

# VBT-75 VACUUM BOTTLE TESTER

## USER'S MANUAL



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## SAFETY SUMMARY

### FOLLOW EXACT OPERATING PROCEDURES

Any deviation from the procedures described in this operator's manual may create one or more safety hazards, damage the VBT-75, or cause errors in the test results; Vanguard Instruments Co., Inc. assumes no liability for unsafe or improper use of the VBT-75. The following safety precautions must be observed during all phases of test set up, test hookups, testing, and test-lead disconnects.

### SAFETY WARNINGS AND CAUTIONS

This device shall be used only by **trained operators**. All circuit breakers under test shall be **off line and fully isolated**.

### SERVICE AND REPAIR

- Do not install substitute parts or perform any unauthorized modification to any VBT-75 test unit.
- Repairs must be performed only by Vanguard Instruments Company factory personnel or by an authorized repair service provider. Unauthorized modifications can cause safety hazards and will void the manufacturer's warranty.

### EQUIPMENT RATINGS

**IP Rating:** The enclosure for the VBT-75 has an IP rating of 32.

**Pollution Degree:** The VBT-75 has a pollution rating of 2.

**Operating Voltage:** The VBT-75 is rated for use with an operating voltage of 120V or 240V, auto-ranging  $\pm 10\%$  of selected voltage.

**Power Cord:** The VBT-75 is supplied with a 16 AWG, 16A power cord with a NEMA 5-15P plug. Replacement cable shall have the same or better rating and is available through the manufacturer.

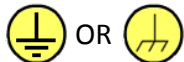
### VENTILATION REQUIREMENTS

The VBT-75 must be operated with the enclosure lid open.

### SAFETY SYMBOLS



Indicates that caution should be exercised



Indicates location of chassis ground terminal

### CLEANING

To clean the VBT-75:

- Disconnect all cables and turn the unit off.
- Use a soft, lint-free cloth to wipe all surfaces clean.
- Avoid getting moisture in openings and connectors.
- Don't use any cleaning products or compressed air.

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## CONVENTIONS USED IN THIS DOCUMENT

This document uses the following conventions:

- A key or switch on the VBT-75 is indicated as **[KEY]** and **[SWITCH]**.
- Screen and menu names are referenced as "SCREEN/MENU NAME".
- VBT-75 LCD screen output is shown as:

```
DISPLAY TEXT LINE 1  
DISPLAY TEXT LINE 2
```

- Warning messages are indicated as:



Warning message

**WARNING**

- Important notes are indicated as:



Note details

**NOTE**

## 1.0 INTRODUCTION

### 1.1 General Description and Features

The VBT-75 is a microprocessor-based, portable, 75kV dc vacuum bottle tester. This lightweight, portable tester is designed for testing circuit-breaker vacuum bottles in the field and at the shop.

Test voltages can be selected from 10 kV dc to 75 kV dc in 5 kV steps. The high-voltage test time can be set from 5 seconds to 2 minutes. The test voltage is raised to the selected voltage and held for the test time duration. After the test time duration has elapsed and the leakage current did not pass the pre-set value of 100  $\mu$ A, 200  $\mu$ A, or 300  $\mu$ A, the test voltage is returned to zero and a "Pass" message is displayed. If a flash-over condition occurs, such as bottle failure, the test voltage is immediately turned off, a "Failure" message is displayed on the LCD screen, and the "TEST FAIL" LED light on the unit is also illuminated.

The presence of high voltage is indicated by an audible tone and an illuminated "HIGH VOLTAGE" LED light. For additional operator safety, an "ARM" switch must be held down during testing.

The VBT-75 features a back-lit LCD screen (16 characters by 2 lines) that is viewable in both bright sunlight and low-light levels. A turn-and-press knob is used to control the unit. An RS-232C interface port is provided for factory calibration and diagnostic testing.

The VBT-75 is furnished with a 10-foot test cable that is terminated with a quick-disconnect test clip. A transportation case is also included.

## 1.2 Technical Specifications

**Table 1. VBT-75 Technical Specifications**

<b>TYPE</b>	Portable 75 kV vacuum bottle tester
<b>PHYSICAL SPECIFICATIONS</b>	Dimensions: 17"W x 10.5"H x 6.5" D (42.7 cm x 26.9 cm x 16.5 cm) Weight: 10 lbs. (4.53 Kg)
<b>INPUT POWER</b>	2 amps, 90-240 Vac, 50/60 Hz
<b>OUTPUT VOLTAGE</b>	10 kV to 75 kV dc in 5,000 volt steps
<b>OUTPUT RIPPLE VOLTAGE</b>	3% max
<b>DISCHARGE TIME</b>	Maximum discharge time for internal high voltage is 3 seconds
<b>DISPLAY</b>	Backlit LCD, 2-lines by 16 characters, visible in bright sunlight and low light conditions
<b>CONTROL</b>	Single turn-and-press knob selector
<b>COMPUTER INTERFACE</b>	One RS-232C port for factory calibration and diagnostics
<b>ENVIRONMENT</b>	Operating: -10° to 50° C (15° to +122° F); Storage: -30° C to 70° C (-22° to +158° F)
<b>HUMIDITY (MAX)</b>	90% RH @ 40° C (104° F) non-condensing
<b>ALTITUDE (MAX)</b>	2000m (6562 ft) to fully safety specifications
<b>CABLES</b>	One power cord, one ground cable, one 10' high-voltage cable, one 10' high-voltage return cable
<b>SHIPPING CASE</b>	Shipping case is included
<b>WARRANTY</b>	One year on parts and labor



**NOTE**

The above specifications are valid at nominal operating voltage and at a temperature of 25°C (77°F). Specifications may change without prior notice.

### 1.3 VBT-75 Controls and Indicators

The VBT-75's controls and indicators are shown in Figure 1 below. A leader line with an index number points to each control and indicator, which is cross-referenced to a functional description in Table 2. The table describes the function of each item on the control panel. The purpose of the controls and indicators may seem obvious, but users should become familiar with them before using the VBT-75. Accidental misuse of the controls will usually cause no serious harm. Users should also be familiar with the safety summary found on the front page of this User's Manual.

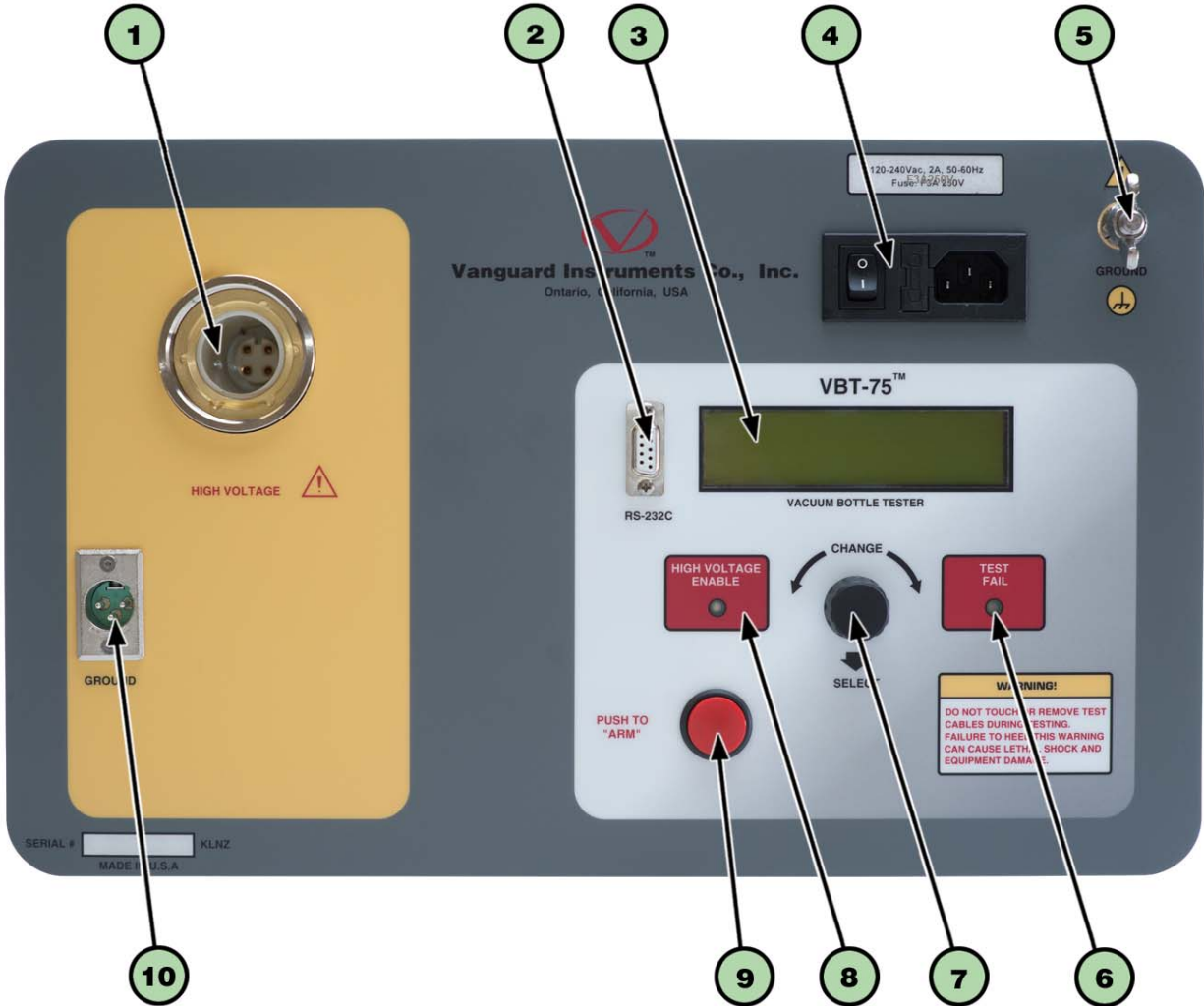


Figure 1. VBT-75 Controls and Indicators


Table 2. Functional Descriptions of VBT-75 Controls and Indicators

Item Number	Panel Markings	Functional Description
1	HIGH VOLTAGE	High voltage cable connector
2	RS-232C	RS-232C interface port for factory calibration and diagnostics
3		Back-lit LCD screen (2 lines x 16 characters). Visible in bright sunlight and low-light levels.
4	120/240 Vac, 2A, 50-60 Hz F3A250V	Input power connector with built-in fuse holder and power switch
5	GROUND	VBT ground stud. Connect ground stud to substation ground using the provided cable.
6	TEST FAIL	Test failure indicator. This indicator turns on if the test current exceeds the present current threshold (100, 200, or 300 $\mu$ A).
7	CHANGE SELECT	VBT turn-and-press control knob.
8	HIGH VOLTAGE ENABLE	This indicator turns on when high test voltage is present at the test leads.
9	PUSH TO "ARM"	Arm switch; press and hold during testing.
10	GROUND	High voltage return cable connector



## 2.0 CABLE CONNECTIONS

The VBT-75 comes furnished with one 10-foot (3.05m) high voltage cable and one 10-foot voltage return cable. Both cables are terminated with alligator clamps that are used to connect to the vacuum bottle being tested. A typical cable connection is shown in Figure 2 below.

 **WARNING**

- To protect the VBT-75 against static discharge in the substation, always connect the unit's ground stud to the substation ground.
- The circuit breaker must be off-line and completely isolated.
- The vacuum bottle under test should be in the OPEN position.

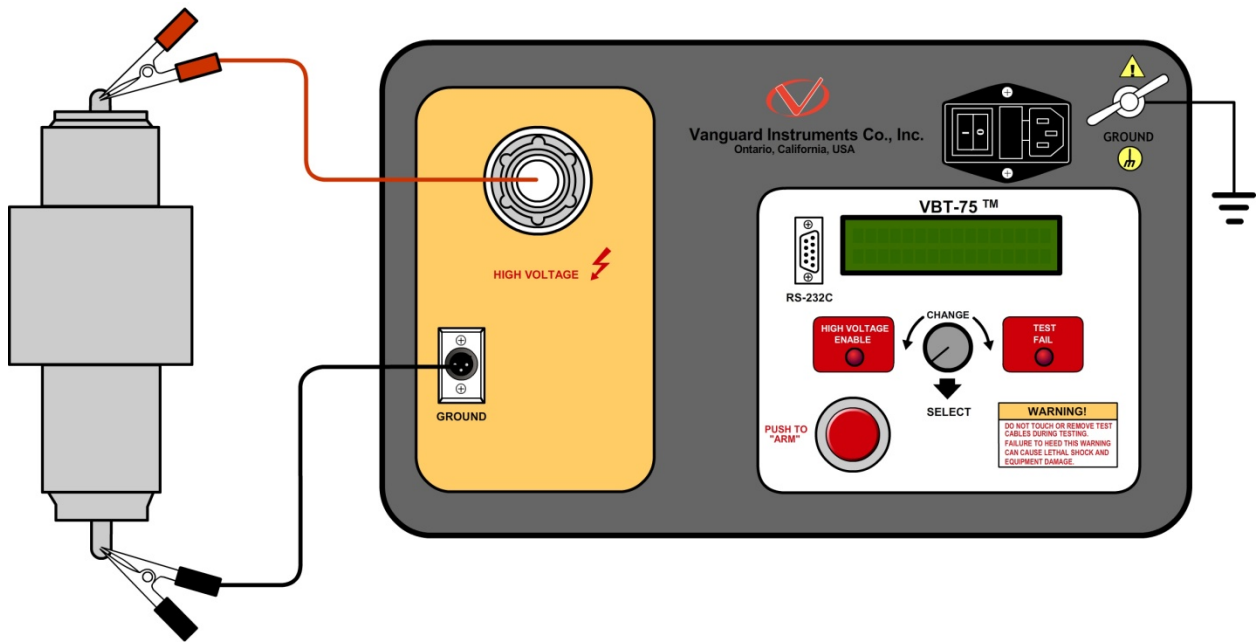


Figure 2. VBT-75 Connection Diagram

## 3.0 OPERATING PROCEDURES

### 3.1 Set the Date and Time

Follow the steps below to set the date and time for the VBT-75's internal clock:

- a. Start from the "START-UP" menu:

```
MAIN: <RUN TEST>
      14:16:15
```

Turn the **[CONTROL KNOB]** until the following screen is displayed:

```
MAIN: <UTIL>
      14:16:18
```

Press the **[CONTROL KNOB]**.

- b. The following screen will be displayed:

```
UTIL: <SET TIME>
      14:16:22
```

Press the **[CONTROL KNOB]**.

- c. The following screen will be displayed:

```
MM-DD-YY  HH:MM
_
```

Turn the **[CONTROL KNOB]** to select the first digit of the month and then press the **[CONTROL KNOB]**. The cursor will move over to the second digit of the month. Continue this process to enter the date and time. When you press the **[CONTROL KNOB]** for the last time to set the second digit of the current minute, the date and time will be set and you will be returned to the "START-UP" menu.

### 3.2 Changing the LCD Screen Contrast

Follow the steps below to adjust the VBT-75's LCD screen contrast:

- a. Start from the "START-UP" menu:

```
MAIN: <RUN TEST>
      14:16:15
```

Turn the **[CONTROL KNOB]** until the following screen is displayed:

```
MAIN: <CONTRAST>
      14:16:15
```

Press the **[CONTROL KNOB]**.

- b. The following screen will be displayed:

```
CONTRAST ADJUST
"PRESS" to EXIT
```

Turn the **[CONTROL KNOB]** clock-wise or counter-clockwise to adjust the screen contrast. Press the **[CONTROL KNOB]** when the contrast is to your liking. You will be returned to the "START-UP" menu.

### 3.3 Performing a Test

Follow the steps below to perform a test:



**NOTE**

If you are performing a test for the first time since the unit has been turned on, you will be prompted for the test duration time, test voltage, and test threshold. If you have already performed a test since the unit has been turned on, the VBT-75 will use the test parameters from the first test. To change the test parameters, see section 3.4.

- a. Start from the "START-UP" menu:

```
MAIN: <RUN TEST>
      14:16:15
```

Press the **[CONTROL KNOB]**

- b. The following screen will be displayed:

```
TIME: <5 sec>
      18:02:05
```

Turn the **[CONTROL KNOB]** to select the desired test duration and then press the **[CONTROL KNOB]**.

- c. The following screen will be displayed:

```
VLTG: <10 KV>
      18:02:15
```

Turn the **[CONTROL KNOB]** to select the desired test voltage and then press the **[CONTROL KNOB]**.

- d. The following screen will be displayed:

```
THRES: <300 uA>
      18:02:20
```

Turn the **[CONTROL KNOB]** to select the flash-over threshold and then press the **[CONTROL KNOB]**.

- e. The following confirmation screen will be displayed:

```
"PRESS" IF OK
10KV 5sec 300uA
```

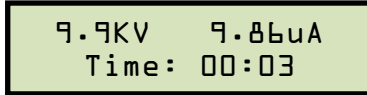
Press the **[CONTROL KNOB]** to confirm the test parameters.

- f. The following screen will be displayed:

```
PRESS RED SWITCH
TO START TEST
```

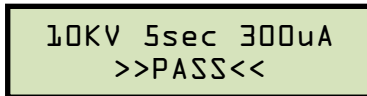
Press and hold the red **[ARM SWITCH]**.

- g. The VBT-75 will initiate the test and start the timer based on the test duration selected. The screen will be updated with the test voltage and the leakage current as shown below:



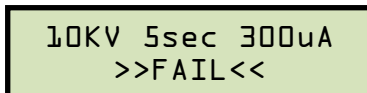
```
9.9KV  9.86uA
Time: 00:03
```

- h. After the test time duration has elapsed, the test results will be displayed. If the leakage current did not pass the preset value set in step d, the test voltage is returned to zero and a "PASS" message is displayed as shown below:



```
10KV 5sec 300uA
>>PASS<<
```

However, if a flash-over condition occurred, such as bottle failure, the test voltage is immediately turned off and a "FAIL" message is displayed as shown below:



```
10KV 5sec 300uA
>>FAIL<<
```

The "TEST FAIL" LED on the front panel will also be illuminated to indicate a test failure.

Release the **[ARM SWITCH]** and press the **[CONTROL KNOB]** to return to the "START-UP" menu.

### 3.4 Changing Test Parameters

The first time you perform a test after turning on the VBT-75, you will be prompted for the test duration time, test voltage, and test threshold. The VBT-75 will use these settings for performing subsequent tests. Follow the steps below to select different test parameters:

- a. Start from the "START-UP" menu:

```
MAIN: <RUN TEST>
      14:16:15
```

Turn the **[CONTROL KNOB]** until the following screen is displayed:

```
MAIN: <SETUP>
      14:16:20
```

Press the **[CONTROL KNOB]**.

- b. The following screen will be displayed:

```
TIME: <5 sec>
      18:02:05
```

Turn the **[CONTROL KNOB]** to select the desired test duration and then press the **[CONTROL KNOB]**.

- c. The following screen will be displayed:

```
VLTG: <10 KV>
      18:02:15
```

Turn the **[CONTROL KNOB]** to select the desired test voltage and then press the **[CONTROL KNOB]**.

- d. The following screen will be displayed:

```
THRES: <300 uA>
      18:02:20
```

Turn the **[CONTROL KNOB]** to select the flash-over threshold and then press the **[CONTROL KNOB]**.

The test parameters will be updated and any subsequent tests that are performed will use these parameters.



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