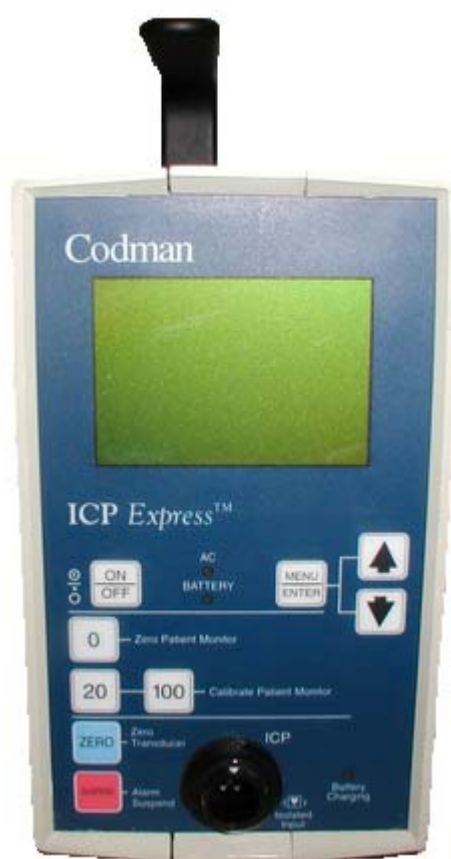


**CODMAN NEURO**



ICP EXPRESS™  
82-6634/ 82-6637/ 82-6635

BIOMED MANUAL



Contact: Codman • 325 Paramount Drive • Raynham, MA 02767  
Phone: 800-343-5969  
Fax: 508-828-3701

**Table of Contents**

1.0 PURPOSE OF DOCUMENT.....3

2.0 TEST EQUIPMENT REQUIRED .....3

3.0 REQUIRED TOOLS.....3

4.0 RELATED DOCUMENTS .....3

5.0 PRODUCT DESCRIPTION.....3

6.0 GENERAL SAFETY SUMMARY.....3

7.0 TABLE OF SYMBOLS .....4

8.0 TECHNICAL SPECIFICATIONS .....10

9.0 CLASSIFICATION/SAFETY .....11

10.0 SERVICE SAFETY SUMMARY .....11

11.0 ELECTROSTATIC DAMAGE PREVENTION .....11

12.0 REPLACEABLE PARTS.....12

13.0 TEST PROCEDURE (82-6634 & 82-6637 ONLY) .....14

14.0 TEST PROCEDURE (82-6635 ONLY) .....24

15.0 SPARE PARTS.....34

16.0 DHF (82-6634 & 82-6637 ONLY) .....35

17.0 DHF (82-6635 ONLY) .....38

## 1.0 Purpose of document

- This document describes the process, test equipment, tools and spare parts needed to repair and test the ICP Express.
- This service manual is intended to be used for the service and repair tasks by trained and authorized personnel at approved service centers.

## 2.0 Test Equipment Required

Equipment Description	Part #	Calibration Schedule
Digital Multimeter (DMM)	Fluke 8808A (or equivalent)	calibrate per manufacturers requirement
Pressure Simulator	Fogg BP-600	calibrate per manufacturers requirement
Leakage Tester	DWG-166646002 (or equivalent)	N/A
Adapter Cable	Codman 198433	Visual Inspection

## 3.0 Required Tools

Tool Description	Part #
Philips Head Screwdriver #2	Standard Tool
70% isopropyl alcohol solution	Standard Tool
Clean soft cloth	Standard Tool

## 4.0 Related Documents (Verify for correct model)

Document Agile #	Description
LCN 182446-001	82-6634 Instructions for use (IFU)
LCN 195440-001	82-6637 Instructions for use (IFU)
LCN 182937-001	82-6635 Instructions for use (IFU)

## 5.0 Product Description

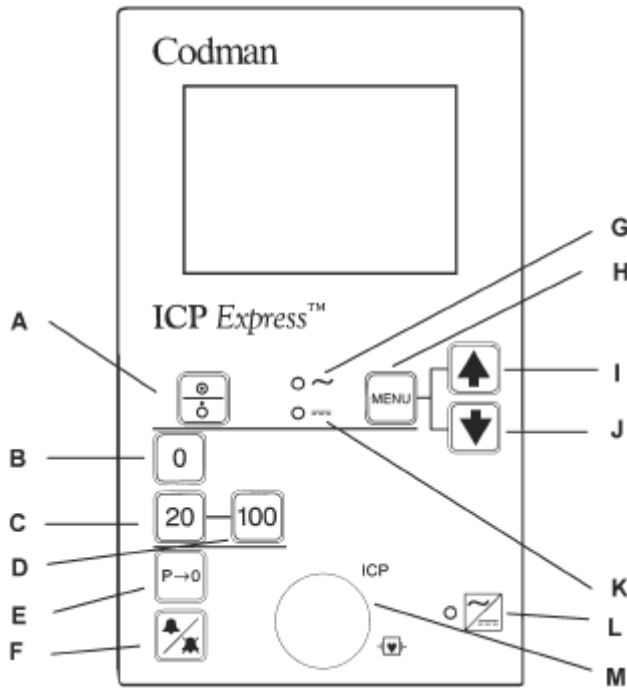
The ICP EXPRESS Monitor is intended to serve as an interface between the CODMAN® MICROSENSOR® ICP Transducer and compatible patient monitoring systems. When connected to a MICROSENSOR, the ICP EXPRESS Monitor provides a continuous numeric display of the mean, systolic and diastolic intracranial pressure. For detailed waveform analysis the ICP EXPRESS Monitor generates an output signal that may be interfaced directly to the pressure channel input on most patient monitoring systems. The ICP EXPRESS Monitor is designed for use wherever ICP monitoring is appropriate, such as emergency rooms, operating rooms, and intensive care units. The small profile and light weight of the ICP EXPRESS Monitor make it ideal for monitoring ICP during patient transport, with or without a separate transport monitor. The ICP EXPRESS Monitor operates continuously on AC power, or for up to three hours on its own internal rechargeable battery.

## 6.0 General Safety Summary

Review the safety precautions outlined in section 10.0 in order to prevent injury to the patient and operator, and to avoid damage to this product or any products connected to it. Only trained and authorized personnel should perform service procedures.

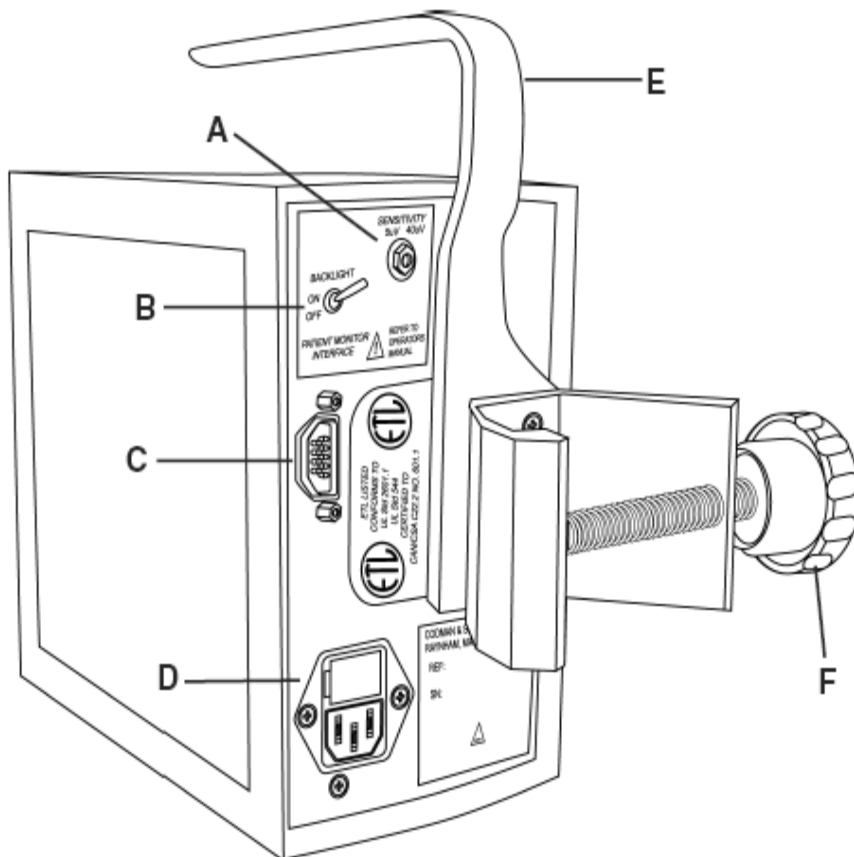
## 7.0 Table of Symbols

### 7.1 82-6634 (110v /120v)



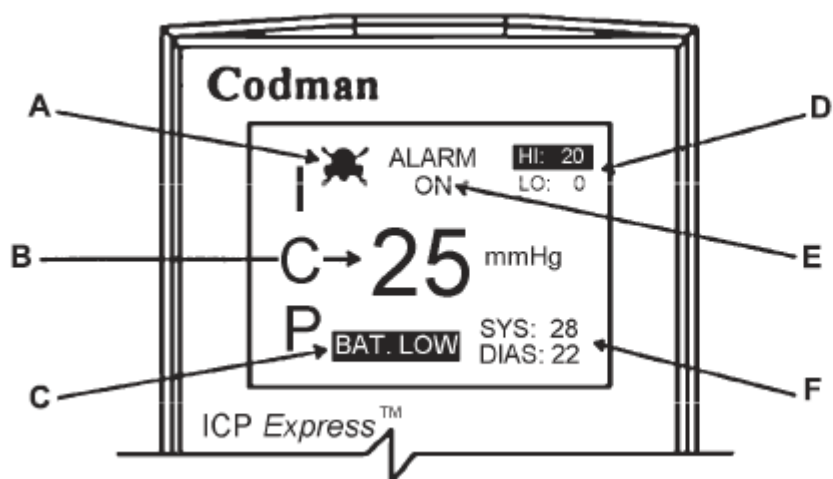
#### ENGLISH ICP EXPRESS MONITOR FRONT PANEL

- A. ON/OFF Key
- B. Patient Monitor Zero Key
- C. Patient Monitor 20 mmHg Calibration Key
- D. Patient Monitor 100 mmHg Calibration Key
- E. Transducer Zero Key
- F. Alarm Suspend Key
- G. AC Indicator
- H. MENU Key
- I. UP Arrow Key
- J. DOWN Arrow Key
- K. BATTERY Indicator
- L. BATTERY Charging Indicator
- M. ICP Input



#### ENGLISH ICP EXPRESS MONITOR REAR PANEL

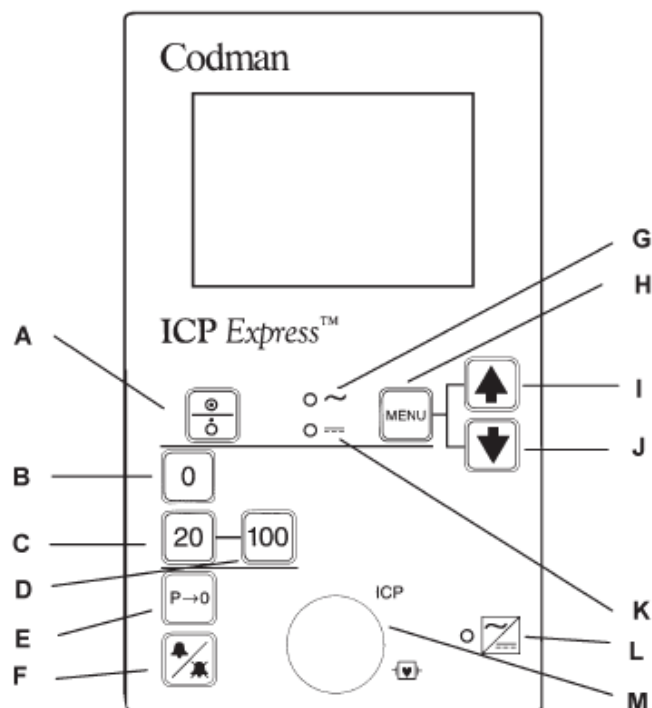
- A. Patient Monitor Sensitivity Selection Switch
- B. Display Backlight ON/OFF Switch
- C. Patient Monitor Interface Connector
- D. AC Power Entry Module
- E. Handle
- F. Pole Clamp



# **ENGLISH** **ICP EXPRESS MONITOR** **DISPLAY**

- A. Alarm Suspend
- B. Mean ICP
- C. Low Battery Alert
- D. Alarm Limits (HIGH Alarm engaged)
- E. Alarm ON/OFF status
- F. Systolic and Diastolic ICP

## 7.2 82-6637 (Japan Version)



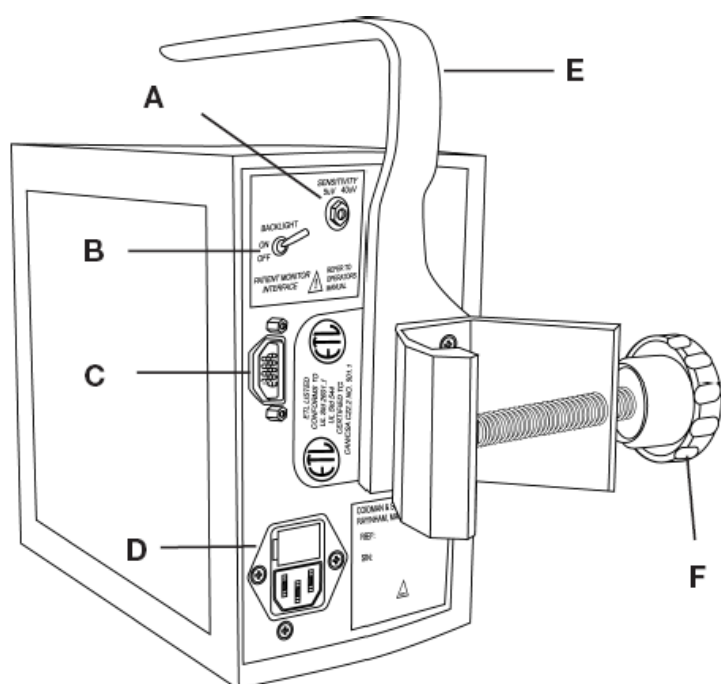
### ENGLISH ICP EXPRESS MONITOR FRONT-PANEL

- A. ON/OFF Key
- B. Patient Monitor Zero Key
- C. Patient Monitor 20 mmHg Calibration-Key
- D. Patient Monitor 100 mmHg Calibration-Key
- E. Transducer Zero Key
- F. Alarm Suspend Key
- G. AC Indicator
- H. MENU Key
- I. UP Arrow Key
- J. DOWN Arrow Key
- K. BATTERY Indicator
- L. BATTERY Charging Indicator
- M. ICP Input

### 参考図

#### ICPエクスプレス前面パネル

- A. オン/オフキー
- B. 患者モニターゼロキー
- C. 患者モニター20 mmHg校正キー
- D. 患者モニター100 mmHg校正キー
- E. トランスデューサーゼロキー
- F. 警報停止キー
- G. 交流インディケータ
- H. MENUキー
- I. 上矢印キー
- J. 下矢印キー
- K. バッテリーインディケータ
- L. バッテリー充電中インディケータ
- M. ICP入力



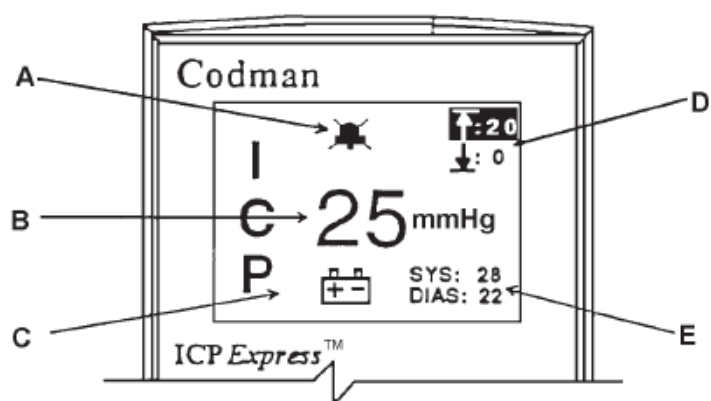
### ENGLISH ICP EXPRESS REAR-PANEL

- A. Patient Monitor Sensitivity Selection Switch
- B. Display Backlight ON/OFF Switch
- C. Patient Monitor Interface Connector
- D. AC Power Entry Module
- E. Handle
- F. Pole Clamp

### 参考図

#### ICPエクスプレス背面パネル

- A. 患者モニター感度選択スイッチ
- B. ディスプレイバックライトON/OFFキー
- C. 患者モニターインターフェイスコネクタ
- D. 交流電源入力モジュール
- E. ハンドル
- F. ポールクランプ

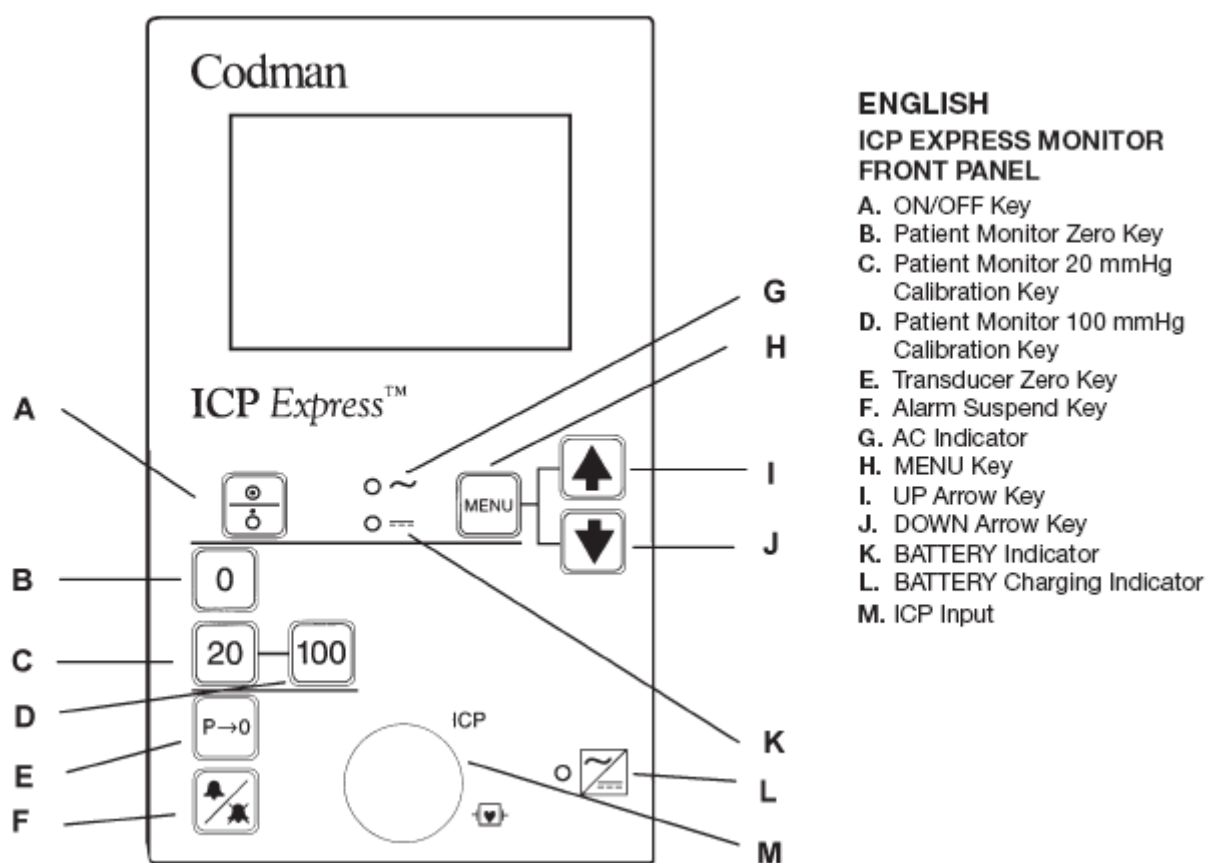
**ENGLISH****ICP EXPRESS DISPLAY**

- A. Alarm Suspend
- B. Mean ICP
- C. Low Battery Alert
- D. Alarm Limits (HIGH (↑) Alarm engaged)
- E. Systolic ICP (Top)  
Diastolic ICP (Bottom)

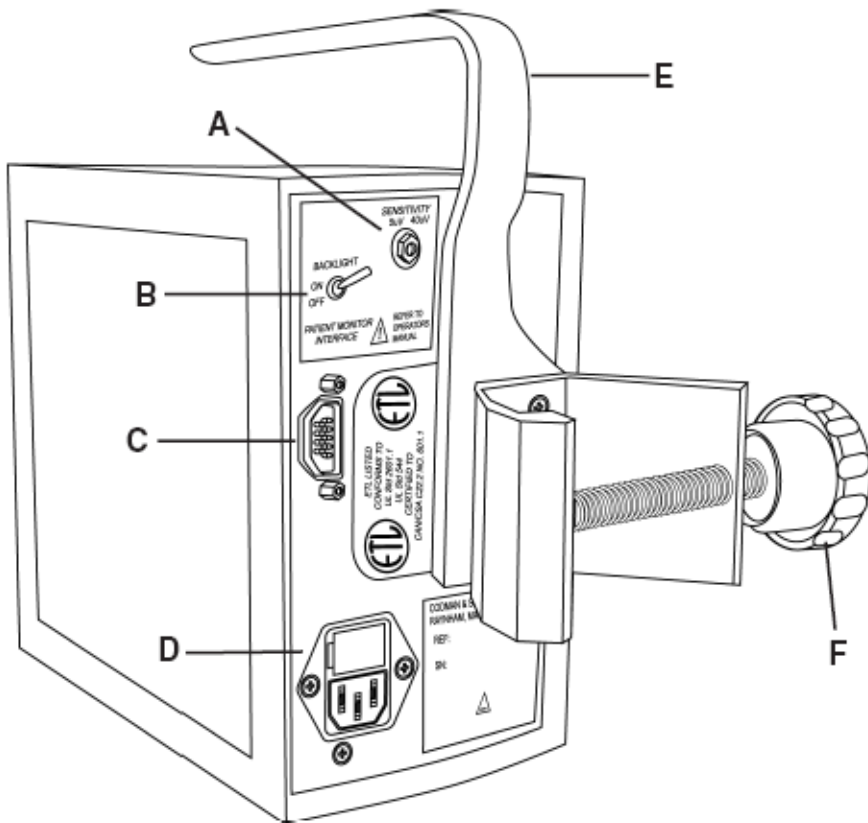
**参考図****ICPエクスプレスディスプレイ**

- A. 警報停止
- B. 平均ICP
- C. バッテリー消耗警告
- D. 警報リミット (上限 (↑) 警報作動中)
- E. 収縮期・弛緩期ICP

## 7.3 82-6635 (220v /240v)

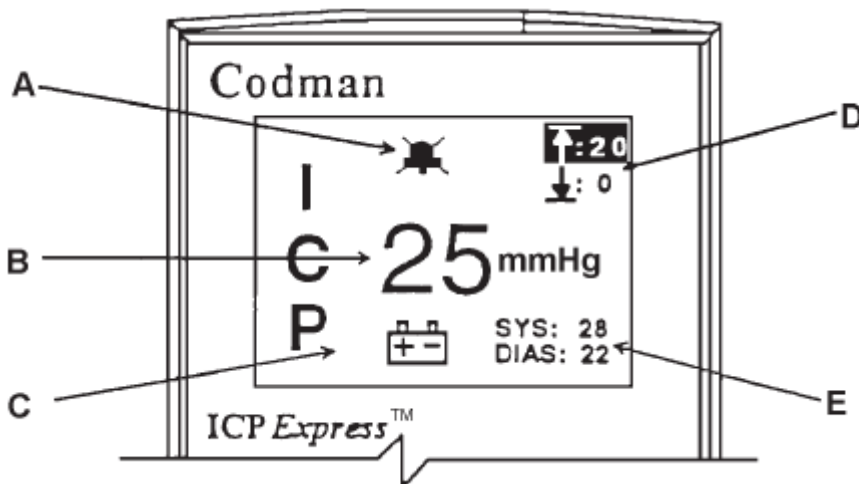






# **ENGLISH** **ICP EXPRESS MONITOR** **REAR PANEL**

- A. Patient Monitor Sensitivity Selection Switch
- B. Display Backlight ON/OFF Switch
- C. Patient Monitor Interface Connector
- D. AC Power Entry Module
- E. Handle
- F. Pole Clamp



# **ENGLISH** **ICP EXPRESS MONITOR DISPLAY**

- A. Alarm Suspend
- B. Mean ICP
- C. Low Battery Alert
- D. Alarm Limits (HIGH (̄))  
Alarm engaged)
- E. Systolic and Diastolic ICP

## 8.0 Technical Specifications

Pressure Channel	
Operating Range:	–50 to 250 mmHg
Transducer Excitation Voltage:	5 VDC, $\pm 2.6\%$
Transducer Sensitivity (Gain):	5 $\mu\text{V/V/mmHg}$
Input Impedance:	10 M $\Omega$
Frequency Response:	0 to 200 Hz (–3 dB)
Zero Range:	$\pm 100$ mmHg (auto pushbutton)
Drift:	$<0.1$ mmHg/ $^{\circ}\text{C}$ (exclusive of transducer)
Pressure Display Accuracy:	$\pm 1\%$ of reading or 1 mmHg, whichever is larger (exclusive of transducer)
Pressure Display Resolution:	1 mmHg
Isolation:	Isolated from ground related circuits by $>4000$ Vrms.
Leakage Current:	$<10$ $\mu\text{A}$ at 117 VAC, 50–60 Hz (826634) $<10$ $\mu\text{A}$ at 100 VAC, 50–60 Hz (826637) $<10$ $\mu\text{A}$ at 230 VAC, 50–60 Hz (826635)
Alarms	
Alarm Parameter:	Mean ICP
Low (LO) Limit, Default:	0 mmHg (user adjustable)
High (HI) Limit, Default:	20 mmHg (user adjustable)
Low (LO) Limit Range:	–50 to +249 mmHg; 1 mmHg steps
High (HI) Limit Range:	–49 to +250 mmHg; 1 mmHg steps
External Patient Monitor Interface	
Output Signal Sensitivity:	5 $\mu\text{V/Vex/mmHg}$ or 40 $\mu\text{V/Vex/mmHg}$ (user selected; referenced to excitation voltage of patient monitor)
Output Signal Accuracy:	$\pm 1$ mmHg or 1%, whichever is greater (exclusive of transducer)
Reference Signals:	0, 20 and 100 mmHg
Input Impedance:	350–500 $\Omega$
Source Impedance:	350 $\Omega$
Frequency Response:	0 to 200 Hz (–3 dB)
Recommended External Patient Monitor Specifications	
Excitation Voltage Range:	0.5 to 10.0 VDC or VAC rms
Excitation Voltage Frequency:	DC to 5000 Hz
Transducer Sensitivity (Gain):	5 $\mu\text{V/Vex/mmHg}$ or 40 $\mu\text{V/Vex/mmHg}$
Drift:	$<0.1$ mmHg/ $^{\circ}\text{C}$
Zero Range:	at least $\pm 100$ mmHg
Frequency Response:	at least 10 Hz
Leakage:	$<10$ $\mu\text{A}$ at 117 VAC, 60 Hz (826634) $<10$ $\mu\text{A}$ at 100 VAC, 60 Hz (826637) $<10$ $\mu\text{A}$ at 230 VAC, 60 Hz (826635)
Isolation:	Isolated from ground related circuits by 4000 Vrms.
Display	
Type:	Liquid Crystal Display (LCD)
Active Viewing Area:	2.215 in. x 1.51 in. (5.6 x 3.8 cm)
Matrix Size:	128 x 64 pixels
Backlight:	Blue-Green Electroluminescent (EL)
Viewing Angle:	$\pm 30^{\circ}$
Environmental	
Operating Temperature Range:	41 $^{\circ}\text{F}$ to 113 $^{\circ}\text{F}$ (5 $^{\circ}\text{C}$ to 45 $^{\circ}\text{C}$ )
Non-Operating Temperature Range (Storage and Transportation):	–40 $^{\circ}\text{F}$ to 140 $^{\circ}\text{F}$ (–40 $^{\circ}\text{C}$ to 60 $^{\circ}\text{C}$ )

Operating/Non-Operating Humidity Range:	5% to 90% (non-condensing)
<b>Mechanical</b>	
Size:	6.1 in. H x 3.5 in. W x 6.2 in. D (15.5 cm H x 8.9 cm W x 15.7 cm D)
Weight:	4.75 lbs (2.15 kg)
<b>Power Requirements</b>	
Rated Input:	100 - 120 VAC 0.2A (826634 & 826637) 200–260 VAC 0.1A (826635)
Supply Frequency:	50/60 Hz
Supply Voltage:	100 - 120 VAC (826634 & 826637) 200–260 VAC (826637)
<b>Battery Operation</b>	
Type:	Lead Acid, rechargeable
Battery Operating Time:	3 hours, nominal (fully charged, new battery)
Charge Time:	12 hours maximum (for fully discharged battery)
Low Battery Alert:	<15 minutes life remaining

## 9.0 Classification/Safety

- The ICP EXPRESS Monitor is a Class I, CF Type Medical Equipment.
- The input of ICP EXPRESS is protected against defibrillator discharge with no interruption to normal functionality.
- The ICP EXPRESS Monitor complies with: IEC 60601-1 (2005) Medical Equipment, Part 1: General Requirements for Safety
- IEC 60601-1-2 (2001) Electromagnetic Compatibility (EMC) Requirements and Tests

## 10.0 Service Safety Summary

- Only trained and authorized personnel should perform service procedures. Read the Service Safety Summary and the General Safety Summary before performing any service procedures.
- All repairs requiring opening of the case should only be performed by a trained and qualified repair center. Please direct all repairs to a trained and qualified repair center. (800-343-5969 within the United States).
- Do not service alone. Do not perform internal service or adjustments on this instrument unless another person capable of rendering first aid and resuscitation is present.
- Use care when servicing with the Power on. Dangerous voltages or currents may be present in this product. To avoid electric shock, do not touch exposed connections. Do not remove the top cover or any protective cover while the instrument is powered or connected to AC mains.
- Full Safety Verification Tests must be performed after a service procedure. Any service procedure that involves removing the board assemblies must be followed by complete safety verification procedures.

## 11.0 Electrostatic Damage Prevention

The ICP Express contains electronic components that are susceptible to damage from electrostatic discharge. Static voltages of 1 kV to 30kV are common in unprotected environments. Observe the following precautions to avoid static damage:

- Minimize handling of static-sensitive components.
- Transport and store static-sensitive components or assemblies in their original containers, or a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
- Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should only be performed at a static-free workstation by qualified personnel.

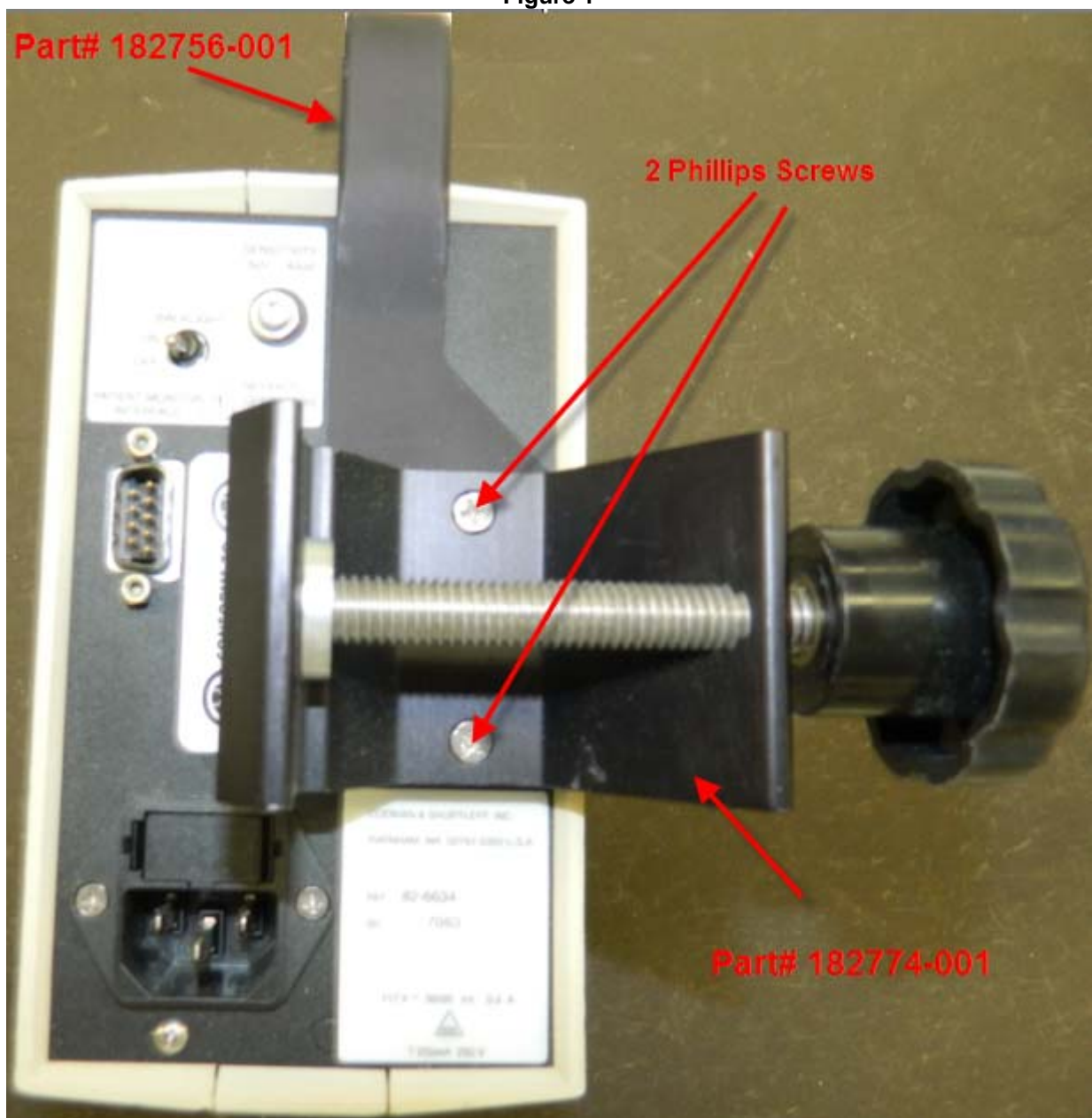
- Nothing capable of generating or storing a static charge should be allowed on the workstation surface.
- Pick up components by the body, never by the leads.
- Do not slide the components over any surface.
- Avoid handling components or assemblies in areas that have a floor or work surface covering capable of generating a static charge.

## 12.0 Replaceable parts

Pole clamp and handle (Part# 182756-001 Handle, Part# 182774-001 Clamp)

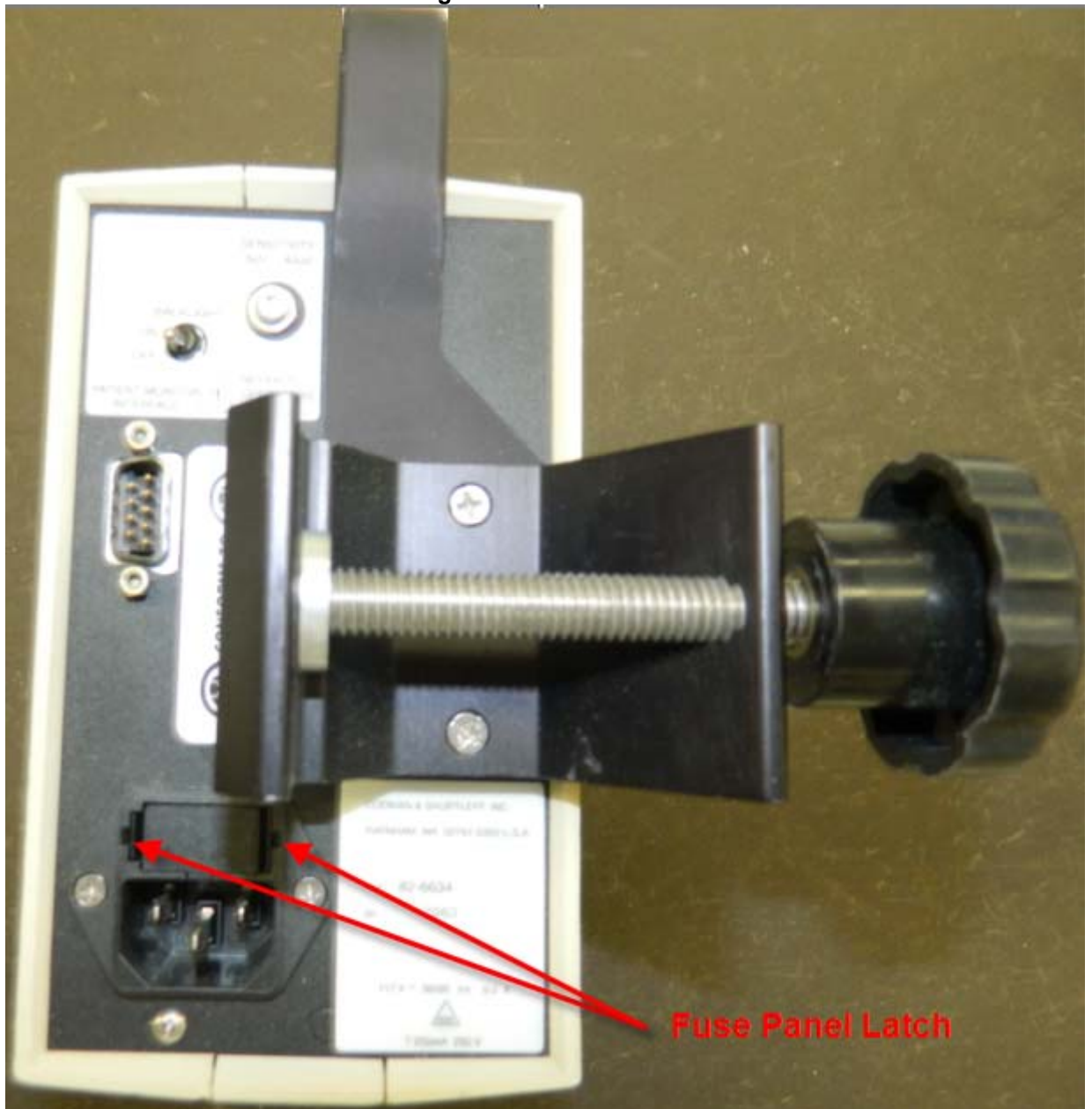
- Using a #2 Phillips screwdriver, remove the 2 screws connecting the pole clamp to the rear panel, as outlined in Figure 1.

**Figure 1**



- Using a small flat headscrewdriver, release the fuse holder by pressing on the latch on each side of the fuse holder as outlined in Figure 2

**Figure 2**



### 13.0 Test Procedure (82-6634 & 82-6637 Only)

**Note:** DUT = Device (ICP Express) Under Test

**Note:** If the DUT fails any of the following tests please return the unit for service to a trained and qualified repair center.  
(800-343-5969 within the United States)

#### 13.1 Visual Inspection

13.1.1 Record DUT serial number.

#### 13.2 Fuses

Equipment: Small slotted head screwdriver

Remove the external fuse holder from the rear panel AC entry module and verify the proper installation of the two 5x20 mm fuses. Verify and record the proper fuse rating: 250 mA (0.25 A), 250 V, time delay (type SB or T). Re-install the fuses and the external fuse holder into the AC entry module. Press firmly on both sides of the fuse holder to ensure correct installation in the AC entry module.

#### 13.3 Electrical Safety Inspection

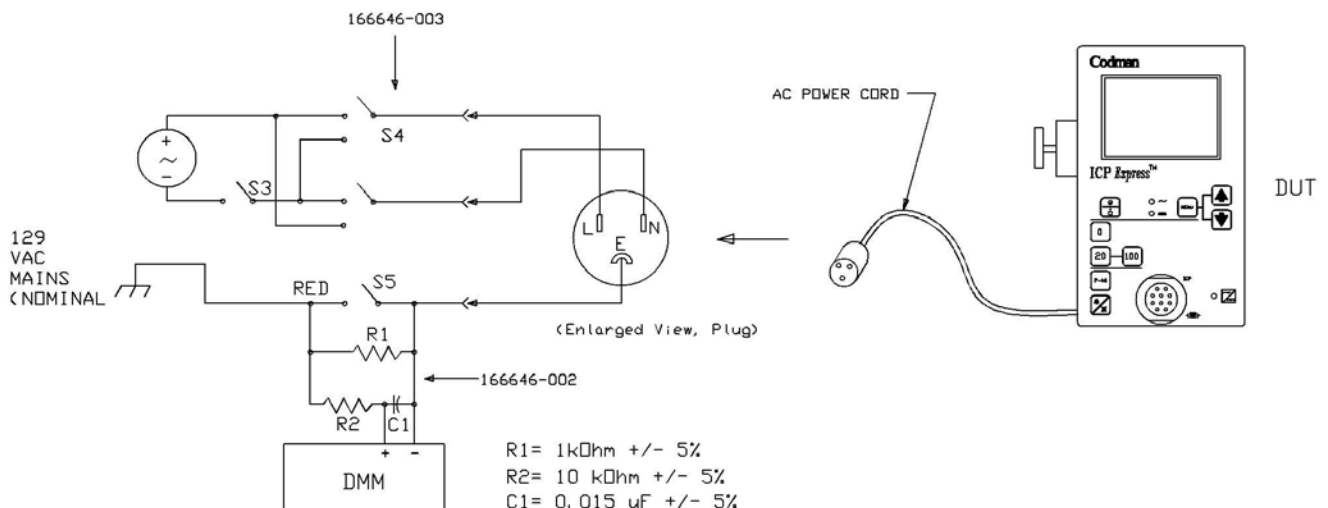
13.3.1 Leakage Current

**Note:** Leakage current tests are to be performed in accordance with IEC60601-1, 2<sup>nd</sup>, ed..

**Equipment:** Digital multimeter, RC input circuit per IEC60601-1, 2<sup>nd</sup> ed., front panel receptacle shorting connector, leads, 60 Hz specified power source.

13.3.1.1 Chassis Leakage (refer to Figure 3)

Measure and record the chassis leakage current for each condition listed in Figure 3. Set the DMM to read in the "AC" mode in the 1000 mV range. All DMM readings must measure less than 1000 mV (equivalent to 1000 FA). This test must be performed with the DUT in the ON condition.



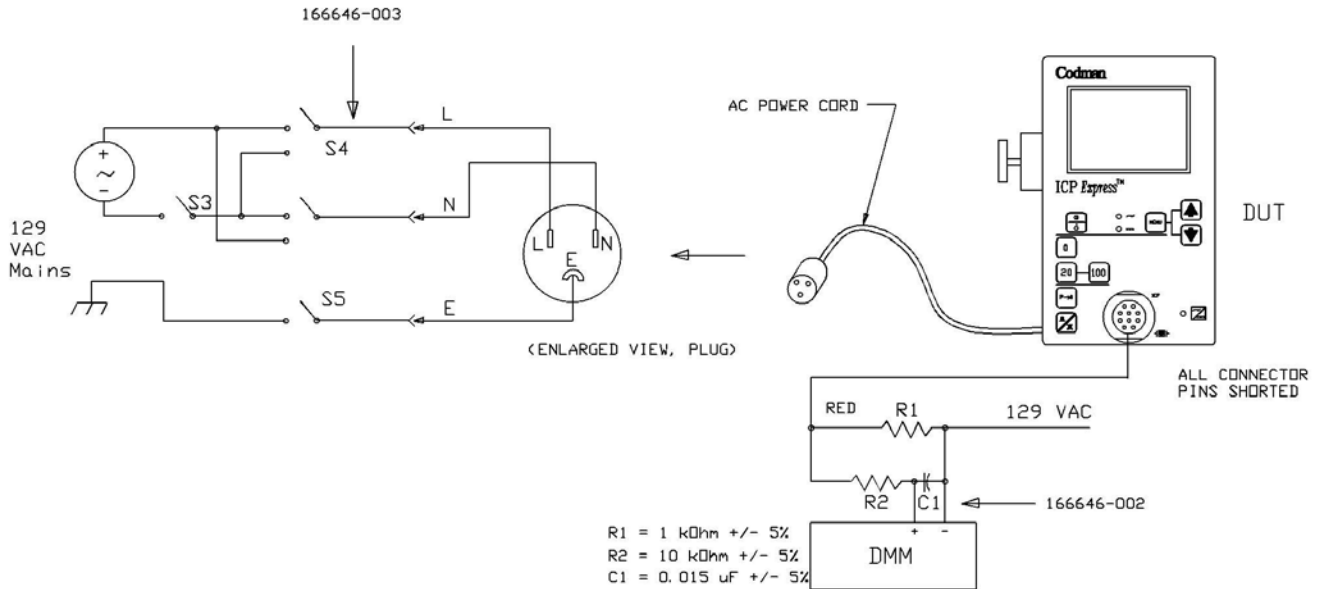
TEST CONDITIONS: CHASSIS LEAKAGE CURRENT

TEST	S3 (LINE)	S4 (POLARITY)	S5 (GROUND)	DMM LIMIT
1	CLOSED	NORMAL	OPEN	1000 mV
2	CLOSED	REVERSED	OPEN	1000 mV
3	CLOSED	NORMAL	CLOSED	500 mV
4	CLOSED	REVERSED	CLOSED	1000 mV

Figure 3

### 13.3.1.2 Patient Leakage (refer to Figure 4)

Measure and record the patient leakage current for each condition listed in Figure 4. Set the DMM to read in the "AC" mode in the 100 mV range. All DMM readings must measure less than 50 mV (equivalent to 50 uA).



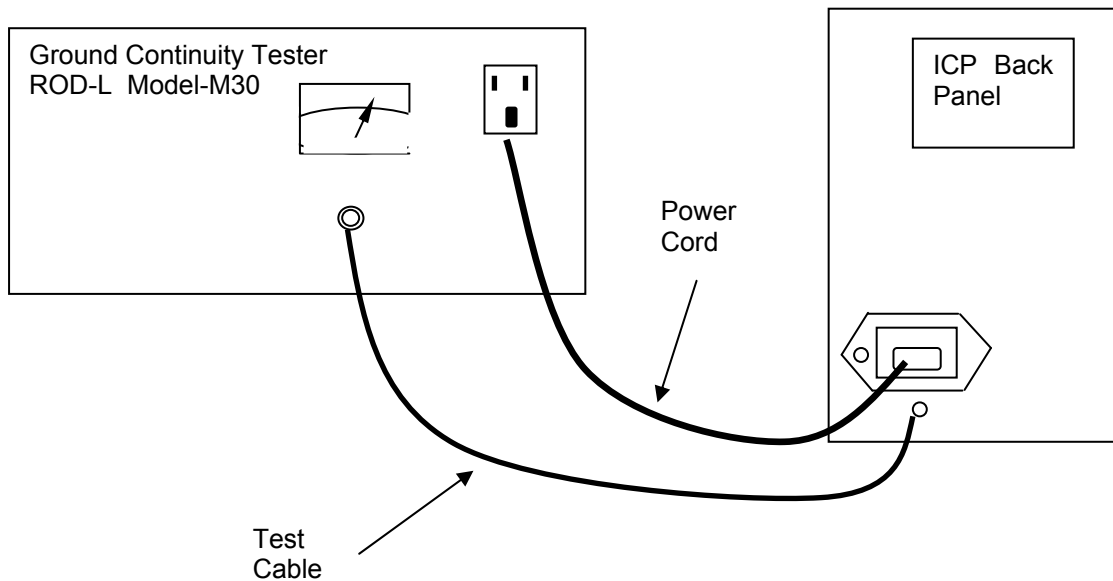
TEST CONDITIONS: PATIENT LEAKAGE CURRENT

TEST	S3 (LINE)	S4 (POLARITY)	S5 (GROUND)	DUT ON/OFF	LIMIT
1	CLOSED	NORMAL	OPEN	OFF	50 mV
3	CLOSED	REVERSED	OPEN	OFF	50 mV
5	CLOSED	NORMAL	CLOSED	OFF	50 mV
7	CLOSED	REVERSED	CLOSED	OFF	50 mV

Figure 4

### 13.3.2 Ground Continuity (refer to Figure 5)

- A. Disconnect the test cable from the meter and press the test button on the meter to force it to failure as resistance is higher than 0.15 Ohm. Record the result in the attachment table (PASS/FAIL)
- B. Test resistance between the earth terminal of the AC power cord and AC entry inlet metal screw head using high current meter ROD-L, Model-M30 as shown in Figure 5. Resistance threshold of this meter is set to 0.15 ohm. Record the result in the attachment table (PASS/FAIL)



**Figure 5**

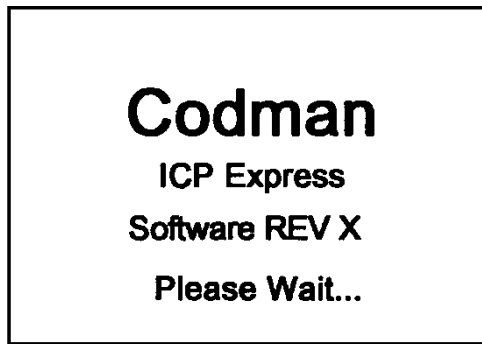
## 13.4 Functional Inspection

### 13.4.1 Power-Up Sequence

- 13.4.1.1 Plug the DUT into a standard 120 VAC, 60 Hz (82-6634) or 100VAC, 60HZ (82-6637) AC mains supply. At this point, do not attach any cables other than the AC power cord.
- 13.4.1.2 Verify that the green AC and Battery Charging indicators illuminate. Verify that the yellow BATTERY indicator does not illuminate.
- 13.4.1.3 Switch the rear panel BACKLIGHT switch to the OFF position. Verify that the front panel LCD backlight is not illuminated.
- 13.4.1.4 Switch the rear panel BACKLIGHT switch to the ON position. Verify that the front panel LCD backlight illuminates.
- 13.4.1.5 Press the front panel ON/OFF key. Verify the following power-up conditions.
  - A. Audio alarm sounds for approximately 2 seconds (at which time the LCD screen is in a random state) followed by,
  - B. All pixels on LCD display turn black for approximately 3 seconds, followed by,



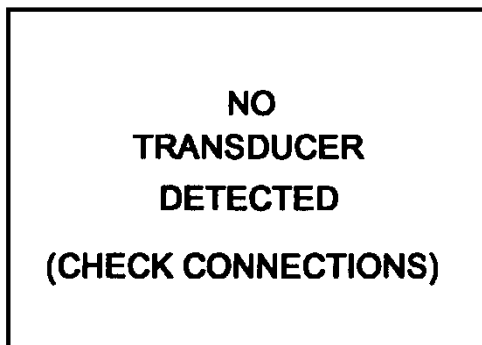
- C. Introductory Screen, per Figure 6, displayed for approximately 10 seconds.



**Figure 6**

NOTE: 82-6637 screen may be in Japanese.

- 13.4.1.6 Record the software revision as displayed in the Introductory Screen.
- 13.4.1.7 Verify display changes to "NO TRANSDUCER DETECTED (CHECK CONNECTIONS)" per Figure 7.



**Figure 7**

NOTE: If the screen is in Japanese, press the menu key and change to English.

#### 13.4.2 Pressure Signal Display and Monitor Output Accuracy Test.

Equipment: Fogg BP-600 Pressure Simulator, Fogg Adapter Cable

- 13.4.2.1 Adjust the Fogg BP-600 simulator to a setting of 0 mmHg.
- 13.4.2.2 Connect the Fogg BP-600 simulator to the DUT using the Fogg adaptor cable.
- 13.4.2.3 Verify that the DUT displays the message "'TRANSDUCER DETECTED PLEASE WAIT..." per Figure 8, for approximately 5-10 seconds.

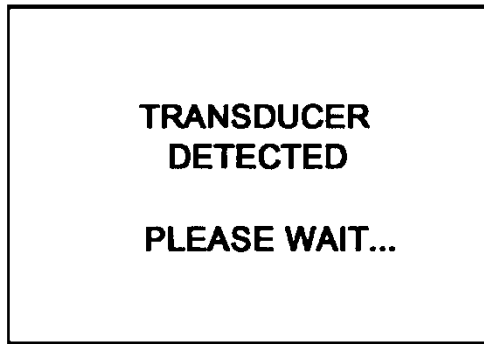


Figure 8

- 13.4.2.4 Verify that the display changes to "PRESS ZERO TO ZERO TRANSDUCER" per Figure 9.

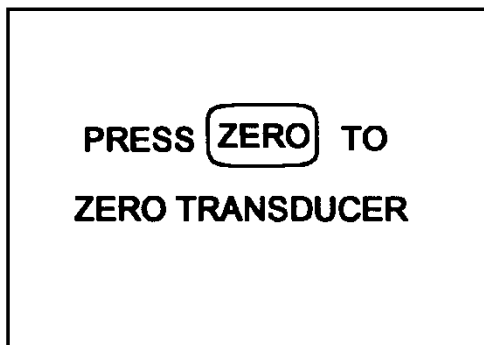


Figure 9

NOTE: "ZERO" = P → O" on 82-6637

- 13.4.2.5 Press the front panel ZERO key and verify that the display changes to "TRANSDUCER ZEROING IN PROCESS PLEASE WAIT..." per Figure 10, for approximately 5 seconds.

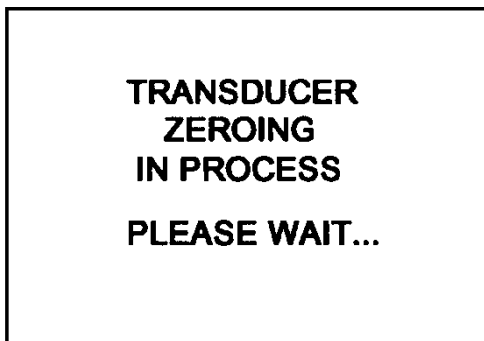


Figure 10

- 13.4.2.6 Verify that the display message changes to ZEROING COMPLETE ZERO REFERENCE = NNN / RECORD ZERO REFERENCE THEN PRESS MENU/ENTER" per Figure 11. Verify that NNN = 497 to 503. Record NNN, then press the MENU/ENTER key. Record values.

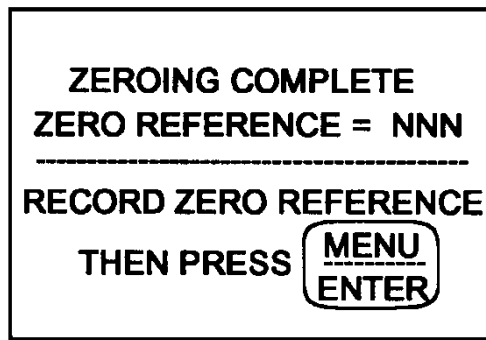


Figure 11

NOTE: MENU/ENTER" = "MENU" on 826637

- 13.4.2.7 Verify that the display changes to the standard run mode per Figure 12 with the mean, systolic and diastolic pressures reading zero +/- 1 mmHg. Verify that the ALARM is in the OFF condition and that no ALARM LIMITS are displayed on the screen. Record values.

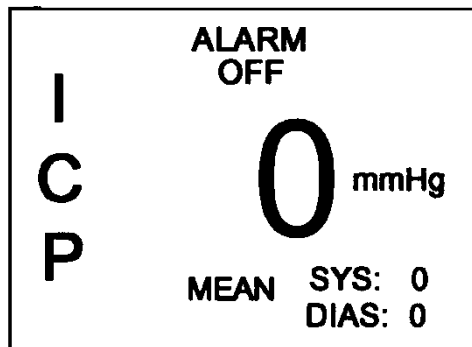


Figure 12

NOTE: On 82-6637, "ALARM OFF" = Bell with slash marks, "MEAN" is absent

### 13.5 LED Indicator Test

13.5.1 With the DUT still plugged into the AC mains supply and in the standard run mode, verify that the green AC and Battery Charging indicators are illuminated. Verify that the yellow BATTERY indicator is not illuminated.

13.5.2 Press the DUT ON/OFF key to turn the DUT OFF. Verify that the AC and Battery Charging indicators remain illuminated. Verify that the BATTERY indicator does not illuminate.

13.5.3 Press the DUT ON/OFF key to turn the unit back ON. Unplug the AC power cord from the AC mains supply and verify that the green AC and Battery Charging indicators turn off and the yellow BATTERY indicator illuminates.

13.5.4 Press the DUT ON/OFF key to turn the unit OFF. Verify that none of the indicators are illuminated.

### 13.6 Pressure Display and Audio Alarm Functionality Test

Equipment: Fogg BP-600 Pressure Simulator, Fogg Adapter Cable

13.6.1 Plug the DUT back into the AC supply and press the front panel ON/OFF key to turn the unit ON.

13.6.2 Verify that the Fogg simulator is still connected to the DUT (reconnect if necessary). After the power-up sequence is complete, verify that the DUT displays "PROCEED TO ZERO PATIENT MONITOR / PRESS MENU/ENTER WHEN MONITOR DISPLAYS 0".

13.6.3 Adjust the Fogg Simulator to the 0 mmHg setting and press the ZERO key on the DUT front panel. Press MENU/ENTER when prompted by the DUT.

13.6.4 From the standard run mode screen, press the MENU/ENTER key to access the main menu. Verify that the display appears as shown in Figure 13.

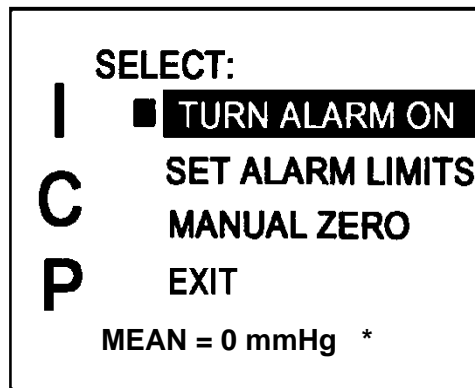


Figure 13

NOTE: "Mean" = 0 mmHg is for 82-3364 only.

13.6.5 With the cursor on the "TURN ALARM ON" item, press the MENU/ENTER key. Verify screen returns to RUN mode with "ALARM ON" at top of screen. Press MENU/ENTER and verify top menu item is "TURN ALARM OFF". (NOTE: Audible alarm may start at any time.)

13.6.6 Use the DUT front panel arrow keys to move the menu cursor to the "SET ALARM LIMITS" item. Press the MENU/ENTER key and verify that the "SET HI ALARM" screen appears as shown in Figure 22 with the displayed limit = 14.

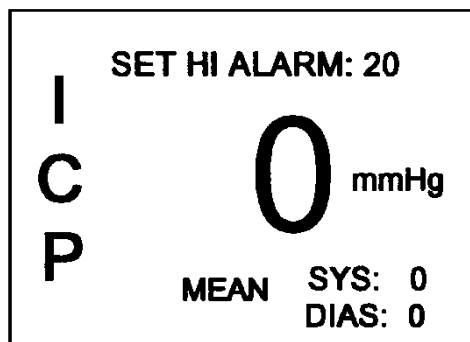


Figure 14

NOTE: "SET HIGH ALARM = "↑" on 82-6637 "MEAN" is absent.

13.6.7 Use the arrow keys to set the HI limit to 21, then press MENU/ENTER. Verify that the "SET LO ALARM" screen appears as shown in Figure 15, with the displayed limit = 0.

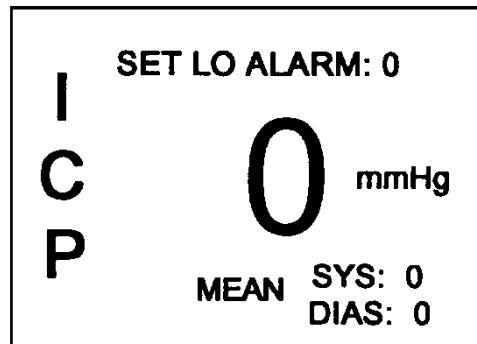


Figure 15

NOTE: "SET LO ALARM = ↓" on 82-6637 "MEAN" is absent.

13.6.8 Use the arrow keys to set the LO limit to -1, then press MENU/ENTER. Verify that the DUT returns to the standard run mode with the "ALARM ON" and "HI: 21", "LO: -1" limits displayed at the top of the screen per Figure 16. Verify that the display and audio alarms are not engaged at this time.

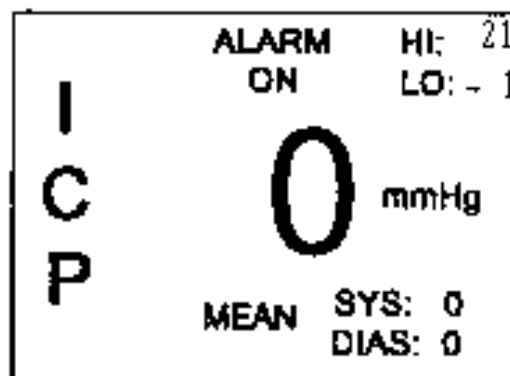


Figure 16

NOTE: On 82-6637 "ALARM ON" = Bell w/ slash marks.  
 "HI" = ↑  
 "LO" = ↓  
 "MEAN" is absent

13.6.9 Set the Fogg simulator to -2 mmHg. Verify that the display and audio alarms engage within approximately 3 seconds of the mean pressure display going past the -1 mmHg limit. Verify that the "LO: -1" limit is blinking in reverse video and that the audio alarm is sounding off/on approximately once per second.

13.6.10 Press the DUT front panel SUSPEND key. Verify that the alarm suspend icon (Bell with slash marks) is displayed in the top left hand corner of the screen, the audio alarm stops, and the display alarm continues to blink.

13.6.11 Press the SUSPEND key again. Verify that the audio and display alarms are both engaged again, and the alarm suspend icon disappears.

13.6.12 Adjust the Fogg simulator to a setting of 12 mmHg. Verify that both the display and audio alarms disengage within approximately 3 seconds of the mean pressure passing the -1 mmHg limit.

13.6.13 Adjust the Fogg simulator to a setting of 22 mmHg. Verify that the display and audio alarms engage within approximately 3 seconds of the mean pressure display going past the 21 mmHg limit. Verify that the "HI: 21" limit is blinking in reverse video and the audio alarm is sounding off/on approximately once per second.

13.6.14 Adjust the Fogg simulator to 0 mmHg. Verify that the HI display and audio alarms disengage within approximately 3 seconds of the mean display passing the 21 mmHg limit.

### 13.7 Cable EEPROM READ/WRITE Test

Equipment: Fogg BP-600 Pressure Simulator, Fogg Adapter Cable.

13.7.1 Verify that the DUT is ON, still connected to the Fogg simulator, and in standard run mode.

13.7.2 Press the DUT MENU/ENTER key to access the main menu. Use the arrow keys to position the menu cursor on the MANUAL ZERO selection, then press the MENU/ENTER key again.

13.7.3 Verify that the display changes to "MANUAL ZERO REFERENCE / ZERO REFERENCE = NNN / USE ARROWS TO ADJUST", per Figure 17.

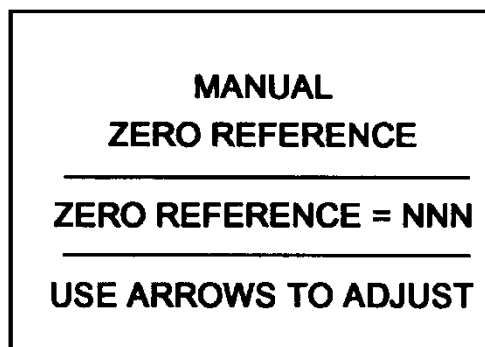


Figure 17

13.7.4 Use the arrow keys to adjust the value NNN to "500", then press MENU/ENTER.

13.7.5 Disconnect the Fogg simulator from the DUT. Verify that the DUT displays "NO TRANSDUCER DETECTED (CHECK CONNECTIONS)".

13.7.6 While switching the Fogg simulator between 0 and 1 mmHg approximately once per second, reconnect the Fogg simulator to the ICP Express. Continue to switch the Fogg simulator from 0 to 1 mmHg while the DUT displays the message "TRANSDUCER DETECTED PLEASE WAIT..."

13.7.7 Verify that the DUT displays the message "TRANSDUCER DETECTED ZERO REFERENCE = NNN / ACCEPT REFERENCE ADJUST REFERENCE", per Figure 18. Verify that the value NNN = 500. Record values.

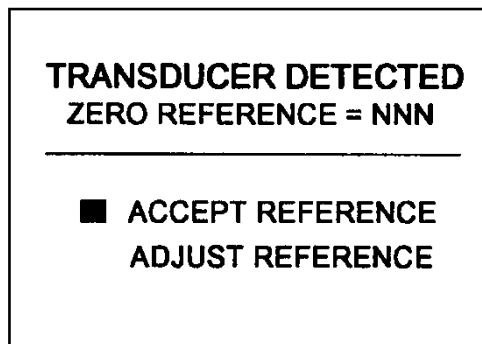


Figure 18

13.7.8 Press the MENU/ENTER key to return to standard run mode.

### 13.8 Zero Lock-Out Test

Equipment: Fogg BP-600 Pressure Simulator, Fogg Adapter Cable

13.8.1 With the DUT still connected to the Fogg simulator and in the standard run mode, begin switching the Fogg from 0 to 1 mmHg approximately once per second.

13.8.2 While continuing to switch the Fogg setting from 0 to 1 mmHg, press the ZERO key on the DUT front panel. Verify that the DUT sounds a triple beep alarm but remains in the standard run mode.

### 13.9 Non-Volatile EPROM Test (82-6637 ONLY)

13.9.1 Remove ICP Express Cable from ICP Express.

13.9.2 Press MENU key.

13.9.3 Switch Language to Japanese, then press MENU.

13.9.4 Switch ICP Express OFF.

13.9.5 Switch ICP Express ON and verify unit powers up in Japanese.

13.9.6 Switch unit OFF.

Important: Japanese unit must be left in Japanese language at completion of test.

### 13.10 Final Charge

Connect the DUT to a nominal 120 VAC source for a minimum of 12 hours. Verify that the green AC and battery charging indicators illuminate upon connection to the AC power. The DUT should be left in the OFF condition during the 12-hour charge.

### 13.11 Final Switch Settings

At the conclusion of testing, leave the rear panel switches in following positions:

13.11.1 Sensitivity Switch: 5uV position.

13.11.2 Backlight: ON position.

Also, verify that the unit is in the OFF condition (blank LCD screen - no LEDs illuminated).

## 14.0 Test Procedure (82-6635 Only)

**Note:** DUT = Device (ICP Express) Under Test

**Note:** If the DUT fails any of the following tests please return the unit for service to a trained and qualified repair center.  
(800-343-5969 within the United States)

### 14.1 Visual Inspection

14.1.1 Record DUT serial number.

### 14.2 Fuses

Equipment: Small flat head screwdriver

Remove the external fuse holder from the rear panel AC entry module and verify the proper installation of the two 5x20 mm fuses. Verify and record the proper fuse rating: 125 mA (01.25 A), 250 V, time delay (type SB or T). Re-install the fuses and the external fuse holder into the AC entry module. Press firmly on both sides of the fuse holder to ensure correct installation in the AC entry module.

### 14.3 Electrical Safety Inspection

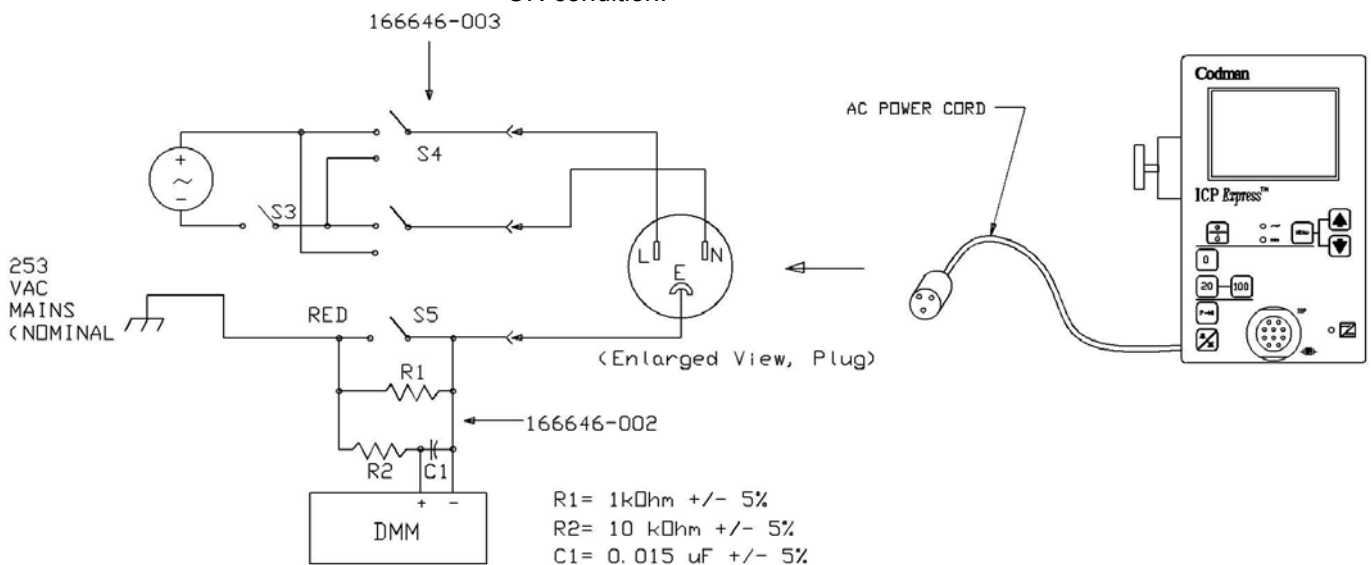
14.3.1 Leakage Current

**Note:** Leakage current tests are to be performed in accordance with IEC60601-1, 2<sup>nd</sup>, ed..

**Equipment:** Digital multimeter, RC input circuit per IEC60601-1, 2<sup>nd</sup> ed., front panel receptacle shorting connector, leads, 60 Hz specified power source.

14.3.1.1 Chassis Leakage (refer to Figure 19)

Measure and record the chassis leakage current for each condition listed in Figure 19. Set the DMM to read in the "AC" mode in the 1000 mV range. All DMM readings must measure less than 1000 mV (equivalent to 1000 uA) or 500mV (equivalent 500uA). This test must be performed with the DUT in the ON condition.





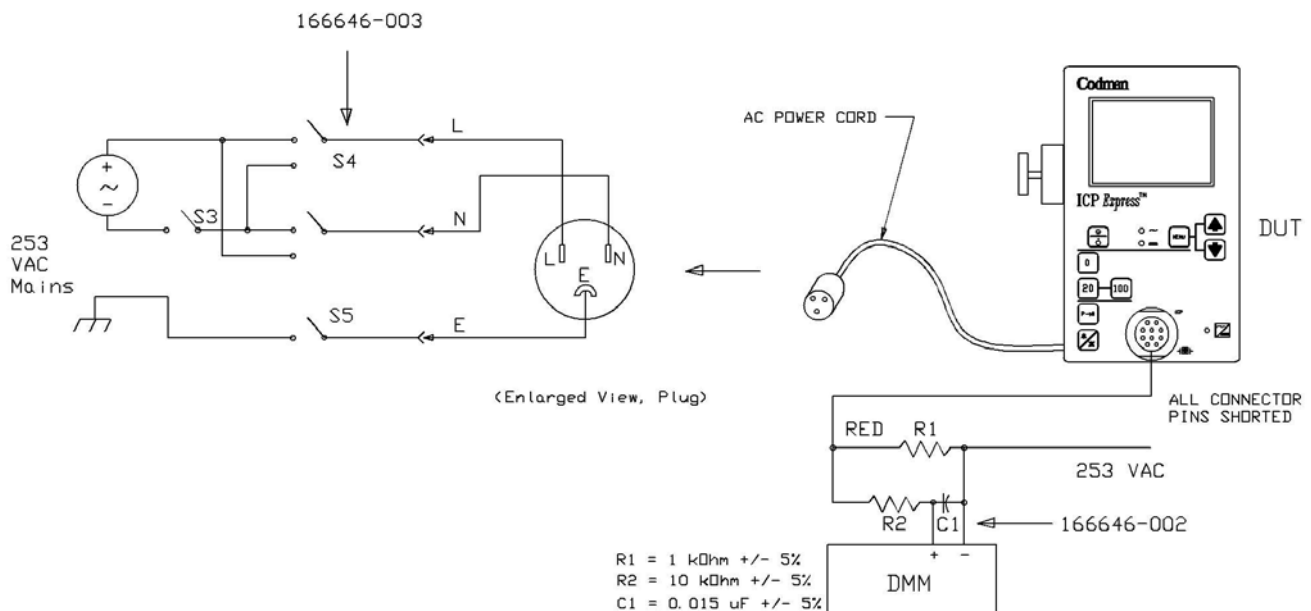
### TEST CONDITIONS: CHASSIS LEAKAGE CURRENT

TEST	S3 (LINE)	S4 (POLARITY)	S5 (GROUND)	DMM LIMIT
1	CLOSED	NORMAL	OPEN	1000 mV
2	CLOSED	REVERSED	OPEN	1000 mV
3	CLOSED	NORMAL	CLOSED	500 mV
4	CLOSED	REVERSED	CLOSED	1000 mV

### Figure 19

#### 14.3.1.2 Patient Leakage (refer to Figure 20)

Measure and record the patient leakage current for each condition listed in Figure 20. Set the DMM to read in the "AC" mode in the 100 mV range. All DMM readings must measure less than 50 mV (equivalent to 50  $\mu$ A).



### TEST CONDITIONS: PATIENT LEAKAGE CURRENT

TEST	S3 (LINE)	S4 (POLARITY)	S5 (GROUND)	DUT ON/OFF	LIMIT
1	CLOSED	NORMAL	OPEN	OFF	50 mV
3	CLOSED	REVERSED	OPEN	OFF	50 mV
5	CLOSED	NORMAL	CLOSED	OFF	50 mV
7	CLOSED	REVERSED	CLOSED	OFF	50 mV

**Figure 20**

### 14.3.2 Ground Continuity (refer to Figure 21)

- A. Disconnect the test cable from the meter and press the test button on the meter to force it to failure as resistance is higher than 0.15 Ohm. Record the result in the attachment table (PASS/FAIL)

- B. Test resistance between the earth terminal of the AC power cord and AC entry inlet metal screw head using high current meter ROD-L, Model-M30 as shown in Figure 21. Resistance threshold of this meter is set to 0.15 ohm. Record the result in the attachment table (PASS/FAIL)

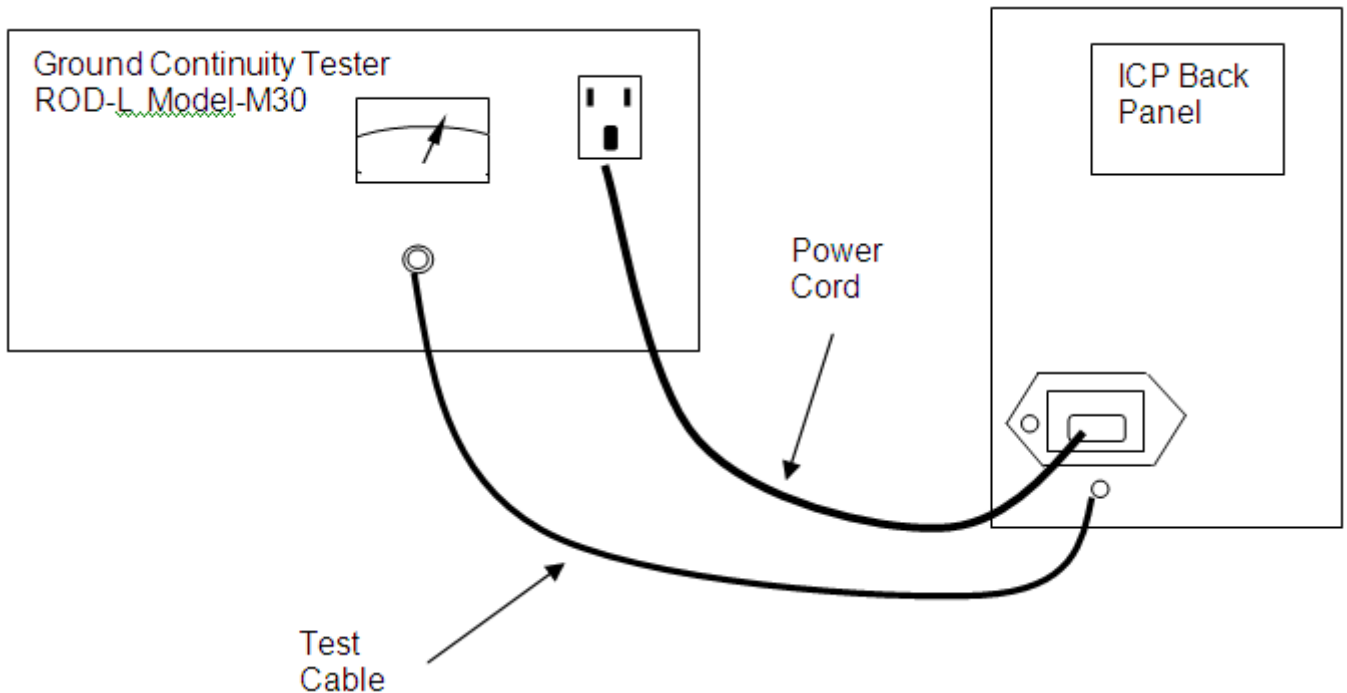


Figure 21

## 14.4 Functional Inspection

### 14.4.1 Power-Up Sequence

- 14.4.1.1 Plug the DUT into a standard 230 VAC, 60 Hz, AC mains supply. At this point, do not attach any cables other than the AC power cord
- 14.4.1.2 Verify that the green AC and Battery Charging indicators illuminate. Verify that the yellow BATTERY indicator does not illuminate.
- Switch the rear panel BACKLIGHT switch to the OFF position. Verify that the front panel LCD backlight is not illuminated.
- Switch the rear panel BACKLIGHT switch to the ON position. Verify that the front panel LCD backlight illuminates
- 14.4.1.3 Press the front panel ON/OFF key. Verify the following power-up conditions.
- Audio alarm sounds for approximately 2 seconds (at which time the LCD screen is in a random state) followed by,
  - All pixels on LCD display turn black for approximately 3 seconds, followed by,
  - Introductory Screen, per Figure 22, displayed for approximately 10 seconds.

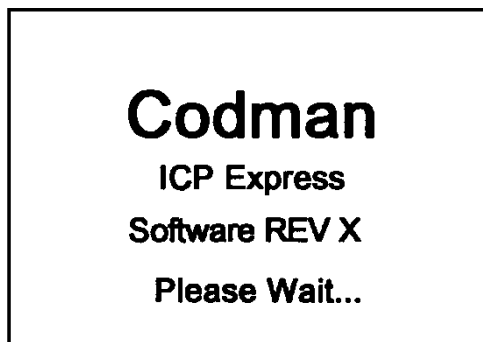


Figure 22

- 14.4.1.4 Record the software revision as displayed in the Introductory Screen.
- 14.4.1.5 Verify display changes to "NO TRANSDUCER DETECTED (CHECK CONNECTIONS)" per Figure 23.

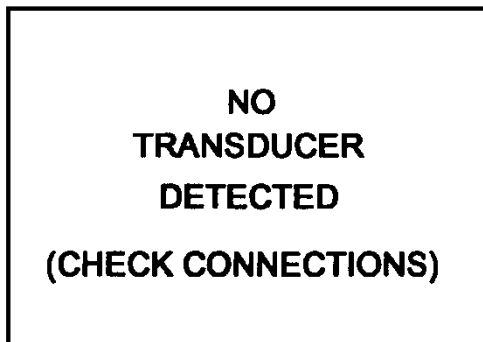


Figure 23

#### 14.4.2 Pressure Signal Display and Monitor Output Accuracy Test.

Equipment: Fogg BP-600 Pressure Simulator, Fogg Adapter Cable.

- 14.4.2.1 Adjust the Fogg BP-600 simulator to a setting of 0 mmHg.
- 14.4.2.2 Connect the Fogg BP-600 simulator to the DUT using the Fogg adaptor cable.
- 14.4.2.3 Verify that the DUT displays the message "TRANSDUCER DETECTED PLEASE WAIT..." per Figure 24, for approximately 5-10 seconds.



Figure 24

- 14.4.2.4 Verify that the display changes to "PRESS P→O TO ZERO TRANSDUCER" per Figure 25.

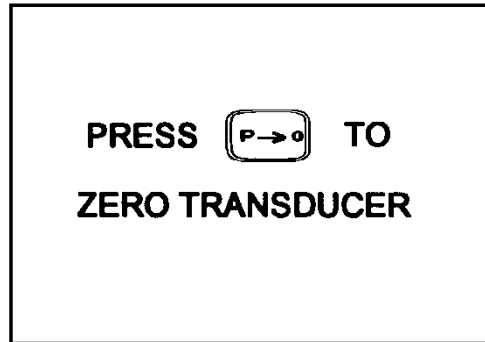


Figure 25

- 14.4.2.5 Press the front panel P→O key and verify that the display changes to "TRANSDUCER ZEROING IN PROCESS PLEASE WAIT..." per Figure 26, for approximately 5 seconds.

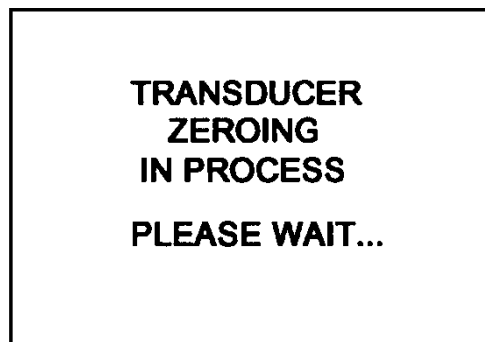


Figure 26

- 14.4.2.6 Verify that the display message changes to "ZEROING COMPLETE ZERO REFERENCE = NNN / RECORD ZERO REFERENCE THEN PRESS MENU" per Figure 27. Verify that NNN = 497 to 503. Record NNN, then press the MENU key. Record values.

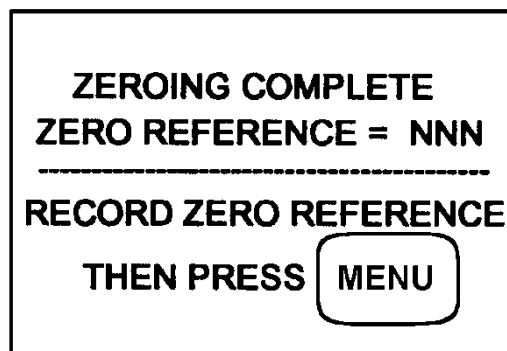


Figure 27

- 14.4.2.7 Verify that the display changes to the standard run mode per Figure 28 with the mean, systolic and diastolic pressures reading zero +/- 1 mmHg. Verify that the ALARM is in the OFF condition and that no ALARM LIMITS are displayed on the screen. Record values.

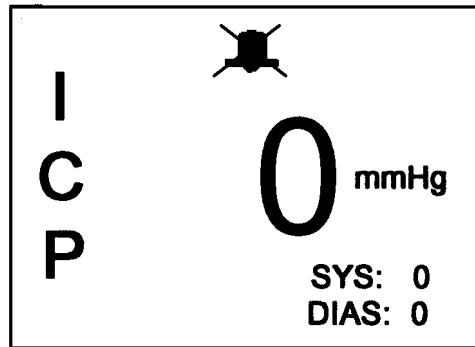


Figure 28

## 14.5 LED Indicator Test

14.5.1 With the DUT still plugged into the AC mains supply and in the standard run mode, verify that the green AC and Battery Charging indicators are illuminated. Verify that the yellow BATTERY indicator is not illuminated.

14.5.2 Press the DUT ON/OFF key to turn the DUT OFF. Verify that the AC and Battery Charging indicators remain illuminated. Verify that the BATTERY indicator does not illuminate.

14.5.3 Press the DUT ON/OFF key to turn the unit back ON. Unplug the AC power cord from the AC mains supply and verify that the green AC and Battery Charging indicators turn off and the yellow BATTERY indicator illuminates.

14.5.4 Press the DUT ON/OFF key to turn the unit OFF. Verify that none of the indicators are illuminated.

## 14.6 Pressure Display and Audio Alarm Functionality Test

Equipment: Fogg BP-600 Pressure Simulator, Fogg Adapter Cable

14.6.1 Plug the DUT back into the AC supply and press the front panel ON/OFF key to turn the unit ON.

14.6.2 Verify that the Fogg simulator is still connected to the DUT (reconnect if necessary). After the power-up sequence is complete, verify that the DUT displays "PROCEED TO ZERO PATIENT MONITOR / PRESS MENU WHEN MONITOR DISPLAYS 0".

14.6.3 Unplug the monitor interface cable from the DUT. Verify that the DUT display changes to "TRANSDUCER DETECTED PLEASE WAIT..." and then to "PRESS ZERO TO ZERO TRANSDUCER".

14.6.4 Adjust the Fogg Simulator to the 0 mmHg setting and press the ZERO key on the DUT front panel. Press MENU when prompted by the DUT.

14.6.5 From the standard run mode screen, press the MENU key to access the main menu. Verify that the display appears as shown in Figure 29.

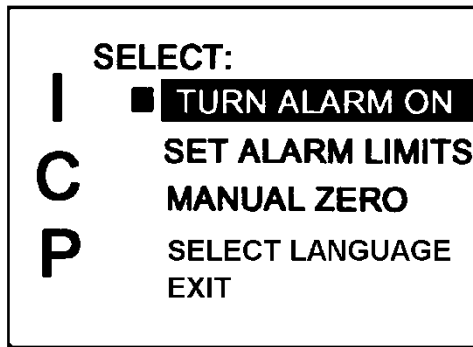


Figure 29

- 14.6.6 With the cursor on the "TURN ALARM ON" item, press the MENU key. Verify screen returns to RUN mode with "ALARM ON" at top of screen. Press MENU and verify top menu item is "TURN ALARM OFF". (NOTE: Audible alarm may start at any time.)
- 14.6.7 Use the DUT front panel arrow keys to move the menu cursor to the "SET ALARM LIMITS" item. Press the MENU key and verify that the "SET HI ALARM" screen appears as shown in Figure 30 with the displayed limit = 20.

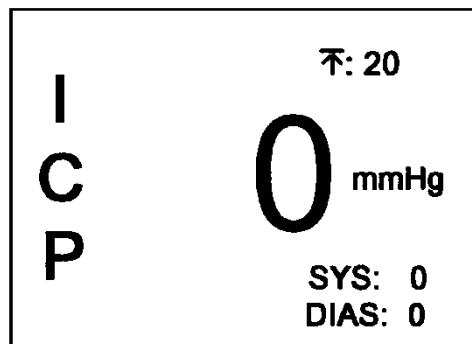


Figure 30

- 14.6.8 Use the arrow keys to set the HI limit to 25, then press MENU. Verify that the "SET LO ALARM" screen appears as shown in Figure 31, with the displayed limit = 0.

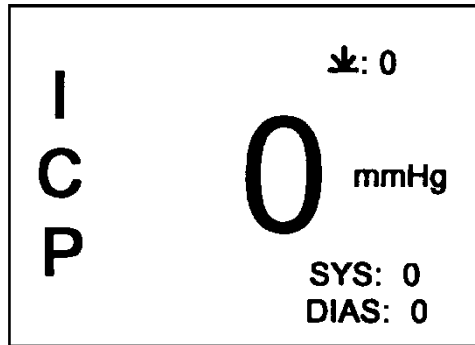


Figure 31

- 14.6.9 Use the arrow keys to set the LO limit to -5, then press MENU. Verify that the DUT returns to the standard run mode with the "ALARM ON" and "HI: 25", "LO: -5" limits displayed at the top of the screen per Figure 32. Verify that the display and audio alarms are not engaged at this time.

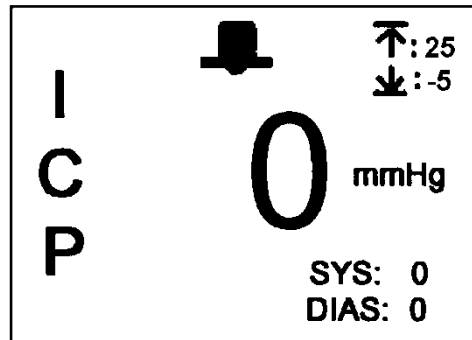


Figure 32

- 14.6.10 Set the Fogg simulator to -6 mmHg. Verify that the display and audio alarms engage within approximately 3 seconds of the mean pressure display going past the -5 mmHg limit. Verify that the "LO: -5" limit is blinking in reverse video and that the audio alarm is sounding off/on approximately once per second.
- 14.6.11 Press the DUT front panel SUSPEND key. Verify that the alarm suspend icon (Bell with slash marks) is displayed in the top left hand corner of the screen, the audio alarm stops, and the display alarm continues to blink.
- 14.6.12 Press the SUSPEND key again. Verify that the audio and display alarms are both engaged again, and the alarm suspend icon disappears (bell only, no slash marks).
- 14.6.13 Adjust the Fogg simulator to a setting of 10 mmHg. Verify that both the display and audio alarms disengage within approximately 3 seconds of the mean pressure passing the -5 mmHg limit.
- 14.6.14 Adjust the Fogg simulator to a setting of 26 mmHg. Verify that the display and audio alarms engage within approximately 3 seconds of the mean pressure display going past the 25 mmHg limit. Verify that the "HI: 26" limit is blinking in reverse video and the audio alarm is sounding off/on approximately once per second.

- 14.6.15 Adjust the Fogg simulator to 0 mmHg. Verify that the HI display and audio alarms disengage within approximately 3 seconds of the mean display passing the 25 mmHg limit.

## 14.7 Cable EEPROM READ/WRITE Test

Equipment: Fogg BP-600 Pressure Simulator, Fogg Adapter Cable.

- 14.7.1 Verify that the DUT is ON, still connected to the Fogg simulator, and in standard run mode.
- 14.7.2 Press the DUT MENU key to access the main menu. Use the arrow keys to position the menu cursor on the MANUAL ZERO selection, then press the MENU key again.
- 14.7.3 Verify that the display changes to "MANUAL ZERO REFERENCE / ZERO REFERENCE = NNN / USE ARROWS TO ADJUST", per Figure 33.

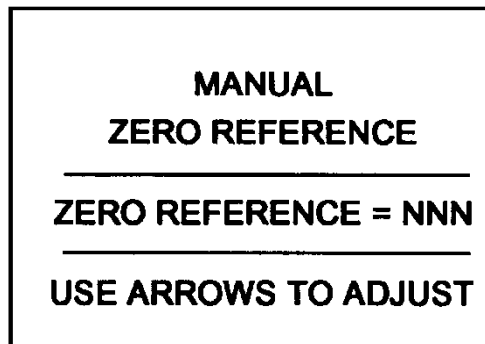


Figure 33

- 14.7.4 Use the arrow keys to adjust the value NNN to "500", then press MENU.
- 14.7.5 Disconnect the Fogg simulator from the DUT. Verify that the DUT displays "NO TRANSDUCER DETECTED (CHECK CONNECTIONS)".
- 14.7.6 While switching the Fogg simulator between 0 and 1 mmHg approximately once per second, reconnect the Fogg simulator to the ICP Express. Continue to switch the Fogg simulator from 0 to 1 mmHg while the DUT displays the message "TRANSDUCER DETECTED PLEASE WAIT..."
- 14.7.7 Verify that the DUT displays the message TRANSDUCER DETECTED ZERO REFERENCE = NNN / ACCEPT REFERENCE ADJUST REFERENCE", per Figure 34. Verify that the value NNN = 500. Record values.

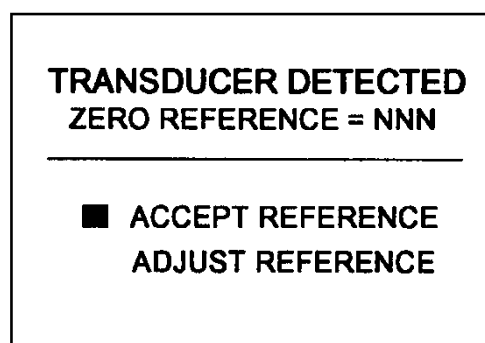


Figure 34



14.7.8 Press the MENU key to return to standard run mode.

## 14.8 Zero Lock-Out Test

Equipment: Fogg BP-600 Pressure Simulator, Fogg Adapter Cable

14.8.1 With the DUT still connected to the Fogg simulator and in the standard run mode, begin switching the Fogg from 0 to 1 mmHg approximately once per second.

14.8.2 While continuing to switch the Fogg setting from 0 to 1 mmHg, press the ZERO key on the DUT front panel. Verify that the DUT sounds a triple beep alarm but remains in the standard run mode.

## 14.9 Non-Volatile RAM Test (Multilingual Version, 194124, only)

14.9.1 Connect the Fogg simulator (set to ZERO mmHg) to the DUT.

14.9.2 Press the "ZERO" key on the front panel board to zero the Fogg simulator.

14.9.3 Press the MENU key to accept the returned zero reference.

14.9.4 When in the standard run mode, hit the MENU key again to access the Menu. Verify the screen as shown below:

```

      SELECT:
I    TURN ALARM ON
      SET ALARM LIMITS
C    MANUAL ZERO
      SELECT LANGUAGE
P    EXIT
  
```

14.9.5 Use the arrow keys to position cursor on "SELECT LANGUAGE" item, then hit the MENU key. Verify the language menu as shown below:

```

      SELECT LANGUAGE:
      ENGLISH          ITALIAN
      FRENCH           SPANISH
      GERMAN           PORTUGUESE
  
```

14.9.6 Use the arrow keys to select "FRENCH" then hit MENU.

14.9.7 Verify that the screen returns to run mode.

14.9.8 Hit the ON/OFF key to turn the system off.

14.9.9 Press ON/OFF key to turn system back ON. Verify the "CODMAN" screen as follow (in French):

```

      Codman
      ICP Express™
      Logiciel Rev n
      Veuillez Patienter
  
```

14.9.10 Press ZERO key when prompted by French screen "APPUYEZ P→0 POUR METTRE LA CAPTEUR A ZÉRO."

14.9.11 Press MENU key to accept offset (screen in French).

14.9.12 When in RUN mode, hit MENU key to access main menu as shown below:

**SÉLECTIONNEZ:**  
**ACTIVER ALARME**  
**LIMITES ALARME**  
**MISE À ZÉRO MANUELLE**  
**SÉLECTION LANGUE**  
**QUITTER**

14.9.13 Use arrow keys and select "SÉLECTION LANGUE". Hit MENU key to access language select menu.

14.9.14 Use arrow key to select "ANGLAIS". Hit MENU to select.

14.9.15 Turn unit off.

## 14.10 Final Charge

Connect the DUT to a nominal 230 VAC source for a minimum of 12 hours. Verify that the green AC and battery charging indicators illuminate upon connection to the AC power. The DUT should be left in the OFF condition during the 12-hour charge.

## 14.11 Final Switch Settings

At the conclusion of testing, leave the rear panel switches in following positions:

14.11.1 Sensitivity Switch: 5uV position.

14.11.2 Backlight: ON position.

Also, verify that the unit is in the OFF condition (blank LCD screen - no LEDs illuminated).

## 15.0 Spare Parts

Part Number	Description
182756-001	HANDLE STANDOFF POLE MOUNT
182774-001	CLAMP POLE MOUNT
6097-316	Fuses for 240 VAC (826635)
6097-353	Fuses for 117VAC (826634/ 826637)

**16.0 Device History Sheet For Test Process - (82-6634/ 82-6637)**

Technician Name :	DATE :
----------------------	--------

Type : ICP Express	Model :
Manufacturer: Codman	S/N (Section 13.1.1):

--	--

<b>13.0 Test Procedure</b>		
<b>CHECKING</b>	<b>RESULT</b>	<b>COMMENTS</b>
<u>13.1.2</u> - Verify cosmetic appearance in accordance with referenced specifications.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.2</u> - Verify proper installation and proper value of external fuses (2x).	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.3.1.1</u> - Leakage Current (CHASSIS):</b>		
S3 Close / S4 Normal / S5 Open (Max. leak is 1000mV/ 100µA)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Rev / S5 Open (Max. leak is 1000mV/ 100µA)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Normal / S5 Close (Max. leak is 500mV/ 100µA)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Rev / S5 Close (Max. leak is 1000mV/ 100µA)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.3.1.2</u> - Leakage Current (PATIENT) – Unit Powered Off:</b>		
S3 Close / S4 Normal / S5 Open (Max. leak is 50mV/ 10µA)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Rev / S5 Open (Max. leak is 50mV/ 10µA)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Normal / S5 Close (Max. leak is 50mV/ 10µA)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Rev / S5 Close (Max. leak is 50mV/ 10µA)		
<b><u>13.3.2</u> - Ground Continuity:</b>		
Force to failure before test (> 0.15 ohms)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
Resistance between the power cable ground receptacle and power cord retainer screw (< 0.015 ohms)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.4</u> - Functional Inspection:</b>		
<u>13.4.1.2</u> - Verify green AC and Battery Charging LEDS are ON. Verify yellow BATTERY LED is OFF.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.4.1.3</u> - With Backlight switch in OFF position, verify LCD backlight is OFF.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:

<u>13.4.1.4</u> - With Backlight switch in ON position, verify LCD backlight is ON.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.4.1.5</u> - Verify correct power-up conditions:</b>		
Audio alarm (approx. 2 sec.)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
Black screen (approx. 3 sec.)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
Introductory screen (approx. 10 sec.)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.4.1.6</u> - Verify and record software REV displayed during intro. screen.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.4.1.7</u> - Verify NO XDUCER... screen.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.4.2.3</u> - Verify XDUCER DETECTED... screen	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.4.2.4</u> - Verify PRESS ZERO... screen	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.4.2.5</u> - Verify XDUCER ZEROING... screen.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.4.2.6</u> - Verify ZEROING COMPLETE... screen Record "nnn"	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Reading:      Initials:
<u>13.4.2.7</u> - Verify run mode screen. Record mean, systolic and diastolic readings.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Reading:      Initials: Reading: Reading:
<b><u>13.5</u> - LED Indicator Test:</b>		
<u>13.5.1</u> - Verify green AC and Battery Charging LEDS (2x) are ON; Yellow BATTERY LED is OFF	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.5.2</u> - With unit off, verify 13.5.1 still prevails	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.5.3</u> - Turn unit back on and unplug AC power. Verify green LEDS go off and yellow BATTERY LED comes ON	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.5.4</u> - Turn unit off and verify all LEDS are off	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.6</u> - Pressure Display and Audio Alarm Functionality Test</b>		
<u>13.6.2</u> - Verify PROCEED TO ZERO...screen	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.4</u> - Verify menu screen.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.5</u> - Verify TURN ALARM OFF	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.6</u> - Verify SET HI ALARM screen	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.7</u> - Set HI limit to 21, hit enter and verify LO ALARM screen	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.8</u> - Set LO limit to -1. Verify run mode and proper alarm conditions	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:

<u>13.6.9</u> - Set Fogg at -2 , verify LO alarm engages	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.10</u> - Hit SUSPEND key and verify suspend icon, audible alarm stops, but visual blinking alarm continues.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.11</u> - Hit SUSPEND key again and verify all alarms re-engage, suspend icon disappears.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.12</u> - Set Fogg to 12, verify all alarms disengage	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.13</u> - Set Fogg at 22, verify HI alarm engages.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.6.14</u> - Set Fogg at 0 mmHg, verify all alarms disengage.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.7</u> - Cable EEPROM Read/Write Test:</b>		
<u>13.7.3</u> - Verify MANUAL ZERO... screen.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.7.7</u> - Verify XDUCER DETECTED... screen and record "NNN"	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Reading:      Initials:
<b><u>13.8</u> - Zero Lock-Out Test:</b>		
<u>13.8.2</u> - Verify triple beep while trying to zero with varying Fogg input.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.9</u> - EEPROM TEST (82-6637 ONLY):</b>		
<u>13.9.5</u> - Verify unit powers up in Japanese.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.10</u> - FINAL CHARGE:</b>		
<u>13.10</u> - Connect to 120VAC. (at least 12 hrs on AC)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>13.11</u> - Final Switch Settings:</b>		
<u>13.11.1</u> - SENSITIVITY SWITCH: 5 uV POSITION	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>13.11.2</u> - BACKLIGHT: ON	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:

**17.0 Device History Sheet For Test Process - (82-6635)**

Technician Name :	DATE :
Type : ICP Express	Model :
Manufacturer: Codman	S/N (Section 14.1.1):

**14.0 Test Procedure**

CHECKING	RESULT		COMMENTS
<u>14.1.2</u> - Verify cosmetic appearance in accordance with referenced specifications.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.2</u> - Verify proper installation and proper value of external fuses (2x).	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<b><u>14.3.1.1 - Leakage Current (CHASSIS):</u></b>			
S3 Close / S4 Normal / S5 Open (Max. leak is 1000mV/ 1000 $\mu$ A)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Rev / S5 Open (Max. leak is 1000mV/ 1000 $\mu$ A)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Normal / S5 Close (Max. leak is 500mV/ 500 $\mu$ A)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Rev / S5 Close (Max. leak is 1000mV/ 1000 $\mu$ A)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<b><u>14.3.1.2 - Leakage Current (PATIENT) – Unit Powered Off:</u></b>			
S3 Close / S4 Normal / S5 Open (Max. leak is 50mV/ 50 $\mu$ A)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Rev / S5 Open (Max. leak is 50mV/ 50 $\mu$ A)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Normal / S5 Close (Max. leak is 50mV/ 50 $\mu$ A)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
S3 Close / S4 Rev / S5 Close (Max. leak is 50mV/ 50 $\mu$ A)			
<b><u>14.3.2 - Ground Continuity:</u></b>			
Force to failure before test (> 0.15 ohms)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
Resistance between the power cable ground receptacle and power cord retainer screw (< 0.015 ohms)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<b><u>16.4 - Functional Inspection:</u></b>			
<u>14.4.1.2</u> - Verify green AC and Battery Charging LEDS are ON. Verify yellow BATTERY LED is OFF.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.4.1.2</u> - Verify green AC and Battery Charging LEDS are ON. Verify yellow BATTERY LED is OFF.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.4.1.2</u> - With Backlight switch in ON position, verify LCD backlight is ON.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:

<b>14.4.1.3 - Verify correct power-up conditions:</b>			
Audio alarm (approx. 2 sec.)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
Black screen (approx. 3 sec.)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
Introductory screen (approx. 10 sec.)	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.4.1.4</u> - Verify and record software REV displayed during intro screen.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.4.1.5</u> - Verify NO XDUCER... screen.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.4.2.3</u> - Verify XDUCER DETECTED... screen	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.4.2.4</u> - Verify PRESS P→0... screen	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.4.2.5</u> - Verify XDUCER ZEROING... screen.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.4.2.6</u> - Verify ZEROING COMPLETE... screen Record "nnn"	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Reading: Initials:
<u>14.4.2.7</u> - Verify run mode screen. Record mean, systolic and diastolic readings.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Reading: Initials: Reading: Reading:
<b>14.5 - LED Indicator Test:</b>			
<u>14.5.1</u> - Verify green AC and Battery Charging LEDS (2x) are ON; Yellow BATTERY LED is OFF	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.5.2</u> - With unit off, verify 16.5.1 still prevails	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.5.3</u> - Turn unit back on and unplug AC power. Verify green LEDS go off and yellow BATTERY LED comes ON	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.5.4</u> - Turn unit off and verify all LEDS are off	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<b>14.6 - Pressure Display and Audio Alarm Functionality Test</b>			
<u>14.6.2</u> - Verify PROCEED TO ZERO...screen	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.6.3</u> - Verify TRANSDUCER DETECTED... screen, and then PRESS ZERO... screen.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.6.5</u> - Verify menu screen.	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.6.6</u> - Verify TURN ALARM OFF	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.6.7</u> - Verify SET HI ALARM screen	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.6.8</u> - Set HI limit to 25, hit enter and verify LO ALARM screen	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:
<u>14.6.9</u> - Set LO limit to -5. Verify run mode and proper alarm conditions	<input type="checkbox"/> OK	<input type="checkbox"/> Not OK	Initials:

<u>14.6.10</u> - Set Fogg at -6 , verify LO alarm engages	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>14.6.11</u> - Hit SUSPEND key and verify suspend icon, audible alarm stops, but visual blinking alarm continues.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>14.6.12</u> - Hit SUSPEND key again and verify all alarms re-engage, suspend icon disappears.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>14.6.13</u> - Set Fogg to 10, verify all alarms disengage	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>14.6.14</u> - Set Fogg at 26, verify HI alarm engages.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>14.6.15</u> - Set Fogg at 0 mmHg, verify all alarms disengage.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>14.7</u> - Cable EEPROM Read/Write Test:</b>		
<u>14.7.3</u> - Verify MANUAL ZERO... screen.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>14.7.7</u> - Verify XDUCER DETECTED... screen and record "NNN"	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Reading:      Initials:
<b><u>14.8</u> - Zero Lock-Out Test:</b>		
<u>14.8.2</u> - Verify triple beep while trying to zero with varying Fogg input.	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>14.9</u> - Non-Volatile RAM Test</b>		
<u>14.9.9</u> - Verify unit turns ON in French	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>14.9.14</u> - Return unit to English	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>14.10</u> - FINAL CHARGE:</b>		
<u>14.10</u> - Connect to 120VAC. (at least 12 hrs on AC)	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<b><u>14.11</u> - Final Switch Settings:</b>		
<u>14.11.1</u> - SENSITIVITY SWITCH: 5 uV POSITION	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials:
<u>14.11.2</u> - BACKLIGHT: ON	<input type="checkbox"/> OK <input type="checkbox"/> Not OK	Initials: