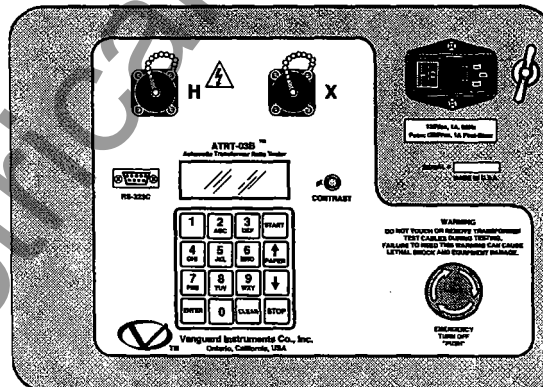
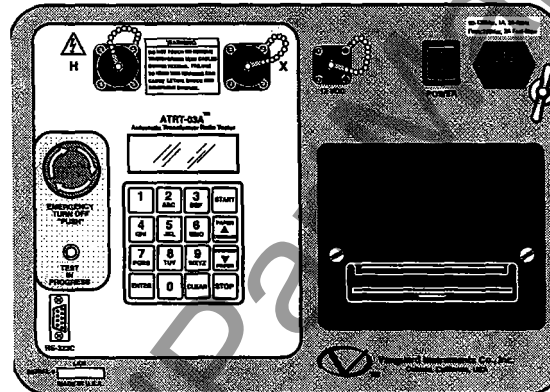
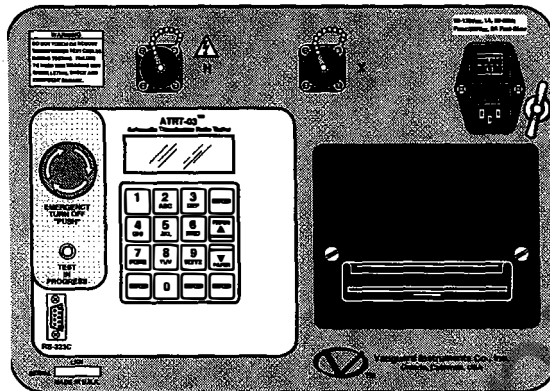


**OPERATING INSTRUCTIONS for
Models ATRT-03, ATRT-03A and ATRT-03B
Three-Phase Transformer Turns-Ratio Meter**



This manual applies to Models ATRT-03, ATRT-03A and ATRT-03B; the operating procedures are virtually the same for all models; any differences are clearly described within the step-by-step procedures.

**Manufactured by
Vanguard Instruments Co., Inc
1710 East Grevillea Ct.
Ontario, CA 91761**

www.ElectricalPartManuals.com

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APPENDIX A

TABLE OF STANDARD TRANSFORMERS

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SAFETY WARNINGS AND CAUTIONS

The following safety precautions must be observed during all phases of set-up, test-hookups, testing, and after-test disconnects. Failure to heed these warnings and cautions can result in death, injury, or serious equipment failure.

Do not Service or Test alone.

Do not perform test procedures or service unless another person is also present who is capable of rendering aid and resuscitation.

Avoid Contact with High Voltages

Because power-station environments contain high voltages and currents, there is always a possibility of personal contact with an unexpected lethal voltage caused by magnetic induction and/or electrostatic leakage from live EHV circuitry. Un-terminated tower lines accumulate very high static voltages from ionized air moving (wind) past the lines and will accumulate lethal voltages. Accordingly, when test transformers are connected to de-energized ("dead") lines that are ungrounded, regardless of how short the lines, always discharge these lines before attaching any test lead. Because of the possible dire consequences of physical contact, engineers and technicians must always treat equipment and hookups as if a lethal or unsafe condition will eventually occur. No matter how unlikely it is that a hazard exists, never assume anything about the safety of any test setup. Ensure personal safety by always checking first-hand to eliminate every possible hazard!

Avoid Contacting High-Voltage Inductive "Kicks"

Any transformer with many winding turns and an iron core supports induced magnetic fields, such that even low-level test-currents produce a magnetic field that, if interrupted, can produce a high-voltage spike capable of causing severe injury or death. Accordingly, it's important for personnel safety that test leads be securely attached to the transformer terminals to prevent their being accidentally disconnected during testing. All personnel are warned to stand clear of the transformer and the ATRT-03 during all turns-ratio testing. Test technicians should always ensure that all non-technical personnel present (who may not understand the hazards), be required to stand clear of all transformers and equipment during all phases of transformer turns-ratio testing.

Do Not Modify Test Equipment

Because of the added risk of introducing additional or unknown hazards, do not install substitute parts or perform any unauthorized modification to any Model ATRT-03/03A/03B 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.

Follow Exact Operating Procedures

Any deviation from procedures described in this operator's manual may create one or more safety hazards, damage the ATRT-03/03A/03B or the test transformer, or cause errors in the test results; VIC assumes no liability for unsafe or improper use of the ATRT-03/03A/03B.

1-0. Introduction

The Model ATRT-03/03A/03B is a microprocessor-based, three-phase, field-portable, automatic, transformer turns-ratio test meter. The ATRT-03/03A/03B is designed for on-site measuring of: turns ratios, winding polarity, and no-load excitation currents of single and 3-phase utility transformers. The ATRT-03/03A/03B can also test potential transformers (PTs) and primary current transformers (CTs).

The ATRT-03/03A/03B is supplied with single and three-phase hook-up (H & X) cables. A relay matrix allows the ATRT-03/03A/03B to apply the test voltage to the primary (H) winding and monitor the voltage on the secondary (X) winding. Three phase transformers are tested without changing test leads for each phase tested.

2-0. Applicability

The ATRT-03/03A/03B is available in three models: ATRT-03, ATRT-03A (AC/DC power), and ATRT-03B (no printer).

- a. The ATRT-03 is a line-powered, 120/240 Vac (selectable), 50/60 Hz unit.
- b. The ATRT-03A can be powered by 120-240 Vac, or 80-300 Vdc, or 12 Vdc.
- c. The ATRT-03B is a line-powered 120/240 Vac (selectable), 50/60 Hz unit without built-in printer.

3-0. ATRT-03/03A/03B Description

The ATRT-03/03A/03B checks test-lead hook-ups for error before each test: The ATRT-03/03A/03B applies a low-level test voltage (300 mV) across the winding being tested and senses the induced secondary voltages. When an induced voltage is greater than the applied excitation voltage, it's detected as a hookup error. If a connection error is detected, the ATRT-03/03A/03B aborts the test and displays: "Hook-Up Error." But, if no hookup error is detected, the ATRT-03/03A/03B applies a full test voltage to the transformer being tested and the winding (voltage) ratio is displayed. Excitation current (in milliamperes), winding polarity, and winding phase-angle measurements are also displayed.

The ATRT-03/03A/03B lets users enter nameplate voltages for the specified turns-ratio calculation. Besides calculating the turns-ratio, the ATRT-03/03A/03B also calculates the percentage of difference error—based on the difference between the calculated and measured values.

The ATRT-03/03A/03B lets users save transformer test records on the built-in FLASH EEPROM. A typical test record consists of 99 readings of H and X nameplate voltages, phase A/B/C turns ratios, excitation current and phase angle. Up to 200 records can be stored in the ATRT-03/03A/03B memory. Stored records can be recalled and printed or transferred to the IBM PC.

The ATRT-03, ATRT-03A, ATRT-03B can also store 128 Transformer Test Plans in its FLASH EEPROM. A test plan allows the user to store transformer nameplate voltages. Using the nameplate voltages during a test; the ATRT-03/03A/03B can print "PASS" and "FAIL" results on each of the transformer tests.

Model ATRT-03 (v) Operating Instructions

A built-in 4.5-inch wide thermal printer (not available with ATRT-03B) allows the user to print test reports in the field. A 16-key, alpha-numeric keypad allows the user to control and enter transformer test data. A built-in RS-232C port allows the ATRT-03/03A/03B to interface with an IBM compatible PC. Transformer-testing program software, supplied with each ATRT-03/03A/03B, runs on an IBM Windows®-based computer and lets users control the ATRT-03 from a computer in the field. With a computer, users can run a test and save the test results in the field, then recall the test later in an office to generate a test report. Since data are stored in an ASCII format, test results can be exported into any database desired.

4-0. Principle of Operation

The ATRT-03/03A/03B measures transformer turns ratio by applying a test voltage across the high (H) winding and sensing induced voltage on the secondary (X) side. (For safety, testing is always done in a step-down transfer, regardless of the transformer's actual use.) There's no load on windings during testing, so the measured voltage ratio is virtually the same as the winding turns ratio. The ATRT-03/03A/03B measures turns-ratios in a range from 0.8 to 15,000. Excitation current (via H leads) is measured for reference and ranges from 0.0 to 2,000 mA. Winding polarity is displayed as +/- signs and measured in degrees with ± 0.2 degree resolution. The ATRT-03/03A/03B calibrates its own sensing circuits before each test; therefore, calibration by the operator is not required.

Note:

Phase angle measurement is printed in detail format only.

5-0. Specifications

Model ATRT-03/03A/03B specifications are listed in Table 5-0.

Model ATRT-03 (v) Operating Instructions

Table 5-0. Model ATRT-03/03A/03B Turns-Ratio Meter Specifications
(Unless otherwise indicated, each specification is the same for all three ATRT-03 models.)

Type	Portable, Automatic, Three-Phase Transformer Turns-Ratio Meter
Size (inches)	17 L by 13 W by 7 H
Weight (pounds)	17
Input Voltage	ATRT-03/03B: 120/240 Vac (Selectable) ATRT-03A: 85 to 264 Vac, 110 to 370 Vdc, 12Vdc (car battery)
Turns Ratio-Measuring Ranges	0.800 to 15,000.00
Turns-Ratio Accuracy	0.8-999: $\pm 0.1\%$ 1,000-1,499: $\pm 0.2\%$ 1,500-1,999: $\pm 1.0\%$ 2,000-15,000: $\pm 2.0\%$
Calibration	Self Calibrating; No operator calibration required
Excitation Voltage	ATRT-03/03B: 8 Vac, 40 Vac, 100 Vac (Selectable) ATRT-03A: 20 Vac
Excitation Current	ATRT-03/03B: 0 to 2 amp; ATRT-03A: 0 to 200 milliamperes
Current Accuracy	$\pm 1\text{mA}$ (± 1 Digit)
Phase Angle	0 to 360 degree
Phase Angle Accuracy	± 0.2 degree Reading (± 1 Digit)
Winding Polarity	Displayed on LCD screen
Display	LCD: 20 Characters wide by 4 Lines, viewable in bright sunlight
Serial Interface	RS-232C, 19200 baud, 8 data bits, 2 start bits, 1 stop bit
Temperature	• Operating: -20 °C to 55 °C • Storage: -40 °C to 65 °C
Warranty	One-Year on Parts and Labor

Model ATRT-03 (v) Operating Instructions

5-1. ATRT-03/03A/03B Supplied Cables

Table 5-1. ATRT-03/3A/3B Cable Set

Item	Description	Qty
1	H Test-Lead Cable, 15-foot Single-Phase Cables	1
2	X Test-Lead Cable, 15-foot Single-Phase Cables	1
3	H Test-Lead Cable, 15-foot Three-Phase Cables	1
4	X Test-Lead Cable, 15-foot Three-Phase Cables	1
5	H Extension Cable, 30-foot Three-Phase Cables	1
6	X Extension Cable, 30-foot Three-Phase Cables	1
7	Power cord	1
8	DC power cord (Note)	1
9	Ground Cable	1

Note:

1. A canvas cable-carrying bag is included with the cable set.
2. DC power cord is supplied with the ATRT-03A only.

6-0. Cable Marking and Identification

Both H and X cable test leads are terminated with heavy-duty battery clips. Test cables are identified as follows:

Table 6-1. Cable Markings and Identification

Test Cable Name	Transformer Terminals	Clip Color	Identification
Single Phase H Cables	H	Red	H1, H2
Single Phase X Cables	X	Black	X1, X2
Three Phase H Cables	H	Red	H0, H1, H2, H3
Three Phase X Cables	X	Black	X0, X1, X2, X3

7-0. ATRT-03/03A/03B Front Panel Descriptions

7-1. ATRT-03 Operating Controls and Indicators

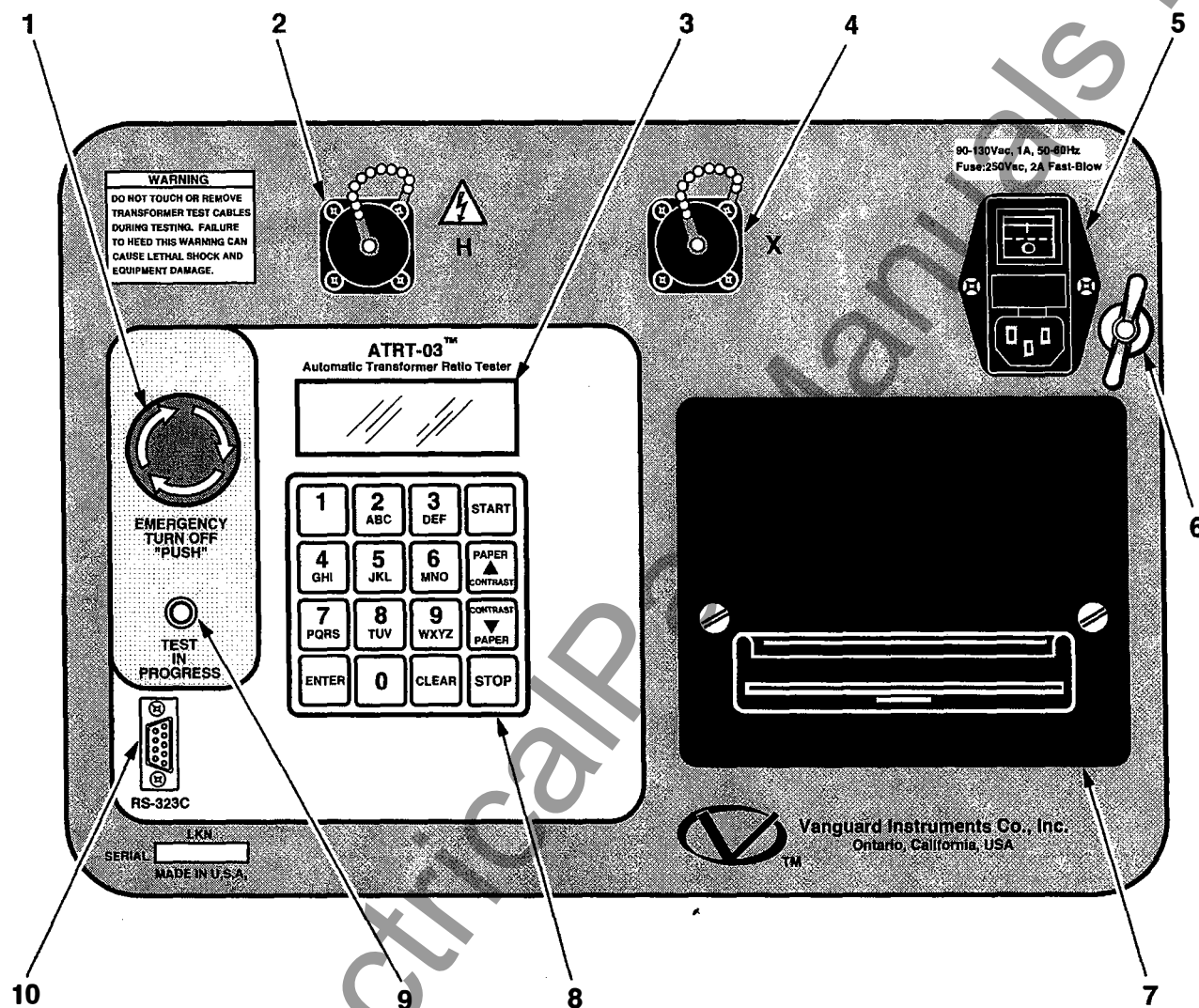


Figure 7-1. Model ATRT-03 Front-Panel Controls, Indicators, and Connectors

Model ATRT-03 (v) Operating Instructions

Table 7-1. Model ATRT-03 Front-Panel Controls, Indicators, and Connectors

Fig. 7-1 Index	Panel Markings	Functional Description
1	EMERGENCY TURN OFF "PUSH"	Emergency turn-off test voltage switch.
2	H	H Voltage Test Connector.
3	None (display)	LCD screen: 4 line by 20 character, back-lighted, sunlight readable. Displays menus, test results, and status readouts.
4	X	X Voltage Test Connector.
5	120/240 Vac, 1A, 50/60Hz Fuse: 250Vac, 2A,	Input power connector and fused power switch with third-wire safety ground.
6	None (wing nut)	ATRT-03 ground stud. Connect this ground stud to substation ground.
7	None (printer)	Thermal printer, 4.5-inch wide.
8	None (Keypad)	Pushbutton operating controls, 16-keys.
9	TEST IN PROGRESS	Red LED, Test in progress. This LED flashes when ATRT-03 responds to a command or when test voltage is applied to the test transformer. The ATRT-03 flashes the LED and beeps at a 1 second rate during test.
10	RS-232C	Computer-Interface port, 9-pin, female DB type connector; RS-232C interface allows the ATRT-03 to interface with an IBM PC computer. Data rate is set to 19,200 baud, 1 start bit, 8 data bits, 2 stop bits, and no parity bit. Connector pin functions are: PIN SIGNAL 2 Rx 3 Tx 5 Gnd

7-2. ATRT-03A Operating Controls and Indicators

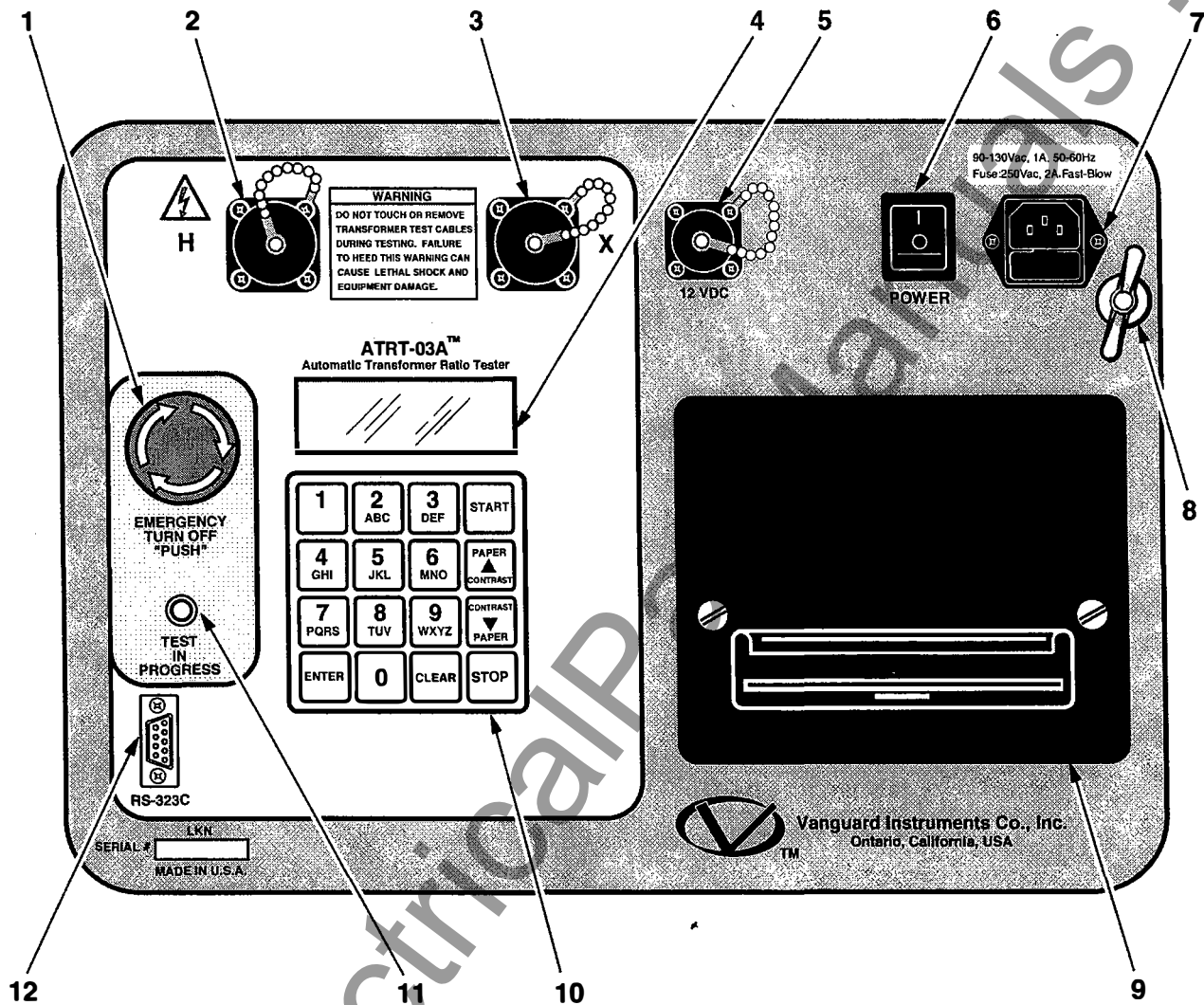


Figure 7-2. Model ATRT-03A Front-Panel Controls, Indicators, and Connectors

Model ATRT-03 (v) Operating Instructions

Table 7-2. Model ATRT-03A Front-Panel Controls, Indicators, and Connectors

Fig. 7-2 Index	Panel Markings	Functional Description
1	EMERGENCY TURN OFF "PUSH"	Emergency turn off test voltage switch.
2	H	H Voltage Test Connector.
3	X	X Voltage Test Connector.
4	None (display)	LCD screen: 4 line by 20 character, back lighted, sunlight readable. Displays menus, test results, and status readouts.
5	12 VDC	12 VDC input connector. A 10-foot cigarette-lighter adapter power cord will be provided with the ATRT-03A.
6	POWER	Power Switch.
7	120/240Vac, 1A, 50/ 60Hz Fuse: 250Vac, 2A, Fast Blow	Input power connector and fused power switch with third-wire safety ground.
8	None (wing nut)	ATRT-03A ground stud. Connect this ground stud to substation ground.
9	None (printer)	Thermal printer, 4.5-inch wide printout.
10	None (keypad)	Pushbutton operating controls, 16-keys.
11	TEST IN PROGRESS	Red LED, Test in progress LED. This LED flashes when ATRT-03A responds to a command or when test voltage is applied to the test transformer. The ATRT-03A flashes the LED and beeps at a 1 second rate during test.
12	RS-232C	Computer-interface port, 9-pin, female DB type connector; RS-232C interface port allows the ATRT-03A to interface with an IBM PC computer. Data rate is set to 19,200 baud, 1 start bit, 8 data bits, 2 stop bits, and no parity bit. Connector pin functions are: PIN SIGNAL 2 Rx 3 Tx 5 Gnd

7-3. ATRT-03B Operating Controls and Indicators

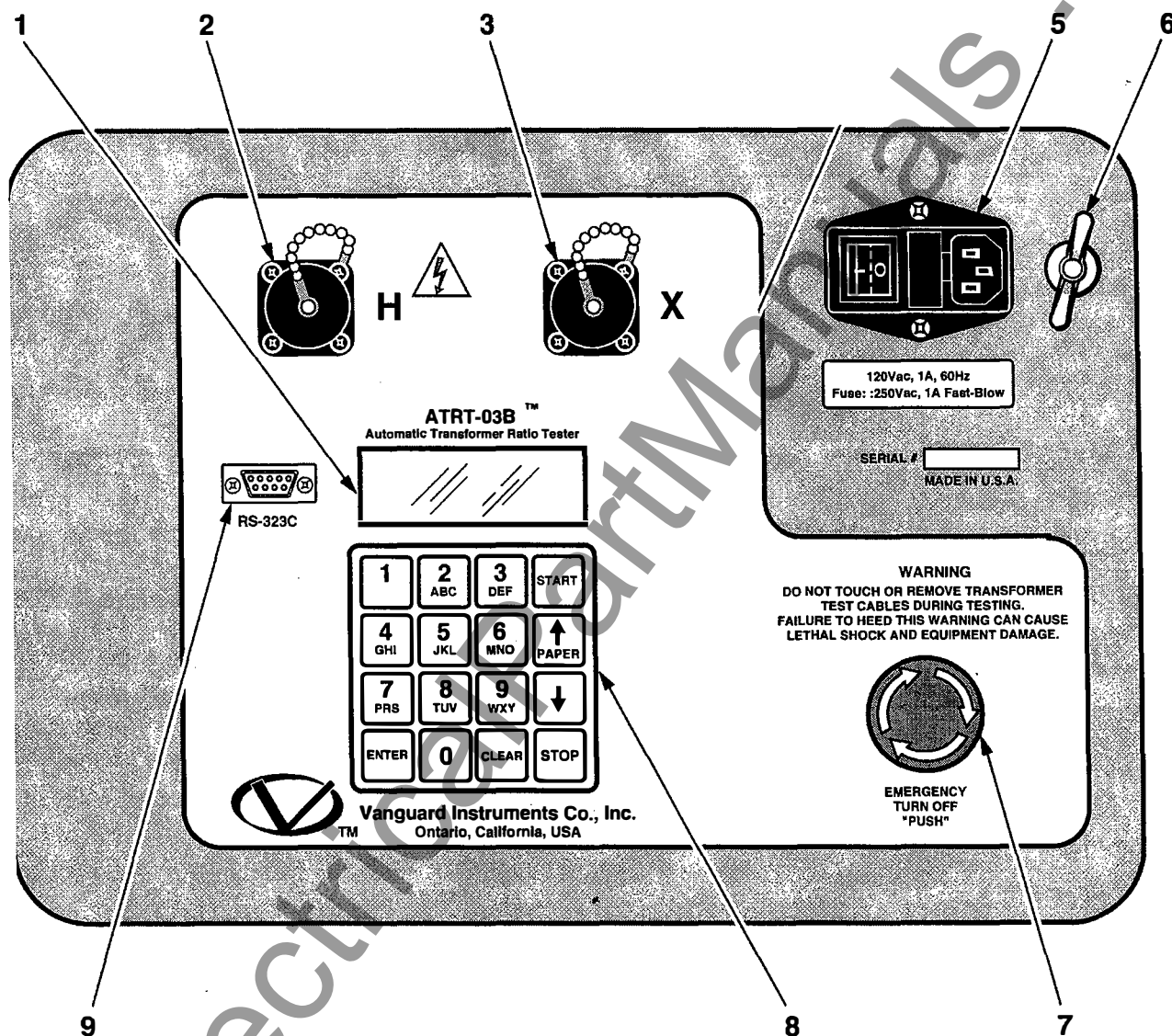


Figure 7-3. Model ATRT-03B Front-Panel Controls, Indicators, and Connectors

Model ATRT-03 (v) Operating Instructions

Table 7-3. Model ATRT-03B Front-Panel Controls, Indicators, and Connectors

Fig. 7-3 Index	Panel Markings	Functional Description
1	None (display)	LCD screen: 4 line by 20 character, back-lighted, sunlight readable. Displays menus, test results, and status readouts.
2	H	H Voltage Test Connector.
3	X	X Voltage Test Connector.
4		
5	120/240Vac, 1A, 50/60Hz; Fuse: 250Vac, 2A, Fast Blow	Input power connector and fused power switch with third-wire safety ground.
6	None (wing nut)	ATRT-03B ground stud. Connect this ground stud to substation ground.
7	EMERGENCY TURN OFF "PUSH"	Emergency turn off test voltage switch.
8	None (Keypad)	Pushbutton operating controls, 16-keys.
9	RS-232C	Computer-interface port, 9-pin, female DB type connector; RS-232C interface port allows the ATRT-03B to interface with an IBM PC computer. Data rate is set to 19,200 baud, 1 start bit, 8 data bits, 2 stop bits, and no parity bit. Connector pin functions are: PIN SIGNAL 2 Rx 3 Tx 5 Gnd

8-0. ATRT-03/03A Printer and Printer Paper

The ATRT-03/03A built-in thermal printer uses 4.5-inch wide thermal paper for printing test results. To maintain the highest quality test-result printing and to avoid paper jamming, the use of paper supplied by our factory is highly recommended. Additional paper can be ordered from either of the two sources listed below:

Vanguard Instruments Co, Inc.

1710 Grevillea Court

Ontario, CA 91761

Tel: 909-923-9390

Fax: 909-923-9391

Part Number: TP-4 Paper

OR

BG Instrument Co.

13607 E. Trent Ave.

Spokane, WA 99216

Tel: 888-244-4004

Fax: 509-893-9803

Part Number: TP4 paper

9-0. ATRT-03/03A/03B Storage Capabilities

9-1. ATRT-03/03A/03B Test Record Storage Capabilities

The ATRT-03/03A/03B is capable of storing up to 200 transformer test records. These test records are stored in FLASH EEPROM. The users can retrieve these records from FLASH EEPROM to be printed by the thermal printer or they can be transferred to the PC.

9-2. ATRT-03/03A/03B Transformer Test Plan Storage Capabilities

Each ATRT-03/03A/03B is capable of storing up to 128 Transformer Test Plans in the FLASH EEPROM. Test plans allow the user to run a complete transformer test to obtain PASS/FAIL results.

10-0. ATRT-03/03A/03B Operating Voltages

10-1. ATRT-03/03B Operating Voltages

The ATRT-03 and ATRT-03B operating voltage are selectable between 110/220 V, 50/60 Hz or 220/240, 50/60 Hz. Voltage selection is set by the reference transformer jumpers as shown in Table 10-1.

Table 10-1. Voltage-Selection Jumper Pins

VOLTAGE SELCTION	TRANSFORMER
110/220 Vac	Pin 1 & 2, 3 & 4
220/240 Vac	Pin 2 & 3

Note

Operating voltage is preset from factory.

Model ATRT-03 (v) Operating Instructions

10-2. ATRT-03A Operating Voltages

The ATRT-03A uses a special switching power supply, the input **AC receptacle** voltage range is from **90-240 Vac** or **80-300 Vdc**.

The DC power plug will accept 12 Vdc from a battery. A DC power cable with a cigarette-lighter plug is provided with each ATRT-03A.

11-0. ATRT-03/03A/03B Special Features

11-1. ATRT-03/03A/03B LCD Contrast Control

To Darken the LCD display, press and hold the “↑ Contrast” switch for two seconds; to lighten the LCD display, press and hold the “↓ Contrast” switch for two seconds.

11-2. ATRT-03/03B Test Voltages

The ATRT-03 and ATRT-03B have 3 selectable test voltages: 8 Vac, 40 Vac, and 100 Vac. The ATRT-03A uses 20 Vac for test voltage. Refer to paragraph 26-0 for test voltage selection.

11-3. ATRT-03/03A/03B RS-232C Computer-Control port

The ATRT-3/03A/03B can be controlled remotely via an RS-232C port. The ATRT-03/03A/03B computer control must be enabled before it can be controlled via the RS-232C port. (Refer to paragraph 24-0 for procedures to enable the computer interface control.)

12-0. Windows-Based PC Transformer Analysis Software

Windows-Based PC Transformer Analysis Software is delivered with each ATRT-03/03A/03B.

This software allows the user to test transformer turns ratio via a PC. Test results can be saved and run later in a shop or an office environment. Such test-result records can also be saved in any user-specified database or archival records.

13-0. ATRT-03 Cable Hook Up

13-1. ATRT-03/03A/03B Ground Cable

Always ground the ATRT-03/03A/03B before connecting H and X cables. Use the ground cable provided with the cable set.

13-2. Typical Transformer connection to ATRT-03/03A/03B

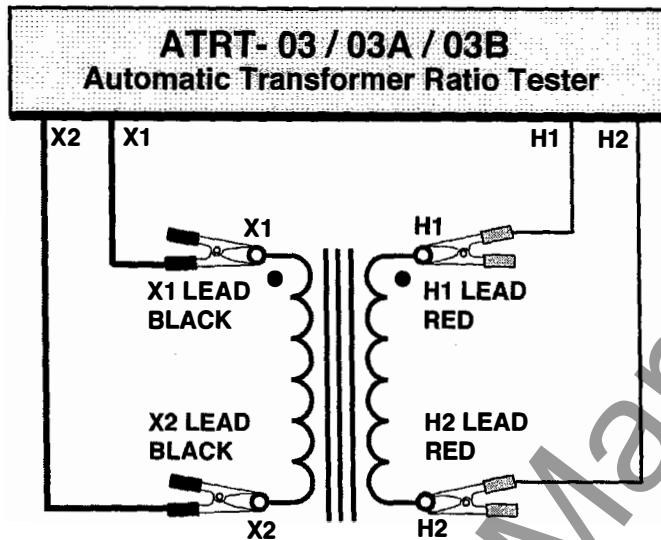


Figure 13A. Typical Connection for Single-Phase Transformer

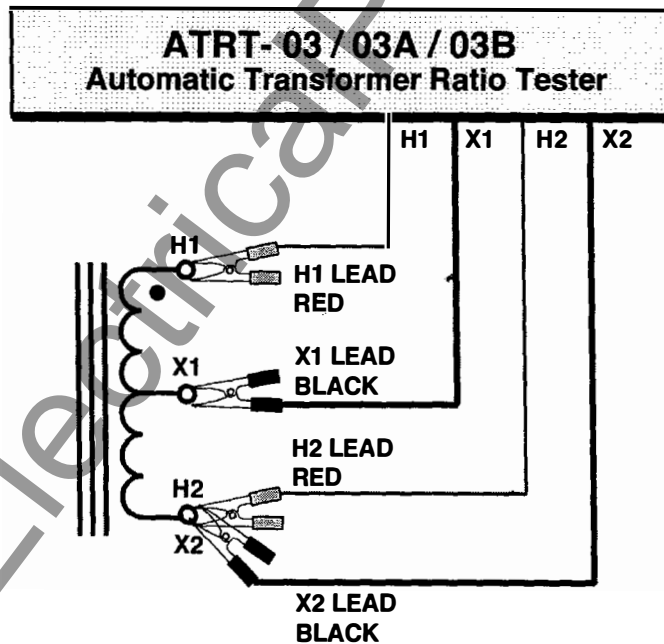


Figure 13B. Typical Connection for Single-Phase Auto Transformer

Model ATRT-03 (v) Operating Instructions

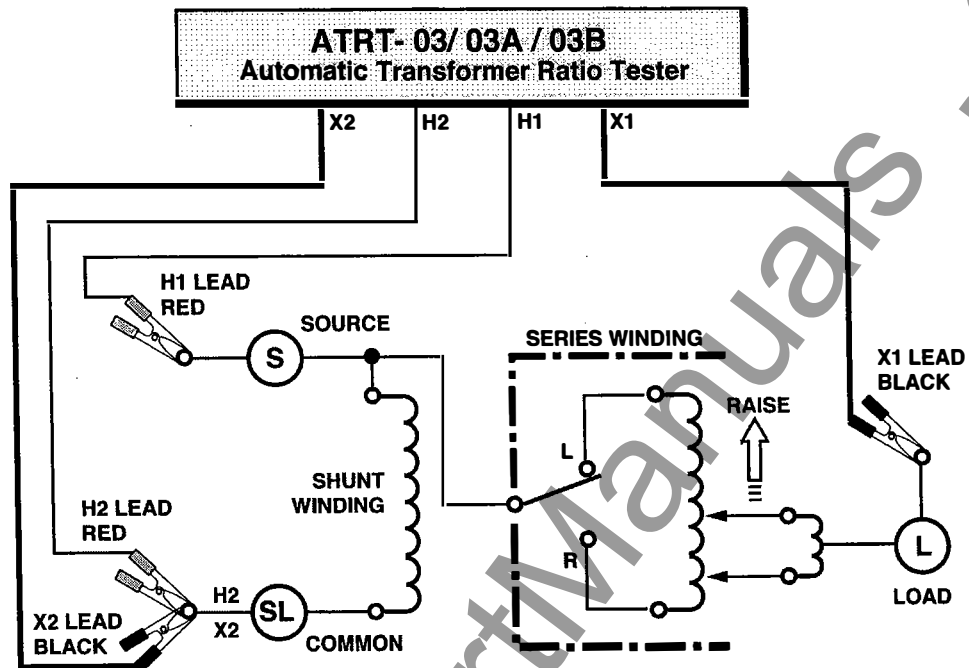


Figure 13C. Typical Connection for Type A Voltage Regulator

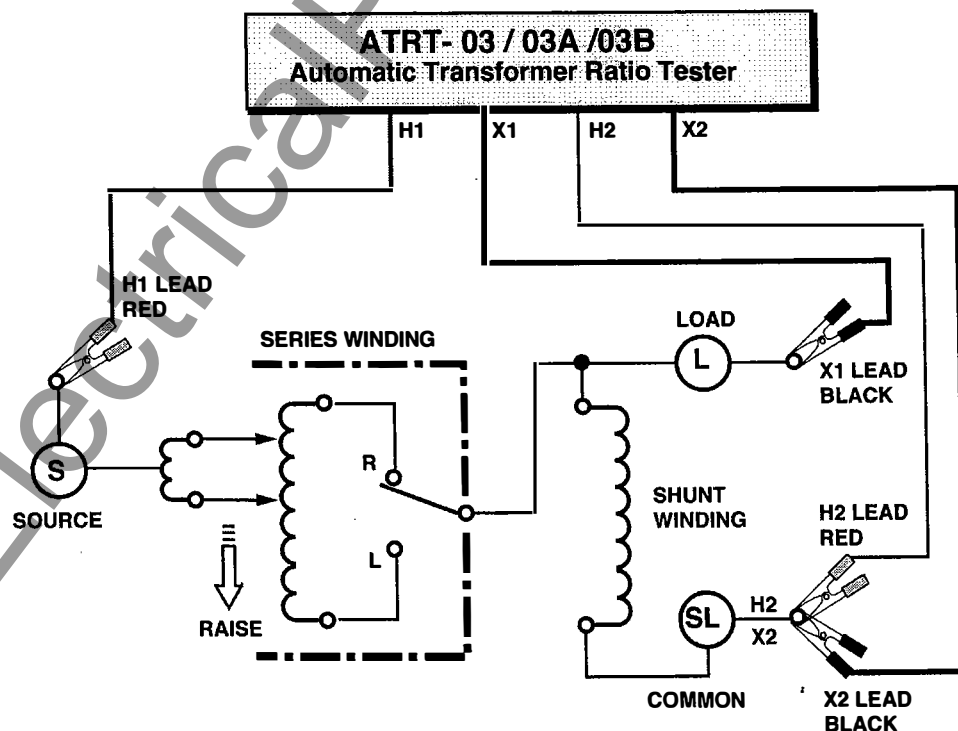


Figure 13D. Typical Connection for Type B Voltage Regulator

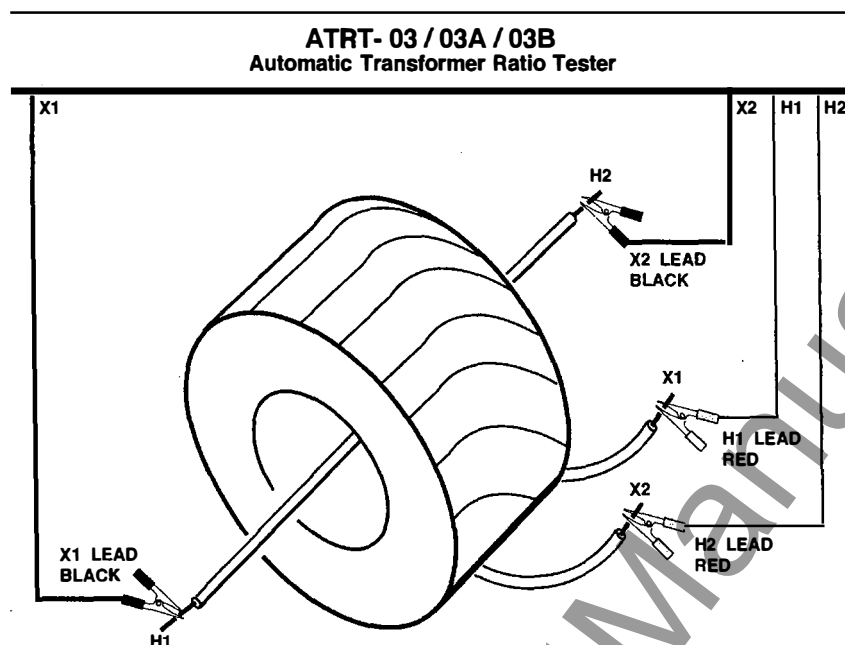


Figure 13E. Typical Connection for Donut Type (un-mounted) CT

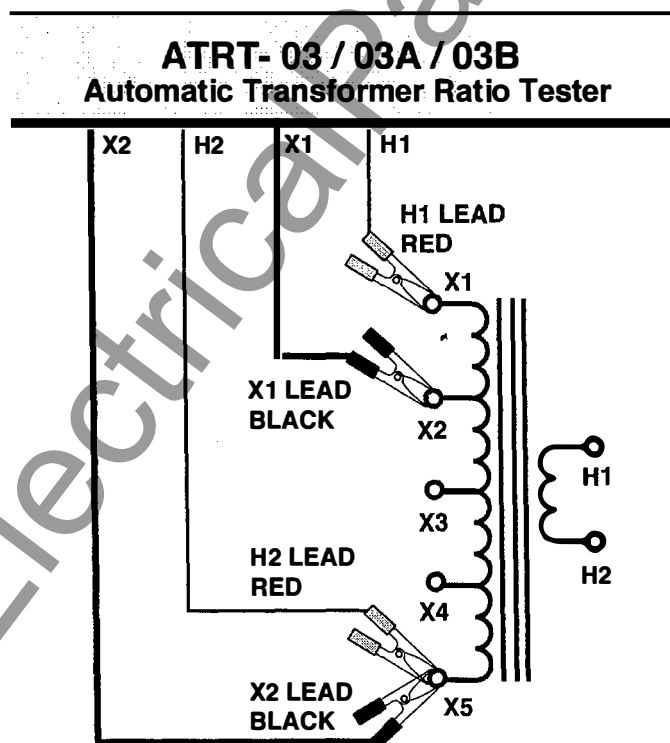
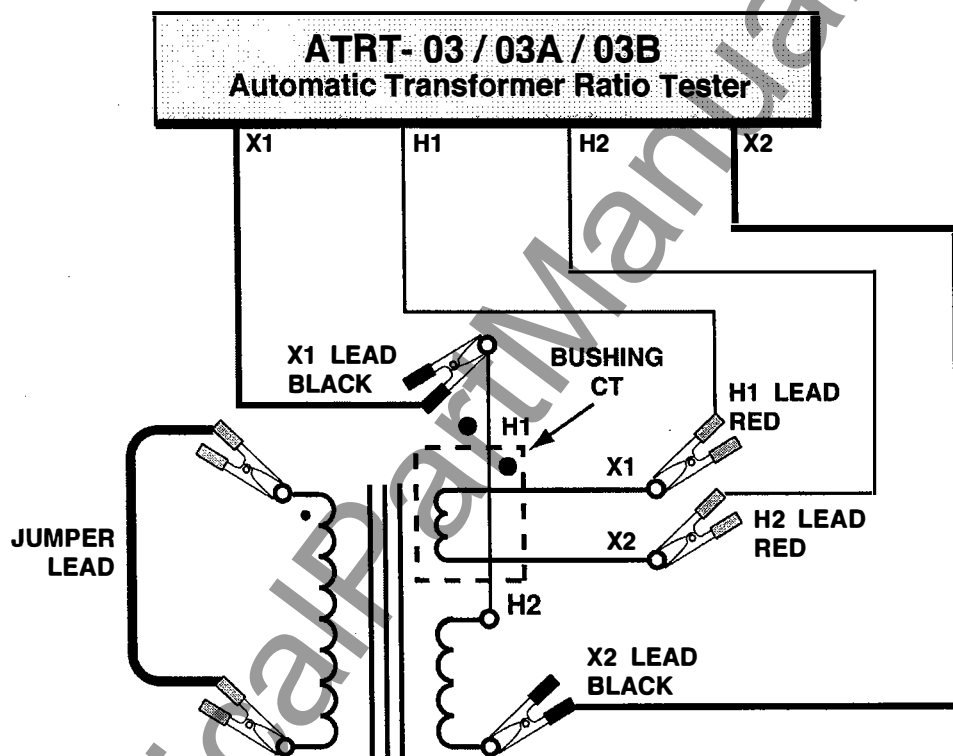


Figure 13F. Typical Connection for Multi-tap CT



**Figure 13G. Typical Connection for Bushing-Mount-CT
(single-phase, 2-winding transformer)**

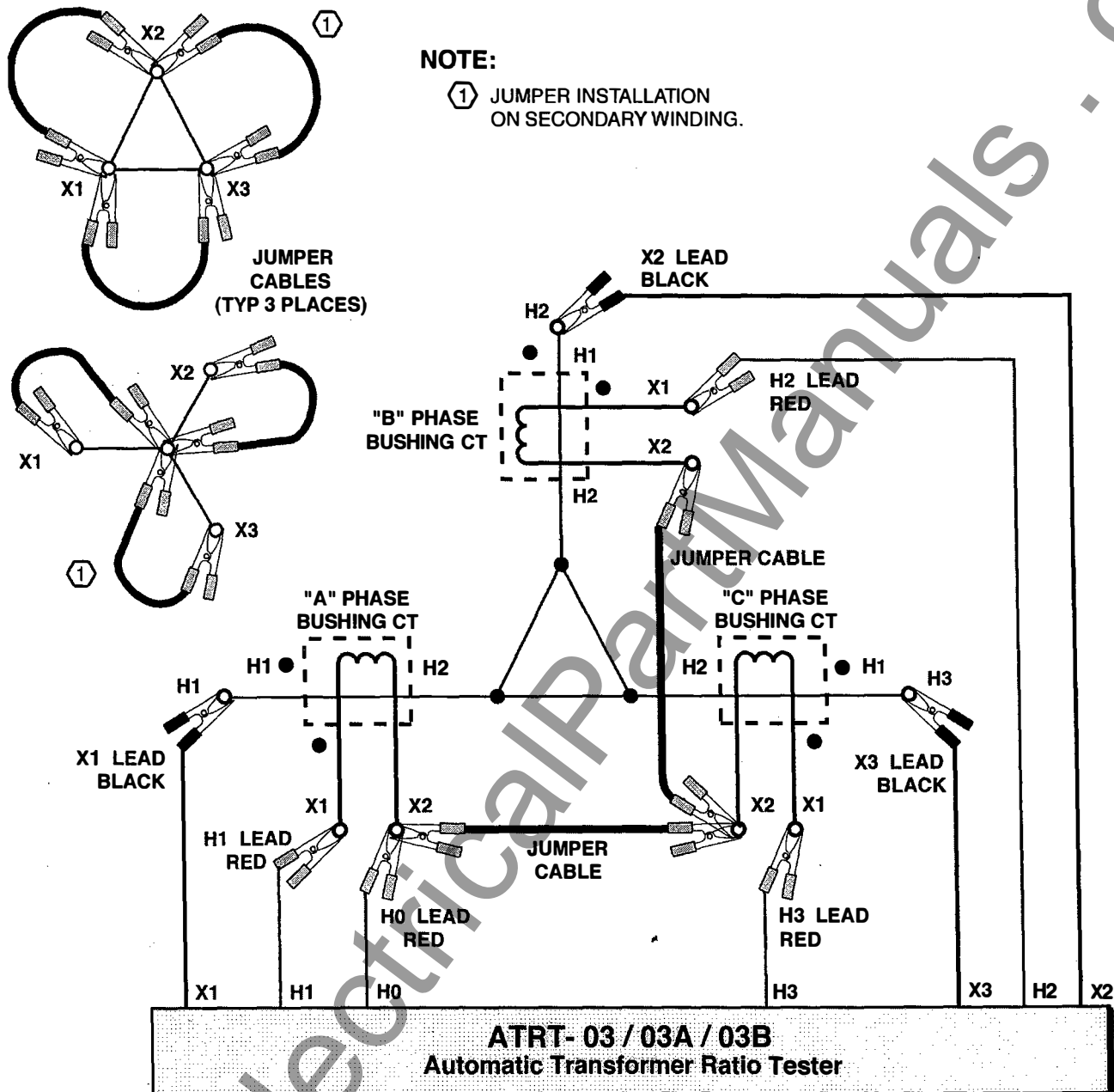


Figure 13H. Typical Connection for Bushing Mount CTs on Delta Transformer

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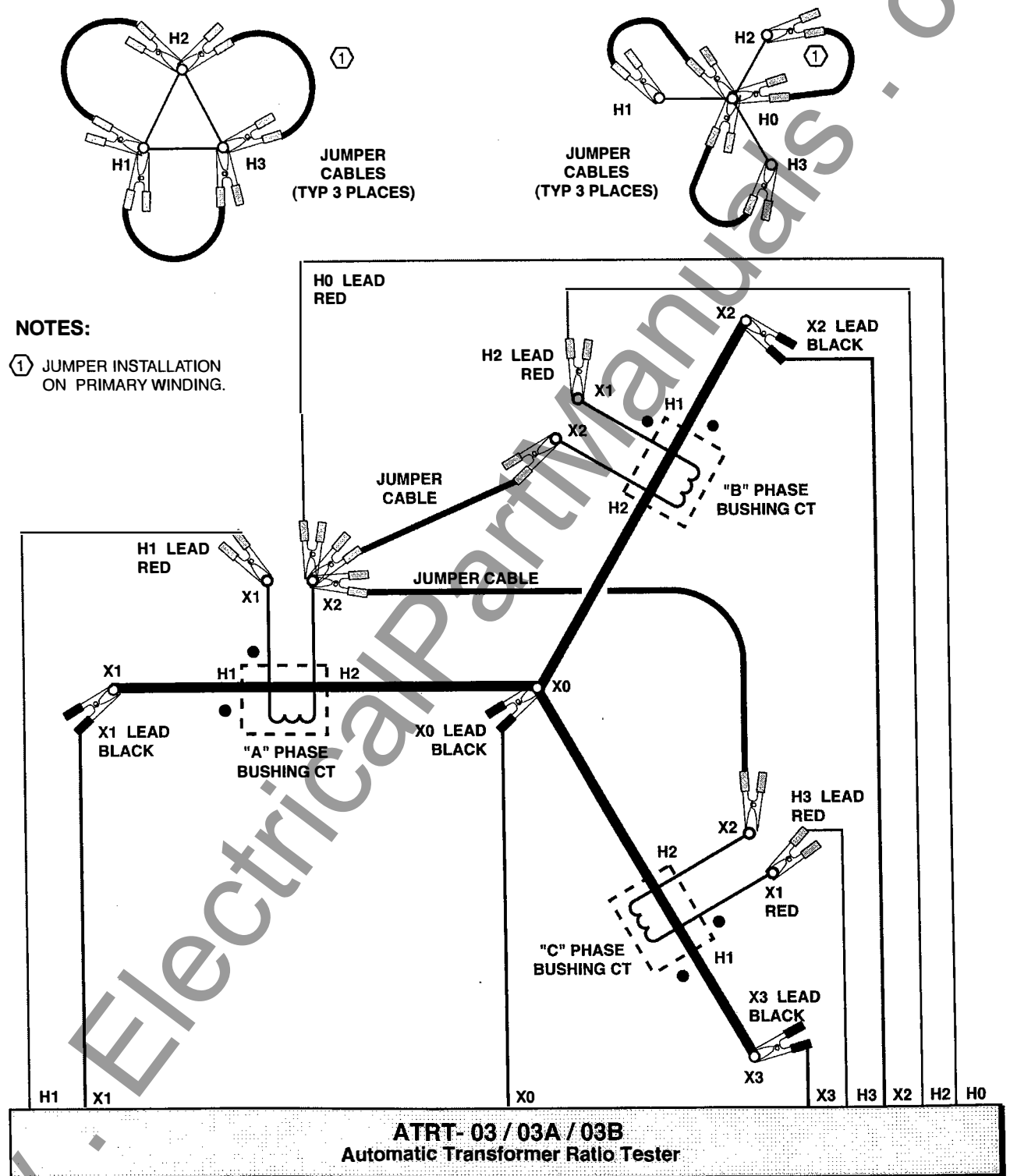


Figure 13I. Typical Connection for Bushing Mount CTs on Wye Transformer

14-0. Single-Phase Transformer Test Procedure

Table 14-0 shows the steps to test a single-phase transformer (7,200V/480V). Each of the menus is described in detail in the following paragraphs:

Table 14-0. Single-Phase Transformer Test Procedure Steps

STEP	DESCRIPTION	DISPLAY	ACTION
1	Initiate Transformer Test	1.TEST XFMR 04/12/00 2.SETUP 13:06:02 3.CALCULATOR 4.DIAGNOSTIC	Press key 1
2	Select Single Phase Transformer	XFMR CONFIGURATION: 1.SNGL PHS 2.dT-Y 3.Y-dT 4dT-dT 5.Y-Y	Press key 1
3	Select to use transformer name plate voltage	XFMR NAME PLATE VLTG 1.YES 2.NO	Press key 1
4	Enter H line voltage	ENTER H WINDING NAME-PLATE VOLTAGE V	Use keys 0-9
5	Confirm H voltage	ENTER H WINDING NAME-PLATE VOLTAGE 7200 V	Press ENTER
6	Enter X line voltage	ENTER X WINDING NAME-PLATE VOLTAGE V	Use keys 0-9
7	Confirm X voltage	ENTER X WINDING NAME-PLATE VOLTAGE 480 V	Press ENTER
8	Start test	SINGLE PHASE XFMR "START" TO RUN TEST OR "STOP" TO ABORT	Press START key
9	Observe ratio, excitation current, and percentage error	RATIO mA %DIFF +15.006 0001 0.04	None
10	Go to next screen	RATIO mA %DIFF +15.006 0001 0.04	Press any key
11	Print test result on built-in printer	PRINT TEST RESULTS? 1.YES 2.NO	Press key 1
12	Select print format	PRINT FORMAT 1.COLUMN 2.DETAILED	Select detailed format print report

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Table 14-0. Single-Phase Transformer Test Procedure Steps (cont.)

STEP	DESCRIPTION	DISPLAY	ACTION
13	Store reading in buffer	KEEP THIS READING? 1.YES 2.NO	Press key 1
14	Don't want to append this reading to previous test results (Refer to Note)	PREVIOUS DATA IN BUF. 09/01/00 1.APPEND PREV. DATA 2.CLEAR PREV. DATA	Press key 2
15	End test	RUN ANOTHER TEST? 1.YES 2.NO	Press key 2
16	Store Test Results in FLASH EEPROM	SAVE THIS RECORD? 1.YES 2.NO	Press key 1
17	Test Results Saved in FLASH EEPROM confirmation	RECORD NUMBER 3 HAS BEEN SAVED	Press any Key
18	Return to main menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:02 3.CALCULATOR 4.DIAGNOSTIC	None

NOTE

When starting a new test, the user can append the new test results to previous test results stored in scratch-pad memory. This feature is handy in a situation where the user is running a test and has to terminate the test. Later, the user can continue the test from where it left off instead of repeating the entire test. Refer to section 14-13 for more details.

14-1. Start-Up Menu

1.TEST XFMR	04/12/00
2.SETUP	13:06:02
3.CALCULATOR	
4.DIAGNOSTIC	

Figure 14-1. Start-up Menu

a. Description: The “Start-Up” menu lets the user test a transformer, set-up time, select computer interface, or use a calculator to manually enter voltage data for transformer turns-ratio calculation.

b. Origin: The “Start-Up” menu first displays after power is applied to the ATRT-03/03A/03B.

c. Action Options:

Press key 1 to initiate a transformer test.

Press key 2 to set clock or select computer interface.

Press key 3 to calculate transformer turns ratio.

Press key 4 to run diagnostics.

NOTE

Real time and date are shown on top left of LCD screen.

See section 11-1 for LCD contrast control.

14-2. Test Transformer Selection Menu

XFRMER CONFIGURATION:	
1.SNG PHS	2.dT-Y
3.Y-dT	4.dT-dT
5.Y-Y	6.SP TEST

Figure 14-2. Transformer Selection Menu

- a. Description:** This menu allows the user to select a particular transformer to be tested.
- b. Origin:** XFRMER CONFIGURATION menu display as a result of pressing key 1 from the "Start-Up" menu (see Figure 14-1).
- c. Action Option:** Press key 1, 2, 3, 4, or 5, depending upon the transformer configuration to be tested. Press STOP to return to the "Start-Up" menu.

NOTE

1. The ATRT-03/03A/03B will support 36 "Non-Standard Transformer" type tests. These "Non-Standard Transformer" tests are identified under special test (selection #6 of Figure 14-2).
2. Non-Standard Transformer configuration is shown in Appendix B.

14-3. Transformer Test Procedure Menu

STOP BETWEEN PHASES? 1.NO 2.YES

Figure 14-3. Transformer Test Procedure Menu

a. Description: This menu allows the operator to pause between phases or proceed to the next phase automatically.

b. Origin: This menu is displayed after the operator selects the transformer type to be tested.

c. Action Option: Press key 2 (YES) to stop test between phases. Press key 1 (NO) to bypass this option.

NOTE

The <STOP BETWEEN PHASES? > Menu is shown only with three-phase transformer test.

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14-4. Transformer Voltage Name Plate Menu

XFMR NAME PLATE VLTG 1.YES 2.NO
--

Figure 14-4. Nameplate Voltage Selection Menu

a. Description: This menu allows the operator to use the transformer nameplate voltages to derive a calculated turns ratio. This calculated turns ratio is then used to compare with the measured turns ratio, which produces an error-difference percentage.

b. Origin: Select key 1 or 2 from options listed in Figure 14-3. This menu is displayed after the operator selects the transformer type to be tested.

c. Action Option: Press key 1 (YES) to use the calculated ratio in the test results and advance to "Transformer Name Plate Voltage" menu (Figure 14-5). Press key 2 (NO) to bypass this option and advance to "Start Test" menu (Figure 14-6).

NOTE

1. If the user continues to run another test on the transformer, the menu below will be displayed (figure 14-4A). The user now has a new option: the same nameplate voltage data can be used.

2. Press key 3 to use the current nameplate voltage and advance to "Start Test" menu (Figure 14-6).

XFMR NAME PLATE VLTG 1.YES 2.NO 3.USE PREVIOUS DATA
--

Figure 14-4A. Nameplate Voltage Selection Menu

14-5. Transformer Voltage Data Entry Menu

**ENTER H WINDING
NAME-PLATE VOLTAGE:
V**

Figure 14-5A. H-Winding Voltage Entry Display #1

**ENTER H WINDING
NAME-PLATE VOLTAGE:
7200V**

Figure 14-5B. H-Winding Voltage Entry Display #2

**ENTER X WINDING
NAME-PLATE VOLTAGE:
V**

Figure 14-5C. X-Winding Voltage Entry Display #1

**ENTER X WINDING
NAME-PLATE VOLTAGE:
480V**

Figure 14-5D. X-Winding Voltage Entry Display #2

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- a. Description:** This menu allows the user to enter the H and X voltages of the transformer to be used in the turns-ratio calculation. The user must enter the transformer nameplate line voltages.
- b. Origin:** H and X voltage data entry menu will appear if the user has pressed the YES key on the Voltage-Selection menu (see Figure 14-4).
- c. Action Option:** Press keys 0 thru 9 to enter transformer voltages. Press ENTER key to confirm voltage entry. Press CLEAR key to re-enter input.

14-6. Start Test Menu



SINGLE PHASE XFMRER
"START" TO RUN TEST
OR
"STOP" TO ABORT

Figure 14-6. Start Test Menu

- a. Description:** This menu allows the user to start or abort a test.
- b. Origin:** After the user enters the nameplate voltages (see Figure 14-5) or selects NO on the "XFMR NAME PLATE VLTG" menu (see Figure 14-4).
- c. Action Option:** Press START to start the test and press STOP to abort the test.

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14-7. Transformer Turns-Ratio Test Result Display

RATIO	mA	%DIFF
+15.006	0001	0.04

Figure 14-7. Test Result Display

a. Description: The ATRT-03/03A/03B displays the transformer winding polarity, turns-ratio, excitation current (in milliamps), and turns-ratio error percentage. A typical turns-ratio test-result screen is shown on Figure 14-7 above.

NOTE

Ratio displayed: 15.006
Polarity displayed: "+" (in phase)
Excitation current: 1 ma
Percentage error: 0.04 %

b. Origin: This screen displays after the user presses START on the "Start Test Menu".

c. Action Option: Press any key to return to go to "Print Transformer Test Results" Menu.

14-8 Print Transformer Test Results Menu

PRINT TEST RESULTS?
1.YES
2.NO

Figure 14-8. Print Transformer Test Results Menu

a. Description: The ATRT-03/03A can print the current test result (displayed on the LCD screen) using the built-in thermal printer. Follow the steps below to print test results.

b. Origin: Menu appears after operator presses any key from "Transformer Turns-Ratio Test Result Display Menu" (Figure 14-7).

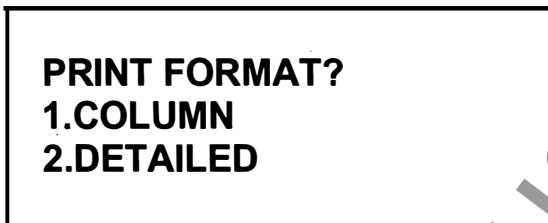
c. Action Option: Select key #1 to print test results (see Figure 14-8). Select key #2 to bypass print option.

NOTE

This menu is not available with the ATRT-03B.

Model ATRT-03 (v) Operating Instructions

14-9. Print Transformer Test Results Format Menu



PRINT FORMAT?
1.COLUMN
2.DETAILED

Figure 14-9. Print Transformer Test Results Format Menu

a. Description: The ATRT-03/03A will ask for the report format when the operator first asks for "Print Test Results." See Figure 14-10 for a typical column format printout. See Figure 14-11 for a detailed format printout.

b. Origin: This menu is displayed once after operator selects "YES" from the "Print Transformer Test Results Menu" (Figure 14-8).

c. Action Option: Press key #1 for column format. Press key #2 for detail format.

NOTE

This menu is not available with the Model ATRT-03B.

14-10. ATRT-03/03A Test Result Print Out In Column Format

RECORD NUMBER 1			
TRANSFORMER TEST RESULTS			
DATE: 11/16/00		TIME: 09:59:08	
COMPANY:			
STATION:			
CIRCUIT:			
MFR:			
MODEL:			
S/N:			
KVA RATING:			
OPERATOR:			
TEST VOLTAGE = 40 VOLTS			
TYPE: SINGLE PHASE XFORMER			
H TAP: _____		H VOLTAGE: 007,200	
X TAP: _____		X VOLTAGE: 000,480	
PHS M_RATIO	mA	%DIFF	C_RATIO
A +15.006	0001	00.04	15.0000

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Figure 14-10. Column Format Printout

NOTE

1. Test record time and date is printed at the top line of print out.
2. Test voltage is 40 volts in this test. See section 26-0 for more detail about test voltages.
3. Type of transformer under test is single phase.
4. H tap voltage is 7,200 volts.
5. X tap voltage is 480 volts.
6. Measured ratio is 15.004
7. Excitation current is 1.0 mA
8. Percentage error between calculated ratio and measured ratio is 0.04%
9. Calculated ratio is: 15.000
10. Winding polarity is shown as "+" or in phase.

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14-11. ATRT-03/03A Test Result Print Out In Detail Format

RECORD NUMBER 1	
TRANSFORMER TEST RESULTS	
DATE: 11/16/00 TIME: 09:59:08	
COMPANY: STATION: CIRCUIT: MFR: MODEL: S/N: KVA RATING: OPERATOR:	
TEST VOLTAGE = 40 VOLTS	
TYPE: SINGLE PHASE XFORMER	
TEST H1-H2 AND X1-X2	
NAME PLATE VOLTAGE:	
H VOLTAGE:	007,200
H TAP SETTING:	
X VOLTAGE:	000,480
X TAP SETTING:	
CALCULATED RATIO:	15.0000
MEASURED RATIO:	15.006
DIFFERENCE:	00.04 %
MEASURED PHASE-ANGLE:	000.000 DEG
MEASURED CURRENT:	0001 mA

Figure 14-11. Detail Format Printout

NOTE

1. Test record time and date is printed at the top line of print out.
2. Test voltage is 40 volts in this test. See section 26-0 for more detail about test voltages.
3. Type of transformer under test is single phase.
4. H tap voltage is 7,200 volts.
5. X tap voltage is 480 volts.
6. Measured ratio is 15.004
7. Excitation current is 1mA
8. Percentage error between calculated ratio and measured ratio is 0.04%
9. Calculated ratio is 15.000
10. Winding phase angle is measured as 0.000 Degrees.

14-12. Keep Transformer Ratio Reading Menu

KEEP THIS READING?

1.YES

2.NO

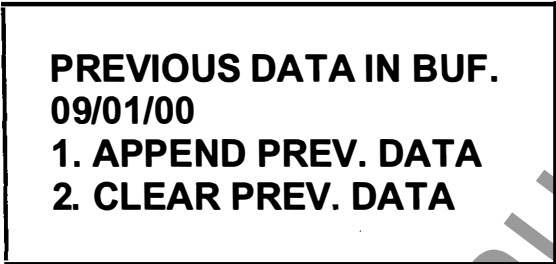
Figure 14-12. Keep Transformer Ratio Reading Menu

a. Description: The user has the option to store the current test result in a scratch pad memory or disregard the current results. After the last test, the ATRT-03/03A/03B will ask if the user wants to store all test results in scratch pad memory into the FLASH EEPROM.

b. Origin: After test results are printed by the thermal printer or the user selects "NO" from the "Print Test Results" screen (Figure 14-9).

c. Action Option: Select key 1 to store current transformer ratio readings in scratch-pad memory, go to "Repeat Test Menu." Select key 2 to go to "Repeat Test Menu" (Figure 14-14).

14-13 Append This Reading Menu



PREVIOUS DATA IN BUF.
09/01/00
1. APPEND PREV. DATA
2. CLEAR PREV. DATA

Figure 14-13. Append Transformer Ratio Reading Menu

1. Description: This menu will appear only once at the end of a new test and only when the user is running the same type of transformer test. For example, the last test the user ran was a “Delta to Wye” test before powering down the unit. The user is now running another “Delta to Wye” test. The ATRT-03/03A/03B will present this menu after the first result displayed. The user can append this new test results to the previous test results still residing in the scratch pad memory. This feature is handy when the user has to stop a test on a transformer. The user can continue the test instead of having to repeat the entire test.

2. Origin: The menu will appear if the user selects “YES” from the “KEEP THIS READING” menu (Figure 14-12).

3. Action Option: Select key 1 to append this reading to other test results in scratch pad memory. Select key 2 to store this reading in scratch patch memory only.

14-14. Repeat Test Menu

RUN ANOTHER TEST? 1.YES 2.NO
--

Figure 14-14. Repeat Test Menu

a. Description: The user can select to run another test on the transformer or end the current test from this menu.

b. Origin: After “Keep Transformer Ratio Reading” or “Append This Reading” menu.

c. Action Option: Select key 1 to run another test and advance to “Transformer Name Plate Voltage” menu (Figure 14-4). Select key 2 to end the current test and advance to “Save Test Record” menu (Figure 14-15).

14-15. Save Test Record Menu

SAVE THIS RECORD?

1.YES

2.NO

Figure 14-15. Print Transformer Test Results Menu

- a. Description:** The user can transfer all test results from the scratch pad memory and save these in the FLASH EEPROM. The ATRT-03/03A/03B can store up to 200 test-records in the FLASH EEPROM.
- b. Origin:** After selecting key 1 or 2 from "Run Another Test" menu (Figure 14-14).
- c. Action Option:** Select key 1 to save current test record (see Figure 14-15). Select key 2 to bypass this option.

14-16. Record Storage Confirmation Menu



A rectangular box with a black border containing the text "RECORD NUMBER 3 HAS BEEN SAVED!".

**RECORD NUMBER 3
HAS BEEN SAVED!**

Figure 14-16. Record Storage Confirmation Menu

Description: The ATRT-03/03A/03B will assign a test record ID number to each of the records saved in the FLASH EEPROM.

Origin: Select key 1 from "Save Test Record" menu.

Action Option: Press any key to return to main menu (Figure 14-1).

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15-0. Three-Phase Transformer Test Procedure using Nameplate Voltages

Table 15-1 shows the steps to test a Delta to WYE (12,000/208V) transformer.

Table 15-1. Three-Phase Transformer Test Procedure Steps

STEP	DESCRIPTION	DISPLAY	ACTION
1	Initiate Transformer Test	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 1
2	Select Delta to Y Phase Transformer	XFMR CONFIGURATION 1.SNGL PHS 2.dT-Y 3.Y-dT 4.dT-dT 5.Y-Y	Press key 2
3	Select to use transformer nameplate voltage	XFMR NAME PLATE VLTG 1.YES 2.NO	Press key 1
4	Select no stop between phases	STOP BETWEEN PHASES? 1.NO 2.YES	Select key 1
5	Enter H line voltage	ENTER H WINDING NAME-PLATE VOLTAGE V	Use keys 0-9
6	Confirm H voltage	ENTER H WINDING NAME-PLATE VOLTAGE 12000 V	Press ENTER
7	Enter X line voltage	ENTER X WINDING NAME-PLATE VOLTAGE V	Use keys 0-9
8	Confirm X voltage	ENTER X WINDING NAME-PLATE VOLTAGE 208 V	Press ENTER
9	Start test	DELTA to Y XFORMER "START" TO RUN TEST OR "STOP" TO ABORT	Press START key
10	Observe test results	RATIO mA %DIFF +100.05 002 0.12 +100.06 002 0.13 +100.06 002 0.13	None
11	Go to next screen	RATIO mA %DIFF +100.05 002 0.12 +100.06 002 0.13 +100.06 002 0.13	Press any key
12	Print test result on built-in printer	PRINT TEST RESULTS? 1.YES 2.NO	Press key 1

Table 15-1. Three-Phase Transformer Test Procedure Steps (cont.)

STEP	DESCRIPTION	DISPLAY	ACTION
13	Select print format	PRINT FORMAT 1.COLUMN 2.DETAILED	Select Column format print - report
14	Store reading in buffer	KEEP THIS READING? 1.YES 2.NO	Press key 1
15	End test	RUN ANOTHER TEST? 1.YES 2.NO	Press key 2
16	Store Test Results in FLASH EEPROM	SAVE THIS RECORD? 1.YES 2.NO	Press key 1
17	Test Results Saved in FLASH EEPROM confirmation	RECORD NUMBER 3 HAS BEEN SAVED	Press any Key
18	Return to main menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:02 3.CALCULATOR 4.DIAGNOSTIC	None

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15-1. Print Out of a Delta-to-Wye Transformer Test in Column Format

RECORD NUMBER 2			
TRANSFORMER TEST RESULTS			
DATE: 11/16/00		TIME: 10:26:39	
COMPANY:		VANGUARD INSTRUMENT	
STATION:			
CIRCUIT:			
MFR:			
MODEL:			
S/N:			
KVA RATING:			
OPERATOR:			
TEST VOLTAGE = 40 VOLTS			
TYPE: DELTA to Y XFORMER			
H TAP: _____		H VOLTAGE: 012,000	
X TAP: _____		X VOLTAGE: 000,208	
PHS M_RATIO		3A	%DIFF
A +100.05		0002	00.12
B +100.06		0002	00.13
C +100.06		0002	00.13
			C_RATIO
			99.9288
			99.9288
			99.9288

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Figure 15-1. Delta-to-Wye Column Format Printout

NOTE

1. Test record time and date is printed at the top line of print out.
2. Test voltage is 40 volts in this test. See section 13-0 for more detail about test voltages.
3. Type of transformer under test is Delta to Wye.
4. H tap voltage is 12,000 volts.
5. X tap voltage is 208 volts.
6. Measured ratio, excitation current, % Diff
 - A phase: Ratio=100.05, Ext Current= 002 mA, % Diff= 0.12
 - B phase: Ratio=100.06, Ext Current= 002 mA, % Diff= 0.13
 - C phase: Ratio=100.06, Ext Current= 002 mA, % Diff= 0.13
7. Winding polarity is shown as "+" or in phase.

16-0. Running a Special Transformer Test

Table 16-1 shows the steps to test a Dy11 transformer.

Table 16-1. Three-Phase Transformer Test Procedure Steps

STEP	DESCRIPTION	DISPLAY	ACTION
1	Initiate Transformer Test	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 1
2	Select Special Transformer Test	XFMR CONFIGURATION 1.SNGL PHS 2.dT-Y 3.Y-dT 4.dT-dT 5.Y-Y 6.SP TEST	Press key 6
3	Scroll to the special test #8 (Note 1)	1.ENTER SP TEST NUM 2.SCROLL TO SELECT	Press key 2
4	Scroll to test #8 (Dy11)	SPECIAL TEST LISTING "UP" TO SCROLL FWD "DWN" TO SCROLL RVS	Use "UP" key
5	Confirm Special Test	ST #8 Dy11 XMFR "ENTER" TO USE TEST	Press ENTER
6	Do not use nameplate voltage	XFMR NAME PLATE VLTG 1.YES 2.NO	Press key 2
7	Install jumper from H2 to H3 Before running test	Dy11 XFMR JUMPER H3-H2 "START" to RUN TEST	Press "START" key
8	Install jumper from H1 to H3 Before running test	JUMPER H1-H3 "START" to RUN TEST	Press "START" key
9	Install jumper from H1 to H2 Before running test	JUMPER H2-H1 "START" to RUN TEST	Press "START" key
10		RATIO mA %DIFF +100.04 002 +100.06 002 +100.05 002	None
11	Go to next screen	RATIO mA %DIFF +100.04 002 +100.06 002 +100.05 002	Press any key
12	Print test result on built-in printer	PRINT TEST RESULTS? 1.YES 2.NO	Press key 1
13	Select print format	PRINT FORMAT 1.COLUMN 2.DETAILED	Select Column format print report

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Table 16-1. Three-Phase Transformer Test Procedure Steps (cont.)

STEP	DESCRIPTION	DISPLAY	ACTION
14	Store reading in buffer	KEEP THIS READING? 1.YES 2.NO	Press key 1
15	End test	RUN ANOTHER TEST? 1.YES 2.NO	Press key 2
16	Store Test Results in FLASH EEPROM	SAVE THIS RECORD? 1.YES 2.NO	Press key 1
17	Test Results Saved in FLASH EEPROM confirmation	RECORD NUMBER 3 HAS BEEN SAVED	Press any Key
18	Return to main menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:02 3.CALCULATOR 4.DIAGNOSTIC	None

16-1. Special Transformer Test Print Out

TRANSFORMER TEST RESULTS	
DATE: 11/16/00	TIME: 10:35:13
COMPANY: VANGUARD INSTRUMENT STATION: CIRCUIT: MFR: MODEL: S/N: KVA RATING: OPERATOR:	
TEST VOLTAGE = 40 VOLTS	
TYPE: Dy11 XFMR <SPEC TEST #8>	
H TAP: _____	H VOLTAGE:
X TAP: _____	X VOLTAGE:
PHS M-RATIO 3A	
A	+100.04 0002
B	+100.06 0002
C	+100.05 0002
DATE: 11/16/00	TIME: 10:35:13

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Figure 16-1. Special Dy11Transformer Test Print Out

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17-0. Printing Test Record Directory

The following steps allow the user to print the directory of the test record stored in FLASH EEPROM.

Table 17-1 Print Test Record Directory

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3 CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "Next Page" menu	1. ENTER XFMR ID 2. REVIEW RECORD 3. RESTORE RECORD 4. NEXT PAGE	Press key 3
3	Print "Directory" menu	1. RESTORE RECORD 2. DIRECTORY 3. ERASE RECORD	Press key 2
4	Select "Short directory"	PRINT DIRECTORY 1. FULL DIRECTORY 2. SHORT DIRECTORY	Press key 2

17-1. Select Test Record Directory Menu



Figure 17-1. Select Directory Menu.

a. Description: From the "Restore Record" menu, the user can:

1. Restore a test record.
2. Print record directory in FLASH EEPROM.
3. Erase test records in FLASH EEPROM.

b. Origin: From the "Start-Up" Menu (see figure 14-1), press key 2 (SET UP); then, on the next display, press 3 (RESTORE RECORD).

c. Action Option:

1. Press key 1 (RESTORE RECORD) to restore a test record (see 20-0).
2. Press key 2 (DIRECTORY) to print test record directory.
3. Press key 3 (ERASE RECORDS) to erase test records in FLASH EEPROM.

17-2. Print Test Record Directory Menu

PRINT DIRECTORY
1.FULL DIRECTORY
2.SHORT DIRECTORY

Figure 17-2. Print Directory Menu

a. Description: From the "Print Directory" menu, the user can print a short directory or long directory. Short directory selection will print the last 10 record headers in FLASH EEPROM. Long directory selection will print all test record headers in FLASH EEPROM.

b. Origin: From the "Start-Up" Menu (see figure 14-1), press key 2 (SET UP). Press key 3 (RESTORE RECORD). Press key 2 (DIRECTORY).

c. Action Option:

1. Press key 1 (FULL DIRECTORY) to print all test record headers.
2. Press key 2 (SHORT DIRECTORY) to print the last 10 test record headers.

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17-3. Test Record Directory Print Out

TEST DIRECTORY	
RECORD NUMBER: 5	
DATE/TIME: 11/16/00 15:14:08	
XFMR TYPE: SINGLE PHASE XFMR	
NUMBER OF TAPS: 2	
STATION:	
CIRCUIT:	
MFR: GE	
MODEL: 12 445	
S/N:	
RECORD NUMBER: 4	
DATE/TIME: 11/16/00 11:05:22	
XFMR TYPE: SINGLE PHASE XFMR	
NUMBER OF TAPS: 2	
STATION:	
CIRCUIT:	
MFR: GE	
MODEL: 12 445	
S/N:	
RECORD NUMBER: 3	
DATE/TIME: 11/16/00 10:35:13	
XFMR TYPE: Dy11 XFMR	
NUMBER OF TAPS: 1	
STATION:	
CIRCUIT:	
MFR:	
MODEL:	
S/N:	
RECORD NUMBER: 2	
DATE/TIME: 11/16/00 10:26:39	
XFMR TYPE: DELTA to Y XFMR	
NUMBER OF TAPS: 1	
STATION:	
CIRCUIT:	
MFR:	
MODEL:	
S/N:	
RECORD NUMBER: 1	
DATE/TIME: 11/16/00 09:59:08	
XFMR TYPE: SINGLE PHASE XFMR	
NUMBER OF TAPS: 1	
STATION:	
CIRCUIT:	
MFR:	
MODEL:	
S/N:	

Figure 17-3. Test Record Directory Print Out

18-0. Restoring a Test Record to Thermal Printer.

The following steps allow the user to restore a test record from FLASH EEPROM to the thermal printer.

Table 18-1. Restoring a Test Record to Thermal Printer

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "Restore Record" menu	1. ENTER XFMR ID 2. REVIEW RECORD 3. RESTORE RECORD 4. NEXT PAGE	Press key 3
3	Select "Restore Record" menu	1. RESTORE RECORD 2. DIRECTORY 3. ERASE RECORD	Press key 1
4	Restoring a test record using record number	RESTORE RECORD 1. ENTER RECORD NUMBR 2. SCROLL TO SELECT	Press key 1
5	Enter record number	RESTORE RECORD NUMBER: "ENTER" TO CONFIRM	Use key 0-9 to enter record number
6	Confirm record number	RESTORE RECORD NUMBER: "ENTER" TO CONFIRM	Press "ENTER" key
7	Record recalled to memory	RECORD RESTORED!	Press any key
8	Select Print Record on thermal printer	REVIEW RECORD 1. SCROLL TEST RECORD 2. PRINT TEST RECORD	Press key 2
9	Select Column format	PRINT FORMAT 1. COLUMN 2. DETAILED	Press key 1
10	ATRT-03 print test report	PRINTING REPORT PLEASE WAIT	None

18-1. Test Record Menu



Figure 18-1. Test Record Menu

a. Description: From the "Save/Restore" menu, the user can:

1. Restore a test record.
2. Print record directory in FLASH EEPROM.
3. Erase test records in FLASH EEPROM.

b. Origin: From the "Start-Up" menu (see figure 14-1), press key 2 (SET UP); then, on the next display, press 3 (RESTORE RECORD).

c. Action Option:

1. Press key 1 (RESTORE RECORD) to restore a test record
2. Press key 2 (DIRECTORY) to print test record directory.
3. Press key 3 (ERASE RECORDS) to erase test records in FLASH EEPROM.

18-2. Restore Test Record Menu

RESTORE RECORD:
1. ENTER RECORD NUMBER
2. SCROLL TO SELECT

Figure 18-2. Restore Test Record Menu.

- a. Description:** The user can restore a test record from FLASH EEPROM as follows:
1. Select key 1 to enter a specific record number.
 2. Select key 2 to scroll to the record number.
- b. Origin:** From the “Start-Up” menu (see figure 14-1), press key 2 (SET UP). Press key 3 (RESTORE RECORD). Press key 1 (RESTORE RECORD).
- c. Action Option:** Select key 1 or 2.

18-3. Restore Test Record Using Record Number



**RESTORE RECORD
NUMBER:
"ENTER" TO CONFIRM**

Figure 18-3. Restore Test Record Menu #2

- a. Description:** The user can restore a test record from FLASH EEPROM by entering the record number.
- b. Origin:** From the "Start-Up" menu (see figure 14-1), press key 2 (SET UP). Press key 3 (RESTORE RECORD). Press key 1 (RESTORE RECORD), Press key 1 (ENTER RECORD NUMBER).
- c. Action Option:** Enter record number using key 0-9, then press "ENTER" key to confirm.

18-4. Print /Scroll a Test Record Menu

REVIEW RECORD
1.SCROLL TEST RECORD
2.PRINT TEST RECORD

Figure 18-4. Print or Scroll through Test Record

a. Description: The user can review a test record by scrolling through the test results on the LCD or print the test results on the thermal printer.

b. Origin: From the "Start-Up" menu (see figure 14-1), press key 2 (SET UP). Press key 3 (RESTORE RECORD). Press key 1 (RESTORE RECORD), Press key 1 (ENTER RECORD NUMBER), Enter record number using key 0-9, Press "ENTER".

c. Action Option: Press key 1 (SCROLL TEST RECORD) to view test record on the LCD. Press key 2 (PRINT TEST RECORD) to output record on to the thermal printer (ATRT-03 and ATRT-03A only).

Model ATRT-03 (v) Operating Instructions

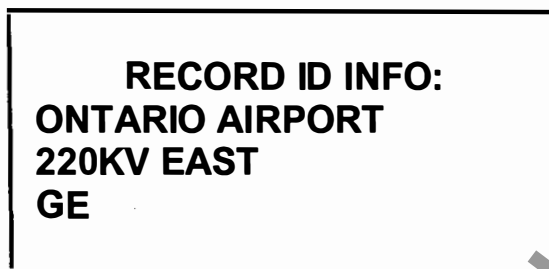
19-0. Restoring a Test Record to LCD.

The following steps allow the user to restore a test record from FLASH EEPROM and to be viewed on LCD.

Table 19-1. Restoring a Test Record to LCD

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "Restore Record" menu	1. ENTER XFMR ID 2. REVIEW RECORD 3. RESTORE RECORD 4. NEXT PAGE	Press key 3
3	Select "Restore Record" menu	1.RESTORE RECORD 2.DIRECTORY 3.ERASE RECORD	Press key 1
4	Restoring a test record using record number	RESTORE RECORD 1. ENTER RECORD NUMBR 2. SCROLL TO SELECT	Press key 1
5	Enter record number	RESTORE RECORD NUMBER: "ENTER" TO CONFIRM	Use key 0-9 to enter record number
6	Confirm record number	RESTORE RECORD NUMBER: "ENTER" TO CONFIRM	Press "ENTER" key
7	Record recalled to memory	RECORD RESTORED!	Press any key
8	Select Print Record on thermal printer	REVIEW RECORD 1.SCROLL TEST RECORD 2.PRINT TEST RECORD	Press key 1
9	View Test Record ID (Note)	RECORD ID INFO: ONTARIO AIRPORT 220KV EAST GE	Press "ENTER" key
10	View Transformer type, number of taps, time and date	SINGLE PHASE XFORMER 2 TAPS 07/16/00 12:01:00	Press "ENTER" key
11	View Tap #1 Ratio, mA, %DIFF Then advance to next tap	#1 SINGLE PHASE RATIO mA %DIFF +100.00 0.00 0.00	Press "ENTER" key to advance or "STOP" to end

19-1. Scroll Test Record Menu:

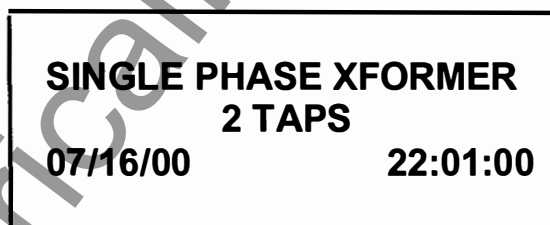


**RECORD ID INFO:
ONTARIO AIRPORT
220KV EAST
GE**

Fig 19-1A. Scroll Test Record LCD Display First Screen

NOTE

1. The second line of the Record ID Info displays the Substation Name.
2. The third line of the Record ID Info displays the Circuit Name.
3. The fourth line of the Record ID Info displays the Transformer Manufacturer Name.
4. The above transformer's ID is shown as follows:
Substation: ONTARIO AIRPORT
Circuit: 220KV EAST
Mfr: GE
4. Use the “^” or “v” key advance to the next screen.



**SINGLE PHASE XFORMER
2 TAPS
07/16/00 22:01:00**

Fig 19-1B. Scroll Test Record LCD Display Second Screen

NOTE

1. The first line of the screen displays the transformer type.
2. The second line of the screen displays the number of taps of the transformer.
3. The third line of the screen displays the date and time of the test.
4. Use the “^” or “v” key advance to the next screen.

#1 SINGLE PHASE		
RATIO	mA	%DIFF
+100.00	0.00	0.00

Fig 19-1C. Scroll Test Record LCD Display Third Screen

NOTE

1. The first line of the screen displays the test number. In the example above, the display is showing the test results from test #1 of the record.
2. The second line of the screen displays the test result of phase A.
3. The third line of the screen displays the test result of phase B.
4. The fourth line of the screen displays the test result of phase C.
5. Use the “^” and “v” key advance to the next screen.
6. Use “STOP” key to return to main menu.

20-0. Printing a Test Plan in Memory

The following paragraph is not applicable to the ATRT-03B.
Table 26-1 shows the steps to print a transformer test plan stored in FLASH EEPROM. Transformer test plan contains transformer test voltage at different taps. Calculated ratio (derived from transformer voltages) is then compared with the tested ratio for percentage error. A transformer test report containing **test plan** will show "PASS" and "FAIL."

Table 20-1. Print A Test Plan from ATRT-03/03A Memory

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "NEXT PAGE" menu	1.ENTER XFMR ID 2.REVIEW RECORD 3.RESTORE RECORD 4.NEXT PAGE	Press key 4
3	Select "TEST PLAN" menu	1.COMPUTER CONTROL 2.SET TIME 3.SET TEST VOLTAGE 4.TEST PLANS	Press key 4
4	Select "PRINT TEST PLAN"	1.LOAD TEST PLAN 2.UNLOAD TEST PLAN 3.TST PLAN DIRECTORY 4.PRINT TEST PLAN	Press key 4 (PRINT TEST PLAN)
5	Select Test Plan by Scrolling	PRINT TEST PLAN 1.ENTER PLAN NUMBER 2.SCROLL TO SELECT	Press key 2 to select scroll.
6	Scroll forward to test plan	TEST PLAN DIRECTORY "UP" to SCROLL FWD "DWN" TO SCROLL RVS	Press "∧" key
7	Select test plan (Note)	2V SNG PHS TAPS:5 WESTINGHOUSE 2000288 Voltage Reg Test Plan	Press "ENTER" key
8	Test plan being printed on thermal printer	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	None

Note

1. A summary of transformer test plan is shown on the LCD.
2. The first line of the display indicates the test plan number, type of transformer, number of taps.
3. Line #2 identifies the transformer manufacturer as WESTINGHOUSE.
4. Transformer model is "2000288" (line 3).
5. Line #4 contains a comment the operator used in the test plan.

Model ATRT-03 (v) Operating Instructions

20-1. Printing Test Plan Menu 1



1.LOAD TEST PLAN
2.UNLOAD TEST PLAN
3.PRN TST PLAN DIR.
4.PRINT TEST PLAN

Figure 20-1. Test Plan Menu 1

a. Description: From the “Test Plan” menu, the user can:

1. Load a Test Plan from FLASH EEPROM to be used in a test.
2. Unload Test Plan from test memory (Note 1).
3. Print Test Plan directory
4. Print Test Plan.

b. Origin: From the “Start-Up” menu (see figure 14-1), press key 2 (SET UP), press key 4 (NEXT PAGE), press key 4 (TEST PLAN).

c. Action Option: Press key 4 to print a test plan from memory.

Note:

The user unloads a Test Plan from test memory to clear the name-plate voltages loaded in memory.

20-2. Printing Test Plan Menu 2

PRINT TEST PLAN
1. ENTER PLAN NUMBER
2. SCROLL TO SELECT

Figure 20-2. Print Test Plan Menu 2

- a. Description:** The ATRT-03/03A Test Plan from FLASH EEPROM can be printed from this menu. The user can select the Test Plan by entering Test Plan number or Scroll through the directory.
- b. Origin:** From the “Start-Up” menu (see figure 14-1), press key 2 (SET UP), press key 4 (NEXT PAGE), press key 4 (TEST PLAN), Press key 4 (PRINT TEST PLAN).
- c. Action Option:** Press key 1 to enter the Test Plan number. Press key 2 to scroll to Test Plan.

Model ATRT-03 (v) Operating Instructions

20-3. Printing Test Plan Menu 3



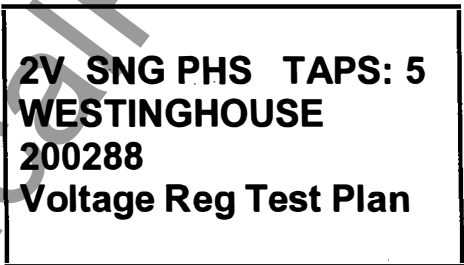
TEST PLAN DIRECTORY
"UP" TO SCROLL FWD
"DWN" TO SCROLL RVS

Figure 20-3. Test Record Menu

a. Description: The user scrolls to the selected test plan stored in memory to print.

b. Origin: From the "Start-Up" menu (see figure 14-1), press key 2 (SET UP), press key 4 (NEXT PAGE), press key 4 (TEST PLAN), Press key 4 (PRINT TEST PLAN), Press key 2 (SCROLL TO SELECT).

c. Action Option: Use "∧" or "∨" to test plan. Press "ENTER" key to print test plan.



2V SNG PHS TAPS: 5
WESTINGHOUSE
200288
Voltage Reg Test Plan

Figure 20-3A. Typical Test Plan Header

Note:

1. Test number residing in memory is #2.
2. Transformer type is "SINGLE PHASE VOLTAGE REGULATOR".
3. There are 5 taps identified in this test plan.
4. A "Voltage Regulator" test plan is indicated by letter "V" (after the test plan number).
5. A "Load Tap Changer" test plan is indicated by letter "L" (after the test plan number).
6. The transformer type is Single Phase Voltage Regulator.
7. There are 5 taps in this test plan.
8. Transformer manufacturer is "Westinghouse"
9. Transformer type is "200288"
10. Special user comment on this test: "JUST A TEST"
11. The user can store up to 128 test-plans in FLASH EEPROM.

20-4. Typical Single Phase Voltage Regulator Test Plan Print Out

TEST PLAN NUMBER 2	
TYPE: SINGLE PHASE XFORMER VOLTAGE REGULATOR	
MFR:	WESTINGHOUSE
MODEL:	2000288
KVA RATING:	10KVA
COMMENTS:	Voltage Reg Test Plan
MAX DEVIATION: 0.50%	
NUMBER OF TAPS: 5	
TAP: RAISE 2	
I VOLTAGE:	007,200 V
X VOLTAGE:	007,290 V
TAP: RAISE 1	
I VOLTAGE:	007,200 V
X VOLTAGE:	007,245 V
TAP: NEUTRAL	
I VOLTAGE:	007,200 V
X VOLTAGE:	007,200 V
TAP: LOWER 1	
I VOLTAGE:	007,200 V
X VOLTAGE:	007,155 V
TAP: LOWER 2	
I VOLTAGE:	007,200 V
X VOLTAGE:	007,110 V

Figure 20-4, Typical Single Phase Voltage Regulator Print Out

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20-5. Typical Three Phase Load Tap Changer Test Plan Print Out

TEST PLAN NUMBER 1	
TYPE: DELTA to Y XFORMER LOAD TAP CHANGER	
MFR:	WESTINGHOUSE
MODEL:	1234
KVA RATING:	20KVA
COMMENTS:	LTC Test Plan
MAX DEVIATION: 0.50%	
NUMBER OF TAPS: 5	
TAP: RAISE 2	
H VOLTAGE:	007,200 V
X VOLTAGE:	000,243 V
TAP: RAISE 1	
H VOLTAGE:	007,200 V
X VOLTAGE:	000,241 V
TAP: NEUTRAL	
H VOLTAGE:	007,200 V
X VOLTAGE:	000,240 V
TAP: LOWER 1	
H VOLTAGE:	007,200 V
X VOLTAGE:	000,238 V
TAP: LOWER 2	
H VOLTAGE:	007,200 V
X VOLTAGE:	000,237 V

Figure 20-5. Typical Three Phase Load Tap Changer Test Plan Print Out

20-6. Typical Wye to Delta Test Plan Print Out

TEST PLAN NUMBER 3	
TYPE: Y to DELTA XFORMER	
MFR:	GE
MODEL:	2000666
KVA RATING:	63MVA
COMMENTS:	Y to Delta Test Plan
MAX DEVIATION: 0.50%	
NUMBER OF TAPS: 3	
TAP #1	
H VOLTAGE:	007,200 V
X VOLTAGE:	000,480 V
TAP #2	
H VOLTAGE:	007,200 V
X VOLTAGE:	000,240 V
TAP #3	
H VOLTAGE:	007,200 V
X VOLTAGE:	000,120 V

Figure 20-6. Typical Wye to Delta Test Plan Print Out

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21-0. Load a Test Plan From Memory

Table 21-1 shows the steps to load a transformer test plan to run a transformer test. Transformer test plan contains transformer test voltages. Calculated ratio (derived from transformer voltages) is then compared with tested ratio for percentage error. A test report using test plan shows "PASS" and "FAIL".

Table 21-1. Load A Test Plan from ATRT-03/03A/03B Memory

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "NEXT PAGE" menu	1. ENTER XFMR ID 2. REVIEW RECORD 3. RESTORE RECORD 4. NEXT PAGE	Press key 4
3	Select "TEST PLAN" menu	1.COMPUTER CONTROL 2.SET TIME 3.SET TEST VOLTAGE 4.TEST PLANS	Press key 4
4	Select "LOAD TEST PLAN"	1.LOAD TEST PLAN 2.UNLOAD TEST PLAN 3.TST PLAN DIRECTORY 4.PRINT TEST PLAN	Press key 1 (LOAD TEST PLAN)
5	Select Test Plan by Scrolling	LOAD TEST PLAN 1. ENTER PLAN NUMBER 2.SCROLL TO SELECT	Press key 2 to select scroll.
6	Scroll forward to test plan	TEST PLAN DIRECTORY "UP" to SCROLL FWD "DWN" TO SCROLL RVS	Press "∧" key
7	Select test plan	2 SNG PHS TAPS:2 GE 12 445 JUST A TEST	Press "ENTER" key
8	Test plan loaded to memory	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3. CALCULATOR 4.DIAGNOSTIC	None

21-1. Load Test Plan Menu



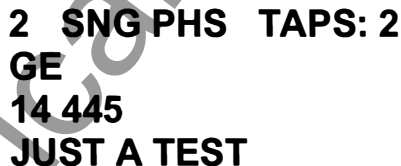
LOAD TEST PLAN
1. ENTER PLAN NUMBER
2. SCROLL TO SELECT

Figure 21-1. Test Record Menu

a. Description: The ATRT-03/03A/03B Test Plan from FLASH EEPROM is loaded to memory to be used for testing a transformer. The user can select the Test Plan by entering Test Plan number or Scroll through the directory.

b. Origin: From the “Start-Up” menu (see figure 14-1), press key 2 (SET UP), press key 4 (NEXT PAGE), press key 4 (TEST PLAN), Press key 4 (LOAD TEST PLAN).

c. Action Option: Press key 1 to enter the Test Plan number. Press key 2 to scroll to Test Plan.



2 SNG PHS TAPS: 2
GE
14 445
JUST A TEST

Figure 21-1A . Typical Test Plan Header

Note:

1. Test number residing in memory is #2. (The user can store up to 128 test-plan in FLASH EEPROM).
2. The transformer type is Single Phase.
3. There are 4 taps in this test plan.
4. Transformer manufacturer is “GE”
5. Transformer type is “12 445”
6. Special user comment on this test: “JUST A TEST”

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22-0. Test a Transformer Using a Test Plan.

Table 22-1 shows the steps to test a single-phase transformer. Each of the menus is described in detail in the following paragraphs:

Table 22-1 Test a Transformer Using a Test Plan

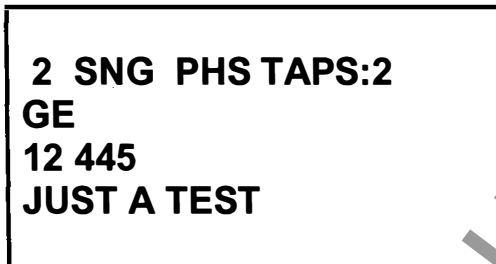
STEP	DESCRIPTION	DISPLAY	ACTION
1	Initiate Transformer Test	1.TEST XFMR 04/12/00 2.SETUP 13:06:02 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "SETUP"	1. ENTER XFMR ID 2. REVIEW RECORD 3. RESTORE RECORD 4. NEXT PAGE	Press key 4
3	Select "TEST PLAN" menu	1.COMPUTER CONTROL 2.SET TIME 3.SET TEST VOLTAGE 4.TEST PLANS	Press key 4
4	Select "LOAD TEST PLAN"	1.LOAD TEST PLAN 2.UNLOAD TEST PLAN 3.TST PLAN DIRECTORY 4.PRINT TEST PLAN	Press key 1
5	Select Test Plan by Scrolling	LOAD TEST PLAN 1. ENTER PLAN NUMBER 2. SCROLL TO SELECT	Press key 2 to select scroll.
6	Scroll forward to test plan	TEST PLAN DIRECTORY "UP" to SCROLL FWD "DWN" TO SCROLL RVS	Press "∧" key
7	Select test plan	#2 SNG PHS TAPS:02 GE 12 445 JUST A TEST	Press "ENTER" key
8	Test plan loaded in memory. Start test now	1.TEST XFMR 04/12/00 2.SETUP 13:08:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 1
9	ATRT-03 displays test plan load in memory to be used.	2 SNG PHS TAPS:2 TEST PLAN LOADED 1.CONTINUE 2.UNLOAD TEST PLAN	Press key 1 to use test plan
10	ATRT-03/03A/03B displays tap #1 voltage.	TAP NUMBER 1 H VTG: 12,000 X VTG: 480 "START" to RUN TEST	Press START key To run test

Table 22-1 Test a Transformer Using a Test Plan (cont.)

STEP	DESCRIPTION	DISPLAY	ACTION
11	Observe ratio, excitation current, and percentage error	RATIO mA %DIFF +26.615 0001 0.19 P	None
12	Go to next screen	RATIO mA %DIFF +26.615 0001 0.19 P	Press any key
13	Select no print	PRINT TEST RESULTS? 1.YES 2.NO	Press key 2
15	Store reading in buffer	KEEP THIS READING? 1.YES 2. NO	Press key 1
16	ATRT-03/03A/03B displays tap #2 voltage	TAP NUMBER 2 H VTG: 12,000 X VTG: 240 "START" to RUN TEST	Press START key to run test
17	Observe ratio, excitation current, and percentage error.	RATIO mA %DIFF +53.319 0001 0.03 P	None
18	Go to next screen	RATIO mA %DIFF +53.319 0001 0.03 P	Press any key
19	Select no printout	PRINT TEST RESULTS? 1.YES 2.NO	Press key 2
20	Store reading in buffer	KEEP THIS READING? 1.YES 2.NO	Press key 1
21	Last test complete, Save all tests in memory	END OF TEST PLAN 1.DONE WITH TEST 2.REPEAT A TEST	Press key 1
22	Save record in FLASH EEPROM now	SAVE THIS RECORD 1.YES 2.NO	Press key 1
23	Test Results Saved in FLASH EEPROM confirmation	RECORD NUMBER 3 HAS BEEN SAVED	Press any Key
24	Return to main menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:02 3.CALCULATOR 4.DIAGNOSTIC	None

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22-1. Test Plan Identification Menu



2 SNG PHS TAPS:2
GE
12 445
JUST A TEST

Figure 22-1. Test Plan Identification Menu

a. Description: Test plan identification screen shows transformer type, transformer manufacturer, transformer model, number of test on test plan, and special note from the user.

The following information belongs to the test plan above:

1. The test plan above is the second test plan stored in memory.
2. Transformer type is "Single Phase".
3. Transformer model is 12 445.
4. There are 2 taps (position) on this test plan.
5. Special user's note is "JUST A TEST".

b. Origin: This menu is shown after the user selects a test plan from memory.

c. Action Option: After a test plan ID is shown on the screen, press "ENTER" key to use.

22-2. Test Plan Loaded in Memory Menu

2 SNG PHS TAPS:2
TEST PLAN LOADED
1.CONTINUE
2.UNLOAD TEST PLAN

Figure 22-2. Test Plan Loaded in Memory Menu

- a. Description:** This menu indicates that Test Plan #2 is loaded in memory. The user can run a transformer test using this test plan (to get "PASS/FAIL" results) or run test not using test plan.
- b. Origin:** This menu is shown after the user pressed "ENTER" from menu shown in figure 22-1.
- c. Action Option:** Press key 1 to use test plan. Press key 2 to run test without test plan.

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22-3. Test Result Display Using Test Plan

RATIO	mA	%DIFF
+26.610	0001	0.21 P

Figure 22-3. Test Result Display with Test Plan

- a. Description:** This display shows the measured transformer ratio, excitation current, percentage error, and "PASS/FAIL" condition of this test.
- b. Origin:** This menu is shown after the ATRT-03/03A/03B ran a test.
- c. Action Option:** Press any key to advance to next test.

Note

"PASS" and "FAIL" status is shown as "P" or "F" next to the "%DIFF" display.

22-4 Test Result Print Out Using Test Plan

TRANSFORMER TEST RESULTS			
DATE: 11/16/00		TIME: 15:13:39	
COMPANY:			
STATION:			
CIRCUIT:			
MFR:		GE	
MODEL:		12 445	
S/N:			
KVA RATING:		1KVA	
OPERATOR:			
TEST VOLTAGE = 40 VOLTS			
TYPE: SINGLE PHASE XFORMER			
H TAP: _____		H VOLTAGE: 012,800	
X TAP: _____		X VOLTAGE: 000,480	
PHS M_RATIO		MA	%DIFF C_RATIO
A		+26.615 0001	00.19 P 26.6667
H TAP: _____		H VOLTAGE: 012,800	
X TAP: _____		X VOLTAGE: 000,240	
PHS M_RATIO		MA	%DIFF C_RATIO
A		+53.317 0001	00.03 P 53.3333
DATE: 11/16/00		TIME: 15:14:08	

VANGUARD INSTRUMENT CO., INC. REV 1.33 HPN (C) 2000
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 ONTARIO, CA, 91761, USA
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 WWW.VANGUARD-INSTRUMENTS.COM
 SERIAL NUMBER: 18046

Figure 22-4. Test Result Print Out of a Single Phase Transformer Test Using Test Plan

Note

“PASS” and “FAIL” status is shown as “P” or “F” next to the “%DIFF” print out.

Model ATRT-03 (v) Operating Instructions

23-0. Change ATRT-03/03A/03B Real Time Clock

The following steps show how to change the ATRT-03/03A/03B real time clock.

Table 23-1. Change ATRT-03/03A/03B Real Time Clock

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "Next Page" menu	1. ENTER XFMR ID 2. REVIEW RECORD 3. SAV/RES RECORD 4. NEXT PAGE	Press key 4
3	Select "Set Time" menu	1.COMPUTER CONTROL 2.SET TIME 3.SET TEST VOLTAGE	Press key 2
4	Enter Time and Date	ENTER MM-DD-YY HH:MM:SS	Use keys 0-9

23-1. Set Real Time Clock Setup Menu

1.COMPUTER CONTROL
2.SET TIME
3.SET TEST VOLTAGE

Figure 23-1. ATRT-03/03A/03B Setup Menu

a. Description: "Set Up" menu allows the user to:

1. Set ATRT-03/03A/03B under computer control.
2. Set Real Time Clock.
3. Set ATRT-03/03B test voltage.

b. Origin: Select key 2 from main menu, then on next display press key 4

c. Action Option: Select one of the above.

23-2. Set Time and Date

ENTER
MM-DD-YY HH:MM:SS

Figure 23-2. Time and Date Display

- a. Description:** The ATRT-03/03A/03B has a real time clock powered with a back-up battery. The ATRT-03/03A/03B displays the current time and date in the upper right of the “Start-Up” menu screen (see Figure 14-1).
- b. Origin:** From the “Start Up” menu (fig. 14-1), press key 2 (SET UP); press key 4 (NEXT PAGE), press key 1 (SET TIME).
- c. Action Option:** Enter month, day, year, hour, minute and second using keys 0-9.

Model ATRT-03 (v) Operating Instructions

24-0. Enable Computer Interface

The following steps will put the ATRT-03 under computer interface mode.

Table 24-1. Change ATRT-03/03A/03B Real Time Clock

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "Next Page" menu	1. ENTER XFMR ID 2. REVIEW RECORD 3. SAV/RES RECORD 4. NEXT PAGE	Press key 4
3	Select "Computer Control" menu	1.COMPUTER CONTROL 2.SET TIME 3.SET TEST VOLTAGE	Press key 1
4	ATRT-03/03A/03B is under computer interface.	COMPUTER ITF MODE *** CAUTION *** CABLES MAY HAVE VLTG "STOP" TO ABORT	None

24-1. ATRT-03/03A/03B Computer Interface Menu

COMPUTER ITF MODE
***** CAUTION! *****
CABLES MAY HAVE VLTG
"STOP" TO ABORT

Figure 24-2. Select Computer Interface Display

a. Description: ATRT-03/03A/03B testing can be remotely controlled via an IBM-compatible PC through an RS-232C port. In this mode, the Transformer Analysis software (provided with the ATRT-03/03A/03B) allows the user to control the ATRT-03 from his PC. Using this software, the user can transfer test records stored in the ATRT-03/03A/03B FLASH EEPROM to his PC or store transformer test plan into ATRT-03/03A/03B memory.

b. Origin: On the "Start-Up" menu (see Figure 14-1), press key 2 (SET UP); on "Set Up" menu, press key 4 (NEXT PAGE), press key 2 (COMPUTER CONTROL) to show the COMPUTER ITF MODE display (the ATRT-03/03A/03B testing remains under computer control for as long as this screen displays).

c. Action Option: Press STOP to abort computer control and return to the "Start-Up" menu.

NOTE

Refer to the ATRT-03/03A/03B software manual for IBM compatible PC interface mode.

Model ATRT-03 (v) Operating Instructions

25-0. Entering Transformer Identification for Test Record Menu

The following steps allow the user to enter transformer identification for test record.

Table 25-1. Enter Transformer Identification for Test Record

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "Enter Xfmr ID" menu	1. ENTER XFMR ID 2. REVIEW RECORD 3. SAV/RES RECORD 4. NEXT PAGE	Press key 1
3	Enter Company name	COMPANY:	Use 0-9 keys to enter Company name. Use "Enter" key to confirm. (Note)
4	Enter Substation name	STATION:	Use 0-9 keys to enter Substation name. Use "Enter" key to confirm.
5	Enter Circuit name	CIRCUIT:	Use 0-9 keys to enter Circuit name. Use "Enter" key to confirm.
6	Enter Manufacturer name	MANUFACTURER:	Use 0-9 keys to enter Transformer Manufacturer name. Use "Enter" key to confirm.

Model ATRT-03 (v) Operating Instructions

Table 25-1. Enter Transformer Identification for Test Record (cont.)

STEP	DESCRIPTION	DISPLAY	ACTION
7	Enter Transformer Model	MODEL:	Use 0-9 keys to enter Transformer model. Use "Enter" key to confirm.
8	Enter Transformer Serial Number	SERIAL NUMBER:	Use 0-9 keys to enter Transformer serial number. Use "Enter" key to confirm.
9	Enter Transformer KVA rating	KVA RATING:	Use 0-9 keys to enter Transformer KVA rating. Use "Enter" key to confirm.
10	Enter Operator name	OPERATOR:	Use 0-9 keys to enter the Operator name running test. Use "Enter" key to confirm.

Note

Use ↑ and ↓ keys to move cursor.

Model ATRT-03 (v) Operating Instructions

26-0. ATRT-03/03B Test Voltage Selections

The following steps allow the user to select a test voltage.

Table 26-1. Select Test Voltages

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Set Up" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 2
2	Select "Next Page" menu	1.ENTER XFMR ID 2.REVIEW RECORD 3.SAV/RES RECORD 4.NEXT PAGE	Press key 4
3	Select "Set Test Voltage" menu	1.COMPUTER CONTROL 2.SET TIME 3.SET TEST VOLTAGE	Press key 3
4	Select 8 Vac test voltage. (Note 1)	SELECT TEST VOLTAGE 1. 8V (CT TEST) 2. 40V (NORMAL TEST) 3. 100V (NOISY ENV.)	Select 1
5	Confirm Test Voltage	TEST VOLATGE SET TO 8 VOLTS RMS	Press ENTER key to confirm

NOTE

1. The **ATRT-03/03B** will default to **40 Vac** test voltage when power is first applied to the unit. Once the new test voltage is selected, this voltage will be active until a new voltage is selected.
2. The **ATRT-03A** uses **20 Vac** test voltage.

26-1. Test Voltage Selection

The ATRT-03, ATRT-03B Units shipped after September of 2000 have the test voltage selection capabilities. There are 3 test voltages available: 8 Vac, 40 Vac, and 100 Vac.

1. The 8 Vac test voltage is reserved for testing transformers that require low-test voltage. Most of these transformers are metering Current Transformers. Higher test voltage may put these CTs into saturation.

2. The 40 Vac test voltage, default test voltage, is recommended for testing power transformers.

3. The 100 Vac is recommended for testing power transformers in a noisy environment.

The test voltage can be selected when using the "Computer Interface Mode" or from the keypad in the "Stand Alone Mode."

SELECT TEST VOLTAGE 1.8V (CT TEST) 2.40V (NORMAL TEST) 3.100V (NOISY ENV.)

Figure 26-1. Select Test Voltage menus

1. Description: The user can select 3 different test voltages (8 Vac, 40 Vac, 100 Vac) to test transformers.

2. Origin: From "Start-Up" menu, select key 2, key 4 (NEXT PAGE), key 3 (SET TEST VOLTAGE).

3. Action Option: Select key 1 or 2 or 3 for 8 Vac or 40 Vac or 100 Vac.

NOTE

1. The **ATRT-03, ATRT-03B** will always default to **40 Vac** test voltage when power is first applied to the unit.

2. The **ATRT-03B** uses **20 Vac** test voltage generated by an internal oscillator.

3. After **new voltage** is selected, the **ATRT-03/03B** will use this voltage until a new test voltage is selected.

Model ATRT-03 (v) Operating Instructions

27-0. ATRT-03/03A/03B Cable Test

The following steps allow the user to run diagnostics on the ATRT-03/03A/03B cables.

Table 27-1. ATRT-03/03A/03B Cable Diagnostic

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Diagnostic" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 4
2	Select "Cable Test" menu	DIAGNOSTIC 1.CABLE TEST 2.VERIFICATION TEST	Press key 1
3	Connect cables	CABLE TEST CONNECT: H0-X0, H1-X1 H2-X2, H3-X3 THEN "ENTER" KEY	Press "ENTER" key
4	Observe test results	CABLE TEST H0-X0, H1-X1: OK H0-X0, H2-X2: OK H0-X0, H3-X3: OK	Press any key to return to main menu

Note:

A failed diagnostic on the cable test will be showed as "NOT OK".

28-0. ATRT-03/03A/03B Verification Test

The following steps allow the user to run verification test on the ATRT-03/03A/03B electronics.

Table 28-1. ATRT-03/03A/03B Verification Test

STEP	DESCRIPTION	DISPLAY	ACTION
1	Select "Diagnostic" menu	1.TEST XFMR 04/12/00 2.SETUP 13:06:00 3.CALCULATOR 4.DIAGNOSTIC	Press key 4
2	Select "Verification Test" menu	DIAGNOSTIC 1.CABLE TEST 2.VERIFICATION TEST	Press key 2
3	Connect cables	CABLE TEST CONNECT: H0-X0, H1-X1 H2-X2, H3-X3 THEN "ENTER" KEY	Press "ENTER" key
4	ATRT-03 run Delta to Delta Test	RATIO mA %DIFF +1.0000 0001 +1.0000 0001 +1.0000 0001	Press "ENTER" key to advance
5	ATRT-03 run Y to Y Test	RATIO mA %DIFF +1.0000 0001 +1.0000 0001 +1.0000 0001	Press "ENTER" key to return to main menu.

Note:

1. A ratio reading of 1.0000 is expected for all the test combinations for the ATRT-03/03A/03B.
2. Disregard the excitation current reading in this test.

Model ATRT-03 (v) Operating Instructions

APPENDIX A Table of Standard Transformers



Vanguard Instruments Co., Inc.

STD TEST NO.	TRANSFORMER CONFIGURATION		PHASE	WINDING TESTED		TURNS RATIO	VECTOR GROUP	NOTES
	HIGH-VOLTAGE WINDING (H)	LOW-VOLTAGE WINDING (X)		HIGH VOLTAGE WINDING	LOW VOLTAGE WINDING			
1			1 Ø	H ₁ -H ₂	X ₁ -X ₂	$\frac{V_H}{V_X}$	1ph0	1 Ø STD
2			A	H ₁ -H ₃	X ₁ -X ₃	$\frac{V_H}{V_X}$	Dd0	Δ-Δ STD
			B	H ₂ -H ₁	X ₂ -X ₁			
			C	H ₃ -H ₂	X ₃ -X ₂			
3			A	H ₁ -H ₃	X ₁ -X ₀	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Dyn1	Δ-Y STD
			B	H ₂ -H ₁	X ₂ -X ₀			
			C	H ₃ -H ₂	X ₃ -X ₀			
4			A	H ₁ -H ₀	X ₁ -X ₀	$\frac{V_H}{V_X}$	YNyn0	Y-Y STD
			B	H ₂ -H ₀	X ₂ -X ₀			
			C	H ₃ -H ₀	X ₃ -X ₀			
5			A	H ₁ -H ₀	X ₁ -X ₂	$\frac{V_H}{V_X \cdot \sqrt{3}}$	YNd1	Y-Δ STD
			B	H ₂ -H ₀	X ₂ -X ₃			
			C	H ₃ -H ₀	X ₃ -X ₁			

APPENDIX B
Table of Non-Standard Transformers



Vanguard Instruments Co., Inc.

SPEC TEST NO.	TRANSFORMER CONFIGURATION		EXT. JUMPER	PHASE	WINDING TESTED		CAL. TURN RATIO	VECTOR GROUP	NOTES
	HIGH-VOLTAGE WINDING (H)	LOW-VOLTAGE WINDING (X)			HIGH VOLTAGE WINDING	LOW VOLTAGE WINDING			
1				A	H ₁ -H ₃	X ₃ -X ₁	$\frac{V_H}{V_X}$	Dd6	
				B	H ₂ -H ₁	X ₁ -X ₂			
				C	H ₃ -H ₂	X ₂ -X ₃			
2			H ₃ -H ₂ H ₁ -H ₃ H ₂ -H ₁	A	H ₁ -H ₃	X ₁ -X ₃	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Dy1	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H ₂ -H ₁	X ₂ -X ₁			
				C	H ₃ -H ₂	X ₃ -X ₂			
3			—	A	H ₁ -H ₃	X ₃ -X ₀	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Dyn5	
				B	H ₂ -H ₁	X ₁ -X ₀			
				C	H ₃ -H ₂	X ₂ -X ₀			
4			H ₃ -H ₂ H ₁ -H ₃ H ₂ -H ₁	A	H ₁ -H ₃	X ₃ -X ₂	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Dy5	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H ₂ -H ₁	X ₁ -X ₃			
				C	H ₃ -H ₂	X ₂ -X ₁			
5			—	A	H ₁ -H ₃	X ₀ -X ₁	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Dyn7	
				B	H ₂ -H ₁	X ₀ -X ₂			
				C	H ₃ -H ₂	X ₀ -X ₃			
6			H ₃ -H ₂ H ₁ -H ₃ H ₂ -H ₁	A	H ₁ -H ₃	X ₃ -X ₁	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Dy7	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H ₂ -H ₁	X ₁ -X ₂			
				C	H ₃ -H ₂	X ₂ -X ₃			
7			—	A	H ₁ -H ₃	X ₀ -X ₃	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Dyn11	
				B	H ₂ -H ₁	X ₀ -X ₁			
				C	H ₃ -H ₂	X ₀ -X ₂			
8			H ₃ -H ₂ H ₁ -H ₃ H ₂ -H ₁	A	H ₁ -H ₃	X ₂ -X ₃	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Dy11	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H ₂ -H ₁	X ₃ -X ₁			
				C	H ₃ -H ₂	X ₁ -X ₂			
9			—	A	H ₁ -H ₃	X ₁ -X ₃	$\frac{V_H}{V_X}$	Dz0	NO ACCESSIBLE NEUTRAL
				B	H ₂ -H ₁	X ₂ -X ₁			
				C	H ₃ -H ₂	X ₃ -X ₂			
10			—	A	H ₁ -H ₃	X ₃ -X ₁	$\frac{V_H}{V_X}$	Dz6	NO ACCESSIBLE NEUTRAL
				B	H ₂ -H ₁	X ₁ -X ₂			
				C	H ₃ -H ₂	X ₂ -X ₃			

Model ATRT-03 (v) Operating Instructions

APPENDIX B

Table of Non-Standard Transformers (cont.)



Vanguard Instruments Co., Inc.

SPEC TEST NO.	TRANSFORMER CONFIGURATION		EXT. JUMPER	PHASE	WINDING TESTED		CAL. TURN RATIO	VECTOR GROUP	NOTES
	HIGH-VOLTAGE WINDING (H)	LOW-VOLTAGE WINDING (X)			HIGH VOLTAGE WINDING	LOW VOLTAGE WINDING			
11				A	H ₁ -H ₀	X ₂ -X ₁	$\frac{V_H}{V_X \cdot \sqrt{3}}$	YNd7	
				B	H ₂ -H ₀	X ₃ -X ₂			
				C	H ₃ -H ₀	X ₃ -X ₁			
12			H ₃ -H ₂ H ₁ -H ₃ H ₂ -H ₁	A	H ₁ -H ₃	X ₁ -X ₂	$\frac{V_H \cdot \sqrt{3}}{V_X \cdot 2}$	Yd1	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H ₂ -H ₁	X ₂ -X ₃			
				C	H ₃ -H ₂	X ₃ -X ₁			
13			—	A	H ₁ -H ₀	X ₃ -X ₁	$\frac{V_H}{V_X \cdot \sqrt{3}}$	YNd5	
				B	H ₂ -H ₀	X ₁ -X ₂			
				C	H ₃ -H ₀	X ₂ -X ₃			
14			H ₃ -H ₂ H ₁ -H ₃ H ₂ -H ₁	A	H ₁ -H ₃	X ₃ -X ₁	$\frac{V_H \cdot \sqrt{3}}{V_X \cdot 2}$	Yd5	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H ₂ -H ₁	X ₁ -X ₂			
				C	H ₃ -H ₂	X ₂ -X ₃			
15			H ₃ -H ₂ H ₁ -H ₃ H ₂ -H ₁	A	H ₁ -H ₃	X ₂ -X ₁	$\frac{V_H \cdot \sqrt{3}}{V_X \cdot 2}$	Yd7	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H ₂ -H ₁	X ₃ -X ₁			
				C	H ₃ -H ₂	X ₁ -X ₃			
16			—	A	H ₁ -H ₀	X ₁ -X ₃	$\frac{V_H}{V_X \cdot \sqrt{3}}$	YNd11	
				B	H ₂ -H ₀	X ₂ -X ₁			
				C	H ₃ -H ₀	X ₃ -X ₂			
17			H ₃ -H ₂ H ₁ -H ₃ H ₂ -H ₁	A	H ₁ -H ₃	X ₁ -X ₃	$\frac{V_H \cdot \sqrt{3}}{V_X \cdot 2}$	Yd11	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H ₂ -H ₁	X ₂ -X ₁			
				C	H ₃ -H ₂	X ₃ -X ₂			
18				A	H ₁ -H ₀	X ₀ -X ₁	$\frac{V_H}{V_X}$	YNyn6	
				B	H ₂ -H ₀	X ₀ -X ₂			
				C	H ₃ -H ₀	X ₀ -X ₃			
19			H ₂ -H ₀ H ₃ -H ₀ H ₁ -H ₀	A	H ₁ -H ₀	X ₁ -X ₂	$\frac{V_H}{V_X}$	YNy0	NO ACCESSIBLE NEUTRAL ON LOW VOLTAGE WINDING
				B	H ₂ -H ₀	X ₂ -X ₃			
				C	H ₃ -H ₀	X ₃ -X ₁			
20			X ₃ -X ₀ X ₁ -X ₀ X ₂ -X ₀	A	H ₁ -H ₃	X ₁ -X ₀	$\frac{V_H}{V_X}$	Yyn0	NO ACCESSIBLE NEUTRAL ON HIGH VOLTAGE WINDING
				B	H ₂ -H ₁	X ₂ -X ₀			
				C	H ₃ -H ₂	X ₃ -X ₀			

APPENDIX B
Table of Non-Standard Transformers (cont.)



Vanguard Instruments Co., Inc.

SPEC TEST NO.	TRANSFORMER CONFIGURATION		EXT. JUMPER	PHASE	WINDING TESTED		CAL. TURN RATIO	VECTOR GROUP	NOTES
	HIGH-VOLTAGE WINDING (H)	LOW-VOLTAGE WINDING (X)			HIGH VOLTAGE WINDING	LOW VOLTAGE WINDING			
21			—	A	H1-H3	X1-X3	$\frac{V_H}{V_X}$	Yy0	NO ACCESSIBLE NEUTRAL
				B	H2-H1	X2-X1			
				C	H3-H2	X3-X2			
22			$\frac{H_2-H_0}{H_3-H_0}$ $\frac{H_1-H_0}{H_2-H_0}$	A	H1-H0	X2-X1	$\frac{V_H}{V_X}$	YNy6	NO ACCESSIBLE NEUTRAL ON LOW VOLTAGE WINDING
				B	H2-H0	X3-X2			
				C	H3-H0	X1-X3			
23			$\frac{X_3-X_0}{X_1-X_0}$ $\frac{X_2-X_0}{X_3-X_0}$	A	H1-H3	X0-X1	$\frac{V_H}{V_X}$	Yyn6	NO ACCESSIBLE NEUTRAL ON HIGH VOLTAGE WINDING
				B	H2-H1	X0-X2			
				C	H3-H2	X0-X3			
24			—	A	H1-H3	X3-X1	$\frac{V_H}{V_X}$	Yy6	NO ACCESSIBLE NEUTRAL
				B	H2-H1	X1-X2			
				C	H3-H2	X2-X3			
25			—	A	H1-H3	X1-X0	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Yzn1	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H2-H1	X2-X0			
				C	H3-H2	X3-X0			
26			$\frac{H_3-H_2}{H_1-H_3}$ $\frac{H_2-H_1}{H_3-H_2}$	A	H1-H3	X1-X2	$\frac{V_H \cdot \sqrt{3}}{V_X \cdot 2}$	Yz1	NO ACCESSIBLE NEUTRAL
				B	H2-H1	X2-X3			
				C	H3-H2	X3-X1			
27			—	A	H1-H3	X3-X0	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Yzn5	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H2-H1	X1-X0			
				C	H3-H2	X2-X0			
28			$\frac{H_3-H_2}{H_1-H_3}$ $\frac{H_2-H_1}{H_3-H_2}$	A	H1-H3	X3-X1	$\frac{V_H \cdot \sqrt{3}}{V_X \cdot 2}$	Yz5	NO ACCESSIBLE NEUTRAL
				B	H2-H1	X1-X2			
				C	H3-H2	X2-X3			
29			—	A	H1-H3	X0-X1	$\frac{V_H \cdot \sqrt{3}}{V_X}$	Yzn7	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H2-H1	X0-X2			
				C	H3-H2	X0-X3			
30			$\frac{H_3-H_2}{H_1-H_3}$ $\frac{H_2-H_1}{H_3-H_2}$	A	H1-H3	X2-X1	$\frac{V_H \cdot \sqrt{3}}{V_X \cdot 2}$	Yz7	NO ACCESSIBLE NEUTRAL
				B	H2-H1	X3-X2			
				C	H3-H2	X1-X3			

Model ATRT-03 (v) Operating Instructions

APPENDIX B Table of Non-Standard Transformers (cont.)

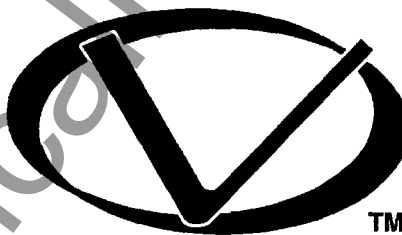


Vanguard Instruments Co., Inc.

SPEC TEST NO.	TRANSFORMER CONFIGURATION		EXT. JUMPER	PHASE	WINDING TESTED		CAL. TURN RATIO	VECTOR GROUP	NOTES
	HIGH-VOLTAGE WINDING (H)	LOW-VOLTAGE WINDING (X)			HIGH VOLTAGE WINDING	LOW VOLTAGE WINDING			
31			—	A	H1-H3	X0-X3	$\frac{V_H}{V_X} \cdot \frac{\sqrt{3}}{2}$	Yzn11	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H2-H1	X0-X1			
				C	H3-H2	X0-X2			
32			H3-H2 H1-H3 H2-H1	A	H1-H3	X1-X3	$\frac{V_H}{V_X} \cdot \frac{\sqrt{3}}{2}$	Yz11	NO ACCESSIBLE NEUTRAL
				B	H2-H1	X2-X1			
				C	H3-H2	X3-X2			
33			—	A	H1-H0	X3-X1	$\frac{V_H}{V_X} \cdot \sqrt{3}$	ZNy5	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H2-H0	X1-X2			
				C	H3-H0	X2-X3			
34			H3-H2 H1-H3 H2-H1	A	H1-H3	X3-X1	$\frac{V_H}{V_X} \cdot \frac{\sqrt{3}}{2}$	Zy5	NO ACCESSIBLE NEUTRAL
				B	H2-H1	X1-X2			
				C	H3-H2	X2-X3			
35			—	A	H1-H0	X1-X3	$\frac{V_H}{V_X} \cdot \sqrt{3}$	YNy11	NO ACCESSIBLE NEUTRAL ON WYE WINDING
				B	H2-H0	X2-X1			
				C	H3-H0	X3-X2			
36			H3-H2 H1-H3 H2-H1	A	H1-H3	X1-X3	$\frac{V_H}{V_X} \cdot \frac{\sqrt{3}}{2}$	Zy11	NO ACCESSIBLE NEUTRAL
				B	H2-H1	X2-X1			
				C	H3-H2	X3-X2			

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