

# ATRRT-03A S2

*automatic, 3-phase transformer turns ratio tester*



Vanguard Instruments Company, Inc.  
[www.vanguard-instruments.com](http://www.vanguard-instruments.com)



# ATR-03A S2

*automatic, 3-phase transformer turns ratio tester*

## Product Overview

The ATRT-03A S2 is a three-phase transformer turns-ratio tester with a built-in rechargeable battery that offers three hours of continuous operation. The ATRT-03A S2 can be used as a standalone unit or can be computer-controlled. It can be operated locally using its alpha-numeric keypad and rotary switch. Information is displayed on a back-lit LCD screen (128 x 64 pixels) that is viewable in both bright sunlight and low-light levels. Test reports can be printed in the field on the unit's built-in 4.5-inch wide thermal printer. The ATRT03A S2 can store up to 112 test records and 128 test plans in Flash EEPROM. Test records or test plans can be stored or transferred to and from a PC via the available interfaces (RS-232C port, USB port, USB Flash drive port).

The ATRT-03A S2 is a battery-powered, microprocessor-based, automatic, three-phase, transformer turns-ratio tester. The ATRT-03A S2 determines the transformer turns-ratio using the IEEE C57.12.90 measurement method. The ATRT-03A S2 generates and outputs an excitation test voltage to the transformer's three primary windings. The induced secondary voltage is sensed and the transformer turns ratio is calculated. The ATRT-03A S2 can measure turns-ratios from 0.8 to 15,000. The transformer turns-ratio, excitation current, and phase-angle readings are displayed on the unit's LCD screen. The built-in transformer type detection feature allows the ATRT-03A S2 to detect and test 130 transformer types defined by ANSI, CEI/IEC and Australian standards.

## Transformer Test Voltages

The ATRT-03A S2 generates excitation test voltages internally. Three test voltages (8 Vac, 40 Vac, 100 Vac) allow the ATRT-03A S2 to test CT's and PT's, as well as power transformers.

## Auto-Detect Transformer Configuration

The ATRT-03A S2 can automatically detect 130 specific vector groups for different transformer types defined by ANSI, CEI/IEC, and Australian standards.

## Internal Test Record Storage

Up to 112 test records can be stored in the ATRT-03A S2'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 available interfaces (RS-232C port, USB port, USB Flash drive port).

## Power Sources

The ATRT-03A S2 can be continuously powered for three hours from its built-in rechargeable lead acid batteries or from a single-phase 100-240 Vac 50/60 Hz power source. A built-in charger allows the batteries to be charged while in use. The ATRT-03A S2 can also be powered directly from a 12 Vdc power source such as a car battery.

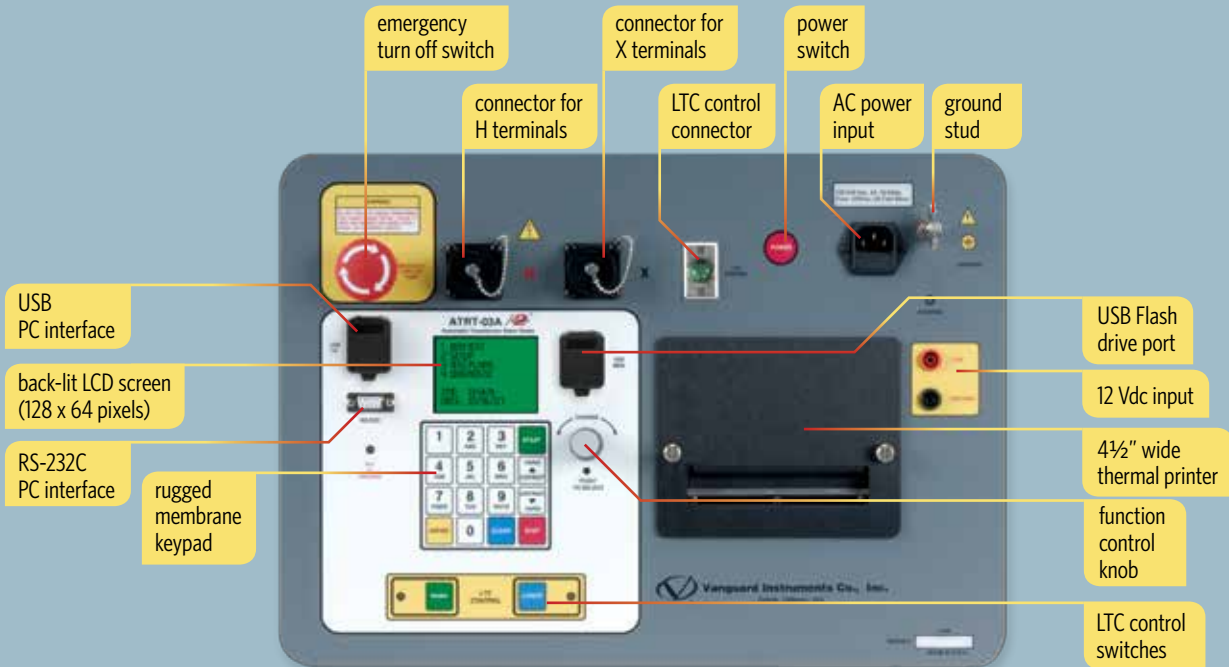
## outstanding features

- Battery or AC-powered
- Ratio range: 0.8 – 15,000 : 1
- Capable of detecting 130 different 3-phase transformer types defined by ANSI, IEC, and Australian standards
- 3 test voltages: 8Vac, 40Vac, and 100Vac
- Phase angle and excitation current measurement
- RS-232C and USB PC interfaces
- Built-in 4½" wide thermal printer

## ordering information

Part No.	Description
9042-UC	ATR-03A S2, cables, and PC software
9042-SC	ATR-03A S2 shipping case
TP4-CS	TP4 thermal printer paper (24 rolls)

# ATRT-03A S2 Features



## Transformer Test Plans

The ATRT-03A S2 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 to derive the percentage error and Pass/Fail results. By using 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 PC software and can be transferred to the ATRT-03A S2 via the available interfaces (RS-232C port, USB port, USB Flash drive port).

## User Interface

The ATRT-03A S2 features a back-lit LCD screen (128 x 64 pixels) that is viewable in both bright sunlight and low-light levels. The test results screen displays the transformer turns-ratio, excitation current, phase angle, and percentage error. The unit is controlled via a rugged, 16-key, membrane keypad and a digital rotary switch.

## Computer Interface

In computer-controlled mode, the unit can be controlled via the RS-232C or USB interface using the included TTRA S2 transformer turns ratio analyzer software. This Windows®-based application can be used to run tests and to store test results on a PC. Test results can also be exported to Excel, PDF, and XML formats for further analysis.

## Transformer Load Tap Changer Control

Voltage regulator or LTC tap positions can be changed remotely using the unit's built-in transformer load tap changer. This feature eliminates the need to manually raise or lower tap positions from the transformer control panel.

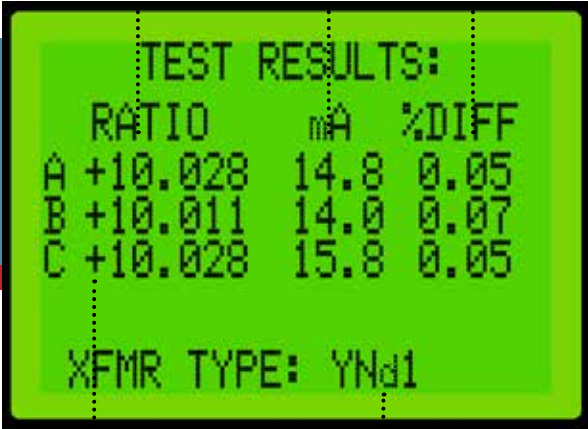
## Built-in Thermal Printer

The ATRT-03A S2 features a convenient built-in 4½" wide thermal printer that can be used to print test results.

## USB Flash Drive Interface

A built-in USB Flash drive interface provides a convenient method for transferring test plans and test records to or from a USB Flash drive. The user can store up to 999 transformer test plans and test records on a USB Flash drive, and the supplied PC software can be used to view the test records.

Measured Ratio for Phase A, B, and C      Excitation Current Reading      Percentage Error



Winding Polarity

Transformer Type

## typical 3-phase test results screen

RECORD NUMBER 1			
TRANSFORMER TEST RESULTS			
DATE: 01/26/15	TIME: 14:29:53		
COMPANY: VANGUARD	STATION: LAB		
CIRCUIT: DY TRANSFORMER TAP3	MFR: GE		
MODEL: DIS TRANS	S/N: F639943		
KVA RTG: 500	OPERATOR: VI		
TEST VOLTAGE = 40 V, 60 Hz			
TYPE: Dyn1			
H TAP: _____	H VOLTAGE: 12,000		
X TAP: _____	X VOLTAGE: 208		
CALCULATED RATIO: 99.926			
PHS M-RATIO	mA	PHASE	%DIFF
A +99.996	2.6	0.05	0.07
B +100.04	2.1	0.06	0.12
C +100.04	3.2	0.06	0.12

## thermal printer output

Test results can be quickly printed in the field on the ATRT-03A S2's built-in thermal printer without the need to connect the unit to a PC.

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1520 S. Hellman Avenue, Ontario, CA 91761, USA      Phone: 909.923.9390      FAX: 909.923.9391 www.vanguard-instruments.com																																							
TRANSFORMER TURNS RATIO REPORT																																							
Filename: test001.txt      Date: January 26, 2015      Time: 04:02 PM      Page (1/1)																																							
Company: VANGUARD Location: LAB Circuit: DY TRANSFORMER TAP3 Operator: Comment:	MFR: GE Device: Transformer Type: Dyn1 Model: DIS TRANS Rating: 500 Serial #: F639943 Max Deviation %: .3 Test Voltage: 40V																																						
<table border="1"> <thead> <tr> <th>HIGH VOLTAGE WINDING (H)</th> <th>LOW VOLTAGE WINDING (X)</th> <th>VECTOR GROUP</th> <th>PHASE</th> <th>INTERNAL GROUPS</th> <th>HIGH VOLTAGE WINDING</th> <th>LOW VOLTAGE WINDING</th> <th>REAL RATIO</th> <th>TURNS RATIO</th> <th>NOTES</th> </tr> </thead> <tbody> <tr> <td>H<sub>1</sub>-H<sub>2</sub></td> <td>X<sub>1</sub>-X<sub>2</sub></td> <td rowspan="3">Dyn1</td> <td>A</td> <td></td> <td>H<sub>1</sub>-H<sub>2</sub></td> <td>X<sub>1</sub>-X<sub>2</sub></td> <td><math>\frac{V_1}{V_2} \cdot \sqrt{3}</math></td> <td><math>\frac{N_1}{N_2} \cdot \sqrt{3}</math></td> <td></td> </tr> <tr> <td>H<sub>2</sub>-H<sub>3</sub></td> <td>X<sub>2</sub>-X<sub>3</sub></td> <td>B</td> <td></td> <td>H<sub>2</sub>-H<sub>3</sub></td> <td>X<sub>2</sub>-X<sub>3</sub></td> <td><math>\frac{V_2}{V_3} \cdot \sqrt{3}</math></td> <td><math>\frac{N_2}{N_3} \cdot \sqrt{3}</math></td> <td></td> </tr> <tr> <td>H<sub>3</sub>-H<sub>1</sub></td> <td>X<sub>3</sub>-X<sub>1</sub></td> <td>C</td> <td></td> <td>H<sub>3</sub>-H<sub>1</sub></td> <td>X<sub>3</sub>-X<sub>1</sub></td> <td><math>\frac{V_3}{V_1} \cdot \sqrt{3}</math></td> <td><math>\frac{N_3}{N_1} \cdot \sqrt{3}</math></td> <td></td> </tr> </tbody> </table>	HIGH VOLTAGE WINDING (H)	LOW VOLTAGE WINDING (X)	VECTOR GROUP	PHASE	INTERNAL GROUPS	HIGH VOLTAGE WINDING	LOW VOLTAGE WINDING	REAL RATIO	TURNS RATIO	NOTES	H <sub>1</sub> -H <sub>2</sub>	X <sub>1</sub> -X <sub>2</sub>	Dyn1	A		H <sub>1</sub> -H <sub>2</sub>	X <sub>1</sub> -X <sub>2</sub>	$\frac{V_1}{V_2} \cdot \sqrt{3}$	$\frac{N_1}{N_2} \cdot \sqrt{3}$		H <sub>2</sub> -H <sub>3</sub>	X <sub>2</sub> -X <sub>3</sub>	B		H <sub>2</sub> -H <sub>3</sub>	X <sub>2</sub> -X <sub>3</sub>	$\frac{V_2}{V_3} \cdot \sqrt{3}$	$\frac{N_2}{N_3} \cdot \sqrt{3}$		H <sub>3</sub> -H <sub>1</sub>	X <sub>3</sub> -X <sub>1</sub>	C		H <sub>3</sub> -H <sub>1</sub>	X <sub>3</sub> -X <sub>1</sub>	$\frac{V_3}{V_1} \cdot \sqrt{3}$	$\frac{N_3}{N_1} \cdot \sqrt{3}$		
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TEST	H VOLT	H TAP	X VOLT	X TAP	C-RATIO	M-RATIO	DEV [%]	P/F	I[mA]	DEGREE	RES																												
1	12000		208		99.9260	A: +99.996 B: +100.042 C: +100.043	0.07 0.12 0.12	P P P	2.600 2.100 3.200	0.060 0.060 0.060																													

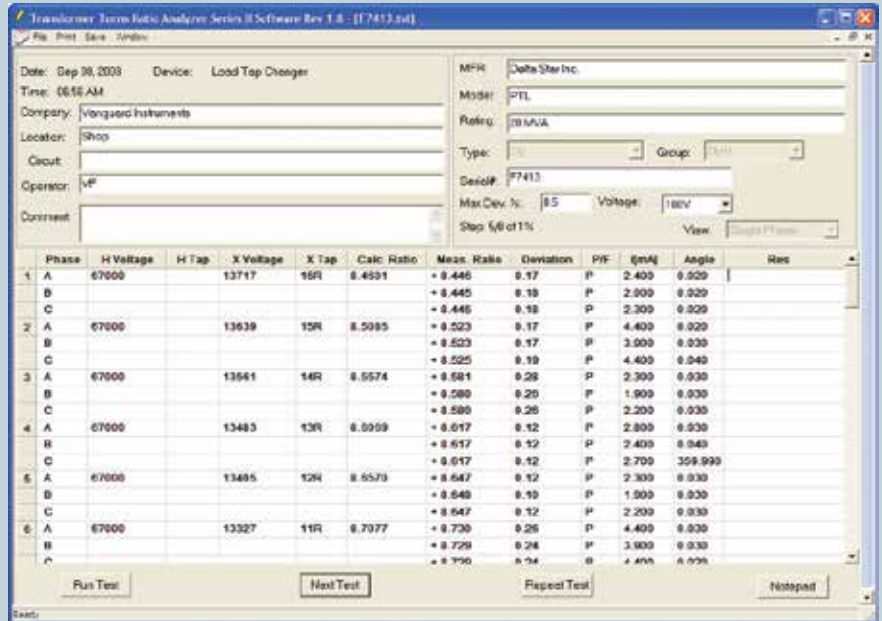
## desktop printer output

Test reports can be generated with the included TTRA S2 PC software. Test records can be exported to Excel, PDF, and XML formats for further analysis

























# TTRA S2 Software

The ATRT-03A S2 comes with the Vanguard Transformer Turns Ratio Analysis Series 2 (TTRA S2) PC software. The TTRA S2 software can be used to test winding turns ratios of transformers, voltage regulators, and load-tap changers. Test plans can be created using the TTRA S2 application and then transferred to the ATRT-03A S2. Test records can be exported to Excel, PDF, and XML formats for further analysis.

The latest version of the TTRA S2 software can always be downloaded free from the Vanguard web site at [www.vanguard-instruments.com](http://www.vanguard-instruments.com). Please note that you will need to create a free account on our site in order to download software or firmware.



## ATRT-03A S2 technical specifications

 <b>physical specifications</b>	<b>Dimensions:</b> 20"W x 7½"H x 15½" D (50 cm x 19 cm x 39.6 cm) <b>Weight:</b> 27 lbs. (12 Kg)	 <b>input power</b>	100 – 240 Vac, 50/60 Hz or 12 Vdc
 <b>batteries</b>	two lead acid batteries (12V, 2AH) provide up to 3 hours of operation	 <b>ITC contact</b>	240 Vac, 2A
 <b>measuring method</b>	ANSI/IEEE C5712.90	 <b>ratio measuring range</b>	0.8 – 15,000 : 1
 <b>typical turns-ratio accuracy</b>	<b>8 Vac:</b> 0.8 – 1,000 (±0.08%), 1,001 – 4,000 (±0.1%), 4,001 – 15,000 (±0.25%) <b>40 Vac:</b> 0.8 – 1,000 (±0.05%), 1,001 – 4,000 (±0.1%), 4,001 – 15,000 (±0.2%) <b>100 Vac:</b> 0.8 – 1,000 (±0.05%), 1,001 – 4,000 (±0.1%), 4,001 – 15,000 (±0.2%)	 <b>current reading range</b>	0 – 1 Ampere, accuracy: ±0.1mA, ±2% of reading (±1 mA)
 <b>test voltages</b>	8 Vac @ 350 mA, 40 Vac @ 70 mA, 100 Vac @ 20 mA	 <b>phase angle measurement</b>	0 – 360 degrees accuracy: ±0.2 degree (±1 digit)
 <b>display</b>	back-lit LCD screen (128 x 64 pixels) viewable in bright sunlight and low-light levels	 <b>computer interfaces</b>	One RS-232C port, one USB port
 <b>printer</b>	built-in 4½" wide thermal printer	 <b>internal test plan storage</b>	stores up to 128 transformer test plans; plans can be transferred to PC.
 <b>pc software</b>	Windows®-based transformer turns-ratio analysis software is included with purchase	 <b>external data storage</b>	up to 999 test records on external USB flash drive (drive not included)
 <b>internal test record storage</b>	stores 112 complete transformer test records, each record holding the test record header and up to 99 readings	 <b>humidity</b>	90% RH @ 40°C (104°F) non-condensing
 <b>safety</b>	designed to meet UL 61010A-1 and CAN/CSA C22.2 No. 1010.1-92 standards	 <b>altitude</b>	2,000 m (6,562 ft) to full safety specifications
 <b>temperature</b>	<b>Operating:</b> -10°C to +50°C (+15°F to +122°F) <b>Storage:</b> -30°C to +70°C (-22°F to +158°F)	 <b>cables</b>	one 15 ft (4.6m) single phase set, one 15 ft (4.6m) 3-phase set, one 25 ft (7.6m) extension set, one safety ground, one RS-232C, one USB, cable bag
 <b>options</b>	shipping case, 30' (9.14 m) 3-phase H and X leads, 30' (9.14 m) single phase H and X leads	 <b>warranty</b>	one year on parts and labor

**NOTE:** the above specifications are valid at nominal voltage and ambient temperature of +25°C (+77°F). Specifications are subject to change without notice.



## Instruments designed and developed by the hearts and minds of utility electricians around the world.

Vanguard Instruments Company (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, transformer winding-resistance meters, mega-ohm 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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