

# *medTester 1000B*

*Automated Biomedical  
Equipment Test System*



2000 ARROWHEAD DRIVE  
CARSON CITY, NEVADA 89706  
PHONE: 702.883.3400  
FAX: 702.883.9541

Operating and Service Manual





**medTester 1000B  
Automated Biomedical Equipment Test System**

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## Addendum

This addendum is for the medTester 1000 and 1000B Operating and Service Manuals, both at Revision D.

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### CHANGE TO THE MANUALS

This change affects the Specifications' Accuracy boxes on page 13 of the medTester 1000 manual, and page 9 of the medTester 1000B manual. Change the following specification in each manual

from:

Leakage Current	$\pm 1.0\%$ of range, DC to 1.0 kHz $\pm 2.5\%$ of range, 1.0 kHz to 100.0 kHz $\pm 5.0\%$ of range, 100.0 kHz to 1.0 MHz
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to:

Leakage Current	$\pm ( 5.0\% \text{ of reading} + 1\mu\text{A} ) @ \text{DC}$ and 48 Hz to 100 kHz.
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## Addendum

This addendum is for the medTester 1000 and 1000B firmware revisions 4.01.

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### TEST LIMITS

Adjust test limits for resistance, case leakage, lead leakage, and isolation leakage from 0 to 32,000. After selecting specific tests, set the limits during a "MAKE" operation.

#### Key Defintions

- DEC 1      Decrements the value by 1 unit
- INC 1      Increments the value by 1 unit
- DEC 10     Decrements the value by 10 units
- INC 10     Increments the value by 10 units
- SAVE       Saves the displayed value

---

### DOWNLOADING TO SENTINEL

You must have the following options enabled to download electrical safety tests to Sentinel:

- RS232/Printer
- Storage
- Download

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### DOWNLOADING IN FLAT FILE FORMAT

You must have the following options enabled to download electrical safety tests to a flat file format (using "DOWN3.EXE"):

- RS232/Printer
- Storage
- Download

---

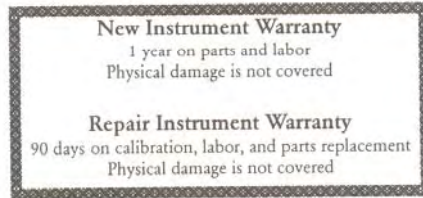
### DOWNLOADING MEDTESTER CONFIGURATION

You can download medtester configuration (including tests and limits) to Sentinel if you have the following options enabled:

- RS232/Printer
- Storage
- Download

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**Dynatech Nevada Inc.**

2000 Arrowhead Drive, Carson City, NV 89706-0403

P.O. Box 1925, Carson City, Nevada 89702-1925

800-648-7952

702-883-3400

Fax: 702-883-9541

**Part Number:** 9508-0211

**Revision:** D

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**Chapter I**  
**Getting Started**

**INTRODUCTION**

The medTester 1000B is a microprocessor based system that automates electrical safety testing, performance testing and general purpose data logging. To reduce power consumption and size, the portable medTester 1000B uses a low power logic design. You can control the medTester 1000B via software-definable function keys. Or depending on which medTester 1000B options you have, you can control it via external computer, external keyboard, and/or Bar Code Reader. Other options offer a direct computer interface to compatible database programs. In addition, you can purchase an option which upgrades the medTester 1000B to a full-blown medTester 5000B (see the Options chapter).

**ELECTRICAL SAFETY TESTING**

In compliance with the specifications set forth by ANSI, NFPA and AAMI, the medTester 1000B measures potentially unsafe electrical conditions such as leakage current flow and ground cord resistance. Leakage current, for example, might flow through the human body causing injury. Ground cord resistance is also measured because if the path to ground has too much resistance, current might flow through the human body instead.

**PERFORMANCE TESTING**

Performance testing helps verify that a piece of equipment is performing to its specifications. Because each type of equipment requires tests unique to its operation, the medTester 1000B comes equipped with the features necessary to test the basic performance of ECG equipment. However, the medical environment doesn't just consist of ECG equipment, so the medTester 1000B also accepts options for performance testing on all types of equipment.

**MANUAL MEASUREMENTS**

You can select any safety or performance measurement while in manual mode. The measurement is performed and displayed continuously. While in manual mode, the medTester 1000B does not store data in its internal memory. Instead the test results are sent to the display, or if you have the RS-232/Printer Option installed, to a printer.

### **AUTOMATIC MEASUREMENTS**

One of the medTester 1000B's most powerful features is its ability to automate autosequences (collections of safety and performance tests that execute as a group). The medTester 1000B is shipped with 10 autosequences for testing biomedical equipment and one for monitoring line voltage. However, you can modify any of the autosequences (except line monitor) to meet your particular needs (see the chapter on Customizing for more information). You can either view, or if you have the RS-232/Printer Option installed, print the test results. The current record is then automatically erased when you start a new sequence or execute a manual test (unless, that is, you have the Record Storage Option installed).

### **COMPUTER CONTROL**

With the RS-232/Printer Option and appropriate software (medBase1 and/or Sentinel), the medTester 1000B can send and receive data and commands, such as safety and performance tests, from an external computer via either RS-232 serial port. Both ports are standard PC interfaces common to most brands of PC compatible computers.

**SPECIFICATIONS****Tests Performed**

Power Cord Resistance	Four terminal Kelvin cable measurement
Case Leakage Risk Current	External (with Kelvin cable) Internal (through ground conductor)
Lead Leakage Risk Current	All leads and individual leads
Interlead Leakage Risk Current	5 tests: each lead to all remaining leads
Isolation Lead Sink Test	All leads to ground
Load Current Measurement	20 Amps



**ECG Performance Tests**

Squarewave	2 Hz, 1.0 mVp-p
DC Pulse	4.0 sec, +1.0 mVp
Sine Bursts	1.0 mVp-p, 1.0 sec 10 Hz 40 Hz 60 Hz 100 Hz 1000 Hz
Triangle Wave	2 Hz, 1.0 mVp-p
CMRR, Sine Wave	60 Hz, 20 mVp-p
ECG Sequence	1.0 mV R-Wave 30 BPM 60 BPM 120 BPM 240 BPM
Sine Wave	0.5 Hz, 1.0 mVp-p
Ventricular Tachycardia	
Ventricular Fibrillation	

**Automated Safety Test Protcols**

Case Leakage w/Kelvin cable	Critical Device with 5/10 patient leads Critical Device with 3 patient leads Critical Device with 4 patient leads Critical Device without patient leads General care device
Case Leakage via ground wire	Critical Device with 5/10 patient leads Critical Device with 3 patient leads Critical Device with 4 patient leads Critical Device without patient leads General care device

**Measurement Methods**

Voltage and Current	True Root Mean Square (RMS)
Resistance	Four Terminal Technique
Input Load	DC to 1.0 MHz (ANSI/AAMI ESI-1985 test load)
Resistance Test Current	100.0 mA
Isolation Test	Line voltage through 120.0 K Ohm resistor
Insulation Leakage Test	GFI Detects line to ground current in excess of 10.0 mA
External Meter	Ohms, Current AAMI load always in circuit for current

Data Input/Output

<p>Front Panel Keys (membrane keyboard)</p>	<p>Software menu keys (5 function or "F" keys)</p> <p>Test Mode Select Keys:                      External Resistance                      Power Cord Resistance                      Internal Case Leakage                      External Case Leakage                      ECG Lead Leakage                      Equipment Current                      Line Voltage</p> <p>Receptacle Control Keys:                      Closed Neutral                      Open Neutral                      Closed Ground                      Open Ground                      Normal Polarity                      Reverse Polarity</p> <p>Other Keys:                      Print key                      Escape key                      Arrow keys (4)</p>
<p>Binding Posts</p>	<p>10 AHA color coded posts</p> <p>Compatible with:                      3.2 and 4.0 mm electrodes                      Banana jacks                      Snap electrodes</p>
<p>External Input jacks</p>	<p>For millivolt and microamp measurement</p>
<p>Current Source jacks</p>	<p>Constant 100 mA DC current source</p>
<p>100 <math>\mu</math>A Test Point</p>	<p>Constant 100 <math>\mu</math>A DC current source</p>
<p>0.5 Ohm Test Points</p>	
<p>Ground Stud</p>	<p>Case ground</p>
<p>ECG High Level Output</p>	<p>1/4 inch phone jack (1 volt)</p>

**Data Input/Output (cont.)**

Analog Input	Connector for medTester 1000B options
Bar Code Input	Connector for bar code wand
RS-232 Com Ports	COM1 and COM2 ±8 volts unregulated @ 80 mA
Printer Port	Parallel Centronics type

**Power Requirements**

Line Voltage	120 volts AC, USA only
Line Frequency	50/60 Hz

**Full Scale Ranges**

Line Voltage	130 volts maximum
Microamps/Millivolts	199.9 microamps, 1999.0 millivolts
Ohms	1.999 ohms
Current	20.0 amps

**Accuracy**

Leakage Current	± 1.0% of range, DC to 1.0 kHz ± 2.5% of range, 1.0 kHz to 100.0 kHz ± 5.0% of range, 100.0 kHz to 1.0 MHz
Resistance	± 1.0% of range
Equipment Current	± 5.0% of range
Line Voltage	± 5.0% of range

## Electrical Safety Test Load

Low Frequency Impedance	1.0 kohm
Frequency Response	AAMI ESI - 1985

## Overcurrent Protection

Line	20 amp double pole breaker
Internal 5 V Supply	1/4 amp slo-blo
Test Receptacle, GFCI	5.0 milliamps

## Test Receptacle Selections

Polarity	Normal Reverse
Ground	Intact Open
Neutral	Intact Open

**Physical**

Width	12.5 inches
Length	10.0 inches
Height	4.0 inches
Weight	10.0 pounds
Display	80 character (40 x 20 lines) Backlit Liquid Crystal Display (LCD)
Power Cord	Captive 14 gauge
Power Plug	Hospital grade 20 amps

**Miscellaneous**

Test Leads	Kelvin cables (2)
Clock	Date and Time regulation Real time clock IC Battery back up

**ACCESSORIES**

Bar Code Label Software	P/N 9519-0133
Logmar Bar Code Software	P/N 9519-0147
Bar Code Reader	P/N 3010-0246
Kelvin Cable	P/N 9501-0032
medBase1 Software	P/N 9519-0125
medBase1 Demo	P/N 9519-0130
RS-232 Com Cable	P/N 3010-0250
202A Isolation Test Module	P/N 9519-0137

**OPTIONS**

RS-232/Printer Option	P/N 9519-0197
External Serial Keyboard Options Required: RS-232/Printer	P/N 9519-0194
Record Storage Option Options Required: RS-232/Printer External Keyboard or Bar Code Option	P/N 9519-0195
Download Option Options Required: RS-232/Printer External Keyboard or Bar Code Option Record Storage	P/N 9519-0196
Toolbox Option	P/N 9519-0179
Bar Code Option Options Required: RS-232/Printer	P/N 9519-0151
medTester 5000B Upgrade Options Required: RS-232/Printer Record Storage Download	P/N 9515-0027



### INSTRUMENT FAMILIARITY

The medTester 1000B's operating controls and interfaces are described below with detail about the top and rear panels, power on self-tests and initial configuration.

#### Tilt Bail

The tilt bail is a wire stand located near the back of the medTester 1000B's enclosure. You can operate the medTester 1000B laying flat on its four feet, or you can tilt the medTester 1000B by pulling the bail down.

#### Ventilation

Because the sides of the medTester 1000B provide ventilation and mechanical support, the medTester 1000B operates without a fan. However, there must be adequate ventilation to release the warm air inside the enclosure. It is important therefore to keep the ventilation holes on the sides of the instrument free of any obstructions.

#### Power

The medTester 1000B uses low power CMOS technology for its microprocessor and support circuits. Of these, the analog circuits and relay coils draw the most power. However, the overall power consumption is quite low--typically less than 10 watts.

### TOP PANEL

The top panel includes the keyboard, test receptacle, ECG binding posts, external meter binding posts, test points and LCD display. It is covered by a membrane panel which functions as a keyboard and label for the top of the instrument.

#### Display

The liquid crystal display (LCD) has two lines with 40 characters per line. Backlit with an LED material, the display stays on as long as the medTester 1000B is powered up. The DISPLAY keys (described in the next section) control the backlighting and viewing angle of the display.

**Keys**

The medTester 1000B's microprocessor scans the keyboard keys. medTester 1000B software then decodes your keystrokes and determines the appropriate response.

**Keyboard**

The membrane keyboard is a sealed assembly which should be cleaned with a damp cloth. Do not, however, soak the keyboard or use solvents to clean it. The keyboard is divided into several areas:

**Display Keys**

There are two keys with the word "DISPLAY" between them on the left side of the LCD display. Pressing the key with the white circle brightens the display; pressing the key with the black circle darkens it. These keys also change the viewing angle. Like other large LCD displays, the appearance of the medTester 1000B's display changes with the viewing angle. The DISPLAY key allows you to select the most comfortable viewing angle, which the medTester 1000B then automatically stores in memory. To reset the angle, simply press either DISPLAY key. Your new setting automatically replaces the old.

Note: If the display looks as though it is not on or working properly when you turn the medTester 1000B on, check the viewing angle by pressing either one of the DISPLAY keys a few times. The viewing angle may be adjusted too far one way or the other making the display difficult to read.

**Function Keys**

Just below the LCD display on the top panel there are five function keys marked F1 through F5. These keys are used to select different menu options appearing in the display just above them. The display is 40 characters wide which means that up to 8 characters can appear above each function key. These keys enable the medTester 1000B to be menu driven, a technique whereby a user operates an instrument by selecting a choice from a menu, not by entering commands.

The medTester 1000B's firmware is structurally organized into a tree. Pressing function keys to make menu choices moves you to sublevels (or branches) of this tree. A diagram of this menu structure is located in the beginning of this chapter.

### **Test Mode Select Section**

With the exception of the ECG LEAD LEAKAGE switch, the keys in this area of the keyboard allow you to access manual tests by pushing a single key. The ECG LEAD LEAKAGE switch takes you into the ECG portion of the menu where you can then select your desired lead combinations.

### **Receptacle Control**

The keys in this area of the keyboard allow you to change the receptacle configuration during a manual test. Any changes in the configuration are shown by the LEDs located at the right of the display.

### **Escape Key**

Located at the upper right side of the keyboard, the escape key is used to return to a previous menu or to abort an operation. Repeatedly pressing the escape key, for example, always eventually returns you to the power-up menu (MENU 1); pressing the escape key during an autosequence aborts the operation and returns you to menu mode.

### **Print Key**

The print key is located below the display view angle adjust keys. Pressing the print key during a manual test prints the test reading on the medTester 1000B's display; pressing the print key after an autosequence prints the sequence test results.

### **Cursor Control Keys (Arrow Keys)**

The four cursor control keys on the right hand side of the keyboard are marked with arrows pointing up, down, left and right. The up and down cursor control keys allow you to scroll down through a record; the left and right cursor keys allow you to scroll through the menu horizontally. The ability to scroll through a menu horizontally is important because the tree-structured menu often has more than five choices at any given level. When the menu does have more than five choices, the symbols "<" and ">" appear in the leftmost and/or rightmost columns of the bottom line of the display. If the symbol "<" appears, the left cursor key will move the menu left; if the symbol ">" appears, the right cursor key will move the menu right. When both symbols are displayed, there are menu selections in both directions.

### Display Annunciators (LEDs)

The eight Light Emitting Diodes (LEDs) on the right side of the top panel indicate status conditions. Explanations for all eight follow.

#### **Current Source LED**

Indicates that the current source used to make resistance measurements is active. A resistance measurement cannot be made unless this LED is on.

#### **Iso Volts LED**

Indicates the presence of isolation voltage on the ECG LEAD posts during an isolation sink current test. The line voltage applied to the ECG LEAD posts is limited to 1 milliamperere.

#### **Open Ground LED**

Indicates that the ground of the test receptacle is disconnected.

#### **Closed Ground LED**

Indicates that the ground connection of the test receptacle is intact.

#### **Rev Polarity LED**

Indicates the reverse polarity condition (Hot and Neutral connections are switched) of the test receptacle.

#### **Norm Polarity LED**

Indicates that the test receptacle polarity (Hot and Neutral connections) is normal.

#### **Open Neutral LED**

Indicates that the neutral connection of the test receptacle is open or unconnected.

#### **Closed Neutral LED**

Indicates that the neutral connection is closed.

### ECG Posts

There are ten binding posts used for ECG LEADS. Of these ten, the six V/chest lead posts are connected to each other internally. The ECG LEAD posts are used for testing devices with patient leads. The tops of the ECG POSTS are designed to accept snap connectors. Unscrewing the sleeves exposes a 4 mm hole designed to accept diagnostic pin electrodes (including banana plugs).

The ECG POSTS measure lead leakage currents and output performance waveforms. The isolation test connects line voltage (limited to 1 milliampere) to the ECG POSTS.

**WARNING!!! TOUCHING THE ECG POSTS DURING AN ISOLATION LEAD SINK TEST CAN RESULT IN A SHOCK FROM LINE VOLTAGE.**

### External Meter Posts

There are four external meter binding posts. The red and black pair on the left side is the EXT INPUT for millivolt/microamp measurements; the red and black pair on the right side is a 100 milliampere current source used for resistance measurements.

When external resistance and external current measurements are being taken, two Kelvin cables are used. One Kelvin cable plugs into the two red posts, the other into the two black posts.

For equipment safety measurements, such as case external leakage, case internal leakage, and power cord ground resistance, only one Kelvin cable is used. It plugs into the red posts.

### Test Points

The four test points just below the EXTERNAL METER posts on the top panel can be used to verify that the medTester 1000B's internal metering circuitry is operating correctly.

#### 100 Microampere Test Point

This test point connects to a DC constant current source that delivers 100 microamps. It is referenced to case ground (i.e., it is not floated like the 100 milliamp current source). The 100 Microampere Test Point is used to perform case external and internal leakage tests.

To perform case external leakage measurements, plug a Kelvin cable into the red external meter posts. Then connect the clip end of the Kelvin cable to the 100 microamp post. Next, use the function keys or External Case Leakage key (in the Test Mode Select section) to enter the case external mode. If the display reads approximately 100 microamps, then the internal metering circuitry is operating correctly.

The 100 microamp current source is useful for training purposes because it can be thought of as simulating a piece of equipment with case external current leakage.

To perform case internal leakage measurements, select the case internal leakage mode with the function keys or the Internal Case Leakage key (in the Test Mode Select section). Clip the alligator jaws end of the Kelvin cable to the 100 microamp test point. Insert a ground adapter pin (supplied with the medTester 1000B) into the ground pin hold of the test receptacle and touch the other end of the Kelvin cable (the banana end) to the ground pin adapter. The display should read approximately 100 microamps.

In addition to performing case external and internal leakage measurements, the 100 microamp test point can be used to test ECG LEADS. You can select all leads to ground, or an individual lead to ground. However, do not select either ALL/ISO or LD/ISO because it could severely damage your medTester. Use the function keys or the ECG Lead Leakage Key (in the Test Mode Select section) to select the ECG lead leakage test and clip the Kelvin cable to the 100 microamp test point. You can then touch the other end of the Kelvin cable (the banana end) to the ECG LEAD posts. The display should read 100 microamps for all of the posts unless you have selected the individual lead mode. In this case, only the individual lead you selected will display a reading when connected.

#### **0.5 Ohm Test Point**

The 0.5 ohm test points simulate power cord resistance allowing you to verify the operation of the resistance measurement circuitry. Two 0.5 ohm test points are required for the four terminal resistance measurement technique (explained in the Resistance section of Chapter 3). The four-terminal technique eliminates the effects of probe and contact resistance. Eliminating the effects of this resistance is essential with measurements of less than 1 ohm.

### Ground Stud

The ground stud tests the reading that represents zero ohms on the medTester 1000B. This reading is taken before resistance measurements, so the offset may be subtracted from any resistance measurements you make. Power cord resistance self tests are also performed with this test point.

## REAR PANEL

The instrument serial number, which should always be included in any correspondence with Dynatech Nevada, is printed on the rear panel label. The rear panel also contains the AC power cord, power switch, and interface connectors for the following: RS-232 com ports, parallel printer, high level ECG output, analog input and bar code reader.

### Power Switch

Located above the power cord on the back panel is the power switch, which turns the medTester 1000B on and off, and is also a circuit breaker. When the switch is off, there is no AC power applied to any of the circuits inside the medTester 1000B (including the test receptacle). However, even with the power switch off, the test receptacle ground is still connected to the ground in the medTester 1000B power cord. If the AC line current exceeds 20 amperes, the breaker inside the switch trips, turning the power to the circuitry off. This limits the maximum current that can be delivered by the test receptacle to 20 amperes. If the medTester 1000B display doesn't light up when the power switch is turned on, the medTester 1000B's 1/4 amp internal fuse might be blown.

### High Level ECG Output

The high level ECG output is a 1/4" phone jack on the rear panel. This jack is active with a 1 volt signal when ECG performance waves are output to the ECG binding posts on the top panel. Because this is a digitally generated signal, if you use an unfiltered oscilloscope to view the waveform, steps will be visible. However, if you use a patient monitor instead of a scope, the waveforms will appear smoother.

**Analog Input**

This jack is connected to an input on the system Analog to Digital (A/D) converter.

**Serial Com Ports**

The two serial com ports on the medTester 1000B (COM1 and COM2) conform to RS-232C specifications. Because the serial com ports can send and receive data, you can print test results by connecting a serial printer to either port or you can control the medTester 1000B from a computer. (For more information on computer control, see the Options Chapter.) Both serial com ports are configured with the same pin signal definitions used by PC compatible computers. In addition, the medTester 1000B defines Pin 12 which supplies +8 volts raw. Although pin 14 (-8 volts raw) is available for future options, it must first be factory enabled.

**Printer Port**

The medTester 1000B's 8 bit parallel printer interface is wired like a PC compatible computer parallel port (in other words, it is Centronics compatible). This means that if you have a PC computer, you can control a parallel printer from the medTester 1000B. Make sure that you turn the medTester 1000B on before connecting a printer.

**Bar Code Port**

An optional Bar Code Reader plugs into the bar code port on the medTester 1000B's rear panel. When you wave the Bar Code Reader over a printed bar code, the medTester 1000B automatically interprets the bar code type.

**POWER ON SELF TESTS****Software**

When the medTester 1000B power is first turned on, it displays the software revision number and momentarily turns on all the LED indicators.



### Line Voltage

The medTester 1000B also evaluates the power outlet it's plugged into by measuring 3 line voltages: Hot-Neutral, Neutral-Ground, and Hot-Ground. If it is a normal grounded outlet, the medTester 1000B won't give you a message. If not, depending on the conditions, the medTester 1000B displays one of the following messages in order of priority:

"Low Line Voltage!!"  
Press 'ESC' to continue.

"High Line Voltage!!"  
Press 'ESC' to continue.

"Open Grounded or Isolated Power!!"  
Check system voltages.

"Reverse Polarity Outlet!!"  
Press 'ESC' to continue.

If one of these messages is displayed, you must press the ESC key to return to MENU 1. The ESC key must be pressed twice if the OPEN GND/ISO PWR message appears.

### Batteries

The medTester 1000B tests two batteries at power up. If either one is low, the display reads "Batteries low, replace soon." Both batteries must be replaced if this message comes up. You probably won't lose data that has been stored if you don't replace the batteries immediately, but you do need to replace them as soon as possible. Press the ESCAPE key to continue.

### INITIAL SETUP AND CONFIGURATION

Although the medTester 1000B comes with standard factory configurations, you can alter these configurations and save your changes. The medTester 1000B stores information in an electrically erasable read-only memory (EEROM).

### **Date/Time Set Up**

A real time calendar clock circuit with a 3-volt battery backup keeps track of the year, month, day, hour, and minute. The medTester 1000B uses this information to automatically record the time and date on all service records. Set the clock by selecting UTIL and then TIME/DATE. Use the INC and DEC keys to set the time and date.

### **Buzzer**

Select the UTIL menu item and then BUZZ to set the speaker's duration, tone and loudness.

## **Chapter 2**

### **Tutorial**

**INTRODUCTION**

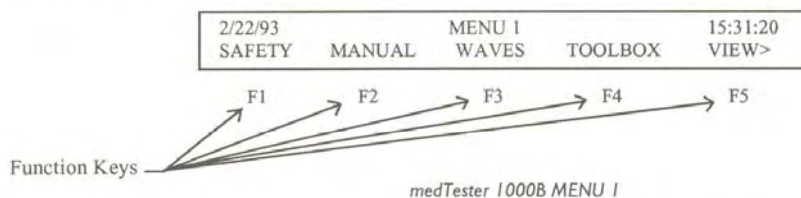
This tutorial gives you step-by-step instructions to familiarize you with medTester 1000B and its operation. Before you begin, be sure to review the Instrument Familiarity section in Chapter 1.

**Power Up**

Locate the AC power switch at the rear of the medTester. Apply power to the instrument and observe the display. The instrument name and revision will appear, followed by the main menu.

Note: If you wish to darken or lighten the display, use the DISPLAY keys to the left of the display. The black circle darkens the display and the white circle lightens it. Once you have adjusted the display to the proper intensity, observe the main menu.

**Main Menu and Function Keys**



Notice the function keys at the bottom of the display (F1-F5). By pressing these keys, you can make selections from the main menu. However, only a portion of the main menu is visible, as indicated by VIEW> to the lower right of the display. To view MENU 2, locate the arrow keys on the lower right of the instrument panel and press the right arrow key.

To return to MENU 1, simply press the left arrow key.

**Safety Tests**

You will notice a SAFETY mode in MENU 1. The medTester 1000B is equipped with 10 preprogrammed safety autosequences that can be reprogrammed to suit your testing needs. For a listing of autosequences and their factory settings, go to Chapter 3.

To select an autosequence, follow these steps.

- 1) Choose SAFETY from the main menu by pressing F1.
- 2) The next screen will prompt you to select a desired sequence.

SELECT DESIRED SEQUENCE				
A1	A2	A3	A4	A5>
F1	F2	F3	F4	F5

*Autosequence Selection Menu*

- 3) Remember that an arrow to the right of the display indicates that only a partial menu is shown. Press the right arrow key to view the remainder of the autosequence menu.
- 4) When you are ready, choose the desired autosequence using the function keys (F1-F5).
- 5) If you have installed the RS-232/Printer Option (see Chapter 5), you will be prompted to enter the following information.

Operator Code	(3 characters max.)
Device Type	(16 characters max.)
Manufacturer Code	(16 characters max.)
Location	(16 characters max.)
Model Number	(16 characters max.)
Serial Number	(16 characters max.)
Control Number	(16 characters max.)
Physical Inspection Line 1	(40 characters max.)
Physical Inspection Line 2	(40 characters max.)

For information on customizing prompts, see Chapter 4.

- 6) medTester now gives you a prompt.

PLUG IN EUT, ATTACH KELVIN CABLE AND PATIENT LEADS: WHEN READY, PRESS 'F5'				
---	--	--	--	--

F1            F2            F3            F4            F5

*Autosequence Prompt*

- 7) Plug a Kelvin cable into the two red binding posts on the front panel and attach the Kelvin cable clamp to an exposed grounded surface of the EUT. Next, attach the EUT's patient leads to medTester's top panel ECG binding posts.
- 8) After you have made all the proper connections, press F5 to start the autosequence.
- 9) medTester will measure three system line voltages, calculating one voltage and displaying the value and then advancing to the following screen to measure the next voltage.

NEUTRAL-GND VOLTAGE =		1.6 VOLTS RMS		
-----------------------	--	---------------	--	--

F1            F2            F3            F4            F5

HOT-GND VOLTAGE =		116.1 VOLTS RMS		
-------------------	--	-----------------	--	--

F1            F2            F3            F4            F5

HOT-NEUTRAL VOLTAGE =		115.9 VOLTS RMS		
-----------------------	--	-----------------	--	--

F1            F2            F3            F4            F5

*System Line Voltage Measurements*

- 10) If the Kelvin cable connection is not good, the medTester CURRENT SOURCE LED will flash and the buzzer will sound until a good connection is made.
- 11) If the ground resistance is greater than the preset limit, the LEDs will flash and the buzzers will beep. medTester will display the out-of-spec value and preset limit. Press F5 so you can return to the power cord ground resistance check.

CORD TEST. Press 'F5' to continue .155 OHMS
--

F1            F2            F3            F4            F5

*Cord Test*

- 12) Follow the screen prompt by pressing the F5 function key and recheck your connections. If this test is within the preset limit, you can continue to the next step. If the second test measures an out-of-spec value, then medTester will terminate the autosequence and return to MENU 1.
- 13) After you have successfully completed these measurements, medTester advances to the next screen.

TURN EUT POWER OFF THEN PRESS 'F5'
------------------------------------

F1            F2            F3            F4            F5

*Screen Prompt*

- 14) Follow the screen prompts to turn EUT power off and then press F5 when ready. medTester will now measure case leakage tests.

CASE X, NP GND NEU .0 uAMPS RMS
------------------------------------

F1            F2            F3            F4            F5

CASE X, NP OG NEU .2 uAMPS RMS
-----------------------------------

F1            F2            F3            F4            F5

*Case Leakage Tests*

- 15) If the value is out-of-spec, medTester will beep and the LEDs will flash. If the leakage values are within range, then medTester will prompt you to turn the EUT power on and press F5.
- 16) medTester will perform case leakage tests with the equipment power on and then display the results.

EUT CURRENT = .00 AMPS RMS
----------------------------

F1          F2          F3          F4          F5

*Equipment Current Test Results*

If a GFI fault occurs, the autosequence will terminate.

- 17) After completing the case leakage tests, medTester 1000B automatically advances to the lead leakage tests. Below is a sample lead leakage test screen.

RA-GND, NP OG NEU .0 uAMPS RMS
-----------------------------------

F1          F2          F3          F4          F5

*Lead Leakage Test Screen*

- 18) medTester will run through the lead leakage tests. When the testing is completed, press F1 if you would like to output various performance waves to the EUT.

OUTPUT WAVES? YES      NO
------------------------------

F1          F2          F3          F4          F5

*Output Option Screen*

- 19) If you answered 'YES' (F1), the following screen will appear.

PERF WAVE #1: 2 Hz square Press 'F' or cursor keys to advance
--

F1          F2          F3          F4          F5

*Performance Wave Screen*

To advance to the next screen, you will need to use the F5 function key.

For a listing of performance waves, see the Safety Tests section in Chapter 3.

- 20) If you have installed the RS-232 option, you can enter the following data.



PERF COMMENTS (40 Chars max)				
F1	F2	F3	F4	F5
COMMENTS (40 Chars max)				
F1	F2	F3	F4	F5
NEXT TEST DUE DATE (9 Chars max)				
F1	F2	F3	F4	F5

*Comment Screens*

If you do not wish to enter any data, simply press the down arrow key.

- 21) After the comments have been added, medTester will compute the autosequence test time in seconds. Turn the test receptacle off and store the record. For information on printing, see the RS-232/Printer section in Chapter 5. For samples of printed autosequences, go to Chapter 3.

**Manual Tests**

While in the MANUAL mode, you can select any safety or performance measurement. You can access the manual menu by using the function keys, TEST MODE SELECT keys (described later), or remote commands if you have the RS-232/Printer Option (see Chapter 5).

To go into the MANUAL menu, select MANUAL (F2) and you will see the MANUAL TESTS screen.

MANUAL TESTS				
VOLTS	$\mu$ A/mV	EUT-CUR	OHMS	ISOPWR
F1	F2	F3	F4	F5

*Manual Tests Screen*

Each of the manual tests will be described in further detail below.

**Line Voltage**

To go into the LINE VOLTAGE TESTS mode:

- 1) select VOLTS (F1) from within the MANUAL menu.

The medTester 1000B evaluates the power outlet it's plugged into by measuring 3 line voltages.

LINE VOLTAGE TEST				
HOT-NEUT	HOT-GND	NEUT-GND		
F1	F2	F3	F4	F5

*Line Voltage Test Screen*

**Hot to Neutral (HOT-NEUT)** -- This is the most common line voltage measurement. Follow these steps to begin the hot to neutral measurement.

- 1) Press the F1 function key to go into HOT-NEUT mode.

Note: You can also select line voltage hot to neutral by choosing the LINE VOLTAGE key from the TEST MODE SELECT section on the front panel of medTester 1000B.

- 2) The medTester will display a line voltage range between 90 and 130 Volts AC.

HOT-NEUTRAL VOLTAGE = 114.8 VOLTS RMS				
HOT-NEUT	HOT-GND	NEUT-GND		
F1	F2	F3	F4	F5

*Hot to Neutral Screen*

**Hot to Ground (HOT-GND)** -- This measurement is important in determining whether the outlet medTester is plugged into is grounded. To advance to the next measurement:

- 1) Press the F2 function key.
- 2) medTester will display a hot to ground measurement. A normal reading will usually fall into the range of 110 and 120 volts.

HOT-GND VOLTAGE = 115.3 VOLTS RMS				
HOT-NEUT	HOT-GND	NEUT-GND		
F1	F2	F3	F4	F5

*Hot to Ground Screen*

**Neutral to Ground (NEUT-GND)** -- This reading determines if hot and neutral are reversed at the receptacle that medTester is plugged into. To begin:

- 1) Select the F3 function key for this measurement.

NEUTRAL-GND VOLTAGE = 1.6 VOLTS RMS				
HOT-NEUT	HOT-GND	NEUT-GND		
F1	F2	F3	F4	F5

*Neutral to Ground Screen*

The value should be less than 2 volts AC; however, if hot and neutral are reversed, then the reading could be greater than 100 VAC.

**Leakage Current Test ( $\mu\text{A}/\text{mV}$ )**

After completing the LINE VOLTAGE TESTS, press the ESC key to return to the MANUAL TESTS menu. Now go into the LEAKAGE CURRENT TESTS mode by pressing F2.

LEAKAGE CURRENT TEST				
CASEX	CASEIN	EXT	ECG	
F1	F2	F3	F4	F5

*Leakage Current Test Screen*

Case leakage measures the electrical current flowing from case to ground. medTester measures both external and internal leakage current.

**External Case Leakage (CASEX)** -- To make this measurement, follow these steps.

- 1) You need to first connect a Kelvin cable from the red jacks on the medTester front panel to the case of the equipment under test (EUT). See Figure 3.4 in Chapter 3.
- 2) Next choose CASEX (F1). You can access this mode more directly if you press the EXTERNAL CASE LEAKAGE key in the TEST MODE SELECT section on medTester's front panel.
- 3) The next screen will appear.

CASE EXTERNAL LEAKAGE =	.0 uA
	DC

F1      F2      F3      F4      F5

*Case External Leakage Screen*

- 4) When you are done measuring external leakage, press ESC to return to the previous menu.

**Internal Case Leakage (CASEIN)**

- 1) Now go into the CASEIN menu by pressing F2 or by selecting the INTERNAL CASE LEAKAGE key in the TEST MODE SELECT section of the panel.
- 2) You will see the next screen.

CASE INTERNAL LEAKAGE =	.2 uA
	DC

F1      F2      F3      F4      F5

*Case Internal Leakage Screen*

- 3) The default condition for the test receptacle is open ground. (See Figure 3.3 in Chapter 3.) The annunciator LEDs will indicate the current receptacle configuration. However, you can change the receptacle configuration by using the RECEPTACLE CONTROL keys to do so.
- 4) When you have completed this measurement, press the ESC key to return to the previous menu.

**External Leakage (EXT)** -- To perform the External Leakage test, follow these directions.

- 1) Look for the two external meter input jacks (labeled "EXT INPUT") on the instrument's top left panel.
- 2) Plug the Kelvin cables into the external meter inputs as well as into the current source to be measured. The Kelvin cables will also plug into the ohm current source inputs but this is just because of the configuration of the Kelvin cable. The ohm/current source connections will perform no function in this measurement.
- 3) Now press F3 (EXT) to begin the test.

EXTERNAL LEAKAGE =	.2.7 uA	DC
F1	F2	F3
		F4
		F5

*External Leakage Screen*

- 4) When testing is completed, press the ESC key to return to the previous menu.

**ECG Test (ECG)** -- The medTester 1000B has 10 ECG binding posts on the front panel. All of the "V" leads have a common connection inside the medTester. You can access the ECG tests through the main menu or more directly by pressing the ECG LEAD LEAKAGE key on the TEST MODE SELECT panel. There are three major categories of ECG measurements, which are described below.

*Leakage to Ground* -- For the leakage to ground measurement configuration, see the Figure 3.6 in Chapter 3 and then follow these directions.

- 1) Connect the ECG leads of the unit under test to the ECG binding posts on medTester 1000B's front panel.

Note: You can connect all leads to ground or any individual lead to ground. Also, you can configure the test receptacle with normal or reverse polarity and with open or closed ground.

- 2) To choose the measurement for all leads to ground, select ALL/GND by pressing F1 and view the screen.

ECG LEAKAGE ALL TO GND =					.0 uA
					DC

F1            F2            F3            F4            F5

*Leakage All to Ground Screen*

- 3) When you have completed this measurement, press ESC to return to the previous screen.
- 4) To perform the next test (individual lead connected to ground), press LD/GND (F2).

ECG LEAKAGE TO GND				
RL	RA	LA	LL	V

F1            F2            F3            F4            F5

*Leakage to Ground Screen*

- 5) medTester will measure the following:

RL (Right Leg, Lead to Ground)  
 RA (Right Arm, Lead to Ground)  
 LA (Left Arm, Lead to Ground)  
 LL (Left Leg, Lead to Ground)  
 V (V Leads, Lead to Ground)

- 6) As an example, select LA (F3) to measure Left Arm, Lead to Ground.

LEFT ARM, LEAD TO GND =					.0 uA
					DC

F1            F2            F3            F4            F5

*Left Arm, Lead to Ground Screen*

- 7) After you have finished testing, return to the ECG test menu.

*Interlead Leakage* -- This measurement connects all ECG leads (except one) together at one side of the AAMI load and connects the remaining ECG lead to the other side of the AAMI load. Resulting current flow passes through the AAMI load. Before beginning the test, refer to the interlead leakage illustration in Chapter 3 and then follow these directions.

- 1) Press F3 to select the interlead leakage measurement and notice the display.

ECG LEAKAGE LD-LD				
RL	RA	LA	LL	V
F1	F2	F3	F4	F5

*Interlead Leakage Screen*

- 2) For an example, select LL (Left Leg, Lead to Lead) by pressing F4.

LEFT LEG, LEAD TO LEAD = .0 uA				
DC				
F1	F2	F3	F4	F5

*Left Leg, Lead to Lead Screen*

- 3) Browse through the rest of the interlead leakage menu and when you are ready, return to the ECG test menu.

*Isolation Lead Leakage* -- The purpose of this test is to measure the isolation of patient leads driven by line voltage. For an illustration of the isolation test configuration, refer to Chapter 3, Figure 3.8. As with the leakage to ground measurement, you have the option of doing this test in all leads mode or individual mode.

To test in all leads mode:

- 1) Connect every ECG binding post to the AAMI load (which is driven by the isolation transformer).
- 2) Make sure the test receptacle is fixed at normal polarity and closed ground for this test.

**Caution!!**

**Keep in mind that line voltage is present on the ECG posts when you hold the isolation key down.**

When you are ready, press F4, the ALL/ISO key and medTester will measure all leads.

ISOLATION ALL LEADS =				uA RMS
				ON VOLTS

F1                  F2                  F3                  F4                  F5

*All Leads Isolation Test*

- 3) When you are finished testing all leads, press ESC to return to the previous menu.

To test an individual lead:

- 1) Connect the ECG lead of your choice to the AAMI load.
- 2) The test receptacle should be fixed at normal polarity and closed ground.

**Caution!!**

**Line voltage is present on the ECG post when you hold the isolation key down.**

- 3) Press F5 (LD/ISO).

ECG ISOLATION				
RL	RA	LA	LL	V

F1                  F2                  F3                  F4                  F5

*Individual Lead Isolation Test*

- 4) Now press F1 to perform the Right Leg, Isolation test.

RIGHT LEG ISOLATION =				uA RMS
				ON VOLTS

F1                  F2                  F3                  F4                  F5

*Right Leg Isolation Test*



- 5) When you have completed the above test, perform the remaining measurements and press the ESC key to return to the previous menu.

**Test Receptacle Load Current (EUT-CUR)**

The load current is the current that is drawn through the "hot" lead of the test receptacle, which can be thought of as an AC ammeter. For more details on the load test receptacle load current, see Figure 3.10 in Chapter 3.

When you perform the load current measurement, follow these directions.

- 1) Plug the device under test into medTester's test receptacle.
- 2) From within the MANUAL menu, press F3 (EUT-CUR) to access the test receptacle load current screen. You can also enter this mode by pressing the EQUIPMENT CURRENT key in the TEST MODE SELECT section.

EUT CURRENT =	.00 AMPS RMS
---------------	--------------

F1                      F2                      F3                      F4                      F5

*Test Receptacle Load Current Screen*

- 3) Upon completion of this measurement, return to the previous menu for the next test.

**Resistance Tests (OHMS)**

For the resistance tests, you will use the four-terminal resistance measurement technique because this method is very accurate when measuring low (less than 1 ohm) resistance values. If you would like a more detailed explanation of the four-terminal technique, go to the Resistance section in Chapter 3 and then follow these directions.

- 1) Select OHMS (F4) from the MANUAL menu to display the resistance test screen.

RESISTANCE TEST				
PWORD		EXT		
F1	F2	F3	F4	F5

*Resistance Test Screen*

- 2) You will notice that there are two tests to select from. These will be described below.

**Power Cord Resistance** -- This test measures not only the resistance of the ground wire in the power cord, but also the resistance of the case to the ground wire of the power cord in the device under test.

Chapter 3, Figure 3.2 illustrates the configuration for making a four-terminal resistance measurement. After you have reviewed the figure and have read the Power Cord Resistance section in Chapter 3, you are ready to begin this measurement.

- 1) Make sure the Kelvin cables are properly connected to medTester and the device under test.
- 2) Next, press F1 (PWORD) from within the RESISTANCE TEST mode. You can also access the power cord test by selecting the POWER CORD RESISTANCE key from the TEST MODE SELECT section.
- 3) medTester 1000B will now give you a power cord resistance value.

POWER CORD RESISTANCE = 1.147 OHMS				
PWORD		EXT		
F1	F2	F3	F4	F5

*Power Cord Resistance Screen*

- 4) After you have received a satisfactory reading, press ESC to return to the RESISTANCE menu.

**External Ohms** -- You will also use the four-terminal method for the external ohms test. If you have any questions on the configuration for making this measurement, refer to Figure 3.1 in Chapter 3 and then begin the test when ready.

- 1) Make sure the Kelvin cable jaws are insulated from each other in order to force the test current to take a known path. Doing so also provides a voltage sense at

the point where the test current flows into and out of the unknown resistance.

- 2) From within the Resistance test menu, press F2 (EXT) to measure external ohms.

EXTERNAL RESISTANCE =	OHMS
PWRCORD EXT	

F1            F2            F3            F4            F5

*External Resistance Screen*

- 3) When the external ohms measurement is complete, you can return to the MANUAL menu for the last test.

**Isolated Power and GFI Test (ISOPWR)**

You will need Dynatech's model 202A Isolated Power Test Model to perform this test (see Figure 3.11 in Chapter 3). Before beginning this test, it would be helpful to refer to the 202A manual for additional details on ground fault and isolated power testing.

When testing:

- 1) Plug the 202A into medTester 1000B's test receptacles.
- 2) Attach 202A's output cable plugs into medTester's external meter inputs.
- 3) Press the ISOPWR key (F5) in the MANUAL TESTS menu to begin testing.

ADAPTER CURRENT =	3.8 uA
	DC

F1            F2            F3            F4            F5

*Isolated Power and GFI Test Screen*

- 4) Dynatech's Model 202A simulates faults that occur on isolated power and grounded systems. Its output is read by the external meter inputs and digitized by medTester's circuitry.
- 5) Now return to MENU 1 by pressing the ESC key twice.

**Performance Wave Tests**

You can choose from 15 different waveforms for evaluating patient monitors. Follow the steps listed below to select a performance waveform.

- 1) Select WAVES (F3) from MENU 1 to bring up a selection of waveforms. To view the entire menu, use the right arrow key.

SELECT PERF WAVE				
2HZ SQ	4 SEC	10HZ	40HZ	60HZ>
F1	F2	F3	F4	F5

*Performance Waveform Menu*

- 2) Press F4 to select 40HZ and medTester will confirm your choice by displaying the waveform name in the upper left corner of the display screen.

PERF WAVE #4: 40 Hz sine				
2HZ SQ	4 SEC	10HZ	40HZ	60HZ>
F1	F2	F3	F4	F5

*Waveform Displayed*

- 3) To choose a different waveform, simply select the function key for that particular waveform.

The waveform will now be output at the top panel ECG posts and rear panel high level ECG output.

- 4) When you have completed the performance waveform test, return to MENU 1.

**ToolBox Option (TOOLBOX)**

If you have purchased the medTester 1000 ToolBox Option, you have three adapters (Tachometer, Temperature, and Humidity) that will plug into the EXT INPUT on medTester's top panel. A number of testing modes are available, including monitor tests for temperature and humidity. For information on these monitor tests, refer to Chapter 5.

Be sure that you are in MENU 1 now and choose TOOLBOX (F4). medTester gives you the option of measuring the three adapters.

TOOLBOX OPTION				
TAC	TEMP	HUMID		
F1	F2	F3	F4	F5

*ToolBox Option Screen*

**Tachometer (TAC)** -- The Tachometer Adapter calculates the speed of rotating devices, such as centrifuges. To perform this measurement, follow these directions:

- 1) Plug the Tachometer Adapter test leads into the EXT INPUT jacks on medTester's front panel.

Note: Make sure the Tachometer Adapter range switch is set to HIGH RANGE (1000-19990 RPM) in order to interface correctly with medTester.

- 2) Now select TAC from the TOOLBOX menu in order to view the next screen.
- 3) Place a piece of reflective tape on the rotating surface of the device you are testing. The light beam from the tachometer should shine on the tape.
- 4) Turn on the device under test and point the tachometer at the reflective tape. On the right side of the Tachometer Adapter case is an Adapter Activate Button. Press and hold down this button.
- 5) medTester now makes these measurements.

SPEED = 6570 RPM		'ESC to Quit'
MAX RPM = 20840		
F1	F2	F3
F4	F5	

*Tachometer Adapter Measurement*

- 6) Any time you wish to terminate the measurement and return to the previous menu, press the ESC key.

**Temperature Adapter Operation (TEMP)** -- The purpose of the Temperature Adapters is to verify hospital environmental conditions.

In order to perform this test, follow this sequence of steps.

- 1) Notice the INPUT EXT jacks on medTester 1000B's front panel. Plug the Temperature Adapter test leads into these jacks and make sure the polarity of the test leads is correct in relation to the medTester jacks.
- 2) Next set the Temperature Adapter power switch to the °F position. The red LED on the box should light up.
- 3) Select the TEMP key (F2) from the TOOLBOX option menu and medTester will display the following.

```
TEMPERATURE = 75.5 Deg F
'ESC' to Quit
```

F1            F2            F3            F4            F5

*Temperature Adapter Operation*

- 4) When you are done, press the ESC key and prepare for the next test.

**Humidity Adapter Operation (HUMID)** -- To verify hospital environmental conditions for humidity, do the following.

- 1) Plug the Humidity Adapter test leads into the EXT INPUT jacks and check for correct polarity of the test leads.
- 2) Turn the Humidity Adapter power switch to ON.
- 3) Press the F3 (HUMID) function key from within the TOOLBOX menu and medTester will calculate the relative humidity.

```
RELATIVE HUMIDITY = 66.3 %
'ESC' to Quit
```

F1            F2            F3            F4            F5

*Humidity Adapter Operation*

- 4) To exit, press the ESC key.

**Custom Menu (CUSTOM)**

medTester 1000B allows you to customize in a number of areas. To go into the CUSTOM menu, press F1 (CUSTOM) from MENU 2 and medTester will display the next screen.

CUSTOMIZING MEDTESTER				
SEQUENCES	INIT	PAUSE	OPTIONS	
F1	F2	F3	F4	F5

*CUSTOM Menu*

Each of the Custom menu choices will be discussed now.

**SEQUENCES** -- This option allows you to modify autosequences A1 through A10. (For a list of options, see Chapter 4.) To go into the sequences menu:

- 1) Press the F2 function key to bring up the sequences screen.

CUSTOMIZING MEDTESTER				
MAKE	VIEW			
F1	F2	F3	F4	F5

*SEQUENCE Menu*

- 2) Now select the MAKE key (F1) to modify autosequences A1-A10.

SELECT DESIRED SEQUENCE				
A1	A2	A3	A4	A5>
F1	F2	F3	F4	F5

*MAKE Screen*

- 3) Select an autosequence (A1) by pressing the F1 key.

0 CASE X, NP GND NEU			KEEP	REMOVE
F1	F2	F3	F4	F5

*Selected Autosequence*

- 4) Use the F4 (KEEP) and F5 (REMOVE) function keys to edit the autosequences.
- 5) When you are done making changes, return to the previous menu.

**INIT** -- If you would like to reset autosequences, RS-232 configuration, and all ports to the factory default condition, select INIT (F3) from the CUSTOM menu.

- 1) You are presented with the following choices.

Init Medtester? (RECS WILL BE ERASED!)				
HOSP	MANUF	QUIT		

F1            F2            F3            F4            F5

*INIT Menu*

- 2) Choosing HOSP (F1) initializes medTester for hospital use; selecting MANUF (F2) initializes it for manufacturer's use.
- 3) Regardless of which choice you select, medTester will ask you:

ARE YOU SURE?				
YES	NO			

F1            F2            F3            F4            F5

*medTester 1000B Initialization Prompt*

- 4) Confirm your selection and then medTester returns you to the previous screen.

**PAUSE** -- To adjust the length of the pause between each test:

- 1) Press F4 (PAUSE) and you are given several options.

SELECT AUTOSEQ PAUSE: Now set to STEP				
NONE	3 SEC	6 SEC	9 SEC	STEP

F1            F2            F3            F4            F5

*Autosequence Pause Selection*

- 2) Use the function keys to make your selection, which will appear to the upper right of the display.
- 3) When you have completed your changes, press ESC to return to the CUSTOM menu.



**OPTIONS** -- Pressing F5 (OPTIONS) shows you which options you have installed. For example:

Installed Options				
Barcode				
F1	F2	F3	F4	F5

OPTIONS Screen

Press the ESC key when you are done viewing your options.

**Utilities Menu (UTIL)**

If you wish to alter medTester 1000B's standard factory configurations, you can do so within the UTIL menu. Follow these steps to change the date and time setup and the buzzer.

**Date/Time Set Up (TIME/DATE)** -- The real time calendar clock keeps track of the year, month, day, hour, and minute. The time and date is then automatically recorded on all service records.

In order to change the date or time:

- 1) Go to Menu 2 by pressing the right arrow key.
- 2) Press F2 to select UTIL and to go into the UTILITIES menu.

UTILITIES				
TIME/DATE BUZZ				
F1	F2	F3	F4	F5

Utilities Menu

- 3) Press F1 will bring up this screen.

8 ENTER HOUR				
INC	DEC			STORE
F1	F2	F3	F4	F5

Time/Date Screen

- 4) Use the F1 and F2 function keys to adjust the hour. If you repeatedly press the INC (F1) key, the amount will increase. The DEC (F2) key will decrease it.

When you are satisfied with the changes, press F5 to save them.

- 5) medTester will advance to the minutes, day, month, and year screens. Make your changes in the same manner, saving them when you are done. Your information will be stored in an electrically erasable read-only memory (EEROM).

**Buzzer (BUZZ)** -- Return to the UTIL menu now and follow these steps to adjust the buzzer duration, loudness, and tone.

- 1) Press F2 and the next screen will appear.

SET BUZZER				
LENGTH	LOUD	TONE	TEST	SAVE
F1	F2	F3	F4	F5

*Set Buzzer Screen*

- 2) In order to set the length of the buzzer, keep pressing the F1 function key until reaching the desired duration. Follow the same steps for loudness and tone, using the correct function keys.
- 3) To test your changes, press F4 (TEST).
- 4) When you are satisfied with the results, press the F5 (SAVE) key to store your changes and to return to the UTIL menu.

Now that you have completed this tutorial, you should be more familiar with medTester and its operation. Should you have any questions or desire further information on a certain section, feel free to review specific sections in the Tutorial or consult the Operating Instructions.

**Chapter 3**  
**Operating Instructions**

**MANUAL TESTS**

Although automated, the medTester 1000B has all the features of a manual safety tester. You can access the manual features using the function keys (F1-F5), TEST MODE SELECT keys, or remote commands.

**LINE VOLTAGE**

The different configurations for the three possible line voltage measurements are shown in Figure 3.9. The same analog process converts the line voltage measurements to a digital value that the microprocessor can read.

**Hot to Neutral**

The most common line voltage measurement is hot to neutral. Typical values range between 100 and 120 volts AC.

When the medTester 1000B is powered up, its software ensures that the line voltage is within the range of 90 to 130 volts AC. If the value is out of this range, the medTester displays an error message (see the "Power-On Self-Tests" section in the Getting Started chapter for more information).

You may directly select line voltage hot to neutral once you are in the TEST MODE SELECT section by pressing the LINE VOLTAGE key. Pressing the ESC key terminates the test.

**Hot to Ground**

The second measurement, hot to ground, is particularly important in determining whether the outlet the medTester 1000B is plugged into is grounded. If the reading is 0 volts (or close to it), then the outlet is not grounded. Normally, the reading should be almost the same as the hot to neutral reading (approximately 110 to 120 volts AC). When powered-up, the medTester 1000B tests this voltage and displays an error message if there is no ground connection.

**Neutral to Ground**

The third measurement is neutral to ground. Normally, this reading is <2 volts AC. This reading determines if hot and neutral are reversed at the receptacle that the medTester 1000B is plugged into. If hot and neutral are reversed, then the reading will be quite high

(i.e. greater than 100 Vac). The medTester 1000B tests for reversal of hot and neutral at power-up. If it exists, the medTester then displays an error message.

## CURRENT

On the front panel of the medTester 1000B is a 100 microampere current source test point. This test point is used to verify the measurement circuitry's operation in the current mode. The medTester should display a reading of 100 microamperes. This test source should not be used for calibration.

## Case Leakage

Case leakage is the term used to describe the electrical current that flows from case to ground. If you touch the case of an instrument, this current could flow through you if you complete the path to ground. The medTester 1000B performs this measurement two different ways measuring both "external leakage current" and "internal leakage current."

External leakage current is the current that flows from the case of the equipment under test (EUT) to earth ground. The current flow is shown in Figure 3.4. This measurement is made by connecting a Kelvin cable from the red jacks on the medTester front panel to the case of the EUT. The current that flows from the case directly to ground through an external path is measured. The current flowing down the ground wire of the power cord is not measured.

Internal leakage current flows from the EUT power cord ground wire and medTester AAMI test load to earth ground. Figure 3.3 shows the current flow for this test. The medTester 1000B test receptacle is on during this test. Test receptacle ground is held open to avoid shorting out the AAMI test load. Polarity may be set to normal or reverse.

### External Case Leakage

Press MANUAL (F2), uA/mv (F2), and then CASEX (F1) to select external case leakage. To access this mode more directly, press the EXTERNAL CASE LEAKAGE key in the TEST MODE SELECT section on the medTester front panel. In this mode, the default condition for the test receptacle is open ground. The annunciator LEDs indicate the current receptacle configuration. If you wish to

change the receptacle configuration, use the RECEPTACLE CONTROL keys to do so. Pressing the ESC key returns you to the previous menu.

#### Internal Case Leakage

Press MANUAL (F2), uA/mv (F2), and then CASEIN (F2) to select external case leakage. To access this mode more directly, press the INTERNAL CASE LEAKAGE key in the TEST MODE SELECT section on the medTester front panel. In this mode, the default condition for the test receptacle is open ground. The annunciator LEDs indicate the current receptacle configuration. If you wish to change the receptacle configuration, use the RECEPTACLE CONTROL keys to do so. Pressing the ESC key returns you to the previous menu.

#### External Leakage

Press MANUAL (F2), uA/mv (F2), and then EXT (F3) to select this mode. The bottom line of the LCD defines a function key for DC measurements (F5). The ESC key aborts the test and returns to the previous menu.

The medTester 1000B is equipped with external meter inputs. There are two jacks labeled "EXT INPUT" on the top left side of the instrument. These jacks are used to measure external current. The test lead configuration is shown in Figure 3.5. Note that the Kelvin cables plugged into the external meter inputs also plug into the ohm current source inputs. This is only due to the construction of the Kelvin cable assembly. In this measurement the ohm/current source connections perform no function (They are used when making four-terminal resistance measurements).

The jaws of the Kelvin cables connect to the current source to be measured. The current flows through one Kelvin cable and into the medTester 1000B. To complete the circuit, the current returns through the other cable to the measured current source.

### ECG LEAD TESTS

There are 10 ECG binding posts on the front panel of the medTester 1000B. All of the "V" leads have a common connection inside the medTester 1000B. The medTester 1000B can perform three major categories of ECG measurements: "Leakage to Ground," "Interlead Leakage," and "Isolation Lead Leakage."

**Leakage to Ground**

The leakage to ground measurement configuration is shown in Figure 3.6. Note that the measurement can be done with all leads connected to ground or any individual lead connected to ground.

The test receptacle can be configured with normal or reverse polarity, with open or closed ground. The ECG leads of the device under test are connected to the binding posts on the medTester 1000B front panel. The current(s) flowing down the lead(s) are connected to ground through the AAMI load.

**Interlead Leakage**

The interlead measurement is illustrated in Figure 3.7. This measurement connects all the ECG leads (except one) together at one side of the AAMI load. The remaining ECG lead is connected to the other side of the AAMI load. The resulting current flow passes through the AAMI load. Any lead may be selected as the individual lead (remember that all "V" leads are tied together).

The example in Figure 3.7 compares the right leg ("RL") to the remaining ECG leads.

**Isolation Lead Leakage**

The isolation test configuration is shown in Figure 3.8. This test measures the isolation of patient leads driven by line voltage. A transformer is used to generate a voltage source that is the same amplitude as the incoming AC line voltage. This voltage source is current limited by a 120K ohm resistor. One side of the AAMI load is driven by this source; the other side is connected to the ECG leads via the binding posts.

The test may be done in all leads mode or individual lead mode. In the all leads mode every ECG binding post is connected to the AAMI load (which is being driven by the isolation transformer) whereas in the individual lead mode, only the ECG lead of your choice is connected to the AAMI load. The test receptacle is fixed with normal polarity and closed ground during this test. To perform it, you must hold down the isolation function key.

**CAUTION!!!**

**Line voltage is present on the ECG post(s) when you hold the isolation key down.**

### TEST RECEPTACLE LOAD CURRENT

Press MANUAL (F2) and EUT-CUR (F3) to select the test receptacle load current. To access this mode more directly press the EQUIPMENT CURRENT key in the TEST MODE SELECT section on the medTester 1000B front panel. Pressing the ESC key terminates the test and returns you to the previous menu.

The load current is the current being drawn through the "hot" lead of the test receptacle which may be thought of as an AC ammeter. The device under test is plugged into the test receptacle. The test receptacle is fixed at normal polarity and closed ground. A coil inside the medTester 1000B produces an output proportional to the AC current being drawn through the hot lead. See Figure 3.10 for more details.

### RESISTANCE

#### Four-Terminal Resistance Measurements

Kelvin cables allow you to make accurate low-resistance measurements because the medTester 1000B doesn't have to calculate lead and contact resistance for them. Using two cables results in a four-terminal resistance measurement. Each half of the Kelvin cable clamp is electrically isolated from the other half, allowing a two-point measurement to be made from one cable.

The four-terminal technique is used because it is very accurate when measuring low (less than 1 ohm) resistance values. Two Kelvin cables are used in this measurement. A 100 milliamperere current source is used to force a known current through the unknown resistance. The path of the 100 milliamps is from one side of one Kelvin cable through the unknown resistance and back through one side of the other Kelvin cable. The voltage measured is the drop across the unknown resistance caused by the 100 milliamperere current flow. Therefore, only the unknown resistance, not the resistance of the Kelvin cables, is included in the resistance measurements. This is the advantage of four-terminal resistance measurements.

To use the 0.5 ohm resistance test points, select the power cord resistance measurement with the function keys. Plug a Kelvin cable into the two red external meter jacks. Clip the Kelvin cable onto the two test points labeled 0.5. It is very important to have one jaw of the Kelvin cable on one test point and the other jaw of the Kelvin



cable on the other test point. Do not let the jaws touch each other and do not clip the jaws onto just one test point. The reason for the two test points is that the 0.5 ohm resistor is internal to the medTester 1000B. By providing two test points, the Kelvin cables are effectively extended into the instrument to the exact point where the resistor is located, thereby eliminating the effects of internal wiring resistance. Note that this is how the resistance measurement works in practice, also. The Kelvin cable is clipped to the body of the equipment under test and Kelvin cable resistance is eliminated.

#### External Ohms

Press MANUAL (F2), OHMS (F4), and then EXT (F2) to select external ohms. To access this mode more directly, press EXTERNAL RESISTANCE in the TEST MODE SELECT section on the medTester 1000B front panel. The jaws in the Kelvin cable assembly are insulated from each other. This is done to force the test current to take a known path and provide a voltage sense at the point where the test current flows into and out of the unknown resistance. Figure 3.1 illustrates the configuration for making a four-terminal resistance measurement.

#### Power Cord Resistance

Press MANUAL (F2), OHMS (F4), and then PWRCORD (F1) to select power cord resistance. To access this mode more directly, press the POWER CORD RESISTANCE key in the TEST MODE SELECT section on the medTester 1000B front panel. The four-terminal resistance technique is used for this test. This test uses one external Kelvin cable and one internal equivalent. Figure 3.2 illustrates the connections required to perform the measurement. One Kelvin cable is plugged into the red external meter jacks. One red jack is the current source; the other is the voltage sense line. The black external meter jacks are not used. The Kelvin cable is clipped to the case of the instrument under test. The other two terminals (Kelvin equivalents) needed to make the four-terminal measurement are inside the medTester 1000B. There are two connections to the test receptacle ground pin in Figure 3.2. One connection is to the current source; the other is to the voltage sense line. These two connections perform the same function as the second Kelvin cable. The connections are made to the ground of the test receptacle to allow the test to be performed while the device under test is plugged into the medTester 1000B. This test measures not only the resistance of the ground wire in the power cord, but the resistance of the case to the ground wire of the power cord in the device under test.

There are two test points on the medTester 1000B front panel that simulate a power cord resistance. The Kelvin cable is clipped across the two points (labeled 0.5 ohm) to get a reading. The other end of the Kelvin cable is plugged into the read external meter jacks. The reading displayed should be approximately 500 milliohms (or 0.5 ohms). These test points are useful for verifying that the metering circuitry is operational. However, they should not be used for calibration purposes.

The ground cord resistance of the medTester 1000B can also be measured by plugging the medTester 1000B into the dual receptacle and the Kelvin cable into the ground path of the dual receptacle. The ground pin adapters supplied with the medTester 1000B will facilitate the Kelvin cable connection to the dual receptacle ground pin. Use the manual test selection of external ohms.

It is possible to use the external resistance mode to measure power cord resistance. To do so, connect one Kelvin cable to the EUT case and the other Kelvin cable to the ground pin of the power cord. The advantage of power cord resistance tests is that the power cord resistance can be measured and electrical safety tests can all be performed without having to plug and unplug the power cord from the medTester 1000B test receptacle. This makes it very convenient for you to do a variety of tests with a minimum number of cable changes.

#### ISOLATED POWER AND GFI TEST

You need Dynatech model 202A ISOLATED POWER TEST MODULE to perform this test. The 202A plugs into the test receptacle of the medTester 1000B, and its output cable plugs into the medTester's external meter inputs (Figure 3.11). The Model 202A simulates faults that occur on isolated power and grounded systems. The 202A's output is read by the external meter inputs and digitized by the medTester's circuitry.

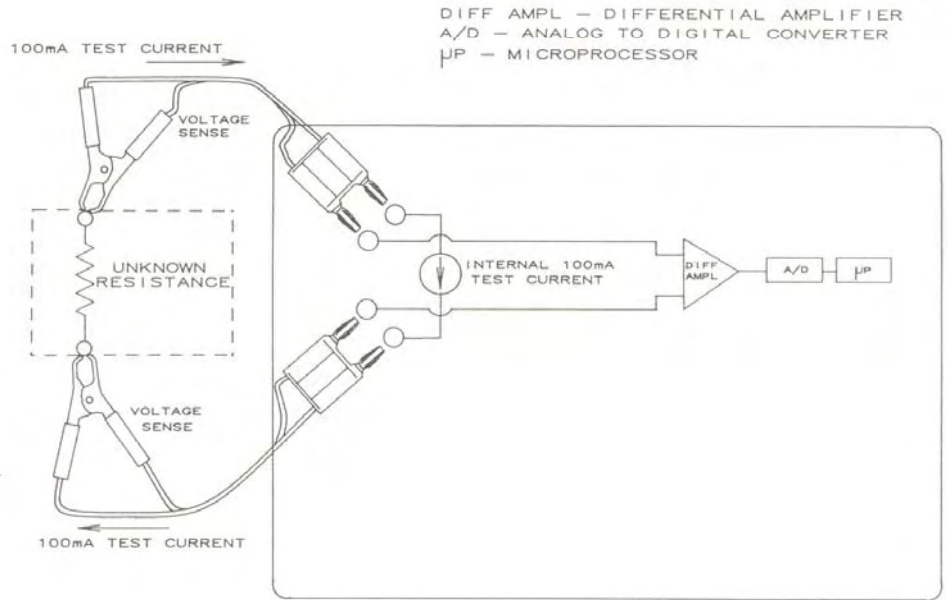
When the 202A is used for a ground fault test, the internal ground fault circuit in the medTester 1000B raises its trip point to 10 milliamps. This allows the 202A to test the wall outlet for a value up to 10 milliamps without tripping the medTester 1000B GFI circuit.

Please refer to the 202A manual for further details on ground fault and isolated power testing.

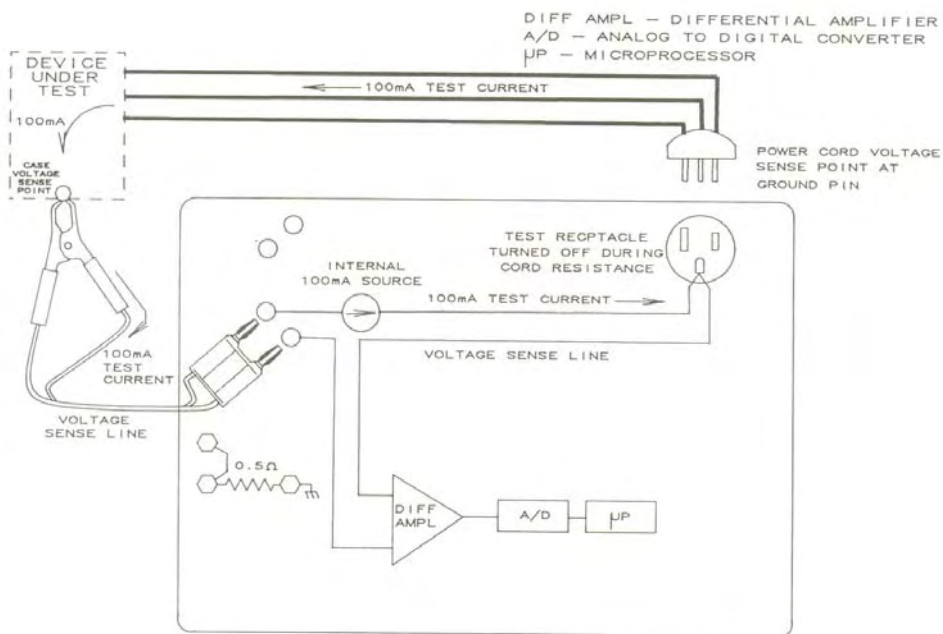
### DC ONLY

The medTester 1000B measures only the DC component of a voltage or current in this mode. The DC ONLY function can be selected by pressing F5 in the following test modes:

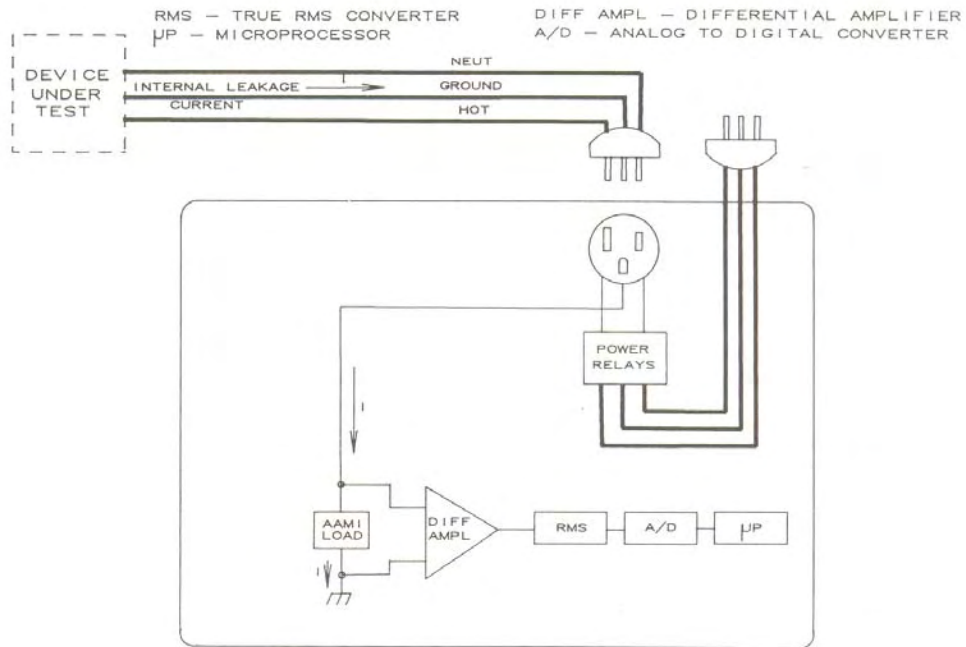
Internal Case Leakage  
External Case Leakage  
ECG: All/Gnd, Ld/Gnd, Ld/Ld



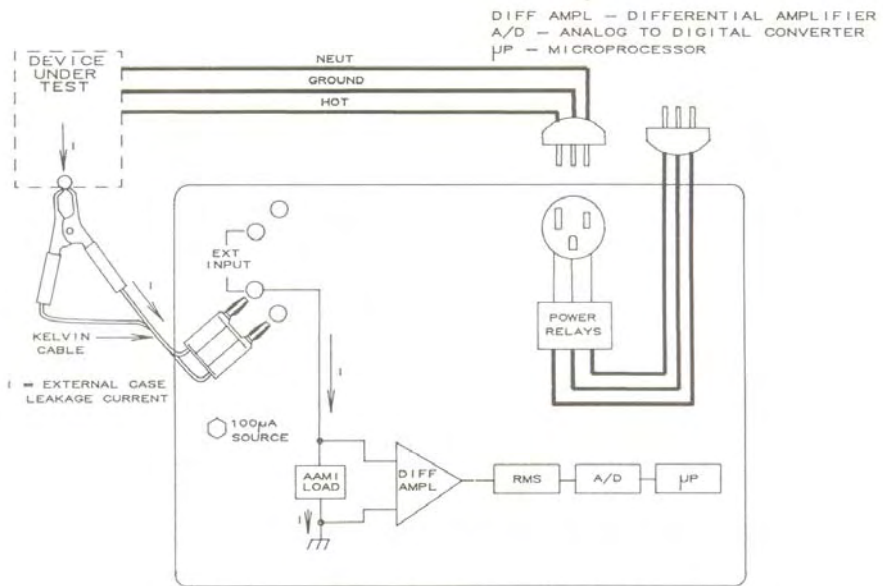
External Meter Resistance  
Figure 3.1



Power Cord Resistance Test  
 Figure 3.2

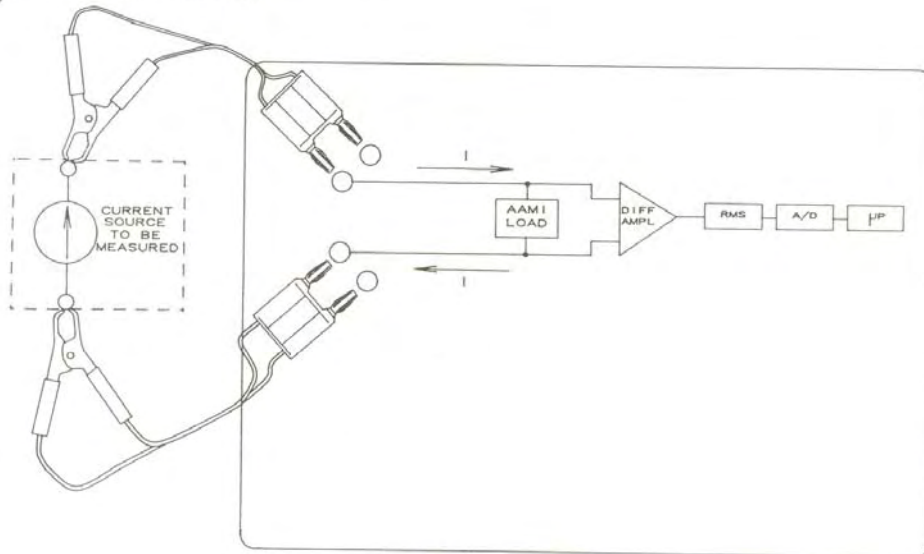


Case Internal Leakage  
 Figure 3.3



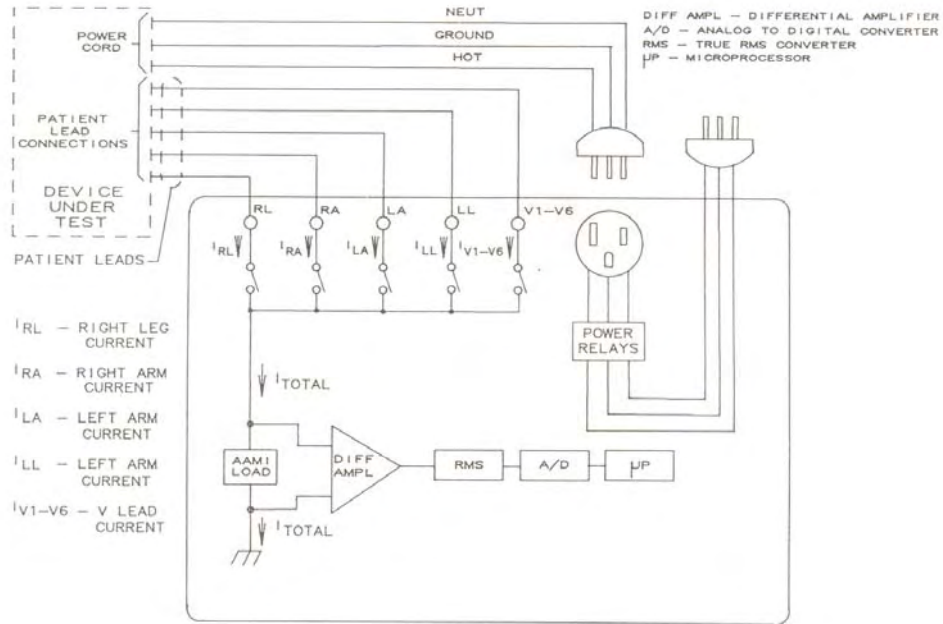
Case External Leakage  
 Figure 3.4

I - EXTERNAL CURRENT  
DIFF AMPL - DIFFERENTIAL AMPLIFIER  
RMS - TRUE RMS CONVERTER  
A/D - ANALOG TO DIGITAL CONVERTER  
µP - MICROPROCESSOR

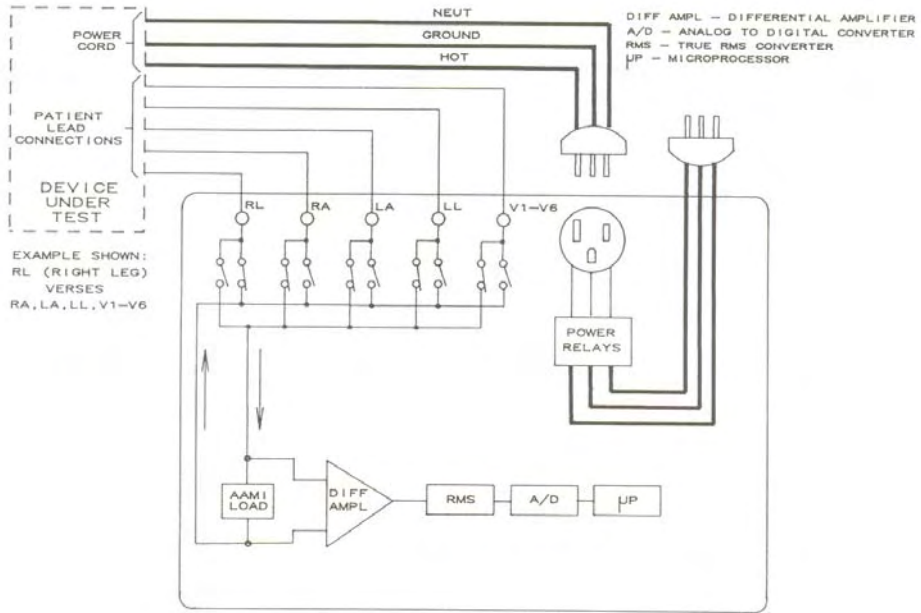


External Current  
Figure 3.5

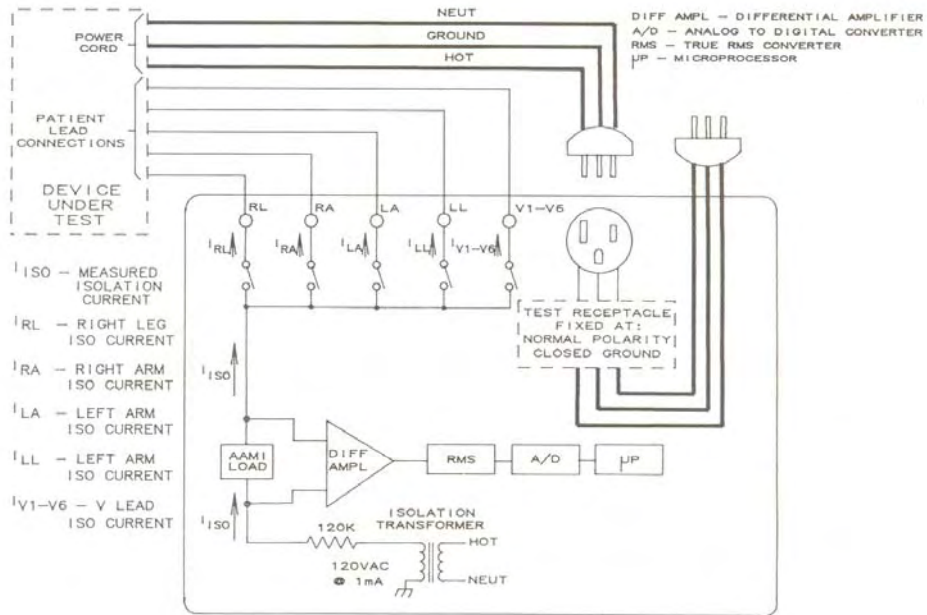




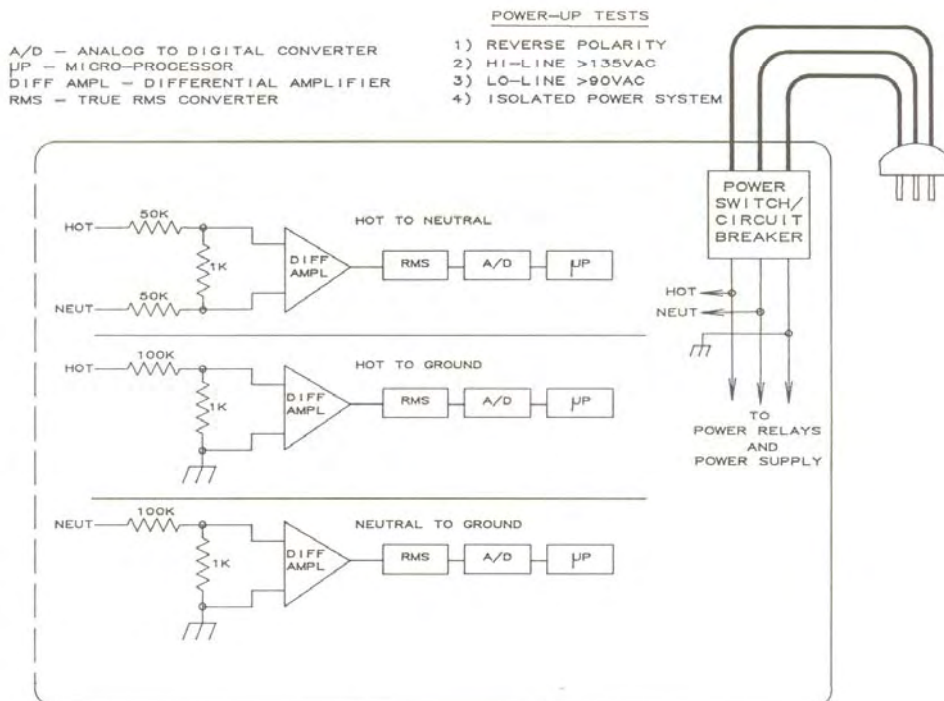
ECG Lead Leakage to Ground  
 All Leads to Ground & Individual Lead to Ground  
 Figure 3.6



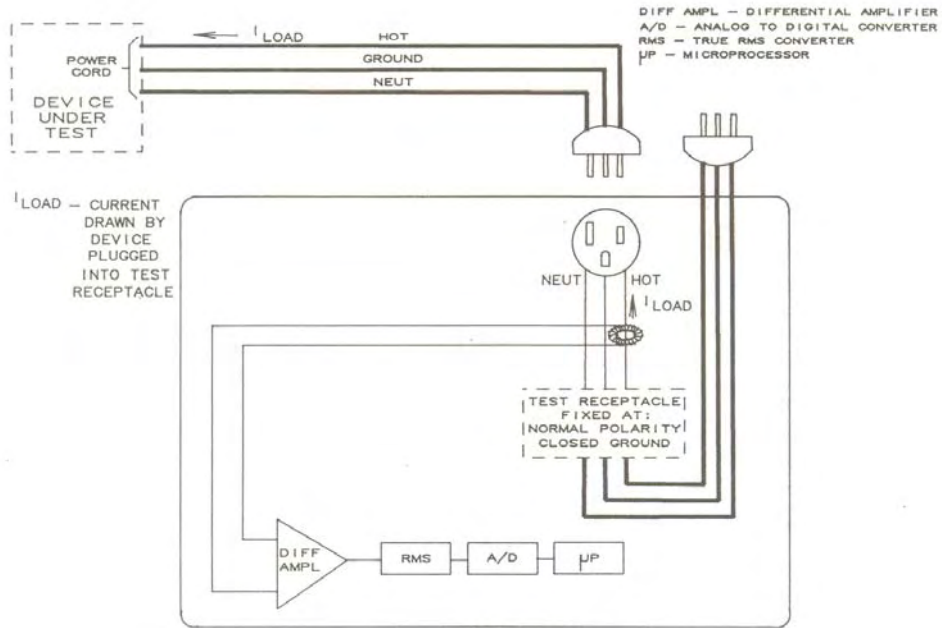
ECG Interlead Leakage  
Figure 3.7



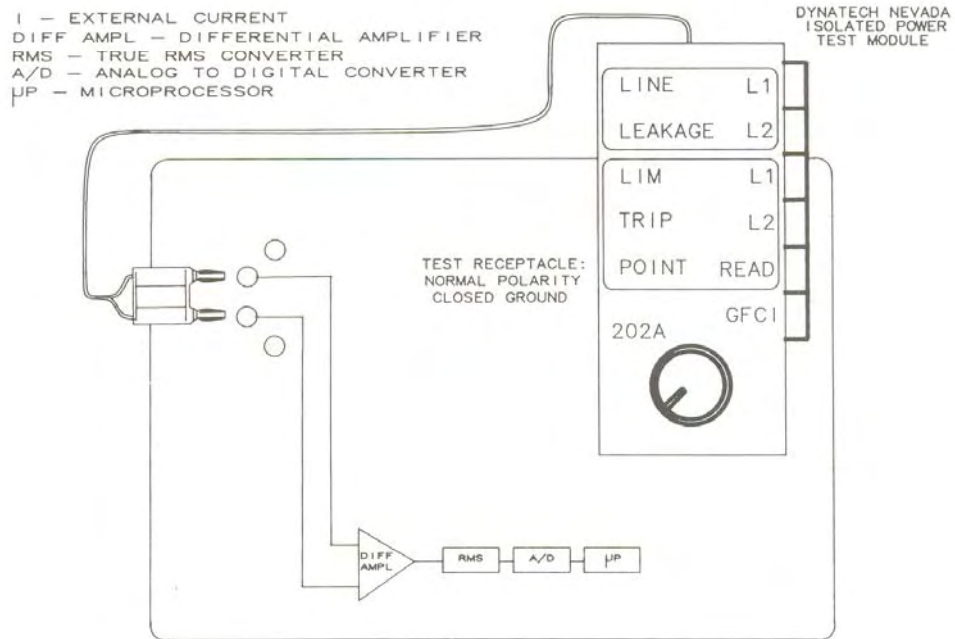
ECG Lead Isolation Test  
 All Lead & Individual Lead  
 Figure 3.8



Three Types of Line Voltage Measurements  
 Figure 3.9



Equipment Load Current  
Figure 3.10



Isolated Power System & Ground Fault Test  
 Figure 3.11

**SAFETY TESTS**

The medTester 1000B comes with 10 preprogrammed autosequences. All autosequences (with the exception of A16) may be reprogrammed to suit your specific testing requirements. The following table lists the autosequences and their factory settings.

Remote Command	Device	Leakage	ECG	Limit		
				Lead	ISO	Case
A1	Critical Devices	Ext	5 and 10 electrodes	10	20	100
A2	Critical Devices	Ext	3 electrodes	10	20	100
A3	Critical Devices	Ext	4 electrodes	10	20	100
A4	Critical Devices	Ext	Case Only			100
A5	Critical Devices	Ext	Case Only			500
A6	Critical Devices	Int	5 and 10 electrodes	10	20	100
A7	Critical Devices	Int	3 electrodes	10	20	100
A8	Critical Devices	Int	4 electrodes	10	20	100
A9	Critical Devices	Int	Case Only			100
A10	General Devices	Int	Case Only			500
A16	Line Monitor	N/A	N/A			

**OPERATION OF AUTOSEQUENCES A1-A10**

The following is a general description of autosequences 1-10. The sections on leads and performance wave testing do not apply to general devices since they do not have leads.

The Test Mode Select and Receptacle Control keys are disabled during an autosequence.

**Autosequence Selection**

An autosequence can be selected by one of the following methods:

- 1) Select SAFETY (F1) from the main menu and then select the desired sequence using the function keys (F1-F5).

- 2) Enter a remote autosequence number via COM1 or COM2 (external keyboard).
- 3) Enter an autosequence number with the Bar Code Reader.

**Autosequence Execution**

- 1) After an autosequence has been selected and the RS-232/Printer Option is installed, you will be prompted to enter the following information:

Field Description	Length
Operator Code	3 characters maximum
Device Type	16 characters maximum
Manufacturer Code	16 characters maximum
Location	16 characters maximum
Model Number	16 characters maximum
Serial Number	16 characters maximum
Control Number	16 characters maximum
Physical Inspection Line 1	40 characters maximum
Physical Inspection Line 2	40 characters maximum

(See the Customizing Chapter for more information on customizing prompts).

You are now prompted to do the following tasks:

- 2) Plug the equipment under test (EUT) into the medTester 1000B's test receptacle.
- 3) Plug a Kelvin cable into the two red binding posts on the medTester 1000B front panel. Attach the Kelvin cable clamp to an exposed grounded surface of the EUT.
- 4) Attach the EUT patient leads to the medTester top panel ECG binding posts.



- 5) Press F5 to start the autosequence when all connections are properly made.
- 6) Three system line voltage measurements are automatically conducted:

Neutral (L2) to Ground  
Hot (L1) to Ground  
Hot (L1) to Neutral (L2)

- 7) If there is not a good connection with the Kelvin cable at this point, the medTester CURRENT SOURCE LED will flash and the buzzer will sound until a good ground connection is made. Once you've made a good connection, press F5 to measure the case ground resistance. The results are displayed on the medTester's display. If the test is within the preset limit, the medTester proceeds to the next autosequence step.

If the ground resistance is greater than the preset limit, the LEDs will all flash and the buzzer will beep. The medTester displays the out-of-spec value and the preset limit. Press F5 and the medTester returns to the beginning of the power cord ground resistance test. This gives you a second chance to check connections, etc. Press F5 again to remeasure the power cord ground resistance. If the second test is within the preset limit, the autosequence proceeds to step 8. If the second test measures an out-of-spec value, the autosequence terminates, and the medTester returns to MENU 1.

- 8) You are now prompted to turn the EUT power off and then press F5.
- 9) The case leakage tests (equipment power off) are performed.

The medTester test receptacle will automatically switch to the proper configuration (after a 5-second delay) during an autosequence.

If an out-of-spec value is measured, the medTester will beep and the LEDs will flash.

- 10) After the case leakage tests (equipment power off) have been completed, you are prompted to turn the EUT power on and then press F5. The lead leakage tests (equipment power on) are performed.

If a GFI fault occurs, the autosequence will be immediately terminated.

- 11) After the case leakage tests (equipment power on) have been performed, the medTester 1000B automatically advances to the lead leakage tests (equipment power on).
- 12) After the lead leakage tests (equipment power on) have been performed, you have the option of outputting various performance waves to the EUT. You must press F5, if prompted, to advance in certain portions of this part of the autosequence.

The performance waves are listed in the following table.

Performance Wave	Frequency
Square	2 Hz 1 kHz
Step	4 Second
Sine	10 Hz 40 Hz 60 Hz 100 Hz
Triangle	2 Hz
CMRR	60 Hz
ECG	30 BPM 60 BPM 120 BPM 240 BPM

- 13) At the end of the autosequence, the user may enter the following data:

PERF COMMENTS	(40 characters maximum)
COMMENTS	(40 characters maximum)
NEXT TEST	
DUE DATE	(9 characters maximum)

Press the ESC key if you do not wish to make any entries.

- 14) After the last data has been entered, the system will automatically compute the autosequence test time in seconds. Turn the test receptacle off, store the record, and return to MENU 1.

#### LINE MONITOR VOLTAGE TEST (A16)

The line monitor voltage test makes a periodic measurement of the line voltages L1-L2, L1-GND, and L2-GND. An automatic measurement is made once every minute or more frequently if the line voltage fluctuates by more than 2 volts.

A printer must be on and connected to the medTester 1000B before this test can be run because the Line Monitor Voltage Test is not saved as an autosequence record. Results are sent directly to the printer.

Once you press LINEMONITOR (F1) in the third part of the SAFETY menu, line voltage measurements start immediately.

A bar graph will be printed giving a visual indication of the hot to neutral voltage. Any hot to neutral measurement that falls outside of the preset test limit (<90 volts, >130 volts) will cause a # sign to be printed.

The autosequence may be terminated by pressing the ESC key.

#### PRINTED SAMPLES OF AUTOSEQUENCES

Samples of the medTester 1000B default autosequences are on the following pages.

```

MedTester 1000B          REC # 1
SEQUENCE : 1            DATE: 5/30/91      TIME: 9:31:14
OPERATOR CODE:
DEVICE INFORMATION
TYPE:                   MANF:
MODEL:                  SN:              LOC:
                                  CN:
PHYSICAL INSPECTION

LINE VOLTAGES
L1-L2          L1-GND          L2-GND
117.3          117.7          3.7 VOLTS RMS
GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF
CASE X, NP GND NEU      .0 uAMPS RMS
CASE X, NP OG NEU      .0 uAMPS RMS

CASE LEAKAGE TESTS, EQUIPMENT POWER ON
CASE X, NP GND NEU      .0 uAMPS RMS
CASE X, NP OG NEU      .0 uAMPS RMS

LEAD LEAKAGE TESTS, EQUIPMENT POWER ON
ALL-GND, NP GND NEU      .0 uAMPS RMS
ALL-GND, NP OG NEU      .0 uAMPS RMS
RL-GND, NP OG NEU      .0 uAMPS RMS
RA-GND, NP OG NEU      .0 uAMPS RMS
LA-GND, NP OG NEU      .0 uAMPS RMS
LL-GND, NP OG NEU      .0 uAMPS RMS
V1/6-GND, NP OG NEU      .0 uAMPS RMS
RL-LDS, NP OG NEU      .1 uAMPS RMS
RA-LDS, NP OG NEU      .1 uAMPS RMS
LA-LDS, NP OG NEU      .1 uAMPS RMS
LL-LDS, NP OG NEU      .1 uAMPS RMS
V1/6-LDS, NP OG NEU      .1 uAMPS RMS
RL-LDS, NP GND NEU      .0 uAMPS RMS
RA-LDS, NP GND NEU      .1 uAMPS RMS
LL-LDS, NP GND NEU      .0 uAMPS RMS
LA-LDS, NP GND NEU      .1 uAMPS RMS
V1/6-LDS, NP GND NEU      .1 uAMPS RMS
ISO ALL, NP GND NEU      .6 uAMPS RMS

EUT CURRENT DRAWN .0 amps
PERFORMANCE COMMENTS:
COMMENTS:
NEXT TEST DUE DATE:
ELAPSED TEST TIME: 52 SECONDS
    
```

MedTester 1000B                      REC # 2

SEQUENCE : 2                      DATE: 5/30/91                      TIME: 9:32:09

OPERATOR CODE:

DEVICE INFORMATION

TYPE:	MANF:	LOC:
MODEL:	SN:	CN:

PHYSICAL INSPECTION

LINE VOLTAGES

L1-L2	L1-GND	L2-GND
116.6	117.5	4.3 VOLTS RMS

GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF

CASE X, NP GND NEU	.0 uAMPS RMS
CASE X, NP OG NEU	.0 uAMPS RMS

CASE LEAKAGE TESTS, EQUIPMENT POWER ON

CASE X, NP GND NEU	.0 uAMPS RMS
CASE X, NP OG NEU	.0 uAMPS RMS

LEAD LEAKAGE TESTS, EQUIPMENT POWER ON

ALL-GND, NP GND NEU	.0 uAMPS RMS
ALL-GND, NP OG NEU	.0 uAMPS RMS
RL-GND, NP OG NEU	.0 uAMPS RMS
RA-GND, NP OG NEU	.0 uAMPS RMS
LA-GND, NP OG NEU	.0 uAMPS RMS
RL-LDS, NP OG NEU	.1 uAMPS RMS
RA-LDS, NP OG NEU	.1 uAMPS RMS
LA-LDS, NP OG NEU	.1 uAMPS RMS
RA-LDS, NP GND NEU	.0 uAMPS RMS
LA-LDS, NP GND NEU	.1 uAMPS RMS
ISO ALL NP GND NEU	.7 uAMPS RMS

EUT CURRENT DRAWN .0 amps

PERFORMANCE COMMENTS:

COMMENTS:

NEXT TEST DUE DATE:

ELAPSED TEST TIME: 52 SECONDS

MedTester 1000B                      REC # 3

SEQUENCE : 3                      DATE: 5/30/91                      TIME: 9:51:03

OPERATOR CODE:

DEVICE INFORMATION

TYPE:	MANF:	LOC:
MODEL:	SN:	CN:

PHYSICAL INSPECTION

LINE VOLTAGES

L1-L2	L1-GND	L2-GND
115.5	116.3	3.3 VOLTS RMS

GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF

CASE X, NP GND NEU	.0 uAMPS RMS
CASE X, NP OG NEU	.0 uAMPS RMS

CASE LEAKAGE TESTS, EQUIPMENT POWER ON

CASE X, NP GND NEU	.0 uAMPS RMS
CASE X, NP OG NEU	.0 uAMPS RMS

LEAD LEAKAGE TESTS, EQUIPMENT POWER ON

ALL-GND, NP GND NEU	.0 uAMPS RMS
ALL-GND, NP OG NEU	.0 uAMPS RMS
RL-GND, NP OG NEU	.0 uAMPS RMS
RA-GND, NP OG NEU	.0 uAMPS RMS
LA-GND, NP OG NEU	.0 uAMPS RMS
LL-GND, NP OG NEU	.0 uAMPS RMS
RL-LDS, NP OG NEU	.0 uAMPS RMS
RA-LDS, NP OG NEU	.1 uAMPS RMS
LL-LDS, NP OG NEU	.1 uAMPS RMS
V1/6-LDS, NP OG NEU	.2 uAMPS RMS
RA-LDS, NP GND NEU	.1 uAMPS RMS
LL-LDS, NP GND NEU	.1 uAMPS RMS
LA-LDS, NP GND NEU	.1 uAMPS RMS
ISO ALL, NP GND NEU	.6 uAMPS RMS

EUT CURRENT DRAWN .0 amps

PERFORMANCE COMMENTS:

COMMENTS:

NEXT TEST DUE DATE:

ELAPSED TEST TIME: 54 SECONDS

MedTester 1000B                      REC # 4

SEQUENCE : 4                      DATE: 5/30/91                      TIME: 9:51:59

OPERATOR CODE:

DEVICE INFORMATION

TYPE:	MANF:	LOC:
MODEL:	SN:	CN:

PHYSICAL INSPECTION

LINE VOLTAGES

L1-L2	L1-GND	L2-GND
115.4	116.0	3.8 VOLTS RMS

GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF

CASE X, NP GND NEU	.0 uAMPS RMS
CASE X, NP OG NEU	.0 uAMPS RMS

CASE LEAKAGE TESTS, EQUIPMENT POWER ON

CASE X, NP GND NEU	.0 uAMPS RMS
CASE X, NP OG NEU	.0 uAMPS RMS

EUT CURRENT DRAWN .0 amps

COMMENTS:

NEXT TEST DUE DATE:

ELAPSED TEST TIME: 34 SECONDS

MedTester 1000B                      REC # 5

SEQUENCE : 5                      DATE: 5/30/91                      TIME: 9:52:36

OPERATOR CODE:

DEVICE INFORMATION

TYPE:	MANF:	LOC:
MODEL:	SN:	CN:

PHYSICAL INSPECTION

LINE VOLTAGES

L1-L2	L1-GND	L2-GND
114.2	115.9	3.6 VOLTS RMS

GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF

CASE X, NP GND NEU	.5 uAMPS RMS
CASE X, NP OG NEU	.0 uAMPS RMS

CASE LEAKAGE TESTS, EQUIPMENT POWER ON

CASE X, NP GND NEU	.0 uAMPS RMS
CASE X, NP OG NEU	.0 uAMPS RMS

EUT CURRENT DRAWN .0 amps

COMMENTS:

NEXT TEST DUE DATE:

ELAPSED TEST TIME: 21 SECONDS





```

MedTester 1000B          REC # 7
SEQUENCE : 7            DATE: 5/30/91      TIME: 9:54:17
OPERATOR CODE:
DEVICE INFORMATION
TYPE:                   MANF:
MODEL:                  SN:              LOC:
                                           CN:
PHYSICAL INSPECTION

LINE VOLTAGES
L1-L2                   L1-GND           L2-GND
114.7                   116.1           3.2 VOLTS RMS
GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF
CASE I, NP OG NEU      .3 uAMPS RMS
CASE I, RP OG NEU      .4 uAMPS RMS

CASE LEAKAGE TESTS, EQUIPMENT POWER ON
CASE I, NP OG NEU      .2 uAMPS RMS
CASE I, RP OG NEU      .4 uAMPS RMS

LEAD LEAKAGE TESTS, EQUIPMENT POWER ON
ALL-GND, NP GND NEU    .0 uAMPS RMS
ALL-GND, NP OG NEU    .0 uAMPS RMS
RL-GND, NP OG NEU     .0 uAMPS RMS
RA-GND, NP OG NEU     .0 uAMPS RMS
LA-GND, NP OG NEU     .0 uAMPS RMS
RL-LDS, NP OG NEU     .1 uAMPS RMS
RA-LDS, NP OG NEU     .1 uAMPS RMS
LA-LDS, NP OG NEU     .1 uAMPS RMS
RA-LDS, NP GND NEU    .1 uAMPS RMS
LA-LDS, NP GND NEU    .1 uAMPS RMS
ISO ALL, NP GND NEU    .6 uAMPS RMS

EUT CURRENT DRAWN .0 amps

PERFORMANCE COMMENTS:
COMMENTS:
NEXT TEST DUE DATE:
ELAPSED TEST TIME: 51 SECONDS
    
```

MedTester 1000B                      REC # 8

SEQUENCE : 8                      DATE: 5/30/91                      TIME: 9:55:10

OPERATOR CODE:

DEVICE INFORMATION

TYPE:	MANF:	LOC:
MODEL:	SN:	CN:

PHYSICAL INSPECTION

LINE VOLTAGES

L1-L2	L1-GND	L2-GND
115.0	116.0	3.2 VOLTS RMS

GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF

CASE I, NP OG NEU	.2 uAMPS RMS
CASE I, RP OG NEU	.4 uAMPS RMS

CASE LEAKAGE TESTS, EQUIPMENT POWER ON

CASE I, NP OG NEU	.2 uAMPS RMS
CASE I, RP OG NEU	.4 uAMPS RMS

LEAD LEAKAGE TESTS, EQUIPMENT POWER ON

ALL-GND, NP GND NEU	.0 uAMPS RMS
ALL-GND, NP OG NEU	.0 uAMPS RMS
RL-GND, NP OG NEU	.0 uAMPS RMS
RA-GND, NP OG NEU	.0 uAMPS RMS
LA-GND, NP OG NEU	.0 uAMPS RMS
LL-GND, NP OG NEU	.0 uAMPS RMS
RL-LDS, NP OG NEU	.1 uAMPS RMS
RA-LDS, NP OG NEU	.1 uAMPS RMS
LL-LDS, NP OG NEU	.1 uAMPS RMS
V1/6-LDS, NP OG NEU	.1 uAMPS RMS
RA-LDS, NP GND NEU	.1 uAMPS RMS
LL-LDS, NP GND NEU	.1 uAMPS RMS
LA-LDS, NP GND NEU	.1 uAMPS RMS
ISO ALL, NP GND NEU	.6 uAMPS RMS

EUT CURRENT DRAWN .0 amps

PERFORMANCE COMMENTS:

COMMENTS:

NEXT TEST DUE DATE:

ELAPSED TEST TIME: 63 SECONDS

MedTester 1000B                      REC # 9

SEQUENCE : 9                      DATE: 5/30/91                      TIME: 9:56:15

OPERATOR CODE:

DEVICE INFORMATION

TYPE:	MANF:	LOC:
MODEL:	SN:	CN:

PHYSICAL INSPECTION

LINE VOLTAGES

L1-L2	L1-GND	L2-GND
115.0	115.9	3.1 VOLTS RMS

GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF

CASE I, NP OG NEU	.3 uAMPS RMS
-------------------	--------------

CASE LEAKAGE TESTS, EQUIPMENT POWER ON

CASE I, NP OG NEU	.2 uAMPS RMS
-------------------	--------------

EUT CURRENT DRAWN .0 amps

COMMENTS:

NEXT TEST DUE DATE:

ELAPSED TEST TIME: 24 SECONDS

MedTester 1000B                      REC # 10

SEQUENCE : 10                      DATE: 5/30/91                      TIME: 9:56:41

OPERATOR CODE:

DEVICE INFORMATION

TYPE:	MANF:	LOC:
MODEL:	SN:	CN:

PHYSICAL INSPECTION

LINE VOLTAGES

L1-L2	L1-GND	L2-GND
114.3	115.5	3.1 VOLTS RMS

GROUND RESISTANCE: .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF

CASE 1, NP OG NEU	.3 uAMPS RMS
-------------------	--------------

CASE LEAKAGE TESTS, EQUIPMENT POWER ON

CASE 1, NP OG NEU	.2 uAMPS RMS
-------------------	--------------

EUT CURRENT DRAWN .0 amps

COMMENTS:

NEXT TEST DUE DATE:

ELAPSED TEST TIME: 24 SECONDS

MEDTESTER 1000B

LINE MONITOR TEST

5/30/91

OPERATOR: \_\_\_\_\_ LOCATION: \_\_\_\_\_

TIME:	L1-GND	L2-GND	L1-L2	100	103	106	109	112	115	118	121	124	127	130
10:17	117.1	3.3	115.9	*****										
10:18	117.1	3.3	116.3	*****										
10:19	116.1	3.2	115.4	*****										
10:20	116.7	3.2	116.2	*****										
10:21	116.6	3.3	116.4	*****										
10:22	116.6	3.2	115.9	*****										
10:23	117.1	3.2	116.3	*****										
10:24	116.7	3.2	115.5	*****										
10:25	117.3	3.1	116.5	*****										
10:26	116.4	3.4	115.8	*****										

COMMENTS: \_\_\_\_\_

NEXT TEST DUE DATE: \_\_\_\_\_

**CUSTOMIZING AUTOSEQUENCES**

This example of a medTester 1000B autosequence (on the following page) shows all the possible measurements for Case Leakage Tests and Lead Leakage Tests. You may customize autosequences A1 through A10 and keep or remove any of these measurements. From MENU2, press CUSTOM (F1), SEQUENCES (F2), and MAKE (F1). Select the autosequence you want to modify, and the medTester will display an option that you may decide to keep by pressing F4 or remove by pressing F5.

```

MedTester 1000B                      REC # 11
SEQUENCE : 1                        DATE: 5/30/91                TIME: 10:36:04
OPERATOR CODE:
DEVICE INFORMATION
TYPE:                                MANF:
MODEL:                               SN:                                LOC:
PHYSICAL INSPECTION
LOC:
CN:

LINE VOLTAGES
L1-L2                                L1-GND                    L2-GND
115.6                                115.6                    3.0 VOLTS RMS

GROUND RESISTANCE:                   .000 OHMS

CASE LEAKAGE TESTS, EQUIPMENT POWER OFF
CASE X,    NP GND NEU                .0 uAMPS RMS
CASE X,    NP OG NEU                 .0 uAMPS RMS
CASE X,    RP OG NEU                 .0 uAMPS RMS
CASE X,    NP GND ON                 .0 uAMPS RMS
CASE X,    RP GND ON                 .0 uAMPS RMS
CASE I,    NP OG NEU                 .2 uAMPS RMS
CASE I,    RP OG NEU                 .4 uAMPS RMS
CASE I,    NP OG ON                  .5 uAMPS RMS
CASE I,    RP OG ON                  .5 uAMPS RMS

CASE LEAKAGE TESTS, EQUIPMENT POWER ON
CASE X,    NP GND NEU                .0 uAMPS RMS
CASE X,    NP OG NEU                 .0 uAMPS RMS
CASE X,    RP OG NEU                 .0 uAMPS RMS
CASE X,    NP GND ON                 .0 uAMPS RMS
CASE X,    RP GND ON                 .0 uAMPS RMS
CASE I,    NP OG NEU                 .2 uAMPS RMS
CASE I,    RP OG NEU                 .4 uAMPS RMS
CASE I,    NP OG ON                  .5 uAMPS RMS
CASE I,    RP OG ON                  .5 uAMPS RMS

LEAD LEAKAGE TESTS, EQUIPMENT POWER ON
ALL-GND,   NP GND NEU                .0 uAMPS RMS
ALL-GND,   NP OG NEU                 .0 uAMPS RMS
RL-GND,    NP OG NEU                 .0 uAMPS RMS
RA-GND,    NP OG NEU                 .0 uAMPS RMS
LA-GND,    NP OG NEU                 .0 uAMPS RMS
LL-GND,    NP OG NEU                 .0 uAMPS RMS
V1/6-GND,  NP OG NEU                 .0 uAMPS RMS
ALL-GND,   RP OG NEU                 .0 uAMPS RMS
RL-GND,    RP OG NEU                 .0 uAMPS RMS
RA-GND,    RP OG NEU                 .0 uAMPS RMS
LA-GND,    RP OG NEU                 .0 uAMPS RMS
LL-GND,    RP OG NEU                 .0 uAMPS RMS
V1/6-GND,  RP OG NEU                 .0 uAMPS RMS
RI-LDS,    NP OG NEU                 .1 uAMPS RMS
RA-LDS,    NP OG NEU                 .1 uAMPS RMS
LA-LDS,    NP OG NEU                 .1 uAMPS RMS
LL-LDS,    NP OG NEU                 .1 uAMPS RMS
V1/6-LDS,  NP OG NEU                 .1 uAMPS RMS
RI-LDS,    NP GND NEU                .1 uAMPS RMS
RA-LDS,    NP GND NEU                .1 uAMPS RMS
LL-LDS,    NP GND NEU                .1 uAMPS RMS
LA-LDS,    NP GND NEU                .1 uAMPS RMS
V1/6-LDS,  NP GND NEU                .1 uAMPS RMS
ISO ALL,   NP GND NEU                .7 uAMPS RMS

EUT CURRENT DRAWN                    .0 amps

PERFORMANCE COMMENTS:
COMMENTS:
NEXT TEST DUE DATE:
ELAPSED TEST TIME: 196 SECONDS
    
```



**INTRODUCTION**

The medTester 1000B has 15 different waveforms for evaluating patient monitors.

**PERFORMANCE WAVEFORMS**

The performance waveforms are listed in the following table.

Key	Name	Definition	Remote Name
F1	2HZ SQ	2 Hz Square Wave	W001
F2	4SEC	4 Second Step	W002
F3	10HZ	10 Hz Sine Wave	W003
F4	40HZ	40 Hz Sine Wave	W004
F5	60HZ	60 Hz Sine Wave	W005
Next Submenu			
F1	100Hz	100 Hz Sine Wave	W006
F2	1KHZ	1 kHz Square Wave	W007
F3	2HZT	2 Hz Triangle Wave	W008
F4	CMRR	Common Mode Rejection	W009
F5	30BPM	ECG 30 BPM	W010
Next Submenu			
F1	60BPM	ECG 60 BPM	W011
F2	120BPM	ECG 120 BPM	W012
F3	240BPM	ECG 240 BPM	W013
F4	VTAC	Ventricular Tachycardia	W014
F5	VFIB2	Ventricular Fibrillation	W015

### PERFORMANCE WAVE SELECTION

To select a performance waveform, select WAVES (F3) from MENU 1 and then the performance wave you want (see section on Performance Waveforms). If you have the RS-232/Printer Option installed, you can select waveforms by entering their remote names.

The medTester will confirm your selection by displaying the name of the waveform you chose. The waveform is now output at the top panel ECG posts and rear panel high level ECG output.

If you want to select a different waveform, press the function key for that waveform. You may have to press an arrow key to see more selections. Press the ESC key to exit.

After selecting a performance waveform remotely (requires the RS-232/Printer Option) through an external keyboard, a GTOL command must be typed in to turn the test receptacle off.

**Chapter 4**  
**Customizing**

### INTRODUCTION

You can customize the medTester 1000B in the following areas:

- 1) Test Prompts
- 2) Autosequences
- 3) Measurement limits

### CUSTOM MENU

You may choose the following options from the CUSTOM menu (F1) in MENU 2.

### CONFIG (F1)

If you have installed the RS-232 option, you will have this function, which lets you select which prompts will appear during an autosequence. You may KEEP (press F4) or REMOVE (press F5) the following prompts:

OP CODE  
TYPE  
MANF  
LOC  
MODEL  
SN  
CONT #  
PHY INS  
PERF COM  
COMMENTS  
NEXT TEST  
PLUG IN EUT  
TURN EUT OFF  
TURN EUT ON  
ELAPSED TIME  
MULTI BAR CODE

**SEQUENCES (F2)**

Selecting SEQS from the CUSTOM menu allows you to modify autosequences A1 through A10. The SEQS menu contains three functions, MAKE, VIEW, and PRINT.

**MAKE (F1)**

To modify A1 through A10, select MAKE and decide whether to KEEP (F4) the options listed below in an autosequence or REMOVE (F5) them.

- |                      |                    |
|----------------------|--------------------|
| CASE X, NP GND NEU   | CASE RES LIMIT     |
| CASE X, NP OG NEU    | CASE LEAKAGE LIMIT |
| CASE X, RP OG NEU    | LEAD LEAKAGE LIMIT |
| CASE X, NP GND ON    | ISO LIMIT          |
| CASE X, RP GND ON    |                    |
| CASE I, NP OG NEU    |                    |
| CASE I, RP OG NEU    |                    |
| CASE I, NP OG ON     |                    |
| CASE I, RP OG ON     |                    |
| ALL-GND, NP GND NEU  |                    |
| ALL-GND, NP OG NEU   |                    |
| RL-GND, NP OG NEU    |                    |
| RA-GND, NP OG NEU    |                    |
| LA-GND, NP OG NEU    |                    |
| LL-GND, NP OG NEU    |                    |
| V1/6-GND, NP OG NEU  |                    |
| ALL-GND, RP OG NEU   |                    |
| RL-GND, RP OG NEU    |                    |
| RA-GND, RP OG NEU    |                    |
| LA-GND, RP OG NEU    |                    |
| LL-GND, RP OG NEU    |                    |
| V1/6-GND, RP OG NEU  |                    |
| RL-LDS, NP OG NEU    |                    |
| RA-LDS, NP OG NEU    |                    |
| LA-LDS, NP OG NEU    |                    |
| LL-LDS, NP OG NEU    |                    |
| V1/6-LDS, NP OG NEU  |                    |
| RL-LDS, NP GND NEU   |                    |
| RA-LDS, NP GND NEU   |                    |
| LL-LDS, NP GND NEU   |                    |
| LA-LDS, NP GND NEU   |                    |
| V1/6-LDS, NP GND NEU |                    |
| ISO ALL, NP GND NEU  |                    |
| LINE VOLTAGE TEST    |                    |
| POWER OFF TESTS      |                    |
| SINGLE STEP AUTOSQ   |                    |

### **VIEW (F2)**

To view a particular autosequence's configuration, press VIEW (F2). Then choose the autosequence. VIEW displays the same information a SEQS printout does. Continue pressing F2 to view the autosequence configuration line by line.

**PRINT (F3)**

To print a particular autosequence you configured with the MAKE function, press F3 then choose the autosequence. The printout will show all the measurements and measurement limits you decided to keep. Two typical printouts are illustrated below.

SEQ 1	SEQ 2
<p>CASE X, NP GND NEU                      CASE X, NP OG NEU                      CASE X, RP OG NEU                      CASE X, NP GND ON                      CASE X, RP GND ON                      ALL-GND, NP GND NEU                      ALL-GND, NP OG NEU                      RL-GND, NP OG NEU                      RA-GND, NP OG NEU                      LA-GND, NP OG NEU                      LL-GND, NP OG NEU                      V1/6-GND, NP OG NEU                      ALL-GND, RP OG NEU                      RL-GND, RP OG NEU                      RA-GND, RP OG NEU                      LA-GND, RP OG NEU                      LL-GND, RP OG NEU                      V1/6-GND, RP OG NEU                      RL-LDS, NP OG NEU                      RA-LDS, NP OG NEU                      LA-LDS, NP OG NEU                      LL-LDS, NP OG NEU                      V1/6-LDS, NP OG NEU                      RL-LDS, NP GND NEU                      RA-LDS, NP GND NEU                      LL-LDS, NP GND NEU                      LA-LDS, NP GND NEU                      V1/6-LDS, NP GND NEU                      ISO ALL, NP GND NEU                      LINE VOLTAGE TEST                      POWER OFF TESTS</p>	<p>CASE X, NP GND NEU                      CASE X, NP OG NEU                      CASE X, RP OG NEU                      CASE X, NP GND ON                      CASE X, RP GND ON                      ALL-GND, NP GND NEU                      ALL-GND, NP OG NEU                      RL-GND, NP OG NEU                      RA-GND, NP OG NEU                      LA-GND, NP OG NEU                      ALL-GND, RP OG NEU                      RL-GND, RP OG NEU                      RA-GND, RP OG NEU                      RL-LDS, NP OG NEU                      RA-LDS, NP OG NEU                      LA-LDS, NP OG NEU                      RA-LDS, NP GND NEU                      LA-LDS, NP GND NEU                      ISO ALL, NP GND NEU                      LINE VOLTAGE TEST                      POWER OFF TESTS</p> <p>CASE RES LIMIT 500 milliohms                      CASE LEAKAGE LIMIT 100 uAMPS                      LEAD LEAKAGE LIMIT 10 uAMPS                      ISO LIMIT 20 uAMPS</p>
<p>CASE RES LIMIT 500 milliohms                      CASE LEAKAGE LIMIT 100 uAMPS                      LEAD LEAKAGE LIMIT 10 uAMPS                      ISO LIMIT 20 uAMPS</p>	

**INIT (F3)**

Selecting INIT (F3) from the CUSTOM menu initializes the medTester 1000B system. This resets autosequences, the RS-232 configuration, and all ports to their factory default condition.

There are two choices for INIT. Selecting HOSP (F1) will initialize the medTester 1000B for hospital use and selecting MANUF (F2) will initialize the medTester 1000B for manufacturer's use. Press QUIT (F3) to escape from the initialization procedure.

**Autosequences**

Eliminates any custom autosequences and erases any records in ramtape.

**RS-232 and Printer Ports**

COM1, COM2, and the printer ports are disabled or turned off.

**RS-232 COM Port Configuration**

The RS-232 COM Port default configurations are listed in the following table.

BAUD	9600
STOP	2
PARITY	OFF
LENGTH	8
CTS	OFF



### **PAUSE (F4)**

Adjusts the length of the pause between the autosequence case and lead leakage tests. From MENU 2, press CUSTOM (F1) and then PAUSE (F4). The PAUSE menu selections follow.

### **NONE (F1)**

Eliminates the pause between the case and lead leakage tests.

### **3 SEC (F2)**

Sets a 3-second pause between the case and lead leakage tests.

### **6 SEC (F3)**

Sets a 6-second pause between the case and lead leakage tests.

### **9 SEC (F4)**

Sets a 9-second pause between the case and lead leakage tests.

### **STEP (F5)**

Causes the autosequence to halt after every case and lead leakage test. You must press STEP (F5) before the medTester will move on to the next measurement.

### **OPTIONS (F5)**

Press OPTIONS (F5) repeatedly from the CUSTOM menu to display the installed options in the medTester 1000B. Pressing the ESCAPE key returns you to the CUSTOM menu.

**Chapter 5**

**Options**

**INTRODUCTION: RS-232/PRINTER OPTION**

Adding the RS-232/Printer Option to your medTester enables you to use the parallel printer port and the two serial ports on the rear panel.

This allows you to transmit autosequence records to a computer or printer. You can also attach an external keyboard to one of the serial ports. This gives you more choices for entering information into the medTester by adding access to the alphabet, symbols, and numbers. It also replaces the function, arrow, and escape keys on the medTester's top panel.

**REQUIRED EQUIPMENT**

- 1) medTester 1000B Base Unit
- 2) medTester 1000B RS-232/Printer Option
- 3) External "QWERTY" Keyboard
- 4) Printer

**MENU ADDITIONS**

Refer to the medTester 1000B menu map in Chapter 6 for the location of the new RS-232/Printer Options. They are CONFIG, RS-232, PORTS, PRINT, PRINT TEST, and COMPUTER.

**Config**

The CONFIG function allows you to select which prompts will appear during an autosequence. The following prompts can either be kept (press F4) or removed (press F5).

OP CODE  
TYPE  
MANF  
LOC  
MODEL  
SN  
CONT#  
PHY INS  
PERF COM  
COMMENTS

NEXT TEST  
PLUG IN EUT  
TURN EUT OFF  
TURN EUT ON  
ELAPSED TEST TIME ON/OFF  
MULTI-BAR CODE

**RS-232**

The RS-232 function (F3) is in the UTIL menu. You are able to configure the baud rate, number of stop and parity bits, character length, and clear to send signal for COM1 and COM2.

**Ports**

The PORTS function (F4) is located in the UTIL menu. You can turn the com ports and printer port on or off by selecting PORTS.

**Print**

The PRINT function is located in MENU 2. This enables you to print autosequence records. Also included is a PRINT TEST for all ports. Adding the Record Storage Option creates choices in the PRINT menu for printing one or more records, failed records, and a summary of records.

**Computer**

The COMPUTER function is located in MENU 2. This enables COM1 for external keyboard or connection to a computer.

**REMOTE COMMANDS**

Once the RS-232/Printer Option is installed, you can use remote commands to control medTester 1000B from an external keyboard connected to either one of medTester 1000B's com ports (COM1 or COM2).

The tables on the following pages list the remote commands.

**Test Receptacle**

Remote Command	Definition
TRGO	Test Receptacle, Open Ground
TRNO	Test Receptacle, Open Neutral
TRPN	Test Receptacle, Normal Polarity
TRPR	Test Receptacle, Reversed Polarity
TRGN	Test Receptacle, Open Ground

**Waveforms**

Remote Command	Definition
W001	Performance Wave, Square, 2Hz
W002	Performance Wave, Step, IV, 4 Sec
W003	Performance Wave, 10 Hz Sine
W004	Performance Wave, 40 Hz Sine
W005	Performance Wave, 60 Hz Sine
W006	Performance Wave, 100 Hz Sine
W007	Performance Wave, 1000 Hz Sine
W008	Performance Wave, Triangle, 3 Vp-p, 2 Hz
W009	Performance Wave, 60 Hz CMRR
W010	ECG, 30 BPM
W011	ECG, 60 BPM
W012	ECG, 120 BPM
W013	ECG, 240 BPM
W014	Performance Wave
W015	Performance Wave

**Autosequences**

Remote Command	Definition
A1	Autosequence
A2	Autosequence
A3	Autosequence
A4	Autosequence
A5	Autosequence
A6	Autosequence
A7	Autosequence
A8	Autosequence
A9	Autosequence
A10	Autosequence
A16	Line Monitor Test
A18	Temperature Monitor
A19	H2O Monitor

**Function Keys**

Remote Command	Definition
F1 Key	Function Key
F2 Key	Function Key
F3 Key	Function Key
F4 Key	Function Key
F5 Key	Function Key

## Manual Tests

Remote Command	Definition
CLKE	Case Leakage External
CLKI	Case Leakage Internal
CRST	Case Resistance
ECUR	System Current
IPWR	Iso Power
SV1G	System Voltage L1-Ground
SV2G	System Voltage L2-Ground
SV12	System Voltage L1-L2
XTMR	External Meter, Resistance
XTMI	External Meter
EISO	ECG-Isolation

## Manual/ECG

Remote Command	Definition
RLLD	Right Leg to Lead
RALD	Right Arm to Leads
LALD	Left Arm to Leads
LAGD	Left Arm to Ground
LLGD	Left Leg to Ground
RAGD	Right Arm to Ground
RLGD	Right Leg to Ground
VGND	V Leads to Ground
LLLD	Left Leg to Leads
VLLD	V Leads to Leads

**Calibration**

Remote Command	Definition
VCAL	View Cal Constants
CAL	Calibrate
DAC	DAC Test
SSR	Solid State Relay Test

**Misc**

Remote Command	Definition
DCLR	Device Clear
GTOL	Go to Local
VIEW	View Data
INIT	Initialize Autosequences
MED	Download Data to medBase1
FREE	Space Left in Ramtape
REV	List Revision Number

**FACTORY DEFAULT CONDITIONS**

Although the medTester 1000B is shipped ready for use with preset configurations, you can freely alter the settings. To reset the configuration to factory settings, enter the INIT remote command from the keyboard and choose either the hospital tests (HOSP) or the manufacturer's tests (MANUF). Updating the software EPROMS also results in the configurations being reset to factory settings. Note: Factory default conditions affect autosequences, RS-232/Printer Ports, and RS-232 configurations.



### Autosequences

Autosequences are restored erasing any custom autosequences. Note that ramtape is also erased.

### RS-232/Printer Ports

RS-232 (COM1, COM2) and printer ports are disabled or turned off.

### RS-232 Configuration

The default configuration for RS-232 com ports is listed in the following table.

BAUD	9600
STOP	2
PARITY	OFF
LENGTH	8
CTS	OFF

If the medTester 1000B has the download option installed, these settings are used to communicate with a PC compatible computer for data transfer into medBase1 and/or Sentinel.

**PORT CONFIGURATION****RS-232 Ports**

The RS-232 ports are configured by entering UTIL (F2), RS-232 (F3) and then the desired port (COM1 or COM2). The following table shows the possible RS-232 configurations.

Baud Rate	300 600 1200 2400 4800 9600
Stop Bits	1 2
Parity	Off Even Odd
Length	7 8
CTS (Clear to Send)	On Off

**Parallel Printer Port**

The parallel printer is configured as a standard "Centronics" port for PC compatibility. No other adjustments are necessary.

**Enabling Ports****RS-232 Com Ports**

Select UTIL (F2) and then PORTS (F4) to enable a port (COM1 or COM2). COM1 is the first available choice. Pressing F1 turns COM1 off before proceeding to COM2; pressing F2 turns COM1

on before proceeding to COM2. If you do not want to make any changes, press the ESC key. The COM2 and PRINTER ports are set in the same manner.

The medTester RS-232 com ports (COM1 and COM2) must be on to execute an autosequence or transmit data (i.e. send a record to a computer). However, they don't need to be on to recognize remote commands from an external keyboard. If, for example, you typed in the remote command for Print (PRT), the medTester 1000B would be able to recognize the PRT command, but would be unable to actually sent information to the printer.

**Printer Port**

The printer port must be ON to print records from the medTester 1000B. To enable the printer port, select UTIL (F2) and then PORTS (F4). Choices for COM1 and COM2 will appear first. If you do not want to change these settings, press the ESCAPE key until "PRINTER=" appears on the medTester display (the third choice). Then press F1 to turn the printer port off or F2 to enable it.

**Testing Ports**

To test a port, select the specific port: COM1, COM2, or PRINTER from the PRINT menu. The medTester 1000B then sends a test data string to the port you've selected.

Note: The ports do not have to be enabled for this test. However, they do have to be enabled to print.

**PRINT COMMANDS**

Autosequence test forms can be directed out of any or all of the output ports: COM1 and COM2 (for a computer or serial printer) or PRINTER (for a parallel printer).

If the printer port is ON and you issue a print command without having a printer connected to the port, the medTester 1000B displays "Printer not ready" before returning to the previous menu.

Data is directed out by the following methods:

### PRINT Menu

To print a record from the medTester main menu, select PRINT from Menu 2 (F3). Then choose one of the following 5 commands.

#### **SUMMARY (F1)**

Prints a summary of all records. Summaries include control numbers, op codes, locations, model numbers, serial numbers, sequence numbers, and record numbers. In addition, each summary lists the range of dates covered by the summary.

#### **CURRENT (F2)**

Prints the current record in memory. To find out what the current record is, select VIEW from Menu 1. Press the ESCAPE key to exit.

#### **NEXT (F3)**

Prints the record after the current record.

#### **ALL (F4)**

Prints all the records in numeric order.

#### **FAILED (F5)**

Prints records with faults or measurements out of the specified tolerance. If none exist, the medTester 1000B displays "0 RECORD(S) WITH FAULT(S)."

### Print Key

Located on the left side of the medTester keyboard, the PRINT key sends a print to the printer. If an autosequence has just been performed, pressing the PRINT key sends the test record to the printer. If a manual test is being performed, pressing the PRINT key causes the top line of the display to be printed.

**INTRODUCTION: RECORD STORAGE OPTION**

The medTester 1000B record storage option lets you store up to 25 electrical safety tests.

**EQUIPMENT REQUIRED**

- 1) medTester 1000B RS-232/Printer Option
- 2) External "QWERTY" Keyboard or Barcode Reader

**NEW MENU ADDITIONS**

The MEMORY (press F5) menu in Main MENU 2 is new. Altogether the MEMORY menu has 8 options: five on the first menu and three on the second.

**FIRST (F1)**

Selects the first record (rec #1) in memory for viewing or printing.

Select FIRST and the medTester displays the following:

Rec #1, SEQ # n READY.

This message remains for approximately 2 seconds before the medTester 1000B returns to the MEMORY menu. You can now view or print the record.

**ERASE (F2)**

Erases all records in memory.

Select ERASE and the medTester displays the following:

ARE YOU SURE YOU WANT TO ERASE ALL RECS?

YES	NO
F1	F2

Press F1 to erase or F2 to keep all the records. Pressing either one returns you to the MEMORY menu.

**SPACE (F3)**

Shows the space left in memory for record storage. Select SPACE and the medTester displays the following:

n RECS: ROOM FOR n MORE

This message remains for approximately 3 seconds before the medTester 1000B returns to the MEMORY menu.

The SPACE command will not show any change after records have been deleted. The number of records will not decrease, but if you try to access a deleted record, the medTester will tell you the record has been deleted.

**SEARCH (F4)**

Searches the records in memory for a specific character string or value. Select SEARCH and the medTester displays the following:

STRING FOUND IN RECORD n  
VIEW           PRINT  
F1              F2

You can view or print the record where the character string was found. Press the ESC key to search more records.

If the medTester does not find any more matches for the character string it will display, "DATA NOT FOUND OR NO MORE RECORDS."

This message remains for approximately 2 seconds before the medTester 1000B returns to the MEMORY menu.

**GET (F5)**

Retrieves any record in memory for viewing or printing. Select GET and the medTester displays the following:

4 RANGE = 1-n  
INC           DEC           VIEW       PRINT  
F1            F2            F4        F5

Pressing F1 or F2 increases (INC) or decreases (DEC) the number representing the record. RANGE shows the records available in memory. Pressing F4 allows you to view the record you've selected

while pressing F5 prints it. If you have deleted one of the records in memory and try to retrieve it using the GET command, the medTester displays the following:

Record Deleted

This message remains for approximately 2 seconds before the medTester 1000B returns to the MEMORY menu.

### **FAILED (F1, second part of the MEMORY menu)**

Lists any records with out-of-spec values.

### **DELETE (F2, second part of the MEMORY menu)**

Deletes a record. Select DELETE and the medTester displays the following:

ENTER REC # TO BE DELETED (1-8)

You can enter the record you want deleted. After you type in a number and press return, the medTester displays the following:

REC #n IS GONE!!

If you select SPACE or GET and try to retrieve a record that has been deleted, the medTester will tell you that the record has been deleted.

**Caution!** - Once you've typed in a number and pressed return, the record is *immediately* deleted.

### **DELAST (F3, second part of the MEMORY menu)**

Deletes the last record stored in memory. Select DELAST and the medTester displays the following:

Delete rec # n?  
YES            NO  
F1             F2

You may press F1 to delete or F2 to keep the record.

**INTRODUCTION: DOWNLOAD OPTION**

The Download Option allows you to transfer the 25 records stored in the medTester 1000B to an equipment database management program.

**REQUIRED EQUIPMENT**

- 1) medTester 1000B Base Unit
- 2) RS-232/Printer Option
- 3) External Keyboard
- 4) Record Storage Option
- 5) PC Compatible Computer with medBase1 software installed
- 6) RS-232 Cable

**DOWNLOAD PROCEDURE****Setup**

This section does not explain medBase1 operation, and you may need to reference to your medBase1 manual for more detailed instructions. You must have the medBase1 software installed on your computer and be familiar with medBase1.

Connect an external keyboard to one of the medTester 1000B com ports. See the section on the RS-232/Printer Option earlier in this chapter for more information. Using the RS-232 cable, connect the medTester to a serial port on the computer. Turn the medTester and the computer on.

**Download**

Type DOWN on the computer's keyboard to start the medBase1 download program. All records stored in the medTester will be transferred to the PC. Refer to the medBase1 manual for details.



**INTRODUCTION: TOOLBOX OPTION**

The medTester ToolBox option consists of three adapters: Tachometer, Temperature, and Humidity, that plug into the EXT INPUT on the medTester top panel. The Tachometer Adapter measures the speed of rotating devices such as centrifuges; the Temperature and Humidity Adapters verify hospital environmental conditions. Several testing modes are available including monitor tests for temperature and humidity, manual modes for all three adapters, and remote access via the RS-232/Printer Option.\*

\*Note: The RS-232/Printer Option may be purchased in addition to the medTester 1000B base unit and ToolBox option. However, it is not required for the ToolBox Option.

**REQUIRED EQUIPMENT**

- 1) medTester 1000B Base Unit
- 2) medTester 1000B ToolBox Option

**SPECIFICATIONS****Tachometer**

Range: 100 to 19990 RPM (use HIGH RANGE RPM only)  
Accuracy: 1.2%  
Distance: 2 to 12 inches  
Remote Command: TAC

**Temperature**

Range: 0 to 199.9 degrees F  
Accuracy: 2%  
Remote Command: TEMP  
A18: Autosequence for trending

**Humidity**

Range: 15 to 90 percent  
Accuracy: 4%  
Temperature Range: 32 to 140 degrees F  
Remote Command: H2O  
A19: Autosequence for trending

**TACHOMETER ADAPTER OPERATION****Manual Operation**

- 1) Plug the Tachometer Adapter test leads into the EXT INPUT jacks on the top of the medTester front panel. Observe the correct polarity of the test leads with respect to the medTester jacks.

Note: To correctly interface with the medTester, the Tachometer Adapter range switch must be set to HIGH RANGE (1000-19990 RPM).

- 2) Select the Tachometer Adapter Operation by pressing the TOOLBOX key on the medTester main MENU 1 (F4), then the TAC key (F1) on the Toolbox menu.
- 3) Place a piece of reflective tape on the rotating surface of the device under test where the light beam from the tachometer can shine on the tape.
- 4) Turn the device under test on and point the tachometer at the reflective tape. Then press and hold down the Adapter Activate Button on the right side of the Tachometer Adapter case.
- 5) The medTester displays the following:

```
SPEED = 4452 RPM  
MAX RPM = 4459 RPM  
'ENT' TO QUIT
```

- 6) Press the ENT key to exit.

**RS-232 Remote Control**

- 1) You can access an RPM measurement remotely via RS-232 by typing "TAC." The medTester then makes continuous measurements until a remote carriage return (CR) is sent via RS-232. Once it receives the CR, the medTester returns the value via RS-232.
- 2) Press the ENT key (on the medTester or via RS-232) to exit.

**TEMPERATURE ADAPTER OPERATION****Manual Operation**

- 1) Plug the Humidity Adapter test leads into the EXT INPUT jacks on the top of the medTester front panel. Observe the correct polarity of the test leads with respect to the medTester jacks.
- 2) Turn the Temperature Adapter power switch on to the °F position (currently, the medTester only gives readings in Fahrenheit). If the interface box battery is okay, the red LED on the box will light up.
- 3) Select the Temperature Adapter Operation by pressing the TOOLBOX key on the medTester main menu 1 (F4) and then the TEMP key (F2) on the Toolbox menu.
- 4) The medTester displays the following:

TEMPERATURE 75.5 degrees F  
MAX = 76.1 MIN = 74.3 'ENT' to Quit.

If the new temperature exceeds the old, the maximum or minimum temperature will be updated.

- 5) Press the ENT key to exit.

**RS-232 Remote Control**

- 1) You can access a temperature measurement remotely via RS-232 by typing in "TEMP." The medTester makes a measurement and then returns the value via RS-232.
- 2) Press the ENT key (on the medTester or via RS-232) to exit.

**TEMPERATURE MONITOR**

This mode of operation allows the medTester to make periodic temperature readings, print test results, and store the results in ramtape.

The Temperature Adapter must be turned on and set to °F.

- 1) You can select this test in one of two ways:
  - a) At the main medTester menu, MENU 1, type in "A18" followed by the ENT key.
  - b) Select the Toolbox option from medTester main MENU 1 and then press TEMP-MON (F4).
- 2) Enter OPCODE.
- 3) Enter LOCATION.
- 4) The medTester now begins making temperature measurements. Line two of the display indicates the trigger or SET point, and the measurement interval. You can deliberately terminate testing at any point by pressing the ESC key.
- 5) After testing has been completed, you can print or view the results if you have the RS-232 Option installed. (See the typical printout in the next paragraph.)

MEDTESTER 1000B	TEMPERATURE MONITOR TEST	7/30/93
OPERATOR:_____	LOCATION:_____	DEVICE TYPE:_____
CONTROL NUMBER:_____	SERIAL NUMBER:_____	
TIME	TEMP	50 55 60 65 70 75 80 85 90 95 100 105
15:13	80.7	*****
15:14	80.8	*****
15:15	80.8	*****
15:16	80.8	*****
15:17	80.8	*****
15:18	80.6	*****
15:19	80.8	*****
COMMENTS:_____		
NEXT TEST DUE DATE:_____		

*Temperature Monitor Printout*

**HUMIDITY ADAPTER OPERATION****Manual Operation**

- 1) Plug the Humidity Adapter test leads into the EXT INPUT jacks on the top of the medTester front panel. Observe the correct polarity of the test leads with respect to the medTester jacks.
- 2) Turn the Humidity Adapter power switch to the ON position. The Adapter may also be powered up by depressing and holding down the Sensor Activate Button on the right side of the Humidity Adapter case.
- 3) Select the Humidity Adapter Operation by pressing the TOOLBOX key on the medTester main menu 1 (F4), then the HUMID key (F3) on the Toolbox menu.
- 4) The medTester displays the following:  
  
RELATIVE HUMIDITY = 66.3%  
'ENT' to Quit
- 5) Press the ENT key to exit.

**RS-232 Remote Control**

- 1) You can access humidity measurements remotely via RS-232 by typing in "H2O." The medTester then makes a measurement and returns the value via RS-232.
- 2) Press the ENT key to exit.

**HUMIDITY MONITOR**

This mode of operation allows the medTester to make periodic humidity readings. After testing has been completed, you can print the results.

- 1) The Humidity Adapter must be on.
- 2) You can select this test in one of two ways:
  - a) At medTester main menu 1, type in "A19" followed by the ENT key.
  - b) Select the Toolbox option from medTester main menu 1 and then press HUM-MON (F5).
- 3) Enter OPCODE
- 4) Enter LOCATION
- 5) The medTester now begins making humidity measurements. Line two of the display indicates the trigger or SET point, and the measurement interval. You can deliberately terminate testing at any point by pressing the ESC key.

MEDTESTER 1000B	HUMIDITY MONITOR TEST	7/30/93
OPERATOR: _____ LOCATION: _____ DEVICE TYPE: _____		
CONTROL NUMBER: _____ SERIAL NUMBER: _____		
TIME %RH	30 35 40 45 50 55 60 65 70 75 80 85	
8:13	54.9*	*****
8:14	54.9*	*****
8:15	54.9*	*****
8:16	54.9*	*****
8:16	55.0*	*****
8:17	55.0*	*****
8:18	65.8*	*****
8:19	70.3*	*****
8:20	75.7*	*****
COMMENTS: _____		
NEXT TEST DUE DATE: _____		

*Humidity Monitor Printout*

### INTRODUCTION: BAR CODE OPTION

The medTester 1000B Bar Code Option allows you to enter data quickly and accurately. Mainly used during autosequences, the Bar Code Reader can also control the medTester 1000B by starting autosequences, manual and performance tests. In addition, the Bar Code Reader can cause results to be printed. The Bar Code Reader automatically recognizes the most common codes: Code 39, UPC, Codebar and 2 of 5; you can program the software to accept more than one bar code entry.

### REQUIRED EQUIPMENT

- 1) medTester 1000B Base Unit
- 2) medTester 1000B RS-232/Printer Option
- 3) medTester 1000B Bar Code Option

**HOW TO USE THE BAR CODE READER**

Tilt the Bar Code Reader from the vertical approximately 15 degrees and lightly touch the bar code 1/4 inch in the margin before the bar code. Then move the Bar Code Reader across the bar code at a speed of 3 to 20 inches per second using a smooth rapid stroke. In no time at all you will achieve a high first swipe success rate.

**BAR CODE PRODUCTION**

You can purchase labels preprinted or print them on site. In general, the method of production depends upon your intended use. One advantage to using preprinted labels is that precise tolerances can be maintained, which is important with high density labels. In addition, preprinted labels can be laminated and produced on non-paper substrates with a wide choice of adhesive backings. Preprinted labels tend to be of higher quality than on-site labels; however, they require predetermined label contents and usually have a higher cost per unit.

If you are interested in printing your labels on site, Dynatech Nevada sells a bar code printing program that runs on a PC or compatible computer using a dot matrix printer.

**BAR CODE LABEL SPECIFICATIONS****Background Substrate**

You should print the code on material which is reflective and has a matte finish. For optimum contrast, you should have a background diffuse reflectance of 70 to 80%.

**Ink Color and Type**

Whether printed with black or colored ink, the inked bars should not reflect more than 25%. In addition, the reflectance value should not vary more than 5% within the same character.



**Voids and Specks**

The code should be printed clearly. Voids in the bars, specks or blemishes in the white spaces, and false or missing bar sections can be misinterpreted by the reading equipment as part of the code. In general the width of such flaws is more serious than their height.

**Definition**

The bars in the code should be well-defined (i.e. no rough or fuzzy edges) because the widths of the bars and spaces correspond to the scanner's aperture and resolution.

**Contrast**

The difference between the background and ink reflectance should be at least 50%. In other words, the substrate on which the codes are printed should provide a good contrast with the code bars.

**SOURCE OF PREPRINTED LABELS**

**Dynatech Nevada, Incorporated**  
2000 Arrowhead Drive  
Carson City, NV 89706

**INTRODUCTION: MEDTESTER 5000B  
UPGRADE OPTION**

The medTester 1000B/5000B Upgrade Option adds the full capabilities of the medTester 5000B to the medTester 1000B.

**EQUIPMENT REQUIRED**

- 1) medTester 1000B Base Unit
- 2) medTester 1000B RS-232/Printer Option
- 3) medTester 1000B Record Storage Option
- 4) medTester 1000B Download Option
- 5) medTester 5000B Upgrade Option

**EXPANDED FEATURES**

- 1) Autosequence record storage for 200 or more records
- 2) Full alphanumeric keyboard
- 3) Five more autosequences
- 4) Autosequence renaming
- 5) Performance wave renaming
- 6) Test tag printing
- 7) Up to five custom headers (usually hospital names) for autosequence records
- 8) Editing capability
- 9) An environmental autosequence

**MEDTESTER 5000B OPTIONS****Defibrillator Testing**

- 1) 15 preprogrammed autosequences
- 2) Cardioversion
- 3) Maximum energy and time to charge test
- 4) Waveform playback

**Checklist Option**

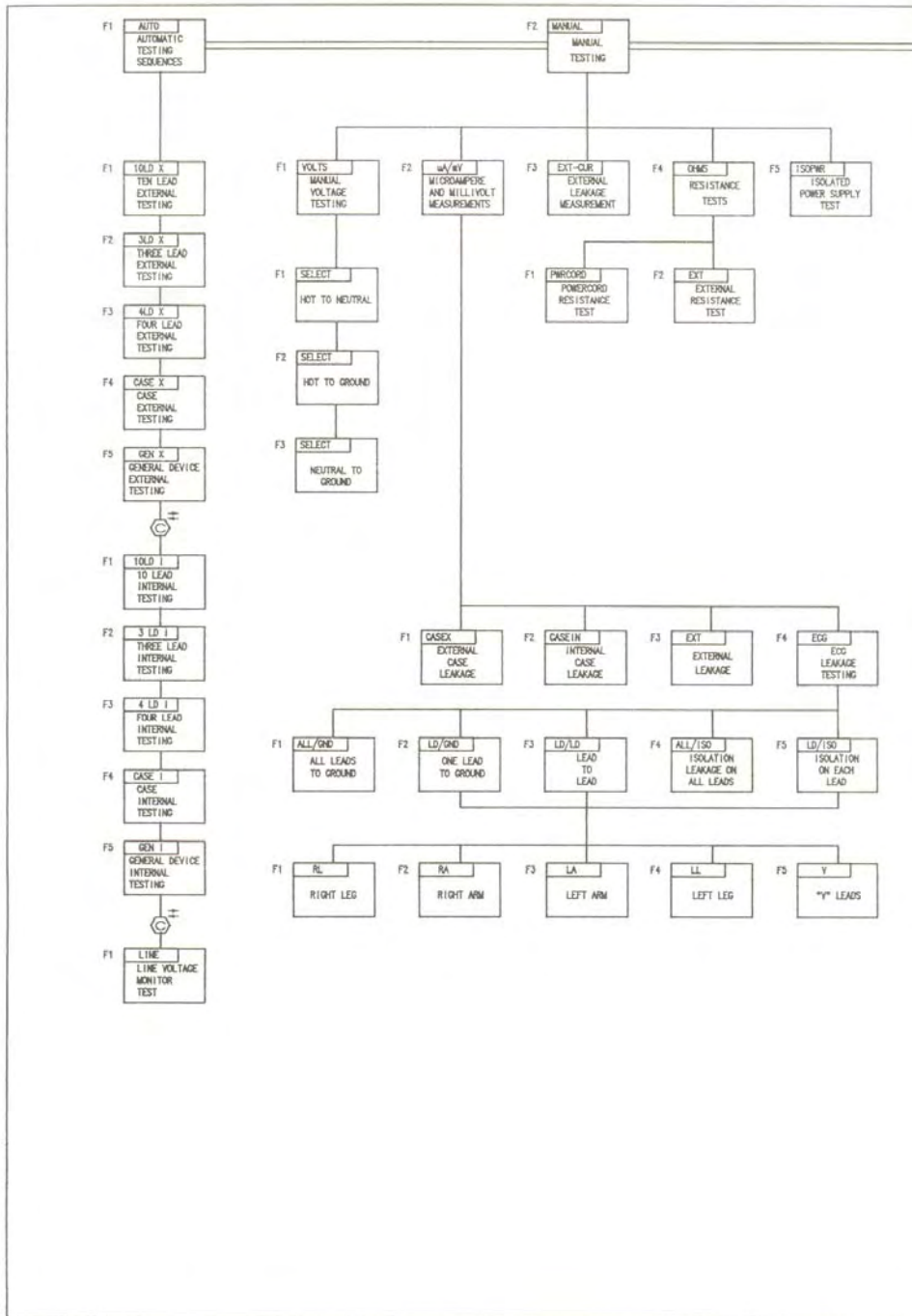
- 1) Store up to 1000B checklist procedures
- 2) Store up to 15000 control numbers
- 3) Store up to 80 check items per checklist
- 4) Control RS-232 devices (215A, medSim)
- 5) Access up to 3 autosequences from one checklist

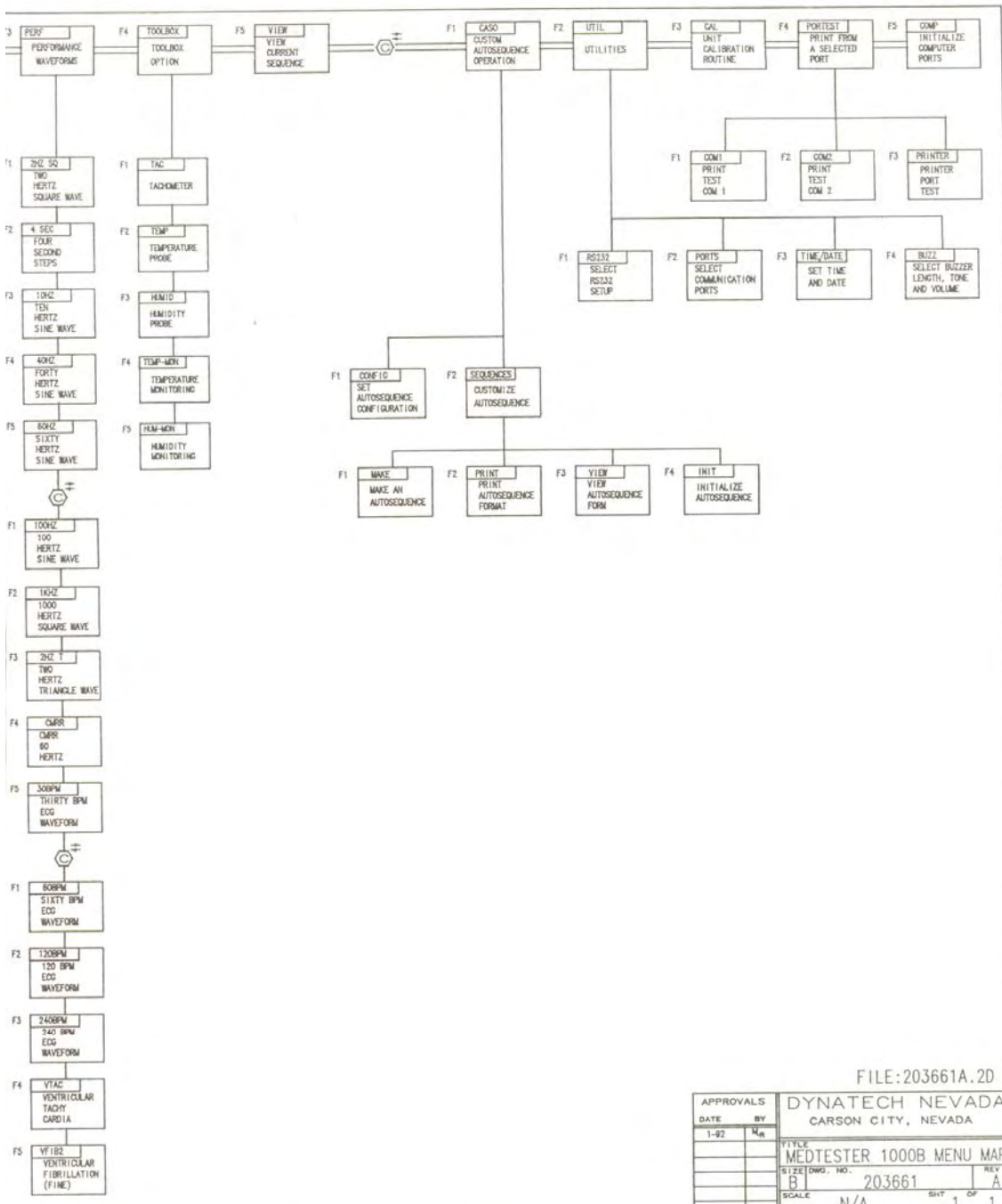
- 6) Assign control numbers to checklists
- 7) Execute medTester remote commands

All of the autosequences (safety, defib, checklist) can be downloaded into medBase1 and/or Sentinel at the rate of 2 records per second.

**Chapter 6**

**Reference**





FILE:203661A.2D

APPROVALS		DYNATECH NEVADA CARSON CITY, NEVADA	
DATE	BY	DATE	BY
1-92	M		

FILE	MEDTESTER 1000B MENU MAP		
SIZE (DWG. NO.)	203661	REV	A
B			
SCALE	N/A	SHT	1 OF 1