OPERATOR'S MANUAL

MODEL 157

CHARGED-PLATE MONITOR

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Thank You

Thank you for buying a Trek instrument. This instrument has been designed and built to high standards to give you years of trouble-free service.

If you have any questions, please feel free to contact your Trek Representative at:

Write:	TREK, INC. 190 Walnut Street Lockport, NY 14094-3710	
Fax:	(716) 201-1804	
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E-Mail:	TREK-CA@aei.com	

We welcome any comments or suggestions you may have relative to the operation, performance, and/or quality of this product.

Trek products are covered by United States and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specifications are subject to change without notice.

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Safety

Review the following safety precautions to maintain safety and prevent damage to the instrument or equipment connected to it.

The safety features of this instrument may be ineffective if the equipment is not operated in the manner stated in this manual.

Refer all maintenance procedures to qualified personnel.

Safety Precautions

Power

Observe polarity of connections and use appropriate battery eliminator ratings for voltage and current.

Avoid Electric Overload

To avoid electric shock or fire hazard, do not apply a voltage to a terminal that is outside the range specified for that terminal.

Avoid Electric Shock

To avoid electric shock, do not touch the high-voltage ion collecting plate or the ion collecting plate connector while the instrument is on.

Do Not Operate Without Covers

To avoid electric shock or fire hazard, do not operate this instrument with the covers removed.

Fuses

There are no user serviceable fuses inside this unit, please refer all problems to Trek, Inc. or an authorized Trek service center.

Safety Precautions (cont.)

Indoor Use Only

This instrument is intended for indoor use only.

Do Not Operate in Wet or Damp Conditions

To avoid electric shock, do not operate this instrument in wet or damp conditions.

Do Not Operate in an Explosive Environment

To avoid injury or fire hazard, do not operate this instrument in an explosive environment.

Product Protection Precautions

Use the Proper Power Source

Do not operate this instrument from a power source that is different than the voltage specified on the serial number tag.

Provide Proper Ventilation

To prevent the instrument from overheating, provide proper ventilation.

Do Not Operate with Suspected Failures

If you suspect there is damage to this instrument, have it inspected by qualified personnel.

Safety Terms and Symbols

Terms in the Manual

These terms may appear in this manual:

Warning: Warning statements identify conditions or practices that could result in injury or loss of life.

Caution: Caution statements identify conditions or practices that could result in damage to this product or other equipment.

Symbols on the Product

These symbols may appear on the instrument:

Warning, risk of electric shock

Caution, refer to Operator's Manual

CAT I Installation category I (overvoltage category): Classification for the operation of a unit using voltage systems or circuits with required standardized limits for transient voltages. Category I pertains to voltages supplied at the peripheral level, with smaller tolerances for transient voltages as specified by the Low-Voltage Safety standard (EN 61010-1).

CE This symbol refers to the compliance of the equipment to the European Council (E.C.) standards.

Preface

This manual provides user information for the Model 157 Charged-Plate Monitor and contains the following chapters and appendixes:

- ***Introduction*** contains a brief product description and describes an incoming confidence test for the unit.
- ***Installation*** contains initial setup information for the Model 157.
- ***Operation*** contains a description of the product's features and a detailed explanation of proper operating procedures.
- ***Specifications*** states the requirements, behavior, and performance of the instrument in a concise format.
- ***Maintenance*** contains proper care and preventative maintenance guidelines for the instrument.
- ***Addendum One: Model 157 LCD Navigational Map*** is a flowchart of the LCD display screen choices and their related pathways.
- ***Addendum Two: Model 157 Computer Software Navigational Map*** is a flowchart of the PC computer software main menu items and their related pathways.
- ***Addendum Three: USB Device Driver First Time Installation*** contains information regarding first time PC software and USB driver installation.
- ***Appendix A: Accessories*** describes other products that are useful with the Model 157.
- ***Appendix B: Warranty Statement*** describes terms and conditions of the Trek Warranty Statement.
- ***Appendix C: Sales & Service*** contains Trek contact information. (*Please go to our web site: www.trekinc.com for a complete list of our sales and service representatives and distributors located in the United States and throughout the world.)*

Section I Introduction

Danger: *This instrument is not rated for use in an explosive environment. DO NOT use it in an explosive environment or an explosion may result.*

This manual provides instructions to install and operate the Trek Model 157 Charged-Plate Monitor. We recommend you take the time to read this manual to take full advantage of the features and benefits of the instrument.

General Information

The Trek Model 157 Charged-Plate Monitor system evaluates the performance of air ionizers and evaluates decay characteristics of materials with features that provide ease of use and systematic record keeping. The required ion balance and discharge time testing for determining air ionizer maintenance requirements can be efficiently executed and automatically recorded.

Features of the Model 157 include a clear and easy-to-read digital display, a bar code wand (optional) with scanning capability for fast ionizer identification while storing tests results, the capability of storing hundreds of ionizer test results for later download and analysis, recording relative humidity and temperature (with an optional thermohygrometer), and a lightweight package for ease of transport.

The innovative Model 157 can help significantly lower costs associated with ionizer performance testing and maintenance. Trek's Charged-Plate Monitors continue to be the CPM of choice for many leading companies in high technology fields such as Disk Drive, LCD, and Semiconductor Manufacturing.

The Model 157 has eliminated the need to transport or use a computer with the charged-plate monitor while testing ionizers. More than 1500 manual tests or up to 1000 automated test sequences can be stored on-board the Model 157. Saved test results are automatically date/time stamped.

The Model 157 includes a USB port for uploading custom automated test sequences and for downloading test results to a computer. Application software for the computer allows for creation of custom test sequences and generation of test reports. Operation of the Model 157 from a computer can be performed directly from the application software.

General Information (cont.)

Test data is easily appended with ionizer identification (ID) and environmental conditions using an optional bar-code wand and/or an optional thermohygrometer.

Balance Tests: The Model 157 resolves 0.1 volts when measuring less than ±100 V DC and features high accuracy with extremely low offset and drift which is ideal for testing ionizers in facilities requiring critical ion balance such as in GMR and TMR manufacturing areas.

Discharge Tests: Start and stop voltages are programmable in 1-volt increments.

Ease of use: The Model 157 incorporates a user-friendly menu system. Frequently used functions are keystroke addressable. Advanced functions can be enabled as needed. A powerful graphics display emphasizes important information and provides operator prompts.

Portability: The Model 157 is small and lightweight. It is designed for ease of movement around the facility.

Long Battery Life: The Model 157 features over eight hours of battery life for long periods of uninterrupted testing.

The Model 157 employs a revolutionary charged-plate monitor design that utilizes an ultrahigh-impedance, high-voltage follower to monitor the ion collecting plate voltage. This technique provides very high accuracy and virtually infinite impedance loading of the plate, while allowing the ion collecting plate to be charged and monitored through the same small-diameter cable connection.

This technique also makes the measurement capacitance independent of the physical size and shape of the ion plate. Therefore, the size and shape of an ion collecting plate, as well as the measurement capacitance, may be customer specified to match a particular ESD-sensitive device within a manufacturing process, or it may be made to conform to the ANSI ESD STM 3.1 standard test method.

Modes of Operation

The Model 157 features three primary modes of operation: a negative (-) discharge mode, a positive (+) discharge mode, and a balance mode. Discharge mode START and STOP voltages are easy to program using prompts on the LCD display or remotely through a computer.

For the discharge modes of operation, the ion collecting plate is precharged, either positively or negatively, to a level above the programmed START voltage. The time required to discharge the ion collecting plate from the programmed START voltage to the programmed STOP voltage is measured by the Model 157. The discharge is due to 'incident ion flow' to the ion collecting plate.

Warning: *A voltage up to 1100 V in series with a 10 MΩ resistor is applied to the ion collecting plate and plate receptacle during discharge mode operation.*

For the balance mode operation, the plate is initially set at zero (if this option is selected from the BALANCE menu) and then allowed to float to the voltage level dictated by 'incident ion flow' to the ion collecting plate.

The simplicity of the design of the 157 makes it very reliable and completely portable. The 157 is powered by a rechargeable battery (supplied) that offers 8 hours of operation from a full charge. The unit can also be operated from a line supply using a battery eliminator/charger.

Caution: *This instrument incorporates a rechargeable 7.2 V battery. Do not substitute a non-rechargeable battery because of risk of fire or explosion. Please contact TREK, INC. or an authorized service organization for battery replacement information.*

Incoming Inspection

Visually inspect the instrument for physical damage such as dents, nicks, scratches, broken fittings, etc. External damage may indicate more serious damage has occurred within the instrument. In the event of damage, notify the factory or your nearest authorized Trek Service Organization and request instructions. Attempts to operate a damaged instrument may cause permanent damage to the instrument.

Incoming Confidence Test

The 157 undergoes extensive checks and adjustments at the factory, and no initial calibration should be required. However, you may wish to perform an incoming confidence test as part of the incoming inspection on the instrument. An incoming confidence test of this nature is intended to confirm that the instrument was not damaged in transit.

We recommend that you familiarize yourself with the information in Section II and Section III before performing this test.

Placing a charged object near the ion collecting plate while the instrument is in the BALANCE TEST mode and observing the LCD display would constitute a reasonable incoming confidence test. A simple source for a charged object is an ordinary pocket comb or a hard plastic screw driver. A pocket comb drawn through the hair will usually produce a charge on the comb. A hard plastic handle of a screw driver brushed against clothing will usually produce a charge on the handle of the screw driver.

Warning: *Do not turn on the 157 until instructed to do so. To do so before the appropriate point in time could result in an electrical shock and/or damage to the instrument.*

1. Ensure the power is OFF.

2. Connect the ion collecting plate to the ION COLLECTING PLATE connector on the rear panel.

3. Connect the GROUND jack to earth ground using the banana-alligator cable provided.

5. Turn on the power.

4. Select MANUAL TEST by momentarily depressing the soft button to the right of the selection

6. Select BALANCE TEST by momentarily pressing down the soft button to the right of the selection.

   Note: *The delay time (in seconds) before testing is commenced is a programmable feature of the Model 157.*

7. Move a charged object towards the ion collecting plate to cause a voltage to be indicated on the PLATE VOLTAGE display.

This completes the incoming confidence test. Turn OFF the 157.

Section II Installation

Mounting

The Model 157 is designed to be operated as a portable benchtop instrument. There are no special mounting requirements.

Battery Operation

Initially charge the Model 157 for 3 hours before operating the instrument. The Model 157 LCD will state battery status on the lower right hand side of the LCD. The words “BATTERY OK” will indicate the battery is at full charge.

The 157 will operate for at least 8 hours from a full charge.

The LCD will indicate LOW BATTERY when the battery is approximately 15 minutes from the minimum operating charge level value.

Caution: *This instrument incorporates a rechargeable 7.2 V battery. Do not substitute a non-rechargeable battery because risk of fire or explosion could result. Please contact TREK, INC. or an authorized service organization for battery replacement information.*

ON/OFF/Back Light Operation

Depress and hold the ON/OFF (I/O) soft button for about one second until the front panel display indicates power ON/OFF status. The unit will toggle between power-up and power-down each time the button is depressed and held for about one second.

Depress and hold the ON/OFF button for a 3 to 5 second period when powering the unit ON to activate the back-light feature.

Battery Charger/Eliminator Connection

The Model 157 is designed to be battery operated or operated while connected to a battery charger/eliminator power cube. Please check the AC line power in your area to ensure compatibility with the AC adapter. The Universal Battery Eliminator/Charger (Model 1K073) operates with an AC line voltage of 100 V to 240 V ±10% AC and provides the following specifications: the output connector is a 2.1 mm DC power plug with a voltage of 15 V DC, ±5% and a current of 2 A.

1. Ensure the power is OFF.

2. Plug the battery charger/eliminator to the CHARGER receptacle on the rear panel.

3. Plug the free end of the AC input line cord connector into the line supply.

Initial Setup Connections

Before operating the Model 157, the following connections should be made:

Ground Connection

The Model 157 must be connected to a ground reference point to ensure accurate and repeatable measurements. All voltage measurements will be made with respect to this ground reference point.

Ion Collecting Plate Connection

Ensure that the power to the unit is OFF when connecting the plate cable to the ION COLLECTING PLATE receptacle on the rear panel.

Warning: *A voltage up to 1100 V in series with a 10 MΩ resistor is applied to the ion collecting plate and plate receptacle during discharge mode operation.*

Output Monitor Connection

Warning: *Exercise extreme caution while connecting a BNC connector cable to the OUTPUT MONITOR BNC receptacle. Do not confuse the OUTPUT MONITOR BNC cable connector for the ION COLLECTING PLATE BNC cable connector. Mis-connecting an OUTPUT MONITOR connection into the ION COLLECTING PLATE connector could deliver a voltage of 1100 volts to the BNC body.*

Initial Setup Connections (cont.)

The OUTPUT MONITOR connector on the rear panel is a buffered output providing a low-voltage replica of the voltage on the ion collecting plate.

The voltage at this output represents 1/200th the voltage on the ion collecting plate. Connect a monitoring device, such as an oscilloscope, to this connector to monitor the voltage level of the ion collecting plate. The signal at this connector can also be used as a feedback signal in closed-loop systems.

Section III Operation

Front Panel Features

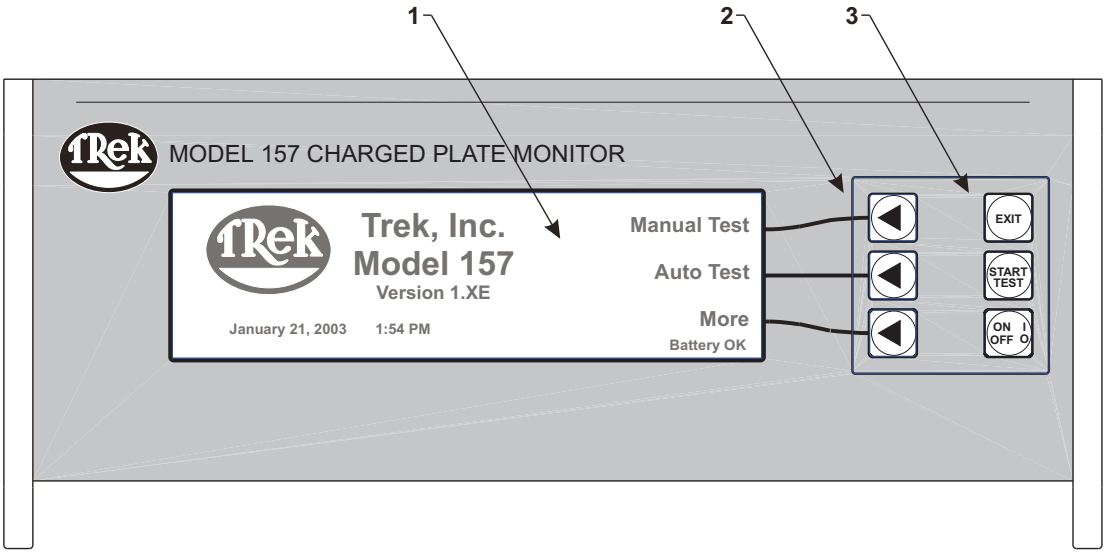


Figure 3-1: Front Panel Features

1. ***LCD Screen:*** This displays program options, measurement values, system status, date, and time, as well as other data.

2. ***SELECTION Buttons:*** These soft buttons select the options displayed on the immediate left. The EXIT button can act as a "BACK" button.

3. ***EXIT, START TEST, and ON /OFF (I/O) Function Buttons:*** These soft buttons select the functions relevant to the operation of the Model 157.

   EXIT: Acts as a back button or exit for menu selections and programing options.

   START TEST: This button will initiate testing.

   ON/OFF (I/O): This button will turn the unit ON and OFF and turn the back light ON and OFF.

Warning: *The Model 157 is battery operated and therefore high-voltage may be present at the ion collecting plate or ion collecting plate connector whether or not the battery charger/eliminator is connected to the rear panel when the POWER switch is ON.*

Rear Panel Features

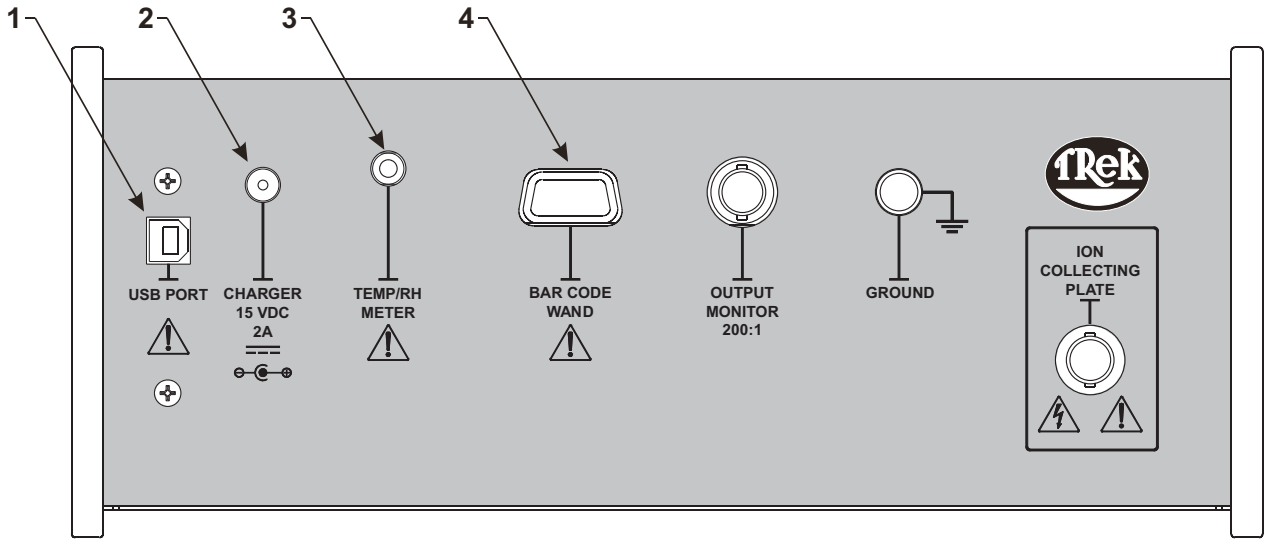


Figure 3-2: Rear Panel Features (cont.)

1. ***USB PORT :*** This connection allows data exchange and remote operation capabilities between the Model 157 and a PC computer.

2. ***CHARGER/SUPPLY Receptacle:*** This receptacle is for connection of the battery eliminator/charger.

3. ***TEMP/RH METER connection (Temperature, Relative Humidity):*** This connector receives an input from an optional thermohygrometer (Omega Model HH311) that enables the Model 157 to display environmental data on the LCD screen and also save or retrieve the information on test results.

4. ***BAR CODE WAND Input Connector:*** A bar code input connector is available on the Model 157-1. This connector is for connection of an optional bar code wand that enables the Model 157-1 to display bar code identification on the LCD screen and also save or retrieve the information on test results. A maximum of 15 bar code characters are allowed.

Rear Panel Features (cont.)

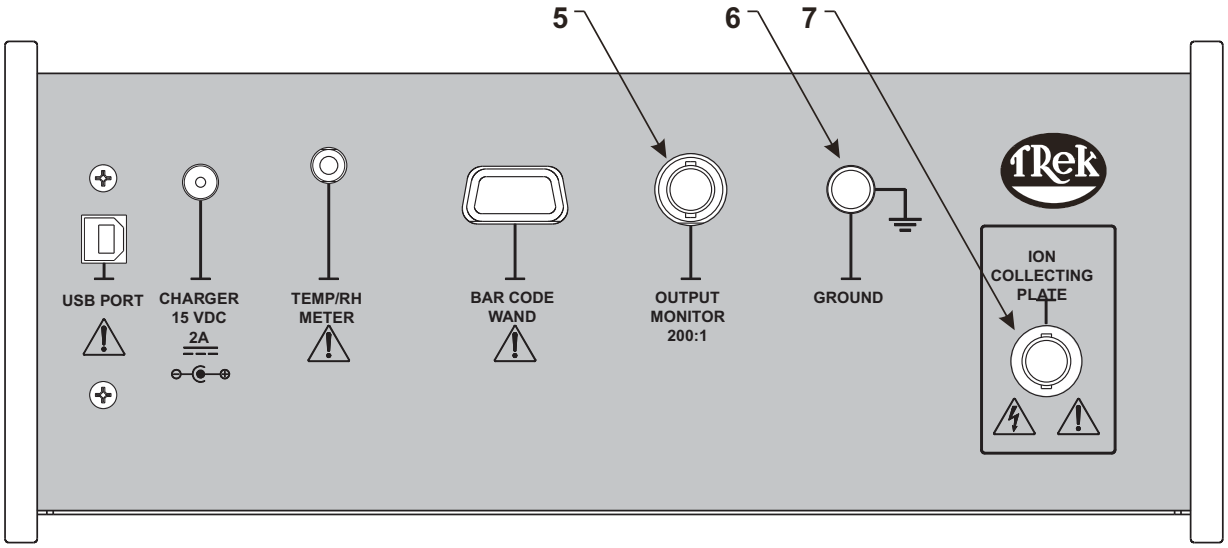


Figure 3-3: Rear Panel Features

5. ***OUTPUT MONITOR Connector:*** This BNC provides a buffered, low-voltage replica of the voltage on the ion collecting plate. The voltage at this output is 1/200th of the voltage on the ion collecting plate.

Warning: *Exercise extreme caution while connecting a BNC connector cable to the OUTPUT MONITOR BNC receptacle. Do not confuse the OUTPUT MONITOR BNC cable connector for the ION COLLECTING PLATE BNC cable connector. Mis-connecting an OUTPUT MONITOR connection into the ION COLLECTING PLATE connector could deliver a voltage of 1100 volts to the BNC body.*

6. ***GROUND Jack:*** This banana jack is for connection to a ground reference point.

7. ***ION COLLECTING PLATE Receptacle:*** This BNC receptacle is for connection of the ion collecting plate.

Warning: *The Model 157 is battery operated and high-voltage may be present at the ion collecting plate or ion plate connector whether or not the battery charger/eliminator is connected to the rear panel when the POWER switch is ON.*

Preliminary Steps

The following is a brief description of the physical apparatus and operation of the unit.

In the (positive) +DISCHARGE and (negative) -DISCHARGE tests, the 157 monitors the time required for the ion collecting plate to discharge from the programmed START voltage to the programmed STOP voltage. In the AUTO MODE, the DISCHARGE test PASSES if the programmed discharge occurs during the programmed time allotted. The test FAILS if the discharge does not take place before the programmed time expires.

In the (positive) +DISCHARGE mode the ion collecting plate is charged to a positive voltage. In the (negative) -DISCHARGE mode the ion collecting plate is charged to a negative voltage.

The ion collecting plate will charge to values as determined by the programming of the unit or software. The discharge timer will start when the plate voltage discharges to the programmed START voltage level. The discharge timer will stop when the plate voltage discharges to the programmed STOP voltage level.

In the BALANCE mode, the 157 monitors the voltage on the plate caused by the imbalance between positive and negative air ions impinging on the plate. The balance is used to indicate the voltage level to which objects placed into the ion field (at the position of the plate). Ideally, the balance voltage will indicate zero volts.

Note: *The BALANCE mode LCD screen contains readouts for maximum voltage (MAX) , Minimum voltage (MIN), and average voltage (AVG) measured. The average voltage reading (AVG) is for the first 10 minute duration of a BALANCE test.*

Zero (0) volts is applied to the plate before the start of the test if it is programmed. In either case, the value indicated will be the voltages as dictated by the presence of air ion imbalances.

Primary operation procedure consists of

1. Place the ion collecting plate in the area to be monitored.

2. Use the soft buttons and LCD screen to select the type of test or testing to be performed (MANUAL TEST or AUTO TEST).

3. Press the START TEST button.

Testing begins.

Preliminary Steps (cont.)

Navigate Screen Menus

Turn on the unit by depressing and holding the "ON/OFF (I/O)" soft button on the unit for about one second. Depress and hold the button (approximately 3-5 seconds) to initiate the "BACK-LIGHT" option. When the unit is ON, the LCD will display the Trek trade mark logo, firmware, software version, battery status, date and time, and three menu choices for:

(1) MANUAL TEST,
(2) AUTO TEST, and
(3) MORE.

Selecting the MORE option will display three more choices:

(4) MEMORY,
(5) SETTINGS, and
(6) MORE.

Selecting the "MORE" option again will return the operator to the first three menu choices. The front panel "EXIT" button also acts as a "return" or "back" button to return to previously displayed screens.

These four primary programming options are: **MANUAL TEST, AUTO TEST, MEMORY**, and **SETTINGS.** They are the major routes into the programming and operation of the unit.

- MANUAL TEST can be used to initiate manual balance and discharge tests.
- AUTO TEST (automated testing) permits rapid execution of a series of tests.
- MEMORY pertains to saved test sequences. All saved test results can be accessed and viewed from this menu section. From MEMORY, the operator can VIEW TEST RESULTS, CLEAR MEMORY, and SET DEFAULT TEST SEQUENCE (AUTO MODE).
- SETTINGS determine test parameters for +DISCHARGE tests, -DISCHARGE tests, and BALANCE tests. From SETTINGS, the SET DATE/TIME STAMP and the CHANGE TEST SETTINGS (MANUAL MODE) can be accessed.

Preliminary Steps (cont.)

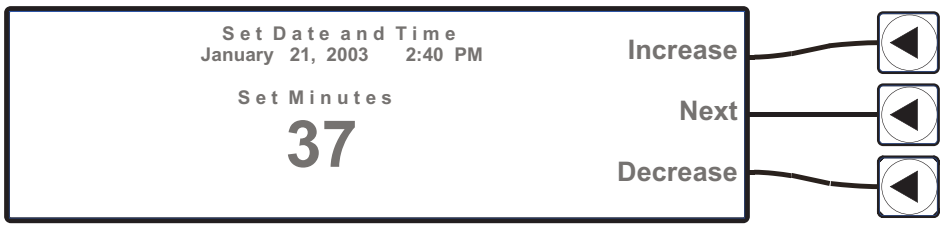
SET DATE/TIME STAMP

Test results can be saved into the unit's internal memory or be uploaded to the PC software for latter analysis. Primary information appended to a test is the date and time the test was executed.

Date and time information is always saved with the test results. Additional information [FAN ID, TEMP/RH, BAR CODE] are saved with the test results if they were inputted at the time the test was executed.

Select SETTINGS, select SET DATE/TIME STAMP, and select SET DATE/TIME STAMP. Use the selection buttons to change numerical values, select the current date. Choices for the time include a 24 or 12 hour day mode. The operator will be prompted to select the hour, the month, the date, and the year.

This date will be on the LCD screen and appear in all saved test result data.



Preprogrammed Parameters

Overview

The Model 157 can hold in its memory two sets of test parameters. One parameter set is for MANUAL TEST modes and one parameter set is for the AUTO TEST mode.

MANUAL TESTS are programmed through the SETTINGS/CHANGE TEST SETTINGS menus. Each individual +Discharge, -Discharge, and Balance test can be performed at any time and in any order.

AUTO TEST mode is programmed from the computer with the software provided (BUILD AUTO TEST). +Discharge, -Discharge, and Balance tests can be performed in any number and in any order and are automatically saved into the unit's internal memory up to a maximum of 100 tests with different parameters.

The internal memory can store as many as 1500 manual or up to 1000 automated test results. Test results are organized by the DATE and the TIME the test was performed. The results can be retrieved from the memory and viewed by the MEMORY/VIEW TEST RESULTS menu, or download to the computer with he software provided.

Some preliminary considerations concerning the routine operation of the unit and the use of the data obtained from the unit should be determined prior to programming the unit. These considerations are dependent upon the individual needs and circumstances of the end user. Among these considerations are:

Preprogrammed parameter settings for the +DISCHARGE tests, -DISCHARGE tests, and BALANCE tests. Test values are loaded into the unit through the following three methods:

1) AUTO TEST: MEMORY menu [SET DEFAULT TEST SEQUENCE] for AUTO TEST settings (automated tests), or

2) MANUAL TEST: SETTINGS menu [CHANGE TEST SETTINGS] for (individual) tests, or

3) MODEL 157 PC SOFTWARE: uploaded from the PC computer software program from saved parameters [BUILD AUTO TEST] for AUTO TEST.

The test settings chosen can be available for prompt execution of tests with the option to save/view the recorded data and/or upload to a PC computer for later analysis. The unit retains parameters and test results even if the unit is turned off and back on again. Parameters such as the delay time before testing begins and if the charged-plate is zeroed before testing begins can also be determined and programmed.

Manual Test Mode

MANUAL TEST can be used to execute balance and discharge tests. To input test parameters for the MANUAL TEST mode, go to the SETTINGS menu and select CHANGE TEST SETTINGS. Use the EXIT button to back through menus on the LCD screen if necessary. Once programmed, these parameters will appear when selecting a test to execute in the manual mode.

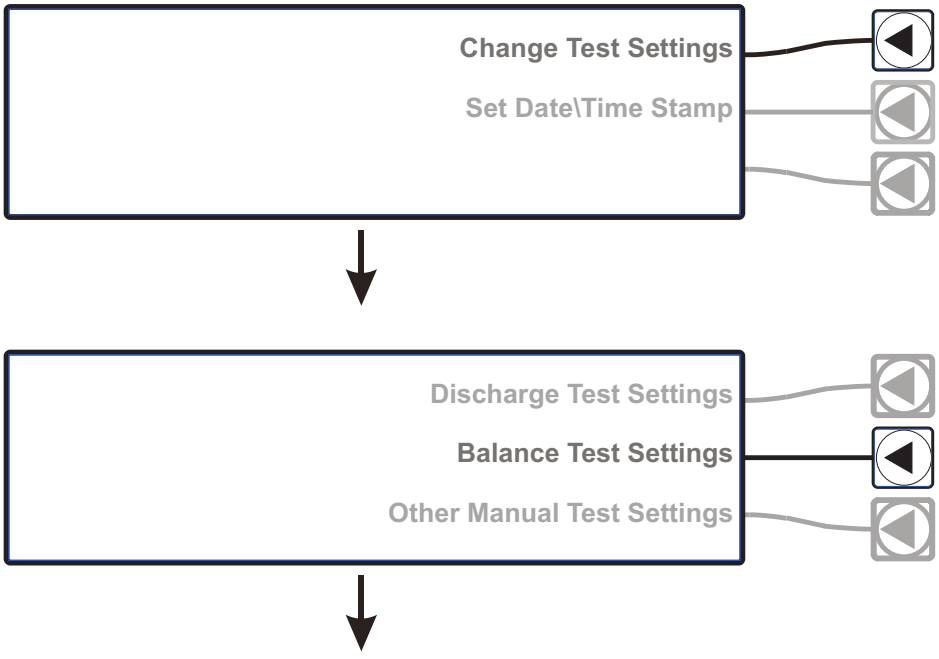
Change Test Settings

The CHANGE TEST SETTINGS menu is accessed when the SETTINGS is selected from the second screen of the main menu. These parameters (test settings) affect the values for the MANUAL MODE test parameters. From the SETTINGS option, select CHANGE TEST SETTINGS. Use the EXIT button to back through menus on the LCD screen if necessary.

Use the selection buttons to select program choices and options, the test type, and changes to the numerical values.

BALANCE TEST SETTINGS will change parameters for balance tests. DISCHARGE TEST SETTINGS will change parameters for (+) and (-) Discharge tests. OTHER MANUAL TEST SETTINGS will determine whether MANUAL TEST data is saved

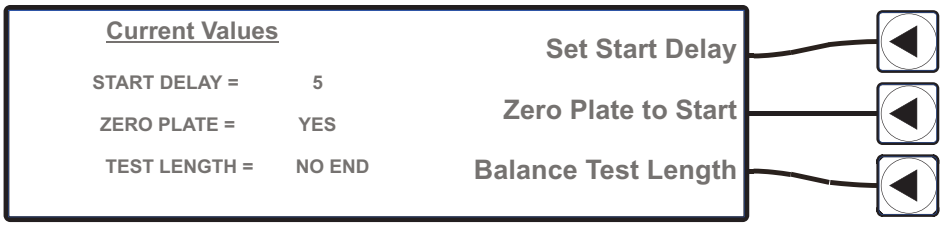
Balance test parameters include whether or not to zero the plate at the start of a test. For +Discharge and -Discharge tests, the SET START DELAY can be programmed to begin the test after a period of time has elapsed.

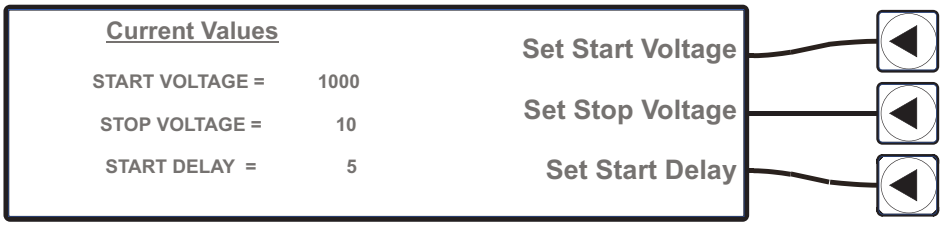


Manual Test Mode (cont.)

Change Test Settings (cont.)

The LCD of the unit displays the settings currently programmed into the unit for either Discharge tests or Balance tests. The values and parameters can be reprogrammed by the operator by selecting the relevant sub menus and following prompts. The prompts include the ability to adjust test parameters by increasing or decreasing the numerical value and selecting the SAVE option.





Save Manual Test Results

The SAVE feature will save MANUAL TEST results. It is chosen though the [SETTINGS] [CHANGE TEST SETTINGS] [OTHER MANUAL TEST SETTINGS] [RECORD MANUAL DATA?] [YES].

If the save option is selected, the operator can augment the test results with a operator designated fan number (FAN ID: A1, B2, and C3), temperature/relative humidity (TEMP/RH), and bar code information (with the Model 157-1).

Saved tests can be viewed through the unit's MEMORY menu [VIEW TEST RESULTS] or uploaded to the PC with the software program [VIEW MEMORY]. In order to upload the data to a computer, the Model 157 software must be installed in a PC with a USB cable connection from the computer to the unit.

See "Addendum One: Model 157 LCD Menu Navigation Map" for information about menu navigation.

AUTO TEST Mode

Automated Testing Mode

AUTO TEST (automated testing) mode offers some advantages over the MANUAL TEST mode. Performing tests and saving test results can be quickly performed in automated and systematic steps. AUTO TEST permits rapid execution of a series of tests. These test results can be saved into the internal memory of the unit for later retrieval and/or uploading into a PC computer.

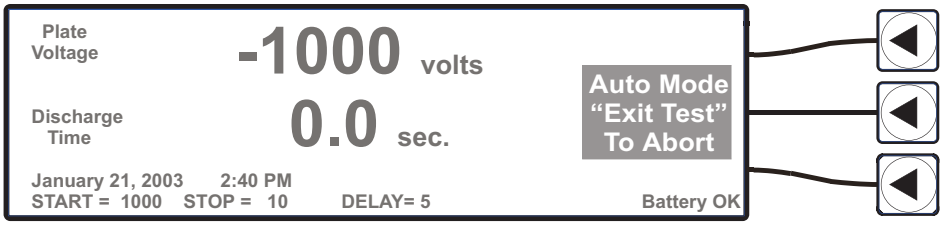
Saved tests can be viewed through the unit's MEMORY menu [VIEW TEST RESULTS] or uploaded to the PC with the software program [VIEW MEMORY]. In order to upload the data to a computer, the Model 157 software must be installed in a PC with a USB cable connection from the computer to the unit.

The AUTO MODE also has the capability to append air ionizer fan identification The operator can append the test results with a operator designated fan number (FAN ID: A1, B2, and C3), temperature/relative humidity (TEMP/RH), and bar code information (with the Model 157-1).

To input parameter values for the AUTO testing mode, go to the MEMORY menu and select SET DEFAULT TEST SEQUENCE or construct test sequences on the PC through the Model 157 computer software BUILD AUTO TEST program and UPLOAD SEQUENCE TO MODEL 157 program.

To activate the AUTO MODE, depress the AUTO MODE button selection on the right of the LCD. Depress the "EXIT" button to abort testing.

Test results are saved into the internal memory and can be uploaded to a PC utilizing the USB port. The USB port for the Model 157 is located on the rear panel of the unit. Please refer to pages III-15, "BUILD AUTO TEST" for more information.



AUTO TEST Mode (cont.)

Default Test Sequence Values for AUTO TEST

Values for the AUTO TEST sequences are programmable by the operator through the Model 157 computer program and uploaded to the unit via the USB port. The following sequence and values are preprogramed into the Model 157. The MEMORY menu / SET DEFAULT TEST SEQUENCE / will give the option of retaining the values which were downloaded from the PC computer program, or revert to the following factory set default sequence:

BALANCE TEST:
Five (5) second delay before start of test.
Fifteen (15) second test with a limit of ±5 V.

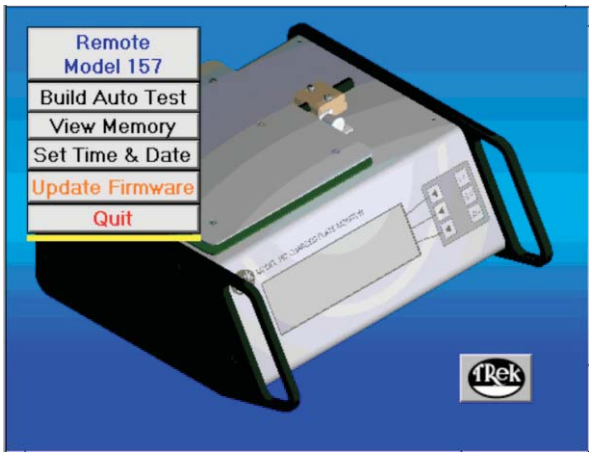
+DISCHARGE TEST:
Five (5) second delay before start of test.
Start voltage=1000 V,
Stop Voltage=100 V,
Test Length=15 seconds,
PASS/FAIL Limit=10 seconds.

-DISCHARGE TEST:
Five (5) second delay before start of test.
Start voltage=-1000 V,
Stop Voltage=-100 V,
Test Length=15 seconds,
PASS/FAIL Limit=10 seconds.

Note: *The BALANCE mode LCD screen contains readouts for maximum voltage (MAX) , Minimum voltage (MIN), and average voltage (AVG) measured. The average voltage reading (AVG) is for the first 10 minute duration of a BALANCE test.*

Computer Software Operation

To enable remote operation of the Model 157 from a computer, store test parameters into the Model 157, or transport the test results stored on the internal memory from the Model 157 to a PC, the PC must have a USB port and the software for the Model 157 installed in the PC.



Install the provided Model 157 software to a PC computer using the Trek software CD-ROM. Use the supplied standard USB cable to connect the USB ports of the Model 157 and the PC.

Computer software operation may offer several advantages to the operator.

PC software main screen choices are summerize as follows:

REMOTE MODEL 157: This selection enables remote control of the Model 157 from a computer. All functions of the unit can be duplicated with the software interface. This features simultaneous numeric displays with computer graphical displays.

BUILD AUTO TEST: This selection allows the operator to review and edit a series of BALANCE or DISCHARGE tests from the Model 157. The operator can also construct a series of tests for uploading to the Model 157. Tests can also be saved to the computer hard drive for a permanent archive.

VIEW MEMORY: This selection allows access to saved test results which includes the Test Date, the Fan (ionizer) ID number, and any optional information as temperature, humidity, and (bar code information with the Model 157-1).

SET DATE AND TIME: 12 hour or 24 hour time format can be selected.

UPDATE FIRMWARE: As instrument firmware updates or revisions are finalized and become available, this selection can update the firmware from the computer to the Model 157.

QUIT: This selection exits the software program.

The following pages will refer to these main sections of the computer software program.

Computer Software Operation (cont.)

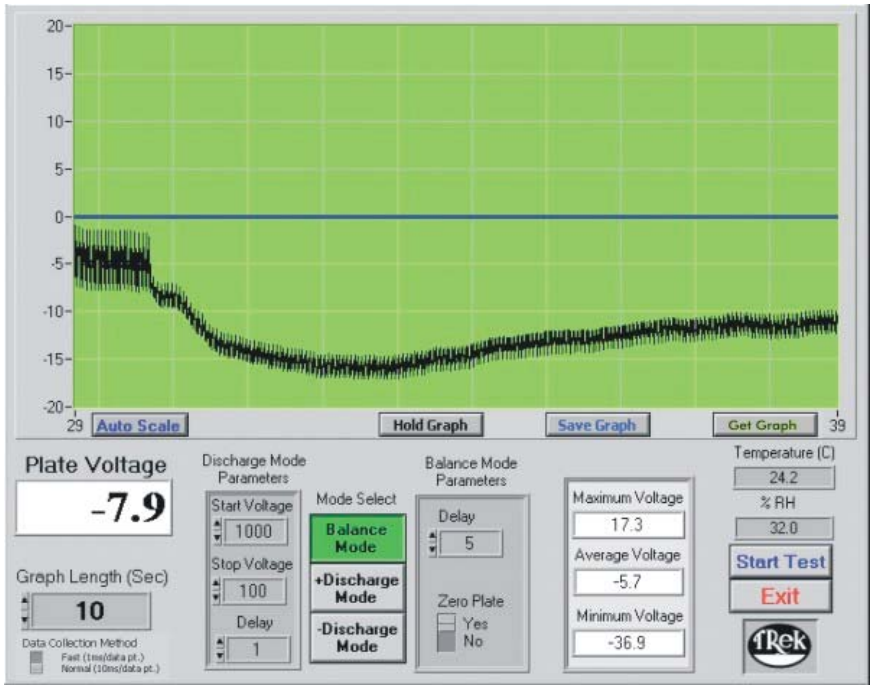
Remote Model 157 Operation

Both BALANCE and DISCHARGE tests can be performed remotely from a PC. Selection of the “REMOTE MODEL 157” item off the main menu will take the operator to a screen to input data for tests. From this screen, test type and parameters can be chosen. The operator can use the mouse to click into a text box or use the TAB key to navigate through the boxes. Once a text box is selected, the value can be determined by either typing in the desired value, using the keyboard “Up ↑” and ”Down ↓” arrow keys to raise or lower the value, or using the arrows located to the left of the box to select the desired value with the mouse.

The graph scale will self-adjust by selecting the “AUTO SCALE” button along the X-axis (voltage value) according to the values that are inserted. The Y-axis (time) can be determined by selecting a value for the GRAPH LENGTH (SEC) box. The graph can be held on screen by selecting the HOLDING button.

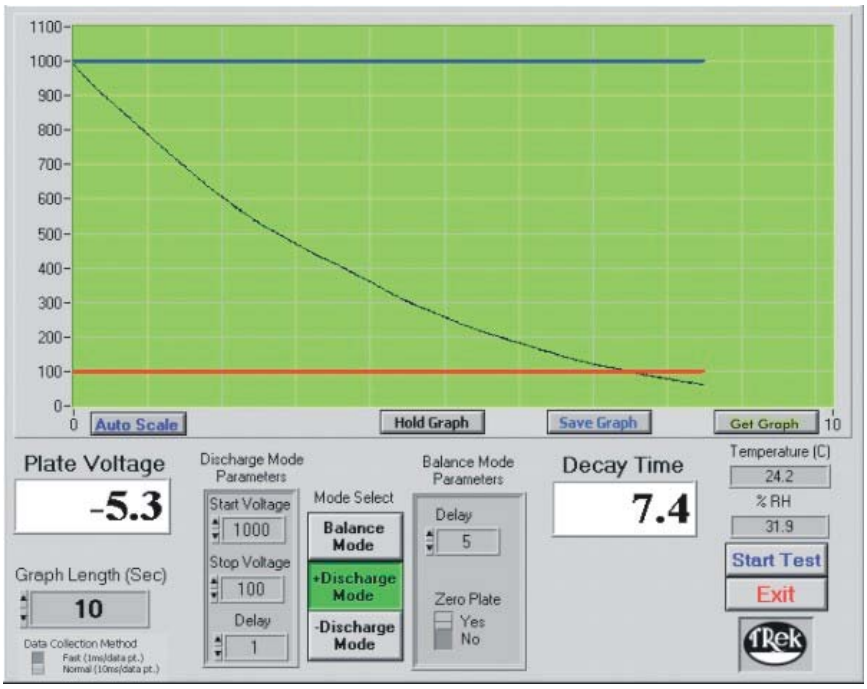
DATA COLLECTION METHOD can be set for FAST (1 millisecond/data point) or NORMAL (10 milliseconds/data point).

MODE SELECT determines the type of test to be performed. Click on the START TEST button to begin the test or to stop the test if the test is in progress.



Computer Software Operation (cont.)

Remote Model 157 Operation (cont.)



Balance Tests

BALANCE MODE PARAMETERS include the DELAY time (in seconds) before the test begins and whether to zero the plate before the start of the test.

Discharge Tests

DISCHARGE MODE PARAMETERS include: + DISCHARGE or -DISCHARGE test, START VOLTAGE, STOP VOLTAGE and the DELAY time (in seconds) before testing begins. The PLATE VOLTAGE displayed is the present plate voltage. The DECAY TIME is in seconds.

Graph Features

AUTO SCALE: Self adjusting selection to display the graph scale.

HOLD GRAPH: Holds the current graph display on screen (Data is not collected during this holding process.)

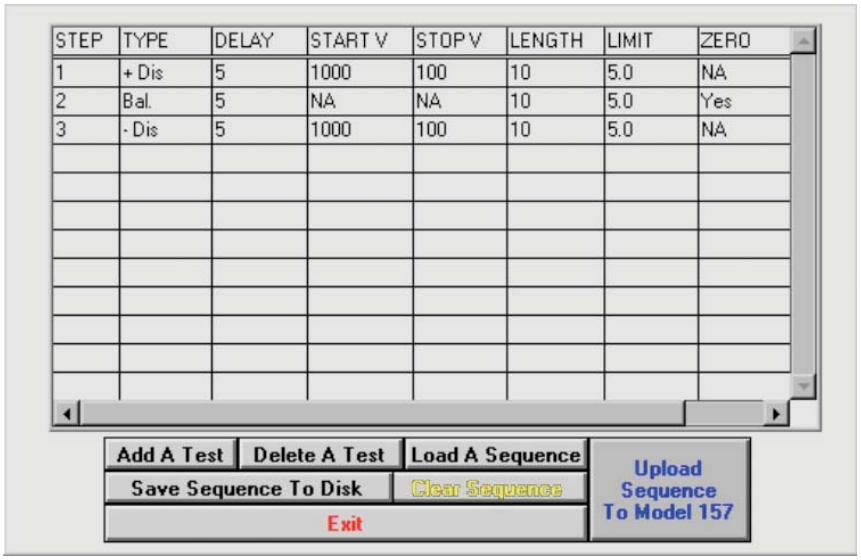
SAVE GRAPH: Allows the operator to store the collected data.

GET GRAPH: Allows the operator to retrieve the collected data.

Computer Software Operation (cont.)

Build Auto Test

BUILD AUTO TEST allows the operator to compose or edit data and parameter programming used during the AUTO TEST function of the Model 157. The program is found as a selection on the opening screen of the software program



This software section allows the operator to program new parameters and sequences for the AUTO TEST mode, edit test results, re-program test parameters, and upload saved AUTO TEST sequences to the Model 157 unit. The uploaded sequences will become the parameters used for the AUTO TEST mode.

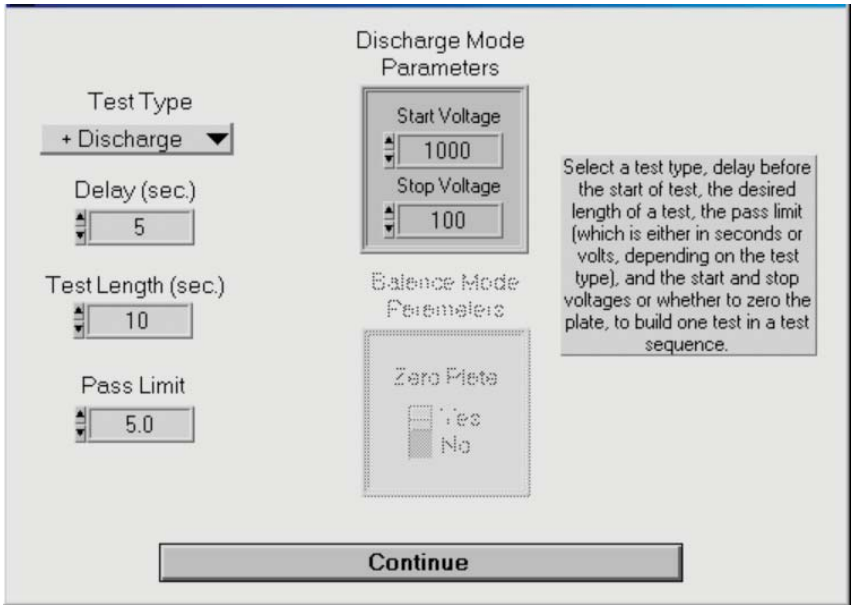
The columns and rows of the table correspond to parameters selected by the operator.

Select ADD A TEST tab from the menu to get to the software screen in order to select test parameters and program new sequences.

After the test sequence has been constructed, the SAVE SEQUENCE TO DISK option will save it to the local hard drive with a user designated file name.

Computer Software Operation (cont.)

Build Auto Test (cont.)



Test Parameters

TEST TYPE: Select a test type, either BALANCE, + DISCHARGE, or -DISCHARGE test.

DELAY: Select the delay time in seconds before the start of the test.

TEST LENGTH: Select the desired length in seconds of the test.

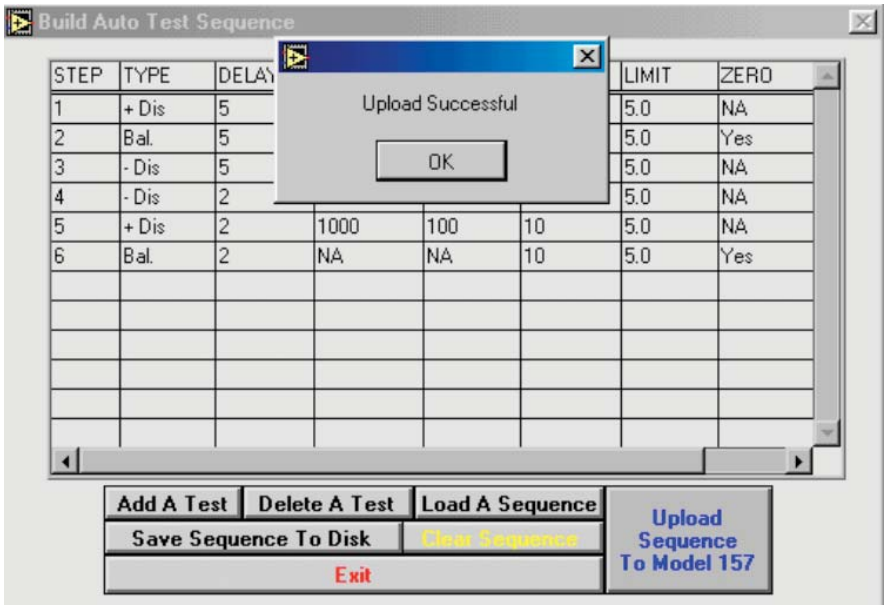
PASS LIMIT: The PASS LIMIT can either be in seconds for the BALANCE test, or in volts for the +DISCHARGE and -DISCHARGE tests

DISCHARGE TEST PARAMETERS: Use the arrow keys to raise or lower the values for the START and STOP voltages.

BALANCE MODE PARAMETERS: If desired, the operator can zero the plate voltage to zero volts before the start of the BALANCE test.

Computer Software Operation (cont.)

Build Auto Test (cont.)



Build Auto Test Software Parameters

ADD A TEST: Selection permits addition of a test to the STEP column. A STEP row consists of a STEP number, a test TYPE, the DELAY before testing starts, the START and STOP Voltages (if a DISCHARGE test is programmed) the test duration or LENGTH, the test LIMIT (or programmed parameters) and whether the plate was to be at ZERO before testing started.

DELETE A TEST: Deletes the entire row of a STEP selection.

LOAD A SEQUENCE: Retrieves a previously saved test sequences from the PC.

SAVE SEQUENCE TO DISK: Saves a sequence to the hard drive of the computer.

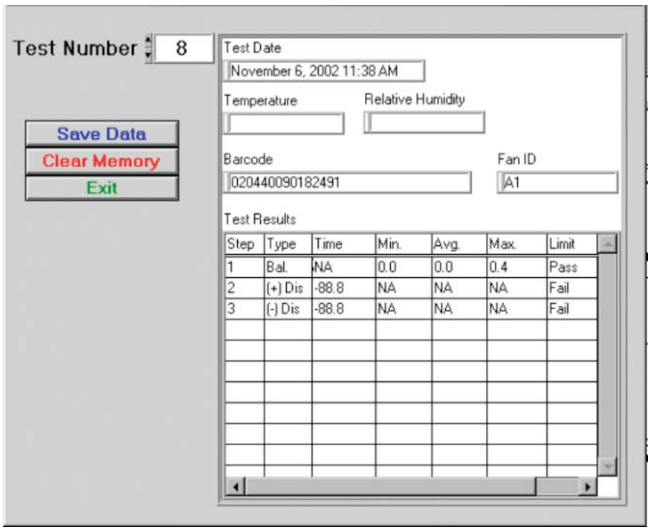
UPLOAD SEQUENCE TO MODEL 157: Uploads the currently displayed parameters to the Model 157 internal memory via the USB cable.

CLEAR SEQUENCE: Clears or deletes the entire displayed test sequences from the program.

EXIT: Exits the “BUILD A TEST SEQUENCE”.

Computer Software Operation (cont.)

View Memory



Tests executed from AUTO MODE or MANUAL MODE are saved to the Model 157 memory can be retrieved and analyzed through the computer software at a later date. The data retrieved from the Model 157 will contain the following information:

TEST NUMBER: The iteration of the chosen AUTO MODE or MANUAL MODE test parameters. For example, the 8th test is the 8th time the AUTO MODE or MANUAL MODE tests were executed.

TEST DATE: Date and time the test was executed.

TEMPERATURE/RELATIVE HUMIDITY: This information is present if the optional thermohygrometer is present when the test was performed.

BAR CODE: This information is present if the optional bar code wand was used after testing was performed.

FAN ID: This information is present only if this information was selected when testing was performed.

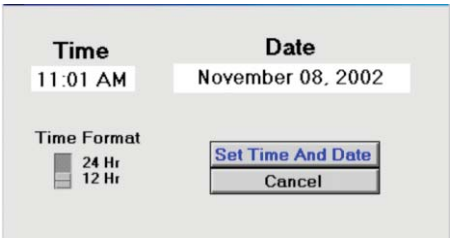
SAVE DATA: Saves all the test results retrieved from the Model 157 in a form that can be opened by most spread-sheet software programs .

CLEAR MEMORY: Erases all the tests stored in the Model 157 internal memory.

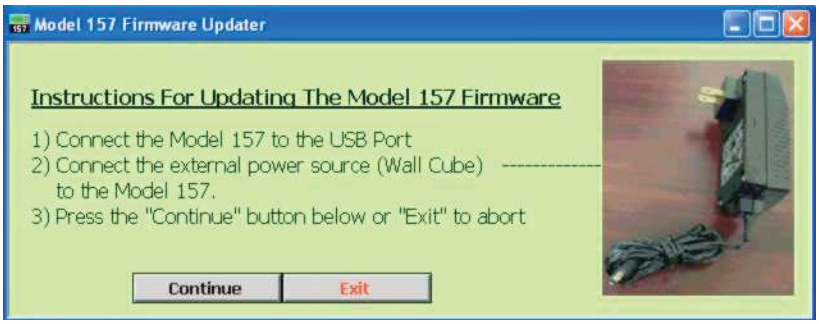
EXIT: Exits the VIEW MEMORY program.

Set Date and Time

Use the mouse to select the time format (either 12 hour or 24 hour). The time and date set are the same as the host computer time and date.



Update Firmware



As Model 157 firmware updates or revisions are finalized and become available, the updates can be downloaded from the Trek web site (www.trekinc.com) or loaded from a disk by the Model 157 software program. When the unit is connected to the computer via a USB cable, the program will update the firmware program from the computer program to the Model 157.

Note: *For best results, exit all programs that may be running on the computer in the background before running firmware upgrades.*

Quit

Click the QUIT button on the main menu to exit out of the Model 157 program.

Monitoring the Plate Voltage using the Output Monitor

The external BNC OUTPUT MONITOR receptacle provides a low-voltage replica of the plate voltage. The OUTPUT MONITOR voltage is 1/200th of the plate voltage. The OUTPUT MONITOR can be connected to an external monitoring device.

For example, if the plate voltage is 500 V, the voltage at the OUTPUT MONITOR receptacle would be:

500 V x 1 V/200 V = 2.5 V.

Section IV Model 157 Specifications

DANGER: *This instrument is not rated for use in an explosive environment. DO NOT use it an explosive environment or an explosion may result.*

PERFORMANCE

Monitored Voltage Range	0 to ±1020 V DC or peak AC.
Bandwidth (-3 dB)	DC to 80 Hz.
Zero Stability (referred to plate voltage)	
Drift with Time (no incident ion flow)	Less than 6 V/minute.
Drift with Temperature	Less than 10 mV/°C, noncumulative.
Discharge Mode Thresholds	
Start Voltage	Programmable from 1 to ±1000 V in 1 V increments.
Start Accuracy	Within ±1 V of programmed start voltage.
Stop Voltage	Programmable from 0 to ±999 V in 1 V increments.
Stop Accuracy	Within ±1 V of programmed stop voltage or ±0.2 V if set less than or equal to 90 V.
Discharge Timer Resolution	0.1 seconds, from 0.1 to 999.9 seconds.
Plate Self-Discharge	Less than 12 volts/minute.

Specifications (cont.)

FEATURES

Menu Selection and Display	Six soft-keys and display prompts navigate the user through system operations. The user-friendly interface allows test selections, parameter adjustments, information retrieval, and other options. Among the functions are:
+DISCHARGE/-DISCHARGE	Automated or manual tests can be performed or programmed. The +DISCHARGE and -DISCHARGE TESTS sets the plate voltage to a value just above the programmed start voltage and resets the discharge timer to zero. Ion flow can charge (or discharge) plate voltage.
BALANCE TEST	This test initially resets the plate to 0 V ±0.5 V and then allows the plate to assume a voltage level dictated by incident air ion flow to the plate.
AUTO (Programmable) Series of Tests and Parameters	Capability to program multiple sets or series of combinations of +DISCHARGE, -DISCHARGE, or ION BALANCE tests.
Memory	Can store or retrieve as many as 1500 manual or up to 1000 automated test results in its internal memory.
TEMP/RH Meter Connector	A connector receives an input from an optional thermohygrometer (Omega Model HH311) and enables the Model 157 to display environmental data on the LCD screen and also save or retrieve the information on test results.

Specifications (cont.)

FEATURES (cont.)

Bar Code Wand Input Connector (available for 157-1 only)	A connector receives an input from an optional bar code wand and enables the Model 157-1 to display bar code identification on the LCD screen and also save or retrieve the information on test results. A maximum of 15 bar code characters are allowed.
Data Retrieval and Analysis	Data can be exported from the Model 157 into a PC computer through a USB port for later analysis or record keeping.
Voltage Monitor Output	A BNC providing a low voltage replica of the plate voltage.
Scale Factor	1/200th of the plate voltage.
DC Accuracy	Better than 0.1% of full scale.
Offset Voltage	Less than ±10 mV (referred to plate voltage).
Output Noise	Less than 10 mV rms (measured using the true rms feature of the Hewlett Packard Model 34401A digital multimeter).
Output Impedance	Less than 0.1 Ω.
LCD Display Screen with LED back light	127 mm x 38 mm (5″ x 1.5″) screen displays all test data and program options with date and time display.
Resolution	240 x 64 pixels.

Specifications (cont.)

FEATURES (cont.)

Ion Collecting Plate

Standard Option	Meets ESD Association Standard ANSI/ESD-STM3.1 requirements for:
Dimensions	150 mm x 150 mm square (6″ x 6″ square).
Capacitance	20 pF ±2 pF.
Non-standard Option	
Dimensions	Specify when ordering.
Capacitance	Specify when ordering.

Power On/Off	An electronic switch controls the power to the unit and also turns on the display back-light.

GENERAL

Power Requirements	Available for all nominal line voltages. Contact TREK, INC. or an authorized service organization for more information. The Universal Battery Eliminator/Charger Model 1K073 provides the following input power:
Specifications	
Output Connector	2.1 mm DC power receptacle.
Voltage	15 V DC ±5%.
Current	2 A.

Specifications (cont.)

GENERAL (cont.)

Battery Operation	Rechargeable battery, internally installed.
Operating Time	Greater than 8 hours from a full charge.
Recharge Time	Less than 3 hours to full charge.
Battery Status Indicator	LCD screen battery status indicator.
Operating Conditions	
Temperature	5 °C to 35 °C.
Relative Humidity	To 80%, noncondensing.
Instrument Dimensions	102 mm H x 241 mm W x 241 mm D (4" H x 9.5" W x 9.5" D).
Instrument Weight	Approx. 2 kg (4.4 lb).
Voltage Monitor Connector	BNC onnector (3 meter length, maximum).
Ground Receptacle	Banana jack.
Cable from Instrument to Floating Plate (Standard 150 mm x150 mm)	Coaxial type.
Diameter	4.95 mm (0.195").
Length	3 meters (10 ft), nominal.
USB Port Connector	Standard USB receptacle on Model 157 unit connects to a PC for data exchanges or transfers.
Computer Requirements	The Model 157 applications software runs on a PC compatible computer, Pentium class processor or better, Windows 98 or better, 2000, or NT, with 16 Mb of RAM, and an available USB port.

Specifications (cont.)

GENERAL (cont.)

Certification	TREK, INC. certifies that each Model 157 is tested and calibrated to specifications using measurement equipment traceable to the National Institute of Standards and Technology or traceable to consensus standards. A Certificate of Calibration accompanies each instrument when it is shipped from the factory.
Low Voltage Safety Compliance	IEC 61010-1
Overvoltage Category	CAT I: Peripheral level outputs (less than 60 volts).
Pollution Category	Degree 1: Operate in environments where no pollution or only dry, nonconductive pollution occurs.

Section V Maintenance

Safety Precautions for the Model 157

Please observe the following safety precautions when checking connections or providing maintenance procedures on the Model 157:

1. Refer all maintenance procedures to qualified personnel.

2. Prior to performing maintenance procedures, turn off the 157 and disconnect the battery charger/eliminator from its power source. Failure to observe this precaution could result in an electrical shock.

3. Allow a cool-down period to reduce the danger of burns from heated parts such as transistors and heat sinks.

4. This instrument incorporates a rechargeable 7.2 V battery which is not user serviceable. Do not substitute a non-rechargeable battery due to risk of fire or explosion. Please contact TREK, INC. or an authorized service organization for battery replacement information.

Please go to our web site: www.trekinc.com for a complete list of our sales and service representatives and distributors located in the United States and throughout the world.

Battery Maintenance

The Model 157 is equipped with a rechargeable battery. Periodic cycling (complete charge and discharge) of the battery is required in order to maximize the life and capacity of the battery. TREK, INC. recommends cycling the battery at least once a month. Cycling of the battery can be accomplished by following the procedure below.

1) Plug the battery eliminator/charger into the Model 157.

2) Charge the battery until the “Full Charge” indicator on the Model 157 LCD screen is acknowledged.

3) Remove the charger from the Model 157.

4) Turn the power to the Model 157 on.

Battery Maintenance (cont.)

5) Leave the Model 157 “ON” for more than 12 hrs.

6) Plug the battery eliminator/charger into the Model 157.

7) Charge the battery until the full charge “Charging Complete” is indicated on the Model 157 is illuminated.

8) Cycling is completed.

Preventative Maintenance

Preventative maintenance consists of inspecting and cleaning the instrument. Preventative maintenance performed on a regular basis may prevent instrument failure and improve reliability.

INSPECTION: Visually inspect the instrument for loose or damaged controls and connectors or other undesirable conditions.

CLEANING: Disconnect the unit from all external connections prior to cleaning. Clean the 157 as operating conditions require.

Clean the exterior of the instrument with a damp cloth. The use of solvents may damage the finish or plastic components. A small brush is effective in removing dirt from the front and rear panel controls and connectors.

Customer Service Assistance

In the event that you require assistance on a maintenance item, direct your request for assistance to the Customer Service Group at TREK, INC. or an authorized Trek Service Organization.

Telephone assistance is usually effective for obtaining additional maintenance information which is beyond the scope of this manual. Troubleshooting advice which is given over the telephone may be useful for solving the simpler malfunctions or confirming that the system should be returned to the factory or to an authorized Trek Service Organization.

Please go to our web site: www.trekinc.com for a complete list of our sales and service representatives and distributors located in the United States and throughout the world.

Service Information

Note: The warranty may be voided if the instrument is serviced within the warranty period by anyone other than TREK, INC. or one of its authorized service organizations.

In the event of a malfunction:

1. Notify the Customer Service Group at TREK. INC., giving full details about the difficulty, including the model number and serial number of the instrument. The Customer Service Group will issue a return authorization number.

2. If requested, forward the instrument (prepaid), with the return authorization number prominently displayed on the shipping container and the packing list, to TREK, INC.

The instrument may also be returned to an authorized Trek Service Organization. Contact the service organization nearest to you for details. Please go to our web site: www.trekinc.com for a complete list of our sales and service representatives and distributors located in the United States and throughout the world.

Appendix A Accessories

Item	Part Number
Operator's Manual with Software CD-ROM	24007
USB Cable	BA103
Carrying Case for Model 157 and Accessories	43863
Nine (9) ft. Banana-to-Banana stackable cord (2.7 meter.)	N9044
Universal AC Adapter (100 V to 240 V AC ±10%)	1K073
Bar Code Wand (DB9 Connector) only with Model 157-1	M1030

OPTIONAL ACCESSORIES

Item	Part Number
Thermohygrometer Kit (Omega HH 311 and serial cable)	1K028
Ion Collecting Plate Tripod Kit	1K065
157 Windows 10 Communication Kit	1K069

ION COLLECTING PLATES

Item	Part Number
STANDARD PLATES	
Model 156AP- C150x150-R3M (6″x 6″, meets ESD Association Standard ANSI/ESD-STM3.1).	17397
Model 156P- C25x25-S3M (1″ x 1″)	17375
SPECIAL PLATES	

Contact TREK, INC. or an authorized sales organization
for applications that require a different size or shape ion collecting plate.

Appendix B Warranty Statement

New instruments sold by TREK, INC. (hereinafter called the "Company") are warranted only as stated below:

Subject to the exceptions and upon the conditions specified below, the Company agrees to correct, either by repair, or in the Company's sole discretion, by replacement, any defect of material or workmanship which develops within one year from the date of original purchase by the customer (user), provided that investigation and factory inspection by the Company discloses that such defect developed under normal and proper use. Repair or replacement are the exclusive remedies under this warranty (batteries are not included under this warranty).

The exceptions and conditions mentioned are as follows:

(a) The Company makes no warranty concerning components or accessories not manufactured by itself.

(b) The Company is released from all obligations under this warranty in the event that repairs or modifications are made by persons other than its own or authorized personnel, unless such repairs by others are made with the prior written consent of the Company. In the event of a failure, and the customer neglects to take prompt and reasonable actions to prevent further damage, the Company cannot be responsible for consequent damage.

(c) THERE ARE NO OTHER WARRANTIES WHICH EXTEND BEYOND THOSE EXPRESSLY PROVIDED FOR HEREIN AND THE AFORESAID WARRANTY AND THE COMPANY'S OBLIGATIONS AND LIABILITIES THEREUNDER ARE IN LIEU OF, AND CUSTOMER WAIVES ALL OTHER WARRANTIES AND GUARANTEES AND ALL OTHER LIABILITIES THEREFORE, EXPRESS OR IMPLIED, ARISING BY LAW OR OTHERWISE, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ALL OBLIGATIONS AND LIABILITIES WITH RESPECT TO LOSS OF USE, REVENUE OR PROFIT, OR INDIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND AND FROM ANY CAUSE WHATSOEVER ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE MANUFACTURE, SALE, HANDLING, REPAIR, MAINTENANCE OR REPLACEMENT OF SAID PRODUCTS.

(d) Representation and warranties made by any person, including dealers and representatives of the Company, which are inconsistent or in conflict with the terms of this warranty (including, but not limited to, the limitations of the liability of the Company as set forth above), shall not be binding upon the Company unless reduced to writing and approved by an officer of the Company.

(e) This warranty shall be governed by the laws of the State of New York.

Appendix C Sales & Service

Please go to our web site: www.trekinc.com for a complete list of our sales and service representatives and distributors located in the United States and throughout the world.

Trek Contact Information:

TREK, INC.
190 Walnut Street
Lockport, NY 14094-3710 USA

Fax: (716) 201-1804
Telephone: 1 800 FOR-TREK
1 (716) 438-7555

Internet: www.trekinc.com
E-Mail: TREK-CA@aei.com

Trek Japan KK
Shin-Kanda Building
1-8-5 Kajicho, Chiyoda-ku
Tokyo, 101-0044, Japan

Fax: 81 3 3526 2986
Telephone: 81 3 3526 2985

Internet: www.trekj.com
E-Mail: sales@trekj.com