

# ATRT-03A S2

*automatic, 3-phase transformer turns ratio tester*



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

# ATRT-03A S2

## *automatic, 3-phase transformer turns ratio tester*



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.

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 ATRT-03A 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).

### 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 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).

### 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).

### outstanding features

- Ratio range: 0.8 – 15,000
- Capable of detecting 130 different 3-phase transformer types defined by ANSI, IEC, and Australian standards
- 3 test voltages available: 8Vac, 40Vac, 100Vac
- Phase angle and excitation current measurement
- RS-232C and USB PC interfaces
- Built-in 4.5-inch wide thermal printer

## ordering information

Part number **ATRT-03AS2**

ATRT-03A S2, cables, and PC software

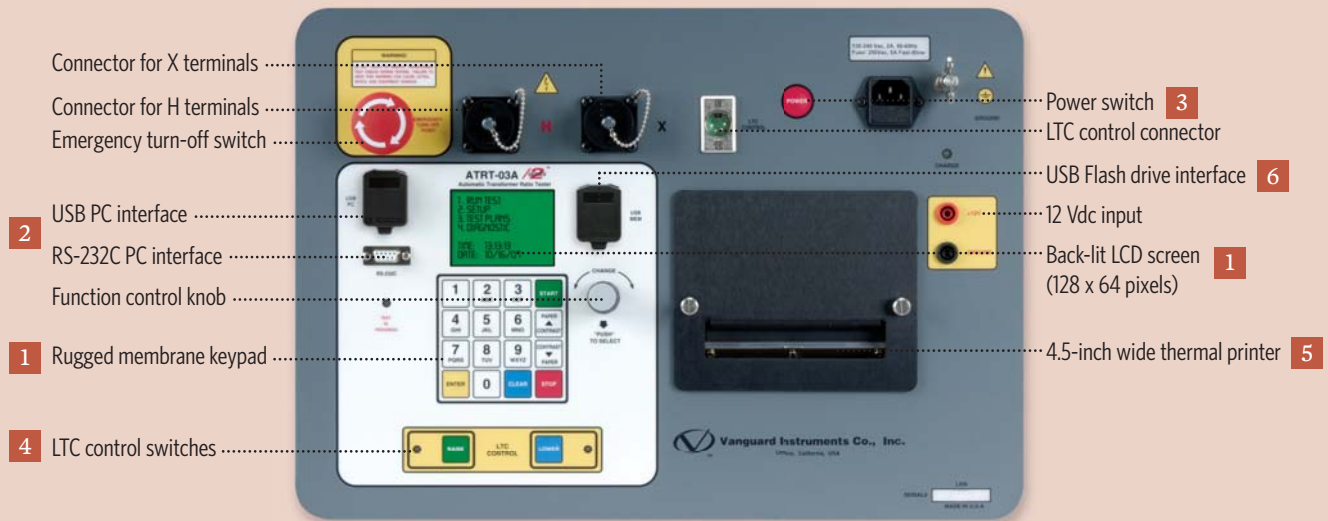
Part number **ATRT-03AS2 CASE**

ATRT-03A S2 shipping case

Part number **Paper-TP4**

Thermal printer paper

# ATRT-03A S2 Controls & Indicators



1

## 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.

2

## Computer Interface

In computer-controlled mode, the unit can be controlled via the RS-232C or USB interface using the supplied PC software (Transformer Turns-Ratio Analyzer application provided with each ATRT-03A S2). 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.

3

## 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.

4

## 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.

5

## Built-in Thermal Printer

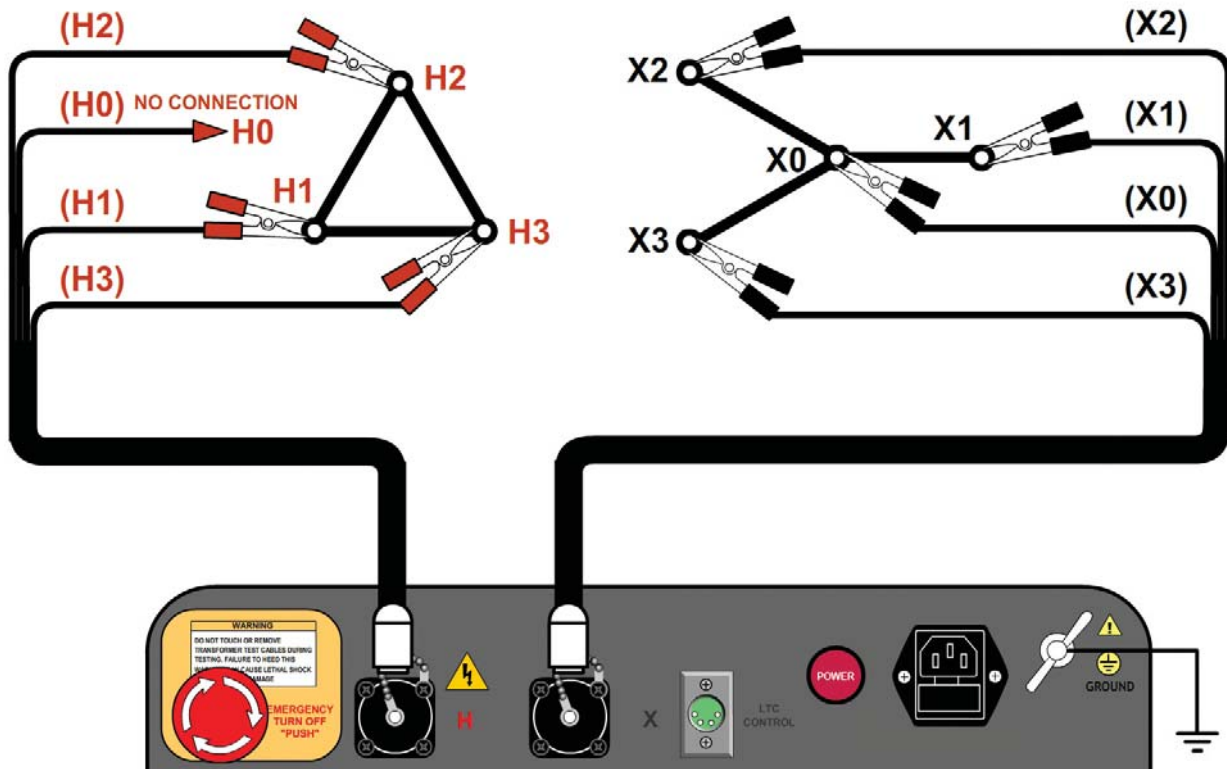
The ATRT-03A S2 features a convenient built-in 4.5-inch wide thermal printer that can be used to print test results.

6

## 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.

# ATRT-03A S2 connections



## ATRT-03A S2 desktop printer output

## ATRT-03A S2 thermal printer output

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TRANSFORMER TURNS RATIO REPORT

Filename: test001.tst Date: Mar 28, 2012 Time: 04:02 PM Page (1/1)

Company: VANGUARD  
 Location: LAB  
 Circuit: DY TRANSFORMER TAP3  
 Operator: VI  
 Comment:

MFR: GE  
 Device: Transformer  
 Type: Dyn1  
 Model: DIS TRANS  
 Rating: 500  
 Serial #: F839943  
 Max Deviation %: .3  
 Test Voltage: 40V

HIGH VOLTAGE WINDING (H)	LOW VOLTAGE WINDING (X)	VECTOR GROUP	PHASE	INTERNAL JUMPER	HIGH VOLTAGE WINDING	LOW VOLTAGE WINDING	MEAS. RATIO	TURN'S RATIO	NOTES
H <sub>1</sub>	X <sub>1</sub>	Dyn1	A		H <sub>1</sub> -H <sub>3</sub>	X <sub>1</sub> -X <sub>0</sub>	$\frac{V_{H1}}{V_{X1}}$	$\frac{V_{H1}}{V_{X1}} \cdot \sqrt{3}$	
H <sub>2</sub>	X <sub>2</sub>		B		H <sub>2</sub> -H <sub>1</sub>	X <sub>2</sub> -X <sub>0</sub>	$\frac{V_{H2}}{V_{X2}}$	$\frac{V_{H2}}{V_{X2}} \cdot \sqrt{3}$	
H <sub>3</sub>	X <sub>3</sub>		C		H <sub>3</sub> -H <sub>2</sub>	X <sub>3</sub> -X <sub>0</sub>	$\frac{V_{H3}}{V_{X3}}$	$\frac{V_{H3}}{V_{X3}} \cdot \sqrt{3}$	

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	0.050 0.060 0.060	

RECORD NUMBER 1

TRANSFORMER TEST RESULTS

DATE: 03/28/12 TIME: 14:29:53

COMPANY: VANGUARD  
 STATION: LAB  
 CIRCUIT: DY TRANSFORMER TAP3  
 MFR: GE  
 MODEL: DIS TRANS  
 S/N: F839943  
 KVA RTG: 500  
 OPERATOR: VI

TEST VOLTAGE = 40 V, 60 Hz

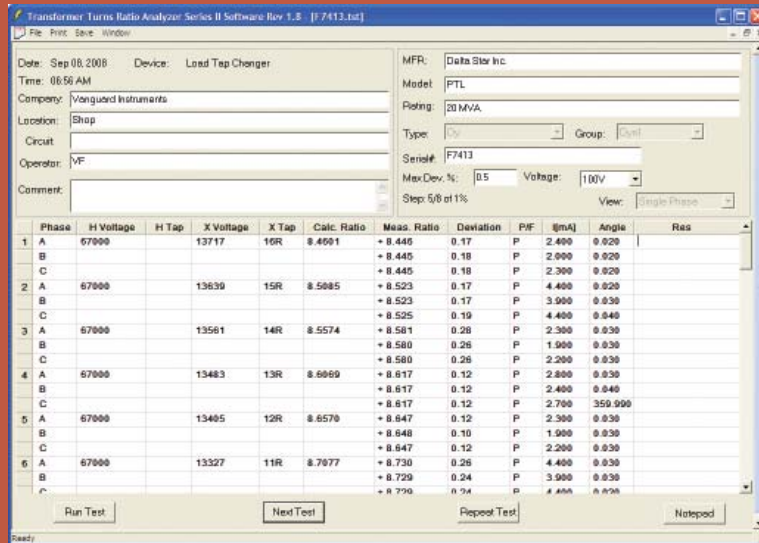
TYPE: Dyn1

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

# Computer control and analysis with included 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.



## ATRT-03A S2 specifications

<b>type</b>	Portable, lightweight, automatic, 3-phase transformer turns-ratio meter
<b>physical specifications</b>	20"W x 7½"H x 15½"D (50 cm x 19 cm x 39.6 cm ); Weight: 27 lbs (12 kg)
<b>operating voltage</b>	100 – 240 Vac, 50/60 Hz
<b>batteries</b>	Two lead acid batteries (12V, 2 AH) provide up to 3 hours of operation
<b>measurement method</b>	ANSI/IEEE C57.12.90
<b>turns ratio measuring range</b>	0.8 – 15,000
<b>turns ratio accuracy</b>	0.8 – 1,999: ±0.1%, 2,000 – 3,999: ±0.25%, 4,000 – 15,000: ±1% @ 8Vac 0.8 – 1,999: ±0.1%, 2,000 – 3,999: ±0.20%, 4,000 – 15,000: ±1% @ 40Vac 0.8 – 1,999: ±0.1%, 2,000 – 3,999: ±0.15%, 4,000 – 15,000: ±1% @ 100Vac
<b>test voltages</b>	8 Vac @ 350 mA, 40 Vac @ 70 mA, 100 Vac @ 20 mA
<b>excitation current reading range</b>	0 – 2 Amperes; Accuracy: ±0.1 mA, ±2% of reading (±1 mA)
<b>phase angle measurement range</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>printer</b>	Built-in 4.5-inch wide thermal printer
<b>computer interfaces</b>	One RS-232C port, one USB port
<b>external data storage</b>	One USB Flash drive interface port; Up to 999 transformer test records can be stored on a USB Flash drive (not included)
<b>internal test record storage</b>	Can store 112 transformer test records internally. Each record holds the test record header and up to 99 readings.
<b>internal test plan storage</b>	Can store 128 transformer test plans internally. Test plans can be transferred to the unit from the PC via the RS-232C/USB port or via the USB Flash drive interface
<b>pc software</b>	Windows®-based Transformer Turns Ratio Analyzer application is included with purchase price
<b>load tap changer contact</b>	240 Vac, 1 Amp
<b>safety</b>	Designed to meet UL 61010A-1 and CAN/CSA C22.2 No. 10101-92 standards
<b>environment</b>	Operating: -10°C to +50°C (+15°F to +122°F); Storage: -30°C to +70°C (-22°F to +158°F)
<b>humidity</b>	90% RH @ 40°C (104°F) non-condensing
<b>altitude</b>	2,000 m (6,562 ft) to full safety specifications
<b>cables</b>	One 15-foot single-phase set, one 15-foot 3-phase set, one 25-foot extension set, one safety ground, one RS-232C, one USB, cable bag
<b>options</b>	transportation case
<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 circuitbreaker analyzer, which was a resounding success. It became the forerunner of an entire series of circuitbreaker 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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