



V50 Series Electrical Safety Testers



Operating Manual

Models V50, V51, V52 and V53

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Vitrek V50 Series – Electrical Safety Tester USER MANUAL

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WARNING

Vitrek Corporation, its representatives, vendors, and distributors assume no liability for the operation of this instrument in an unsafe manner. This instrument generates and delivers hazardous voltages (up to 5KVAC / 6KVDC). Always be extremely careful when using this instrument or any high voltage device. Read this manual completely and observe operating precautions in section three before operating the instrument.

Limited Warranty

The standard warranty period for this instrument is one year from date of shipment. Please refer to your invoice or shipping documents to determine appropriate warranty dates. Vitrek warrants to the original purchaser that this product will be free from defects in material and workmanship under normal use throughout the warranty period, provided that such defects are not determined by Vitrek to have been caused by abuse, misuse, alteration, improper installation, neglect or adverse environmental conditions. Vitrek Corporation's liability under this warranty is limited solely to the repair or replacement of this instrument during the warranty period, provided it is returned to the factory freight prepaid with a return authorization number.

No other warranty is expressed or implied. Vitrek Corporation is not liable for incidental, consequential, direct or indirect damages nor for costs, losses or expenses of any kind. A return authorization number must be obtained directly from the factory for warranty repairs. No liability will be accepted if returned without factory authorization number.

Technical Support

After reading this manual, if you have any questions or need technical assistance, please contact Vitrek customer support at:

Email: info@vitrek.com Vitrek Corporation
Fax: (858)689-2760 9880A Via Pasar
Voice: (858)689-2755 San Diego, CA 92126 USA

Extended Three Year Warranty Program

To qualify your instrument for an extended three-year warranty period you must:

1. Register your unit within 30 days from receipt by faxing or emailing the following data

Vitrek Model no. & S/N	
Contact Name	
Company / Organization	
Street Address	
City, State, Zip Code	
Contact Email Address	
Contact Phone Number	

2. Contact the factory for a reference number to return your unit to the factory for annual calibration and re-certification prior to the expiration of the initial cal due date. Upon receipt of your PO number for the calibration fee, the warranty will be extended for an additional year (up to a maximum of three years total warranty.)

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SAFETY TERMS AND SYMBOLS

These terms may appear in this manual or on the product:



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 property.

The following symbols may appear in this manual or on the product:



DANGER
High Voltage



ATTENTION
Refer to Manual



Protective
Conductor
Terminal



Ground
Terminal

1. V50 SERIES PRODUCT INTRODUCTION

Our goal at Vitrek is 100% customer satisfaction with both our products and our people. Please feel free to contact us if we can be of help with application or technical assistance, repair or calibration services accessories or spare parts.

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1-1. Description

The Vitrek V50 Series Electrical Safety Testers comply with the requirement for electrical equipment and appliance control ordinances as defined by UL, CSA, JIS, BS and many other international standards. The testers are ideal for voltage withstand (Hipot) testing on a wide variety of electrical equipment and components. The Vitrek V50 series is a family of four automatic voltage withstand testers. The functions they provide include AC Hipot, DC Hipot, Insulation Resistance plus continuity.

Function Model	AC	DC	IR
V50	X		
V51	X	X	
V52	X		X
V53	X	X	X

1-2. Features

The V50 series electrical safety testers offer many outstanding features:

- 1) No load setup of trip current and output voltage.** A safe way to setup the trip current and output voltage is without the high voltage being activated.
- 2) A large 24x2 character LCD with adjustable LED back light.**
Provides a clear display showing test parameters including: group, step, mode, status, output voltage, trip current, and test time.
- 3) Easy and quick setup via the front panel.** A user-friendly interface provides user with an easy and quick way to set all parameters.
- 4) Electronic ramping and testing.** Digital controlled ramping time and testing time.
- 5) Line and load regulation.** Linear amplifier with feedback-control, maintains output voltage regardless of the variation of load.
- 6) Selectable output frequency.** 50/60 Hz is selectable by utility setup.
- 7) Adjustable ARC detects level.** ARC detect level is selected by utility setup.
- 8) Storage of up to 6 groups, 6 steps for each group.** A total of 6 groups provide the operator with the capability of testing different products. Each group includes 6 steps.
- 9) Manual output voltage adjustment mode.** With a special test mode in step 0, the operator is able to adjust the output voltage during testing.
- 10) Flashing high voltage indicator.** A flashing red LED indicates danger when high voltage output is activated.
- 11) PLC remote control.** The 9-pin interface provides inputs (START, RESET) and outputs (TEST, PASS, FAIL).
- 12) Data lock function.** Front panel can be locked or unlocked by utility setup.
- 13) Ground Check function.** Check the continuity of earth ground in the power inlet before testing.

2. V50 SERIES SPECIFICATIONS

AC Hipot

Voltage Range: 100 to 5000 VAC RMS

Voltage Setting Resolution: 5V/step

Voltage Regulation: 1% of reading + 5V

Voltage Accuracy: 1% of reading + 5V

Voltage Monitoring: At Output Terminals

Max Output Current: 20mA. Continuous operation up to 10mA, 10 second max above 10mA

Max Current Limits: 0.1 to 20mA

Min Current Limits: 0.0 to 19.9mA

Current Accuracy: 1% of reading + 0.05mA, within current limits

DC Hipot (V51, V53 only)

Voltage Range: 100 to 6000 VDC

Voltage Setting: Resolution: 5V/step

Voltage Regulation: 1% of reading + 5V

Voltage Accuracy: 1% of reading + 5V

Voltage Monitoring: At Output Terminals

Max Output Current: 7.5mA

Minimum Load Impedance: 330 K ohm

Max Current Limits: 0.1 to 7.5mA

Min Current Limits: 0.0 to 7.4mA

Current Accuracy: 1% of reading + 0.05mA

Insulation Resistance (V52, V53 only)

DC Output Voltage: 500V or 1000V

Resistance Range: 1 to 9999M Ω

Resistance Accuracy: 1 to 500M Ω 5% of reading, 501 to 2000M Ω 10% of reading

Continuity Measurement

Test Current: 100mA \pm 10mA

Resistance Range: .001 to 1.500 Ω

Resistance Accuracy: 0.1 Ω

General

Test Database: 6 Test Sequences with up to 6 steps per test sequence

Front Panel Lockout: Prevents the database from editing while in lockout mode

Arc Detect: 10 level trip select

Remote Interface: 9-pin D-sub connector with Outputs of Testing, Pass, Fail and inputs of Start, Reset. Output isolation is 400V with 130mA Continuous load current.

Timer Accuracy: 0.10% \pm 50mS

Power Source: AC100V, 120V, 220V, 230V (\pm 10% 50/60Hz), 250W max

Operating Environment: Indoor, Altitude < 6500ft (2000m). Installation Category II. Pollution Degree 2

Operating Temperature: 0°C to 40°C, 80% RH max.

Storage Temperature: -10°C to 70°C, 70% RH max

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Dimension: 17.6”L x 13”W x 5.9”H, 446(L) x 330(W) x 149(H) mm

Weight: 30 lbs. (14kg) net, 34 lbs. (16 kg) ship

Accessories: NIST certification, TL-2050 Test Leads, Instruction Manual and power cord

Accuracy: Stated specifications apply for 1 year at 23 °C ± 5 °C

Calibration: Certificate of calibration, traceable to NIST provided

Compliance: CE mark certified to EN61010 and EMC directives EN50081-1 & EN50082-2

QuickTest™ Software Option QT-50: Bundled test automation software, with PC parallel interface adapter and cable. Easy to load Graphical test sequence development and operating environment. Provides time/date, operator, test parameters, and test results for review, printout or export to database program.

3. PRECAUTIONS BEFORE OPERATION

3-1. Unpacking the instrument

The product has been fully inspected and tested before shipping from the factory. Upon receiving the instrument, please unpack and inspect it for any damage that may have occurred during transportation. If any sign of damage is found, notify the carrier and Vitrek or your distributor immediately.

3-2. Safety Notice

Work Place Safety

The work place must be isolated from routine traffic and when high voltage testing is in process, a warning signal should be provided.

Checking the Line Voltage

The instrument can be connected to any kind of line voltage shown in the table below. Before connecting the power plug to an AC line outlet, make sure the voltage selector on the rear panel is set to the correct position corresponding to the line voltage. CAUTION: Damage to the instrument may occur if it is connected to the wrong AC line voltage.



WARNING. To avoid electrical shock the power cord protective grounding conductor must be connected to ground.

When line voltage is changed, install the required fuses shown as below:

Line voltage	Range	Fuse	Line voltage	Range	Fuse
100V	90-110V	T 4.0A	220V	198-242V	T 4.0A
120V	108-132V	250V	230V	207-250V	250V



WARNING. To avoid personal injury, disconnect the power cord before removing the fuse holder.

Operator's Precaution

- (1) Because of the extreme high output voltage and current of the breakdown tester, only a qualified person should operate the tester in order to avoid fatal electric shock.
- (2) On-the-job training is required for the operator to use the tester efficiently and safely.
- (3) The operator should be prohibited from wearing metal jewelry, etc in order to avoid an electrical shock.
- (4) A person with a heart condition or who wears a pacemaker must not operate the tester.

Safe, Secure Testing

The earth ground contact of the power cord must be properly connected in accordance with instructions. The return lead must be connected to the tested object first before high voltage testing. Do not handle the alligator test leads while high voltage is applied. Also, when using the optional HV probe do not touch the exposed conductive tip of the test probe during testing. Provide full control the power supplied to the tester by means of a carefully placed on/off switch or remote power control device.



WARNING: During testing, do not touch the test object or any other connected objects

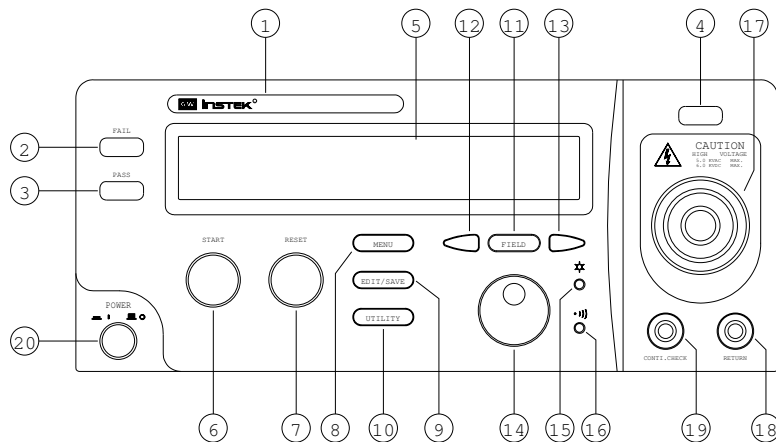
3-3. Environment

The normal ambient temperature range of this instrument is from 0° to 40°C (32° to 104°F). Operation of the instrument above this specific temperature range may cause damage to the circuits.

Do not use the instrument in a place where a strong magnetic or electric field exists, as they may distort the measurements.

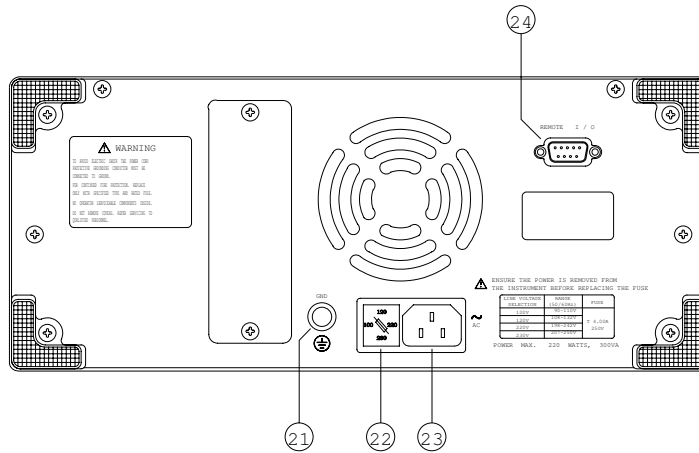
4. PANEL INTRODUCTION

4-1. Front Panel



1	Model Number	Model number and description
2	FAIL Indicator LED	The red LED indicates failure of test procedure
3	PASS Indicator LED	The green LED indicates pass of test procedure
4	CAUTION Indicator LED	During test the red LED will flash to indicate danger.
5	Main Display LCD	The LCD displays all message about test procedure
6	START Button	Press the green button to start a test procedure
7	RESET Button	Press the red button to reset/stop a test procedure
8	MENU Key	When you press the MENU key, the status becomes MENU and you can browse all groups.
9	EDIT/SAVE Key	When you press the EDIT/SAVE key, the status EDIT is active and you can edit this step or setup. Press the EDIT/SAVE key again will save this step or setup.
10	UTILITY Key	When you press the UTILITY key, the status UTILITY is active and you can view all the utility setups.
11	FIELD Key	When you edit the test step, press the FIELD key to change the active parameter of stop.
12	Left Arrow Key	Press the arrow key to adjust knob's resolution.
13	Right Arrow Key	Press the arrow key to adjust knob's resolution.
14	Knob	If status EDIT is active, turn the knob to increase or decrease the value of active parameter. If status MENU is active, turn the knob to increase or decrease active Step.
15	LCD Back light Adjustment	Turn the VR to adjust the LED back light of LCD.
16	Buzzer Volume Adjustment	Turn the VR to adjust the buzzer volume.
17	High Voltage Output Seat	High voltage output terminal.
18	RETURN Terminal	Test return terminal.
19	CONTI. CHECK Terminal	Continuity check output terminal.
20	Power Switch	Press the power switch to turn on the tester.

4-2. Rear Panel



21	Ground Terminal	Connect Ground terminal to the earth ground.
22	Fuse Holder with Voltage Selector	To change AC source voltage, pull the fuse holder and rotate it to the proper value.
23	AC Inlet	Connect the AC power line to the inlet.
24	Remote I/O	The remote I/O performs all the functions of PLC control.

5. OPERATING THE INSTRUMENT

5-1. Main Display LCD

Storage	Mode	Output Voltage/Current	Status
1 : 1	ACW	V = 5 . 0 0 0 k V	R E A D Y
I m A x = 0 1 . 0 0 m A		T E S T = 0 0 0 . 0 s	
Measurement Limit		Ramp/Test Time	

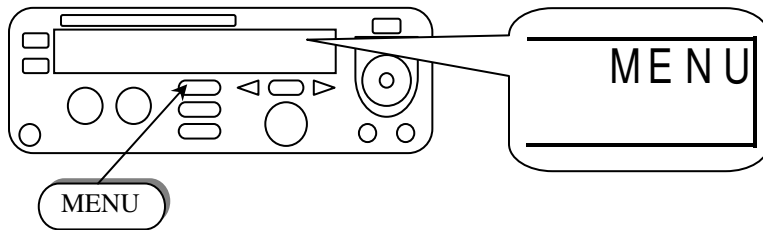
Table of Parameters

Storage	Group: There are a total of 6 groups, 6 steps for each group. The first number indicates the group while the second number indicates the step. Ex. 3:1 means the 1st step in group 3 is active.
Mode	The test mode of tester includes: ACW: AC Withstanding voltage test DCW: DC Withstanding voltage test I R : Insulation Resistance test Cont: Continuity check (The available modes vary by model.) Output voltage or current for each step: AC: Output voltage (0.100~ 5.000 kV) DC: Output voltage (0.100~ 6.000 kV) IR: Output voltage (0.500kV or 1.000kV) Cont: Output current (0.100A)
Status	The status of tester includes: MENU: Browse and check steps of test. EDIT: Edit parameters SAVE: Save parameters UTIL: Browse and check system utility. READY: Ready for test TEST: Testing PASS: The result of test is pass FAIL: The result of test is fail STOP: Stop the test
Measurement Limit	Lower and upper limit of measurement: Imax/Imin: Current measurement limit (ACW & DCW) Rmax/Rmin: Resistance measurement limit (IR & Cont)
Ramp/Test Time	Ramp time and test time: AC: Ramp/Test (000.0~999.9 s) DC: Ramp/Test (000.0~999.9 s) IR: Test (000.0~999.9 s) Con: Test (000.0~999.9 s)

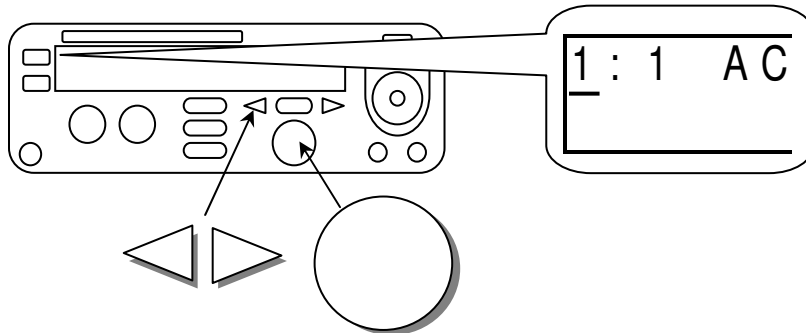
5-2. Preparing the V50 Series EST for Use

To view the Stored Steps

1. Press the **MENU** key to access test number field.

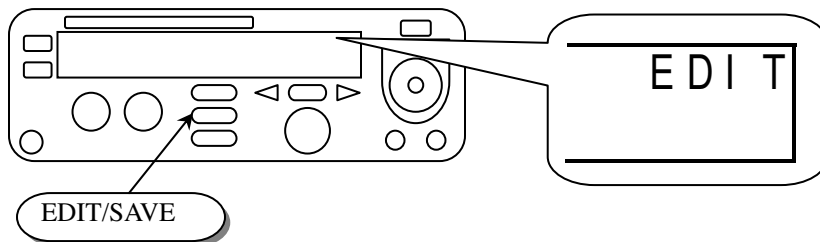


2. Use the left and right arrow keys to select group or step. Use the knob to change the active step.

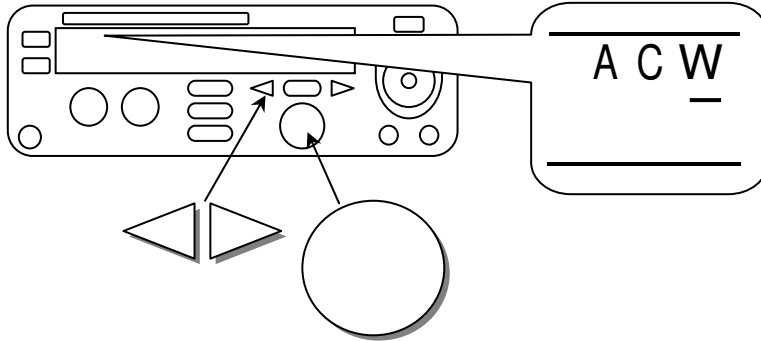


To Edit and Save the Stored Steps

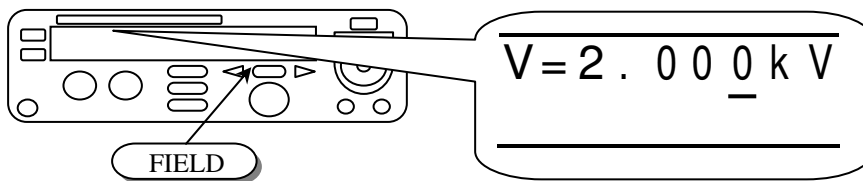
1. Follow the above procedure “To View the Stored Steps” in order to select the desired step.
2. Press the **EDIT/SAVE** key to enter EDIT status.



3. Use the knob to adjust the parameter. Use arrow keys to change the knob's resolution.

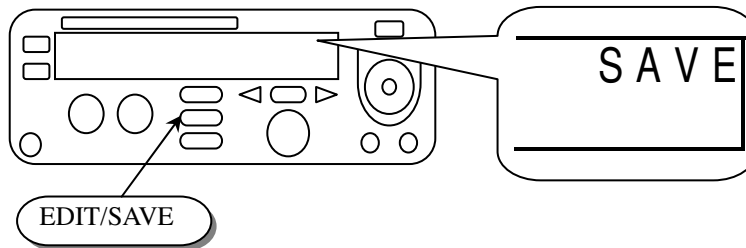


4. Use the **FIELD** key to advance to the next parameter field.



5. Repeat step 3 and 4 to adjust parameters.

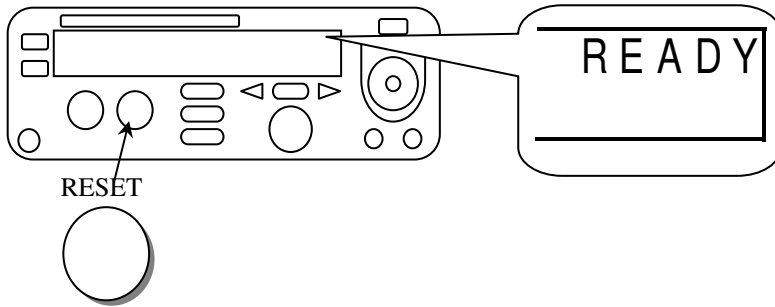
6. After setting all parameters, press **EDIT/SAVE** key to save the step. The status will become SAVE. After the step is saved, the status will return to EDIT.



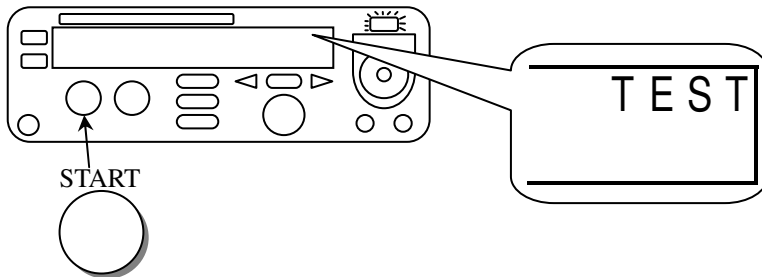
7. Repeat the procedure “To View the Stored Steps” to select another step.

To Begin a Group Test

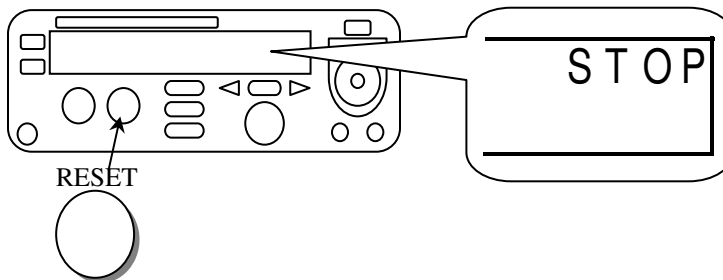
1. Repeat the procedure “**To View the Stored Steps**” to select a step.
2. Press RESET button to enter status READY.



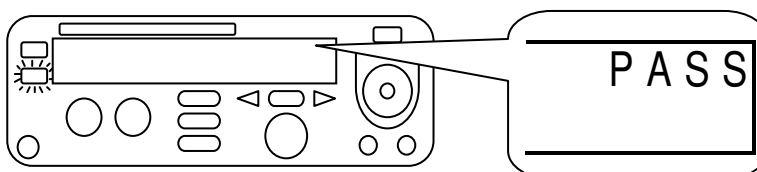
3. Make sure the test environment is safe.
4. Press START button to start the test while the status TEST is active and the CAUTION LED flashes.



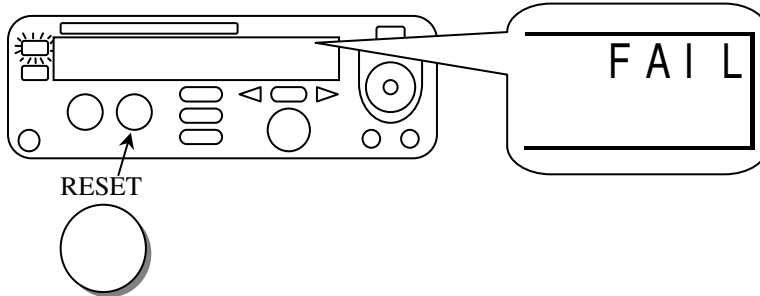
5. If you press RESET button the test will stop immediately.



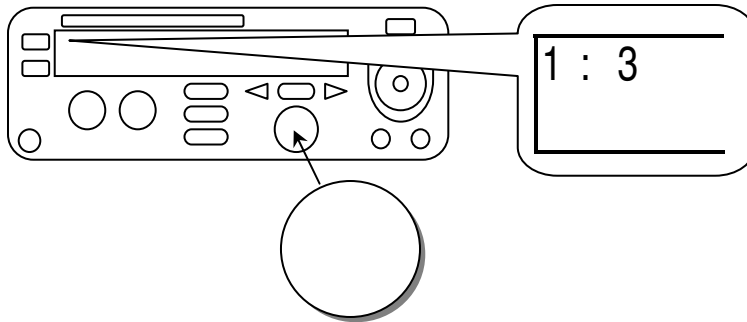
6. If the result is PASS, the PASS LED will be active.



7. If the result is fail, the FAIL LED will be active and the buzzer will alarm the operator. To stop the alarm, press RESET button again.

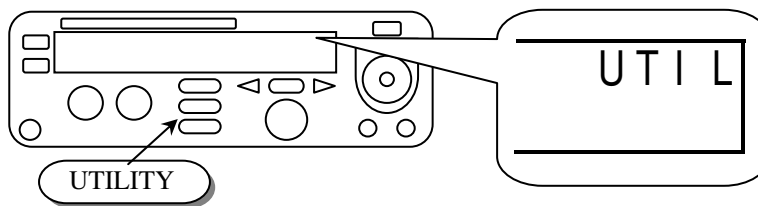


8. Use the knob to view the result of group step by step.



To View the System Utility

1. Press the **UTILITY** key to enter status UTIL.



2. Use the knob or arrow keys to change the active parameter.

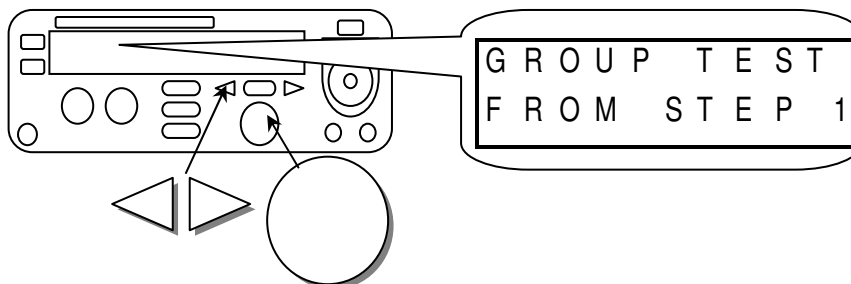


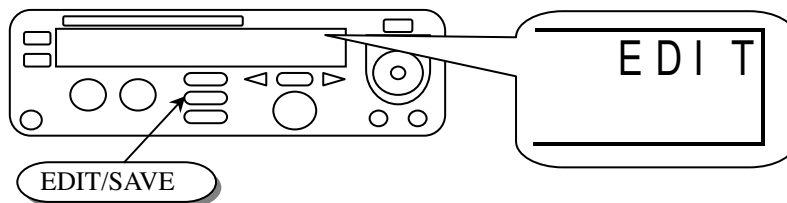
Table of system utility:

Parameter	Option	Description
GROUP TEST	From STEP 1	The group test procedure always begins from step 1 to end of group. (e.g. 3:1~3:6, 4:1~4:6)
	From the present step	The group test procedure always begins from the step selected to end of group. (e.g. 3:3~3:6, 4:3~4:6)
ARC MODE	DISABLE	Disable the function arc detection.
	ENABLE & STOP	Enable the arc detection and stop the test when arc is active.
	ENABLE & CONTINUE	Enable the arc detection and continue the test when arc is active.
ARC CURRENT*		Set the current level of arc detection.
AC FREQUENCY	50 Hz	Set the ac hipot output frequency to 50 Hz.
	60 Hz	Set the ac hipot output frequency to 60 Hz.
CONTROL MODE	MODE 1	Mode 1: Double click (Reset / Start)
	MODE 2	Mode 2: Press the start button directly.
	MODE 3	Mode 3: PLC remote enable
DATA LOCK	UNLOCKED	Accepts and saves all parameters of test step and utility.
	LOCKED	Will not change any parameters of test step and utility.
Conti. Calibration		Calibrates (zeroes) the resistance of test leads for the Continuity check.

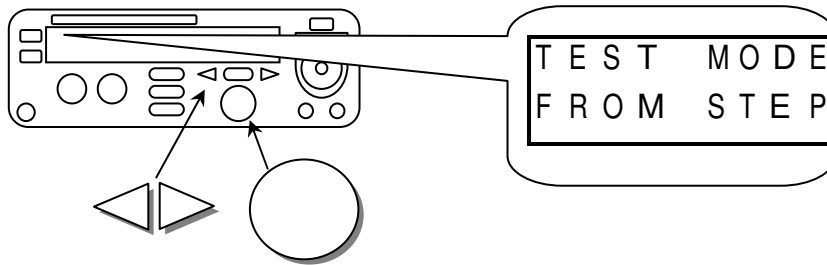
The arc detection circuit is tuned for high frequencies. It does not see any line frequency energy. Arcs are a wide band phenomenon and are not required for electrical safety testing, so it is safe to disable this feature. It is there primarily as a QC feature above and beyond the safety requirement. The safety spec is checking for electrical breakdown of the primary insulation. Breakdown is defined by UL as a sudden and uncontrolled flow of current. Since and arc tends to be a controlled flow of current it is not considered a breakdown.

To Edit/Save the System Utility

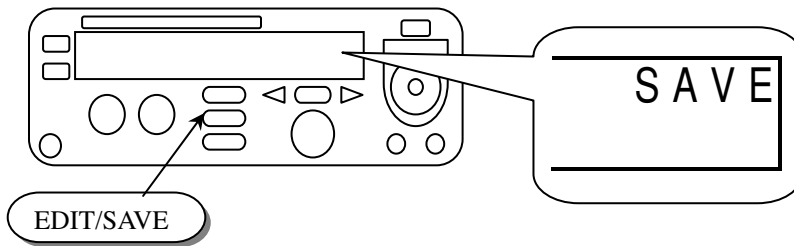
1. Follow the above procedure to view the system “Utility “ to select a parameter.
2. Press the **EDIT/SAVE** key to enter EDIT mode.



3. Use the knob to adjust the parameter. Use arrow keys to change the knob's resolution.



4. After setting the parameter, press **EDIT/SAVE** key in order to save the parameter. The unit will go into SAVE mode. After the parameter is saved, the unit will return to EDIT mode.



5. To exit edit mode, press the UTILITY button to select another parameter, or the MENU button to return to the test menu.
6. Repeat the procedure “**To View the System Utility**” to select another parameter.

5-3. Structure of Test Sequence Storage

The test sequence database of the EST consists of a total of 6 test sequences or groups (group 1 ~ group 6), with 6 steps (step 1 ~ step 6) for each group. In addition to these steps, there is another step “0:0” for manually controlled tests. The order of stored steps is Group: Step. The first number represents the Group number while the second represents the Step number.

		Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Step 1	0:0 →	1:1 →	2:1 →	3:1 →	4:1 →	5:1 →	6:1
		↓	↓	↓	↓	↓	↓
Step 2		1:2	2:2	3:2	4:2	5:2	6:2
		↓	↓	↓	↓	↓	↓
Step 3		1:3	2:3	3:3	4:3	5:3	6:3
		↓	↓	↓	↓	↓	↓
Step 4		1:4	2:4	3:4	4:4	5:4	6:4
		↓	↓	↓	↓	↓	↓
Step 5		1:5	2:5	3:5	4:5	5:5	6:5
		↓	↓	↓	↓	↓	↓
Step 6		1:6	2:6	3:6	4:6	5:6	6:6

The special test step “0:0” contains another two types of tests: CAC and CDC. The function of CAC and CDC is the same as ACW and DCW, except that the user is able to manually adjust the output voltage with the knob during the test.

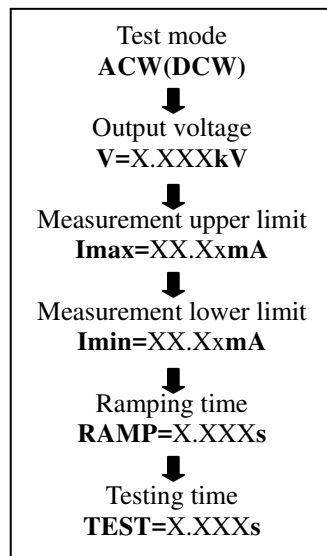
5-4. Menu Parameter Setup

- **AC/DC Hipot - Voltage withstand test (ACW/DCW)**

Press MENU key to enter MENU mode then use knob and arrow keys to select a step.

Press EDIT/SAVE key to enter EDIT mode. The cursor stays at the “test mode” field. Use knob to select desired test ACW (DCW).

Functionality of FIELD key:



Press FIELD key to edit the next field “output voltage”. Use the knob to adjust the desired output voltage while using the arrow keys to adjust the knob’s resolution (0.100~ 5.000 kV for ACW, 0.100~ 6.000 kV for DCW).

Press FIELD key again to enter the next field “measurement upper limit”. Use the knob to adjust the desired upper limit of leakage current while using the arrow keys to adjust the knob’s resolution (0.10~15mA for ACW, 0.10~7.5mA for DCW).

Press FIELD key again to enter the next field “measurement lower limit”. Use the knob to adjust the desired lower limit of leakage current while using the arrow keys to adjust the knob’s resolution (0.10~15mA for ACW, 0.10~7.5mA for DCW).

Press FIELD key again to enter the next field “ramping time”. Use the knob to adjust the desired ramping time while using the arrow keys to adjust the knob’s resolution (0~999.9s).

Press FIELD key again to enter the next field “testing time”. Use the knob to adjust the desired testing time while using the arrow keys to adjust the knob’s resolution (0~999.9s).

Press FIELD key again to return to the first field “test mode” again.

Press EDIT/SAVE key to save all the parameters.

- **Continuous AC/DC withstanding voltage test (CAC/CDC)**

The CAC/CDC test is available only on step “0:0”. Like the traditional hipot tester, you can use the knob and arrow keys to adjust output voltage during the test.

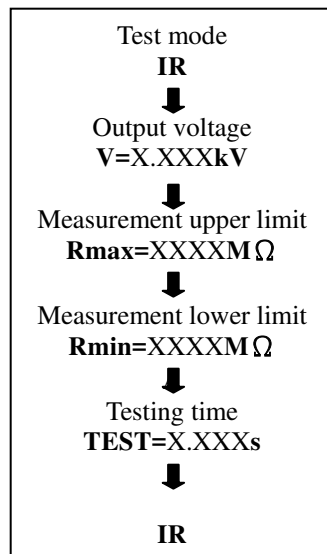
All the parameters of CAC/CDC are the same as ACW/DCW, except the testing time. The testing of CAC/CDC is not limited.

- **Insulation Resistance test (IR)**

Press MENU key to enter status MENU then use the knob and Arrow keys to select a step.

Press EDIT/SAVE key to enter status EDIT. Now the cursor stays at the “test mode” field. Use the knob to select IR mode.

Functionality of FIELD key:



Press FIELD key to edit the next field “output voltage”. Use the knob to adjust the desired output voltage (500V/1000V).

Press FIELD key again to enter the next field “measurement upper limit”. Use the knob to adjust the desired upper limit of resistance while using the arrow keys to adjust the knob’s resolution (0~9999M Ω).

If no upper resistance limit is desired, enter 0.000 and the upper resistance limit will be ignored.

Press FIELD key again to enter the next field “measurement lower limit”. Use the knob to adjust the desired lower limit of resistance while using the arrow keys to adjust the knob’s resolution (0~9999M Ω).

Press FIELD key again to enter the next field “testing time”. Use the knob to adjust the desired testing time while using the arrow keys to adjust the knob’s resolution

Press FIELD key again to return to the first field “Test Mode” again.

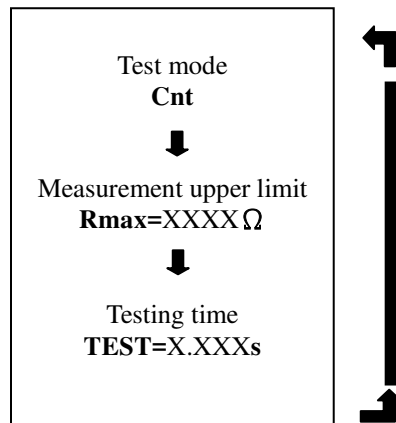
Press EDIT/SAVE key to save all the parameters.

- **Continuity Check (Cont.)**

Press MENU key to enter status MENU then use the knob and arrow keys to select a step.

Press EDIT/SAVE key to enter status EDIT. Now the cursor stays at the “test mode” field. Use the knob to select mode Cnt. The output current is fixed at 0.100A.

Functionality of FIELD key:



Press FIELD key to enter the next field “measurement upper limit”. Use the knob to adjust the desired upper limit of resistance while using the arrow keys to adjust the knob’s resolution (0~1.200).

Press FIELD key again to enter the next field “testing time”. Use the knob to adjust the desired testing time while using the arrow keys to adjust the knob’s resolution (0~999.9s).

Press FIELD key again to return to the first field “test mode” again.

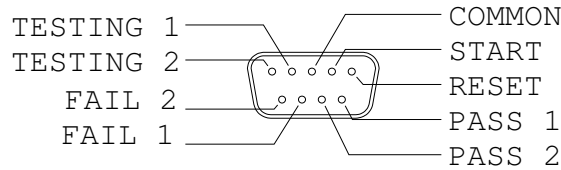
Press EDIT/SAVE key to save all the parameters.

5-5 Remote Interface Operation

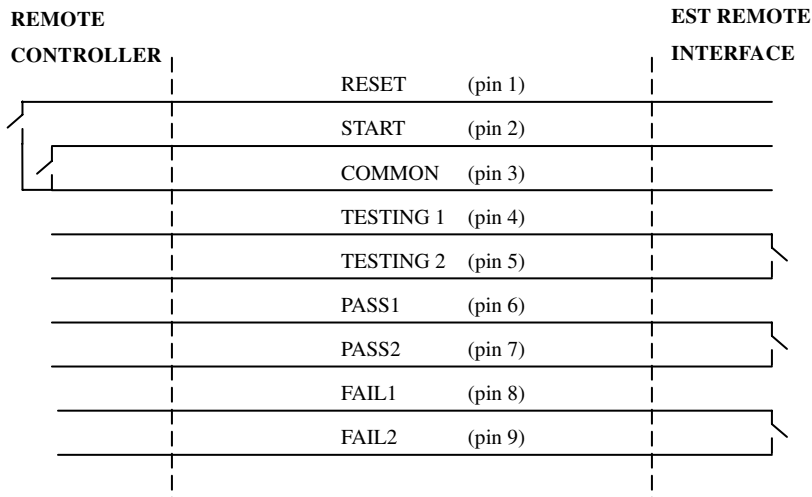
For ease of automating the V50 Series unit when interfacing to a PC, we recommend the use the Vitrek QT-50 test automation software and PC interface adapter. The adapter allows you to control the unit via a standard PC serial port, while the software allows for the development of test sequences and the storage of all test results for viewing or export to a database.

To prepare the unit for control via the remote interface, press the UTILITY key and dial up the TEST CONTROL MODE using the knob. Press the SAVE/EDIT key to edit the field and use the knob to select MODE 3: PLC ENABLE, then press SAVE/EDIT to save the setting and press MENU to exit the utility mode. The unit is now configured for remote operation.

The remote interface provides two inputs (START and RESET) and three outputs (TESTING, PASS and FAIL). The I/O connector is a DB9 FM. Output contacts are rated at 400V/ 1.3 amps maximum.



- RESET:** Connecting “RESET”(pin 1) to “COMMON”(pin 3) will reset or interrupt this machine (the same function as the RESET button on the front panel). A reset is required to clear the pass/fail status and place the tester in the ready mode.
- START:** In status READY, connecting “TEST”(pin 2) to “COMMON”(pin 3) will start the test procedure (the same functionality as the START button in the front panel).
- TESTING 1, 2** While testing, the “TESTING” lines will be shorted and will remain shorted until the pass/fail contacts are set.
- PASS 1, 2** If the result of the test is “pass”, the “PASS 1” and “PASS 2”(pins 6 & 7) will be shorted.
- FAIL 1, 2** If the result of the test is “fail”, the “FAIL 1 and “FAIL 2”(pins 8 & 9) will be shorted. The pass/fail results will remain valid until the reset is activated.



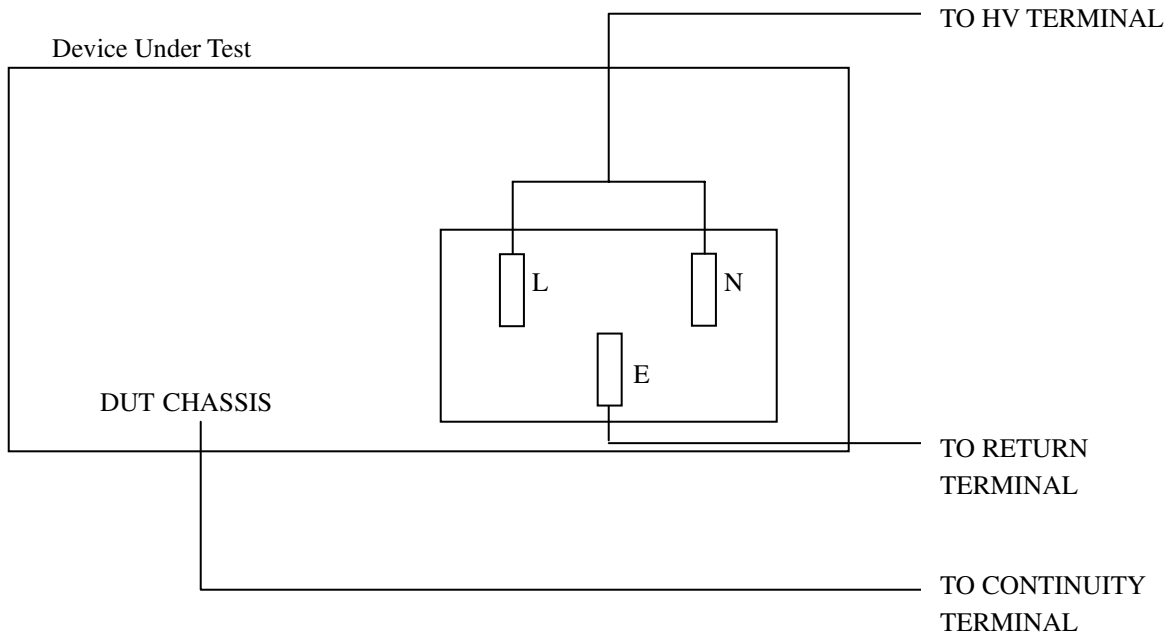
6. MEASUREMENT CONNECTIONS



- 1. High Voltage Output Terminal.** This large HV connector with a red circle around it is the output terminal for all HV tests (ACW, DCW and IR). For typical electrical safety testing, this terminal connects to both the line and neutral power pins of the device under test (DUT). For ease of connection Vitrek offers the TL-IEC-50 shown above, which plugs directly into an IEC 320 style power inlet. For devices using a NEMA 5-15 (North American) power plug the available TL-115-50 provides for quick and convenient connection. CAUTION: The HV terminal is capable of delivering up to 5kVAC or 6kVDC. Avoid contact with the terminal, test leads and the DUT when high voltage is present on this terminal.
- 2. Return Terminal.** The return terminal is the reference terminal for leakage current measurements and is also one of the two terminals used in making a continuity (low resistance) measurement. This terminal typically connects to the earth ground pin of the DUT. Inside the TL-115-50 and the TL-IEC-50 this terminal is connected to the earth socket of the test adapter.
- 3. Conti. Check.** This is the other of the two terminals used in making a continuity (low resistance) measurement. The V50 Series EST's always measure continuity between the "Conti. Check" and the "Return" terminals.

4. **Device Under Test (DUT).** A power supply shown here, represents a typical DUT. The connection to the DUT power inlet is made here by way of the optional TL-IEC-50.
5. **DUT Chassis.** The Conti Check terminal connects directly to the DUT chassis via the standard alligator test lead.

Typical Electrical Safety Test Connection Diagram



7. MAINTENANCE

The following instructions should be used only by a qualified person in order to avoid electrical shock. Do not perform any service other than contained in the operation instructions unless you are qualified to do so.

7-1. Fuse Rating and type

If the fuse blows, the FUNCTION GENERATOR will not operate. Try to determine and correct the cause of the blown fuse, then replace the fuse with the correct rating and type shown as below:

Line voltage	Range	Fuse	Line voltage	Range	Fuse
100V	90-110V	T 4.0A	220V	198-242V	T 4.0A
120V	108-132V	250V	230V	207-250V	250V



WARNING: For continued fire protection, replace only with 250V fuse of the specified type and rating, and disconnect the power cord before proceeding fuse replacement.

7-2. Cleaning

To keep the instrument clean, wipe the case with a damp cloth and detergent. Do not use abrasives or solvents.

7-3. Trouble Shooting

Problem: Unit passes continuity test even when leads are disconnected.

Solution: Unit has improper test lead zeroing. Press “Utility” key use knob to select “Conti Calibration Util” short Continuity and return test leads together and then press the “start” button.

Problem: QT-50 Interface or PLC start input does not work.

Solution: Unit has not been set to correct PLC mode. Press “Utility” key use knob to select “TEST CONTROL MODE. Press the SAVE/EDIT key to edit the field and use the knob to select MODE 3: PLC ENABLE, then press SAVE/EDIT to save the setting and press MENU to exit the utility mode. The unit is now configured for remote operation.

Problem: Start button does not start test.

Solution: Unit is set to PLC mode 3. Press “Utility” key use knob to select “TEST CONTROL MODE. Press the SAVE/EDIT key to edit the field and use the knob to select MODE 1: Normal, then press SAVE/EDIT to save the setting and press MENU to exit the utility mode. The unit is now set for front panel operation.

Problem: ACW or DCW test fails right away with DUT attached or even with no DUT.

Solution: Check the setting for minimum current. If it is set above zero, then set to 0.00mA and try again. Any reading below the minimum current limit value will cause an immediate failure.

Problem: Unit reports “Error ACW Hot Heatsink”

Solution: The V50 series EST’s are not designed to source current above 10mA for more than 10 seconds. Repeated high duty cycle use above 10mA will cause overheating to occur.

7- 4. V50 Series Failure Indications

Note: All indicators occur after you press the reset button to stop the tone, but before you press the reset button to reset the test. It is very easy to just hit the reset button twice and miss these error messages, as they often do not show up for a second after the first press of the reset button.

Failure	Indication
Imeas is less than Imin	The Imeas field in the lower left hand corner of the LCD will change to Imin and blink slowly, displaying the current that failed, not the current Imin setting.
Imeas is greater than Imax	The Imeas field in the lower left hand corner of the LCD will change to Imax and blink slowly, displaying the current that failed, not the current Imax setting.
Rmeas is greater than Rmax	The Rmeas field in the lower left hand corner of the LCD will change to Rmax and blink slowly, displaying the resistance that failed, not the current Rmax setting.
Rmeas is less than Rmin	The Rmeas field in the lower left hand corner of the LCD will change to Rmin and blink slowly, displaying the resistance that failed, not the current Rmax setting.
Arc (with arc detection disabled)	When running a test and an arc failure occurs, the test will fail, but the tester will be displaying a voltage under the set voltage. After pressing reset once, the Imax field will blink, even though the Imeas is still less than the Imax
Arc (with arc detection set to Enable & Stop)	When an arc is detected during a test, a star (*) will appear to the right of the voltage. The test will fail immediately, and upon pressing the reset button once, the star will blink.
Arc (with arc detection set to Enable & Continue)	When an arc is detected in this mode, a star (*) will appear to the right of the voltage, but the test will continue. If the test fails due to the arc breaking down, it will display a voltage under the user’s setting, and after pressing the reset button once, the Imeas field will change to Imax and start blinking, even if the Imeas is under the Imax.

7-5. Vitrek V50 Series Calibration Procedure

Calibration Procedure No. V50-020502

The following procedure will provide verification of the calibration status of the Vitrek V50 Series EST. Utilize the attached V50 Series calibration data sheet for verification sequence, nominal values and maximum allowable tolerance. Not all units in the V50 series have all functions. Omit test points for any given unit where dashes are shown.

Calibration Verification Equipment

Precision AC/DC High Voltage Meter (Vitrek model 4600A or equivalent)

Vitrek 4610A (or 501) HV Standard Resistor Set - 1Ω, 100kΩ (10watts minimum), 1MΩ, 100MΩ, 1GΩ

Verification Procedure

1. Using ACW mode, measure and record the AC output voltages of the V50 Series at settings of 1000 and 5000VAC.
2. Reduce output to zero and hook-up 1MΩ across HV output and return. Apply 1000VAC to resistor and record 1MA reading. Be sure to correct reading for any known deviation from 1000VAC output.

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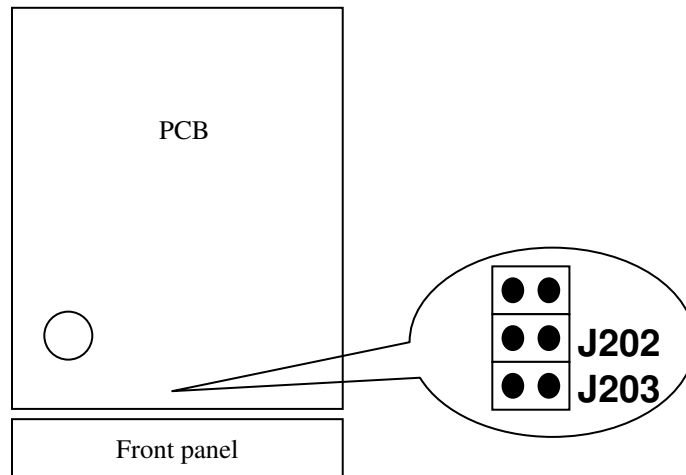
3. Repeat step 2 using 100kΩ for 10mA reading.
4. Using DCW mode, measure and record the DC output voltages of the V50 Series at settings of 1000 and 6000VDC.
5. Using DCW mode, output 1000VDC into a 1MΩ resistor to record 1mA reading. Note: minimum load impedance for DC mode is 330k ohm.
6. Using the IR mode, measure and record 100MΩ and 1GΩ resistors.
7. Use continuity cal function (under “utility”) to “zero out” lead resistance prior to checking continuity accuracy. Using continuity mode, measure and record 1Ω resistor

V50 Series Calibration Data Chart

Nominal Values	V50	V51	V52	V53	Maximum Tolerance
1000VAC					± 15V
5000VAC					± 55V
1mA AC					± .06mA
10mA AC					± .15mA
1000VDC	-----		-----		± 15VDC
6000VDC	-----		-----		± 65VDC
1mA DC	-----		-----		± .06mA
100MΩ	-----	-----			± 5MΩ
1000MΩ	-----	-----			± 100MΩ
1Ω					± .100Ω

The following portion of this procedure is for adjustment of the actual calibration values. The V50 series includes V50 through V53. Switching jumpers (J202 and J203) could change this unit to other models for which it is not configured.

Model	J202	J203
V50	Open	Open
V51	Short	Open
V52	Open	Short
V53	Short	Short



Calibration for each module

The Vitrek V50 Series ESTs can be divided into several modules for calibration & adjustment. The modules consist of: main board, isolation board, AC withstanding voltage, DC withstanding voltage, IR, and Continuity check.

Model	Main Board	Insulating board	AC withstanding voltage	DC withstanding voltage	IR	Continuity check
V50	*	*	*	-	-	*
V51	*	*	*	*	-	*
V52	*	*	*	-	*	*
V53	*	*	*	*	*	*

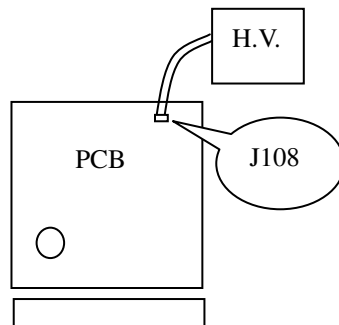
For the safety reasons, the operator could make these calibrations just by adjusting the knobs of front panel. Except the main board & isolation board that adjusted by the VR of PCB.

Main Board Calibration (without high voltage transformer)

1. Pull apart the connector between high voltage transformer & main board (J108).



WARNING: When you open the unit, pull apart J108 first. This will disable the H.V. output in the unit and provide increased technician safety.



2. Check each power voltage.
3. Check the voltage between tp1(+) & GND(-) by DMM, the voltage shall be 0 by adjusting VR201.

Isolation Board Calibration

1. Measure the power source voltage by DMM:
 TP404(+) ~ TP400(-) → -15V±0.3V ; TP405(+) ~ TP400(-) → +15V±0.3V
2. Use high voltage meter (DC) and measure between TP402(+) & TP403(-), the voltage shall be +1150V±2V by adjusting VR401.

Calibration Modules

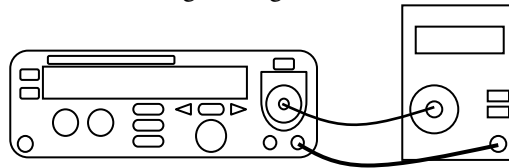
Calibration procedures are built in the software of the EST series. Please follow as:

1. Connect with high voltage transformer & main board. The safety cover should be closed.
2. Press UTILITY key and press power SW. While the machine is turned on, keep pressing the UTILITY key until the LCD shows “PRESS START TO PROCESS”.

3. While the machine is warmed up, the LCD monitor will display the model name.
4. Check the model name. If it's not the same model name, turn off the power and repeat the "MODEL SETTING".
5. In the meantime, EST series will self test the grounding condition of power line. If the earth check failed, EST series will be alarmed. Therefore, turn off the power and re-check grounding again.
6. If self-test is passed, the LCD monitor will display the "PRESS START TO PROCESS" message. Press START key to begin calibration procedures.
7. Select the calibration modules by pressing the left & right arrow key. Press START key to begin calibration procedures. The calibration procedures are following:

STEP 1: AC withstanding voltage- voltage adjustment proceduce (STEP1:ACV)

1. Connect V50 Series unit to Vitrek 4600A high voltage meter.



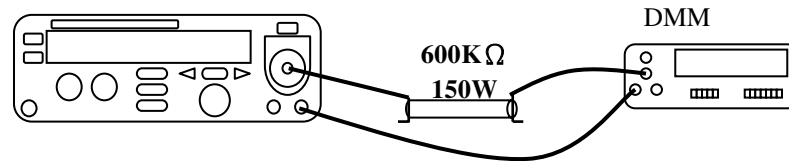
2. Follow " **Modules Calibration Starting Procedures**", Select the calibration module "**STEP 1: ACV**". Press START key to begin calibration procedures.
3. The "50Hz 600V" will be calibrated first. Use knob and left & right arrow key to adjust the value of the LCD monitor. The readout of high voltage meter shall be monitored in the same time. If the meter's readout reach to 600V ($\pm 2V$), wait for 3 seconds and press EDIT/SAVE key.
4. Repeat step 3 for "50Hz 3000V", "60Hz 600V", and "60Hz 3000V" in sequence.
5. After calibration of 4 sets voltage are finished, the LCD monitor will go back the orginal display. Press the left & right arrow key to select the next calibration procedure-"**DC withstanding voltage- voltage adjustment proceduce**". (V50 & V52 will jump to "**AC withstanding voltage- current adjustment proceduce**" directly.)

STEP 2: DC withstanding voltage- voltage adjustment proceduce (STEP2:DCV)

1. The calibrations of "**DC withstanding voltage- voltage adjustment proceduce**" and "**AC withstanding voltage- voltage adjustment proceduce**" are similar. Switch the high voltage meter to "DCV" and press "START" key to calibrate "DC 600V" , "DC 3000V" in sequence. (error deviation is $\pm 2V$). Wait for 3 seconds and press EDIT/SAVE key finally.
2. After calibration of 2 sets voltage are finished, the LCD monitor will go back the orginal display. Press the left & right arrow key to select the next calibration procedure-"**AC withstanding voltage- current adjustment proceduce**".

STEP 3: AC withstanding voltage- current adjustment proceduce (STEP 3: ACI)

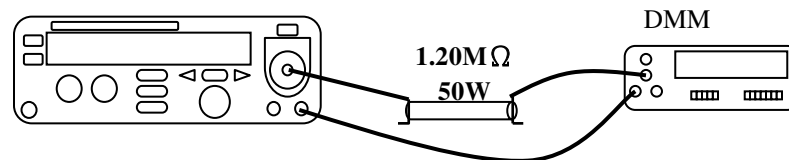
1. Connect a $600\text{K}\Omega/150\text{W}$ resistor with DMM (on the range of AC True RMS current 20mA) and EST in series.



2. Select the “**STEP 3: ACI**” modules by pressing the left & right arrow key. Press START key to begin calibration procedures.
3. The “50Hz 1mA” will be calibrated in advance. Use knob and left & right arrow key to adjust the value of the LCD monitor. The readout of DMM shall be monitored in the same time. If the meter’s readout reach to 1.000mA ($\pm 0.005\text{mA}$), wait for 3 seconds and press EDIT/SAVE key to “AUTO Calibration” mode. EST series will send an output voltage and adjust the setting of cutting current automatically. If entire calibration procedure is finished, the LCD monitor will display an “ADJ to 5mA” message. EST series is going to next calibration procedure for “50Hz 5mA”.
4. Repeat step 3 for “50Hz 5mA”, “60Hz 1mA”, and “60Hz 5mA” in sequence.
After calibration of 2 sets current are finished, the LCD monitor will go back the orginal display. Press the left & right arrow key to select the next calibration procedure-“**DC withstanding voltage- current adjustment proceduce**”. (V50 will jump to “**Continuity check adjustment proceduce**” directly; V52 will jump to “**IR adjustment proceduce**” directly)

STEP 4: DC withstanding voltage- current adjustment proceduce (STEP 4: DCI)

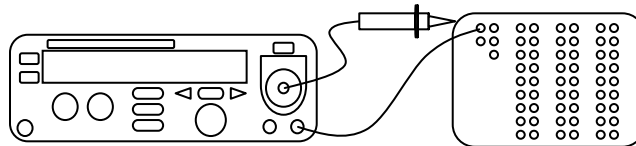
1. The calibrations of “**DC withstanding voltage- current adjustment proceduce**” and “**AC withstanding voltage- current adjustment proceduce**” are similar. Connect a $1.2\text{M}\Omega/50\text{W}$ resistor with DMM (on the range of DC current 20mA) and EST in series. Switch the EST to “DCI” module and press “START” key to calibrate “DC 0.5mA”, “DC 2.5mA” in sequence. (error deviation is $\pm 0.005\text{mA}$). Wait for 3 seconds and press EDIT/SAVE key finally.



2. After calibration of 2 sets current are finished, the LCD monitor will go back the orginal display. Press the left & right arrow key to select the next calibration procedure-“**Insulation Resistance adjustment proceduce**”. (V51 will jump to “**Continuity check adjustment proceduce**” directly)

STEP 5: Insulation Resistance adjustment procedure (STEP 5: IR)

1. Select the “**STEP 5: IR**” modules by pressing the left & right arrow key. Press START key to begin voltage calibration procedures.
2. LCD monitor will display an “ADJ to 513V” message.
3. Use high voltage meter (DC) and measure between TP402(+) & TP403(-), the voltage shall be +513V±2V by adjusting VR403.
4. Press EDIT/SAVE key.
5. LCD monitor will display an “ADJ to 1025V” message.
6. Use high voltage meter (DC) and measure between TP402(+) & TP403(-), the voltage shall be +1025V±2V by adjusting VR403.
7. Press EDIT/SAVE key.
8. LCD monitor will display an “IR OPEN” message.
9. Press START key to begin resistance calibration procedures.
10. EST can self-calibrate automatically. If entire calibration procedure is finished, the LCD monitor will display an “IR 2000 MΩ” message.
11. Connect the 2000 MΩ of “High Resistance Box” with EST.



12. Press START key to begin calibration procedures. If entire calibration procedure is finished, the LCD monitor will display an “IR 50 MΩ” message.
13. Connect the 50 MΩ of “High Resistance Box” with EST.
14. Press START key to begin calibration procedures. If entire calibration procedure is finished, the LCD monitor will display an “IR 100 MΩ” message.
15. Connect the 100 MΩ of “High Resistance Box” with EST.
16. Press START key to begin calibration procedures. If entire calibration procedure is finished, the LCD monitor will display an “IR 2.5 MΩ” message.
17. Connect the 2.5 MΩ of “High Resistance Box” with EST.
18. Press START key to begin calibration procedures. If entire calibration procedure is finished, the LCD monitor will go back the original display. Press the left & right arrow key to select the next calibration procedure-“**Continuity check adjustment procedure**”.

STEP6:Continuity check adjustment procedure (STEP6:Cont)

1. Select the “**STEP 6: CONT**” modules by pressing the left & right arrow key. Press START key to begin calibration procedures. The LCD monitor will display a “GC SHORT” message.
2. The two “RETURN” and “CONT CHECK” terminals shall be shorted circuit.
3. Press START key to begin calibration procedures.
4. If entire calibration procedure is finished, the LCD monitor will display a “GC 1 Ω” message.
5. The two “RETURN” and “CONT CHECK” terminals shall be connected with a 1 Ω resistor.
6. Press START key to start calibration procedures.
7. If entire calibration procedure is finished, the LCD monitor will go back the original display.

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For technical support email info@vitrek.com