UNIVERSAL BIOMETER

DPM-III

BIO-TEK® INSTRUMENTS, INC.

DPM-III Universal Biometer

User's Guide

Part No. 94069
Revision D
October, 1992

Notices

©Copyright Fluke Corporation
Fluke Biomedical
6920 Seaway Blvd.
Everett, WA 98203
Sales & Customer Service:
775-883-3400 • 800-648-7952
http://www.flukebiomedical.com • sales@flukebiomedical.com

Service and Repair
Please call for RMA number before shipping
1420 75th Street SW
Everett, WA 98203
888-99FLUKE (888-993-5853) • 425-446-5560

All Rights Reserved

Restrictions and Liabilities

Information in this document is subject to change, and does not represent a commitment by BIO-TEK Instruments, Inc. Changes made to the information in this document will be incorporated in new editions of the publication. No responsibility is assumed by BIO-TEK for the use or reliability of software or equipment that is not supplied by BIO-TEK, or

its affiliated dealers.

Trademarks

Bio-Tek is a registered trademark and DPM-III is a trademark of Bio-Tek Instruments, Inc.

Revision Appendix

REVISION / DATE	SECTION	CHANGES
A-C	--	Written Prior to addition of Document Revision Record
D	Document	Reformatted document to conform to style; text editing to improve readibility; added Notices, Revision Record, new cover.

Warranty

Refer to the warranty card shipped with your unit for specific warranty information.

Warning

The Universal Biometer is designed to measure positive or negative pressures from pneumatic or hydraulic devices **only**. It is not a direct patient-related device.

Never use the Universal Biometer to measure a patient's blood pressure or to perform any other direct pressure measurement. Bio-Tek will not be responsible for any liabilities resulting from such use.

Do not apply pressures above 125 psi to the Universal Biometer. Permanent damage to the Model DPM-III can result from excessive pressure applications.

Contents

Figures

Introduction

Section 1

Bio-Tek Instrument's Universal Biometer Model DPM-III is a lightweight hand-held pressure and temperature meter. Pressures from various sources can be measured in psi, mmHg, cmH_20, inH_20, or kPa. A male luer lock fitting accommodates stopcocks and pressure fittings.

Temperatures can be measured in either degrees Centigrade or Fahrenheit with any Yellow Springs 700 Series probes. Both temperature and pressure readings are displayed on the large liquid crystal display (LCD). Temperature and pressure can also be monitored over a period of time via the high level output jack (1/4" phono).

Applications

The Universal Biometer can be used to measure and calibrate positive or negative pressures from both pneumatic and hydraulic sources as well as to test equipment for temperature accuracy. With the optional parabolic flow adapter (PFA-1), general flow rates can be measured from 10 to 250 *l*pm for a variety of gasses, with an accuracy of +/-5%. The Universal Biometer can be used with the following equipment:

Pressure

- pneumatic tourniquets
- sphygmomanometers
- non-invasive blood pressure monitors
- ventilators
- compressor pumps
- pressure transducers
- dialysis machines
- drainage devices
- irrigation systems
- volumetric infusion pumps
- pressure gauges
- vacuum gauges
- manometers

Temperature

- blood warmers
- heart-lung bypass units
- heating pads
- hemodialysis units
- humidifiers
- nebulizers
- hypo/hyperthermia
- infant incubators
- radiant warmers
- temperature monitors

Specifications

High-level output jack	1/4" phono jack
Voltage requirement	one 9 volt alkaline battery
Current consumption	14 mA
Battery life	32 hours continuous use (BATT indicator on LCD for low battery)
Operating temperature range	10° to 40°C (50° to 104° F)
Dimensions	14.6 cm x 8.9 cm x 5.4 cm (5.7" x 3.5" x 2.1")
Weight	280g (10 oz.)

Pressure

Ranges	-698 to +776 mmH_2O -949 to + 1055 cmH_2O -374 to + 415 in H_2O -93 to + 103 kPa -13.5 to + 15 psi -13.5 to + 100 psi
Linearity (all scales except 100 psi)	+/-0.5%
Linearity (100 psi scale)	+/-1%
Accuracy (all scales except 100 psi)	+/-1% of reading (up to 15 psi)
Accuracy (100 psi scale)	+/-2% of reading
Repeatability and hysteresis	0.15%
Overpressure	125 psi (1____LCD indication)

Temperature

Measurement Range	0° to 50°C (32° to 122°F)
Accuracy	+/-0.4°C (+/-0.7°F)
Resolution	0.1°C (0.2°F)
Temperature and probe jack*	1/4" phono jack

* Designed for use with Yellow Springs Instrument Company 700 Series probes.

Accessories

Description	Quantity Supplied	Bio-Tek Part Number
General Probe	Optional	48148
Air Probe	Optional	48149
Surface Probe	Optional	48150
Catheter Adapter	1	49160
User's Guide	1	94069
Certificate of Calibration (NBS)	1	98022
Warranty Card	1	94001
Case	Optional	7770111
Parabolic Flow Adapter	Optional	PFA-1

Operation

Section 2

The Universal Biometer has an 8-position **Selector Switch** to select the output range (see ***Figure 2-1***). Readings are displayed on the **LCD**. An external **Zero Knob** allows quick zero adjustment when the unit is vented to atmosphere (for pressure only). Any pressure source can be connected to the Universal Biometer via the male **Luer Lock**.

Temperature probes (700 series) can be connected by a **Phono Plug** to the 1/4" **Phono Jack** for accurate temperature measurement when the unit is switched to either °C or °F.

Probes

- **General Purpose Probe**
  Rugged vinyl-tipped probe. Use for measuring water temperatures.

☛ **Note:** Immerse the probe for a short time only.

- **Air Probe**
  Stainless steel probe. Use for measuring temperatures of test rooms, incubators, remote air readings, and for monitoring of gas streams.

- **Surface Probe**
  Rugged stainless steel, epoxy-backed cup probe. Use for measuring heat loss.

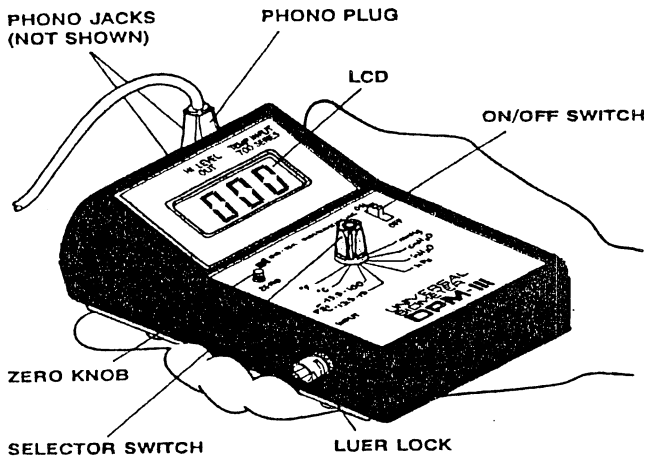


Figure 2-1. Universal Biometer Front Panel

The high level output for both pressure and temperature is obtained by means of another 1/4" phono jack whenever the Model DPM-III ON/OFF switch is switched ON.

Pressure Operation

1. Set the pressure **Selector Switch** to the pressure range to be measured.

2. Zero the Universal Biometer (vented to atmosphere) by turning the front panel **Zero Knob**.

☛ **Note:** The Universal Biometer may take a few seconds to settle to zero when first turned ON.

3. Connect the source of the pressure to the Universal Biometer's input (**Luer Lock**).

☛ **Note:** A stopcock or male-to-female luer lock adapter may be needed for the connection desired.

   A catheter adapter has been provided for connections to various sizes of tubing.

4. Observe the pressure reading on the Universal Biometer. The Biometer should indicate the pressure in the units of measure selected.

5. Use the 1/4" **Phono Jack** labeled **HI-Level** out for term pressure monitoring. The jack provides output to a chart recorder.

6. Check the tubing and tubing connections if a ! _ _ _ is displayed on the far left and all other digits are blanked out. The ! _ _ _ indicates that the limits of the selected range have been exceeded.

☛ **Note:** Hospital-grade tubing can normally be used for all connections between the pressure source and Universal Biometer; however, use rigid tubing for negative pressures.

☛ **Note:** Use securely clamped, reinforced tubing for high pressures (above 5 psi or below -5 psi.)

Specific Pressure Applications

The Universal Biometer is used to:

- Check static cuff pressure and cuff pressure variations (see ***Figures 2-2*** through ***2-5***) for:
  - pneumatic tourniquets
  - sphygmomanometers
  - non-invasive blood pressure monitors

☛ **Note:** On-line pressure or vacuum connections can be made using 3-way connections such as 4-way stopcocks and Y and T adapters as shown in ***Figures 4*** and ***5***.

- Measure positive pressures of compressor outputs (see ***Figures 2, 3, 5,*** and ***6***) for:
  - ventilators
  - compressor pumps
  - respirators

- Check occlusions, and operating and purge pressure (see ***Figures 2, 3,*** and ***7***) for:
  - volumetric infusion pumps.

- Verify negative pressures in diagnostic and surgical suction equipment (see Figures 2, 3, 5, and 6) for:
  - drainage devices
  - OPG
  - thermotic devices

- Verify vacuum pressure in eye surgery equipment (see ***Figures 2, 3***, and ***7***) for:
  - extraction irrigation systems

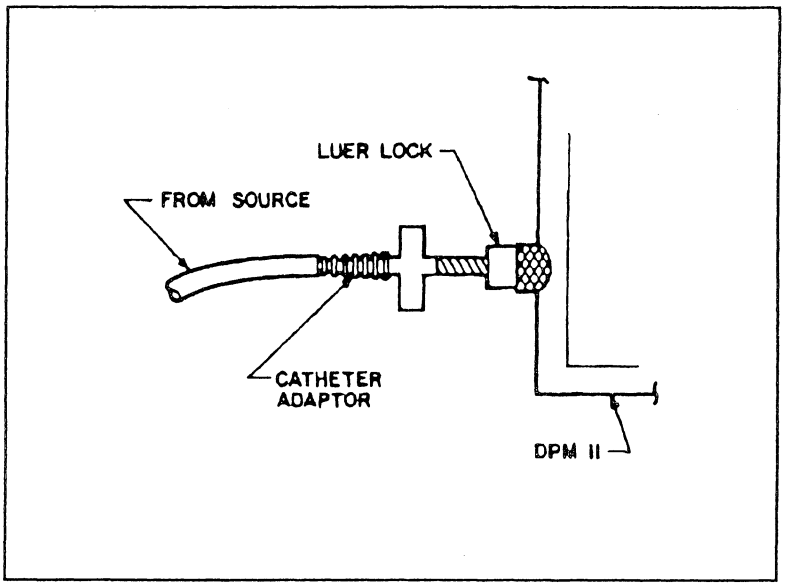


Figure 2-2. Model DPM-III to Catheter Connection

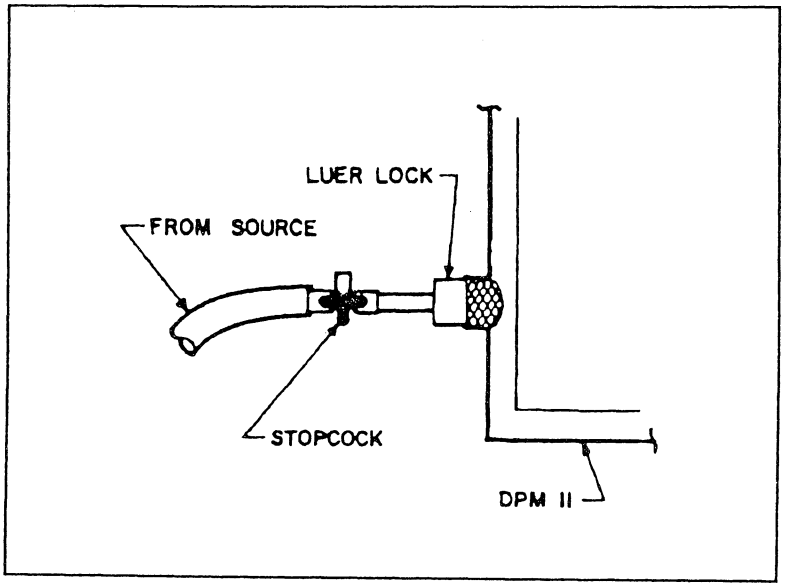


Figure 2-3. Model DPM-III to Stopcock Connection

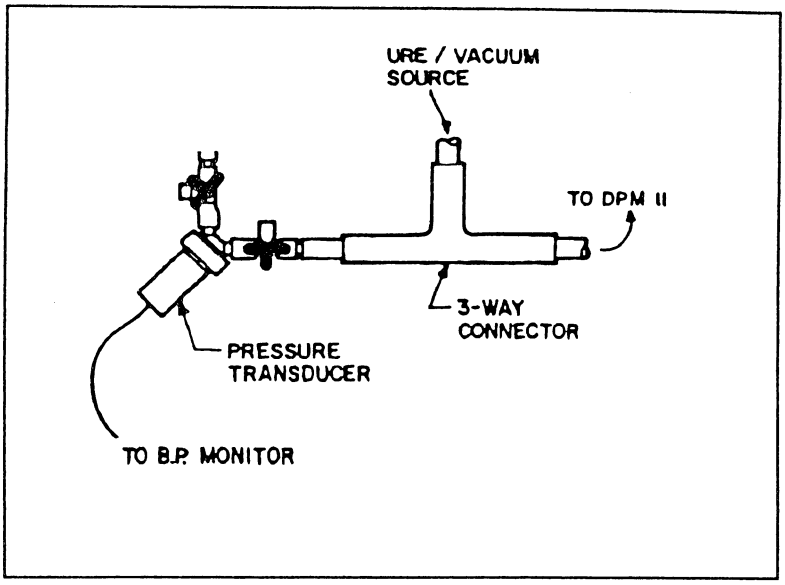


Figure 2-4. Model DPM-III to Transducer Connection

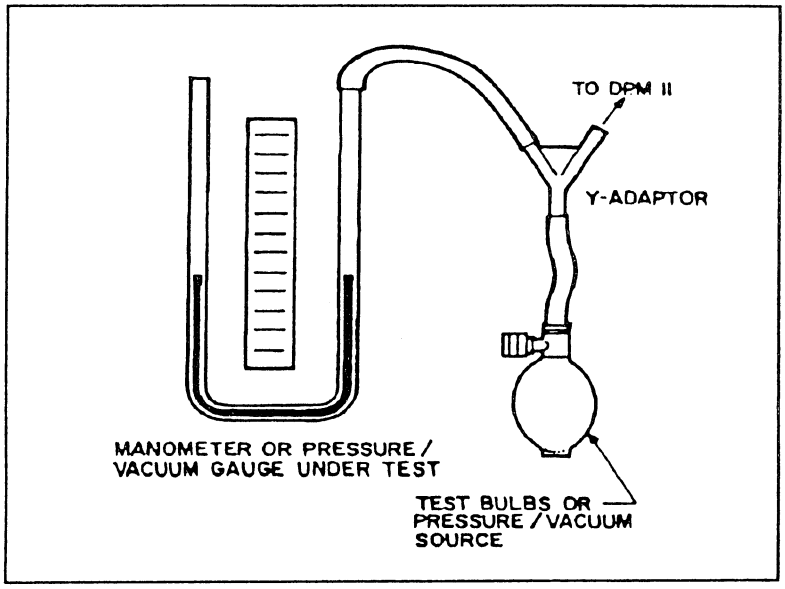


Figure 2-5. Standard Model DPM-III to Manometer Connection

- Check dialysate pressure (see ***Figures 2*** through *5*) for:
  - kidney dialysis machines
- Calibrate pressure-measuring devices (see ***Figures 2*** through *5*) for:
  - pressure transducers
  - blood pressure monitors
  - manometers
  - pressure gauges
  - vacuum gauges.

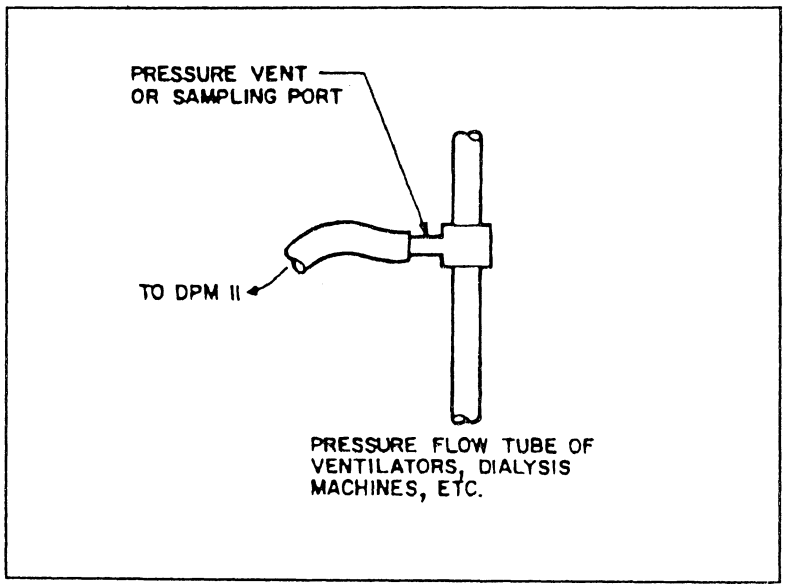


Figure 2-6. Model DPM-III to Flow Device Connection

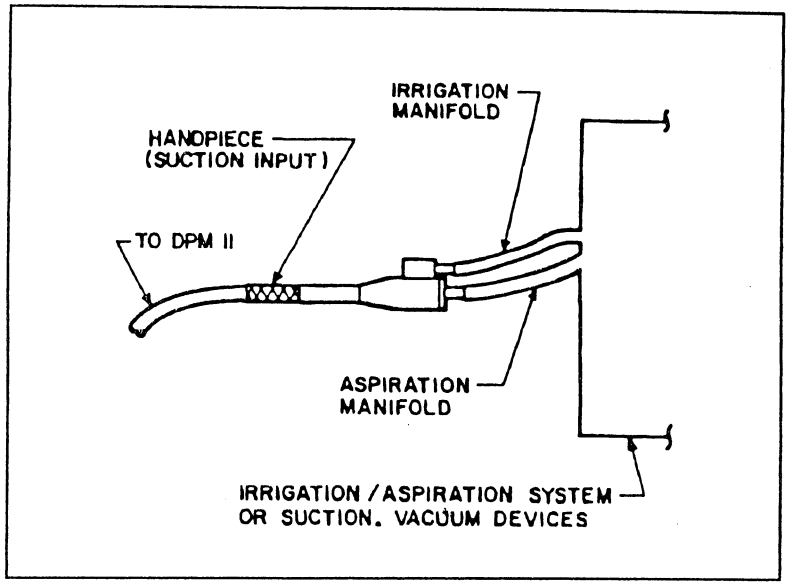


Figure 2-7. Model DPM-III to Vacuum Device Connection

Gas and Liquid Pressure Measurements

- **Air:**
  Make the necessary connections and measure or calibrate the source pressure.

- **Gas and Gaseous mixtures:**
  Before connecting the tube to the Universal Biometer, let the gas or gaseous mixture bleed air from the tube connected to the source into the atmosphere. This insures that a homogeneous medium will be measured for pressure.

- **Liquid mediums:**
  The microswitch (transducer) used in the Universal Biometer has a thermoplastic-polyester (GE-valox) housing. Water and other solvent (liquid) pressures can be measured if the pH is in the range $6.5 < pH < 7.5$.

✓ **Recommendation:**
Use a syringe to flush the Universal Biometer pressure chamber with water after each use to prevent corrosion.

An ordinary syringe can be used to fill the pressure chamber with the liquid medium before making the tubing connection required for pressure measurements.

The following liquids can be used at room temperature and 100% concentration (unless otherwise noted):

Acetic acid (5%)	Ethylene glycol
Acetone	Ethylene oxide
Ammonia (30-35%)	Formaldehyde (37%, 60°C, 140°F) (88% freon, 12% ETO)
Benzaldehyde	
Benzyl alcohol	Formalin (15% methyl alcohol, 37% formaldehyde)
Boiling water (60° C, 140°F)	Hydrochloric acid (10%)
Hydrogen peroxide (10%, 30%)	Potassium permanganate
Methanol vapor	Sodium hydroxide (10%)
Methyl alcohol	Sodium hypochlorite (10%)
Oleic acid	Steam, dry heat (149°C, 300°F)

- Set the **Selector Switch** to the temperature scale to be measured (°C or°F).

- Attach the appropriate temperature probe to the 1/4" phono jack labeled **Temp Output 700 Series**. Bio-Tek offers either air, surface, or general purpose probes for use with the Universal Biometer. Any Yellow Springs 700 series probe can be used with the Universal Biometer. (Refer to the Probes section in this chapter for the information on selecting probes.)

- Use the 1/4" phono jack labeled **Hi Level Out** for term temperature monitoring. The jack provides output to a chart recorder or oscilloscope.

☛ **Remember:** The **Hi Level Out** jack can be used with any output setting on the **Selector Switch.**

☛ **Note:** The user must supply a connector for this output (see ***Figure 8***).

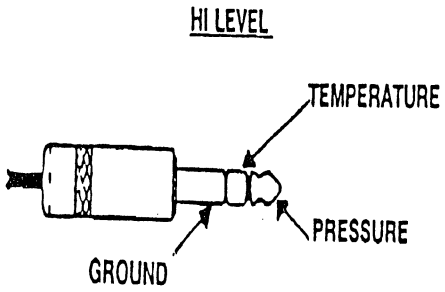


Figure 2-8. Connector to Chart Recorder or Oscilloscope

Specific Temperature Applications

All temperature comparisons should take into account the accuracy of the Universal Biometer, the unit under test, and the probes. The expected temperature readings must reflect this combined accuracy.

Blood Warmers

- Check the heat exchanger temperature of the waterbath (general probe required).

    1. Immerse the Universal Biometer probe into the center of the bath. Do not touch the probe to the sides of the water.

    2. Allow the temperature reading to reach an equilibrium.

    3. Measure and record the temperature of the waterbath.

    4. Compare the temperature reading on the biometer's **LCD** with the temperature setting on the blood warmer.

    5. Allow the warmer to run continuously for 5 minutes while recording the temperature; use the **Hi Level Out** jack on the biometer to measure fluctuations in temperature.

☛ **Note:** Record the temperature change every 15 seconds to accurately monitor the temperature fluctuations.

6. Record the balanced temperature at the end of 5 minutes and compare with the temperature changes during the five-minute interval.

☛ **Note:** The temperature reading of the water in the waterbath and any temperature fluctuations should be within the manufacturer's specifications.

- Check the heat exchanger temperature of dry heat blood warmers (surface probe required).

    1. Apply a heat sink compound to the biometer probe and attach it to the surface of the heat exchanger.

    2. Repeat Steps 2-5 of the temperature test in the previous section (The dry-heat temperature is tested in a manner analogous to the waterbath temperature.

- Check the temperature of the fluid within the blood bag (general probe required).

    1. Fill a blood bag with water.

    2. Provide a waste receptacle to catch the effluent from the blood bag during testing.

    3. Attach a T-adapter to the blood bag opening and tubing to the opposite end of the adapter. (The tubing enables the water to flow into the waste receptacle.)

    4. Place the blood bag in the blood warmer being tested.

    5. Insert the temperature probe of the Universal Biometer into the free arm of the T-adapter.

6. Allow the water to exit from the blood bag and measure the temperature of the water.

☛ **Note:** The blood warmer should maintain the temperature of the water within the bag at the temperature specified by the blood warmer manufacturer. The specific output temperature should be maintained at flow rates of 0, 50, 100, and 150 ml/minute.

- Check over temperature safety features (general probe required).

1. Fill a blood bag with water.

2. Provide a waste receptacle to catch the effluent from the blood bag during testing.

3. Attach a T-adapter to the blood bag opening and tubing to the opposite end of the adapter. (The tubing enables the water to flow into the waste receptacle.)

4. Place the blood bag in the blood warmer being tested.

5. Insert the temperature probe of the Universal Biometer into the free arm of the T-adapter.

6. Refer to manufacturer's operating manual to locate the primary thermostat of the blood warmer.

7. Bypass the primary thermostat and allow the unit to heat.

8. Measure and record the temperature of the water in the bag.

☛ **Note:** The blood warmer's secondary thermostat should prevent the temperature from exceeding the manufacturer's maximum temperature.

- Check the thermometer accuracy (general probe required).

    1. Locate the outflow line of the heater/cooler or mixer on the bypass unit.

    2. Connect the T-adapter with the outflow line.

    3. Plug the general probe into the **Temp Input 700 Series** phono jack on the Universal Biometer.

    4. Insert the biometer probe into the free arm of the T-adapter that is connected to the outflow line of the bypass unit.

    5. Measure the temperature of the fluid that circulates in the bypass unit. The temperature reading on the biometer should be within the manufacturer's accuracy specifications for the temperature setting on the bypass unit.

    6. Temperature fluctuations in the fluid outflow line can also be measured by using the **Hi Level Out** jack on the biometer.

- Check the temperature alarms (general probe required).

    1 Fill a blood bag with water.

    2. Provide a waste receptacle to catch the effluent from the blood bag during testing.

    3. Attach a T-adapter to the blood bag opening and tubing to the opposite end of the adapter. (The tubing enables the water to flow into the waste receptacle.)

4. Place the blood bag in the blood warmer being tested.

5. Insert the temperature probe of the Universal Biometer into the free arm of the T-adapter.

6. Refer to manufacturer's operating manual to locate the primary thermostat of the blood warmer.

7. Bypass the primary thermostat and allow the unit to heat until a high temperature alarm condition has been created.

8. Measure and record the temperature of the water in the bag.

☛ **Note:** The unit should register an alarm condition on the meter and should emit and audible alarm when the maximum operating temperature has been reached as specified by the manufacturer.

In addition to checking the temperature accuracy of the heart-lung bypass units, the biometer can be used to measure the pressure of the blood returning to the patient. Refer to the Pressure Operation section for pressure measuring procedures.

Heating Pads

- Check the operating temperature (general or surface probe required.)

    1. Attach the surface probe of the biometer to a "phantom patient" (a piece of metal 3" by 3" or a comparable substitute.)

2. Wraps the heating pad around the probe and phantom patient.

3. Wrap insulation around the pad to minimize heat dissipation.

4. Measure and record the temperature reading displayed on the biometer for high, low, and any other desired settings on the heating pad.

☛ **Note:** The accuracy should be within manufacturer's specifications.

5. Alternately insert a T-adapter (or the manufacturer's attachment) into the outflow of the heating pad, then measure the temperature of the exiting fluid.

- Check the over temperature safety features (general or surface probe required).

1. Connect a general or a surface prove to the Universal Biometer.

2. Refer to the heating pad manufacturer's operating manual to locate the primary thermostat.

3. Bypass the primary thermostat and allow the unit to heat for at least 15 minutes.

4. Measure the maximum temperature of the heating pad.

☛ **Note:** The secondary thermostat in the heating pad should prevent the temperature from exceeding the manufacturer's specifications.

▼ Check the temperature accuracy (general probe required).

1. Insert a T-adapter into the outflow of the hemodialysis unit.

2. Insert the general temperature probe of the Universal Biometer into the free arm of the T-adapter.

3. Set the temperature control on the hemodialysis unit to 37° C (98.6° F) with a flow rate of 500ml/minute, or according to the manufacturer's specifications.

4. Allow the unit to stabilize for 15 minutes.

5. Measure the temperature of the exiting fluid and record the temperature displayed on the biometer. The temperature should be within the manufacturer's specifications.

☛ **Note:** The **Hi-Level Out** jack in the biometer can be used to record temperature variations.

• Check alarms

1. Insert a T-adapter into the outflow of the hemodialysis unit.

2. Insert the general temperature probe of the Universal Biometer into the free arm of the T-adapter.

3. Set the temperature control on the hemodialysis unit to 37° C (98.6° F) with a flow rate of 500ml/minute, or according to the manufacturer's specifications.

4. Allow the unit to stabilize for 15 minutes.

5. Measure the temperature of the exiting fluid and record the temperature displayed on the biometer. The temperature should be within the manufacturer's specifications.

6. Test the accuracy of the high and low temperature alarms to ensure they are within manufacturer's specifications.

In addition to checking the temperature accuracy of the hemodialysis units, the Universal Biometer can be used to check the blood-circuit pressure accuracy and alarms.

The pressure and alarms are checked by connecting a T-adapter in the blood circuit and inserting the biometer probe into the free arm of the T-adapter. For additional procedures, refer to the section, *Pressure Operation.*

Humidifiers and Nebulizers

- Check the output temperature (general probe required.)

    1. Insert the temperature probe connected to the Universal Biometer into the T-adapter that has been connected to the outflow of the humidifier (or nebulizer)

☞ **Note:** Place the T-adapter as close as possible to the humidifier's temperature sensor. The biometer measures the temperature of the steam from the humidifier, not the water contained in the heating portion of the humidifier.

    2. Set the humidifier to a nominal value (37° C/ 98.6° F) with a gas flow at 10 ml/minute.

3. Allow the system to equalize, and compare the temperature setting of the humidifier to the reading displayed on the Universal Biometer.

4. Set the humidifier to maximum and note temperature changes and the maximum temperature reading.

☛ **Note:** Verify that the readings are within the manufacturer's specifications/

- Check the alarms

1. Verify that the high and low alarms respond to the levels stated in the manufacturer's specifications.

☛ **Note:** The pressure drop through the unit with 10 ml/ minute flow should be less than 5 cmH2O.

In addition to testing the steam temperature of humidifiers and nebulizers, the Universal Biometer can be used to test for leaks by pressurizing the humidifier and noting any pressure loss over time. Check the manufacturer's specifications for the maximum leak rate.

Hypo/Hyperthermia Units

- Check the fluid temperature accuracy (general probe required).

1. Attach a T-adapter to the output of the hypo/ hyperthermia device.

2. Insert the probe connected to the Universal Biometer into the free arm of the T-adapter.

3. Set the hypo/hyperthermia unit to its coolest setting.

4. Measure and record the temperature displayed on the biometer.

5. Repeat the test at the highest setting of the hypo/hyperthermia unit. Results should agree with the manufacturer's specifications.

☛ **Note:** The **Hi Level Out** jack can be used to record temperature variations.

- Check the high and low temperature protection and/or alarms (general probe required).

    1. Refer to the manufacturer's Operator's Manual to bypass the primary thermostat (if applicable).

    2. Operate the unit at the maximum high and low settings to verify the high and low temperature cutoffs, according to manufacturer's specifications.

- Check the patient sensory accuracy in the servo mode (general probe required).

    1. Prepare a flask of water (30-40° C, 87-104° F).

    2. Immerse the probe connected to the Universal Biometer into the flask as close as possible to the patient temperature sensor that is also immersed in the water.

    3. Compare the temperature readings of the two devices. The biometer reading should be within the manufacturer's specification for the patient temperature sensor.

- Check the patient temperature sensor accuracy (general probe required).

    1. Test the patient temperature sensor as follows:

        a. Prepare a flask of water (30° - 40° C, 87° - 104° F).

        b. Immerse the probe connected to the Universal Biometer into the flask as close as possible to the patient temperature sensor that is also immersed in the water.

        c. Compare the temperature readings of the two devices. The biometer reading should be within the manufacturer's specification for the patient temperature sensor.

    2. Test the alarms:

        a. Refer to manufacturer's Operator's Manual to bypass the primary thermostat (if applicable).

        b. Operate the unit at the maximum high and low settings to verify the high and low temperature cutoffs, according to manufacturer's specifications.

- Check the hood air temperature accuracy (air probe required).

    1. Place the Universal Biometer probe in the middle of the incubator at the mid-auxiliary line.

    2. Verify the incubator air temperature is within the manufacturer's specifications when the incubator temperature has equalized.

3. Use the **Hi Level Out** jack on the Universal Biometer to verify the various temperature settings, and monitor temperature variations in the infant incubator.

- Check the high-low temperature protection (verify operation of the safety thermostat) and/or alarms (general probe required).

    1. Refer to the manufacturer's Operator's Manual to bypass the primary thermostat.

    2. Operate the unit at the maximum high and low settings to verify high and low temperature cutoffs according to the manufacturer's specifications.

Radiant Warmers

A general probe is required when testing radiant warmers.

1. Attach a probe connected to the Universal Biometer to a surface that is placed at the same distance as the patient or object to be warmed.

2. Place the patient temperature sensor as close as possible to the probe attached to the biometer to verify the accuracy of the radiant warmer.

3. The points where the warmer turns **ON** or **OFF** should be within the manufacturer's specifications.

4. Check the warmer's alarm accuracy against the manufacturer's specification by bypassing the primary thermostat in the radiant warmer and allowing the warmer to heat until the alarm switches the device **OFF**.

Select an air, general or surface probe, depending on the type of temperature monitor to be tested and the application. Be sure to test each monitor for:

1. Temperature Accuracy: Use the manufacturer's specification when testing the device for upper, lower, and several intermediate temperatures.

2. Any over temperature features that are discussed in the operator's manual, and

3. Alarm features that indicate that the unit has reached an upper or lower limit of its temperature measuring range.

Section 3

Service

Service Information

The Universal Biometer should be returned to the factory if repairs are required.

- Before returning the instrument, contact Bio-Tek's Technical Assistance Center to obtain a **Return Authorization Number**. Record the number in a prominent place on the outside of the packing box, and refer to the number in any correspondence with Bio-Tek Service.

- Pack the instrument carefully, using the original packing material, and insure for full value. If the original packing materials have been discarded, or are unusable, call Bio-Tek for replacement packing or instructions. Failure to pack the instrument properly could void your warranty.

Return the instrument to:

Service and Repair
1420 75th Street SW
Everett, WA 98203
888-99FLUKE (888-993-5853) • 425-446-5560
http://www.flukebiomedical.com • sales@flukebiomedical.com

Battery Replacement

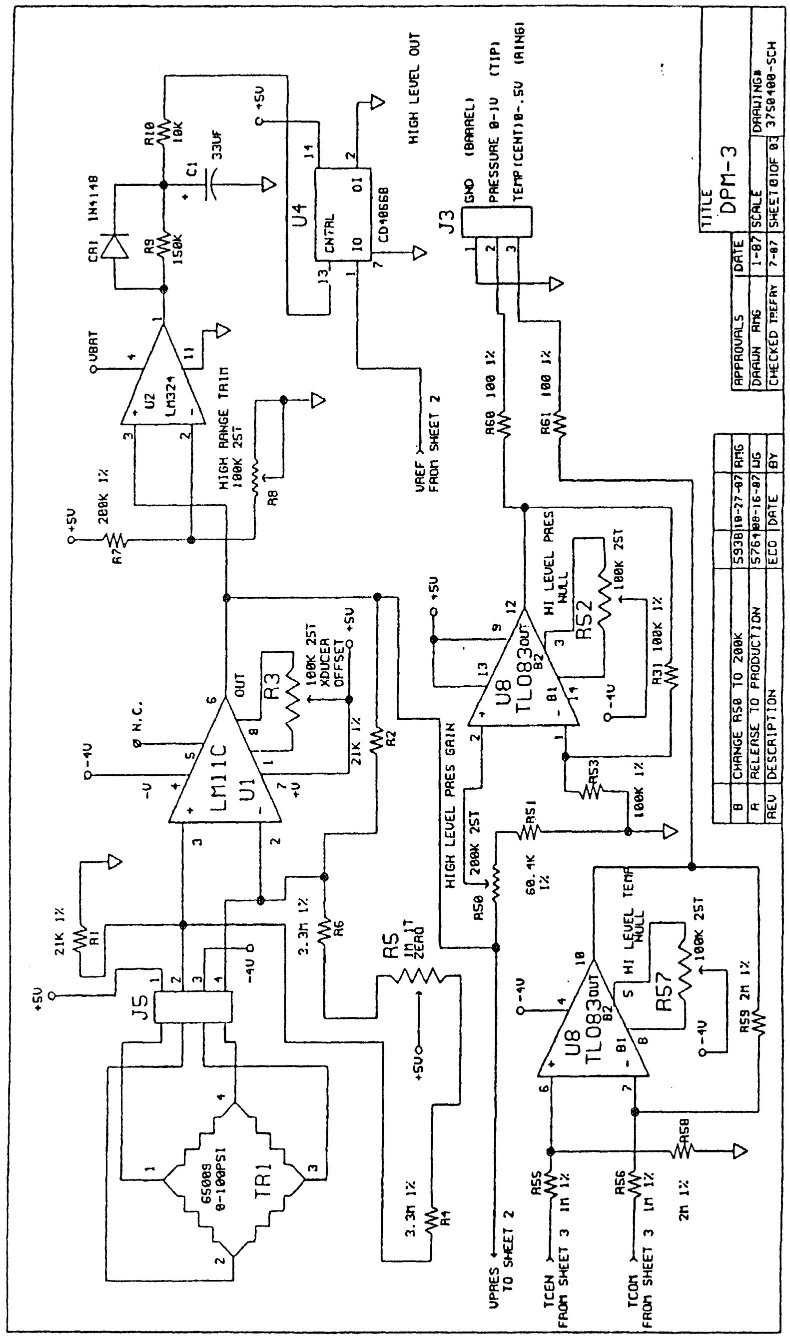
When **BATT** is indicated on the Universal Biometer, the battery power is low, and the battery should be replaced.

Remove the cover of the external battery compartment on the back of the unit and replace the used battery with a **9 V alkaline battery**.

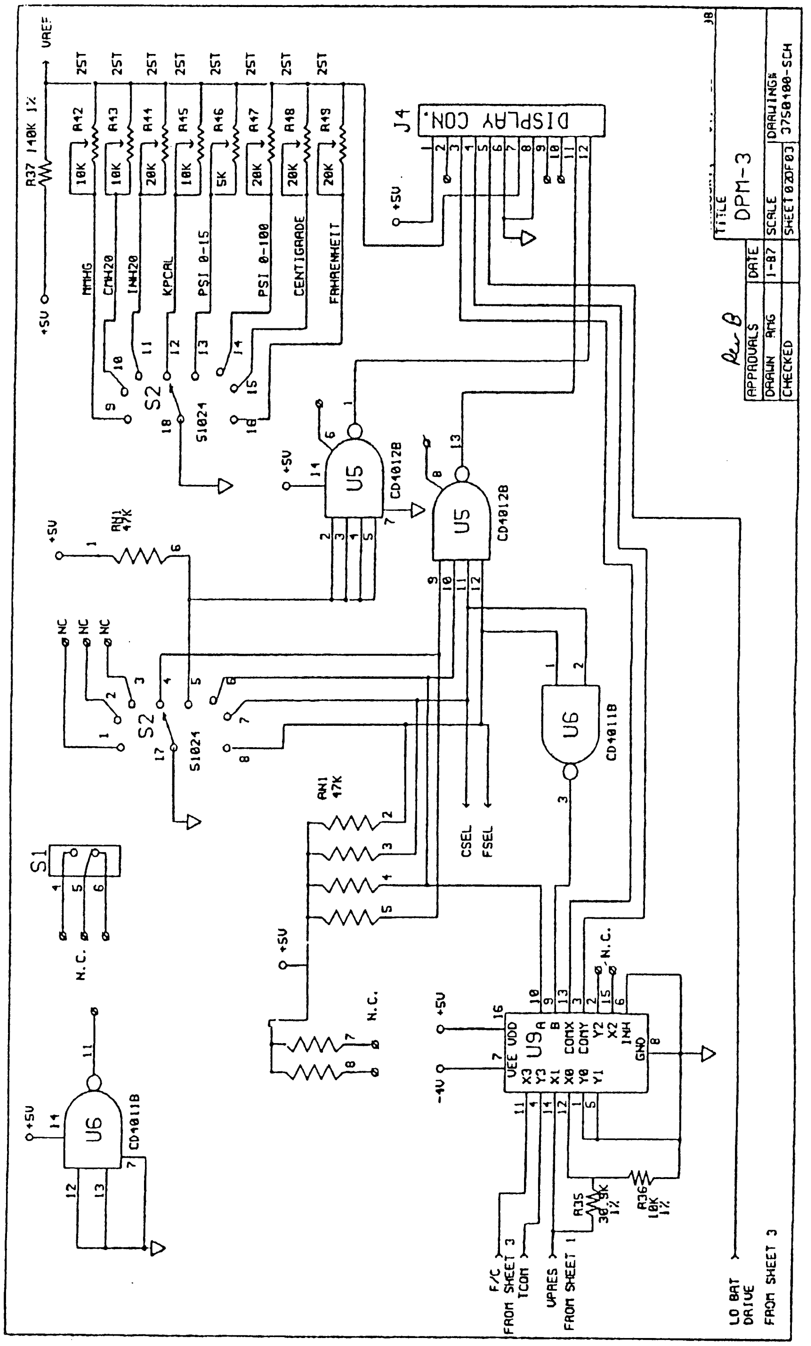
Schematics

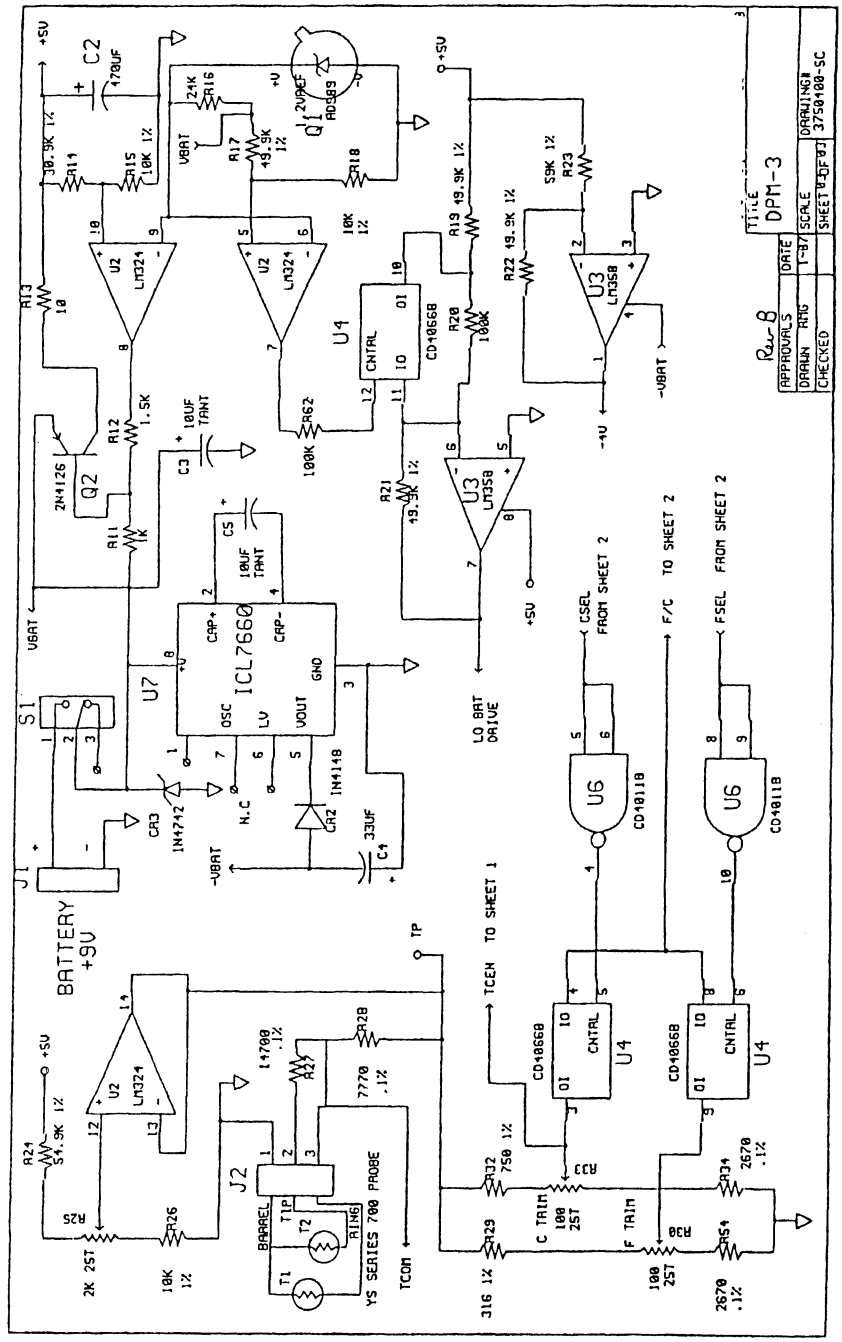
Section 4

The schematics included in this section contain proprietary information belonging to Bio-Tek Instruments, Inc., and are provided for the convenience of Bio-Tek customers familiar with electronic design and service. Copying and/or distribution of these documents without the express permission of Bio-Tek Instruments, Inc. is strictly forbidden.



DPM-3
TITLE
APPROVALS
DATE
DRAWN RMG
CHECKED TREFRY
SCALE
DRAWING#
REV
ECO
DESCRIPTION
BY
CHANGE R50 TO 200K
RELEASE TO PRODUCTION
HIGH LEVEL OUT
GND (BARREL)
PRESSURE 0-1V (TIP)
J3
U4
CD4066B
CNTRL
U2
LM324
VBAT
HIGH RANGE TRIM
LM11C
U1
N.C.
XDUCER OFFSET
HIGH LEVEL PRES GAIN
HI LEVEL PRES NULL
U8
TL083
HI LEVEL TEMP NULL
J5
TR1
ZERO
VPRES TO SHEET 2
VREF FROM SHEET 2
TCEN FROM SHEET 3
TCOM FROM SHEET 3


DISPLAY CON.
J4
U5
CD4012B
U6
CD4011B
U9A
S1
S2
S1024
MMHG
CMH20
INH20
KPCAL
PSI 0-15
PSI 0-100
CENTIGRADE
FAHRENHEIT
CSEL
FSEL
LO BAT
DRIVE
FROM SHEET 3
VPRES
FROM SHEET 1
TITLE
DPM-3
APPROVALS
DATE
DRAWN
CHECKED
SCALE
DRAWING#


BATTERY +9V
ICL7660
YS SERIES 700 PROBE
LO BAT DRIVE
TCEN TO SHEET 1
F/C TO SHEET 2
CSEL FROM SHEET 2
FSEL FROM SHEET 2
DPM-3

DPM - III