	HARNESS, DC CABLE	1	EA
20	3009035104	CABLE FASTENER	2	EA
19	SEE LABEL LIST	LABEL, INTERNAL FUSES	1	EA
18	SEE LABEL LIST	LABEL, EARTH GROUND	2	EA
17	SEE LABEL LIST	LABEL, BATTERY DISPOSE/REPLACE	1	EA
16	SEE LABEL LIST	LABEL, CONTRAST CONTROL	1	EA
15	SEE LABEL LIST	LABEL, VOLUME CONTROL	1	EA
14	4292015001	WASHER, 5.3X1X10 YE	2	EA
13	4192066110	SCREW, M5X8 PAN PH YE	2	EA
12	4192034110	SCREW, M3X8 PAN PH YE	4	EA
11	4292006003	WASHER, 3.2X0.5X7 YE	4	EA
10	F069630005	GASKET, REAR	1	EA
9	F069620002	POLE CLAMP PAD	1	EA
8	F069222003	CLAMP VB PLATE	1	EA
7	4009310117	SCREW, M4X10 CSK PH S.S.	2	EA
6	F069620020	CLAMP VB TAB	1	EA
5	F069222004	CLAMP VB SPRING	1	EA
4	F069620014	CLAMP–V–BLOCK	1	EA
3	F069690005	HEAD BOARD PAD	1	EA
2	F069212501	SUB–PLATE	1	EA
1	F069620501	MAIN HOUSING	1	EA

Figure 11-10 Colleague 3 Pump Center Housing Assembly

NOTE 1: Some older pumps do not have item 12 but have a 12 VDC jack. Pumps with 12 VDC jacks also have one additional wiring harness, part no. F069140012.

NOTE 2: Pumps may be equipped with either Condor power supply part no. F069110522 or Astec power supply part no. F069110519 or F069110523. See page 8-40 for applicability.

NOTE 3: Older 2M8151 and 2M8153 pumps are equipped with an RS232 port and wiring harness in place of the ISOCOM PCB and harness. See Table 2-5 for applicable product codes and Figure 11-5 for an illustration of the RS232 COMM port.
The part number for the RS232 harness is F069140013.



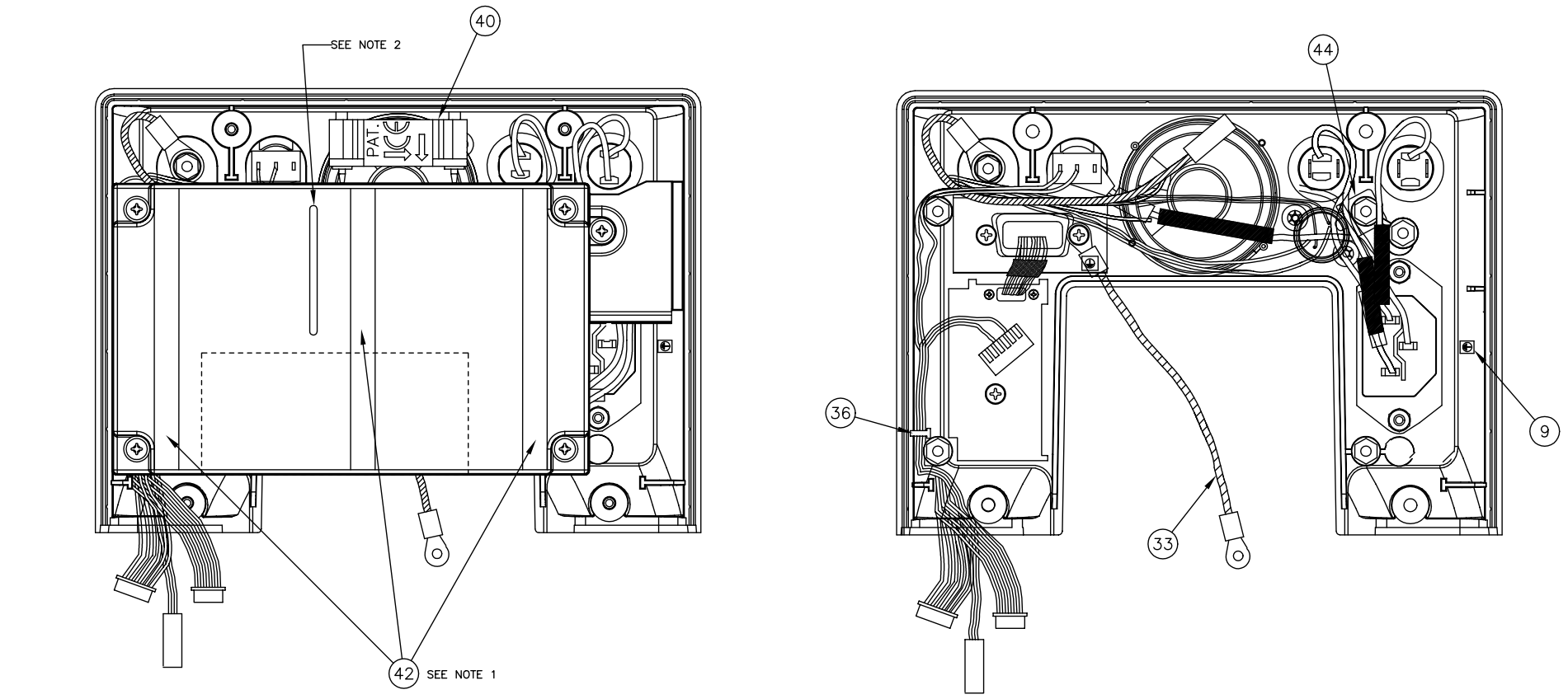
SEE NOTE 3

SEE NOTE 3
SEE NOTE 1

SEE NOTE 2

ITEM	PART NO.	DESCRIPTION	QTY	UOM
44	F069222012	CLIP, BUZZER	1	EA
43	4392014000	FLAT, PUSH NUT	4	EA
42	F069690008	POWER SUPPLY COVER PAD	3	EA
41	F069390005	BRACKET, FAN	1	EA
40	F069180529	FAN, ASSY	1	EA
39	4009310121	SCREW, M3 X 20 SOC FLAT	4	EA
38	4009330117	WASHER, 3.7 X 8 X 0.8 PLASTIC	1	EA
37	4009310120	SCREW, 3.5 X 8 PAN PH B	1	EA
36	3009035001	CABLE TIE	1	EA
35	F069140014	HARNESS, POWER SUPPLY	1	EA
34	F069140022	HARNESS, PS EARTH	1	EA
33	F069140008	HARNESS, EARTH	1	EA
32	F069130518	PCBA, RS232/RS423 COM BOARD	1	EA
31	4292002003	WASHER, 2.4 X 0.5 X 6.5 YE	1	EA
30	4192002111	SCREW, 2.2 X 6.5 PAN PH YE B	1	EA
29	SEE LABEL LIST	LABEL, EXTERNAL FUSES	1	EA
28	4009330107	WASHER, 3.2 X 0.5 X 7 PLASTIC	5	EA
27	F069610007	COVER, CHOKE	1	EA
26	F069610518	INSULATOR	1	EA
25	F069130002	PCBA, CHOKE	1	EA
24	F069390004	STANDOFF, M3 X 20 M/F NYLON	1	EA
23	4392004000	NUT, M3 YELLOW	3	EA
22	4292006003	WASHER, 3.2 X 0.5 X 7 YE	3	EA
21	F069620003	CASE, REAR	1	EA
20	F069140002	HEARNESS, AC	1	EA
19	4192035110	SCREW, M3 X 10 PAN PH YE	7	EA
18	F069630007	GASKET, BEEPER	1	EA
17	5009425108	FUSE, 1.6A 250V SLOBLO	2	EA
16	F069499002	FUSE HOLDER SCHURTER 3101.0110	2	EA
15	F049211002	D-SUB NUT D20418-J2F	2	EA
14	4009390001	D-SUB DUST CAP & STRING	1	EA
13	F069140026	RS423 HARNESS, DB9 TO COMM.PCBA	1	EA
12	F069620032	REAR PLUG	1	EA
11	4009310139	HEX BOLT M3 X 10	1	EA
10	F069630006	GASKET, SPEAKER	1	EA
9	0726A1714	LABEL, EARTH GROUND	2	EA
8	4009330116	WASHER, FLAT 3.2 x 12 x 1	1	EA
7	F069222005	GROUND PLATE	1	EA
6	F069140204	HARNESS, REAR	1	EA
5	4292010001	WASHER, 2.8 X 0.5 X 5 YE	2	EA
4	4009310006	PAN HEAD SCREW, M2.6 X 8	2	EA
3	4009620001	STANDOFF, M3 X 30 F/F NYLON	4	EA
2	F069110522	POWER SUPPLY, CONDOR	1	EA
1	F069120526	SHIELD ASSY,POWER SUPPLY	1	EA

Figure 11-11 Colleague 3 Pump Rear Housing Subassembly



2. UL INSPECTION PROCEDURE REQUIRES THIS SLOT TO BE PRESENT.

1. ADHERE POWER SUPPLY COVER PAD (ITEM 42) ONTO SHIELD ASSEMBLY, POWER SUPPLY (ITEM 1) USING LOCTITE 411 OR 414 AND LOCTITE 770 PRIMER.

NOTES :

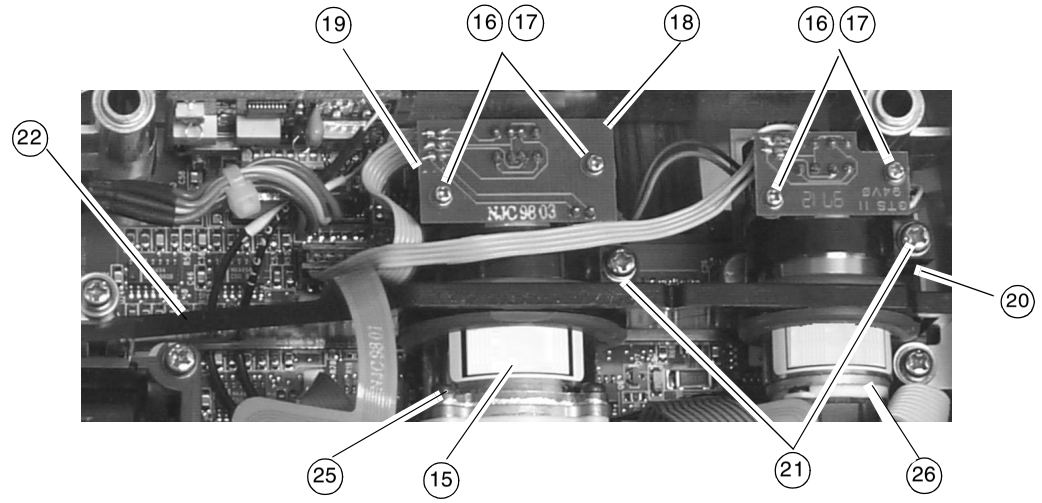
ITEM	PART NO.	DESCRIPTION	QTY	UOM
44	F069222012	CLIP, BUZZER	1	EA
42	F069690008	POWER SUPPLY COVER PAD	3	EA
40	F069180529	FAN, ASSY	1	EA
36	5009499106	CABLE TIE	1	EA
33	F069140008	HARNESS, EARTH	1	EA
9	SEE LABEL LIST	LABEL, BONDING GROUND	2	EA

Figure 11-12 Colleague 3 Pump Rear Housing Wiring Harnesses

Shuttle Motor and Attaching Parts

Table 11-5 Shuttle Motor and Attaching Parts (Figure 11-13)

Index Number	Part Number	Description	Quantity
15	722004561A	Shuttle Pump Motor, Micro-Mo Electronics, Inc. Part No.	1
16	M2X4LWPH	Screw, M2 x 4L with Lock Washer	4
17	M2NW	Washer, Nylon, M2	4
18	F069130506	Subassembly, Motor Encoder	1
19	4009390105	Collar, Shuttle Motor Encoder	1
20	F069610509	Collar, Tube Load Motor Encoder	1
21	M3X14WLWPH	Screw, M3 x 14L with Washer and Lock Washer	2
22	F069610511	Strap, Motor	1
23	M3X8PH	Screw, M3 x 8L	4
24	4009330107	Washer, Nylon, 3.2 x 0.5 x 7	4
25	M25X10PH	Screw, M2.5 x 10L	4
26	S058-322	Tube Loading Motor	1



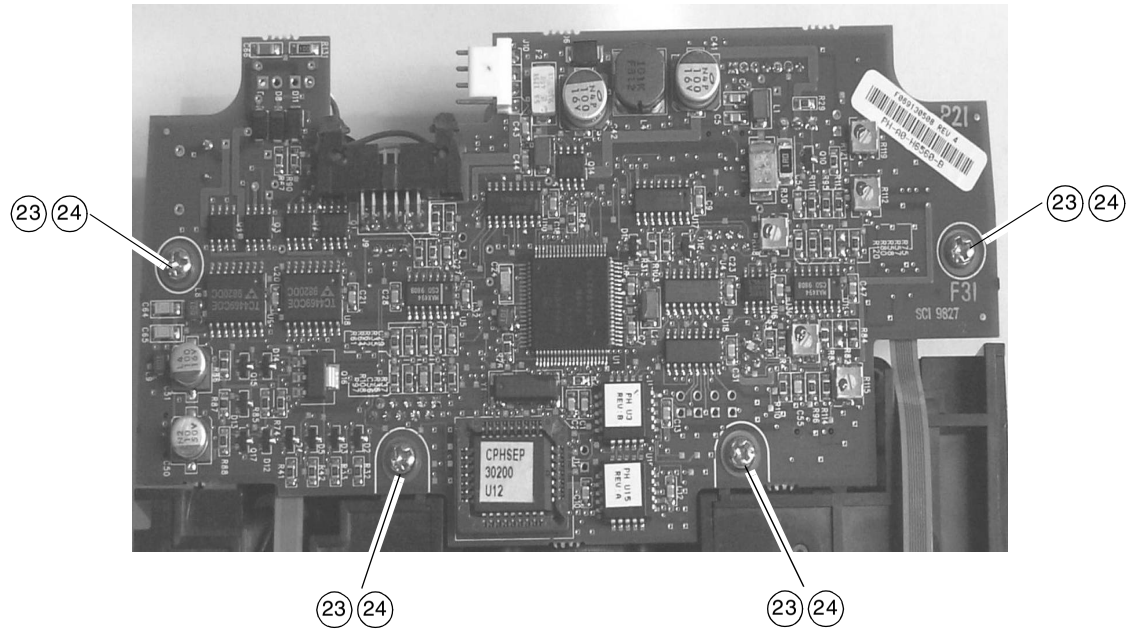


Figure 11-13 Shuttle Motor and Attaching Parts

Chapter 12

Theory of Operation

Overview

This chapter contains a simplified functional analysis of the pump. The following fold-out diagrams in Chapter 13 supplement this information:

- Overall Signal Flow Block Diagram
- Power Distribution Diagram
- Interconnecting Wiring Diagram

The Colleague pump consists of two main modules:

- User Interface Module (UIM)
- Pump Module

The Colleague 3 pump consists of four main modules:

- User Interface Module (UIM)
- Three Pump Modules

The majority of the pump's circuitry resides on two multi-layered printed circuit boards (PCBs):

- User Interface Module Printed Circuit Board (UIM PCB), located in the User Interface Module
- Pump Head Module Printed Circuit Board (PHM PCB), located in each Pump Module

In addition to the two main PCBs, there are seven other PCBs:

- Power supply
- LED Bar
- LCD Inverter
- Toroid Filter
- Air In Line PCB (AIL PCB) (one plugs into each PM PCB)

- Vacuum Fluorescent Display Driver PCB (VFD PCB, in each pump module)
- Isolated Communications Board, located in the rear housing.

Note: The ISOCOM board is used only in pumps that have RS232/RS423 communication ports (all CE-marked pumps and some U.S. pumps). See Table 2-5 for detailed configuration information.

Simplified Overall Signal Flow Description

Each block in the simplified overall signal flow diagram (Figure 13-3) contains a reference number that corresponds to a section that describes its functions. The following list provides the reference numbers.

User Interface Module

1. Toroid Filter
2. Switching Power Supply
3. Main Battery
4. Backup Battery
5. External DC Power Connector (not used)
6. Power Supply Interface Circuitry
7. Battery Charge Level Indicator Circuitry
8. UIM Keypad
9. Keypad Interface Circuitry
10. PANEL LOCKOUT Button
11. Volume Control
12. Contrast Control
13. Real Time Clock Circuitry
14. Master Memory
15. Master Microprocessor Circuitry
16. Slave Microprocessor and Slave Memory Circuitry
17. ACC/Nurse Call
18. Main Speaker Circuitry
19. Main Speaker
20. Backup Beeper Control Circuitry
21. Backup Beeper
22. Display Controller and LED Circuitry
23. CCFT Inverter Module
24. Main Display
25. Back Light Circuit
26. External Communications Circuitry
27. LED/Icons Circuitry
28. Pump Interface Circuitry

Pump Module

29. Pump Module Printed Circuit Board
30. Air In Line PCB (AIL PCB)
31. Pump Mechanism
32. Pump Module Vacuum Fluorescent Display
33. Pump Module Keypad Assembly
34. Accessory Port (not used)

User Interface Module

1. Toroid Filter

The AC input power line contains a toroidal-wound, radio frequency (RF) interference filter that suppresses any RF frequencies riding on the AC power line. Suppression is effective in both directions. There are two externally accessible line fuses, 1.6 A each, that protect each side of the AC power line.

2. Switching Power Supply

A universal switching supply converts AC input power to the 14.0 VDC required by the pump. The supply accepts input voltage ranging from 100 to 120 VAC, at a frequency of 60 Hz, and 220 to 240 VAC at 50 Hz. The supply can deliver a maximum of 40 W. Astec power supplies are internally protected by the 2.5 A fuse F1. Condor power supplies are internally fused at 3.0 A.

3. Main Battery

The Main Batteries supply power to the pump whenever the pump is not connected to AC power, or if AC power fails. If AC power fails during pump operation, Main Battery power is applied automatically, without disruption. Each Main Battery is a sealed, lead-acid battery that provides a nominal 12 VDC and is rated at 2 Ah. The output of the Main Battery is fused at 4.0 A by an in-line, time delay (type T) fuse F103. A float charging circuit automatically recharges the batteries whenever the pump is plugged into an AC power source. The batteries are protected from overcurrent damage by the battery harness with protection circuit's fuses and diodes.

4. Backup Battery

Two 3.6 VDC lithium cells form the 7.2 VDC Backup Battery pack. Whenever AC and Main Battery power are unavailable, the Backup Battery pack supplies power to the Master Memory, RAM, real time clock, Master Microprocessor functions, and Backup Beeper. The Backup Battery pack is rated at 2.1 Ah. The supply lines for the Backup Battery are not fused.

5. External DC Power Connector

Older pumps only; not used.

6. Power Supply Interface Circuitry

The Power Supply Interface is located on the UIM PCB and consists of the following:

- Microprocessor Reset circuit
- Power On/Off circuit

Voltage levels for the UIM PCB are monitored within the Power Supply Interface Circuit and by the Slave Microprocessor to ensure that the microprocessor and memory components receive input power within their specified ranges.

The Microprocessor Reset Circuit generates the signals necessary to reset the Master and Slave Microprocessors when the pump is turned on.

When pressed from the Off state, the ***ON/OFF CHARGE*** key places the pump in the On state. When the pump is in the On state, the ***ON/OFF CHARGE*** key is monitored by the Slave Microprocessor. When the ***ON/OFF CHARGE*** key is pressed while the pump is in the On state, the Slave Microprocessor acknowledges the key press and informs the Master Microprocessor. The Slave and Master Microprocessors power the pump off by removing power from the power On/Off circuitry.

When the pump is in the Off state and plugged into a power source, the Slave Microprocessor and battery level indicator circuitry are activated to monitor the charge going into the main battery. If the pump is unplugged before it is turned on by the ***ON/OFF CHARGE*** key, the Slave Microprocessor deactivates the Power On/Off circuitry, which removes power from the Slave Microprocessor.

Table 12-1 shows the output voltages that are supplied by the Power Supply interface and the circuits to which each is applied.

Table 12-1 Internal DC Voltages

Voltage	Applied to*
V_{mas}	Master Memory Master Microprocessor ACC/Nurse Call External Communications Circuit Display Control Slave Microprocessor Pump Interface Circuit Real Time Clock Test point 1 (TP1)
V_{slv}	Battery Level Indicator ACC/Nurse Call Keypad Slave Microprocessor Main Speaker Slave Memory Slave EPROM Test point 3 (TP3)
V_{key}	Battery Charge Level Indicator Keypad ACC/Nurse Call Backup Beeper Slave Memory Test point 5 (TP5)
V_{mem}	Master Memory Real Time Clock
V_{beep}	Backup Beeper
V_{main}	ACC/Nurse Call Pump Module Backup Beeper F3 (input) Test point 6 (TP6)
V_{mainf}	CCFT Inverter Main Speaker Icon Circuit F3 (output, becomes V_{mainf})

*The test points are located on the UIM PCB.

7. Battery Charge Level Indicator Circuitry

The pump has a battery charge level indicator that shows the charge state of the Main Battery. The battery charge level indicator appears on the Main Display as part of the power-up self-test sequence. You can view the battery charge level indicator at any time by pressing the **Options** soft key on the Main Display, then selecting Battery Charge Level from the Options menu.

The battery charge level indicator displays 10 filled boxes when the battery is fully charged (charging current less than 25 mA). As the battery discharges, the number of filled boxes shown on the display decreases to represent the approximate charge remaining. Not more than two filled boxes are displayed when the battery charge is depleted to the Battery Alert level. No boxes are filled when the charge is depleted to the Battery Low alarm level.

The battery charge level indicator does not affect the operation of the batteries or the pump. The battery charge level indicator circuit monitors Main Battery voltage and current to obtain an estimate of battery charge level.

Battery Charging Circuit

The pump uses a 14.0 V float charging circuit to charge the Main Batteries. When battery capacity is low, the charging current is high. As capacity increases, charging current decreases. This relationship determines the amount of time it takes to charge the Main Batteries to full capacity. The Main Batteries are considered fully charged when the charging current is less than 25 mA.

User Interface Circuits

The user interface circuits are the principal means by which the user controls the pump.

8. UIM Keypad

The UIM keypad contains all the tactile membrane and soft key switches (keys) used to operate the pump. The keypad matrix is configured into a 5 by 8, (x/y) arrangement. A graphics overlay panel and structural member are laminated with the switch membrane layers to form the composite keypad assembly. The structural member provides rigidity and facilitates mounting. Connector J4 of the split 14-lead, printed ribbon cable connects to P4 of the UIM PCB.

9. Keypad Interface Circuitry

The keypad circuitry reads keypad input from the UIM keypad and the pump module keypad. Table 12-2 describes the keys and their functions:

Table 12-2 Keypad Interface Circuitry Keys

Key	Function
ON/OFF CHARGE	Applies power to the pump
Main Display	Restores the home menu display
Volume History	Provides information on the fluid volume infused
Alarm Silence	Silences the alarm momentarily
Back Light	Toggles the LCD back light on and off
Numbers	Enters numbers
CLR	Clears the entry and used as the backspace key in the custom label list screen
.	Decimal point
Rate	Establishes the mode to enter infusion rate
Vol	Establishes the mode to enter the total volume to be infused
START	Starts the infusion process
Open	Allows tubing to be unloaded
STOP	Pauses the infusion process

With the exception of the ***ON/OFF CHARGE*** key and the ***Open*** key, all keys are scanned using a read/write latch, controlled and monitored by the Slave Microprocessor. The ***ON/OFF CHARGE*** key applies its signal directly to the power on/off circuitry of the power supply interface block, described in the Power Supply Interface paragraph. The ***Open*** key applies its signal to a latch, which the Slave Microprocessor then reads.

10. PANEL LOCKOUT Button

There is a ***PANEL LOCKOUT*** button on the rear of the pump. When the panel lockout circuit is activated, most keypad-controlled functions are disabled to prevent unauthorized use. The ***Back Light***, ***Main Display, Volume History,*** and ***Alarm Silence*** keys remain activated. The panel lockout circuit can only be activated after the infusion volumes and rates have been entered and pumping has been started. To deactivate Panel Lockout, press the ***PANEL LOCKOUT*** button again.

Auto Lock — The Auto Lock feature is enabled through the pump's Personality feature set. If Auto Lock is enabled, the front panel locks automatically for two minutes after the last key is pressed (except for ***Back Light***, ***Main Display,*** ***Volume History,*** and ***Alarm Silence*** keys). Press the ***PANEL LOCKOUT*** button to allow use of the keypad.

11. Volume Control

The volume control potentiometer controls the volume of the pump's main speaker, which varies the voltage applied to the speaker. The backup beeper is not affected.

12. Contrast Control

The contrast control potentiometer adjusts the degree of difference between the lightest and darkest parts on the Main Display by varying the amount of voltage that the display controller circuit applies to the Main Display.

UIM Printed Circuit Board

The multi-layer UIM printed circuit board (UIM PCB) is the main PCB of the pump. A total of 11 connectors on the board provide connections to off-board components. Table 12-3 describes these connectors.

Table 12-3 UIM PCB Connectors and Interconnections

UIM PCB Connector	Interconnect
P1	Backup Battery
P2	Main Power/Main Batteries
P3	Pump Module control signals
P4	UIM Keypad
P5	UIM Display
P6	Contrast Control

Table 12-3 UIM PCB Connectors and Interconnections

UIM PCB Connector	Interconnect
P8	Pump Module power
P10	Volume Control
P12	Rear Harness (Main speaker, backup beeper, CCFT Inverter, Comm. Port)
P14	Not used
P15	LEDs/Icons PCB

The UIM PCB contains four fuses:

- F1 (2.0 A) fuses the $V_{unregulated}$ supply PICO SMF TYPE T
- F2 (0.375 A) fuses the VDC supply PICO SMF TYPE T
- F3 (0.5 A) fuses the V_{main} supply PICO SMF TYPE T
- F4 (0.375 A) fuses the Backup Beeper circuit V_{beep} PICO SMF TYPE T

13. Real Time Clock Circuitry

The Real Time Clock maintains the configured date and time. The Master Microprocessor controls and monitors this circuit. The Real Time Clock also generates a 1 Hz clock pulse for checking the oscillators of the Master and Slave Microprocessors.

14. Master Memory

The Master Memory Circuit provides the ROM and RAM necessary for operation of the Master Microprocessor. The ROM contains the program executed by the Master Microprocessor. The RAM provides storage for program variables and user data.

15. Master Microprocessor Circuitry

The Master Microprocessor Circuit is the pump's central controlling microprocessor. It interfaces with the:

- Slave Microprocessor
- Display Controller
- Pump Interface
- Real Time Clock
- External Communications (ACC/Nurse Call)
- Power Supply Interface

- Master Memory Blocks

This microprocessor controls and monitors all of the functions associated with:

- Information display
- External computer communications
- Pump Module communications
- Pump Module usage
- Real Time Clock operation
- Alarm control
- Nurse Call control
- Verification of the proper operation of the Slave Microprocessor, as described below

16. Slave Microprocessor and Slave Memory Circuitry

The Slave Microprocessor and Slave Memory Circuit support the Master Microprocessor and contains data processing and memory circuits. It interfaces with the Master Microprocessor, the Real Time Clock, the battery charge level indicator, the main speaker, the keypad, the power supply interface, and the ACC/ Nurse Call blocks.

The microprocessor controls and monitors all of the functions associated with:

- Reading the keypad
- Monitoring battery and power supplies
- Generating audible alerts/alarms
- Verifying proper operation of the Master Microprocessor

When the pump is in the Off state and plugged into a power source, the Slave Microprocessor and battery charge level indicator circuitry are activated to charge the main batteries. If the pump is unplugged before it is turned on, the Slave Microprocessor deactivates the Power On/Off circuitry, thus removing the power from the Slave Microprocessor.

17. ACC/Nurse Call

The Alarm Control Circuit (ACC) and Nurse Call circuitry control the backup beeper and nurse call alarms.

The Nurse Call circuitry routes an externally-generated signal to the nurse call station via selected pins on the COMM. port. Both normally open (N.O.) and normally closed (N.C.) contacts are available at the COMM. port. The Master Microprocessor controls this circuitry via an I/O port expander. The Nurse Call activates for all alarms and for Battery Low, KVO, and Piggyback Callback alerts.

18. Main Speaker Circuitry

The main speaker circuitry controls and monitors the main speaker. It consists primarily of an audio frequency amplifier and logic interface and control circuitry.

The speaker is activated by the Master Microprocessor and generates sounds based on software commands. Table 12-4 describes the conditions and sounds.

Table 12-4 Main Speaker Conditions and Sounds

Condition	Sound Description (default)
Alert	Single tone of medium duration
Alarm	Rapid 3-beep tone
Key response	Short, single beep tone
Hardware failure	Loud, fixed-volume tone

Circuit inputs consist of the following:

- From the Slave Microprocessor: software-generated AC signals for varying tones and DC signals for steady tones.
- The volume potentiometer (VR102, located on the right rear of the handle) allows the operator to control the speaker's volume. In the event of a hardware failure, this control is overridden to produce a loud, fixed-volume tone.

These signals, when enabled, are amplified to a level sufficient to drive the Main Speaker.

The main speaker circuit also monitors speaker operation. To detect a speaker failure, the speaker current detector monitors current delivered to the speaker from its amplifier. If the speaker current falls below a predetermined limit, a signal is sent to the Slave Microprocessor, which in turn removes power via the amplifier's switch. A failure code is issued, and the backup beeper is activated with a continuous tone.

19. Main Speaker

The main speaker circuit controls the 16 ohm dynamic speaker. It is the primary source of the pump's tones. The main speaker and associated circuitry are checked whenever the pump is powered on. In the event of a main speaker circuitry failure, the pump issues a failure code and activates the backup beeper with a continuous tone.

20. Backup Beeper Control Circuitry

The backup beeper control circuitry can be activated by the Master Microprocessor through the ACC/Nurse Call Circuit, the Slave Microprocessor, or the Power On/Off circuitry. It is activated if any of the following occurs:

- The main speaker fails.
- The power to the main speaker is restricted (such as during a low battery alarm condition).
- There is no activity from the Master or Slave microprocessors, which indicates a UIM PCB failure.

21. Backup Beeper

The backup beeper is a piezoelectric device controlled by the backup beeper control circuitry. It can also be controlled directly by the Slave Microprocessor when it is tested from the Voltage Sensor Data screen in the Service Features Menu. The backup beeper provides a continuous tone when it is activated.

22. Display Controller and LED Circuitry

The display controller circuitry controls the Main (LCD) Display on the UIM. The Main Display, backlit legends, and status LEDs display information that is generated by the UIM. The arrow keys to the right of the Main Display move the display cursor up or down the display screen. The triangle-shaped keys below the Main Display are “soft keys” used to access the menus indicated on the screen above them.

Status LEDs and icons indicate the following:

- Plug icon: pump is plugged into and using an AC power source
- Battery icon: pump is unplugged and operating on battery power
- Monitor: pump is being monitored by an external device
- Computer Control: pump is under the control of an external device

The display circuitry consists of the Main Display, a display controller with frame buffer memory, and a Cold Cathode Fluorescent Tube (CCFT) Inverter that provides power to the CCFT back light. The Master Microprocessor directly controls the display controller circuitry. The Master Microprocessor controls the status LEDs and icons via an I/O port expander.

23. CCFT Inverter Module

The CCFT inverter module is a high frequency, DC-to-AC inverter that provides up to 260 VAC for the CCFT. The inverter module’s operating power is 10 to 14 VDC, controlled by the On/Off input received from the UIM PCB’s Back Light On circuit. The inverter module provides an isolated 260 VAC output directly to the CCFT via its 4-pin output connector and high voltage (flying) leads.

24. Main Display

The Main Display is a self-contained, CCFT backlit, monochrome graphic liquid crystal display (LCD) module. The module contains the following:

- Liquid crystal display printed circuit board (LCD PCB)
- Liquid crystal display (glass with frame)
- CCFT with leads

The Main Display requires only power, data, and control signals as inputs:

- Power required for operation consists of 5 VDC at approximately 15 mA for logic circuitry, and -18 VDC at 10 mA for the LCD drive.
- Four data lines provide data to the LCD.
- Control signals include Scan Start, Framing, Latching Pulse and Display Data, and Transfer Clock. All inputs and outputs are conveyed to and from the module via a 14-pin connector and flat ribbon cables. The UIM PCB Display Controller Circuit drives the Main Display.

25. Back Light Circuit

A switching circuit located on the UIM PCB energizes the CCFT Inverter Module. When the ***Back Light*** key is pressed, transistor Q23 accepts the back light on drive directly from the Pump Interface circuit. Q23 turns on FET QD2A, which acts as a switch. When QD2A is switched on, V_{mainf} (10-14 VDC) operating power is routed to the CCFT inverter, which then converts it to the 260 VAC required by the CCFT.

26. External Communications Circuitry

The external communications circuitry on the UIM PCB handles the communications port. The Master Microprocessor controls external communications circuitry. Older Colleague pumps have communications ports that are RS232-compatible only. Newer (software version 4.02 and up) pumps have an ISOCOM port that is RS232 and RS423-compatible.

27. LED/Icons Circuitry

The LED/Icons circuitry controls the LEDs and icons on the UIM. Table 12-5 describes these LEDs:

Table 12-5 LEDs on the UIM

LED	Type
Plug icon	Status LED; lights when pump is plugged in
Battery icon	Status LED; lights when pump is running on battery
Monitor	Status LED; for computer monitoring
Computer Control	Status LED; for future use

28. Pump Interface Circuitry

The pump interface circuitry communicates between the UIM and the pump module(s). Data, power, and control signals are passed between the UIM and the pump module(s) via two connections.

The UIM and pump module(s) periodically exchange messages. Cyclic redundancy checksums (CRCs) are used to verify the integrity of these messages. If either module does not respond to a message from the other, the pump stops (if it was pumping), an audible alarm occurs, and an error message is displayed.

Pump Module

Colleague pumps have one pump module. Colleague 3 pumps have three independently-programmable pump modules. Pump modules have the following:

- PM PCB
- Air in Line PCB
- Pumping mechanism
- Pump Module keypad
- Vacuum Fluorescent Display
- Accessory port

29. Pump Module Printed Circuit Board

The PM PCB controls operation of the pumping mechanism. The PM PCB receives command information from the UIM PCB via the ribbon cable connected to P9 of each pump module. The PM PCB receives power from the UIM PCB via connector P10.

30. Air In Line PCB (AIL PCB)

An Air In Line PCB plugs into J1 on each PM PCB. The AIL PCB processes analog signals that flow to and from the ultrasonic air sensor piezoelectric elements (receiver and transmitter) located in the tubing path downstream from the shuttle. The receiver and transmitter are situated above and below the tubing, respectively, and are hard-wired to the AIL PCB using separate coaxial cables.

During pumping, the air sensor circuitry samples the output of the receiver element once every 10 µL of flow volume. The air sensor circuitry accumulates an air in line count over an amount of solution delivered. The amount of delivered solution depends on the programmed bubble size. The AIR alarm is triggered and pumping is stopped when the accumulated count exceeds the programmed bubble size. The alarm thresholds are approximately 25µL of air in 0.83 mL delivered, 50µL of air in 1.67 mL delivered, 100µL of air in 3.33 mL delivered, or 150µL of air in 5.0 mL delivered, depending on the programmed bubble size.

All communication between the AIL PCB and the UIM is via the Pump Module Microprocessor circuitry, located on each PM PCB. The AIL PCB requires an operating supply voltage of +5 VDC.

31. Pump Mechanism

The pump mechanism contains the shuttle that pumps fluid through the tubing, as well as the following sensors:

- Air Sensor: Transmits an ultrasonic signal through the tubing and measures the signal received on the other side of the tubing. The received signal is converted to a voltage by the AIL PCB.
- Upstream Occlusion Sensor: Measures decreases in tubing pressure to detect the presence of a tubing occlusion upstream of the pumping mechanism.
- Downstream Occlusion Sensor: Measures increases in tubing pressure to detect the presence of an occlusion downstream of the pumping mechanism.
- Temperature Sensor(s): Shuts down the pump if the temperature is outside of operating range; compensates for changes in tubing due to temperature.
- Tube Load Sensors: Detects the presence or absence of tubing in the pump mechanism. Pumping will not occur if tubing is not present.
- Tube Misload Sensor: An additional sensor detects tubing that is misloaded and causes the PM PCB to send an alarm to the UIM PCB. Pumping will not occur if tubing is misloaded.
- On/Off Clamp Sensors: Detect the presence or absence of the administration set's keyed On/Off clamp in the slot. Pumping will not occur if the keyed On/Off clamp is not present.

The output of all of the sensors, except the air sensor, is sent directly to the PM PCB. The air sensor's output is sent to the AIL PCB for processing before being sampled by the PM PCB.

On/Off Clamp Loading — While the tube alignment mechanism is positioning the tube, a second mechanism closes the administration set's keyed On/Off clamp. This blocks fluid flow while the tubing is being loaded. The On/Off clamp slot is asymmetric and matches the shape of the keyed On/Off clamp, ensuring that the keyed On/Off clamp (and thus the administration set) is inserted correctly. In this way, the operator is forced to load the tubing in the correct direction for pumping to take place (left to right when facing the pump). Once the tubing is loaded and fluid flow is controlled by the pumping mechanism, the mechanism pulls the keyed On/Off clamp to its open position.

Occlusion Detection — The pump uses cantilever beam strain gauges to monitor the contraction or expansion of the tubing, which indicates upstream or downstream occlusions. When a tubing segment is initially loaded into the pump module and the ***START*** key is pressed, the upstream and downstream sensor values are zeroed to represent a new tube without occlusions. This zero point is maintained until a tubing segment is loaded again.

If an occlusion develops on the upstream side of the pump module, a vacuum develops during the shuttle's fill cycle. This causes the tubing under the upstream sensor to collapse. An upstream occlusion alarm occurs when the tubing collapses by a predetermined amount.

Similarly, if an occlusion develops on the downstream side of the pump module, positive pressure develops during the shuttle's delivery cycle that causes the tubing under the downstream sensor to expand. A downstream occlusion alarm occurs when the tubing expands by a predetermined amount. This amount depends on the selected pressure setting and the rate at which the pump is delivering fluid.

Pump Operation — The pump mechanism consists of a reciprocating shuttle and two valves: an inlet valve located upstream of the shuttle, and an outlet valve located downstream of the shuttle. The shuttle pumps fluid by compressing the tubing within its track. The shuttle speed controls the flow rate. The inlet and outlet valves control the direction of fluid flow. A single motor and a dual-function cam operate the shuttle and valves. The cam action ensures that the critical timing between the valves and shuttle is maintained.

The shuttle propels 300 µL per cycle. This equates to an operating speed of 0.9 seconds for 1 cycle at a flow rate of 1200 mL/hr, and 180 minutes for 1 cycle at 0.1 mL/hr.

The following paragraphs and illustrations describe each step of a complete shuttle cycle.

Step 1: With primed tubing inserted and both valves closed, the shuttle is fully open. Pressing the ***START*** key causes delivery to begin (Figure 12-1).

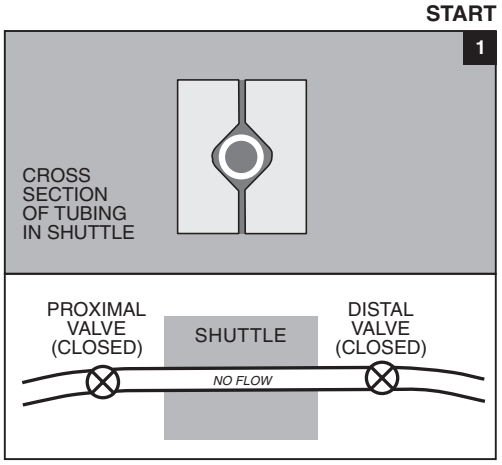


Figure 12-1 Start of Shuttle Cycle

Step 2: Pumping begins when the distal valve opens and the shuttle compresses the tubing in the initial direction (Figure 12-2).

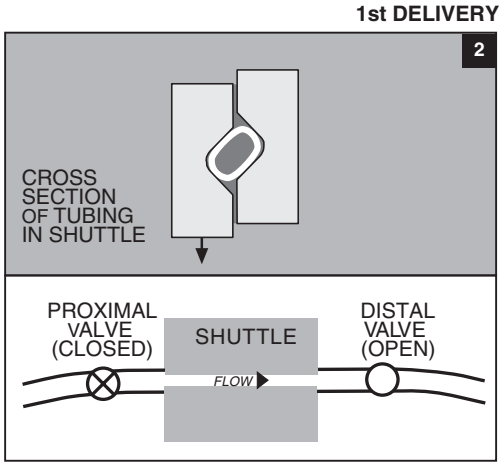


Figure 12-2 First Delivery

Step 3: At the extreme of its travel, the shuttle reverses its direction as the distal valve closes and the proximal valve opens (Figure 12-3).

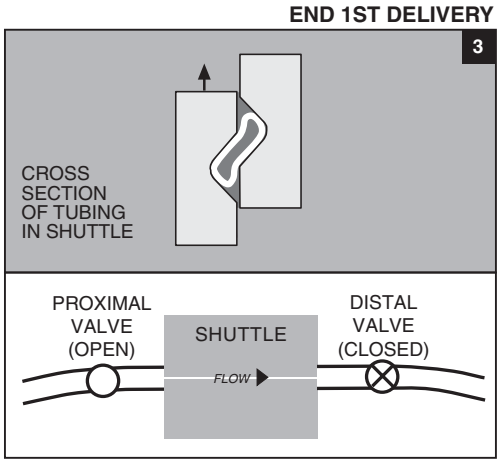


Figure 12-3 End of First Delivery

Step 4: The segment of tubing between the valves begins filling as the shuttle returns to the fully open original position (Figure 12-4).

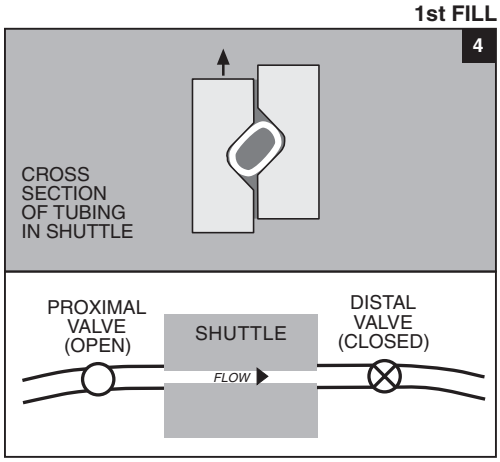


Figure 12-4 First Fill

Step 5: When the shuttle has returned to its original position, filling is complete, and both valves close (Figure 12-5).

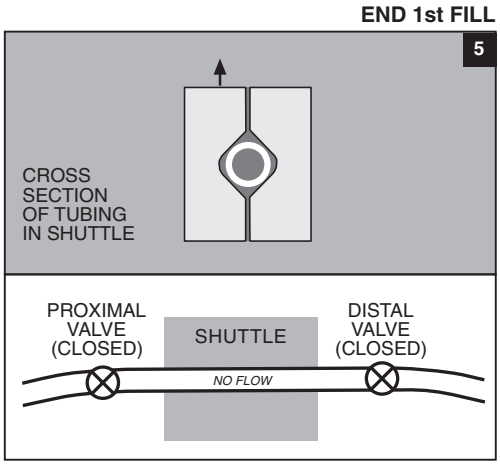


Figure 12-5 End of First Fill

Step 6: The shuttle continues its motion through the original position and starts its second delivery phase (Figure 12-6).

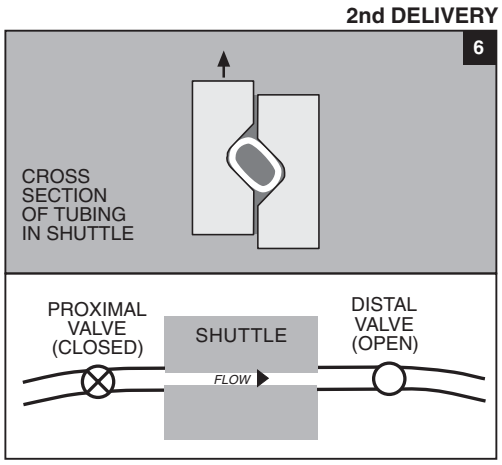


Figure 12-6 Start of Second Delivery

Step 7: The shuttle reaches the end of its travel at the end of the second delivery phase (Figure 12-7).

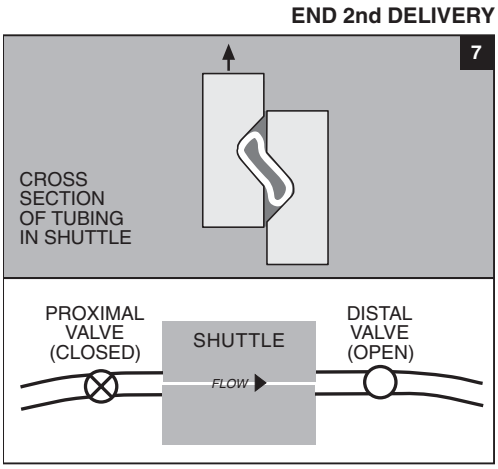


Figure 12-7 End of Second Delivery

Step 8: As during the first fill phase, tubing is reformed by the shuttle. The distal valve closes, and the proximal valve opens. Fluid is drawn in as the shuttle restores the tubing to its original shape (Figure 12-8).

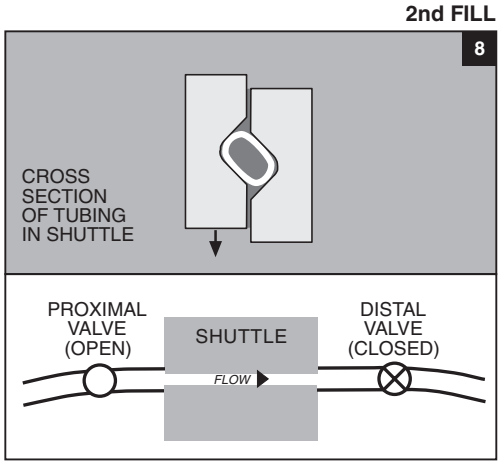


Figure 12-8 Second Fill

Step 9: At the end of the second fill phase, the shuttle has completed one full cycle (Figure 12-9).

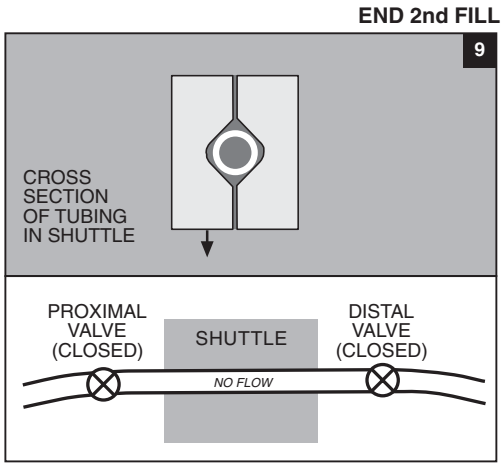


Figure 12-9 End of Second Fill

Manual Tube Release — A hinged tab on the side of each pump module may be flipped outward to provide a knob for manual tube release. Rotating the knob counterclockwise first moves the keyed On/Off clamp to the no-flow (closed) position and then opens the pumping mechanism, which releases the tubing. The manual tube release is intended for use only when the pump is unable to unload the tubing itself (such as if the batteries are dead and there is no AC power available, or if a hardware failure prevents proper unloading). The manual tube release activates a hardware switch and software that notifies the user that the manual tube release was used.

Note: The manual tube release tab must be closed for the pump to operate normally.

32. Pump Module Vacuum Fluorescent Display

Each pump module has an eight-character, vacuum fluorescent dot-matrix display that displays alarm and alert messages, flow rate, and other information related to the infusion. The PM PCB provides power and data to the display's integral PCB.

33. Pump Module Keypad Assembly

During normal operation, the UIM processes the ***Open*** and ***STOP*** keys, located on each pump module. The PM PCB can also sample these keys if the UIM PCB fails. The Running, Alert, and Alarm status LEDs are integral to each pump module keypad and are driven by the PM PCB.

34. Accessory Port

Present on older pumps only; not used.

Protection Against Over/Underinfusion

Software-interlinked monitoring and control functions provide protection against overinfusion and underinfusion. The functions involve the:

- Pump module microprocessor circuitry
- UIM Master Microprocessor
- Shuttle's motor control and positioning circuitry

Two separate software routines are run within the Pump Module microprocessor to monitor, compare, and correct the shuttle motor drive signal to maintain flow volume accuracy.

Basic drive signal calculation

When the pump is programmed to deliver an infusion, a two-stage calculation (cycle time) is begun to establish proper shuttle motor drive. The drive signal is conditioned to deliver the volume programmed, at the proper rate, and over the appropriate time period. The cycle time calculation is repeated during each shuttle cycle, and its results are used to refine the shuttle motor drive signal.

Drive signal verification

Two independent electromechanical closed-loop circuits (the shuttle motor encoder circuitry and the cam index sensor circuitry) establish, maintain, and verify shuttle motor speed:

- The pump module microprocessor compares data obtained by monitoring these circuits (shuttle flow volume and flow rate) with the calculated flow volume based on cycle time.

  If, at any time, the actual flow volume delivered does not closely coincide with the calculated flow volume, pumping is stopped, and an appropriate alarm is set. In this way, the motor drive is continuously adjusted and checked to maintain accurate flow volume delivery.

- The UIM Master Microprocessor continually compares the programmed rate against the rate reported by each pump module for the infusion in progress. If the rate reported by a pump module does not coincide with the programmed rate, pumping is stopped, and an appropriate alarm or failure is set.

Chapter 13

Diagrams

The following foldout diagrams are included in this chapter:

- Figure 13-1 Navigating through the Configuration/Service Screens
- Figure 13-3 Overall Signal Flow Block Diagram
- Figure 13-4 Power Distribution Diagram
- Figure 13-5 Interconnecting Wiring Diagram

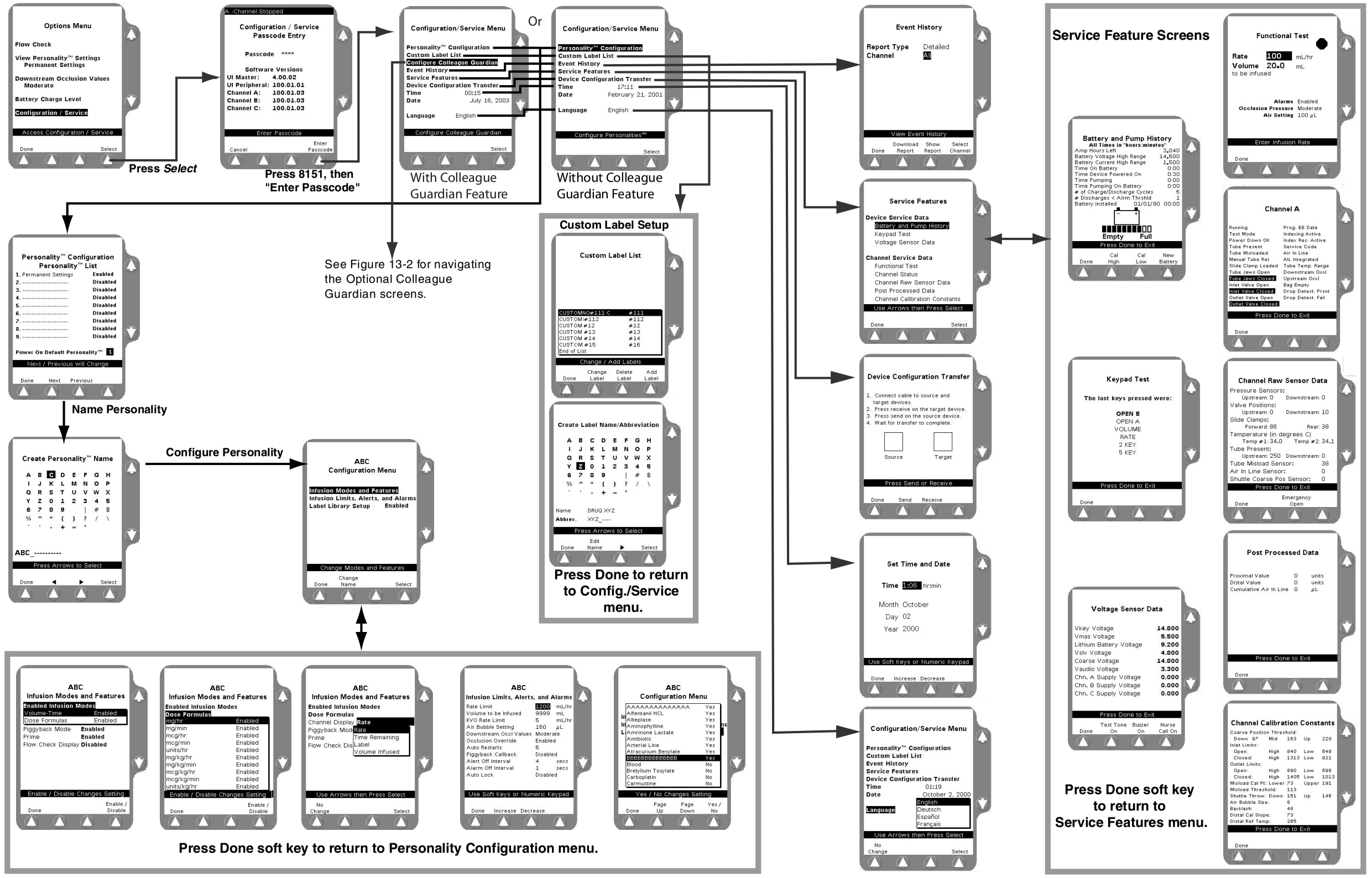


Figure 13-1 Navigating through the Configuration/Service Screens

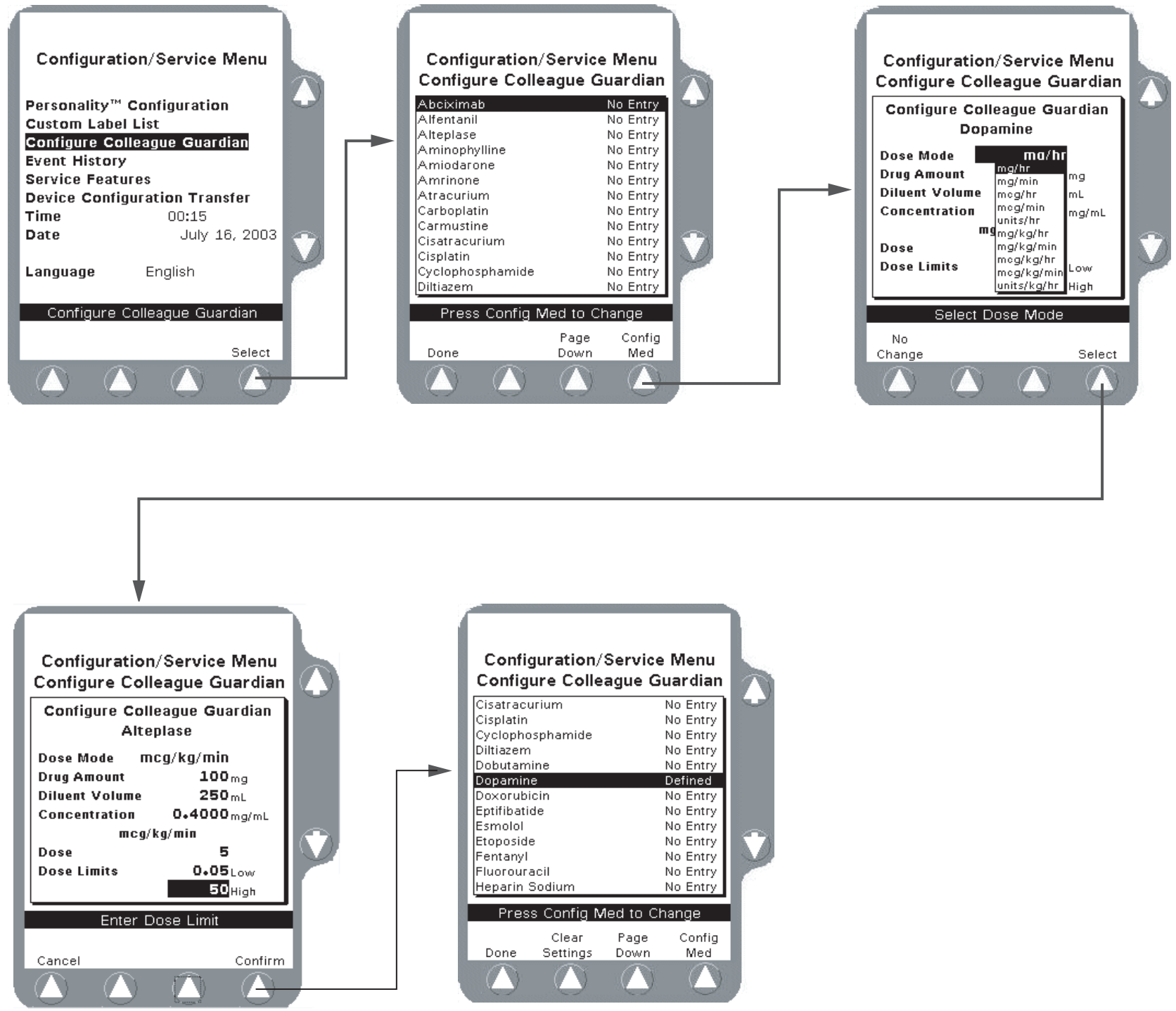


Figure 13-2 Navigating through the Optional Colleague Guardian Feature Configuration Screens

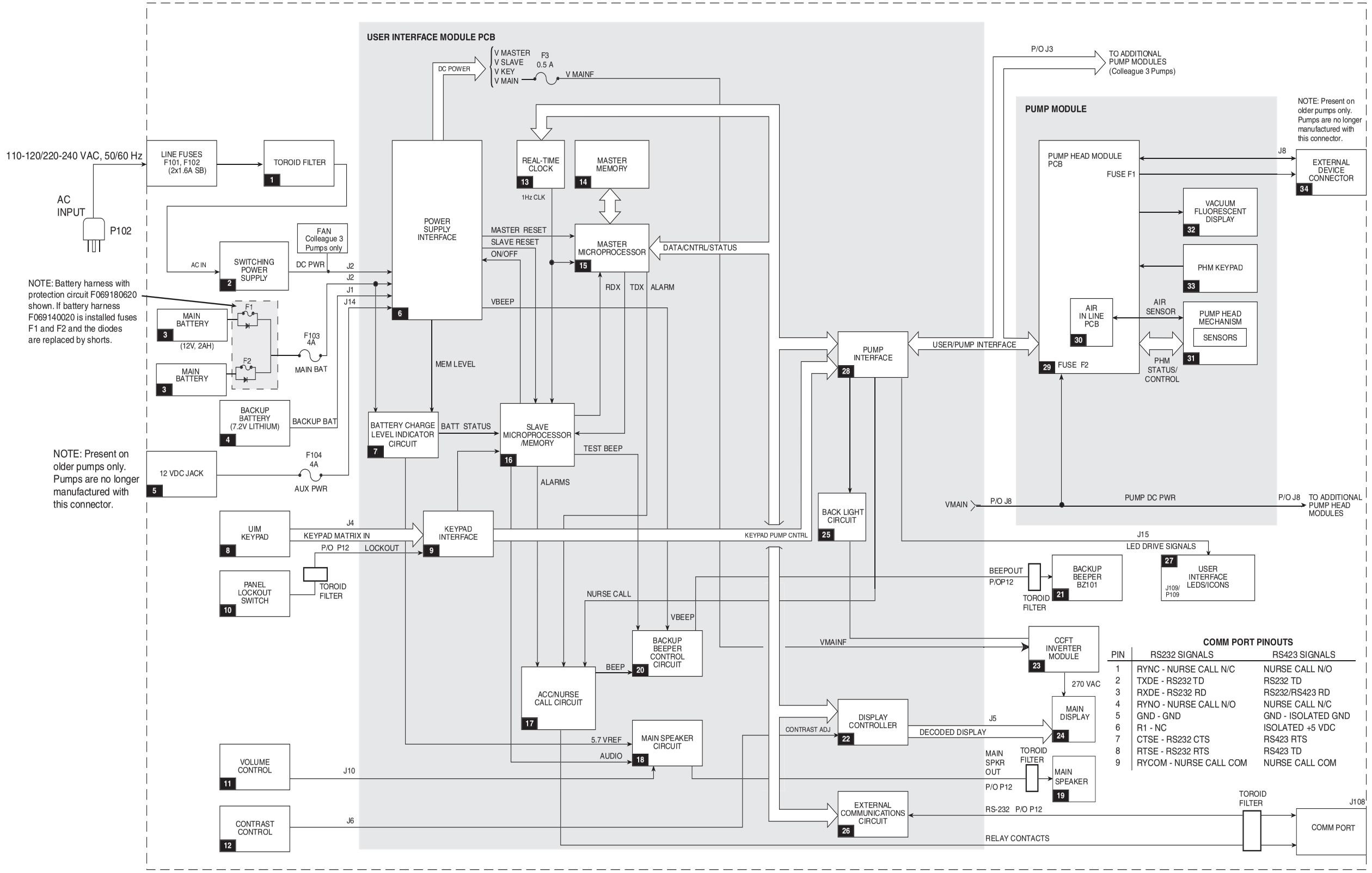


Figure 13-3 Overall Signal Flow Block Diagram

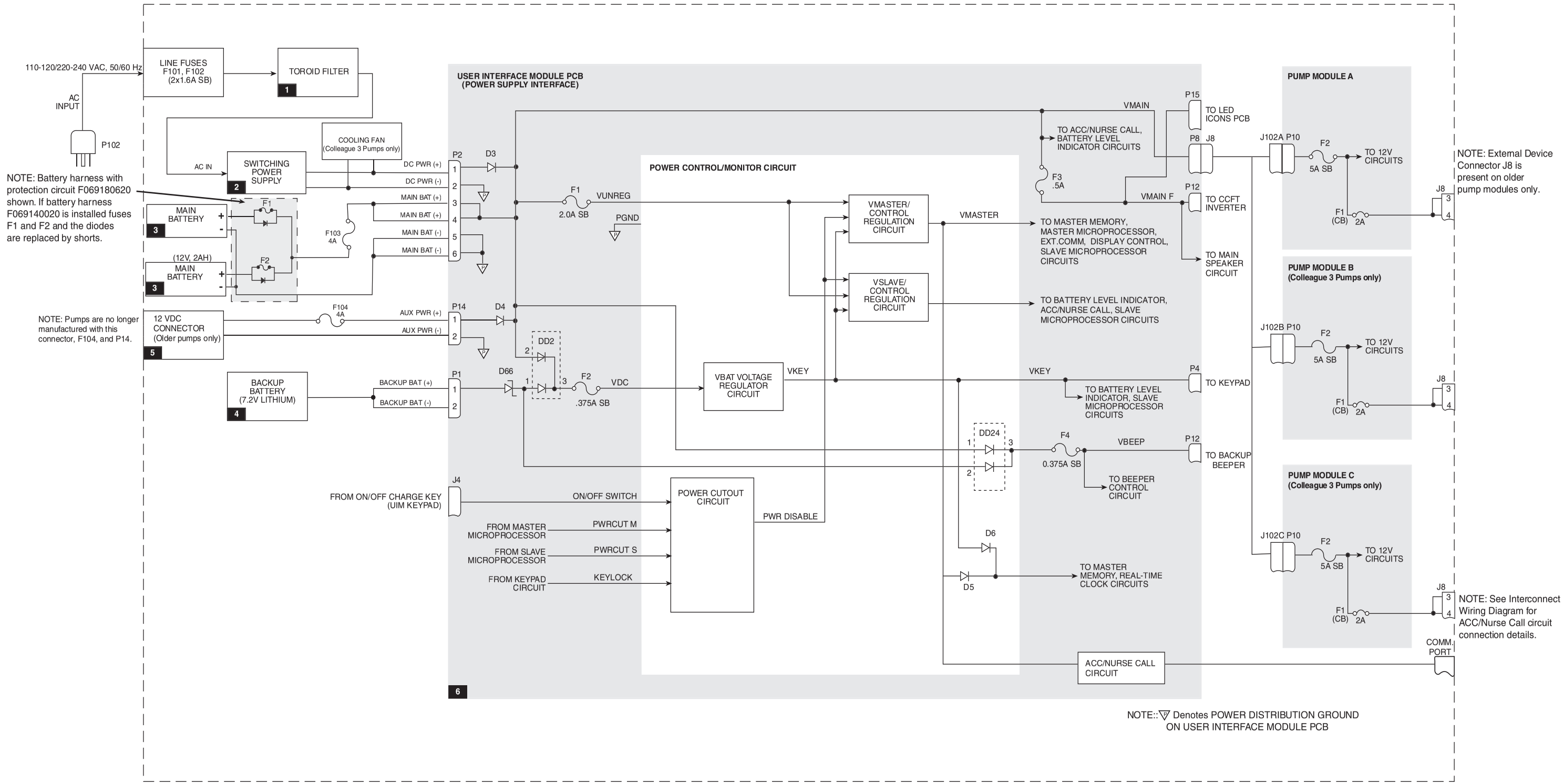


Figure 13-4 Power Distribution Diagram

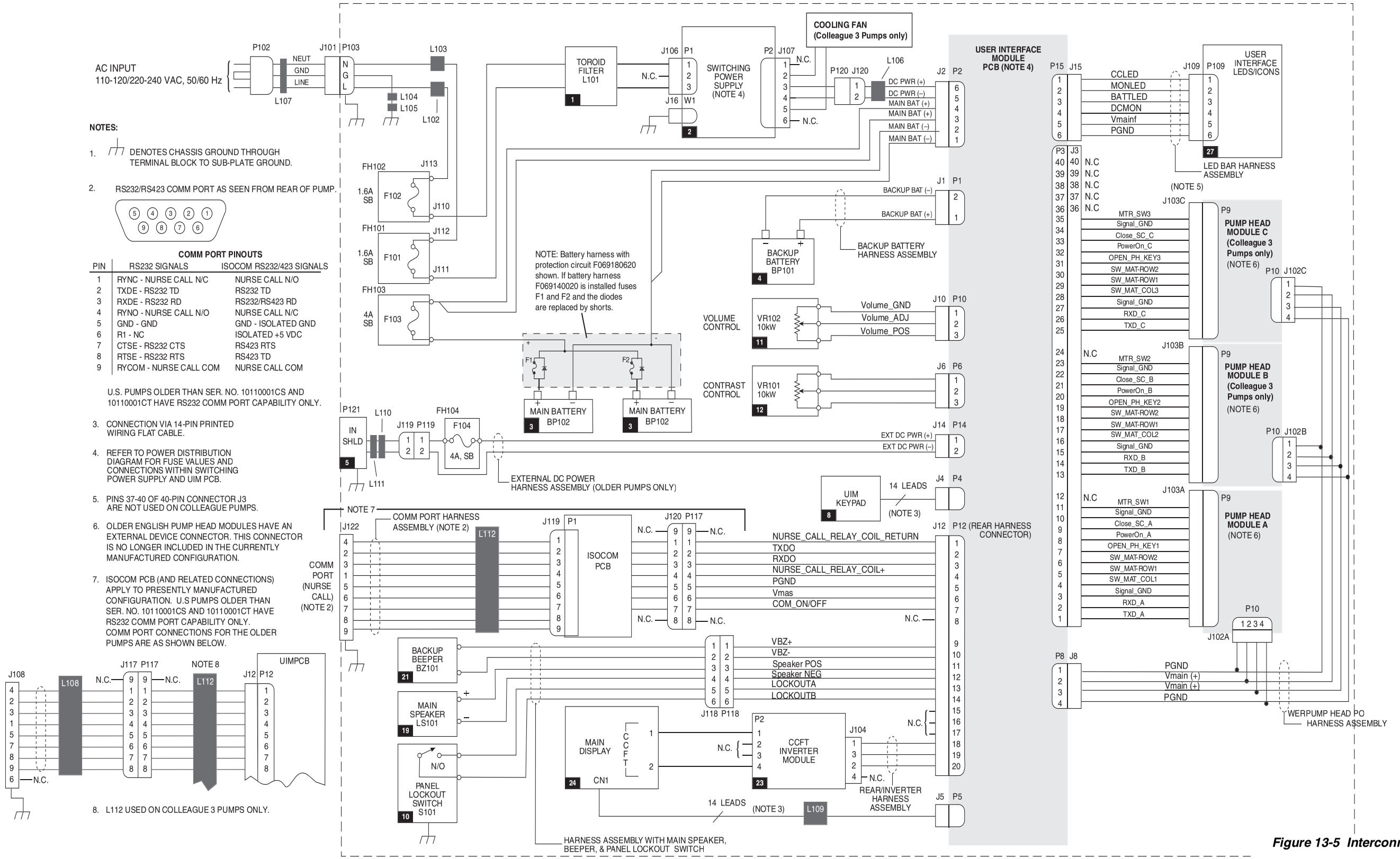


Figure 13-5 Interconnecting Wiring Diagram

Appendix A

Acronym List

Table A-1 lists all acronyms used throughout this manual and their definitions.

Table A-1 *Acronym List*

Acronym	Definition
A	Amperes
AC	Alternating current
A/D	Analog to digital converter
Ah	Amp-hours
AIL	Air in line
ASTM	American Society for Testing and Materials
BCLI	Battery charge level indicator
Bit	Binary digit
C	Centigrade
CAN/CSA	Canada/Canadian Standards Association
CCW	Counterclockwise
CE	Conformité Européene
cm	Centimeter
Comm	Communication(s)
CPU	Central processing unit
CRC	Cyclical redundancy check
CW	Clockwise

Table A-1 *Acronym List — continued*

Acronym	Definition
D	Depth
DC	Direct current
EEC	European Economic Community
EMI	Electro-Magnetic interference
EPROM	Erasable programmable read only memory
F	Fahrenheit
H	Height
hPa	Hecto Pascals
hr	Hour
Hz	Hertz
IA	Intra-arterial
IEC	International Electrical Committee
in.	Inch
IP	Ingress Protection
IV	Intravenous
JCAHO	Joint Committee on Accreditation of Healthcare Organizations
kg	Kilogram
KVO	Keep vein open
L	Liters
lbs	Pounds
LED	Light emitting diode
µA	Micro-ampere
mcg, µg	Microgram
mg	Milligram
MHz	Mega-Hertz
min	Minute, minimum

Table A-1 *Acronym List — continued*

Acronym	Definition
µL	Microliter
mL	Milliliter
mm	Millimeter
mmHg	Millimeters of mercury
MTR	Manual tube release
N/A	Not applicable
NC	Normally closed
NFPA	National Fire Protection Association
NO	Normally open
PC	Personal computer
PCB	Printed circuit board
PHM	Pump Head Module
PN	Part number
PROM	Programmable read only memory
psig	Pounds per square inch gauge
RAM	Random access memory
RH	Relative humidity
RMS	Root mean square
ROM	Read only memory
RTC	Real time clock
TPN	Total parenteral nutrition
U.K.	United Kingdom
U.S.	United States
UIM	User Interface Module
UL	Underwriters Laboratories Inc.
URL	Universal resource locator

Table A-1 *Acronym List — continued*

Acronym	Definition
V	Volts
VAC	Volts alternating current
VDC	Volts direct current
VI	Volume infused
VTBI	Volume to be infused
W	Width

Appendix B

Forms

This Appendix contains forms for you to reproduce and use as you service and maintain the pump. The following forms are included in this Appendix:

- Calibration Data Sheet
- Operational Checkout Data Sheet

Calibration Data Sheet

Pump Serial Number:_____

Tested by: (print name)_____Date:_____ Signature:_____ Date:_____

This section contains a blank data sheet for recording the results obtained when performing the calibration procedures included in Chapter 9. Reproduce one copy of the complete data sheet for each pump you calibrate.

Note: Insert N/A (not applicable) for both Pass and Fail columns whenever a step does not have to be performed or a value entered. For example, if you are calibrating a Colleague pump, mark N/A for all pump module B and C tests, because the pump has only one pump module.

Power Supply				
Step 17 Value (14.00±0.1 VDC)	**Corrective Action Taken**	**N/A**	**Fail**	**Pass**

Battery Charge Level Indicator							
Setup and Battery Preparation							
Note: Colleague pumps with one battery must be upgraded to use two batteries. See “Adding a Second Battery (Colleague Pumps Only)” on page 8-38.							
Batteries charged? (Check one) Yes❑ No❑							
Charge Current Diagnostics							
BCLI out of calibration? Yes ❑ No ❑							
Attempt	**Step 1 (Check box after 2 hours of cooling)**	**Step 5 Value After Adjustment (505 to 507)**	**Step 8 Value After Adjustment (498 to 502)**	**Corrective Action Taken**	**N/A**	**Fail**	**Pass**
1	❑						
2	❑						
3	❑						
BCLI Closed Bezel Calibration Check							
Attempt		**Step 4 Stabilized Cal Low value (480 to 547)**	**Step 6 Cal High value (501 to 522)**	**Corrective Action Taken**	**N/A**	**Fail**	**Pass**
1							
2							
3							

Calibration Data Sheet

Pump Serial Number:_____

Tested by: (print name)_____Date:_____ Signature:_____ Date:_____

AIL PCB Calibration									
Pump Module	Step 14 Value (230±1)	Step 17 Value (>189)	Step 18 Value (<238)	Step 21 Value (<129)	Step 22 Value (step 18) - (step 17)>4	Corrective Action Taken	N/A	Fail	Pass
A									
B									
C									

AIL PCB Calibration Verification							
Pump Module	Step 2 Value (≤128)	Step 5 Value (>189)	Step 7 Value (≥243)	Corrective Action Taken	N/A	Fail	Pass
A							
B							
C							

Operational Checkout Data Sheet

Pump Serial Number:_____

Tested by: (print name)_____Date:_____ Signature:_____ Date:_____

This section contains a blank data sheet for recording the test results after removal/replacement of the components listed below, or for a full Operational Checkout. Reproduce one copy of the complete data sheet for each pump you test.

The tests marked with an asterisk (*) are not applicable (N/A) after removal/replacement of the following assemblies:

- Pump Module
- Accessory Connector Assembly
- Manual Tube Release Knob
- Pump Display Assembly
- Pump Channel Keypad
- Air In Line PCB
- Pump Housing

Note: Insert N/A (not applicable) for both Pass and Fail columns whenever a test does not have to be performed or a value entered. For example, if you are testing a Colleague pump, mark N/A for all pump module B and C tests, because the pump has only one pump module.

Test	If test fails, record indications, replaced/failed components or actions taken	Fail	Pass
Exterior Inspection*			
Power Cord Condition			
RTV Seal Check*			
Mounting Clamp Check*			
Shake Test*			
Power On Self-Test			
Software Version Check (record in table below)		N/A	N/A
Verify that all required upgrades have been incorporated (see Table 2-7 on page 2-19)		N/A	N/A
Event History Check		N/A	N/A
Time/Date Check*			
Check Battery			

Operational Checkout Data Sheet

Pump Serial Number:_____

Tested by: (print name)_____Date:_____ Signature:_____ Date:_____

Software Type	Current Software Version	Upgraded to Version (if applicable)
UI Master		
UI Slave		
Pump Module A		
Pump Module B (Colleague 3 pumps only)		
Pump Module C (Colleague 3 pumps only)		

Test	If test fails, record indications, replaced/failed components or actions taken	Fail	Pass
Keypad Test*			
Voltage Sensor Data Check	**(Record voltage measurements)**		
Chan. A Supply			
Chan. B Supply			
Chan. C Supply			
Vkey			
Vmas			
Lithium battery			
Vslv			
Coarse Voltage			
Vaudio			
Speaker and Backup Beeper Test*			
Nurse Call Relay Test*			

Operational Checkout Data Sheet

Pump Serial Number:_____

Tested by: (print name)_____Date:_____ Signature:_____ Date:_____

Air in Line Test						
Step 6 Value (≥187)	**Step 8 No Failure Codes**	**Step 10 Value (≤128)**	**Step 14 - Air Alarm Occurs**	**Corrective Action Taken**	**Fail**	**Pass**
Pump Module B (Colleague 3 Pumps only)						
Pump Module C (Colleague 3 Pumps only)						

PHM to Pumphead Housing Alignment Test		
Slide clamp slot aligned with pump mechanism	**Pass**	**Fail**
Pump module A (all pumps)		
Pump module B (Colleague 3 pumps only)		
Pump module C (Colleague 3 pumps only)		

Channel Emergency Open Test				
Administration Set Removed			***ON/OFF CHARGE* Key**	
	Pass	**Fail**	**Pass**	**Fail**
Pump Module A:				
Pump Module B:				
Pump Module C:				

Tube Misload Sensor Test		
If test fails, record indications, replaced/failed components or actions taken.	**Fail**	**Pass**
Pump Module A:		
Pump Module B:		
Pump Module C:		
Battery Discharge Test		
If test fails, record indications, replaced/failed components or actions taken.	**Fail**	**Pass**
If batteries were replaced, verify that batteries are of the same make and were manufactured within 3 months of each other.		
If a Colleague pump was upgraded from one battery to two, verify that new ratings label was installed.		

Operational Checkout Data Sheet

Pump Serial Number:_____

Tested by: (print name)_____Date:_____ Signature:_____ Date:_____

Upstream Occlusion Test			
Time to Alarm (≤30 sec.)	If test fails, record indications, replaced/failed components or actions taken	Fail	Pass
Pump Module A:			
Pump Module B:			
Pump Module C:			

Volume Delivery Accuracy Test					
	Final Weight minus Initial Container Weight = Fluid Weight			Final Fluid Weight Range (19.0 to 21.0 grams)	
Pump Module	Initial Weight	Final Weight	Fluid Weight	Pass	Fail
Pump Module A:					
Pump Module B:					
Pump Module C:					

Downstream Occlusion Pressure Test											
Minimum Pressure Reading (0.29 to 4.79 psi at 20 mL/hr)			Minimum Pressure Reading (1.52 to 7.83 psi at 100 mL/hr)			Moderate Pressure Reading (4.24 to 12.83 psi at 100 mL/hr)			Maximum Pressure Reading (6.96 to 17.84 psi at 100 mL/hr)		
Step 12	Pass	Fail	Step 17	Pass	Fail	Step 23	Pass	Fail	Step 29	Pass	Fail
Pump Module A:											
Pump Module B:											
Pump Module C:											

Short Downstream Occlusion Pressure Test		
If test fails, record indications, replaced/failed components or actions taken	Fail	Pass
Pump Module A:		
Pump Module B:		
Pump Module C:		

Operational Checkout Data Sheet

Pump Serial Number:_____

Tested by: (print name)_____Date:_____ Signature:_____ Date:_____

Manual Tube Release Test		
If test fails, record indications, replaced/failed components or actions taken	**Pass**	**Fail**
Pump Module A:		
Pump Module B:		
Pump Module C:		

Electrical Safety Tests				
Test	**Measured Value**	**If test fails, record indications, replaced/failed components or actions taken**	**Pass**	**Fail**
Ground Impedance (≤0.5Ω)				
Leakage Current (≤100µA with ground intact)				
Leakage Current (≤300µA with ground open)				

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Warranty

Baxter warrants that the equipment shall be free from defects in material and workmanship when delivered to the original purchaser. Baxter's sole obligation shall be to repair or replace the product (excluding batteries), at Baxter's option and expense, for a period of one year following the date of initial delivery. The warranty period for batteries is limited to a period of six months following the date of initial delivery.

This warranty extends only to the original purchaser and is not assignable or transferable, and shall not apply to auxiliary equipment or disposable accessories. There are risks associated with using anything other than the recommended Baxter administration sets with this device. Baxter's warranty to repair or replace the product will be null and void if this product is used contrary to the directions for use contained in the labeling. Baxter will assume no responsibility for incidents which may occur if the product is not used in accordance with product labeling.

Installation or use of component parts from sources other than Baxter authorized parts facilities, without the express written consent of Baxter, shall void the warranty given herein. In providing any parts for repair or service of the product, Baxter shall have no responsibility or liability for the actions or inactions of the person performing such repair or service, regardless of whether such person has been trained to perform such repair or service. It is understood and acknowledged that any person other than a Baxter trained service person performing repair or service is not an authorized agent of Baxter.

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