BIO-TEK®
INSTRUMENTS, INC.

601 PRO IEC Safety Analyzer

Operator's Manual

Part No. **6021000**
Revision C
April, 1994

Notices

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Revision Record

Revision	Date	Change
A	12/1/91	First Issue
B	3/12/93	Revised structure of manual to enhance readability; Changed format from 5 1/2 x 8 1/2 to 8 1/2 x 11; Added HEI Test Standard; amplified information in Test Standards section; Added French keyboard layout to Appendix B/Keyboards; Changed illustrated menu text to conform to updated spec.
C	4/17/95	Corrected published inaccuracies in Appendix A, Specifications

Warnings

Use of this instrument is restricted to qualified personnel who recognize shock hazards and are familiar with safety precautions used when operating electrical equipment. Read the manual carefully before operating the 601 Pro.

☛ The following warning and informational symbls can be found on the 601 Pro case:

Symbol	Description
	Dangerous Voltage
	Direct / Alternating Current
	Protective Earth (ground)
	Attention: Consult accompanying documentation
	Off (power: disconnection from Mains)
	On (Power: connection to Mains)

☛ Exercise extreme caution when a shock hazard is present at the instrument input. (During the following tests):

IEC 601-1

- Mains on Applied Part >240 Volts AC
- Insulation Resistance >500 Volts DC
- Earth resistance / Calibration
- Mains on AP Calibration
- Max input voltage 500 Volts AC at Red / Black input jacks. Ensure that you are using correct value replacement fuses.

VDE 751.1

- Equivalent Patient Leakage 240 Volts AC
- Equivalent Device Leakage 240 Volts AC
- Equivalent Calibration

☛ **Do not discharge a defibrillator while it is plugged into the 601 Pro.**

☛ **Inspect the lead ends for possible wear, cracks or breaks before each use.**

☛ **Take leakage current measurements only after earth resistance is measured and found to be less than 0.2 ohms.**

- **Test records stored in the 601 Pro's memory cartridge are not retained if the cartridge is removed from the 601 Pro. After inserting a memory cartridge into the 601 Pro, perform an Erase to clear memory of data fragments and ensure future data integrity.**

- **External devices, such as printers and computers, attached to the 601 Pro, may affect the 601 Pro's ability to sense "open earth" conditions on the Mains input. If Mains voltage readings are in error, remove all external devices.**

- **The Red lead cannot at any time be plugged into outlet conductors.**

- **During Earth Resistance testing, the DUT must be plugged into the 601Pro front outlet.**

- **The operator must perform the Earth Resistance test on the DUT prior to any leakage testing.**

- **If the DUT fails the Earth Resistance test, the operator must discontinue testing and label the DUT defective.**

- **If any single test fails, the test must be immediately discontinued and the DUT labeled defective.**

Nomenclature

International vs. United States Terminology

INTERNATIONAL/IEC NOMENCLATURE	U.S./UL544 NOMENCLATURE
L1	Hot
L2	Neutral
Earth	Ground
Mains	Line Voltage
Applied Parts	Patient Leads
Enclosure/Case	Chassis
Protective Earth	Ground Wire
Earth Leakage Current	Leakage in Ground Wire
Enclosure Leakage	Chassis Leakage
Patient Leakage	Lead Leakage
Patient Auxiliary	Leakage between Patient Leads
Mains on Applied Parts	Lead Isolation
Insulation Resistance	Dielectric Strength or Insulation Resistance between Hot & Neutral to Ground
Earth Continuity	Ground Wire Resistance

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Introduction and Description

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Introduction

The 601 Pro is an automated electrical safety analyzer that meets stringent international standards for electrical safety testing of hospital electromedical equipment.

The 601 Pro conducts electrical safety testing in accordance with IEC 601-1, VDE 751.1 and HEI-95 requirements, flags failures, and simulates performance, ECG, and arrhythmia waveforms. Test results, which are automatically analyzed and saved in non-volatile memory, can be printed using the internal ZY column thermal printer or an attached external printer, or tranferred to ProFile, Bio-Tek's Equipment management software.

The 601 Pro offers automatic, manual or step-mode operation. Manual mode allows any specific test to be performed continuously.

The 601 Pro will accept input from an external keyboard, integrated keypad, barcode wand, or external RS232 device. An external data cartridge simplifies software updates and memory upgrades.

Available Electrical Safety Tests include:

- Mains Voltage
- Current Consumption
- Insulation Resistance
- Protective Earth Resistance
- Earth Leakage Current
- Enclosure Leakage Current
- Patient Leakage Current
- Patient Auxiliary Current
- Mains on Applied Parts
- Dual Lead Voltage
- Dual Lead Leakage

Available ECG Performance Waveforms:

- Square wave: 0.125, 2 Hz
- Sine wave: 10, 40, 50, 60, 100 Hz
- Triangle wave: 2 Hz
- ECG complex: 30, 60, 120, 180, 240 BPM
- Pulse: 30, 60 BPM
- A-Fib, A-Flutter, A-Tach, Idioventricular, PVC1, R-on-T, Run, V-Fib, V-Tach

Accessories

The following accessories are shipped standard with the 601 Pro. To order additional quantities, use the Bio-Tek Part Numbers provided.

Description	Quantity Supplied	Part #
Fuse 10A, 250V	2	46045
Fuse 0.4A, Slo Blo	2	46071
Lead, Red Banana	1	48016
Lead, Black Banana	1	48017
Test Probe	1	48031
Adapter, Banana/Alligator	5	48201
User's Guide	1	6021000
Large Clamp	1	7770014
Warranty Card	1	94001
Printer Paper (Roll)	1	97111
Fuse .1A Slo Blo	2	46077

Optional Accessories

The following optional accessories are available for the 601 Pro. To order, contact your customer service representative and use the Bio-Tek Part Numbers provided.

Description	*Part #*
Carry Case	6022012
RS232 Cable (9F-9F)	6020503
Printer Cable	5020103
Barcode Wand	97113
Keyboard German	48198
Keyboard English	48199
PC Transfer Program	6020504
Powercord Set Australian	75025
Powercord Set UK	75024
Powercord Set Schuko	75026
Powercord Set US 120V	75033

Memory Cartridge Upgrades

The 601 Pro's memory cartridge contains the instrument's programs and stores test results. Upgrades to the memory cartridge are available in the following configurations:

Language	Upgrade	Storage Capability	Part #
USA	2MB	256K	6020301
	4MB	512K	6020302
Germany	2MB	256K	6020303
	4MB	512K	6020304
Italian	2MB	256K	6020305
	4MB	512K	6020308
French	2MB	256K	6020307
	4MB	512K	6020310

Description

The 601 Pro uses a "blister" keyboard (tactile membrane switches) for selection of tests or menu options. The keys are grouped by color and functionality:

Green keys allow movement through menus and options.

- **Arrow** keys move the starred(*) cursor within a menu
- The **enter** key advances to the next menu or selects options.
- The **esc** key backs up to the previous menu or the main menu.

Blue keys allow the user to gain access to additional options, set up functions, and select auto modes. Use blue keys to select:

- class/type
- auto modes
- more (Additional menus System Administation)
- calibration (leads and internal Calibration Check)

Grey keys (1-9) allow the selection of manual tests, which should be performed in numerical sequence. Use gray keys to select the following tests:

- **1** voltage
- **2** current
- **3** insulation
- **4** earth resistance
- **5** test current
- **6** leakage
- **7** patient leakage
- **8** mains on applied part
- **9** ECG

White keys control the printer, receptacle and test leads. Use white keys to select:

- print
- heading
- single/dual
- polarity
- earth
- L2

An internal beep verifies each key entry. For example:

- A **one-beep** signal indicates the entry has been accepted.
- A quick **three-beep** signal indicates an invalid test or key has been selected.
- A **two-beep-per-second** signal indicates high voltage or current is present.

Use the drawing of the 601 Pro's front and back panels (***Figure 1-1***) on the following page to locate the components listed below.

Front Panel

(A)	**Applied Part Terminal**	The jacks allow the direct connection to banana jacks, or 4mm to crocodile adapters provided.
(B)	**Printer**	Optional 24 character printer for immediate results. Enabled through the MORE key.
(C)	**Print Key**	Sends displayed test data to enabled printer. Or in auto mode, selects internal or external printer for all results.
(D)	**Heading Key**	Sends device information fields to enabled printer.
(E)	**Power Receptacle**	Allows standard power plug connection of the Device Under Test. 120V @ 15A or 240V @ 15A max.
(F)	**Red Input Receptacle**	Single test lead connection
(G)	**Black Input Terminal**	Used for dual lead testing in combination with red test lead.

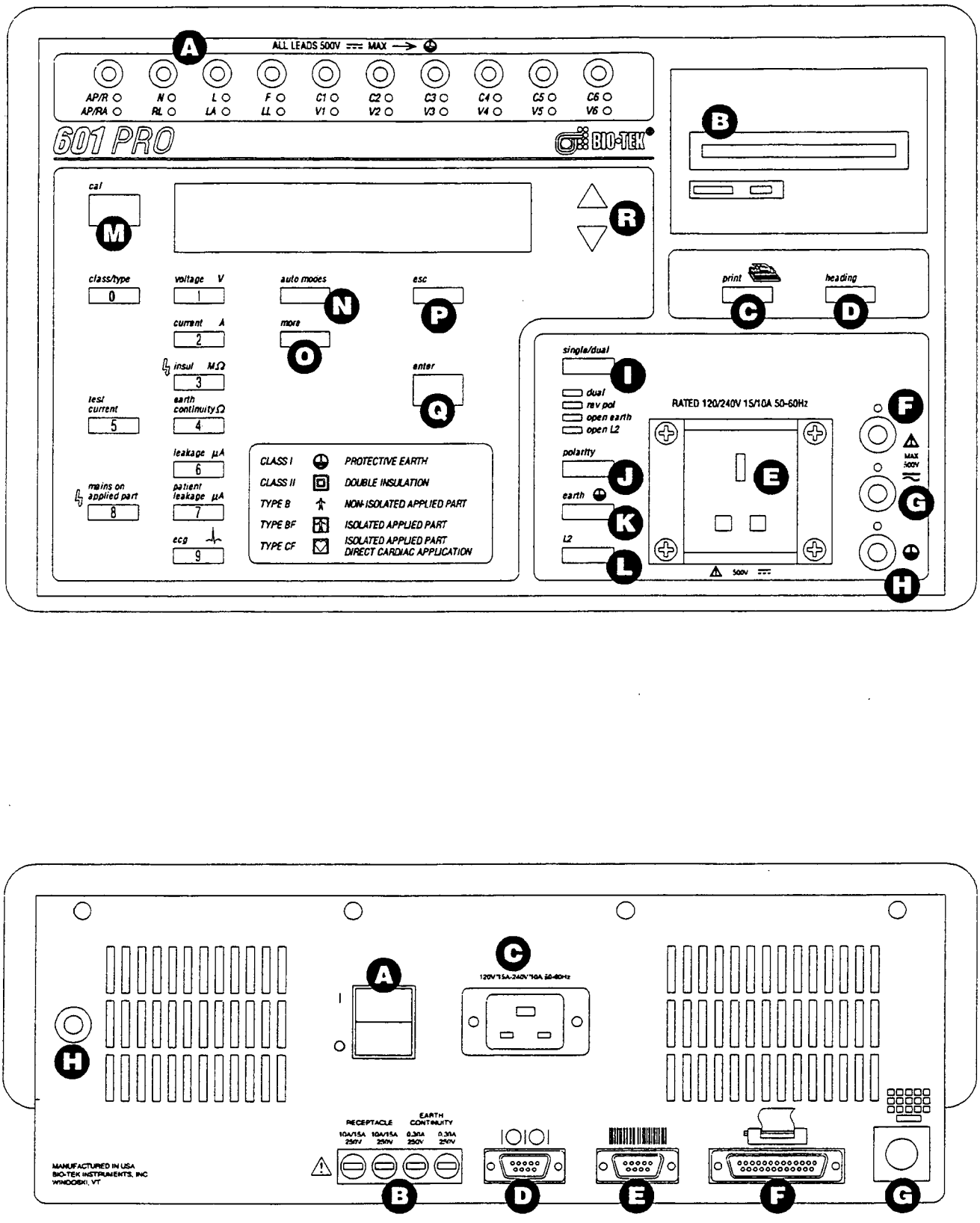

Figure 1-1: 601 Pro Front and Back Panel Illustration

(H)	**Green Input Terminal**	Protective Earth of Device Under Test (DUT)
(I)	**Single/Dual**	Selects either single or dual lead testing. "Dual" LED OFF indicates single lead configuration.Dual lead can only be selected during manual voltage or leakage tests.
(J)	**Polarity Key**	Reverses the polarity (L1, L2) of the power receptacle. "Rev Pol" LED OFF indicates normal polarity.
(K)	**Earth Key**	Opens protective earth line of the power receptacle. "Open Earth" LED OFF indicates closed earth.
(L)	**L2 Key**	Opens L2 line of the front panel receptacle. "Open L2" LED OFF indicates closed neutral. The 601 Pro senses Mains polarity, and always opens the line with the lowest potential, or the neutral line.
(M)	**Cal Key**	Used to measure and store the test lead resistance. Can be accessed within Main Menu, "Earth Resistance," VDE Equiv Device, Patient Leakage, and IEC Mains on AP menu. Results are subtracted from earth resistance tests.

☛ **Note:** *The following keys (0-9) can be used to enter test control numbers in the auto/step modes of operation.*

Class/Type Allows the selection of 6 equipment class/types.

Class	Type
I, II	B, BF, CF

①	**Voltage**	In single lead mode, displays mains voltage. In dual lead mode, displays voltage between red and black test lead.
②	**Current**	Measures the current consumption (in amperes) of the Device under test.
③	**Insulation** ϟ	Tests insulation resistance (mains to case or applied parts to case). Test is performed continuously only while key is pressed.
④	**Earth Resist.**	Measures the earth resistance using a 1A test current unless 10A is selected with the "Test Current" key. The test is performed only while the key is pressed.
⑤	**Test Current**	Allows the selection of 1A or 10A test current for earth resistance measurements.
⑥	**Leakage Key**	In IEC 601-1: In single lead mode, measures enclosure leakage (red test lead to earth), and measures earth leakage (protective earth to earth). VDE 751.1: Performs equivalent device leakage meaurements. In dual lead mode, displays leakage between red and black test leads.
⑦	**Patient Leakage**	IEC 601-1: Measures the patient leakage current (applied part to earth), and patient auxiliary current (leakage between applied parts). VDE 751.1: Performs equivalent Patient leakage measurements.
⑧	**Mains on Applied Part** ϟ	Applies 110% mains voltage to selected applied part and measures leakage to earth in both normal and reverse polarity. Test is performed only while key is pressed. Does not apply to patient auxiliary selections.

⑨	**ECG**	Allows access to ECG, performance, and arrhythmia waveforms for simulation.
(N)	**Auto Modes**	Enters the automatic and step modes of operation.
(O)	**More Key**	Advances to next screen when shown on the display, or allows access to setup functions.
(P)	**Escape Key**	Discontinues current test, or returns user to the previous menu, or to the Main Menu.
(Q)	**Enter Key**	Begins certain tests when displayed on the screen.
(R)	**Up/Down Arrows**	Moves the cursor * to select desired options. In Step mode, advances to next or previous test.

Back Panel

(A)	**On/Off Switch**	Power up the 601 Pro, **I** = ON **0** = OFF.
(B)	**Fuses**	Receptacle (15A 250V) and earth continuity (0.4A 250V) protection. 2 each.
(C)	**Power Cord connection.**	120V/15A or 240V/15A power cord Connection
(D)	**RS232 Connection**	Allows bi-directional computer control. Serial D-9 male connector.

(E)	**Barcode**	Allows the connection of barcode wand for direct information input. D-9 female connector.
(F)	**Printer Connector**	Allows for an external parallel printer. D-25 female connector.
(G)	**Keyboard Input**	Allows the use of an external keyboard for inputs. DIN 5 socket.
(H)	**Earth jack**	Functional earth.

Side Panel

Cartridge Input	The 601 Pro's memory cartridge contains the instrument's programs and stores test results. The cartridge allows simple firmware updates.
☛ **Warning:**	*Removal of the cartridge will result in the loss of stored records.*
☛ **Note:**	***Cartridge must be plugged in fully to obtain opening menu on power up.***

Getting Started: A Quick Overview

2

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Quick Start

This section provides a brief overview of 601 Pro operation, describes the power up sequence and explains how to set up the 601 Pro's class/type designation for the classification and type of instrument to be tested.

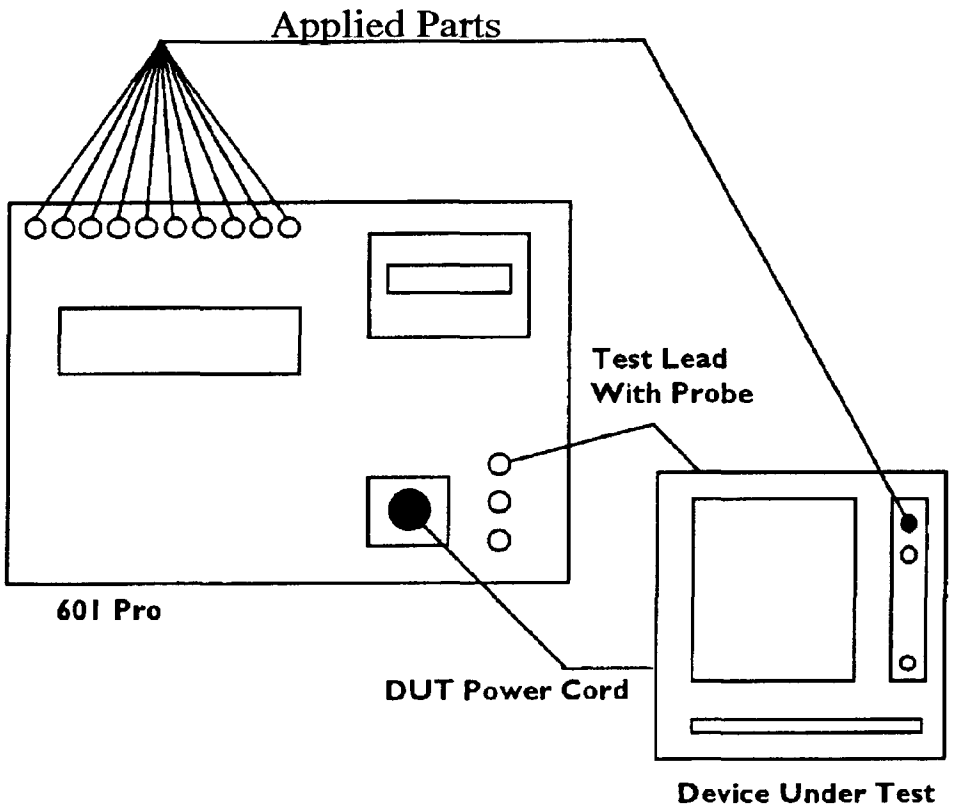
Use this section as a quick reference. If detailed information is required, refer to the specific pages/sections called out in **bold** type.

☛ **Caution:** *Before operating the 601 Pro, read the* ***Warnings*** *section on Page iv.*

Connecting the Device Under Test (DUT) to the 601 Pro

Use the diagram below as a guide when connecting the Device Under Test to the 601 Pro. Applied Parts are optional, depending on the instrument being tested.

When the Device Under Test and the 601 Pro have been connected, power up both units.



The Power Up Sequence

When the 601 Pro is powered up, the instrument immediately begins a self-check routine. Power-up tests include running display/lamp, port setup, wall outlet checks and other general diagnostics. If any of the power-up tests fail, the 601 Pro displays an error message.

If diagnostics are completed successfully, an instrument identification screen appears on the display, followed by the Main Menu:

```
Bio-Tek Instruments, Inc.
601-PRO International Safety Analyzer
Software Version: X.XX
```

```
MAIN MENU
CLASS I, TYPE BF 22:45:02
1. Press CLASS/TYPE to change.
2. Select a TEST 1-9 or AUTOMODES.
```

Quick Start: Manual Operation

❑ At the 601 Pro Main Menu, press the **Class/Type** key.

The class/type should be set to the classification and type of the instrument to be tested. The 601 Pro defaults to **Class I Type BF**.

If the device to be tested conforms to IEC 601-1, its class/type can easily be identified by symbols marked on the instrument.

❑ Determine the class/type for the instrument by using the following chart:

Class/Type Definitions

Class I		Protective Earth (There is no symbol for Class I instruments, however, they generally have a protective earth terminal).
Class II		Double insulation (all plastic case).
Type B		Non-Isolated Applied Part
Type BF		Isolated Applied Part
Type CF		Isolated Applied Part, suitable for direct cardiac application.

❑ To set the class/type from the 601 Pro Main Menu:

- Repeatedly press the **class/type** key to cycle through the class/type options until the desired selection is displayed at the Main Menu.

❑ To select the **class/type** from any other manual test menu:

- Press the **class/type** key from the current menu. The class/type menu will be displayed:

```
CLASS/TYPE SELECTION:  Class II, Type CF

I-B      II-B    ARROWS to advance
I-BF     II-BF   ENTER to save
I-CF     *II-CF  ESC to exit
```

- Advance the cursor to the desired selection with the Arrow ▲ ▼ keys.
- Press the **Enter** key to save the setting and return to the test.

❑ Perform the manual tests (IEC) in numerical order (**1-9**). Follow the menu instructions.

- **Test 1.** Mains voltage. (**Page 3-3**)

- **Test 2.** Current consumption. The front panel receptacle may be modified with polarity, earth, or L2 key. (**Page 3-4**)

- **Test 3.** Insulation Resistance (**Page 3-5**)

- **Test 4.** Earth Resistance. Calibration may be performed with the **Cal** key. (**Page 3-7**)

- **Test 5.** Test Current for Earth Resistance. (1A or 10A) (**Page 3-7**)

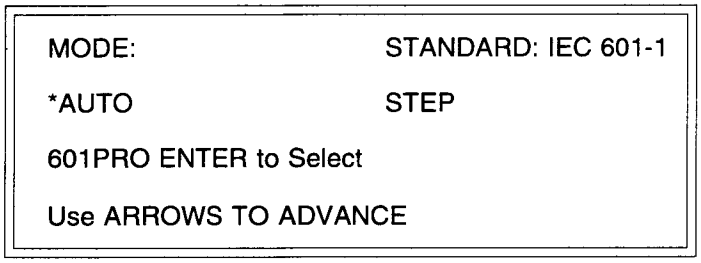
- **Test 6.** Leakage Current. The front panel receptacle may be modified with polarity, earth, or L2 keys. **(Page 3-8)**

- **Test 7.** Patient Leakage Current. The front panel may be modified with the polarity, earth or L2 key. (**Page 3-11**)

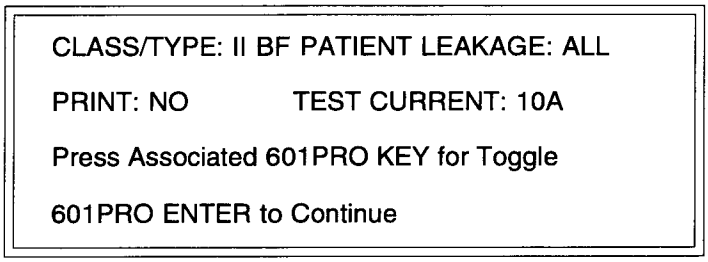
- **Test 8.** Mains on Applied Parts. (**Page 3-13**)

- **Test 9.** ECG Waveforms. (**Page 3-15**).

- ❑ From the 601 Pro Main Menu, press the **auto modes** key. The following menu will appear on the display:



- ❑ Press **enter** to select ***AUTO**. A menu similar to the following appears on the display:



- ❑ Press the key associated with various menu items to toggle values.

  For example, repeatedly pressing the **class/type** key will cycle through class/type values. (These values are defined in a chart on Page 3-4.) Pressing the **print** key will toggle the setting between NO, EXTERNAL and INTERNAL printer.

- ❑ Pressing Patient Leakage will toggle between ALL or NONE patient Leads.

- ❑ When all values have been selected, press **enter** to continue to the next screen.

* CONTROL #:
----AUTOMATIC MODE----
Use 0-9 Barcode, or Ext. keyboard
601PRO ENTER to START, Arrows to Advance

☛ **Note:** *You must enter a control number for the 601PRO to store the test information.*

❑ Pressing ENTER on 601PRO will start the automatic sequence.

❑ Pressing ▲ or ▼ arrow will advance to next data field entry.

Operation: Manual and Automatic Modes

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Manual Operation

The 601 Pro can be used as a manual safety analyzer to perform a single test or a complete IEC/VDE/HEI safety inspection. When the 601 is powered up, the 601 Pro Main menu prompts the user to:

- Indicate the class/type for the instrument to be tested, and
- Select the test (1-9) to be run.

The operator chooses the desired duration for each test. Performing tests 1-9 in sequence takes the instrument through a complete IEC/VDE/HEI check. Refer to Section 6, "Test Standards" to select an IEC/VDE/HEI test protocol.

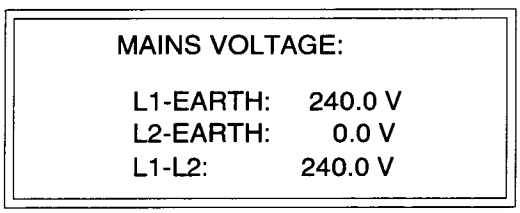
Before starting the test(s), ensure that the 601 Pro and the Device Under test are connected properly. Use the diagram in *Section 2, Getting Started* if necessary. Make sure Device under test power switch is in the ON position and then power up the 601 Pro.

Test #1: Voltage

Single Lead:

The 601 Pro front panel outlet is **off** during single-lead voltage tests. To measure the mains voltage (L1-EARTH, L2-EARTH, L1-L2):

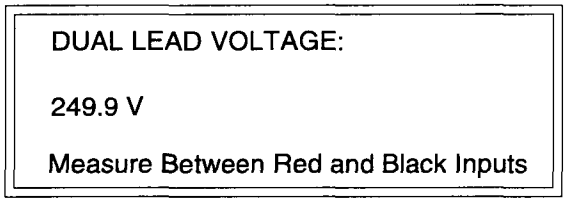
- ❑ Press the **Voltage** key. The MAINS VOLTAGE menu appears on the display, and the test immediately begins. Display voltages are continuously updated until another test is selected.



Dual Lead:

To measure dual lead voltage from the MAINS VOLTAGE menu:

- ❑ Press the white **Single/Dual** key while the MAINS VOLTAGE menu is displayed. The DUAL LEAD VOLTAGE menu will appear, and the test begins.

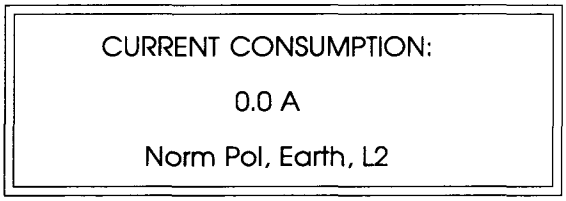


- ❑ Press the **Single/Dual** key again to return to the MAINS VOLTAGE menu.
- ❑ Press the **Esc** key to return to the MAIN MENU.
- ❑ Print key

Test #2: Current Consumption

To measure the current consumption (in Amperes) of the device under test:

- ❑ Plug the device under test into the 601 Pro front panel receptacle.
- ❑ Press the **Current** key. The CURRENT CONSUMPTION menu appears on the display, and the test immediately begins.



- ❑ Modify the configuration of the front panel receptacle by pressing the appropriate white key:
  - Pressing the **Polarity** key toggles the polarity from *Normal* to *Reverse* Polarity.

- Pressing the **Earth key** changes the earth line from *Earth* (closed earth) to *No Earth* (open earth).
- Pressing the **L2 key** changes the L2 line from *L2* (closed L2) to *No L2* (open L2).

The condition of the receptacle is verified on the display and by the LED indicators located next to the receptacle.

❑ Print key

Test #3: Insulation Resistance

The insulation resistance test measures (in Megohms) the dielectric strength from L1 and L2, or applied parts to earth. The 601 Pro presents a test voltage of 500 Volts DC to the mains/applied parts of the device under test. A measurement is taken referenced to its appropriate place.

☛ **Important Note:**

This test is acceptable per IEC 601-1 for non-manufacturers' retesting of devices. The standard specifically indicates that this test ***not be carried out at the full voltage*** *used by manufacturers to stress the device under test. The front panel receptacle is turned off during this test.*

WARNING:

ϟ ***A 2 beep-per-second signal indicates high voltage present at the applied part terminals.***

To perform an insulation resistance test:

❑ Plug the device to be tested into the 601 Pro front panel receptacle.

❑ Attach the device's applied parts to the 601 Pro's applied part terminals.

❑ Press the **Insul** key. The INSULATION RESISTANCE menu appears on the display:

```
INSULATION RESISTANCE: Class I, Type B:
Mains L1,L2-CASE: XX Mohms [LIMIT 2]
TIME:  XX sec
INSULATION to test, Arrows for AP
```

❑ Use the ▲ ▼ keys to select applied part insulation resistance:

```
AP-INSULATION RES:   Class I,Type B
RA-CASE          XX Mohms [LIMIT 5]
TIME: XX sec
INSULATION to Test: Arrows for AP
```

- The options include the following:

  Mains L1, L2 to case

  ALL to case

  RA to case

  RL to case

  LA to case

  LL to case

  V1-V6 to case

❑ Press the **Insul** key again to start the test. Test voltage is applied as long as the key is depressed.

✓ A timer will start when the **Insul** key is depressed up to 60 seconds to record testing time.

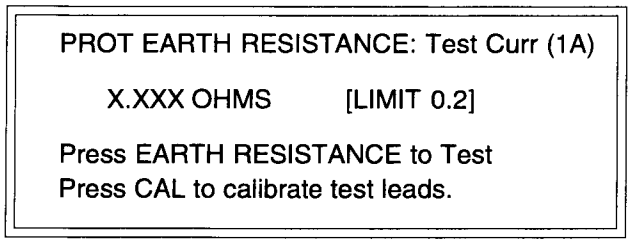
❑ Print key

Test #4 & #5 Earth Resistance

Protective earth resistance is measured using the Red test lead attached to the DUT enclosure or case. Test currents 1 Amp or 10 Amp can be selected (press **Test #5** key to toggle between 1A and 10A). The front panel receptacle power is turned **off** for this test.

To perform a protective earth resistance test:

- ❑ Plug the device under test into the 601 Pro front panel receptacle.
- ❑ Calibrate test leads at the start of each test.
- ❑ Attach the Red Lead from the 601 PRO to the device. A bare exposed metal area should be selected.
- ❑ Press the **Earth Resistance** key. The PROTECTIVE EARTH RESISTANCE menu appears on the display and the test immediately begins.



- ❑ Select a test current (1A or 10A) by pressing the grey **Test Current** Key. The selected test current is displayed in the upper right corner of the display.

☛ **Warning:**

During Earth Resistance testing, the DUT must be plugged into the 601Pro front receptacle. If the DUT fails Earth Resistance, discontinue tests and label device defective.

✓ It is recommended that calibration of the test leads be performed at the start of each day or if the unit does not zero when the test lead is connected between the Red and Green input jacks.

- ❑ Calibrate the test lead by connecting the **RED** test lead from the Red input jack to the **GREEN** input jack.

❑ Press the **Cal** key. The 601 Pro measures the resistance and if less than 0.105 ohms, stores the reading and subtracts it from earth continuity and resistance tests.

- If the leads have too much resistance (higher than 0.105 ohms) or are not properly attached, the following CALIBRATION screen will appear:

```
CALIBRATION IN PROGRESS:
Lead Resistance Too High!

Connect test lead from RED input jack
to GREEN input jack.  ESC to abort.
```

- If a circuit failure has occured or if the test lead is moved around during calibration, the CAL FAILURE screen will appear:

```
CALIBRATION IN PROGRESS:
Cal Failure!

Connect test lead from RED input jack
to GREEN input jack.  ESC to abort.
```

❑ Press the **Earth Resistance** key. The test is performed for 5 seconds unless the key is pressed continuously.

❑ Print key

Test #6: Leakage Current

Perform an Earth Resistance Test on the device **before** performing any leakage tests.

Leakage current is measured the following ways:

- Earth Leakage Current
- Earth Leakage Current, ALL Applied Parts to Earth
- Enclosure Leakage
- Enclosure Leakage, ALL Applied Parts to Earth

An *Invalid* sign will appear next to the reading if the selected test is not applicable to the test standard and class/type chosen and outlet fault conditions present.

Single Lead Leakage (IEC 601-1Test Standard):

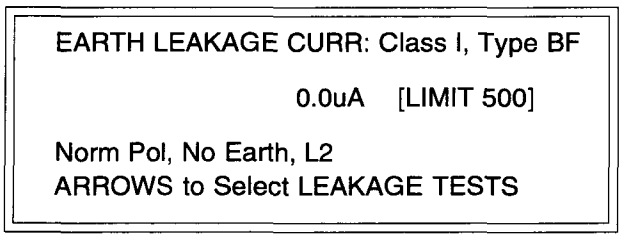
To perform a leakage test in single lead mode (test measurements are made from the Red test lead to earth for enclosure leakage and from device under test earth to earth for earth leakage):

- ❑ Plug the device under test into the 601 Pro front panel receptacle.

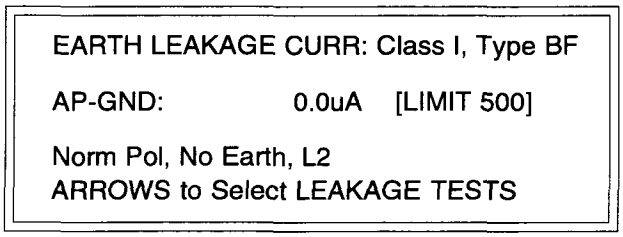
- ❑ Attach the Red test lead from the 601 Pro to the device. A bare exposed metal area should be selected.

- ❑ Attach the applied parts to the 601 Pro applied part terminals if applicable.

- ❑ Press the **Leakage** key. The EARTH LEAKAGE CURR menu appears on the display:



- ❑ Select leakage tests by pressing the ▲ ▼ Arrow keys.



The open earth LED is forced **on**, indictating insufficient protective earth (1K impedance) although it is connected to the 601 Pro chassis.

Enclosure Leakage tests should be measured from non earthed points on the enclosure of the device under test.

- ❑ Modify the configuration of the front panel receptacle by pressing the appropriate white key:

  - **Polarity Key** Changes the polarity from "Normal Polarity" to "Reverse Polarity".
  - **Earth Key** Changes the earth line from "Earth" (closed earth) to "No Earth" (open earth).
  - **L2 Key** Changes the L2 line from "L2" (closed L2) to "NoL2" (open L2).

- ❑ Print key

Equivalent Device Leakage (Select VDE 751.1 Test Standard):

(VDE 751.1 tests specified at line voltages of 190-255VAC only.)

If VDE 751.1 test standard is selected, a leakage test is performed as follows:

- ❑ Plug the device under test into the 601 Pro front panel receptacle.

- ❑ Attach the Red test lead from the 601 Pro to the device. A bare exposed metal area should be selected.

- ❑ Attach the applied parts to the 601 Pro applied part terminals.

- ❑ Press the **Leakage** key. The EQUIVALENT DEVICE LEAKAGE CURRENT menu appears:

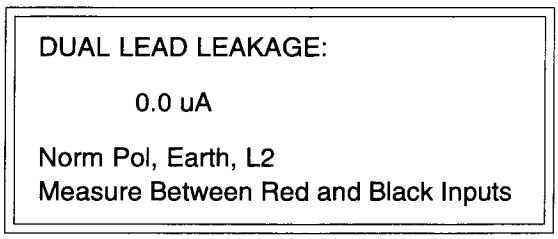
```
EQUIVALENT DEVICE LEAKAGE CURRENT
VDE 751.1    CLASS II, TYPE BF
600 uA   [Limit  ]
Leakage to test, Cal for calibration
```

☛ **Note**: *If 0 uA is not displayed, press* ***Cal*** *key for recalibration. Leads must be disconnected to perform Calibration.*

Dual Lead Leakage:

To perform a dual lead leakage test or point to point measurement from the Earth Leakage menu:

- ❑ Press the **Single/Dual** key. The DUAL LEAD LEAKAGE menu appears. Note that the dual LED is lit when the 601 Pro is in dual lead mode.



- ✓ Pressing the **Single/Dual** key again will return the display back to the LEAKAGE CURRENT test selected.

- ❑ Print key

Test #7 Patient Leakage Current (IEC 601-1Test Standard)

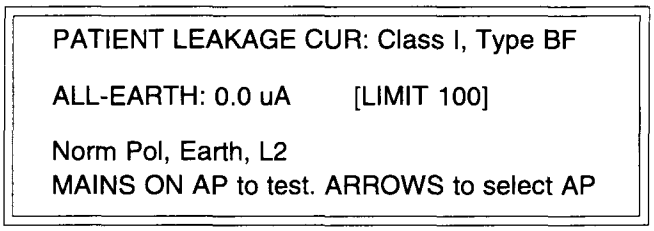
IEC 601-1: Patient leakage currents are measured between applied parts or applied part to ground.

To perform a patient leakage current test:

- ❑ Plug the device under test into the 601 Pro front panel receptacle.

- ❑ Attach the applied parts to the 601 Pro applied part terminals.

❑ Press the **Patient Leakage** key. The PATIENT LEAKAGE CURR menu appears on the display:



❑ To select applied part leakage current, press the ▲ ▼ Arrow keys.

- The options include the following:

  ALL to Earth

  RA to Earth

  RL to Earth

  LA to Earth

  LL to Earth

  V1-V6 to Earth

- The menu changes to PATIENT AUXILIARY CURR for the remaining selections:

  RA to ALL

  RL to ALL

  LA to ALL

  LL to ALL

  V1-V6 to ALL

❑ Modify the configuration of the front panel receptacle by pressing the appropriate key.

- The **Polarity** key changes the polarity from Normal to Reverse Polarity.
- The **Earth** key changes the earth line from Earth (closed earth) to No Earth (open earth).

- The **L2** key changes the L2 line from L2 (closed L2) to No L2 (open L2).

VDE 751.1: Test specified for line voltages of 190V-255V only. If VDE 751.1 test standard is selected, perform Equivalent Patient Leakage Current as follows:

❑ Plug the device under test into the 601 Pro front panel receptacle.

❑ Attach the applied parts to the 601 Pro applied part terminals.

❑ Press the **Patient Leakage** key. The EQUIVALENT PATIENT LEAKAGE CURRENT menu will appear on the display.

```
EQUIVALENT PATIENT LEAKAGE CURRENT
VDE 751.1  CLASS II, TYPE BF

    0 uA        [LIMIT 5000]

Mains AP to test, CAL to calibrate
```

☛ **Note:** Perform calibration if you get a reading other than zero when performing measurement with no device plugged in and no leads attached.

❑ Print key

Test #8: Mains on Applied Part (IEC 601-1 or HEI Standards)

The Mains On Applied Parts test, which is only accessible via test 7, introduces 110% of the mains voltage through a 16.8K ohm limiting resistor, to the chosen applied part terminals. Measurements are then taken between an applied part and earth. Measurements are performed with mains voltage to applied parts in the normal and reverse conditions as indicated on the display.

To perform the mains on applied part test from the PATIENT LEAKAGE menu:

- ❑ Plug the device under test into the 601 Pro front panel receptacle.

- ❑ Attach the applied parts to the 601 Pro applied part terminals.

- ❑ Press the **Mains On Applied Part** key. The MAINS ON APPLIED PART menu will appear on the display.

```
MAINS ON APPLIED PART: Class 1,Type BF

ALL-EARTH    Norm    XXX.X uA   [LIMIT 5000]
ALL-EARTH    Rev     XXX.X uA   [LIMIT 5000]
MAINS ON AP to Test, CAL for calibration
```

- ❑ If zeros are not seen on the display when performing measurements with no device under test, press the **Cal** key to caibrate mains on applied part. The following screen will appear on the display:

```
Disconnect ALL patient leads
and OUTLET connections
ENTER for calibration, ESC to abort
```

- ❑ Press the **Enter** key to begin calibration.

```
Calibration in progress.....

ESC to abort
```

- ❑ Perform the test by pressing the **Mains On Applied Part** key. The test is only performed after the **Mains On Applied Part** key is pressed.

WARNING:

A 2 beep-per-second signal indicates high voltage present at the applied part terminals.

- ❑ To select the applied part, press the **Esc** key to return to the PATIENT LEAKAGE CURR menu. Press the ▲ ▼ Arrow keys to select applied parts. The options are the same as Patient Leakage current.

☛ **Note**: Will not perform for Patient Auxiliary Current options.

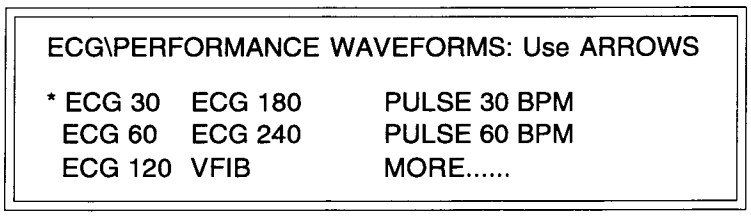
- ❑ Modify the configuration of the front panel receptacle by pressing the appropriate key:
  - The **Polarity** key changes the polarity from Normal to Reverse Polarity.
  - The **Earth** key changes the earth line from Earth (closed earth) to No Earth (open earth).
  - The **L2 key** changes the L2 line from L2 (closed L2) to No L2 (open L2)
- ❑ print key

Test #9: ECG Waveforms

The 601 Pro generates a series of ECG, performance, and arrhythmia waveforms to verify the accuracy of ECG machine/monitors.

To perform a test simulation from any menu:

- ❑ Attach the applied parts to the 601 Pro applied part terminals.
- ❑ Press the **ECG** key to display the ECG/PERFORMANCE menu.

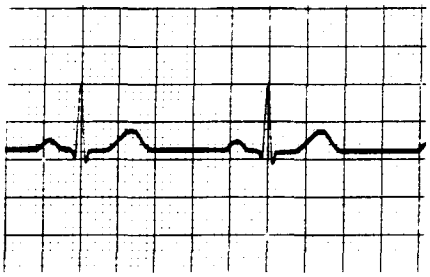


- ❑ Press the ▲ ▼ Arrow keys to select the desired waveform/ frequency with the starred cursor.
- ❑ Press the **More** key for additional waveforms.

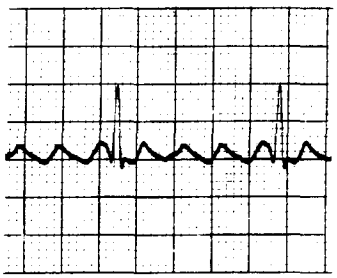
```
ECG\PERFORMANCE WAVEFORMS: Use ARROWS
* SQ    .125 HZ    SINE 40 HZ    SINE 100 HZ
  SQ      2 HZ     SINE 50 HZ    TRI   2 HZ
  SINE   10 HZ     SINE 60 HZ    MORE.....
```

```
ECG\PERFORMANCE WAVEFORMS: Use ARROWS
* AFIB      PVC 1        IDIO
  AFLUT     RUN          VTACH
  ATACH     R ON T       MORE.....
```

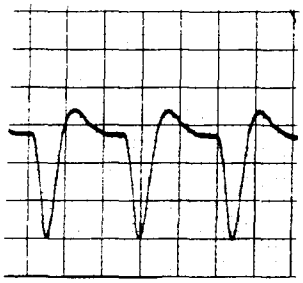
Sample waveforms:



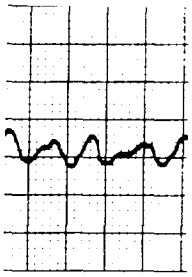
Normal sinus



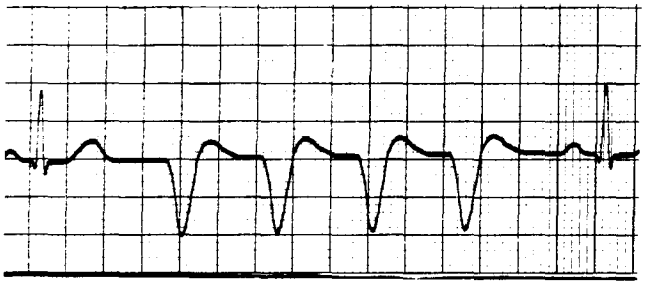
Atrial Flutter



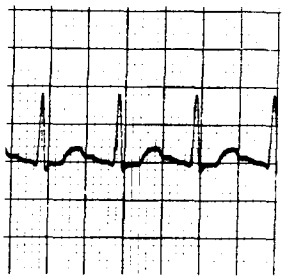
Ventricular Tachycardia



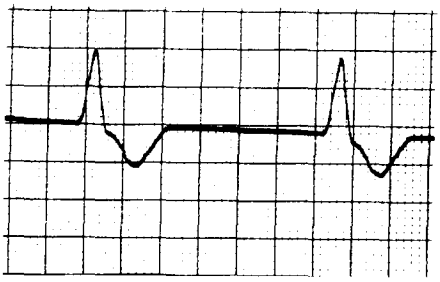
Ventricular Fibrillation



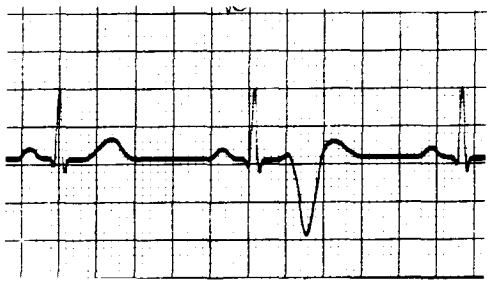
Run



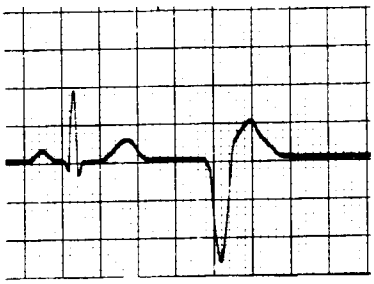
Atrial Tachycardia



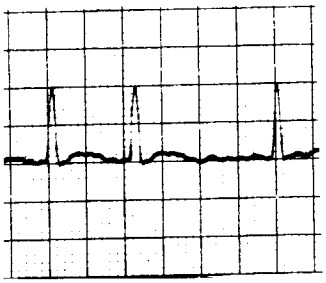
Idioventricular



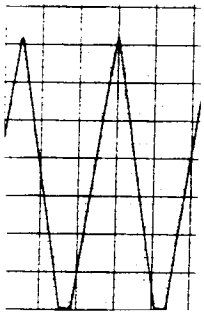
R on T



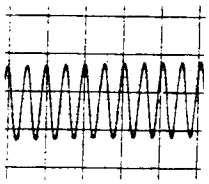
PVC 1



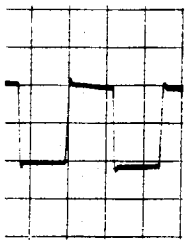
Atrial Fibrillation



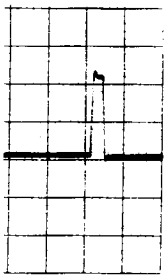
Triangle 2Hz



Sine 10, 40, 50, 60, 100 Hz



Square 0.125 Hz, 2 Hz



Pulse 30, 60 BPM

Auto Operation

The 601 Pro utilizes two modes of automatic testing.

- Step mode sequences through each required IEC/VDE/HEI test (based on class/type selected) under operator control. This allows the operator to modify device connections and extend testing time before proceeding. In Step mode, the insulation resistance test is performed for one minute (IEC-601 only).
- Auto mode automatically sequences the tests until all are complete. This allows the operator to perform a completely automated electrical safety check as quickly as possible. One pause at the Protective earth resistance test allows the operator to determine the correct grounding point for the device.

Equipment information and test results may be printed during testing for immediate review. If a control number is entered, the results are saved for later printing or may be transfered to a computer via the download transfer software.

The *IEC 601-1/HEI 95/VDE Test Limits* chart (*Section 6, Test Standards*) lists valid electrical safety tests, IEC test limits, and associated testing times used by the 601 Pro uses during Step and Auto mode procedures.

Beginning Auto Mode Testing

❑ Press the **Auto Modes** key to access the MODE menu:

```
MODE:              STANDARD: IEC 601

   AUTO                 * STEP

601 Pro ENTER to Select
Use ARROWS to Advance
```

☛ **Note:** *Enclosure Leakage tests should be measured from non-earthed points on the enclosure of the device under test.*

- ❑ Press the ▲ ▼ Arrow keys to select STEP mode.
- ❑ Press the **Enter** key. The following menu appears on the display:

```
CLASS/TYPE: IB   PATIENT LEAKAGE: NONE
PRINT: No        TEST CURRENT: 10A
Press Associated 601 PRO KEY for Toggle
601 PRO ENTER to start.
```

- ❑ Press the **Class/Type** key to select the classification/type for the device to be tested. (For more information on the class/type designation, refer to the chart in *Section 2, Getting Started.*)
- ❑ Press the **Print** key to select internal printer, external printer, or no printer.
- ❑ Press the **Patient Leakage** key to select equipment with applied parts. (Toggles between ALL and NONE)
- ❑ Press the **Test Current** key to select the test current for protective Earth Resistance. (Toggles between 1A and 10A)
- ❑ Press the **Enter** key to enter the STEP MODE menu.

```
* CONTROL# :0123456789
---------- STEP MODE ----------
Use 0-9, Barcode, or Ext. Keyboard
601 PRO ENTER to START, ARROWS to Advance
```

- ❑ A control number can be entered using a barcode wand, external keyboard or the 0-9 keys on the 601 PRO front panel. Entering a control number allows the equipment test record to be saved in memory . The file may then be transferred to a PC and/or ProFile, European Bio-Tek's Equipment Mangement Database, or printed at a later time. The control number is placed on the printout.

  If a control number is entered, two more screens of information can be entered, using an external keyboard, barcode, or keypad..

❑ Press the ▲ ▼ Arrow keys to access the following menus where additional information about the device may be entered via barcode wand, external keyboard, etc.

Repeatedly pressing the ▲ ▼ keys allows the operator to advance from field to field in the menus.

```
*  PROCEDURE ID:
   LOC:
   DEVICE TYPE:
601 Pro ENTER to START, ARROWS to Advance
```

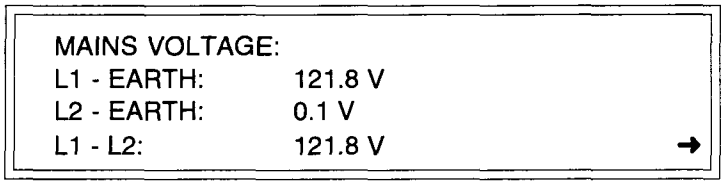
```
*  MFR:
   SERIAL #:
   TECHNICIAN:

601 Pro ENTER to START, ARROWS to Advance
```

Usable field lengths:

• Control Number	15 characters
• Procedure ID	20 characters
• Location	30 characters
• Device Type	20 characters
• Manufacturer	25 characters
• Serial Number	16 characters
• Technician	10 characters

☛ **Note:** *Technician information is stored in non-volatile RAM, eliminating the neccessity to enter this field for each test performed.*

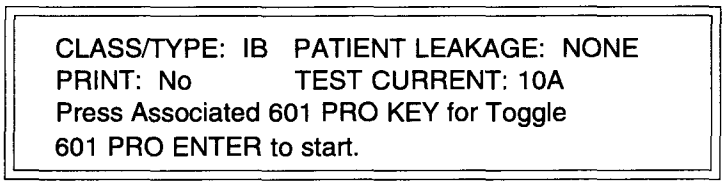
- ❑ Pressing **Enter** starts the Step Test. A menu similar to the following appears on the display:



- ❑ Arrows in upper left and lower right hand corners of the display indicate Step Mode. Press the corresponding up/down **Arrow** key to advance to the next test.

Auto Mode

- ❑ From the MODE menu, use the ▲ ▼ keys to select AUTO. Press the **Enter** key. The following menu appears on the display.



- ❑ Press the **Class/Type** key to select the classification/type for the device to be tested. (For more information on the class/type designation, refer to the chart in *Section 2, Getting Started.*)
- ❑ Press the **Print** key to select internal printer, external printer, or no printer.
- ❑ Press the **Patient Leakage** key to select equipment with applied parts. (Toggles between ALL and NONE)
- ❑ Press the **Test Current** key to select the test current for protective Earth Resistance. (Toggles between 1A and 10A)
- ❑ Press the **Enter** key to enter the AUTOMATIC MODE menu.

```
* CONTROL# :0123456789
---------- AUTOMATIC MODE ----------
Use 0-9, Barcode, or Ext. Keyboard
601 PRO ENTER to START, ARROWS to Advance
```

- ❑ A control number can be entered using a barcode wand, external keyboard or the 0-9 keys on the 601 PRO front panel.

  Entering a control number allows the equipment test record to be saved in memory . The file may then be transferred toa PC and/or ProFile, European Bio-Tek's Equipment Mangement Database, or printed at a later time. The control number appears on the printout.

  If a control number is entered, two more screens of information can be entered, using an external keyboard, barcode, or keypad.

- ❑ Press the ▲ ▼ Arrow keys to access the following menus where additional information about the device may be entered via barcode wand, external keyboard, etc.

  Repeatedly pressing the ▲ ▼ keys allows the operator to advance from field to field in the menus.

```
*  PROCEDURE ID:
   LOC:
   DEVICE TYPE:
601 Pro ENTER to START, ARROWS to Advance
```

```
*  MFR:
   SERIAL #:
   TECHNICIAN:

601 Pro ENTER to START, ARROWS to Advance
```

Usable field lengths:

• Control Number	15 characters
• Procedure ID	20 characters
• Location	30 characters
• Device Type	20 characters

- Manufacturer 25 characters
- Serial Number 16 characters
- Technician 10 characters

☛ **Note:** *Technician information is stored in non-volatile RAM, eliminating the neccessity to enter this field for each test performed.*

❑ Press the **Enter** key to begin automatic testing.

☛ **Note:** *There is a pause for the protective earth resistance test to allow the operator to determine the correct ground ing point for the device under test. Follow the instruc tions on the display to continue. In the Automatic and step modes of operation the comments field accepts information Via: RS232, Barcode, and keyboard. Bio-Tek test equipment such as the QED-6, PMA-1, IDA-2, etc can download test results to the 601 PRO comments fields via the RS232.*

Applications

4

Inside This Section

- Permanently Wired Devices ____ 4-3
- Portable Devices ____ 4-4
- Portable Devices Located in Isolated Power System ____ 4-4
- Testing Three-Phase Portable Devices ____ 4-4
- Testing Conductive Surfaces ____ 4-5
- Detachable Power Supply Cable ____ 4-6
- Battery Powered Equipment ____ 4-6

Testing Devices

This section provides instructions on how to use the 601 Pro to perform routine testing on permanently wired, portable and battery powered devices, as well as conductive surfaces and detachable power cords.

Permanently Wired Devices

When testing a permanently wired device, follow the procedure with the device **off**, and then again with the device **on**. Since the permanently wired device cannot be plugged into the 601 Pro, the Safety Analyzer cannot be used to modify the receptacle configuration.

To test a permanently wired device:

- ❑ Plug the 601 Pro into a nearby outlet with the same earth as the device under test. Power up the 601 Pro.
- ❑ From the 601 Pro MAIN MENU, select the appropriate CLASS/ TYPE for the device under test.
- ❑ Connect a test lead from the 601 Pro's Red input jack to the chassis of the device under test.
- ❑ Turn the device under test **off**. Press the **Earth Resistance** key on the 601 Pro. Connect a test lead from the 601 Pro green input jack to an earth point on the device under test.
- ❑ Perform Cal if needed.
- ❑ Disregard the 0.2 ohm limit. This test will only ensure Earth Resistance. The reading will be higher due to long wiring and, in turn, higher resistance.

- ❑ Run Test #6 by pressing the **Leakage** key. Make sure the 601 Pro front panel outlet is normal polarity, earthed, L2 for appropriate limits.
- ❑ Repeat this test procedure with the device under test **on**.

Portable Devices

- ❑ Test the portable device as detailed in *Section 3, Operation,* using procedures for Manual, Automatic or Step modes.

Portable Devices Located in Isolated Power System

Portable devices located in isolated power systems should be tested on a earth referenced power system.

- ❑ Remove the device under test to an area with an earth referenced power system.
- ❑ Test the device as detailed in *Sections 3, Operation,* using procedures for Manual, Automatic or Step modes.

Testing Three-Phase Portable Devices

When testing three-phase portable devices, the operator must be able to interrupt earth, L2 and reverse polarity. Three-phase equipment cannot be plugged directly into the 601 Pro; an adapter that interrupts the earth, L2 and reverses polarity must be used.

- ❑ Plug the device to be tested into an adapter that allows outlet configuration.

- ❑ Plug the 601 Pro into a nearby outlet with the same earth point as the device under test.

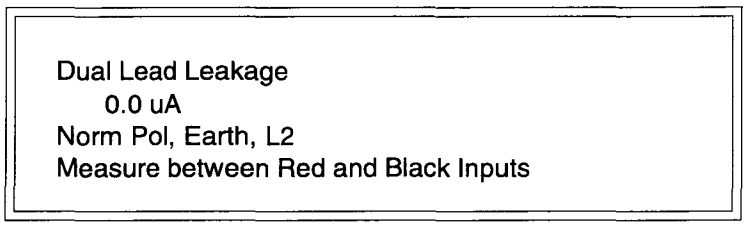
- ❑ Connect a test lead from Red input jack on the 601 Pro to the enclosure (case) of the device.

- ❑ Follow the Manual or Step mode test procedures in *Section 3*. The adapter should be configured the same as the 601 Pro for appropriate limits.

Testing Conductive Surfaces

- ❑ Press the **Leakage** key on the 601 Pro.

- ❑ Press the **Dual Lead** key. The following menu appears on the display.



- ❑ Measure point-to-point leakage between Red and Black input jacks on the 601 Pro.

Detachable Power Supply Cable

The 601 Pro has an isolated measuring curcuit that can measure differences between two points, independent of earth points.

- ❑ Power up the 601 Pro, and plug the detachable cable into the 601 Pro Front Panel.
- ❑ Connect the test lead from the Red input jack to earth of the detachable power supply cable.
- ❑ Press the **Earth Resistance** key (Test #4), and then the **Test Current** key (Test #5) to select a 1A or 10A test current
- ❑ Press the **Earth Resistance** key once more to apply current.

  The detachable power supply cable resistance should be less than 0.1 ohms.

Battery Powered Equipment

- ❑ Power up the 601 Pro and connect a test lead from the Red input jack of the 601 Pro to the enclosure (case) of the device under test.
- ❑ Connect patient applied leads to the applied part terminals on the 601 Pro. Refer to the Manual, Automatic or Step mode procedures in *Section 3, Operation.*
- ❑ Power up the device under test.

Customizing 601 Pro Functions

5

Inside This Section

- Using More to Access Additional Functions _____ 5-3
  - Date/Time _____ 5-4
  - Select Test Standard _____ 5-4
  - Memory _____ 5-5
    - Memory Options: Erase _____ 5-5
    - Memory Options: Transmit _____ 5-6
    - Memory Options: Summary Report _____ 5-8
    - Memory Options: Set User Defaults _____ 5-10
  - COM1 Setup _____ 5-10
  - System Status _____ 5-11
  - Memory Test _____ 5-12
  - Program Test _____ 5-12
  - Language _____ 5-13
  - Calibration Check _____ 5-14

Using the More Key to Access Additional Functions

Several functions of the 601 Pro can be modified by the user. The **More** key allows the operator access to:

- Printer Enable
- Test Standard Selection (See *Section 6*)
- System Status
- Memory Options (Transmit, Print, Etc.)
- Internal Memory and Program Tests
- Calibration Checks
- Keyboard Language Setup
- PC Transfer Protocol
- Communications Parameters
- Date and Time Settings

To access the More functions:

❑ From the 601 Pro Main Menu, press the **More** key. The following menu will appear:

```
ADDITIONAL OPTIONS: Use ARROWS and ENTER
* Set Date/Time          COM1 Setup
  Select Test Standard   Printer Enable
  Memory                 MORE...
```

❑ If the **More** key is pressed a second time, the following menu appears:

```
ADDITIONAL OPTIONS: Use ARROWS and ENTER
* System Status         PROGRAM Test
  MEMORY Test           Language
  Calibration Check     MORE...
```

To select an option from the MORE menu:

- ❑ Press the ▲ ▼ ARROW keys to advance the starred cursor to the desired function

- ❑ Press the **Enter** key to access the menu item.

Date/Time

The date and time are used to record test dates and associated testing times. The clock is in a 24-hour format. Date is DD-MM-YY.

- ❑ When Date/Time is selected from the MORE menu, the following options menu appears.

```
SET TIME: 23:00    DATE: 28-06-93
Press ARROWS to change
Press ENTER to Advance to Next Selection
Press ESC to Exit
```

- ❑ Press the **Enter** key to move from field to field.
- ❑ Use the ▲ ▼ Arrows to change the time/date.
- ❑ When modifications are complete, press **Esc** to exit.

Select Test Standard

The SELECT TEST STANDARD option allows the operator to choose between IEC 601-1, VDE 751.1 or HEI 95 test standards.

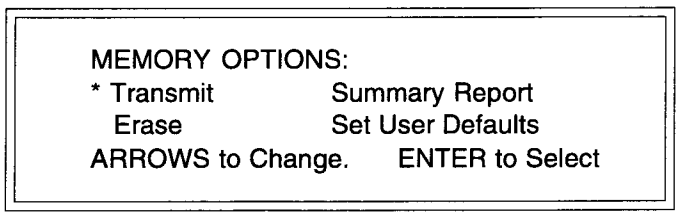
The default is IEC 601-1.

Refer to *Section 6, Test Standards*, for a detailed discussion of IEC 601-1, VDE 751.1 or HEI 95 standards and their selection.

The MEMORY function allows stored test data to be:

- Transmitted via the 601 Pro's RS232 (serial) port to a linked computer. (Refer to the *PC Transfer Protocol* and *Computer Control* sections of this manual for more information on transmitting data to a computer.)
- Sent to an external printer via the 601 Pro's parallel printer port. For more information on sending data to an external, full-format printer, refer to *Section 6, Printing*)
- Erased from memory
- Printed in a summary format (requires an external printer).

When MEMORY is selected from the ADDITIONAL OPTIONS menu, the MEMORY OPTIONS menu appears on the display. Use the ▲ ▼ Arrows to select the desired option, then press **Enter**. Follow the instructions on the screen.



MEMORY OPTIONS: ERASE

Pressing the **Enter** key with the starred cursor at Erase, will delete all previously saved tests.

To conserve 601 Pro memory, perform an Erase after test data has been successfully downloaded to a linked computer (see the following section on transmitting data via the 601 Pro's RS232 port).

☛ **Note:** *Be sure that if a summary report is required, that you print it out before erasing the records.*

Pressing the **Enter** key with the starred cursor at Transmit will display the TRANSMIT menu.

```
TRANSMIT:
* RS232                    SINGLE
EXTERNAL PRINTER
ARROWS to change. ENTER to start.
```

- ❑ Press the ▲ ▼ Arrow keys to select RS232 if test data is to be downloaded to a to computer through the RS232 (COM1) port. Be sure to check the COM1 settings on the 601 Pro to ensure communication parameters match the computer's. The following display appears when the **Enter** key is pressed:

```
TRANSMIT:
    Connect . . .
    ESC to STOP Before Completion
```

A "timeout" error message will appear if data transmission is unsuccessful.

- ❑ Press the ▲ ▼ Arrow keys to select **External Printer** if data will be sent to an external printer through the 601 Pro's parallel printer port. The following display appears when the **Enter** key is pressed:

```
    TRANSMIT:
    TRANSMITTING to External printer
    ESC to STOP Before Completion
```

- ❑ Press the ▲ ▼ Arrow keys to select Single if you only wish to print test data associated with a specific control number. Entering a control number during testing allows test results to be saved in memory and recalled at a later time. A control number can be entered using a barcode, the 601 Pro's numeric keyboard, or with an external keyboard.

An example of a typical printout appears on the following page.

Sample Printout

BIO-TEK INSTRUMENTS, INC. DATE: 02-02-93 TIME: 14:23:00

CONTROL#: 0123456789 PROCEDURE ID: 01234567890123456789
WORKCODE: 0123456789 LOCATION: 012345678901234567891 2345

DEVICE TYPE: 012345678901234567890
MANUFACTURER: 01234567890123456789012345678 9
TECHNICIAN: 0123456789
TEST DATE: 02-02-93

IEC 601 TEST, CLASS I, TYPE CF

Line Voltage (Volts): L1-EARTH 240.0, L2-EARTH 000.0, L1-L2 240.0
Current Consumption (AMPS): 0.00
Earth Continuity: Test current 1 AMP 0.00 Ohms (.200)
Insulation Resistance:
Mains L1, L2-Case: xx Mohms (20)
Applied Part Insulation
L1, L2-ALLXX Mohms (LIMIT 20)
All-Case XX Mohms (LIMIT 20)
Earth Leakage: uA

Norm Pol	0.00 (LIMIT 500)
No L2	0.00 (LIMIT 500)
Rev Pol	0.00 (LIMIT 500)
No L2	0.00 (LIMIT 500)

Enclosure Leakage: uA

Norm Pol	0.00 (LIMIT 500)
No L2	0.00 (LIMIT 500)
No Earth	0.00 (LIMIT 500)
Rev Pol	0.00 (LIMIT 500)
No L2	0.00 (LIMIT 500)
No Earth	0.00 (LIMIT 500)

Patient Lead Leakage: uA

	ALL-EARTH	
Norm Pol	0.00	(LIMIT 500)
No L2	0.00	(LIMIT 500)
No Earth	0.00	(LIMIT 500)
Rev Pol	0.00	(LIMIT 500)
No L2	0.00	(LIMIT 500)
No Earth	0.00	(LIMIT 500)
Mains on AP: uA		
Norm Pol	0.00	(LIMIT 500)
Rev Pol	0.00	(LIMIT 500)

Auxiliary Current: uA	RA-ALL	RL-ALL	LA-ALL	LL-ALL	V1-V6-ALL
Norm Pol	0.00	0.00	0.00	0.00	0.00 (500)
No L2	0.00	0.00	0.00	0.00	0.00 (500)
No Earth	0.00	0.00	0.00	0.00	0.00 (500)
Rev Pol	0.00	0.00	0.00	0.00	0.00 (500)
No L2	0.00	0.00	0.00	0.00	0.00 (500)
No Earth	0.00	0.00	0.00	0.00	0.00 (500)

Figure 5-1. *Sample 601 Pro Printout on an External Printer*

The Summary Report, which is selected from the MEMORY OPTIONS menu, is a standard report which cannot be modified by the operator.

```
MEMORY OPTIONS:
Transmit    * Summary Report
Erase         Set User Defaults
ARROWS to Change    ENTER to Select
```

To print a Summary Report:

- Test results must be saved using a control number, and
- An external printer must be connected to the 601 Pro.

The Summary Report includes the following information: Control number, procedure ID, device type, location, serial number of the device to be tested, the result of the test (pass/fail), and the technician performing the test(s).

❑ From the MEMORY OPTIONS menu, use the ▲ ▼ Arrow keys to select Summary Report. Press **Enter.**

The PRINT SUMMARY REPORT menu appears on the display. Press **Enter** to begin printing a Summary Report of all saved records by control number.

```
PRINT SUMMARY REPORT:
Press ENTER to start SUMMARY REPORT.
ESC to abort.
```

An example of a Summary Report appears on the following page:

Summary Report

SUMMARY REPORT PAGE X
DATE: 2/2/93

CONTROL # / PROCEDURE ID	DEVICE TYPE / LOCATION	SERIAL # / TECHNICIAN	RESULT / TEST DATE
01556 DEFIB/MONITOR IPM	DEFIBRILLATOR ICU	1234 GEORGE M.	PASS 02-02-93
01557 DEFIB/MONITOR REPAIR	DEFIBRILLATOR CCU	5678 GEORGE M.	FAIL 02-02-93
01558 ELECTROSURG UNIT IPM	ELECTROSURGERY UNIT OR WEST	9101 GEORGE M.	PASS 02-02-93
01559 MONITOR IPM	PATIENT MONITOR OR WEST	1213 GEORGE M.	PASS 02-02-93
01560 PUMP IPM	INFUSION PUMP ICU SOUTH	1415 GEORGE M.	PASS 02-02-93
01561 DEFIB/MONITOR IPM	DEFIBRILLATOR ICU	1617 GEORGE M.	PASS 02-02-93
01562 DEFIB/MONITOR REPAIR	DEFIBRILLATOR CCU	1819 GEORGE M.	FAIL 02-02-93
01563 ESU IPM	ELECTROSURGERY UNIT OR WEST	2021 GEORGE M.	PASS 02-02-93
01564 MONITOR IPM	PATIENT MONITOR OR WEST	2223 GEORGE M.	PASS 02-02-93
01566 PUMP IPM	INFUSION PUMP ICU SOUTH	2627 GEORGE M.	PASS 02-02-93
01567 DEFIB/MONITOR REPAIR	DEFIBRILLATOR CCU	2829 GEORGE M.	FAIL 02-02-93
01568 ESU IPM	ELECTROSURGERY UNIT OR WEST	3031 GEORGE M.	PASS 02-02-93
01569 MONITOR IPM	PATIENT MONITOR OR WEST	3233 GEORGE M	PASS 02-02-93.

Figure 5-2. *Sample 601 Pro Summary Report as printed on an External Printer*

This option clears all COM port settings from 601PRO memory and resets the 601 Pro's RS232 (COM) ports to the default values of:

- Baud Rate: 2400
- Parity: None
- Data Bits: 8
- Stop Bits: 1

To restore user default settings:

❑ Press the ▲ ▼ Arrow keys to advance the starred curser to Set User Defaults on the MEMORY OPTIONS menu. Press the **Enter** key.

The message *SETTING USER DEFAULTS* flashes on the display until all defaults have been restored.

✓ If non-volatile RAM (Random Access Memory) has failed, the 601 Pro will sound a three-beep alert.

❑ When default COM port values have been successfully restored, the 601 Pro will beep twice.

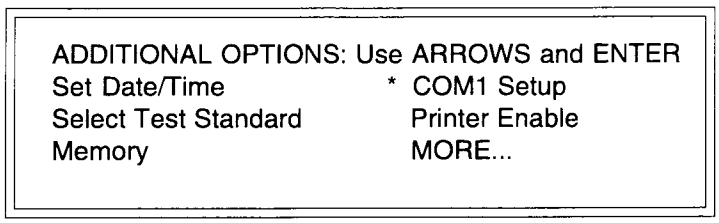
COM1 Setup

The 601 Pro's COM 1 default settings may be modified by the operator to meet computer's COM1 requirements for transferring test data files via the 601 Pro's RS232 serial port. The computer's parameters and 601 Pro settings must match for successful data transfer. The 601 Pro's default settings are:

- Baud Rate: 2400
- Parity: None
- Data Bits: 8
- Stop Bits: 1

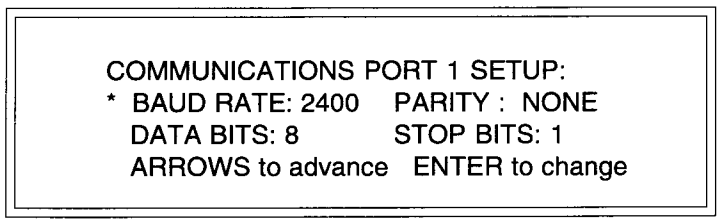
To modify the COM1 settings:

❑ From the 601 Pro Main Menu, press the **More** key to access the ADDITIONAL OPTIONS menu:



- ❑ Use the ▲ ▼ Arrow keys to advance the starred curser to the COM1 setup option. Press the **Enter** key.

  The COMMUNICATIONS PORT 1 SETUP menu appears on the display:



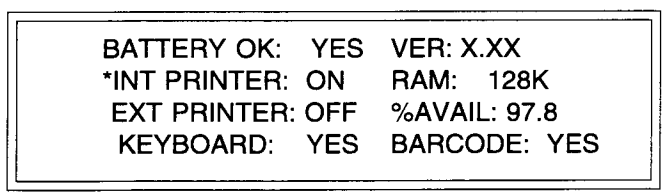
- ❑ Use the ▲ ▼ Arrow keys to move the starred cursor to the field /value you wish to change. Press **Enter** to cycle through the choices.
- ❑ When setup of the COM1 port is complete, press **Esc** to return to the ADDITIONAL OPTIONS menu.

System Status

The System Status option displays information on the 601 Pro's current setup status. This display is informational only; setup values cannot be altered from this menu.

System Status may be accessed from the second ADDITIONAL OPTIONS menu (from the Main Menu, press the **More** key twice).

- ❑ Use the ▲ ▼ Arrow keys to move the starred curser to the System Status option, and press the **Enter** key. A display similar to the following will appear:



* **Note:** *The keyboard option can only be set at the factory.*

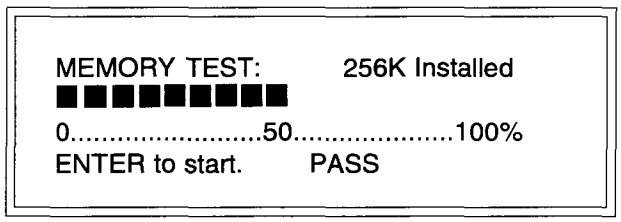
Memory Test

The Memory Test option allows the operator to test the 601 Pro's **R**andom **A**ccess **M**emory (RAM) storage area.

☛ **Caution:** ***The Memory test can only be performed when there are no records in the memory. All data should be transmitted and then erased before performing memory test.***

The Memory Test may be accessed from the second ADDITIONAL OPTIONS menu (from the Main Menu, press the **More** key twice).

- ❑ Use the ▲ ▼ Arrow keys to move the starred curser to the MEMORY TEST option, and press the **Enter** key to start the test. A screen similar to the one shown below will appear.



The Memory Test will indicate on the display whether the 601 Pro passed or failed the RAM test.

In the case of a RAM failure:

- The operator will be alerted during power-up of the 601 Pro.
- To verify the RAM failure:

  Print, or transfer all stored test data to a computer, and use **Erase** (MEMORY OPTIONS menu) to delete all previously saved tests.

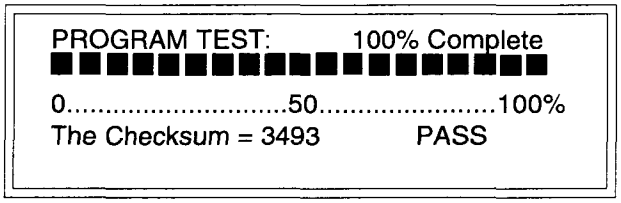
  Power off the 601 Pro, then restart the unit and rerun the MEMORY TEST. If a second test failure occurs, contact Bio-Tek's Technical Assistance Center for instructions.

Program Test

When selected, the Program Test verifies the 601 Pro's firmware -- programs stored in **R**ead **O**nly **M**emory (ROM) -- and displays the results as a checksum.

The Program Test may be accessed from the second ADDITIONAL OPTIONS menu (from the Main Menu, press the **More** key twice).

- ❑ Use the ▲ ▼ Arrow keys to move the starred curser to the PROGRAM TEST option, and press the **Enter** key to access the PROGRAM TEST display. Press **Enter** again to start the test. A screen similar to the following appears on the display:



The ROM test provides a PASS/FAIL designation on the display.

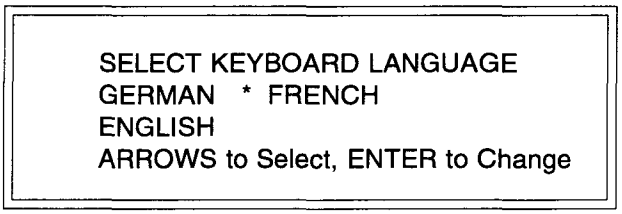
If the 601 Pro fails the ROM test, the unit's cartridge may need to be replaced. Call Bio-Tek's Technical Assistance Center.

Language

The Language option allows the use of a German, French or English external keyboard.

The Language option may be accessed from the second ADDITIONAL OPTIONS menu (from the Main Menu, press the **More** key twice).

- ❑ Use the ▲ ▼ Arrow keys to move the starred curser to the LANGUAGE option, and press the **Enter** key. A menu similar to the one shown here will be displayed.



- ❑ Use the ▲ ▼ Arrow keys to move the starred curser to the desired language. Press **Enter** to return to the ADDITIONAL OPTIONS menu.

The Calibration Check option performs a verification of 601 Pro electronics used for resistance and leakage current measurements.

☛ **Note:** ***Before beginning the calibration check, disconnect all patient leads and 601 Pro outlet connections.***

The Calibration Check option may be accessed from the second ADDITIONAL OPTIONS menu (from the Main Menu, press the **More** key *twice*).

- ❑ Use the ▲ ▼ Arrow keys to move the starred curser to the CALIBRATION CHECK option, and press the **Enter** key. A warning message appears on the display.
- ❑ Press **Enter** again to begin the Calibration Check. A screen similar to the following appears on the display:

```
CALIBRATION CHECK:
RESISTANCE:     PASS
   LEAKAGE:     PASS          ESC to Exit
```

- ❑ If the Calibration Check fails:
  - Resistance: Check the fuses (.4A) and replace if necessary.
  - Unknown: Check that all test leads and any unit plugged into the 601 Pro's front panel receptacle are disconnected. Run the Calibration Check again. If a second failure occurs, the 601 Pro may need to be returned to Bio-Tek for re-calibration.
  - Contact Bio-Tek's Technical Assistance Center for instructions and a Return Authorization number.

Test Standards

6

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  - VDE 751.1 _____ 6-4
  - IEC 601-1 Test Limits for Auto / Step Tests _____ 6-5
  - IEC 601-1 Test Limits for Auto / Step Tests _____ 6-6
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Test Standards and Principles

The 601 Pro is programmed to use IEC 601-1 as the default test standard. Alternative test standards -- Germany's VDE 751 and United Kingdom's HEI 95 -- are available for selection and can be accessed through the MORE menu.

Some electrical tests may not be applicable under certain class/type categories (refer to the charts). In these cases, a message appears on the display suggesting the user change the class/type designation or select another test:

```
INVALID TEST SELECTION FOR:
CLASS 1 TYPE BF
Press CLASS/TYPE for new category
Press ENTER to return to previous test
```

To access VDE 751 or HEI 95 test standards:

- ❑ From the 601 Pro Main menu, press the **More** key to display the ADDITIONAL OPTIONS menu:

```
ADDITIONAL OPTIONS: Use ARROWS and ENTER
  Set Date / Time          COM 1 Setup
* Select Test Standard     Printer Enable
  Memory                       MORE...
```

- ❑ Press the ▲ ▼ Arrow keys advance the starred cursor to Select Test Standards and press the **Enter** key. The SELECT TEST STANDARD menu appears on the display:

```
SELECT TEST STANDARD:  IEC 601
* IEC 601       VDE 751.1      HEI 95
  Press ARROWS to Change
  Press ENTER to Select,  ESC to Exit.
```

- ❑ Use the ▲ ▼ Arrow keys to move the starred curser to the desired standard, and press **Enter**.

VDE 751.1

VDE 751.1 tests are specified for line voltages of >190V.

Manual Operation

All manual tests are the same except for Test # 6, Leakage (now referred to a Equivalent Device Leakage Current) and Test # 7, Patient Leakage (now referred to as Equivalent Patient Leakage Current). The following chart details VDE 751.1 Test Limits:.

TEST #	TEST DESCRIPTION	TIME	LIMITING VALUES					
			CLASS			CLASS II		
			B	BF	CF	B	BF	CF
1	Line Voltage		NA	NA	NA	NA	NA	NA
2	Protective Earth Continuity	5 sec	.2	.2	.2	NA	NA	NA
3	Current Consumption		NA	NA	NA	NA	NA	NA
4	Equivalent Device Leakage uA	2 sec	1K	1K	1K	500	500	500
5	Equivalent Patient Leakage uA	2 sec	NA	5K	50	NA	5K	50

Automatic Operation

There is no change in device screens or comments during automatic or step mode operation with VDE 751.1 Test Limits are defined in the chart above.

IEC 601-1 Test Limits for Auto and Step Tests

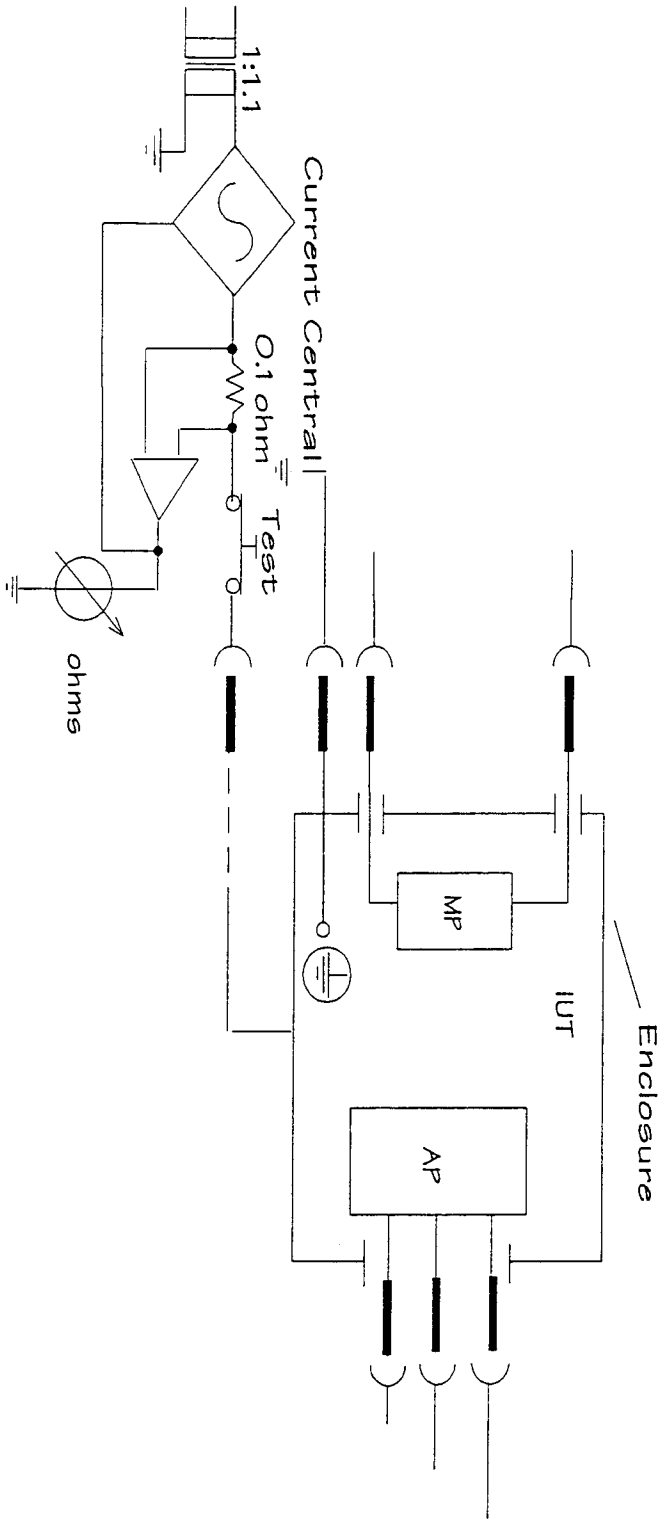
TEST NO.	TEST DESCRIPTION		TIME	LIMITING VALUES					
				Class I			Class II		
				B	BF	CF	B	BF	CF
1	Line Voltage Volts			----			----		
2**	Protective Earth Continuity ohms			.2 ohms			**** N/A		
3***	Insulation	Mains L1-L2-CASE	*5sec/	2	2	20	7	7	70
4	Resistance	AP-CASE	*5sec/	N/A	5	50	N/A	5	50
5	Current Consumption Amps			--	--	--	--	--	--
6	Earth	Norm Pol	2 sec.	500	500	500	N/A	N/A	N/A
7	Leakage	Norm Pol, No L2	2 sec.	1000	1000	1000	N/A	N/A	N/A
8	Current	Rev Pol	2 sec.	500	500	500	N/A	N/A	N/A
9	uA	Rev Pol, No L2	2 sec.	1000	1000	1000	N/A	N/A	N/A
10	Enclosure	Norm Pol	2 sec.	100	100	100	100	100	100
11	Leakage	Norm Pol, No L2	2 sec.	500	500	500	500	500	500
12	Current	Norm Pol, No Earth	2 sec.	500	500	500	N/A	N/A	N/A
13	uA	Rev Pol	2 sec.	100	100	100	100	100	100
14		Rev Pol, No L2	2 sec.	500	500	500	500	500	500
15		Rev Pol, No Earth	2 sec.	500	500	500	N/A	N/A	N/A
16	Patient	Norm Pol	2 sec.	100	100	10	100	100	10
17	Current	Norm Pol, No L2	2 sec.	500	500	50	500	500	50
18	uA	Norm Pol, No Earth	2 sec.	500	500	50	N/A	N/A	N/A
19		Rev Pol	2 sec.	100	100	10	100	100	10
20		Rev Pol, No L2	2 sec.	500	500	50	500	500	50
21		Rev Pol, No Earth	2 sec.	500	500	50	N/A	N/A	N/A
22		Mains on Ap Norm	2 sec.	N/A	5000	50	N/A	5000	50
23		Mains on Ap Rev.	2 sec.	N/A	5000	50	N/A	5000	50
24	Patient	Norm Pol	2 sec.	10	10	10	10	10	10
25	Auxiliary	Norm Pol, No L2	2 sec.	500	500	50	500	500	50
26	Current	Norm Pol, No Earth	2 sec.	500	500	50	N/A	N/A	N/A
27	uA	Rev Pol	2 sec.	10	10	10	10	10	10
28		Rev Pol, No L2	2 sec.	500	500	50	500	500	50
29		Rev Pol, No Earth	2 sec.	500	500	50	N/A	N/A	N/A

* 1 minute for step. ** The limit for Protective Earth Continuity is dependent upon the device under test: .2 ohms for devices with non-detachable power supply cord; .1 ohms for devices with an appliance inlet. *** Limits for Insulation Resistance are not specified in IEC 601.1. These limits are recommended and are based on older VDE 751 and IEC 62. **** N/A = not a valid test for selected class and type. These tests are not performed.

HEI-95 Test Limits for Auto and Step Tests

TEST NO.	TEST DESCRIPTION		TIME	LIMITING VALUES					
				Class I			Class II		
				B	BF	CF	B	BF	CF
2	Protective Earth Resistance			.2 ohms			N/A		
3	M ohms Insulation Resist.	Mains L1-L2-CASE		50	50	50	N/A	7	70
4	M ohms Insulation Resist.	ALL-CASE		N/A	50	50	50	5	50
6	Earth Leakage Current uA	Norm Pol		500	500	500	N/A	N/A	N/A
8	Earth Leakage Current uA	Rev Pol		500	500	500	N/A	N/A	N/A
10	Enclosure Leakage Current uA	Norm Pol		500	500	500	100	100	10
12	Enclosure Leakage Current uA	Norm Pol, No Earth		500	500	500	N/A	N/A	N/A
13	Enclosure Leakage Current uA	Rev Pol		500	500	500	100	100	10
15	Enclosure Leakage Current uA	Rev Pol, No Earth		500	500	500	N/A	N/A	N/A
16	Patient Leakage Current uA	Norm Pol		500	500	50	100	100	10
18	Patient Leakage Current uA	Norm Pol, No Earth		500	500	50	N/A	N/A	N/A
19	Patient Leakage Current uA	Rev Pol		500	500	50	100	100	10
21	Patient Leakage Current uA	Rev Pol, No Earth		500	500	50	N/A	N/A	N/A

Test Principal: Protective Earth Resistance

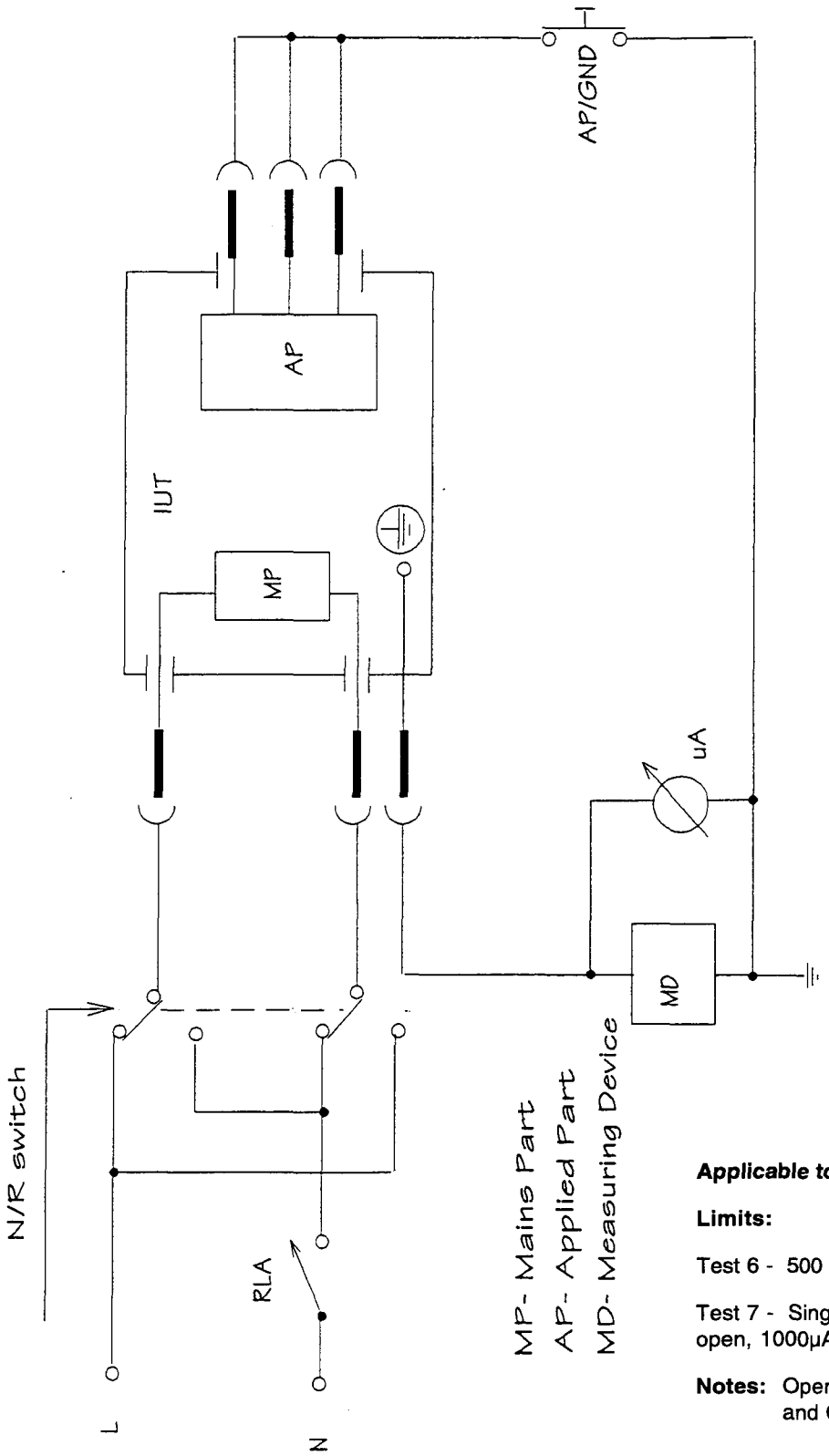


Applicable to: Class 1, Types B, BF and CF.

Limit: OR2, including the Mains Lead.

Notes: Press TEST to apply test current.
Probe all exposed metal parts on IUT.

Test Principle: Earth Leakage



Applicable to: Class I, Types B, BF and CF.

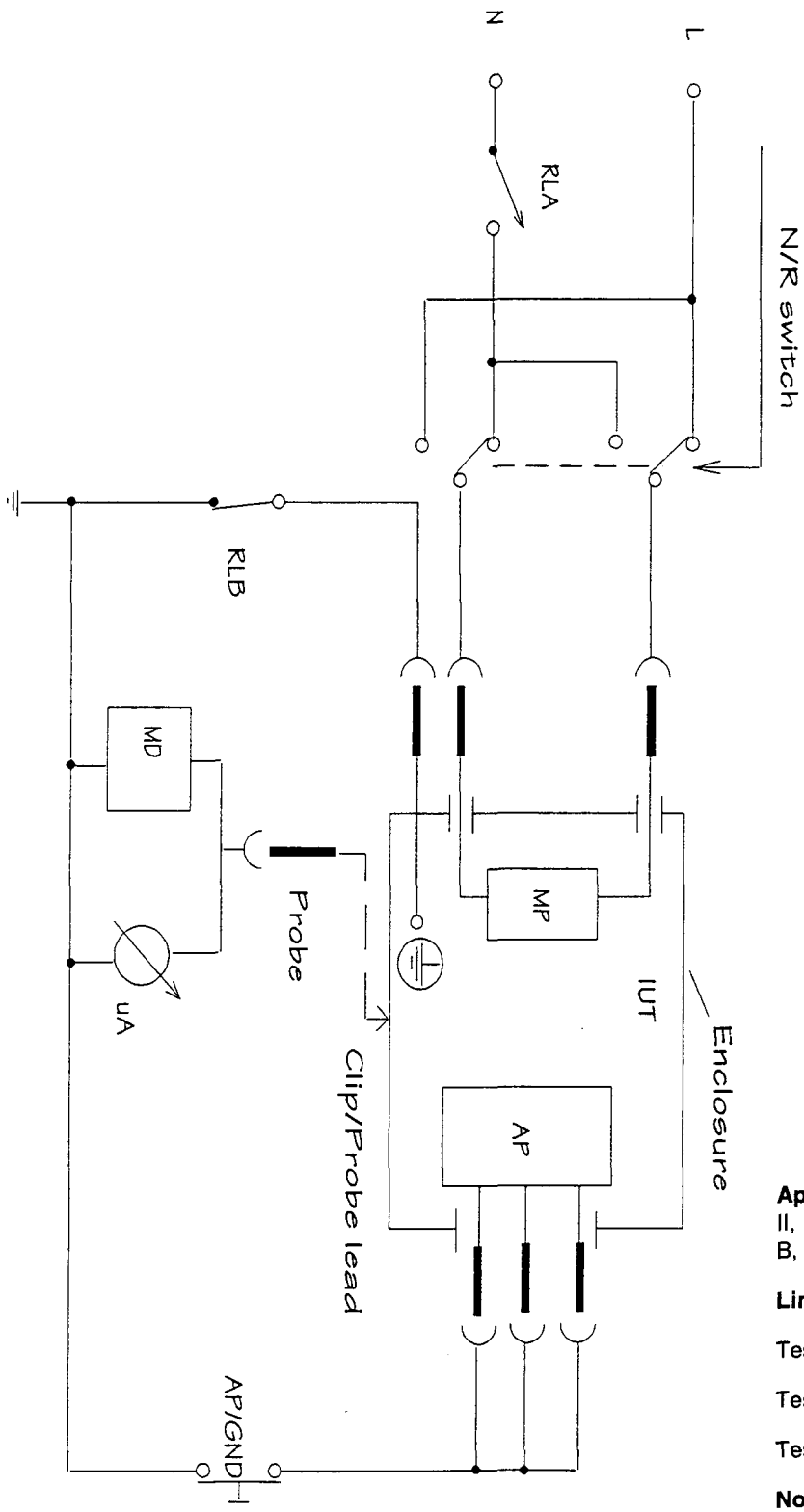
Limits:

Test 6 - 500 υA;

Test 7 - Single fault Condition (SFC) RLA open, 1000μA;

Notes: Operate AP/GND switch for BF and CF.

Test Principle: Enclosure Leakage Current



Applicable to: Tests 8 and 10; Classes I and II, Types B, BF and CF; Test 9: Class I, Types B, BF and CF.

Limits:

Test 8 - Types B, BF and CF 100 υA;

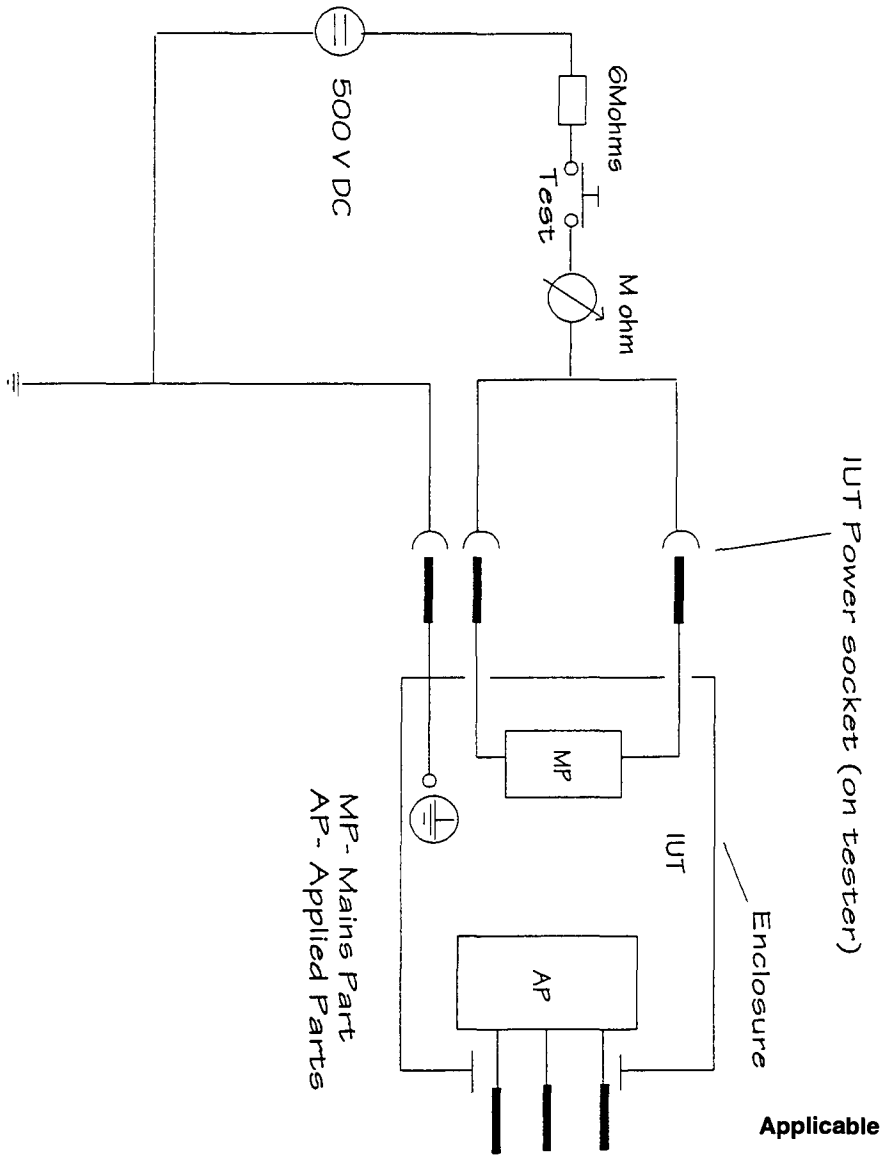
Test 9 - SFC (RLB open) all Types 500 μA;

Test 10 - SFC (RLA open) all Types 500 μA;

Notes: Operate N/R switch and AP/GND switch for BF and CF.

Probe exposed metal part.

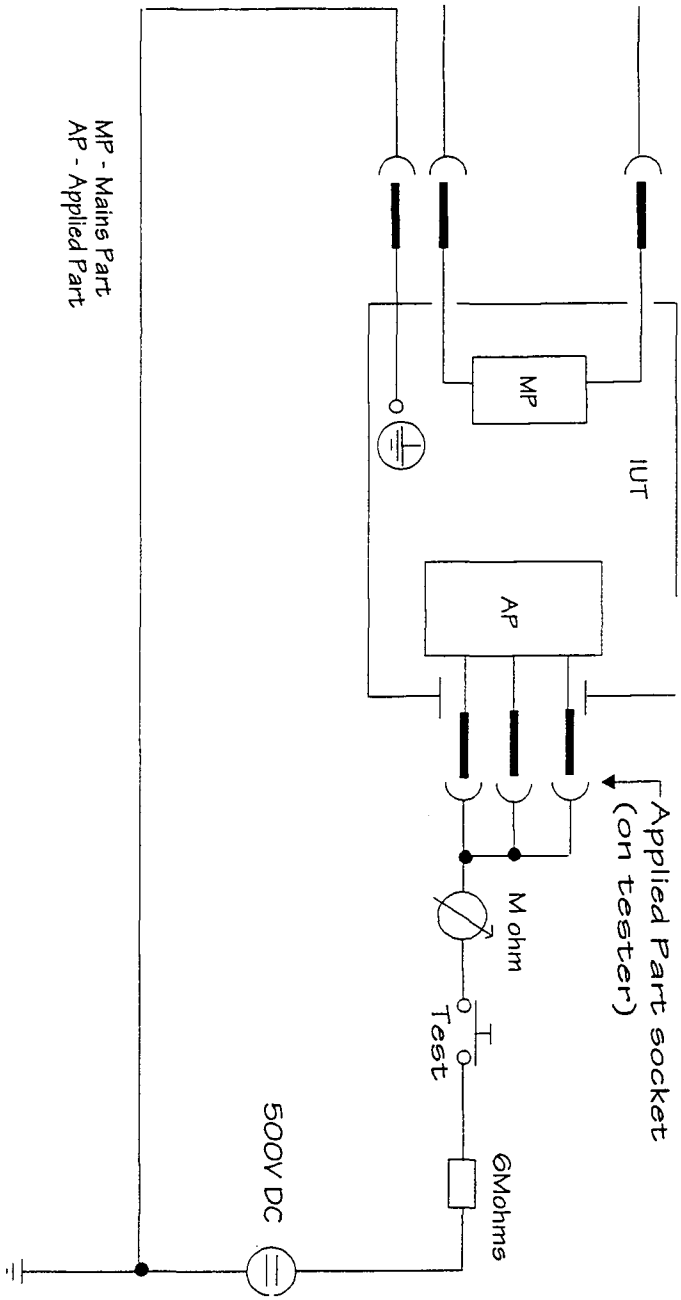
Test Principle: Insulation Resistance, Mains



Applicable to: Class I, Type B, BF and CF.

Note: Press TEST to apply test voltage.

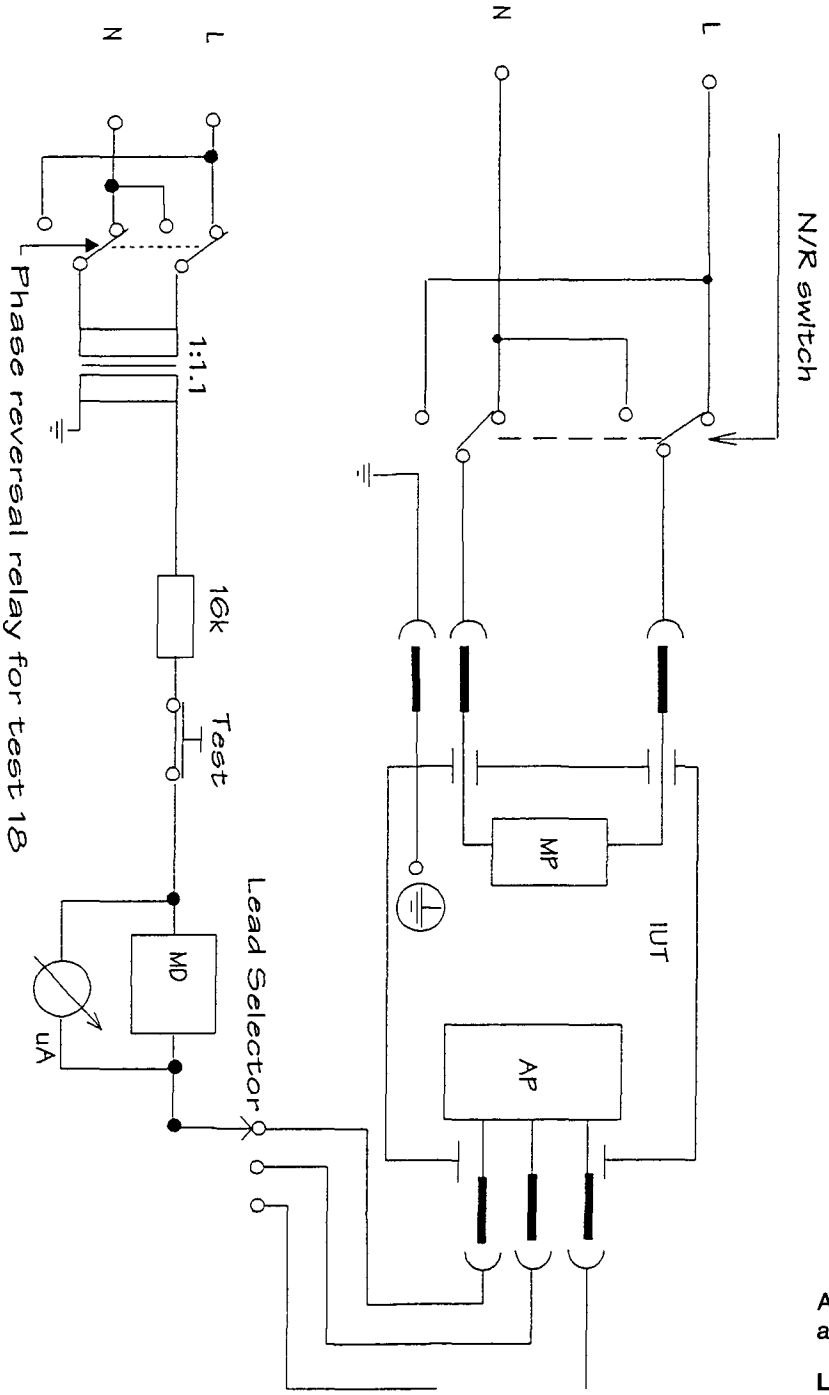
Test Principle: Insulation Resistance, Applied Part



Applicable to: Class I, Type BF and CF.

Note: Press TEST to apply test voltage.

Test Principle: Mains on Applied Part



Applicable to: Class Iand II, Types BF and CF.

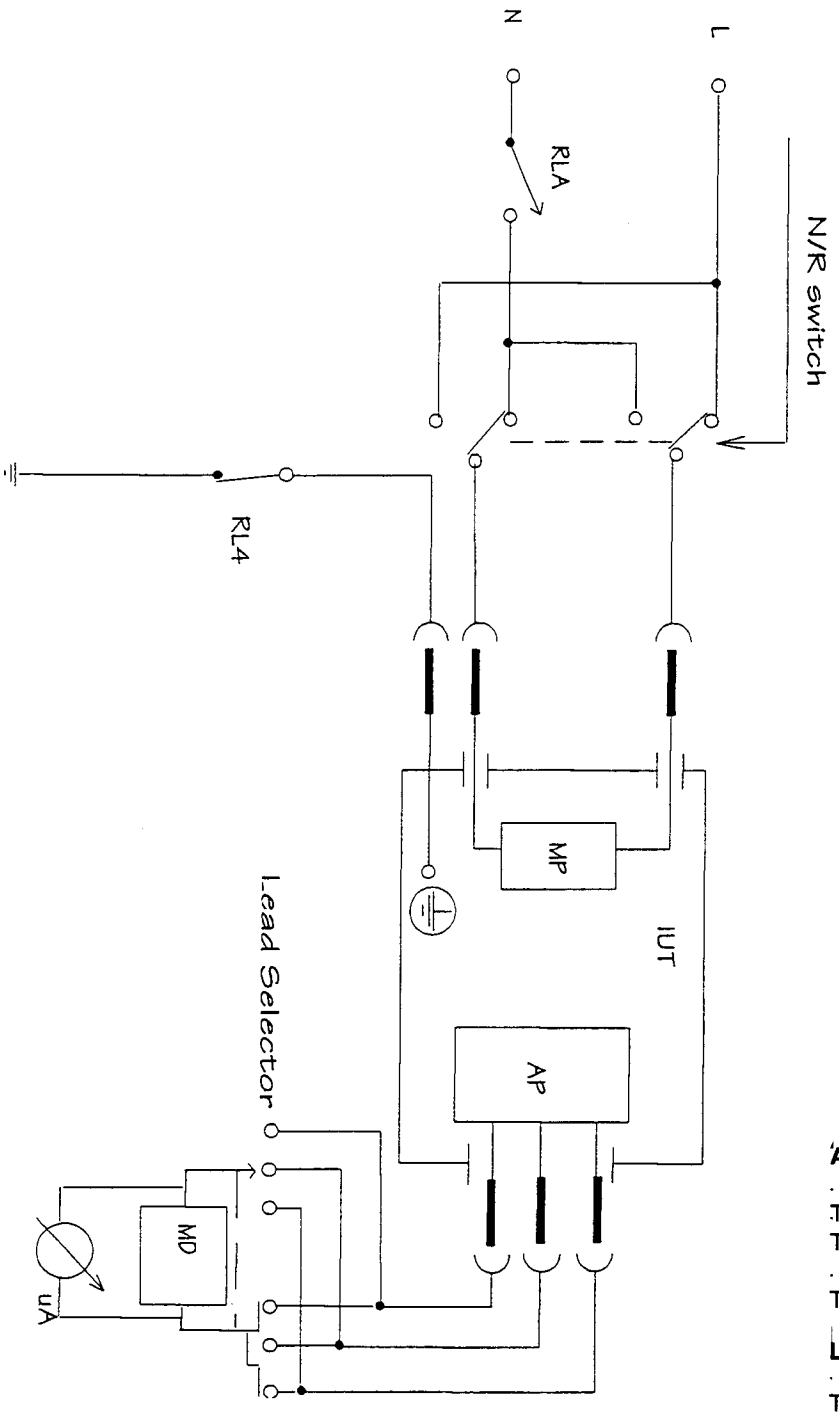
Limits:

Type BF 5000 µA;

Type CF 50 mA per part of the AP

Notes: Operate N/R switch.
Set Norm/Spec switch to Spec for Type CF.

Test Principle: Patient Auxiliary Current



Applicable to:

Tests 14 and 16, Classes I and II, Types BF and CF

Test 15, Class I, Types B, BF and CF

Limits:

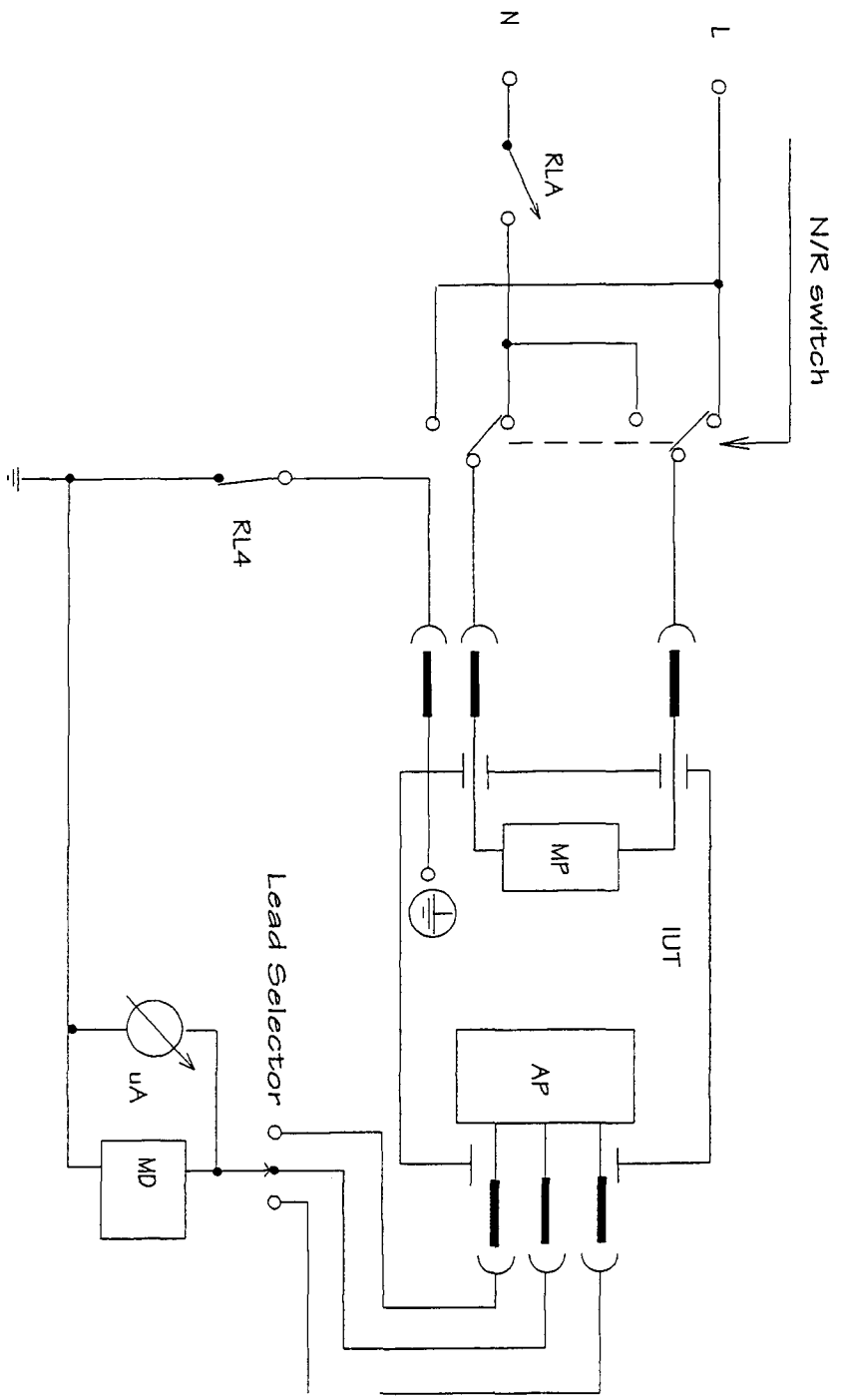
Test 14, Types B, BF and CF 10µA

Test 15, SFC (RL4 Open),
Types B and BF, 500µA
Type CF, 50µA

Test 16, SFC (RL1 Open)
Types B and BF, 500µA

Notes: Operate N/R switch.
Operate lead selector switch

Test Principle: Patient Leakage Current



Applicable to:

Tests 11 and 13, Classes I and II, Types B, BF and CF

Test 15, Class I, Types B, BF and CF

Limits:

Test 11, Types B and BF 100uA
Type CF 10µA per part of the AP

Test 12, Types B and BF 100µA
Type CF 50 µA per part of the AP

Test 13 as Test 12

Printing

7

Inside This Section

- Printing Test Records _____ 7-3
- Manual Mode _____ 7-3
- Adding a Heading _____ 7-4
- Auto Mode _____ 7-5
- Printing Saved Results _____ 7-7

Printing Test Records

The 601 Pro is equipped with a parallel printer port that allows the instrument to be connected to an external IBM compatible printer for full-format printing of test results. In addition, an optional built-in strip printer allows for simple documentation of test results.

Refer to the *Accessories* list in *Section 1* for information on ordering a D25M-C36M parallel printer cable for use with an external printer, or additional rolls of strip paper for the optional internal printer.

Printing can be performed during testing in Auto and Manual Modes. If an external printer is attached, and control numbers assigned to test records, a Summary Report of all data gathered during Auto Mode testing may be saved and printed at a later time.

Pressing the **Print** key sends a description of the present test and its associated measurement to the specified printer. The data may contain up to 24 characters for the optional internal printer and 80 characters for an attached external printer. Pressing the **Heading** key provides a "header" that the operator may use to enter the date, time and device information.

Manual Mode

During Manual Mode, printing is accomplished by simply pressing the **Print** key during the test.

Before printing, the operator must first decide whether the optional internal, or an external printer will be used, and enable the printer(s) prior to testing. To enable (or disable) printing:

- ❑ From the 601 Pro MAIN MENU, press the **More** key to access the ADDITIONAL OPTIONS menu:

```
ADDITIONAL OPTIONS: Use ARROWS and ENTER
Set Date/Time              COM1 setup
Select Test Standard     * Printer enable
Memory                     MORE...
```

❑ Use the ▲ ▼ Arrow keys to advance the starred cursor to the Printer Enable option.

❑ Press the **Enter** key to access the PRINTER ENABLE menu:

```
PRINTER ENABLE:
* INTERNAL:   ON
  EXTERNAL:   OFF
ARROWS to advance.  ENTER to change
```

❑ Use the ▲ ▼ Arrow keys to move the cursor to INTERNAL or EXTERNAL printer. Press the **Enter** key to toggle between ON and OFF.

❑ Press the **Esc** key to save the settings and return to the MAIN MENU.

✓ If the 601 Pro signals an error (3 beeps), the internal printer option is not installed.

Adding a Heading

Printing a header before the start of Manual Tests allows the test technician to log important information about the device to be tested. The Header contains the following information:

```
BIO-TEK INSTRUMENTS INC.
02-09-93
10:09:52
CONTROL#:_____
PROCEDURE ID:_____
LOCATION:_____
DEVICE TYPE:_____
MANUFACTURER:_____
SERIAL NUMBER:_____
TECHNICIAN:_____
CLASS: I TYPE: BF
```

Auto Mode

If Auto Modes testing is selected, either the internal or the external printer can be turned on in the AUTO MODES submenu. This setting temporarily overrides printer setup in Manual Mode.

To select the printer from any menu:

- ❑ Press the **Auto Modes** key to access the MODES menu:

```
MODE:      STANDARD: IEC 601
AUTO       * STEP
601 Pro ENTER to Select
Use ARROWS to Advance
```

- ❑ Use the ▲ ▼ Arrow keys to advance the starred cursor to either the AUTO or STEP mode option. Press **Enter** to select. The following menu will appear:

```
CLASS / TYPE 1 BF     PATIENT LEAKAGE: NONE
PRINT: INTERNAL TEST CURRENT: 10A
Press Associated 601PRO KEY for Toggle
601PRO ENTER to Continue
```

- ❑ Press the **Print** key to toggle between NO, INTERNAL and EXTERNAL printers.

What follows is an example of an Automatic or Step Mode printout to the internal printer. Printing to the external printer will give the same results in full format. A header is automatically placed before the test results:

BIO TEK INSTRUMENTS,INC
02-09-93
14:55:00
CONTROL#: 111-0062
PROCEDURE ID: DEFIBRILLATOR/MONIT
LOCATION: ICU
DEVICE TYPE: DEFIB/MON
MANUFACTURER: HP
SERIAL #: 030993
TECHNICIAN: STEVE
CLASS I, TYPE BF

IEC 601.1 TEST

MAINS VOLTAGE
L1-EARTH: 240.0 V
L2-EARTH: 000.0 V
L1-L2: 240.0 V

****

PROT. EARTH RESISTANCE:
TEST CURRENT: 10 A [OHM]
2.999F [.200]

****

INSUL. RESISTANCE [MOHM]
L1,L2-CASE 0.0F [20]

****

AP-INSULATION RESIST: [MOHM]
CASE-ALL 0.0F [20]

CURRENT CONSUMPTION
00.0 A

EARTH LEAKAGE CUR:		[uA]
NORM POL	0.00	[500]
NO L2(SFC)	0.00	[500]
REV POL	0.00	[500
NO L2(SFC)	0.00	[500]

ENCL. LEAKAGE	CUR:	[uA]
NORM POL	0.00	[500]
NO L2	0.00	[500]
NO EARTH	0.00	[500]
REV POL	0.00	[500]
NO L2	0.00	[500]
NO EARTH	0.00	[500]

PATIENT LEAKAGE CUR		[uA]
ALL-EARTH:		
NORM POL	0.00	[500]
NO L2	0.00	[500]
NO EARTH	0.00	[500]
REV POL	0.00	[500]
NO L2	0.00	[500]
NO EARTH	0.00	[500]

MAINS ON APP. PART:		[uA]
NORM POL	1	[5000]
REV POL	1	[5000]

PATIENT AUXILIARY CURRENT [uA]
NORM POL

RA-ALL	0.00F	[10]
RL-ALL	0.00F	[10]
LA-ALL	0.00F	[10]
LL-ALL	0.00F	[10]
V1-V6-ALL	0.00F	[10]

PATIENT AUXILIARY CURRENT [uA]
NORM POL, NO L2

RA-ALL	0.00	[500]
RL-ALL	0.00	[500]
LA-ALL	0.00	[500]
LL-ALL	0.00	[500]
V1-V6-ALL	0.00	[500]

PATEINT AUXILIARY CURRENT [uA]
NORM POL, NO EARTH

RA-ALL	0.00	[500]
LL-ALL	0.00	[500]
LA-ALL	0.00	[500]
LL-ALL	0.00	[500]
V1-V6-ALL	0.00	[500]

PATIENT AUXILIARY CURRENT [uA]
REV POL

RA-ALL	0.00	[10]
RL-ALL	0.00	[10]
LA-ALL	0.00	[10]
LL-ALL	0.00	[10]
V1-V6-ALL	0.00	[10]

COMMENTS:

UNIT PASSED SAFETY TEST
ELAPSED TIME: 00:10:00

Printing Saved Results

To print out complete test results that have been saved in memory using Control Numbers, refer to ***Section 5***, *Memory*.

Using a Barcode Reader

8

Inside This Section

- Checking the Barcode Installation _____ 8-3
- Barcode Configuration _____ 8-5

The Barcode Connection

A D-9 female connector is provided on the back of the 601 Pro, allowing the use of the optional Hewlett Packard SmartWand™ programmable contact barcode reader .The barcode wand can be used to enter device information, reducing the input time.

The HP SmartWand (HBCR-8300 general purpose) can be programmed to read Code 39, International 2/5, UPC/EAN, Codabar, Code 128, Code 11, and MSI code.

ProFile, Bio-Tek's Equipment Management Database can generate Code 39 barcodes.

Checking the Barcode Wand Installation

The 601 Pro's barcode option is installed at the factory. The barcode wand itself is optional. To verify that the barcode wand is connected properly:

- ❑ From the 601 Pro MAIN MENU, press the **More** key twice to access the second ADDITIONAL OPTIONS MENU:

```
ADDITIONAL OPTIONS: Use ARROWS and ENTER
*  System Status          PROGRAM Test
   MEMORY Test            Language
   Calibration Check          MORE...
```

- ❑ Use the ▲ ▼ Arrow keys to advance the starred cursor to the System Status menu item, and press **Enter**. A display similar to the following appears:

```
BATTERY OK:    YES     VER:      X.XX
INT. PRINTER:  ON      MEM:      256k
EXT. PRINTER:  ON      %AVAIL:   99.2
KEYBOARD:      YES     BARCODE:  YES
```

- ❑ If the barcode wand is installed and configured and programmed, the BARCODE line will read YES.

The wand must be programmed for the 601 Pro before it can be used. Program the wand from the 601 Pro Main Menu:

- ❑ Connect the HP SmartWand into the connector labeled with a barcode on the back of the 601 Pro.

- ❑ Power up the 601 Pro. During programming the 601 Pro Main Menu will be displayed.

- ❑ Use the barcode labels on the following pages to program the HP Smartwand to operate with the 601 Pro. Scan each barcode in the order given. The 601 Pro will beep when a barcode is accepted.

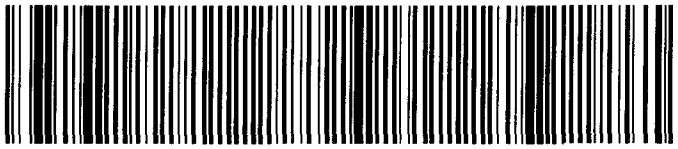
- ❑ Use the barcode wand to enter information in any open field (i.e. Control #, Device Type, Manufacturer) during Auto Modes. A display similar to the following will prompt for information:

```
* CONTROL #:
---------- AUTOMATIC MODE ----------
Use 0-9, Barcode, or Ext. Keyboard
601PRO ENTER to Start, Arrows to Advance
```

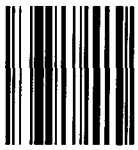
Barcode Configuration

Use the following barcode labels to program the HP SmartWand to operate with the 601 Pro. Scan the labels in the order given.

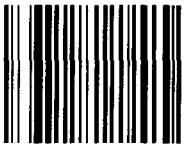
1. Default Configuration



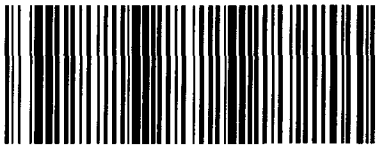
2. Enter Configuration



3. Code 39 Full ASCII Conversion

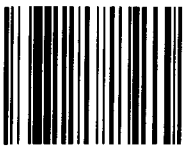


4. 2400 Baud

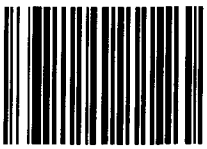


5. Intercharacter Delay

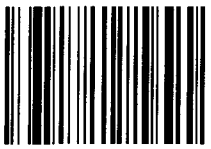
Enable



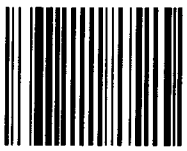
Delay Period



30



6. Exit Configuration



Computer Control

9

Inside This Section

- Computer Control _____ 9-1
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  - Getting Started _____ 9-4
  - Command Protocol _____ 9-4
  - Results _____ 9-5

- Computer Control Commands _____ 9-3
  - Requirements: _____ 9-3
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- Ending the Communications Session _____ 9-12

Computer Control

The 601 Pro can be remotely operated by a host computer. The operator runs all tests normally accessible from the 601 Pro's front panel by sending the appropriate command from the computer to the 601 Pro. The 601 Pro then sends the test results / measurements back to the host computer where they may be saved in a file.

The 601 Pro is linked to the host computer using a standard D9F-D9F serial cable. One end of the serial cable is connected to the 601 Pro's bi-directional RS232 port. The other end is connected to the computer's serial port. Commands are then sent from the host computer to activate front panel functions on the 601 Pro.

Requirements:

- The host computer must have an available serial port;
- Communications software, such as *ProComm, CrossTalk, Kermit,* or *Carbon Copy or Otis* must be loaded on the host computer;
- The host computer and the 601 Pro both must be set to the **same** communications parameters (i.e. 2400 Baud, No Parity, 8 Data Bits and 1 Stop Bits.
  - ✓ Communication parameters for the 601 Pro are set by pressing the **More** key to access the ADDITIONAL OPTIONS MENU, then selecting the COM1 Setup option.
  - ✓ Communication parameters for the host computer are set up within the specific software program used.
- A 9-pin female to 9-pin female D-type connector (available from Bio-Tek or an electronics supply outlet) must be attached to the computer and the 601 Pro.

Getting Started

- ❑ Power down the host computer and the 601 Pro. Connect both units with the serial cable.

  The computer's serial port connector, located on the back of the system, should be labeled COM1.

  The 601 Pro's serial port (RS232) is located on the back of the unit, and is labeled: **I O I O I**

- ❑ Power up the 601 Pro:

  - ✓ Select the **test standard** (IEC 601-1 / VDE 751.1 / HEI).
  - ✓ Check **COM1 Setup** / communication parameters.
  - ✓ Return to the MAIN MENU.

- ❑ Power up the host computer:

  - ✓ Start the communications software program.
  - ✓ Check the **COM1 Setup** / communication parameters. For detailed information, refer to the program's user's manual.
  - ✓ Prepare to issue a command to the 601 Pro by sending the opening **[** of the first command (see command protocol below).

Command Protocol

Communications are established by sending a Command Message from the host computer to the 601 Pro while the 601 Pro is displaying its MAIN MENU.

Command Messages, which can be up to five characters long (including the beginning and ending bracket), use the following format:

[XXX] where **[** = start of command message

X = command character

] = end of command message

* All command characters are in Capital Letters, small case letters will not be recognized.

When a valid command is received by the 601 Pro, computer control is established and the 601 Pro displays the following screen:

```
601 Pro Computer Control Mode
ESC to EXIT Computer Control
Command: (last message)
Result:  (last result)
```

Results

601 Pro test results are automatically sent to the host computer at the completion of each test requested. Each test runs until a result is determined, whether it is a valid result or a failure.

Measurement results are transmitted to the host computer using the following format:

NNNN.DDD<CR>

NNNN	= ranges from 0 - 9999
DDD	= ranges from 0 - 999
<CR>	= end of result

Messages can be of variable length and are separated by a <CR>.

Outlet Control

COMMAND	DESCRIPTION	NOTES
[RPL]	Reverse Polarity	These commands automatically turn the DUT outlet ON
[NPL]	Normal Polarity	OUTLET must be ON prior to calling. If OUTLET is OFF, 601PRO will three beep
[CER]	Closed Earth	
[OER]	Open Earth	
[CL2]	Closed L2	
[OL2]	Open L2	
[ON]	DUT Outlet ON	The DUT [ON] command will always set the outlet to Normal Polarity, Closed L2, Closed Earth
[OFF]	DUT Outlet OFF	

Voltage (IEC 601-1 / VDE 751-1/ HEI 95)

COMMAND	DESCRIPTION	NOTES
[VL1]	Voltage II - Earth	DUT outlet is always OFF and remains OFF.
[VL2]	Voltage L2-Earth	
[V12]	Voltage L1-L2	
DUAL MODE MEASUREMENT		
[DLV]	Dual Lead Voltage	The DUT outlet must be manually set ON and remains ON after completion. If outlet is OFF 601PRO will three beep and send -1.0.

Current (IEC 601.1/ VDE 751.1/ HEI 95)

COMMAND	DESCRIPTION	NOTES
[CUR]	Current Consumption	The DUT outlet must be manually set ON and remain ON after completion. If outlet is OFF 601PRO will three beep and send -1.0.

Insulation Resistance (7 Tests)

COMMAND	DESCRIPTION	NOTES
[IMN]	Mains-Case	The 601 PRo will beep @ 2Hz during Insulation Resistance.
[IAL]	ALL-Case	
[IRA]	RA-Case	The DUT outlet is always OFF and remains OFF after completion.
[IRL]	RL-Case	
[ILA]	LA-Case	
[ILL]	LL-Case	
[IVI]	V1-V6-Case	

Earth Resistance (IEC 601-1 / VDE 751-1)

COMMAND	DESCRIPTION	NOTES
[PEC]	Earth Resistance	DUT outlet is always OFF and remains OFF after completion.
[CAL]	Calibration	
[S01]	Select 1 Amp	
[S10]	Select 10 Amp	

Leakage Current (IEC 601-1) (6 Tests Total)

COMMAND	DESCRIPTION	NOTES
[ENC]	Enclosure No AP-GND	The DUT outlet must be manually set ON and remain ON after completion. If outlet is OFF, 601PRO will three beep and send -1.0.
[ENA]	Enclosure AP-GND	
[ERT]	Earth No AP-GND	
[ERA]	Earth AP-GND	
Leakage Current (VDE 751.1)		
[EDL]	Equiv. Device Leak	
DUAL Mode Measurements		
[DLL]	Dual Lead Leakage	

Patient Leakage (IEC 601.1)

COMMAND	DESCRIPTION	NOTES
[PAL]	Pat. Leakage ALL-EARTH	The DUT outlet must be manually set ON and remain ON after completion. If outlet is OFF, 601PRO will three beep and send -1.0.
[PRA]	Pat. Leakage RA-EARTH	
[PRL]	Pat. Leakage RL-EARTH	
[PLA]	Pat. Leakage LA-EARTH	
[PLL]	Pat. Leakage LL-EARTH	
[PVI]	Pat. Leakage V1-V6-EARTH	

Auxiliary Current

COMMAND	DESCRIPTION	NOTES
[ARA]	Aux. Leakage RA-ALL	The DUT outlet must be manually set ON and remain ON after completion. If outlet is OFF, 601PRO will three beep and send -1.0.
[ARL]	Aux. Leakage RL-ALL	
[ALA]	Aux. Leakage LA-ALL	
[ALL]	Aux. Leakage LL-ALL	
[AVI]	Aux. Leakage V1-V6-EARTH	

Auxiliary Current (VDE 751.1)

[EPL]	Equivalent Leakage

Mains on Applied Parts (110% of mains) (IEC 601-1) (6 Tests)

COMMAND	DESCRIPTION	NOTES
[MAL]	Mains ALL-EARTH	The DUT outlet must be manually set ON and remain ON after completion. If outlet is OFF, 601PRO will three beep and send -1.0. The 601 Pro will beep @ 2Hz during Mains-on Applied Test.
[MRA]	Mains RA-EARTH	
[MRL]	Mains RL-EARTH	
[MLA]	Mains LA-EARTH	
[MLL]	Mains LL-EARTH	
[MVI]	Mains V1-V6-EARTH	
[RAL]	Rev Mains ALL-EARTH	
[RRA]	Rev Mains RA-EARTH	
[RRL]	Rev Mains RL-EARTH	
[RLA]	Rev Mains LA-EARTH	
[RLL]	Rev Mains LL-EARTH	
[RVI]	Rev Mains V1-V6-EARTH	

Calibration Check

COMMAND	DESCRIPTION	NOTES
[CHK]	Calibration Check	Returns "PASS*" or "FAIL*" for each test: RESIST, LEAKAGE. i.e. "PASS*FAIL* refers to RESIST passed, LEAKAGE failed.

ECG/Performance Waves

COMMAND	DESCRIPTION	NOTES
[W02]	ECG 60	
[W03]	ECG 120	
[W04	ECG 180	
[W05]	ECG 240	
[W06]	Pulse 30 BPM	
[W07]	Pulse 60 BPM	
[W08]	Square wave 0.125 Hz	
[W09]	Square wave 2 Hz	
[W10]	Sin 10	
[W11]	Sin 40	
[W12]	Sin 50	
[W13]	Sin 60	
[W14]	Sin 100	
[W15]	Triangle 2 Hz	
[W16]	ARB	
[W17]	ARLUT	
[W18]	ATACH	
[W19]	PVC 1	
[W20]	RUN	
[W21]	R on T	
[W22]	IDIO	
[W23]	VTACH	
[W24]	VRB	
[WSP]	Stop Waveform Output	

Barcode Operation

COMMAND	DESCRIPTION	NOTES
[GBS]	Get Barcode String	601 Pro will halt until a string is wanded successfully. Returns string with end terminator i.e. "Hello World*". The DUT outlet is NOT altered.

Additional Commands

COMMAND	DESCRIPTION	NOTES
[RET] or [R]	Return Last Result	
[VER]	Version of 601 Pro	
[MCL]	Mains on AP CAL	
[BAT]	Battery Status	
[KBD]	External Keyboard Option	
[RAM]	Amount of RAM installed	
[AVL]	Percent RAM available	
[BAR]	Barcode Attached	
[EER]	EEPROM re-initialized	Resets COM parameters to 2400, N, 8, 1.
[PRI]	Print Header	Internal Printer
[PRE]	Print Header	External Printer

Ending the Communications Session

Use the following commands to quit or abort the communications session.

Quit / Abort Session

COMMAND	DESCRIPTION	NOTES
[QUI] or [Q]	Quit COM Session	Upon Valid reception of the quit/abort commands, the DUT outlet is turned OFF, and the outlet status is set to Normal Polarity, Closed L2, Closed Earth, and all ECG waveform generation are terminated.
[ACS]	Abort COM Session	

Transferring Data to a Computer

10

Inside This Section

- PC Transfer Protocol _____ 10-3
  - Requirements _____ 10-3
  - Protocols Supported _____ 10-3
  - Using the PCXFER Utility Program _____ 10-3
  - Hardware Setup _____ 10-4
  - Software Setup _____ 10-4
  - Output File Format _____ 10-6
  - Sample Output File _____ 10-7

PC Transfer Protocol

The software utility program PC601XFR.EXE allows the transfer of stored test records from the 601 Pro to any connected PC computer. The PC transfer utility program is available from Bio-Tek Instruments (P/N 6020504).

Requirements

- IBM PC-AT or 100% compatible computer
- MS-DOS® or PC-DOS ® version 3.30 or later
- Bio-Tek serial cable (P/N 6020503 (included with PC transfer utility program)

  or

  9- to 25-pin RS232 bi-directional serial cable
- NULL Modem device (25 pin to 25 pin

  connectors, or

  9- to 25-pin Null Modem with gender switch

  connector)

Protocols Supported

- **COM Ports:** COM 1 or 2
- **Baud Rates:** 300, 600, 1200, 2400, 9600
- **Stop Bits:** 1, 2
- **Parity:** Even, Odd, None
- **Data Bits:** 7 or 8

Using the PC601XFR Utility Program

Use the following instructions to transfer data files from the 601 Pro to a connected Personal Computer.

Hardware Setup

- ❑ Power off your computer system and the 601 Pro.

  Attach one end of the 601 Pro serial cable (or the 9-pin end of an RS232 bi-directional 9- to 25-pin serial cable) to the 9-pin connector labeled **I O I O I** on the back panel of the 601 Pro.

- ❑ If you are using the supplied serial cable, attach the other end of the cable to the COM1 or COM2 port on the computer.

  Or:

  If not using the supplied cable, attach the 25-pin end of the bi-directional serial cable to a NULL modem device (changes Pins 2/3 — transmit/receive).

  Then attach the other end of the NULL Modem to either the COM 1 or COM 2 port on your computer.

- ❑ Power up the computer and the 601 Pro.

- ❑ Check the 601 Pro's COM1 Setup. (Press the **More** key twice, select COM1 Setup menu item from the ADDITIONAL OPTIONS menu.) You will need to remember these settings when you run the utility program on the PC.

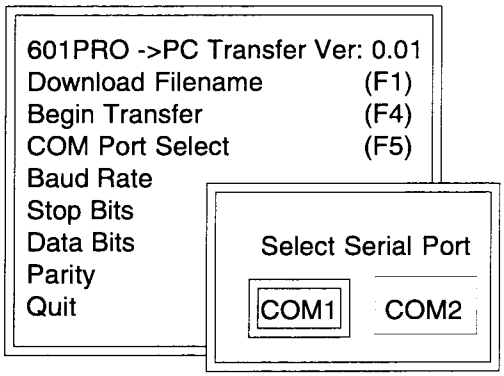
Software Setup

- ❑ Place the disk containing the PC601XFR.EXE program in the computer's floppy drive A: or B:.

  Change to the appropriate drive and execute the program by keying in at the DOS prompt:

  ```
  PC601XFR
  ```

The opening menu will appear.



Default Settings: COM1, 2400, N, 8,1
Download filename: 601Pro.xfr

- ❑ **Download Filename:** Select a name for the 601Pro data file to be transferred, or use the default filename, `601pro.xfr`

- ❑ **COM Port Select, Baud Rate, etc.:** Use the ▲ ▼ Arrow keys on the PC to set the COM Port, Baud Rate, Stop Bits, Data Bits and Parity parameters to match the settings of the 601 Pro.

  Use the ▲ ▼ Arrow keys on the computer to toggle between setting options. The selected option will be contained in a double-lined box. Press ← Enter to save your choice.

☛ **Note:** *The default settings are listed on the display.*

- ❑ **Begin Transfer.** Select this menu item first to start the data transfer process. The **Begin Transfer** function remains in a wait state until data is received from the 601 Pro.

- ❑ Now set up the 601 Pro for data transfer.

  Press the **More** key on the 601 Pro to access the ADDITIONAL OPTIONS menu. Ensure that the Memory menu item is selected (marked with an asterisk). If it is not selected, use the 601 Pro's ▲ ▼ Arrow keys to select MEMORY, then press the **Enter** key on the 601 Pro.

- ❑ Data transfer begins, and a progress bar is activated on the PC display.

☛ **Note:** *If data transfer is unsuccessful (i.e. a communications*

parameter is incorrect), the "progress bar" on the PC screen will stall and repeat until the error is rectified.

- ❑ At the completion of data transfer an output file is generated (default name **`601pro.xfr`** unless you provided another name) in a standard ASCII format.

☛ **Note:** *If the PC601XFR program is run from a floppy disk, the ASCII output file will be stored on the floppy disk unless another path (hard disk drive/directory) is provided.*

- ❑ If you wish to print the output the file, use the printer configured with your database or word processing program to print the output file.

Output File Format

The ASCII output file generated during the data transfer procudure will have the following format:

The first line item is the header:

```
BIO-TEK INSTRUMENTS, INC.
```

The remainder of the information pertains to test results, with results fields delimited by commas. The **P/F/N** designation refers to **P**ass/ **F**ailure or test **N**ot Performed. The individual safety tests are represented by numbers in the first field of each line, and are described in parentheses.

601 Pro fields left blank at the time of test will appear as a blank line. (Control / Line Feed <CTR> <LF>)

A sample output file is reproduced on the following pages.

Sample Output File

```
Month of test
Day of test
Year of test
Hour test performed
Minute test performed
Technician name
Control Number
Procedure ID
Work Order
Location
Device
Manufacturer
Class of test
Type of test
Test Standard Used
Test Current Selected
Leads 0/5 (All/None)
100,result          (Voltage L1-Earth)
101,result          (Voltage L2-Earth)
102,result          (Voltage L1-L2;
150,result,P/F/N    (Earth Continuity)
200,result,P/F      (Insulation Resistance)
201,result,P/F      (Insulation Resistance AP)
250,result          (Current Consumption)
300,result,P/F/N    (Earth Leakage Normal)
301,result,P/F/N    (Earth Leakage No L2)
302,resu:t,P/F/N    (Earth Leakage Rev Pol)
303,result,P/F/N    (Earth Leakage Rev No L2)
350,result,P/F/N    (Enclosure Leak Normal)
351,result,P/F/N    (Enclosure Leak No L2)
352,result,P/F/N    (Enclosure Leak No Earth)
353,result,P/F/N    (Enclosure Leak Rev Pol)
354,result,P/F/N    (Enclosure Leak Rev No L2)
355,result,P/F/N    (Enclosure Leak Rev No Earth)
405,result,P/F/N    (Patient Leak Normal
415,result,P/F/N    (Patient Leak No L2)
425,result,P/F/N    (Patient Leak No Earth)
435,result,P/F/N    (Patient Leak Rev Pol)
445,result.P/F/N    (Patient Leak Rev No 12)
455,result,P/F/N    (Patient Leak Rev No Earth)
465,result,P/F/N    (Mains on Applied Part Normal)
475,result,P/F/N    (Mains on Applied Part Rev)
500,result,P/F/N    (Pat Aux Leak Normal RA-ALL)
501,result,P/F/N    (Pat Aux Leak Normal RL-ALL)
502,result,P/F/N    (Pat Aux Leak Normal LA-ALL)
503,result,P/F/N    (Pat Aux Leak Normal LL-ALL)
504,result,P/F/N    (Pat Aux Leak Normal VI-ALL)
510,result,P/F/N    (Pat Aux Leak No L2 RA-ALL)
```

```
511,result,P/F/N     (Pat Aux Leak No L2 RL-ALL)
512,result,P/F/N     (Pat Aux Leak No L2 LA-ALL)
513,result,P/F/N     (Pat Aux Leak No L2 LL-ALL)

514,result,P/F/N    (Pat Aux Leak No L2 VI-ALL)
520,result,P/F/N    (Pat Aux Leak No Earth RA-ALL)
521,result,P/F/N    (Pat Aux Leak No Earth RL-ALL)
522,result,P/F/N    (Pat Aux Leak No Earth LA-ALL)
523,result,P/F/N    (Pat Aux Leak No Earth LL-ALL)
524,result,P/F/N    (Pat Aux Leak No Earth V1-ALL)
530,result,P/F/N    (Pat Aux Leak Rev Pol RA-ALL)
531,result,P/F/N    (Pat Aux Leak Rev Pol RL-ALL)
532,result,P/F/N    (Pat Aux Leak Rev Pol LA-ALL)
533, result, P/F/N (Pat Aux Leak Rev Pol LL-ALL)
534, result, P/F/N (Pat Aux Leak Rev Pol V1-ALL)
540, result, P/F/N (Pat Aux Leak Rev NoL2 RA-ALL)
541, result, P/F/N (Pat Aux Leak Rev NoL2 RL-ALL)
542, result, P/F/N (Pat Aux Leak Rev NoL2 LA-ALL)
543, result, P/F/N (Pat Aux Leak Rev NoL2 LL-ALL)
544, result, P/F/N (Pat Aux Leak Rev NoL2 V1-ALL)
550, result, P/F/N (Pat Ax Lk Rev NoL2 RA-ALL)
551, result, P/F/N (Pat Ax Lk Rev NoEarth RL-ALL)
552, result, P/F/N (Pat Ax Lk Rev NoEarth LA-ALL)
553, result, P/F/N (Pat Ax Lk Rev NoEarth LL-ALL)
554, result, P/F/N (Pat Ax Lk Rev NoEarth V1-ALL)
PASS/FAIL        (Overall Test Result)
[EOP]
[EPU]
Comments         (Comments Field)
[EOC]
Elapsed Time     (Hour:minutes:seconds)
[EOR]
```

Figure 10-1: *Sample Output File*

The remainder of the records will have the same format as illustrated above. As the last record is received, and End of Session marker **[EOS]** will be placed by the transfer file.

VDE 751.1 tests will use the following fields:

```
300,result,P/F/N    (VDE Equiv Device Leak)
405,result,P/F/N    (VDE Equiv Patient Leak)
```

Troubleshooting & Service

11

Inside This Section

- Error Codes _____ 11-3
- Troubleshooting _____ 11-5
- Service _____ 11-7

Error Messages

The tables that follow list error messages that can occur during operation of the 601 Pro, and a brief description of their meaning.

Power Up

ERROR MESSAGE	ACTION
Insulation Voltage <500V	Check fuse 2 and fuse 3 (100mA) located on Analog board, mounted on top panel.
RAM Failure	Replace RAM with new memory cartridge and re-run the Memory test until the unit passes to clear error messages.
Transformer Configuration	If powering up at 115 V with transformer selected for 230 V AC, Then: 1. Transfer all records so they are not lost; 2. Power off the 601 Pro; 3. Remove the memory cartridge; 4. Set switch located on the board to 115V. If powering up at 230V with transformer selected at 115V AC, set the switch for 230V AC and inspect fuse 2 and 3 on the top board. Replace if necessary and F1 and F2 on back of 601 PRO.
Mains Voltage Too High	Outlet voltage too high for the 601 Pro.
Mains Voltage Too Low	Outlet voltage too low for 601Pro.
Memory Full: Transmit	Before continuing, transmit saved test data to assure integrity.
Delay for Opening Screen	Perform system status to verify keyboard option. If "FAIL", see "FAIL" keyboard.

System Status

ERROR MESSAGE	ACTION
FAIL Keyboard	If option is installed, return for service. If option not installed, dip switch may be set incorrectly.
FAIL Barcode	Ensure the HBCR wand (or compatible barcode device) is installed correctly. If the problem remains uncorrected, try reconfiguring at the Main Menu, using scan codes in the Barcode section of this manual.

Other Errors

ERROR MESSAGE	ACTION
Measurement Error	Measurement Error may occur at various tests as follows: Power-up Error Message: Check F2 and F3 (100mA) on 6020400 (Analog PCB Assembly) Protective Earth Resistance: Check F2 and F3 (100mA) on 6020400 (Analog PCB Assembly) Check 400mA Fuses on back panel (Protective Earth Fuses) During Start of AUTO/STEP: Check F2 and F3 (100mA) on 6020400 (Analog PCB Assembly)
Check Printers!	Any screen. 601PRO is unable to access internal or external printers. External: Check line, cables, connectors, paper; Inernal: Check paper. Press ENTER to continue after printer problem solved.

Computer Control

ERROR MESSAGE	ACTION
601PRO not accepting a string of commands and/or three beeping during communication	Make use there is an inter-character delay of 10ms minimum between characters sent from communications software.

Troubleshooting

Before calling Bio-Tek Technical Service for assistance, please fill out the Troubleshooting Report in Appendix C.

Mail or FAX the form to: Service Department, Bio-Tek Instruments, Inc., Highland Park, Box 998, Winooski, VT. 05404-0998.
FAX: (802) 655-3399.

Service

If repairs are required, the 601 Pro should be returned to the factory or Service Center.

Before returning the 601 Pro for factory service, contact Bio-Tek's Service Department for a Return Authorization Number.

Phone: **(800) 242-4685**
(802) 655-4044 Ext. 298
Fax: **(802) 655-3399**
Telex: **94-0136 BIOTEK SHVT**

The Bio-Tek Technical Assistance Center may be contacted between the hours of 8:30 a.m. to 5:00 p.m. Eastern Standard Time, Monday through Friday, except holidays.

Then:

- Pack the unit carefully
- Enclose your return address and Return Authorization Number
- Insure the unit for full retail value and ship to:

Bio-Tek Instruments, Inc.

Service Department
Highland Industrial Park, Box 998
Winooski, VT 05404-0998
USA

or

Adquipment Medical B.V.

Giessenweg 1
P.O. Box 10043
3004 AA Rotterdam
Netherlands

Tel: (31) 10-4158211
Fax: (31) 10-4157727

Bio-Tek's Electronic Bulletin Board

If you have a computer, modem and communications software, you may also receive Technical Assitance by logging onto Bio-Tek's Technical Assistance Center bulletin board.

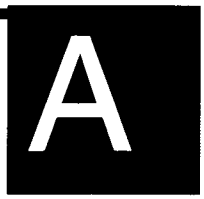
Set your modem communications parameters to 2400 baud, 8 data bits, no parity, 1 stop bit. Speeds up to 9600 baud, dual standard, are supported. Follow the on-screen instructions and leave your questions or comments in private EMAIL to the Sysop for the support staff to process. The BBS number is:

(802) 655-4107

You may be asked to provide the following information:

- Product name and serial number;
- Product version number;
- The specific steps which reproduce the problem;
- A daytime phone number where you can be contacted;
- Computer brand and model;
- The contents of your computer system's AUTOEXEC.BAT and CONFIG.SYS files.

Appendix



Inside

- 601 Pro Specifications

Environmental

Operating Temp:	10^0- 40^0 C (50^o- 104^0 F)
Storage Temp:	-25^0- 50^0 C (-13^0- 122^0 F)
Humidity:	90% Non-Condensing
Voltage:	120/240 Volts 50/60Hz, Factory Selectable
Operating Voltage Range:	120 (90-135) 240 (195-255)
Front Panel Receptacle:	15 Amps @ 120V 15 Amps 1/2 HP Max @ 240V

Leakage Current

Microamps:	0-100.0uA, 100-1000uA, 1000-9995uA, True RMS
Accuracy (per IEC 601-1 filter):	
	DC-1kHz +/-1% of scale +/- 1LSD 1K-100K +/-2.5% of scale +/- 1LSD 100kHz-1MHz +/- 5% of scale +/- 1LSD.
Input Impedance:	IEC 601-1
Freq. Response:	DC-1MHz per IEC 601, VDE 751.1 Equivalent Device Leakage Current.
Accuracy:	Same as mains on applied part.
Single Lead:	Between Red Jack and Receptacle Earth.
Dual Lead:	Between Red Jack and Black Jack.

Equivalent Device Leakage (VDE 751.1)

Ranges/Accuracy:	0-1mA +/- 2% FSO +/- 1 LSD 1mA-10mA +/- 2% FSO +/- 1 LSD

Equivalent Patient Leakage (VDE 751.1)

Range/Accuracy:	0-200µA +/- 2% FSO +/- 1LSD 200-1000µA +/- 2% FSO +/- 1LSD 1mA-10mA +/- 2% FSO +/- 1LSD

Voltage / Dual Lead Voltage

Volts:	0-200mV, 200m[illegible] 200V, 200[illegible]
Accuracy :	[illegible]
Single Lead:	
Dual Lead:	
	[illegible] be
Input Impedance:	> 0.[illegible]

Patient Lead Leakage

Patient Lead Leakage Measurements:

A. Each patient electrode to earth
B. Between any lead and all others
C. From all patient electrodes in common to earth

Patient Leakage Current: Same as Leakage Current specifications.

Frequency Response: Same as Leakage Current specifications.

Earth Resistance

Selectable test current for 1 A or 10.8A at no more than 6V RMS for line voltage at 115/230 +/- 10%. Measured using a two lead technique using an autozero feature for lead resistance compensation.

Ranges/Accuracy:	0-.225 Ohm +/- 2% FSO +/- 1LSD (10.8A source) 0-3 Ohm +/- 2% FSO +/- 1LSD (1A source)
Max Lead Resistance:	.10 Ohm

Single lead measurement to be taken between one test lead and the receptacle Earth.

Current Source:	10.8 A +/- 5% 0-.225 Ohm, 1 A +/- 5% 0-3 Ohm

Mains on Applied Part

Ranges:	0-200µA, 100-1000µA, 1000-9995µA
Freq. Response:	Same as Leakage current
Accuracy:	+/- 2% of scale +/- 1LSD
Applied Voltage:	≥110% of mains through a 16.8K Ohm limiting resistor

Measurement taken between applied part and EARTH.

Insulation Resistance

Applied Voltage:	500V
Ranges:	0.5-5 Meg, 5M-400 Meg
Accuracy:	0.5-100M, +/- 2.0% of scale +/- 1 LSD 100-300M, +/- 5% of scale 300-400 +/- 10% of scale
Applied Voltage:	500V +/- 5% through a 6M Ohm Limiting Resistor

Measurement taken through the DUT outlet as well as the Patient leads.

With input leads shorted, the unit should read 0.0

Outlet Check

Verifies power and ground of the outlet that the safety analyzer is plugged into.

Measures line voltage and displays any faults at power up L1 (HOT)-L2 (NEUTRAL), L1(HOT)-E (EARTH), L2 (NEUTRAL)-E (EARTH)

Current Consumption

Measured in L2 (NEUTRAL) lead 0-15A @ 120V, 0-15A at 240V, +/- 5% fullscale, true RMS.

DUT outlet can be configured as Open or Closed Earth and L2 and Reverse/Normal polarity.

ECG Simulation and Performance Testing

Accuracy:	+/- 2% of reading for rate or +/- 5% of reading for Amplitude, which is fixed at 2mV, LEAD II except for triangle wave which is at 4 mV.
Square wave:	0.125, 2Hz 50% duty cycle
Sine wave:	10, 40, 50, 60, 100 Hz
Triangle wave:	2 Hz @ 4 mV
ECG complex:	30, 60, 120, 180, 240 BPM
Pulse:	30, 60 BPM 63mS pulse width 600-700 us rise and fall time
Other waveforms:	A-Fib, A-Flutter, A-Tach, Idioventricular, PVC1, R-on-T, Run, V-Fib, V-Tach

RS-232:	Baud Rate: 300, 600, 1200, 2400, 9600
Databits:	7 or 8
Parity:	Odd, Even, None
Stop bits:	1 or 2

Standard RS232 Pinouts:

601 Pro	Computer
1 N/C	1 DCD
2 RX	3 TD
3 TX1	2 RD
4 DTR	4 DTR
5 GND	5 GND
6 N/C	6 PSR
7 RTS	7 RTS
8 CTS	8 CTS
9 N/C	9 RI

Printer: Parallel printer port compatible with Star-100 printers. No graphics compatibility provided.

BarcodePinouts:

1 N/C
2 RX
3 TX
4 N/C
5 N/C
6 N/C
7 GND
8 N/C
9 Vcc+5

Appendix B

Inside

- Keyboard Options

Keyboards

Optional keyboards are available for the 601 Pro that allow the user to input text in appropriate menu fields (comments, device manufacturer, technician etc.) or reports.

The keyboard option is installed at the factory. Any PC AT-style 101 keyboard can be connected to the 601 Pro. The circular 5-pin connector is located on the back panel of the 601 Pro, and is marked with a label similar to the following:

Keyboard connector label
601 Pro back panel

To determine if the keyboard option is installed on the 601 Pro:

- ❑ From the 601 Pro Main Menu, press the **More** key twice to access the second ADDITIONAL OPTIONS menu.
- ❑ Use the ▲ ▼ Arrow keys to move the starred cursor to System Status menu item, and press the **Enter** key. A menu similar to the following will appear on the display:

BATTERY OK:	YES	VER:	0.00
INT PRINTER:	ON	MEM:	256K
EXT PRINTER:	ON	%AVAIL:	99.0
KEYBOARD:	YES	BARCODE:	YES

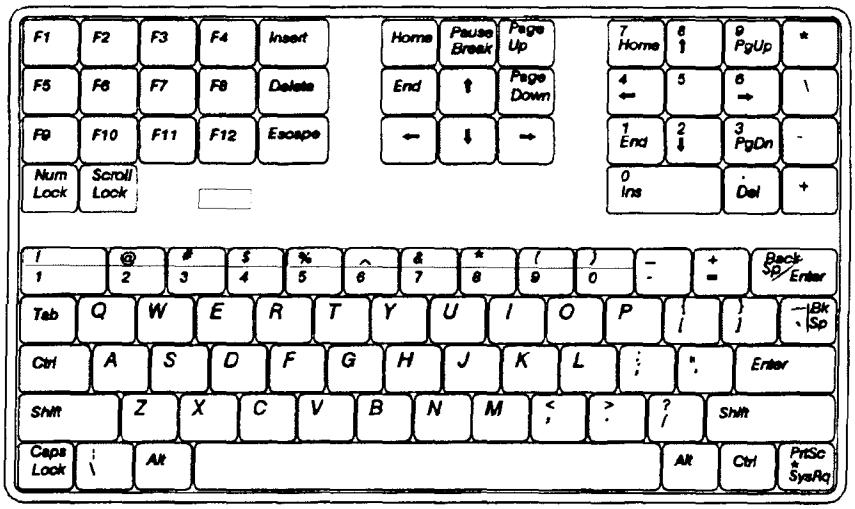
- ❑ If a YES follows the keyboard menu item, the option has been installed.

Supported Keys

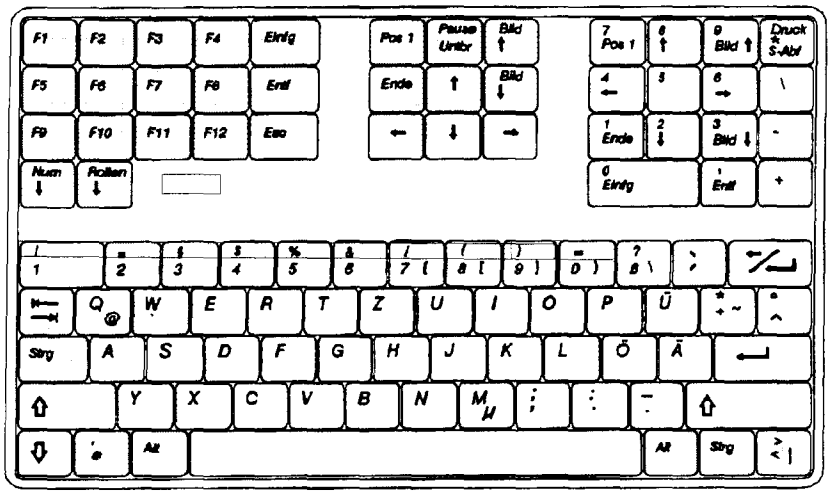
In addition to the standard U.S. keyboard, German and French keyboards are also supported. In the illustrations that follow, note that not all keys are functional with the 601 Pro. Non-functional keys are indicated by a pattern fill. **Shift** characters on keys **0-9** are not supported.

Other keys (**Home, PgUp/PgDn, End, Ins** and **Cursor Arrow**) can only be accessed when the **Numlock** key is on.

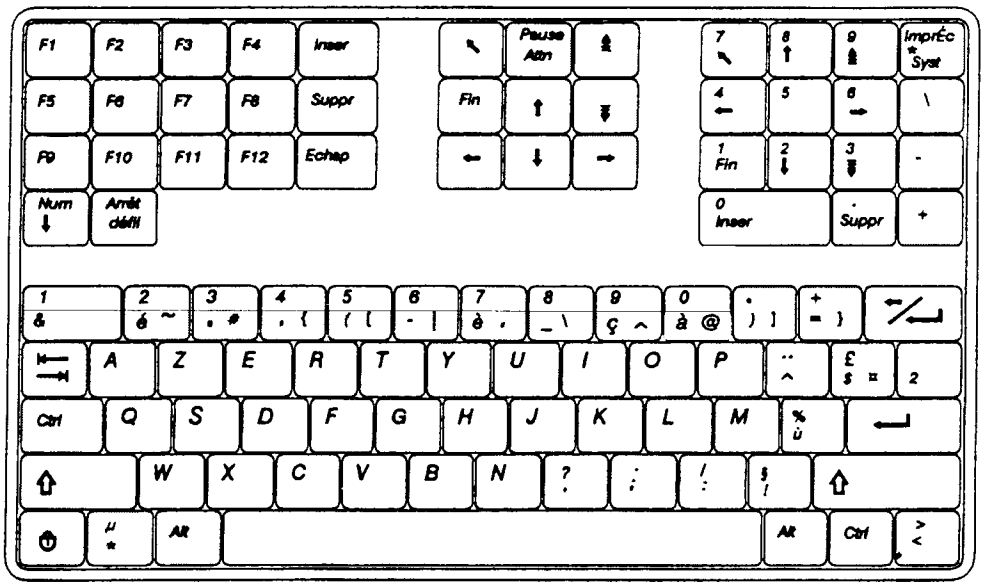
U.S Keyboard



German Keyboard



French Keyboard



MICROTYPE - FRENCH LAYOUT

Trouble Report

C

Inside This Section

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601 Pro Trouble Report Revision A

Mail or FAX this form to: Service Department Bio-Tek Instruments, Inc., Highland Park, Box 998 Winooski, VT 05404-0998

FAX: (802) 655-3399

Please complete the sections below to help us understand the nature of your problem.

Date _____

Name _____ Title _____ Company _____

Department Address _____ Phone _____

601PRO Model/Serial Number _____ Software Ver. (power-up screen) _____

Test Standard Selected: ❑ IEC-601 ❑ VDE-75 ❑ HEI-95

Auto and Manual Operation

Mains Voltage Reading: _____ L1-Earth _____ L2-Earth _____ L1-L2

Dual Lead Voltage Reading: _____

Current

Outlet Configuration (check all that apply):

❑ Normal Polarity ❑ Reverse Polarity ❑ Closed Earth

❑ Closed L2 ❑ Open L2 ❑ Open Earth

Insulation Reading

Applied Part Insulation: _____ RA _____ RL _____ LA _____ LL _____ V1-V6

Mains Insulation: _____

Protective Earth Resistance

❑ 1 Amp ❑ 10 Amp

Use a DVM measure the AC true rms current supplied through the RED and GREEN jacks.

AC Current Reading: _____

Fuses located on back panel intact? (400mA): ❑ Yes ❑ No

Protective Earth Resistance Calibration: ❑ PASS ❑ FAIL

Leakage:

Earth Reading _____ Earth AP-GND Reading _____

Enclosure _____ Enclosure AP-GND _____

Outlet Configuration (check all that apply):

❑ Normal Polarity ❑ Rev. Polarity ❑ Closed Earh

❑ Open Earth ❑ Closed L2 ❑ Open L2

Dual Lead Leakage Reading: _____

Outlet Configuration (check all that apply):

❑ Normal Polarity ❑ Reverse Polarity ❑ Closed Earth

❑ Open Earth ❑ Closed L2 ❑ Open L2

Patient Leakage	**Reading**
RA	_____
RL	_____
LA	_____
LL	_____
V1-V6	_____

Outlet Configuration (check all that apply):

❑ Normal Polarity ❑ Open Earth

❑ Reverse Polarity ❑ Closed L2

❑ Closed Earth ❑ Open L2

Patient Auxilliary	Reading	Patient Auxilliary	Reading
RA-ALL	_____	LL-ALL	
RL-ALL	_____	V1-V6-ALL	
LA-ALL	_____		

Outlet Configuration (check all that apply):

- ❑ Normal Polarity ❑ Closed Earth ❑ Closed L2
- ❑ Reverse Polarity ❑ Open Earth ❑ Open L2

Mains -On -Applied Parts

	Reading		Reading
RA	_____	LL	_____
RL	_____	V1-V6	_____
LA	_____		_____

ECG / Performance

Waveform: _____

Outlet Configuration (check all that apply):

- ❑ Normal Polarity ❑ Reverse Polarity ❑ Closed L2
- ❑ Closed Earth ❑ Open Earth ❑ Open L2

Equivalent Patient Leakage: _____ Equivalent Device Leakage: _____

MORE key

System Status Battery OK: _____ VER: _____

INT Printer: _____ RAM: _____

EXT Printer: _____ %Avail: _____

Keyboard: _____ Barcode: _____

MEMORY Test: ❑ PASS ❑ FAIL

PROGRAM Test: ❑ PASS ❑ FAIL Checksum: _____

Calibration Check RESISTANCE ❑ PASS ❑ FAIL

FUSE (If Applicable) ❑ PASS ❑ FAIL

LEAKAGE ❑ PASS ❑ FAIL

Mains-on Applied Part CAL ❑ PASS ❑ FAIL

VDE CAL ❑ PASS ❑ FAIL

All Fuses Intact

10 Amp p/n 46045 Qty 2 (Back Panel) ❑ YES ❑ NO

0.4 Amp p/n 46071 Qty 2 (Back Panel) ❑ YES ❑ NO

0.1 Amp p/n 46077 Qty 2 (Internal) ❑ YES ❑ NO

Serial Transfer

PC601XFR.EXE Version:

Bio-Tek Serial Cable ❑ YES ❑ NO ❑ Other _____

Description of Device Under Test

Current ____ Amp Voltage _____ Patient Leads ❑ YES ❑ NO

Red lead Attached ❑ YES ❑ NO Plugged into

601PRO ❑ YES ❑ NO

Additional Comments

_____

_____

_____

_____