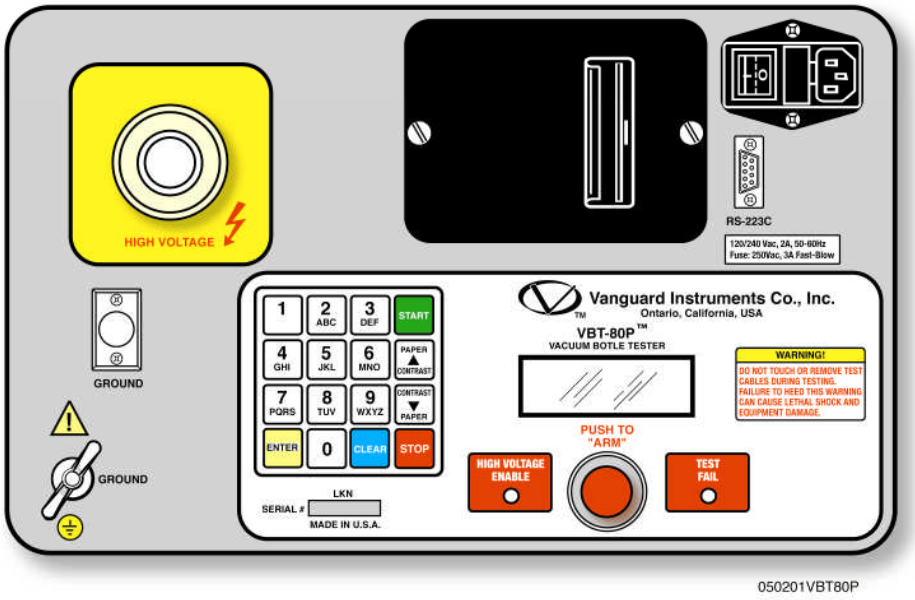
OPERATING INSTRUCTIONS
for the
VBT-80P
Vacuum Bottle Tester



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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-80P, or cause errors in the test results. Vanguard Instruments Co., Inc. assumes no liability for unsafe or improper use of the VBT.
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.

Do Not Modify Test Equipment

Because of the risk of introducing unknown hazards, do not install substitute parts or perform any unauthorized modification to any Model VBT-80P Test unit. To ensure that all designed safety features are maintained, it is recommended that repairs be performed only by Vanguard Instruments Co. factory personnel or by an authorized repair service. Unauthorized modifications can cause serious safety hazards and will nullify the manufacturer's warranty.

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1.0 INTRODUCTION

1.2 General Description

The VBT-80P is a lightweight DC vacuum bottle tester made by Vanguard Instruments Company. The VBT-80P tests a vacuum bottle's integrity by applying a DC voltage across the bottle under test. A simple "PASS" or "FAIL" message indicates the condition of the bottle after each test.

The VBT-80P is rugged and field-portable. It is easy to operate and requires little training for first-time users. Operating the VBT-80P only requires connecting the test leads to the vacuum bottle, selecting the desired test voltage, current threshold, and test time duration, then initiating the test. A keypad with 16 alphanumeric keys allows the user to control and enter circuit breaker test data. A built-in thermal printer produces test results on 2.5-inch-wide thermal paper. The VBT-80P test records can be stored in its FLASH EEPROM memory. Up to 84 records (of 16 readings each) can be stored in the VBT-80P's memory.

1.3 Functional Description

Using a voltage multiplier, the VBT-80P generates a programmable test voltage from 10,000Vdc to 80,000Vdc in 1,000Vdc steps.

The test voltage can be applied for different time durations: 5 seconds, 10 seconds, 30 seconds, 1 minute, or 2 minutes. The current through the bottle is monitored by the VBT-80P's circuitry during a test. If this test current exceeds a preset threshold, the test is terminated and a test "FAIL" message will be displayed on the LCD. The "TEST FAIL" indicator will also be illuminated on the front panel.

The over current threshold can be programmed for 100 micro-amps, 200 micro-amps, or 300 micro-amps.

A test is considered successful if the selected test voltage was applied for the entire test time and the test current did not exceed the preset threshold.

The VBT-80P's LCD displays a "PASS" message along with the test voltage and test duration if a test is successful. The "PASS" and "FAIL"" message can be printed on the built-in thermal printer.

1.4 Furnished Test Accessories

The VBT-80P is supplied with one 10-foot long high-voltage test cable, one 10 foot long voltage-return lead with alligator clamps. A Ground cable, power cord, and a shipping case are also included with each VBT-80P.

Note

The VBT-80P high voltage cable can be replaced in the field. Do not remove this HV cable from the connector except for cable replacement.

Figure 1 High voltage cable

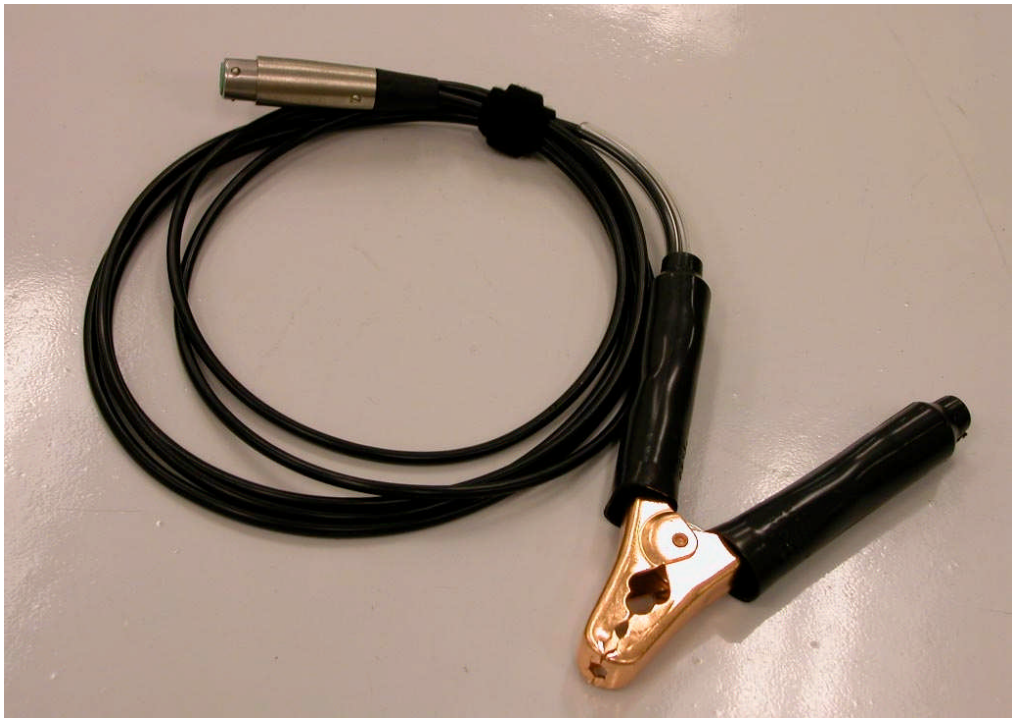


Figure 2 High Voltage return cable

2.0 VBT-80P SPECIFICATIONS

VBT-80P specifications and leading particulars are listed in Table 1.0

Table 1.0 VBT-80P Specifications

MODEL..... VBT-80P

TYPE ..... Special-Purpose Test Equipment, portable 80 kV vacuum bottle tester

SIZE..... 16.8" W by 3.5" H by 10.6" D (42.7 cm by 8.9 cm by 26.9 cm)

WEIGHT ..... 10 pounds (4.53 Kg)

INPUT POWER ..... 2 amps, 90-240 Vac, 50/60 Hz

OUTPUT VOLTAGE... 10kV to 80kV dc in 1,000 volt steps

OUTPUT RIPPLE VOLTAGE ..... 3% max

DISCHARGE TIME..... Maximum discharge time for internal high voltage is 0.3 seconds

DISPLAY ..... Back-lighted LCD, 4-lines by 16 characters

INDICATORS ..... Test Failure Indicator: LED is turned on if test current exceeds the preset current threshold (100μA, 200μA or 300μA).
High Voltage Enable Indicator: LED is turned on when high voltage is present on the high voltage cable.

PRINTER..... 2.5" wide Thermal Printer

ENVIRONMENT..... Operating: -10°C to 55°C (15°F to +122°F)
Storage: -30°C to 70°C (-22°F to +158°F)

FURNISHED ITEMS... One power cord, one ground cable, one 10-ft. high-voltage cable, one 10-ft. high-voltage return cable.

OPTIONS ..... Transportation case included

WARRANTY ..... One-Year Parts & Labor (Post-Warranty Service Contracts Available)

VBT-80P SPECIFICATIONS ARE SUBJECT TO UPGRADES AND MAY BE CHANGED WITHOUT PRIOR NOTICE.

3.0 CONTROL AND DISPLAY

3.1 VBT-80P Front Panel

The VBT-80P controls and displays are shown in Figure 3. Pointing leader lines reference each item with an index number. Each index number is cross-referenced to a functional description in Table 2, which describes the function and purpose of each item on the control panel. Although the purpose of these controls and the display may seem obvious and intuitive, users should become familiar with them before attempting to use the VBT-80P. First-time users should also review and become familiar with the Safety Summary on the front page.

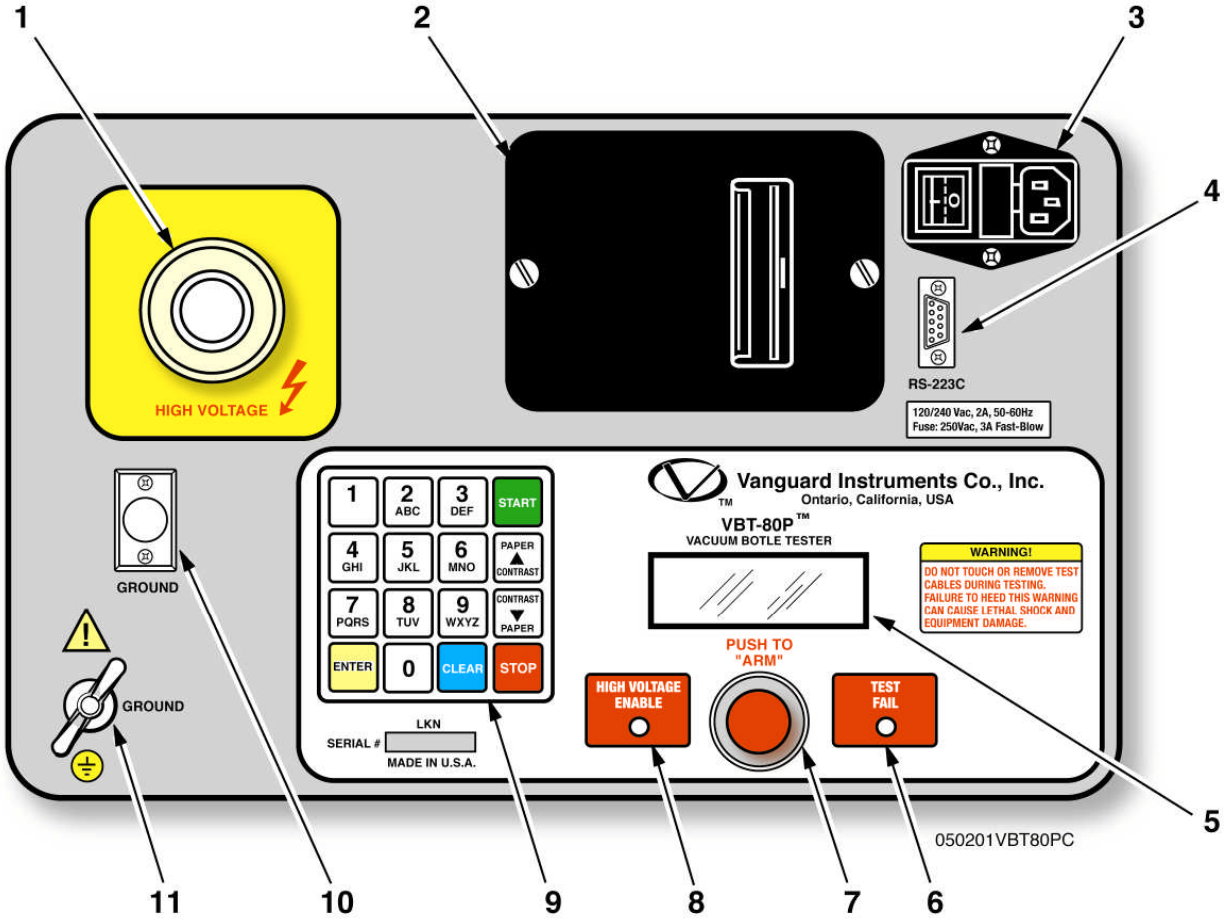


Figure 3 VBT-80P Control-Panel Controls and Display

Table 2.0 Functional Description of VBT-80P Controls and Display

Figure 1 Index #	Adjacent Panel Marking	Functional Description
1	(Connector)	High voltage cable connector
2	No marking	2.5" wide thermal printer
3	No marking	Input power connector with built-in fuse holder and power switch.
4	**RS-232C**	RS-232C interface port, 9-pin connector, female DB type. The port is set to 19,200 baud, 1 start bit, 8 data bits, and no parity bit PIN ..... SIGNAL 2 Rx 3 Tx 5 Signal Gnd This serial port is for factory calibration and firmware updates
5	No marking	LCD, 4-line by 20-character, back-lighted: displays menus of selections, operator entries, and test measurement results.
6	**TEST FAIL**	Test Fail Indicator. This indicator is turned on if the test current exceeds the preset current threshold (100, 200, or 300 μA).
7	**PUSH TO "ARM"**	Arm switch: Press and hold during a test
8	**HIGH VOLTAGE ENABLE**	LED indicator, red: Lights when high voltage is on the high voltage cable.
9	No marking	16-key keypad.
10	**GROUND**	High-voltage-return cable connector.
11	**GROUND** (Wing Nut)	VBT-80P ground stud. Connect ground stud to substation ground using the provided cable.

4.0 VBT-80P SPECIAL FEATURES

4.1 VBT-80P LCD Contrast Control

The VBT-80P LCD is back-lighted for viewing in low light conditions. To increase the LCD display contrast, press and hold the "↑ Contrast" key for more than two seconds. To lighten the LCD display contrast, press and hold the "↓ Contrast" key for more than two seconds.

4.2 Printer Paper Control

To advance paper, press and release the "↑ Paper" key.
To retract paper, press and release the "↓ Paper" key.

4.3 Printer Paper

The VBT-80P built-in thermal printer uses 2.5-inch wide thermal paper for printing test results. In order to maintain the highest quality printing and to avoid paper jams we recommend using the paper supplied by our factory. Paper can be ordered from the following two sources:

Vanguard Instruments Co, Inc.
1520 S. Hellman Ave.
Ontario, CA 91761
Tel: 909-923-9390
Fax: 909-923-9391
Part Number: TP-3 Paper
OR
BG Instrument Co.
13607 E. Trent Ave.
Spokane, WA 99216
Tel: 888-244-4004
Fax: 509-893-9803
Part Number: TP-3 paper

5.0 VBT-80P CABLE CONNECTION

Always ground the VBT-80P before connecting any cables. Use the ground cable provided with the cable set. A typical VBT-80P connection to a vacuum bottle is shown in figure 4.

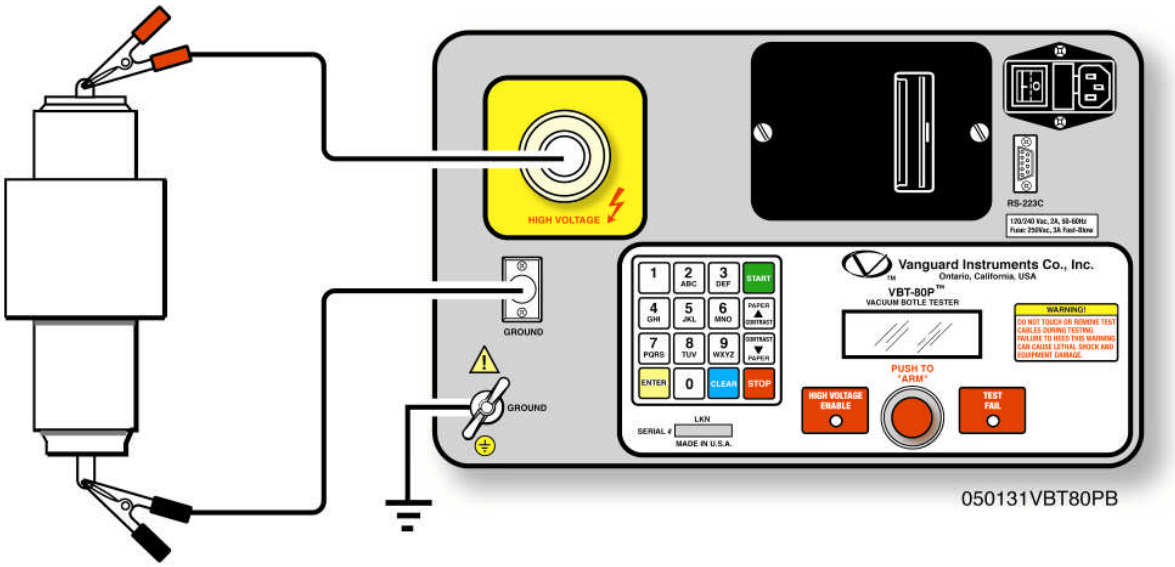


Figure 4 Typical VBT-80P Connection

6.0 OPERATING PROCEDURES

(Refer to tables 3 through 8)

WARNING

Always connect the VBT-80P ground to the substation ground first.

6.1 Run Test Procedure

The following test procedure describes the steps required to run a test

Table 3 Run Test Procedure

STEP	ACTION	DISPLAY
3-1	None. VBT-80P Main menu.	**1.RUN TEST 07/06/06** **2.SETUP 16:22:01**
3-2	To begin the RUN TEST procedure, press key # 1 (RUN TEST) on the MAIN MENU. The "Test Duration" menu appears.	**1. 5 SEC. 2. 10 SEC** **3. 30 SEC 4. 60 SEC** **5. 2 MIN**
3-3	Select a test time duration. Press key # 1 to select 5 seconds for this example.The "Test Voltage" menu appears. **Note** Test voltage can be selected in the 1KV steps.	**ENTER TEST VOLTAGE:** **(10 to 80)** **0 KV**
3-4	Key in the test voltage using the the 0-9 keys.	**ENTER TEST VOLTAGE:** **(10 to 80)** **61 KV**
3-5	Press the "Enter" key to confirm the entry. The "Current Threshold" menu appears.	**1. 300uA** **2. 200uA** **3. 100uA**
3-6	Select a current threshold. Press key # 1 to select 300uA for this example. The "Test parameters" display appears.	**TEST PARAMETERS:** **61KV 5 SEC 300uA** **"CLEAR" TO CHANGE OR** **"ENTER" TO CONTINUE**

Table 3 Run Test Procedure (Continued)

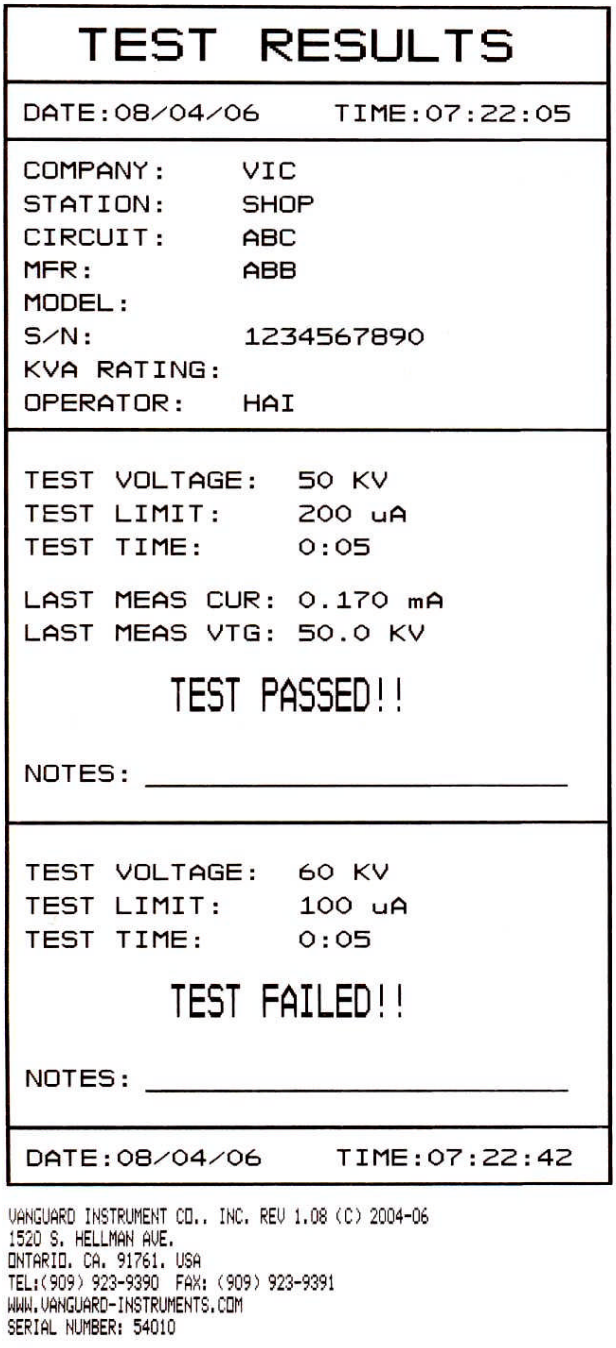
STEP	ACTION	DISPLAY
3-7	Press the "ENTER" key to continue.	**PRESS "ARM" SWITCH TO START TEST**
3-8	Press and hold the "ARM" Switch to run the test.	**TEST IN PROGRESS** **61KV 0.20uA** **TIME 00:05**
3-9	A "TEST FAIL" message will appear if the test current exceed the preset value (300uA in this example) and the test will terminate immediately. The "TEST FAIL" LED will also be lit on the front panel. A "TEST PASS" message will appear if the test current did not exceed the current threshold during the duration of the test.	**TEST COMPLETED** **61KV 5 SEC 300uA** **>>> FAIL <<<** **TEST COMPLETED** **61KV 5 SEC 300uA** **>>> PASS <<<**
3-10	Press the "ENTER" key to go to the print menu	**PRINT TEST RESULTS?** **1.YES** **2.NO**
3-11	Press key #1 to print a test report. A typical test report is shown in figure 5. Press key #2 to skip printing.	**KEEP THIS READING?** **1.YES** **2.NO**
3-12	Press key #1 to keep this reading. Press key #2 to not store this reading in working memory, go to step 3-14.	**TEST SAVED**
3-13	Press the "ENTER" key to advance to the next menu.	**RUN ANOTHER TEST?** **1.YES** **2.NO**
3-14	Press key #1 to run another test, go to step 3-6. Press key #2 to end the test.	**SAVE THIS RECORD?** **1.YES** **2.NO**

Table 3 Run Test Procedure (Continued)

STEP	ACTION	DISPLAY
3-15	Press key #1 to save the test record. The test record is saved in the VBT-80P's Flash EEPROM. A test record number will be assigned. Press the "ENTER" key to return to the main menu. Press key # 2 to skip saving the test record. Go to step 3-16.	**RECORD NUMBER 1** **HAS BEEN SAVED!**
3-16	None. The user selected not to save the test record; a reminder message is displayed	**ARE YOU SURE?** **DATA WILL BE LOST!** **1.DO NOT SAVE RECORD** **2.SAVE RECORD**
3-17	Press key #2 to save the record. Go to step 3-15. Press key #1 to abort saving the record. The VBT-80P will return to the MAIN MENU.	**1.RUN TEST 07/06/06** **2.SETUP 16:22:10**

Note

1. A "FAIL" message will be displayed on the LCD and the "TEST FAIL" indicator will be illuminated on the front panel.
2. The VBT-80P's LCD displays a "PASS" message along with the test voltage and test duration if a test is successful.



TEST RESULTS

DATE:08/04/06 TIME:07:22:05

COMPANY: VIC
STATION: SHOP
CIRCUIT: ABC
MFR: ABB
MODEL:
S/N: 1234567890
KVA RATING:
OPERATOR: HAI

TEST VOLTAGE: 50 KV
TEST LIMIT: 200 uA
TEST TIME: 0:05

LAST MEAS CUR: 0.170 mA
LAST MEAS VTG: 50.0 KV

TEST PASSED!!

NOTES: _____

TEST VOLTAGE: 60 KV
TEST LIMIT: 100 uA
TEST TIME: 0:05

TEST FAILED!!

NOTES: _____

DATE:08/04/06 TIME:07:22:42

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SERIAL NUMBER: 54010

Figure 5 Typical VBT-80P Test Report

6.2. Enter Test Record ID Procedure

This procedure allows the user to enter the equipment identification information to be used with the test record. Each ID field can contain up to 20 characters. Always ***enter the test record ID*** before starting a test.

Table 4 Enter Test Record ID Procedure

STEP	ACTION	DISPLAY
4-1	None. VBT-80P Main menu.	**1.RUN TEST 07/06/06** **2.SETUP 16:22:01**
4-2	On the MAIN MENU, press key # 2 (SETUP) to go to the Setup menu options (shown at right).	**1.RECORD ID** **2.REVIEW RECORD** **3.RESTORE RECORD** **4.NEXT PAGE**
4-3	Press key #1 (RECORD ID) to begin entering identification information. The "COMPANY:" input screen is displayed.	**COMPANY:** **UP/DOWN TO POSITION** **"ENTER" TO ACCEPT**
4-4	Enter the utility COMPANY name using the alpha-numeric keypad. When finished, press ENTER to store the data and go to the "STATION:" input screen.	**STATION:** **UP/DOWN TO POSITION** **"ENTER" TO ACCEPT**
4-5	Enter the utility STATION name using the alpha-numeric keypad. When finished, press ENTER to store the data and go to the "CIRCUIT:" input screen.	**CIRCUIT:** **UP/DOWN TO POSITION** **"ENTER" TO ACCEPT**
4-6	Enter the utility CIRCUIT name using the alpha-numeric keypad. When finished, press ENTER to store the data and go to the "MANUFACTURER:" input screen.	**MANUFACTURER:** **UP/DOWN TO POSITION** **"ENTER" TO ACCEPT**
4-7	Enter the utility MANUFACTURER name using the alpha-numeric keypad. When finished, press ENTER to store the data and go to the "MODEL:" input screen.	**MODEL:** **UP/DOWN TO POSITION** **"ENTER" TO ACCEPT**

Table 4 Enter Test Record ID Procedure (continued)

STEP	ACTION	DISPLAY
4-8	Enter the utility MODEL name using the alpha-numeric keypad. When finished, press ENTER to store the data and go to the "SERIAL NUMBER:" input screen.	**SERIAL NUMBER:** **UP/DOWN TO POSITION** **"ENTER" TO ACCEPT**
4-9	Enter the utility SERIAL NUMBER using the alpha-numeric keypad. When finished, press ENTER to store the data and go to the "COMMENTS:" input screen.	**KVA RATING:** **UP/DOWN TO POSITION** **"ENTER" TO ACCEPT**
4-10	Enter test COMMENTS using the alpha-numeric keypad. When finished, press ENTER to store the data and go to the "OPERATOR:" input screen.	**OPERATOR:** **UP/DOWN TO POSITION** **"ENTER" TO ACCEPT**
4-11	Enter the test OPERATOR name, using the alpha- numeric keypad When finished, press ENTER to store the data and return to the MAIN MENU display.	**1.RUN TEST 07/06/06** **2.SETUP 16:27:00**

This completes the ENTER ID procedure.

NOTE

The VBT-80P will retain the test record ID in memory until it is changed by the operator.

6.3 Restore Record Procedure

This procedure describes how to restore a test record stored in VBT-80P's Flash EEPROM to working memory. The user can then print the test record with the thermal printer.

NOTE

The VBT-80P can store up to 84 test records in the FLASH EEPROM.

Table 5 Restore Test Record Procedure

STEP	ACTION	DISPLAY
5-1	On the MAIN MENU, press key #2 (SETUP) to display the SETUP MENU options (shown at right).	**1.ENTER ID** **2.REVIEW RECORD** **3 RESTORE RECORD** **4.NEXT PAGE**
5-2	Press key #3 to select "RESTORE RECORD"	**1.RESTORE RECORD** **2.DIRECTORY** **3.ERASE RECORD**
5-3	Press key #1 to restore a record.	**RESTORE RECORD** **1.ENTER RECORD NUMBR** **2.SCROLL TO SELECT**
5-4	Press key #1 to enter the record number.	**RESTORE RECORD** **NUMBER:**
5-5	Enter the record number using the number keys. Then press the ENTER key to confirm.	**RECORD RESTORED!**
5-6	Press the"ENTER" key to display the "REVIEW RECORD?" menu options.	**REVIEW RECORD?** **1.SCROLL TEST RECORD** **2.PRINT TEST RECORD**
5-7	Press key #1 to scroll through the test record. Press key #2 to print the test record on the thermal printer. Press "STOP" to return to the MAIN MENU.	**PRINT REPORT** **PLEASE WAIT ……..**

This completes the Restore Record Procedure. A typical test result is shown in figure 5.

6.4 Review Record Procedure

This procedure allows the user to view or print a test report residing in the VBT-80P's working memory

Table 6 Print Record Procedures

STEP	ACTION	DISPLAY
6-1	On the MAIN MENU, press key #2 (SETUP) to select the SETUP MENU options (shown at right).	**1.ENTER ID** **2.REVIEW RECORD** **3.RESTORE RECORD** **4.NEXT PAGE**
6-2	Press key #2 to select the "REVIEW RECORD" menu options.	**REVIEW RECORD** **1.SCROLL TEST RECORD** **2.PRINT TEST RECORD**
6-3	Press key #1 to Scroll through the test record (see next menu). Press key #2 to print the test record, return to step 5-6 of the previous table.	**RECORD ID INFO**
6-4	Press "↑" key to view the next field.	**2 TESTS** **07/06/06 16:20:01**
6-5	Press "↑" key to view the next field.	**TEST NUMBER: 1** **10KV 5 Sec 100uA** **0.00uA AT 10.0KV** **TEST PASSED!**
6-6	Press "↑" key to view the next field.	**TEST NUMBER: 2** **10KV 5 Sec 100uA** **0.00uA AT 10.0KV** **TEST PASSED!**
6-7	Press the "STOP" key to return to the MAIN MENU display.	**1.RUN TEST 07/06/06** **2.SETUP 16:27:00**

This completes Review Record Procedure.

6.5 Print/View Test Record Directory Procedure

This procedure describes the steps to print or view the test record directory.

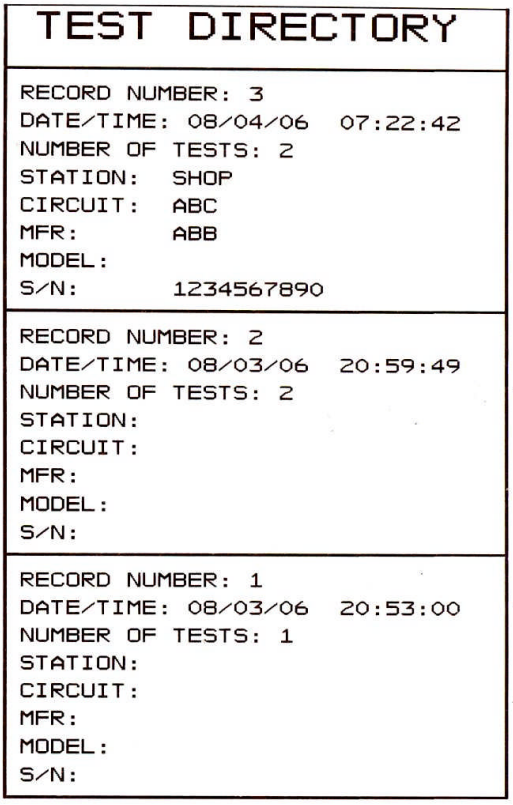
Table 7 Print Test Record Directory

STEP	ACTION	DISPLAY
7-1	On the MAIN MENU, press key #2 (SETUP) to select the SETUP MENU options (shown at right).	**1.ENTER ID** **2.REVIEW RECORD** **3.RESTORE RECORD** **4.NEXT PAGE**
7-2	Press key#3 (RESTORE RECORD)	**1.RESTORE RECORD** **2.DIRECTORY** **3.ERASE RECORD**
7-3	Press key #2 (DIRECTORY)	**1.PRINT DIRECTORY** **2.SCROLL DIRECTORY**
7-4	Press key #1 to select "Print Directory" (see next menu). Press key #2 to scroll through directory (see 7-6).	**PRINT DIRECTORY** **1.FULL DIRECTORY** **2.SHORT DIRECTORY**
7-5	Press key #1 (FULL DIRECTORY) to generate a list of all the records stored in memory Press key # 2 (SHORT DIRECTORY) to generate a list of the last 10 records stored in memory. When the printout is completed, the display returns to the MAIN MENU.	**PRINTING DIRECTORY**
7-6	Continue from 7-4 after presssing key #2 (SCROLL DIRECTORY).	**RECORDS IN DIRECTORY** **"UP" TO SCROLL FWD** **"DWN" TO SCROLL RVS**

Table 7 Print Test Record Directory (Continued)

STEP	ACTION	DISPLAY
7-7	Press the "UP" key to view the first record's information.	**# 1 07/06/06 16:20:00** **1 TEST**
7-8	Press the "UP" key to view next record's information.	**# 2 07/06/06 16:25:00** **2 TEST**
7-9	Press key the "STOP" key to return to the main menu.	**1.RUN TEST 07/06/06** **2.SETUP 16:27:00**

This ends the Print/View Test Record Directory procedure.



TEST DIRECTORY

RECORD NUMBER: 3
DATE/TIME: 08/04/06 07:22:42
NUMBER OF TESTS: 2
STATION: SHOP
CIRCUIT: ABC
MFR: ABB
MODEL:
S/N: 1234567890

RECORD NUMBER: 2
DATE/TIME: 08/03/06 20:59:49
NUMBER OF TESTS: 2
STATION:
CIRCUIT:
MFR:
MODEL:
S/N:

RECORD NUMBER: 1
DATE/TIME: 08/03/06 20:53:00
NUMBER OF TESTS: 1
STATION:
CIRCUIT:
MFR:
MODEL:
S/N:

Figure 6 Typical VBT-80P Directory Print Out

6.6 Erase Test Record Procedure

This procedure describes the steps to delete one or all of the test records stored in the VBT-80P's Flash EEPROM.

Table 8 Erase Test Record Procedure

STEP	ACTION	DISPLAY
8-1	On the MAIN MENU, press key #2 (SETUP) to select the SETUP MENU options (shown at right).	**1.ENTER ID** **2.PRINT RECORD** **3.RESTORE RECORD** **4.NEXT PAGE**
8-2	Press key #3 (RESTORE RECORD)	**1.RESTORE RECORD** **2.DIRECTORY** **3.ERASE RECORD**
8-3	Press key #3 (ERASE RECORD) to display the ERASE RECORD menu options (shown at right).	**ERASE RECORD** **1.ERASE SINGLE RECORD** **2.ERASE ALL RECORDS**
8-4	On the ERASE RECORD menu display, press key #1 to erase a single record. Go to step 8-6 to erase all the test records stored in Flash EEPROM.	**ERASE RECORD** **NUMBER: XX**
8-5	Enter the record number of the record to be deleted then press the "ENTER" key to confirm. Press the "ENTER" key again to return to the Main menu. **NOTE** Press the the "STOP" key to abort.	**RECORD NUMBER: XX** **ERASED!**
8-6	Press key #2 to erase all records. **NOTE** Press the STOP key to abort.	**ERASE ALL RECORDS!** **Are you SURE?** **"ENTER" TO CONTINUE**
8-7	Press the "ENTER" key to confirm.	**ERASING RECORDS** **PLEASE WAIT**
8-8	Press the "ENTER" key to return to the Main menu.	**RECORDS ERASED!**

This ends the Erase Test Record procedure.

6.7 Set VBT-80P Real Time Clock

This procedure describes the steps to set the VBT-80P real time clock.

Table 9 Set Time Procedure

STEP	ACTION	DISPLAY
9-1	On the MAIN MENU, press key #2 (SETUP) to select the SETUP MENU options (shown at right).	**1.ENTER ID** **2.PRINT RECORD** **3.RESTORE RECORD** **4.NEXT PAGE**
8-2	Press key #4 (NEXT PAGE)	**1.COMPUTER CONTROL** **2.SET TIME**
8-3	Press key #2 (SET TIME)	**ENTER** **MM-DD-YY HH:MM:SS**
8-4	Use the number keys to enter the current date and time.	**ENTER** **MM-DD-YY HH:MM:SS**
8-5	The VBT-80P will return to the main menu after the date and time are entered.	**1.RUN TEST 07/06/06** **2.SETUP 16:27:00**

This ends the Set Time procedure.

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