



# INFUSION PUMP ANALYZER



**IPA-1000**

**USER MANUAL**



**BC BIOMEDICAL  
IPA-1000  
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<p style="text-align: center;"><b>BC GROUP</b> <b>IPA-1000</b> <b>INFUSION PUMP ANALYZER</b></p>
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The Model IPA-1000 Series is a Microprocessor based High Precision infusion Pump Analyzer (IPA). It tests the flow rate of intravenous (I.V.) infusion pumps. The flow rates are displayed in milliliters per hour. The unit can test two volumetric pumps for output flow rate simultaneously using two volumetric chambers.

The following are highlights of some of the main features.

IPA-1000 (BASIC FEATURES):

- LARGE GRAPHICS DISPLAY WITH CURSOR SELECTION OF OPTIONS AND SETUP OF PARAMETERS
- +/- 1% OF READING FLOW ACCURACY
- STANDARD MILLILITERS PER HOUR RANGE
- DIGITAL CALIBRATION – NO POTS TO TURN
- SELECTABLE DISPLAY OPTIONS AND DIGIT SIZES
- BATTERY LIFE DISPLAY (0 TO 100%)
- SOFTWARE ADJUSTABLE CONTRAST
- USES ANY COMBINATION OF CHAMBERS
- 3.5 ML & 35 ML CHAMBERS AVAILABLE
- SIMPLE TO MAINTAIN AND CLEAN (NO VALVES)
- REPLACEABLE TUBES
- SEALED LEVEL SENSORS
- AUTOMATIC DETECTION OF CONNECTED CHAMBER TYPE
- PROGRAMABLE END OF TEST AUDIO
- PROGRAMABLE AUTO OR MANUAL TEST START
- OPTIONAL BATTERY ELIMINATOR

OPTIONAL ACCESSORIES:

- BE2000PU 120 VAC BATTERY ELIMINATOR, U.S.
- BE2000PE 220 VAC BATTERY ELIMINATOR, EUROPE
- BC20-30109 SOFT CARRYING CASE

AVAILABLE MODELS:

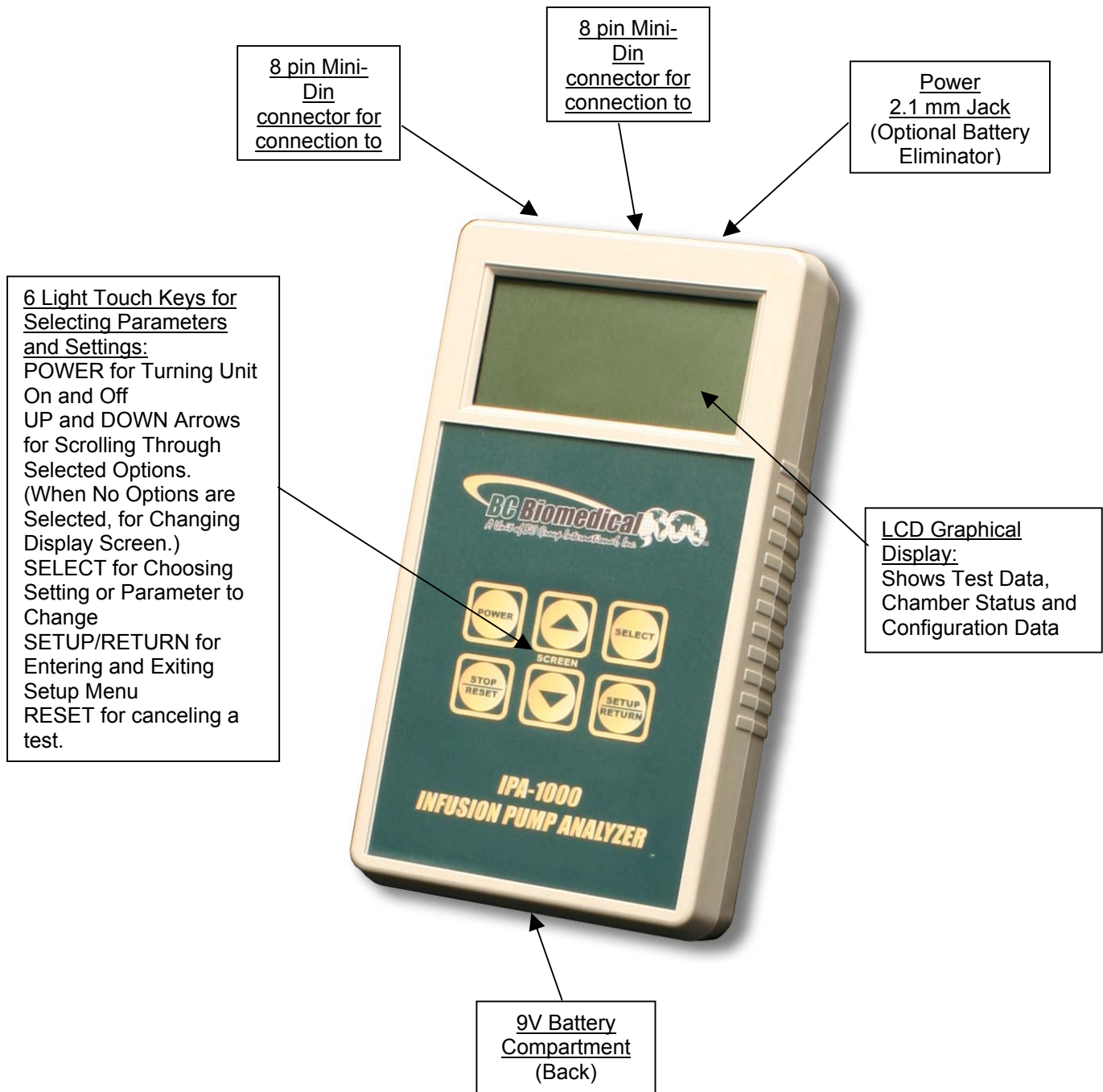
The base unit plus one of the volumetric chambers are required to test infusion pumps.

The part numbers are:

- IPA-1000 INFUSION PUMP ANALYZER BASE UNIT
- MC3.5-1000 3.5 mL VOLUMETRIC CHAMBER
- MC35-1000 35 mL VOLUMETRIC CHAMBER

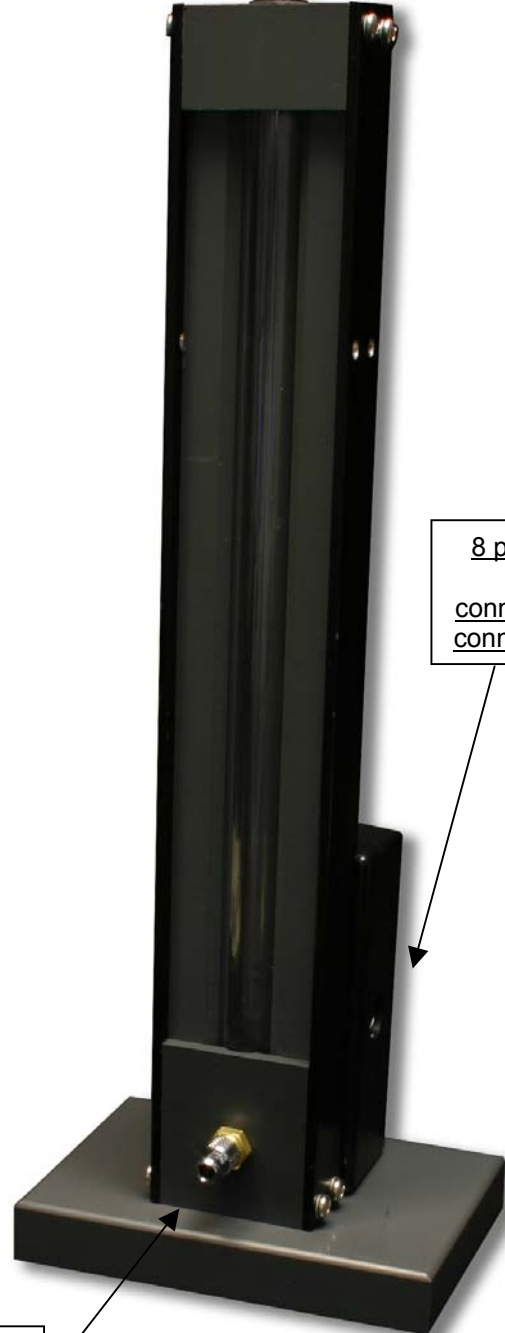
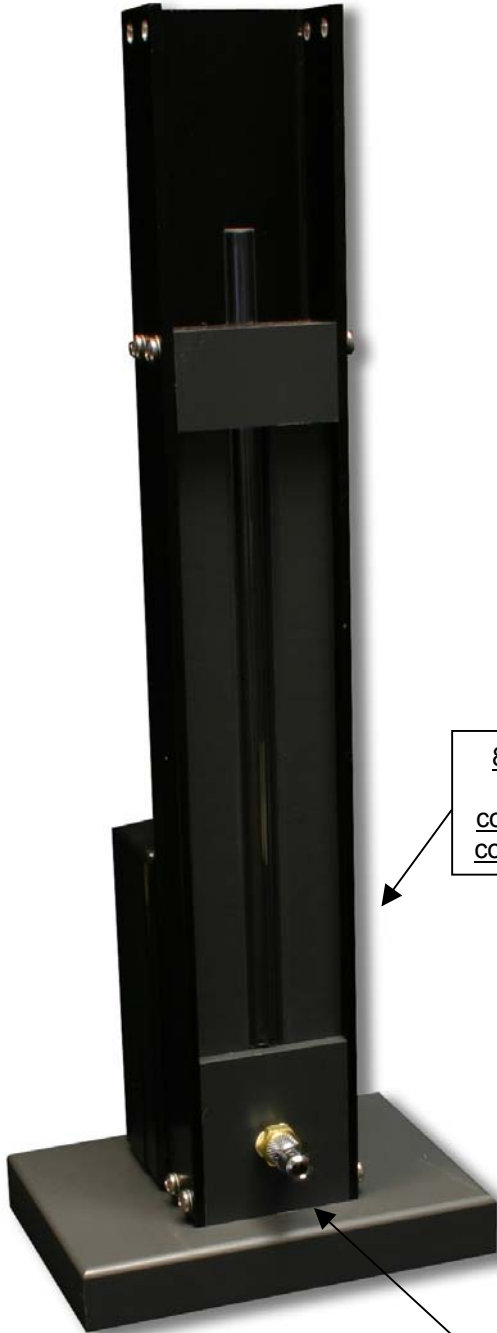
## OVERVIEW

This section looks at the layout of the IPA-1000 and its Chambers and gives descriptions of the elements that are present.



3.5 mL Chamber  
MC3.5-1000

35 mL Chamber  
MC35-1000



8 pin Mini-Din  
connector for  
connection to

8 pin Mini-Din  
connector for  
connection to

Luer Lock  
Connector for  
Fluid In

## KEYS

Six tactile-touch keys are provided for system operation:



– This key turns the unit off and on. The unit will return to the screen that was active when it was turned off.



– In the DISPLAY MODE, these keys toggle the display through the available main screens.

In the SELECT MODE, if a parameter has been highlighted, these keys will scroll through the available settings.



– On the Setup screen, there are a number of parameters that may be selected and changed. This key sequences the cursor (Highlight) through those parameters.





– This key is used to STOP any of the running flow tests or to manually reset the system if Auto Test Reset is set to NO. (See Setup Section for more details.)



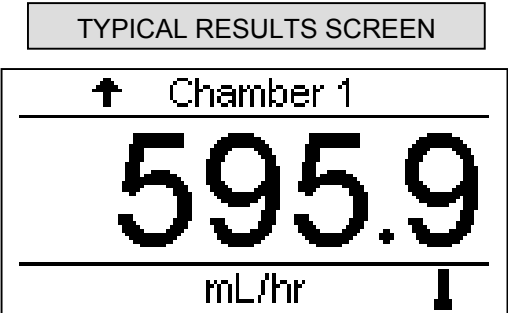
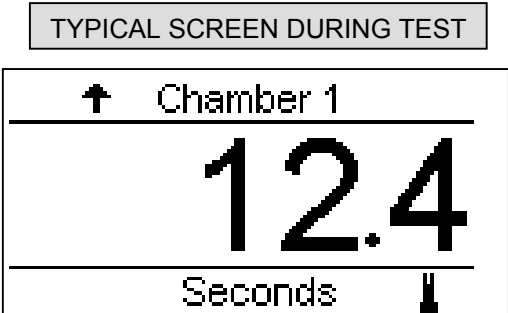
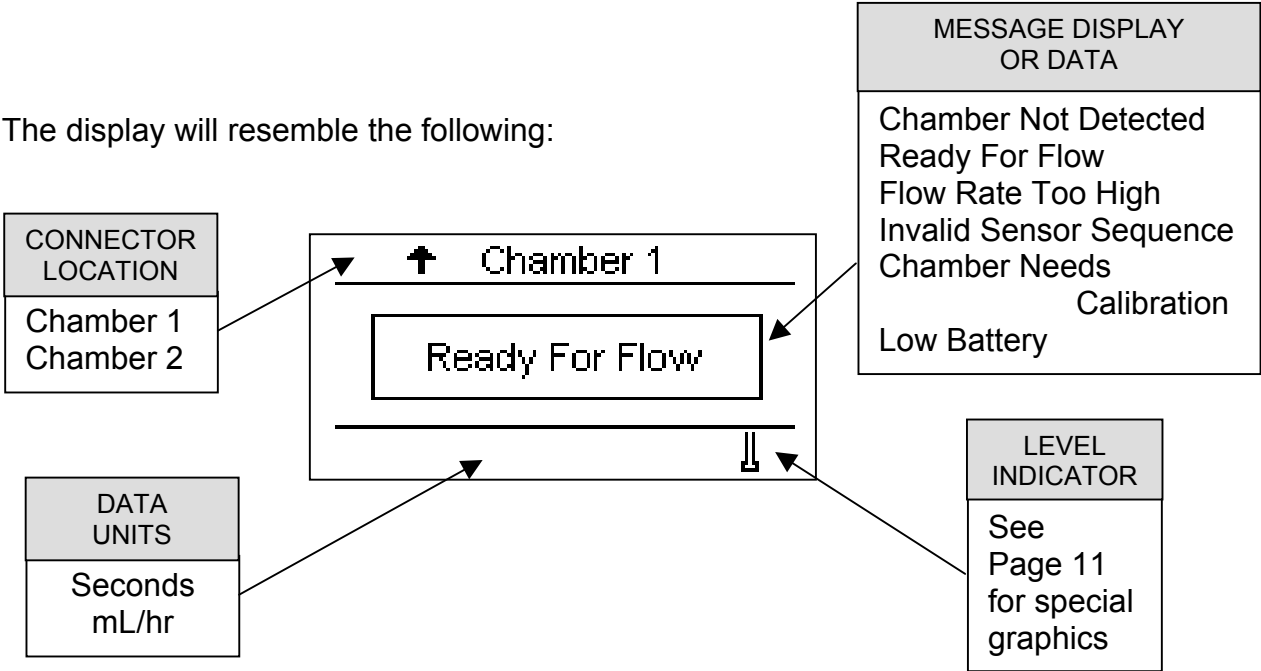
– This key toggles the unit into and out of the Setup Mode. Depressing this key will enter the Setup screen where the configuration can be viewed and adjusted. Depressing the key again will exit the Setup Mode and return to the previously viewed main screen.

# SCREENS

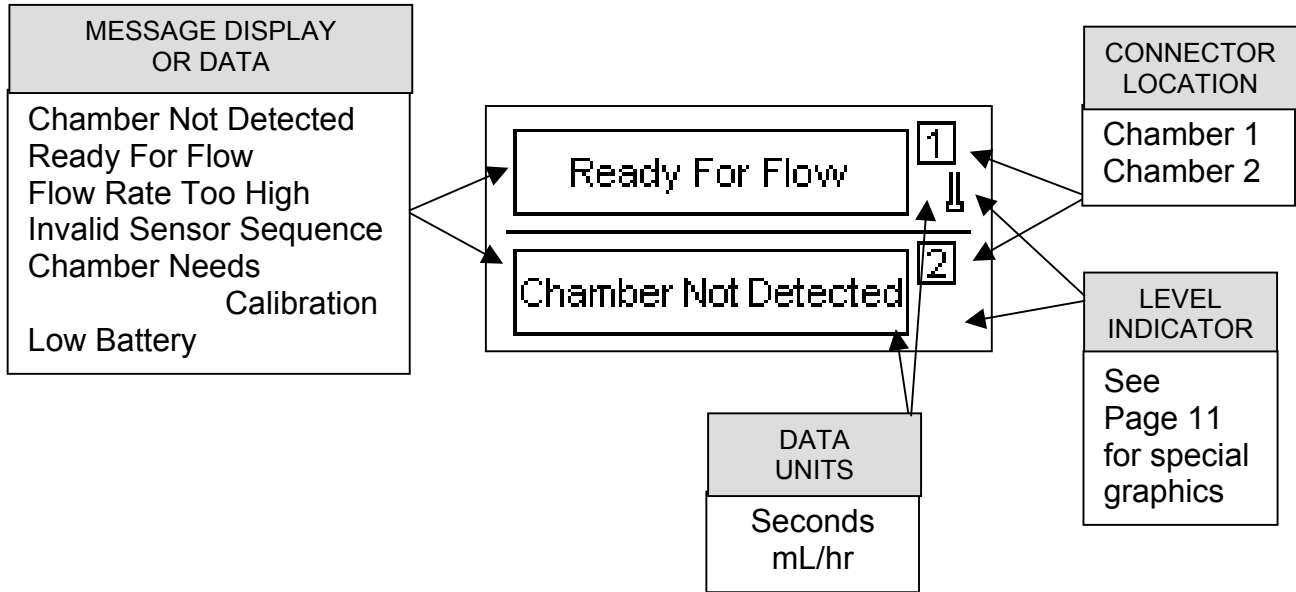
**MAIN SCREENS** – There are four main screens: Chamber 1, Chamber 2, DUAL and Connector. The available screens can be toggled using  .

**CHAMBER SCREENS** – The Chamber screens have a large time and flow rate display, as shown below. The arrow at the top of the screen indicates the connector used for that Chamber. The level indicator at the bottom of the screen identifies the level of water in the Chamber.

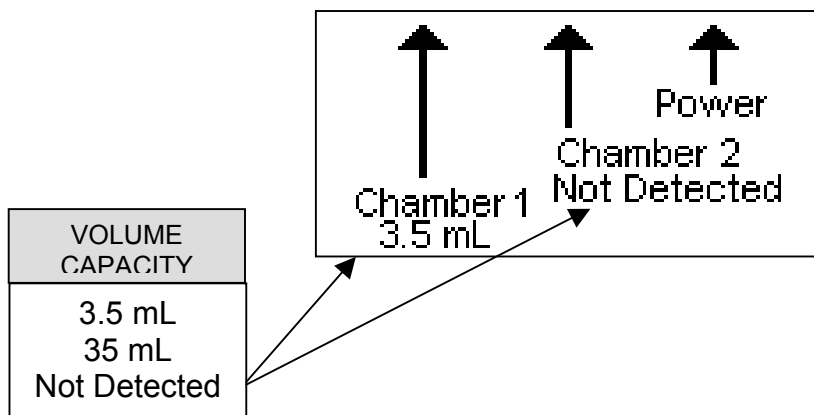
The display will resemble the following:



**DUAL SCREEN** – The DUAL screen shows the status of both Chambers at the same time.



**CONNECTOR SCREEN** – The connector screen indicates the layout of the connectors at the top of the IPA-1000. Also shown is the volume capacity of any connected Chambers.



## MESSAGES

Several status messages are available to indicate the present state of the system. The following is a brief description of the available messages:

**CHAMBER NOT DETECTED** – This message indicates that a Chamber has not been detected.

**READY FOR FLOW**– This message indicates that the Chamber is reset and waiting for fluid to be detected at the bottom sensor. As soon as fluid is detected, the timer will begin running and the test will begin. The test ends when the fluid reaches the top sensor or when the Reset key is depressed.

**FLOW RATE TOO HIGH** – This message indicates that the flow rate is higher than the resolution of the meter.


**INVALID SENSOR SEQUENCE**– This message indicates that water is detected at the top sensor but not at the bottom sensor. This could be caused by either a bad sensor or a bubble in the tube.


**CHAMBER NEEDS CALIBRATION**– This message indicates that a Chamber has been detected, but the calibration data stored in the Chamber is invalid. The Chamber should be returned for re-calibration.


**LOW BATTERY**– This message indicates that the batteries are low and should be replaced.


**LEVEL INDICATOR**


A special graphic has been incorporated into the display to identify the level of water in each Chamber. The graphic is located at the lower right corner of the display for each channel.

 This graphic indicates that water is not present at the lower or upper sensor.






 This graphic indicates that fluid is present at the lower sensor.

 These graphics are displayed sequentially to indicate that a test is running.

 This graphic indicates that water is detected at the top and bottom sensor.

 This graphic indicates that water is present at the top sensor, but not the bottom. This is an invalid condition, indicative of either a bubble at the bottom sensor or a faulty sensor.

## SETUP

The Setup Mode allows the user to adjust the configuration of the meter. The Setup screen can be entered using the  key. The parameters can be changed by using  key to highlight the line and   to toggle the available options. The Setup screen can be exited using the  key.

System Setup	
1) Auto Off Timer (Min)	30
2) Auto Test Reset	yes
3) End of Test Beeps	5
4) Contrast Adjust	5
5) Battery Life	100%

The following is a breakdown of the parameters available in the configuration of the unit and their available options:

System Setup Configuration		
Parameter	Description	Range
Auto Off Timer (Min)	Determines the period of inactivity before the unit is turned OFF. A timer is started when the unit is turned ON and is reset each time a key is pressed. When the timer reaches the value set in this parameter, the power is automatically turned OFF. (NOTE: Setting this parameter to 0 disables the Auto Off timer. When running from line power, the unit does not automatically shut off. Auto Off timer is inactive during a test.)	0-30 Minutes
Auto Test Reset	The auto reset mode automatically resets the system for a new flow test when the tube is emptied. If Auto Test Reset is set to NO, the user must manually press the RESET key to configure the system for another test.	YES/NO
End of Test Beeps	This determines the number of times that the unit will beep at the completion of a test. If set to zero, the unit will not beep.	0-15
Contrast Adjust	Sets the contrast of the display screen.	0-20
Battery Life	Displays current life of the battery. At 10%, a warning screen will appear. At 0%, the unit will power down automatically.	0-100% (Read Only)
Software	Displays current software program.	(Read Only)

## OPERATIONS

### CONNECTING CHAMBERS

Chambers are connected to the base unit with a straight through 8Pin Mini Din male to 8Pin Mini Din Male cable. Chambers can be connected or disconnected at any time. Disconnecting a chamber while a test is running will cancel the test.

As a chamber is connected or disconnected, the display will change to display the available chambers. For example, if a test is running on Channel 1 and a second Chamber is plugged into Channel 2, the display will automatically change to the dual display mode. If both chambers are connected and Chamber 1 is removed, the display will automatically change to the large screen displaying Chamber 2.

NOTE: The screen can always be manually changed by using the




keys.


## THEORY OF OPERATIONS

Infrared sensors are used to detect the presence of water in the chamber. There are two sensors in each chamber. As water is detected at the bottom sensor, an internal timer is started. The timer runs internally in hundredths of seconds but is only displayed in tenths of seconds. The test automatically ends when water is detected at the top sensor. A buzzer will sound to indicate that the test is complete. The buzzer can be programmed to sound for a specific number of beeps (0-15 beeps, see setup).

The flow rate is calculated based on the volume of the chamber and the time required to fill the tube. The volume of the chamber is calibrated and stored internally in the chamber. Since the calibration data is stored in the chamber, they are interchangeable with any base unit.

A test in progress can be aborted by pressing the  key, by disconnecting the chamber or by water not being detected at the bottom sensor.

## RUNNING A TEST

To run a flow test, the chamber must be Ready for Flow, as indicated in the base unit display (see Messages). When the base unit is setup for Manual Reset, the  key must be used to manually reset the unit after each test. When the base unit is setup for Automatic Reset, the chamber will be automatically reset when the water level drops below the bottom sensor.

A flow test can be started whenever the display indicates “Ready for Flow”. The flow test is started by water being detected at the bottom sensor. Before initiating the flow on the Infusion pump under test, ensure that the pump is programmed to deliver a sufficient amount of water to fill the chamber to the top sensor.

NOTE: The chamber volumes of 3.5mL and 35mL are nominal; it is advised that delivery volume should be about 4 mL and 40 mL respectively.

## OPTIMIZING MEASUREMENTS

To optimize the performance of the IPA-1000, it is recommended that a wetting agent be used to minimize the surface tension of the test solution. The test solution should be Distilled water mixed with “MICRO-90.” “MICRO-90” can be purchased from Cole- Parmer in a 1% solution (Part Number A-18100-01, [www.coleparmer.com](http://www.coleparmer.com), 1-800-323-4340). Further dilute the “MICRO –90” by using one part of “MICRO-90” to 10 parts of Distilled water. If foaming becomes a problem, dilute the “MICRO-90” to a 20:1 solution.

The sheeting action of the test solution has a minor effect on test results. It is recommended to discard the first reading of a device under test. Run the test and then repeat the test. Only record data from the second test.

Any droplets remaining in the chamber after a test run will affect the accuracy of the test results. Adjust the drain rate to minimize the droplets.

### !!! CAUTION !!!

**ONLY DISTILLED WATER SHOULD BE USED IN THE CHAMBERS WITH THE IPA-1000. DO NOT USE TAP WATER, GLUCOSE OR ANY OTHER FLUID; THIS WILL CAUSE THE TUBING TO BECOME CONTAMINATED.**

## MANUAL REVISIONS

<u>Revision #</u>	<u>Program #</u>	<u>Revisions Made</u>
Rev 01	DT7312CA	Preliminary Manual
Rev 02	DT7312CA	Page Numbers adjusted

## LIMITED WARRANTY

**WARRANTY:** BC GROUP INTERNATIONAL, INC. WARRANTS ITS NEW PRODUCTS TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP UNDER THE SERVICE FOR WHICH THEY ARE INTENDED. THIS WARRANTY IS EFFECTIVE FOR TWELVE MONTHS FROM THE DATE OF SHIPMENT.

**EXCLUSIONS:** THIS WARRANTY IS **IN LIEU OF** ANY OTHER WARRANTY EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF **MERCHANTABILITY** OR FITNESS FOR A PARTICULAR PURPOSE.

**BC GROUP INTERNATIONAL, INC.** IS NOT LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

NO PERSON OTHER THAN AN OFFICER IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR ASSUME ANY LIABILITY.

**REMEDIES:** THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY SHALL BE: (1) THE REPAIR OR REPLACEMENT OF DEFECTIVE PARTS OR PRODUCTS, WITHOUT CHARGE. (2) AT THE OPTION OF **BC GROUP INTERNATIONAL, INC.**, THE REFUND OF THE PURCHASE PRICE.

## SPECIFICATIONS

### IPA-1000 UNIT

<b>FLOW RANGE 3.5 mL CHAMBER</b>	0.0 to 999.9 mL/hr
<b>FLOW RANGE 35 mL CHAMBER</b>	15.0 to 9999.9 mL/hr
<b>FLOW RESOLUTION</b>	0.1 mL/hr
<b>FLOW ACCURACY</b>	+/- 1% RDG, +/- LSD
<b>TIME RESOLUTION INTERNAL</b>	0.01 Seconds
<b>DISPLAY</b>	LCD Graphical 128 X 64 Pixels
<b>SETUP MEMORY</b>	EEPROM, All Parameters
<b>MEMORY RETENTION</b>	10 Years w/o Power
<b>OPERATING RANGE</b>	0 to 50 Degrees C
<b>STORAGE RANGE</b>	-40 to 60 Degrees C
<b>CONSTRUCTION</b>	Enclosure - ABS Plastic Face - Lexan, Back Printed
<b>SIZE</b>	7.09 x 3.94 x 1.56 inches 180 x 100 x 40 mm (HxWxD)
<b>WEIGHT</b>	≤ 1 lbs. (0.45 kg)
<b>CONNECTIONS FOR BASE UNIT</b>	Power - 2.1 mm Center Negative Chamber - 8 pin Mini Din Female
<b>INTERCONNECT CABLE</b>	8 pin Mini Din Male to 8 pin Mini Din Male Straight Through
<b>POWER</b>	LINE: 9VDC, Center Negative BATTERY: 9V Alkaline
<b>POWER CONSUMPTION</b>	ON: No Modules - 8 mA, 1 Module - 12 mA, 2 Modules - 16 mA OFF: less than 60µA
<b>BATTERY LIFE</b>	CONTINUOUS: TBD OFF: 12 months
<b>BATTERY ELIMINATOR (OPTIONAL)</b>	BE2000PU (120 VAC) - US BE2000PE (220 VAC) - Euro 9V, 200 mA DC

### 3.5 mL and 35mL CHAMBERS

<b>FLOW RANGE 3.5 mL CHAMBER</b>	0.0 to 999.9 mL/hr
<b>FLOW RANGE 35 mL CHAMBER</b>	15.0 to 9999.9 mL/hr
<b>FLOW RESOLUTION</b>	0.1 mL/hr
<b>FLOW ACCURACY</b>	+/- 1% RDG, +/- LSD
<b>OPERATING RANGE</b>	0 to 50 Degrees C
<b>STORAGE RANGE</b>	-40 to 60 Degrees C
<b>CONSTRUCTION</b>	Enclosure - ABS Plastic
<b>SIZE</b>	14.0 x 5.0 x 3.5 inches 356 x 127 x 89 mm (HxWxD)
<b>WEIGHT</b>	≤ 2.2 lbs (1 kg)
<b>CONNECTIONS FOR CHAMBERS</b>	Unit - 8 pin Mini Din Female Flow Media - Luer Lock
<b>INTERCONNECT CABLE</b>	8 pin Mini Din Male to 8 pin Mini Din Male Straight Through
<b>FLOW MEDIA</b>	Distilled Water

**NOTES**