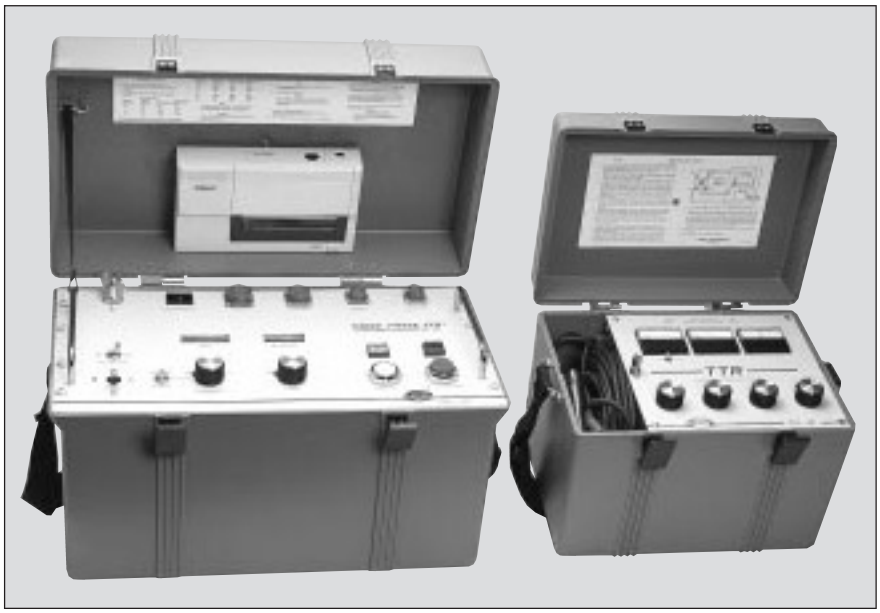

BIDDLE®
TTR®

Three-Phase Model

- **Microprocessor controlled, automatic balancing**
- **Reduces testing time by 50%**
- **Expanded ratio range of 2700:1**
- **Printer option**
- **Eliminates the need for manual setup changes**

Transformer Turns Ratio Test Sets

DESCRIPTION

Biddle® TTR® Transformer Turns Ratio Test Sets measure the turns ratio and exciting current of windings in power, potential and current transformers. Deviations in turns ratio readings indicate problems in one or both windings or the magnetic core circuit.

The TTR test sets aid in identifying:

- Shorted coils
- Open circuits
- Incorrect connections
- Internal faults or tap-changer defects in step regulators as well as in transformers.

The three-phase model is a fully automatic, microprocessor-based system with an expanded ratio range of 2700:1 to cover most current and potential transformers with unmatched accuracy of ±0.1%.

The automatic operation reduces test function time to under 10 seconds, providing dramatic cost savings to the user. Additional time saving is gained from the simple switch settings which eliminate the need for manual setup changes.

An optional printer is available for recording testing results.

The model is available in either hand-cranked or line-operated versions and measures highly sensitive turns ratios of up to 129.99:1 with accuracy of ±0.1%. An optional auxilary transformer extends the ratio range to 329.99:1.

The TTR set operates on the principle that the voltage ratio of the transformer at no load is practically equal to the true turns ratio.

The major source of error in a transformer is a primary impedance drop due to magnetizing current, which is kept to a minimum by excitation at a fraction of rated voltage. By employing a design that meets both of these conditions along with the use of a null balance system, the turns ratio of a transformer can be determined accurately.

When measuring the turns ratio of distribution and power transformers, the accuracy is well within 0.1%.

APPLICATIONS

- Three-phase model: Fully automatic units are used for testing single- and three-phase transformers and voltage regulators, for high-ratio readings ranging from 0.8:1 to 2700:1.

An RS-232C interface is provided for data transfer or for use with the optional lid-mounted printer.

This single-phase TTR test set is operated by turning a crank.

- Single-phase models: These models are primarily used for testing single-phase power and distribution transformers, for low-ratio readings up to 129.99:1, or up to 329.99:1 with an auxiliary transformer.

They also can be used to test three-phase transformers by connecting and testing each phase separately.

FEATURES AND BENEFITS

Three-Phase Model

- Microprocessor-based control provides fully automatic operation. Test function takes less than 10 seconds.
- Digital readout displays ratio, exciting current and self-diagnostic messages for simplicity of operation.
- Expanded ratio range of 2700:1 covers most current and potential transformers.
- The simple switch settings for all combinations of transformer connections eliminate the need for manual setup changes.
- 40 volt output voltage selection allows testing current transformers.
- Error messages reduce incorrect connections and incorrect settings.
- RS-232C interface allows download to an optional lid-mounted printer.

SPECIFICATIONS

Model	Power Source	Range		Accuracy	Dimensions	Weight	CAT. NO.
		Turn Ratio	Exciting Current		H x W x D		
Single-phase field sets	Hand-cranked	0.001 to 129.999	0 to 1 A**	±0.1%	10 H x 10.5 W x 14.5 D in. 250 H x 260 W x 370 D mm	18 lb (8.2 kg)	550005
	Line*		0 to 5 A**		11 H x 15 W x 29 D in. 280 H x 380 W x 737 D mm	26 lb (11.8 kg)	550027
Single-phase rack mounted	Line*				10 H x 10.5 W x 19 D in. 255 H x 267 W x 483 D mm	22 lb (10 kg)	550022
Three-phase automatic	Line*	0.800 to 2700	0 to 1999 mA		12.5 H x 12 W x 20 D in. 320 H x 300 W x 510 D mm	36 lb (16.5 kg)	550100***

* 120 Vac, 50/60 Hz. To order 240 Vac, 50/60 Hz, add **–47** to Cat. No.
** Divide by 5 switch for increased resolution
*** To order instrument with printer mounted in lid, add **–39** to Cat. No.
*** To order instrument with printer in lid and 240 Vac, 50/60 Hz, add **–39–47** to Cat. No.

FEATURES AND BENEFITS (cont.)

Single-Phase Models

• Available in hand-cranked or line-operated models, these units provide unmatched accuracy (±0.1%) in a portable design.

• Rack-mounted model is suitable for routine production testing by transformer manufacturers or repair shops. This unit is line-operated.

The instrument displays error messages if test connections are incorrect.

• Line-operated model for shop or field testing is packaged in a rugged, wooden case.

• Measures highly sensitive turn ratios up to 129.99:1. An optional auxiliary transformer extends this ratio range to 329.99:1.

SPECIFICATIONS

Three-Phase Model

Output

- 120 volt, 50/60 Hz standard test for power and distribution transformers
- 40 V, 50/60 Hz for current transformers

Selector switches provide automatic selection of transformer winding type and phase under test.

Metering

Turns Ratio: 5-digit LCD
Exciting Current: 3½-digit LCD

Error Messages Indicate

Exciting current overloads
Incorrect polarity
Incorrect lead connections
Internal out-of-calibration
Ratio values beyond instrument range

Single-Phase Models

Output

8 V, 50/60 Hz

Line-operated models supply up to 5 A for testing specialty power transformers having a high ratio and a low secondary voltage.

Metering: Four decade dials

OPTIONAL ACCESSORIES

Thermal printer and protective interlocks are available for use with the three-phase TTR test set.

Printer

Test results can be documented with a thermal printer.

A header can be printed that provides spaces to record the TTR serial number, test date, operator name, transformer information, temperature, test voltage, relative humidity and comments/notes.

The header automatically includes the type of transformer (single- or three-

Select the transformer winding type and phase under test, press a button, and ratios are displayed automatically.

An optional printer provides hard-copy documentation.

Auxiliary transformer for single-phase TTR

phase) and the configuration of the high- and low-voltage windings.

The three-phase TTR automatically identifies whether three-phase or single-phase leads are being used and sends the test results to the printer in the proper format.

The test result printout includes ratio, exciting current and polarity. A space is included for the transformer tap number.

Protective Interlocks

An interlock shorting plug is supplied with the test set. Both a foot-switch and a hand switch interlock are available as optional accessories.

Auxiliary Transformer

An auxiliary transformer extends the ratio range of single-phase models to 329.99:1. Turns ratio is 100:1 and 200:1, and is accurate to within ±0.1%.

The auxiliary transformer includes all the necessary cables for connection to the TTR set and the transformer under test.

Calibration reference transformer

Dimensions
8 H x 13 W x 10 D in.
203 H x 330 W x 254 D mm

Weight: 13 lb (5.9 kg)

Calibration Reference Transformer

Calibration reference transformers are available for both single- and three-phase test sets. They provide a reference standard for periodic calibration checks to document proof of calibration.

A Calibration Certificate of Turn Ratio Accuracy traceable to the NIST is furnished with each calibration reference transformer, providing accuracies of ±0.05%.

Dimensions (single- and three-phase)

8 H x 14 W x 10 D in.
203 H x 356 W x 254 D mm

Weight

Single-Phase: 11 lb (5.0 kg) approx
Three-Phase: 16 lb (7.3 kg) approx

ORDERING INFORMATION

Item (Qty)	Cat. No.
Three-phase automatic TTR, line,	
120 Vac, 50/60 Hz	550100
240 Vac, 50/60 Hz	550100-47
Three-phaseTTR with printer, mounted in lid	
120 Vac, 50/60 Hz	550100-39
240 Vac, 50/60 Hz	550100-39-47
Single-phase TTR, hand-cranked	550005
Single-phase TTR, line, 120 Vac, 50/60 Hz	550027
Single-phase TTR, line, 240 Vac, 50/60 Hz	550027-47
Single-phase TTR, rack-mounted, line,	
120 Vac, 50/60 Hz	550022
Single-phase TTR, rack-mounted, line,	
240 Vac, 50/60 Hz	550022-47

Included Accessories

Three-Phase Models

Cables	
Power cord, 8 ft (2.5 m) [1]	17032
Grounding cord, 15 ft(4.5 m) [1]	4702-5
With heavy-duty clips for one-phase connections	
to H winding, 10 ft (3 m) [1]	28549-1H
to X winding, 10 ft (3 m) [1]	28550-1X
With heavy-duty clips for three-phase connections	
to H winding, 30 ft (9 m) [1]	28541-1H
to X winding, 30 ft (9 m) [1]	28542-1X
Shorting plug for interlock receptacle [1]	28552
All cables are supplied in a canvas bag with an adjustable shoulder strap. Longer cable lengths are also available.	
Instruction manual	AVTM55-1J

Item (Qty)	Cat. No.
Single-Phase Models	
Cable assembly	19494
With C-clamps for X (low-voltage) winding, 10 ft (3 m) [2]	
With spring clips for H (high-voltage) winding, 13 ft (4 m) [2]	
All cables are permanently connected to the test set.	
Instruction manual	AVTM55JD

Optional Accessories

Three-Phase Models

Printer with cable	550105
Case, shipping and storage, heavy-duty, padded	550615
Calibration reference transformer	550055
Printer paper [1 roll]	27705-1
Carrying case	
For cables	218744-1
Soft pack for TTR	246010
Extension cable for high- and low-voltage cables, 15 ft (4.5 m)	550110
Foot switch interlock	10229-5
Hand switch interlock	27980-2

Single-Phase Models

Auxiliary transformer, extends the ratio range to 329.99	550030
Calibration reference transformer	550050

Note: The cables have been designed for use with the TTR test sets. Any substitution may cause errors in reading and may be dangerous to the operator.