

# ATRT-03

automatic, 3-phase transformer turns ratio tester



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

# ATRT-03

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



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

The ATRT-03 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-03's measuring circuitry self-calibrates before each measurement. It requires neither adjustment nor temperature compensation. The ATRT-03's turns-ratio measurement accuracy is 0.1% or better.

The ATRT-03 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-03 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-03 outputs a low-level test voltage to verify the hook-up condition before applying the full test voltage to the transformer.

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

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

The ATRT-03 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-03 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.

### Computer Interface

The ATRT-03 can be computer-controlled via the RS-232C interface using the supplied PC software. The Windows®-based software can be used to run a test 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 optional Tap-Changer Remote Control Box. This option eliminates the need to manually raise or lower tap positions from the transformer control panel.

### Internal Test Record Storage

Up to 200 test records can be stored in the ATRT-03'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 Plans

The ATRT-03 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 included PC software and can be transferred to the ATRT-03 via the RS-232C interface.

### Built-in Thermal Printer

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

## ordering information

Part number **ATRT-03**

ATRT-03, cables, and PC software

Part number **ATRT-03 CASE**

ATRT-03 shipping case

Part number **Paper-TP4**

Thermal printer paper

# ATRT-03 Controls & Indicators



## ATRT-03 specifications

- type** Portable, automatic, three-phase transformer turns-ratio meter
- physical specs** 17"W x 7"H x 13" D (43.2 cm x 17.8 cm x 33.0 cm); Weight: 14 lbs (6.4 kg)
- input power** 3 amps, 100 – 120 Vac or 200 – 240 Vac (selectable), 50/60 Hz
- measurement method** ANSI/IEEE C57.12.90
- ratio measuring range** 0.8 – 15,000 (5-digit resolution)
- turns ratio accuracy** 0.8 – 1999: ±0.1%, 2,000 – 3,999: ±0.25%, 4,000 – 15,000: ±1% @ 8 Vac  
 0.8 – 1999: ±0.1%, 2,000 – 3,999: ±0.20%, 4,000 – 15,000: ±1% @ 40 Vac  
 0.8 – 1999: ±0.1%, 2,000 – 3,999: ±0.15%, 4,000 – 15,000: ±1% @ 100 Vac
- test voltages** 8 Vac @ 1 amp, 40 Vac @ 0.6 amp, 100 Vac @ 0.1 amp
- excitation current reading range** 0 – 2 Amperes; Accuracy: ±1mA, ±2% of reading (±1 digit)
- phase angle measurement** 0 – 360 degrees; Accuracy: ±0.2 degrees (±1 digit)
- display** Back-lit LCD screen (20 Characters by 4 Lines); Viewable in bright sunlight and low-light levels
- printer** Built-in 4.5-inch wide thermal printer
- computer interface** One RS-232C port
- pc software** Windows®-based Transformer Turns-Ratio Analyzer application is included
- internal test record storage** Stores 200 complete transformer test records. Each test record includes name-plate voltage, winding turns-ratios, excitation current, and winding phase angle
- internal test plan storage** Stores up to 128 transformer test plans
- safety** UL Certified (UL 61010A-1), CAN/CSA Certified (C22.2 No. 1010.1-92)
- environment** Operating: -10°C to +50°C (+15°F to +122°F);  
 Storage: -30°C to +70°C (-22°F to +158°F)
- humidity** 90% RH @ 40°C (104°F) non-condensing
- altitude** 2,000 m (6,562 ft) to full safety specifications
- cables** one 15-foot single-phase cable set, one 15-foot 3-phase cable set, one 25-foot extension cable set, one RS-232C cable, cable carrying bag
- options** transportation case, transformer load tap-changer remote control device
- warranty** 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.

## ATRT-03 thermal printer output

| RECORD NUMBER 1          |                    |       |         |
|--------------------------|--------------------|-------|---------|
| TRANSFORMER TEST RESULTS |                    |       |         |
| DATE: 03/28/12           | TIME: 15:33:47     |       |         |
| COMPANY: VANGUARD        | LAB                |       |         |
| STATION: LAB             | DY TRANS TAP3      |       |         |
| CIRCUIT: GE              | GE                 |       |         |
| MFR: DIS TRANS           | F639943            |       |         |
| S/N: F639943             | 500                |       |         |
| KVA RATING: 500          | UI                 |       |         |
| TEST VOLTAGE = 40 VOLTS  |                    |       |         |
| TYPE: DELTA to Y XFORMER |                    |       |         |
| H TAP: _____             | H VOLTAGE: 012,000 |       |         |
| X TAP: _____             | X VOLTAGE: 000,208 |       |         |
| PHS M_RATIO              | MA                 | %DIFF | C_RATIO |
| A                        | +100.04            | 0003  | 00.11   |
| B                        | +100.05            | 0002  | 00.12   |
| C                        | +100.05            | 0003  | 00.12   |

## ATRT-03 desktop printer output

| TRANSFORMER TURNS RATIO REPORT                                 |        |       |        |                        |         |  |                      |                         |                   |                         |     |
|--|--------|-------|--------|------------------------|---------|--|----------------------|-------------------------|-------------------|-------------------------|-----|
| Filename: test001.txt Date: 03/28/12 Time: 15:33:47 Page (1/2) |        |       |        |                        |         |  |                      |                         |                   |                         |     |
| Company: VANGUARD  |        |       |        | MFR: GE                |         |  |                      | Device: Transformer     |                   |                         |     |
| Location: LAB  |        |       |        | Circuit: DY TRANS TAP3 |         |  |                      | Type: Delta to Y (Dyn1) |                   |                         |     |
| Operator: VI   |        |       |        | Model: DIS TRANS       |         |  |                      | Rating: 500             |                   |                         |     |
| Comment:   |        |       |        | Serial #: F639943      |         |  |                      | Max Deviation %: 0.3    |                   |                         |     |
|  |        |       |        | Test Voltage: 40V      |         |  |                      |                         |                   |                         |     |
|  |        |       |        |                        |         |  |                      |                         |                   |                         |     |
| TEST   | H VOLT | H TAP | X VOLT | X TAP                  | C-RATIO | M-RATIO                                | DEV(%)               | P/F                     | PHAS              | DEGREE                  | RES |
| 1  | 12000  |       | 208    |                        | 99.9280 | A = 100.04<br>B = 100.05<br>C = 100.05 | 0.11<br>0.12<br>0.12 | P<br>P<br>P             | 3.0<br>2.0<br>3.0 | 0.209<br>0.000<br>0.209 |     |
| 2  |        |       |        |                        |         | A:<br>B:<br>C:                         |                      |                         |                   |                         |     |
| 3  |        |       |        |                        |         | A:<br>B:<br>C:                         |                      |                         |                   |                         |     |
| 4  |        |       |        |                        |         | A:<br>B:<br>C:                         |                      |                         |                   |                         |     |
| 5  |        |       |        |                        |         | A:<br>B:<br>C:                         |                      |                         |                   |                         |     |
| 6  |        |       |        |                        |         | A:<br>B:<br>C:                         |                      |                         |                   |                         |     |



## 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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