

# ATRT-03A

Automatic Turns Ratio Tester



**Vanguard Instruments Company**

[www.vanguard-instruments.com](http://www.vanguard-instruments.com)



# Automate



## ATRT-03A

### ***Automatic, Three-Phase Turns-Ratio Testing***

The ATRT-03A is Vanguard's second generation, microprocessor-based, automatic, three phase, transformer turns-ratio tester. This lightweight, portable, battery-powered unit is designed for testing transformers at utility power substations.

The ATRT-03A determines the transformer turns-ratio using the IEEE C57.12.90 measurement method. The transformer turns-ratio (ranging from 0.8 to 15,000) is determined by precisely measuring the voltages across the unloaded transformer windings. To ensure accuracy, the ATRT-03A's measuring circuitry self-calibrates before each measurement. It requires neither adjustment nor temperature compensation. The ATRT-03A's turns-ratio measurement accuracy is 0.1% or better.

The ATRT-03A can perform a specific test for each transformer type (such as single phase, delta to Y, Y to delta, delta to delta, or Y to Y) without the need to switch test hookup cables. Also, the unit's automatic transformer phase detection feature can detect different transformer vector diagrams. The ATRT-03A can automatically detect and test 67 transformer types defined by ANSI, CEI/IEC and Australian standards.

To prevent an accidental wrong test-lead hook-up (e.g., when the operator reverses H and X leads), the ATRT-03A outputs a low-level test voltage to verify the hook-up condition before applying the full test voltage to the transformer. Three test voltages (8 Vac, 40 Vac, 100 Vac) allow the ATRT-03A to test CT's and PT's, as well as power transformers.

In addition to measuring a transformer's turns-ratio, the ATRT-03A can also measure a transformer's excitation current (in milli-amperes) and its winding phase angle.

The ATRT-03A can also calculate the turns-ratio percentage error if the transformer's nameplate voltages are provided. The baseline turns-ratio is calculated using the nameplate voltages, and the test results are compared to the baseline turns-ratio. The percentage error is then calculated from the difference between the baseline and test turns-ratios.

### ***User Interface***

The ATRT-03A features a back-lit LCD screen (20 characters by 4 lines) that is viewable in both bright sunlight and low-light levels. The test results screen displays the transformer turns-ratio, excitation current, and turns-ratio accuracy. The unit is controlled via a rugged, 16-key, membrane keypad.

### ***Thermal Printer***

A built-in 4.5-inch wide thermal printer prints test results in a 14 point font for easy viewing. The printer and paper dispenser are mounted under the front panel for protection.

### ***Internal Test Record Storage***

Up to 200 test records can be stored in the ATRT-03A's Flash EEPROM memory. Each test record may contain up to 99 turns-ratio, excitation current, phase angle, and nameplate voltage readings. Test records can be recalled locally or transferred to a PC via the RS-232C interface.

### ***Transformer Test Plan Storage***

The ATRT-03A can store up to 128 transformer test-plans in its Flash EEPROM. A test plan is comprised of the transformer nameplate voltages for each tap setting. The calculated turns-ratio based on the nameplate voltages is compared with the measured turns-ratio. By recalling a test plan, a transformer can be quickly tested and turns-ratio Pass/Fail reports can be reviewed. Test plans can be created with the included PC software and can be transferred to the ATRT-03A via the RS-232C interface.

### ***Computer Interface***

The ATRT-03A can be computer-controlled via the RS-232C interface using the supplied PC software. The Windows® XP/Vista-based software can be used to run a test and to store test results on a PC. Test results can also be exported to Microsoft® Excel.

### ***ATRT-03A Input Power Sources***

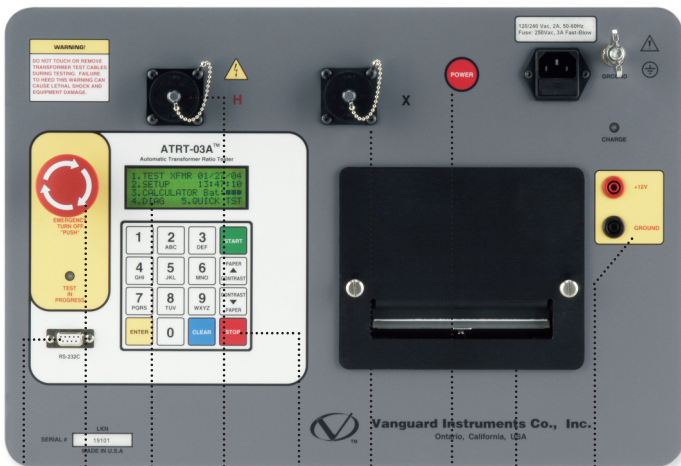
The ATRT-03A is powered by two 12Vdc/2AH rechargeable SLA batteries. The high capacity, low power consuming circuitry allows the ATRT-03A to be used continuously for up to three hours between charges. The ATRT-03A features a built-in charger allowing the batteries to be charged while in use. The unit can be operated from a wide range of voltages and power sources such as 85 – 264 Vac, 110 – 370 Vdc, or a 12 Vdc car battery.

### ***Transformer Load Tap Changer Control***

An optional Tap-Changer Remote Control Box can be used to remotely change transformer taps. This remote-controlled tap-changer box eliminates the need to manually change the transformer's step-up and step-down taps.

# Automatic Three-Phase Turns-

# the Tedious Procedure of Transformer Turns-Ratio Testing



## Ordering Information

### ATRT-03A, Three Phase Transformer Turns-Ratio Tester

ATRT-03A, Cables, PC Software  
ATRT-03A Carrying Case  
Load Tap Changer Controller  
4.5-inch Printer Paper

Part No. ATRT-03A  
Part No. ATRT-03A Case  
Part No. LTC Controller  
Part No: Paper - TP4

Emergency Turn-Off  
Connector for H Terminals  
Connector for X Terminals  
4.5-Inch Wide Thermal Printer  
RS-232C Interface  
Back-lit LCD Screen (20 characters by 4 lines)  
Rugged 16-Key Membrane Keypad  
Power Switch  
12 VDC Cigarette Lighter Input

PC Printer Output

## Test Results - Page #1 of 2

Date:	Aug 01, 1997	Time:	07:38 PM	MF:	GE	Y to Delta					
Device Type:	Transformer	Manufacturer:	GE	Model:	0802753						
Operator:	DAVID J. WILSON	Max Deviation %:	2	File Name:	ATR03A.TXT						
Comments:	New Test				ANCHR21ST						
Vanguard Instruments											
Test Data:											
TEST	PHASE	N VOLT	N TAP	X VOLT	X TAP	CALC. RATIO	MEAS. RATIO	DIFF. %	P/F	NA	PHASE
1	A 80-80/80-02	235,000	1	14,495	1	9.620	9.628	0.08	P	15.40	
	B 80-80/80-02						9.628	0.08	P	15.40	
	C 80-80/80-02						9.628	0.07	P	15.70	
2	A 80-80/80-02	235,000	1	14,490	2	9.626	9.637	0.10	P	15.80	
	B 80-80/80-02						9.638	0.16	P	15.80	
	C 80-80/80-02						9.638	0.14	P	15.70	
3	A 80-80/80-02	235,000	1	17,110	3	10.610	10.610	0.00	P	15.40	
	B 80-80/80-02						10.609	0.06	P	15.50	
	C 80-80/80-02						10.609	0.08	P	15.70	
4	A 80-80/80-02	235,000	2	14,490	1	9.626	9.631	0.05	P	15.40	
	B 80-80/80-02						9.631	0.10	P	15.50	
	C 80-80/80-02						9.628	0.20	P	15.70	
5	A 80-80/80-02	235,000	3	17,100	2	9.626	9.670	0.45	P	15.40	
	B 80-80/80-02						9.668	0.40	P	15.40	
	C 80-80/80-02						9.660	0.50	P	15.70	
6	A 80-80/80-02	235,000	2	17,110	3	10.610	10.608	0.05	P	15.40	
	B 80-80/80-02						10.609	0.09	P	15.50	
	C 80-80/80-02						10.604	0.11	P	15.70	
7	A 80-80/80-02	235,000	3	14,490	1	9.626	9.693	0.67	P	15.40	
	B 80-80/80-02						9.686	0.52	P	15.40	
	C 80-80/80-02						9.686	0.40	P	15.70	
8	A 80-80/80-02	235,000	3	17,100	2	9.626	9.660	0.38	P	15.40	
	B 80-80/80-02						9.660	0.38	P	15.50	
	C 80-80/80-02						9.657	0.46	P	15.70	
9	A 80-80/80-02	235,000	3	17,110	3	9.626	9.697	0.66	P	15.40	
	B 80-80/80-02						9.697	0.66	P	15.70	
	C 80-80/80-02						9.716	0.11	P	15.40	
10	A 80-80/80-02	235,000	4	14,490	1	9.626	9.774	0.13	P	15.40	
	B 80-80/80-02						9.774	0.13	P	15.50	
	C 80-80/80-02						9.768	0.05	P	15.70	

TRANSFORMER TEST RESULTS	
DATE: 10-19-02	TIME: 14:30:28
COMPANY: VANGUARD CO	STATION: FACTORY
CIRCUIT: 3 PHASE	GE
MODEL: TRANS 123	S/N: 123456
KVA RATIO: 300	OPERATOR: NUMBER 1
TEST VOLTAGE = 40 VOLTS	
TYPE: DELTA to Y W/FORMER	
H TAP: 1	H VOLTAGE: 012.600
PHS RATIO: 100	DIFF: 0.000
A = 100.06 0002 00.13 104.9253	B = 100.06 0002 00.13 104.9253
C = 100.06 0003 00.12 104.9253	
DATE: 10-19-02	TIME: 14:30:28
VANGUARD INSTRUMENTS CO., INC. REV. 1.1; MFG. (C) 2000,2001	
11000 S. 11TH ST. P.O. BOX 10000	
DALLAS, TEXAS 75240-1000 (214) 920-9391	
FAX: (214) 920-9392 E-MAIL: SALES@VANGUARD.CO	
SERIAL NUMBER 12345	

## SPECIFICATIONS

<b>TYPE</b>	Portable, lightweight, automatic, battery-powered three-phase transformer turns-ratio meter
<b>PHYSICAL SPECIFICATIONS</b>	19"W x 7"H x 15"D (48.2cm x 17.8 cm x 38.1 cm); Weight: 25 lbs (11.3 kg)
<b>INPUT POWER</b>	3 amps, 85 – 264 Vac or 110 – 370 Vdc or 12 Vdc
<b>BATTERIES</b>	Two 12Vdc/2AH, rechargeable Sealed Lead Acid batteries (up to 3-hours operation)
<b>MEASUREMENT METHOD</b>	ANSI/IEEE C57.12.90
<b>RATIO-MEASURING RANGE</b>	0.8 – 15,000 (5-digit resolution)
<b>URNS-RATIO ACCURACY</b>	0.8 – 1999: $\pm 0.1\%$ , 2,000 – 3,999: $\pm 0.25\%$ , 4,000 – 15,000: $\pm 1\%$ @ 8 Vac 0.8 – 1999: $\pm 0.1\%$ , 2,000 – 3,999: $\pm 0.20\%$ , 4,000 – 15,000: $\pm 1\%$ @ 40 Vac 0.8 – 1999: $\pm 0.1\%$ , 2,000 – 3,999: $\pm 0.15\%$ , 4,000 – 15,000: $\pm 1\%$ @ 100 Vac
<b>ADJUSTMENT</b>	None required
<b>TEST VOLTAGES</b>	8 Vac @ 1 amp, 40 Vac @ 0.6 amp, 100 Vac @ 0.1 amp
<b>EXCITATION CURRENT READING RANGE</b>	0 – 2 Amperes; Accuracy: $\pm 1\text{mA}$ , $\pm 2\%$ of reading ( $\pm 1$ digit)
<b>PHASE-ANGLE MEASUREMENT</b>	0 – 360 degrees; Accuracy: $\pm 0.2$ degrees ( $\pm 1$ digit)
<b>DISPLAY</b>	Back-lit LCD screen (20 Characters by 4 Lines); Viewable in bright sunlight and low-light levels
<b>PRINTER</b>	Built-in 4.5-inch wide thermal printer
<b>COMPUTER INTERFACE</b>	RS-232C (19,200 baud) port
<b>PC SOFTWARE</b>	Windows® XP/Vista-based Transformer Turns-Ratio Analyzer application is included with purchase price
<b>INTERNAL TEST RECORD STORAGE</b>	Stores 200 complete transformer test records. Each test record includes nameplate voltage, winding turns-ratios, excitation current, and winding phase angle
<b>INTERNAL TEST PLAN STORAGE</b>	Stores up to 128 transformer test plans
<b>SAFETY</b>	Designed to meet UL 61010A-1 and CAN/CSA C22.2 No. 1010.1-92 standards
<b>ENVIRONMENT</b>	Operating: $-10^{\circ}$ to $50^{\circ}$ C ( $15^{\circ}$ to $122^{\circ}$ F); Storage: $-30^{\circ}$ C to $70^{\circ}$ C ( $-22^{\circ}$ to $158^{\circ}$ F)
<b>CABLES</b>	One 15-foot single-phase cable set, One 15-foot 3-phase cable set, One 25-foot extension cable set, One cable-carrying duffel bag included
<b>OPTIONS</b>	Transportation case, transformer tap-changer remote control device
<b>WARRANTY</b>	One year on parts and labor

Note: All specifications herein are valid at nominal voltage and ambient temperature of  $+25^{\circ}\text{C}$  ( $+77^{\circ}\text{F}$ ). Specifications are subject to change without notice.

# -Ratio Tester

**Vanguard Instruments Company**  
Reliability Through Instrumentation



## **Vanguard Instruments Company, Inc.**

Vanguard Instruments Co., (VIC), was founded in 1991. Currently, our 28,000 square-foot facility houses Administration, Design & Engineering, and Manufacturing operations. From its inception, VIC's vision was, and is to develop and manufacture innovative test equipment for use in testing substation EHV circuit breakers and other electrical apparatus.

The first VIC product was a computerized circuit-breaker analyzer, which was a resounding success. It became the forerunner of an entire series of circuit-breaker test equipment. Since its beginning, VIC's product line has expanded to include microcomputer-based, precision micro-ohmmeters, single and three-phase transformer winding turns-ratio testers, winding-resistance meters, transformer tap-changing controllers, megaohm resistance meters, and a variety of other electrical utility maintenance support products.

VIC's performance-oriented products are well suited for the utility industry. They are rugged, reliable, accurate, user friendly, and most are computer controlled. Computer control, with innovative programming, provides many automated testing functions. VIC's instruments eliminate tedious and time-consuming operations, while providing fast, complex, test-result calculations. Errors are reduced and the need to memorize long sequences of procedural steps is eliminated. Every VIC instrument is competitively priced and is covered by a liberal warranty.



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