

AVTM55-5J
Rev. A
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**Instruction Manual AVTM 55-5J
for
Three-Phase TTR®
Calibration Standard
Catalog No. 550055**

**High-Voltage Equipment
Read the entire manual before operating.**

**Aparato de Alto Voltaje
Antes de operar este producto lea este manual enteramente.**

Megger.

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Disclaimer Notice

The information contained in this manual is believed to be adequate for the intended use of the product. If the product or its individual instrument are used for purposes other than those specified herein, confirmation of their validity and suitability must be obtained from Megger. Refer to the warranty information included at the end of this instruction manual. Specifications are subject to change without notice.

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1

INTRODUCTION

Receiving Instructions

Check the equipment received against the packing list to ensure that all materials are present. Notify Megger of any shortage. Telephone (610) 676-8500.

Examine the instrument for possible damage received in transit. If any damage is discovered, file a claim with the carrier at once and notify Megger or its nearest authorized sales representative, giving a detailed description of the damage.

This instrument has been thoroughly tested and inspected to meet rigid specifications before being shipped. It is ready for use when set up as indicated in this manual.

General Information

This Calibration Standard has been designed for use as a reference transformer for checking the accuracy of the Megger Three-Phase TTR[®] (Transformer Turn Ratio Test Set) and Single-Phase TTR[®] (TTR100). The standard is also useful for troubleshooting and repair of the instrument. Each Calibration Standard is supplied with a Calibration Certificate of turns ratio accuracy traceable to NIST. NIST is unable to furnish traceability on ratios above 1000.

The standard is essentially a multi-winding toroidal autotransformer whose turns are controlled by three decade switches and a four-step multiplier switch. The transformer provides a ratio range of 0.8 to 2220.

The standard operates on the principle that the voltage ratio of a transformer at no load is almost exactly equal to the true turn ratio. The major source of error is the primary impedance drop due to the magnetizing current. High precision ratios are achieved by using a toroidal core of high permeability, by making the resistance of the exciting winding low, and by use of essentially null-balance comparison techniques.

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SAFETY

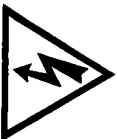
The Catalog Number 550055 Calibration Standard contains no source of power and does not present a shock hazard in itself. However, the standard is normally energized from a TTR test set which produces a 120 V, 50/60 Hz source of electrical energy. All persons making or assisting in tests must use all practical safety precautions to prevent contact with energized parts of the test equipment and related circuits. Persons not directly involved with the tests must be kept away from test activities by suitable barriers, barricades, or warnings.

Connect the GROUND terminal of the TTR test set and Calibration Standard to a low-impedance earth ground.

If the equipment is operated properly and all grounds correctly made, test personnel need not wear rubber gloves. As a routine safety procedure, however, some users require that rubber gloves be worn, not only when making connections to high-voltage terminals, but also when manipulating the controls. Megger considers this an excellent safety practice.

- Safety is the responsibility of the user.
- The purpose of the Calibration Standard is limited to use as described in this manual. Do not use the equipment with any ratimeter type equipment other than specifically described.
- Stay clear of all exposed connections and conductors while test is in progress.
- Do not connect the Calibration Standard to energized equipment.
- Do not perform tests in an explosive atmosphere.
- Corrective maintenance must only be performed by qualified personnel who are familiar with the construction and operation of the Calibration Standard and the hazards involved.
- Refer fuse replacement to qualified service personnel only. To avoid electric shock and fire hazard, use only the fuse specified in the parts list which is identical in respect to type, voltage rating, and current rating.

The following warning and caution notices are used throughout this manual where applicable.



WARNING

Warning, as used in this manual, is defined as a condition or practice which could result in personal injury or loss of life.



CAUTION

Caution, as used in this manual, is defined as a condition or practice which could result in damage to or destruction of the equipment or apparatus under test.

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SPECIFICATIONS

Electrical

Turns ratio range	0.8 to 2220
Turns ratio resolution:	0.01 up to ratios of 11.1 0.1 for ratios between 10.0 and 111.0 1 for ratios between 100 and 1110 2 for ratios between 200 and 2220

Turns ratio accuracy: ± 0.05 percent of setting

NOTE: Each Calibration Standard is supplied with a Calibration Certificate of turns ratio accuracy traceable to NIST. NIST is unable to furnish traceability on ratios above 1000.

Exciting voltage:	40 to 120 V, 50/60 Hz
Exciting winding:	H1-H2 terminals
Terminals provided:	H1 and H2: exciting winding X1 and X2: secondary winding Ground

Environmental

Operating temperature range:	-4 to 122°F (-20 to 50°C)
Storage temperature range:	-58 to 140°F (-50 to 60°C)
Relative humidity:	0 to 90 percent noncondensing (operating) 0 to 95 percent noncondensing (storage)

Megger.

Physical Data

Dimensions:	13-1/2 x 10-1/4 x 8 in. (L x W x H) (34.5 x 26 x 20.5 cm)
Weight:	16 lb (7.5 kg)
Case:	Bronze colored, impact-resistant, polycarbonate with removable lid and carrying handle.

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CONTROLS AND TERMINALS

See Figure 1 for identification and location of Calibration Standard controls and terminals. Their function is described in the following. Figure 2 shows a simplified schematic of the standard.

H Winding Terminals:

High-voltage (H) winding terminals of Calibration Standard. This is the exciting winding and must be connected to the corresponding H test leads of the three-phase TTR test set.

X Winding Terminals:

Low-voltage (X) winding terminals of Calibration Standard. This winding must be connected to the corresponding X test leads of the three-phase TTR test set.

Ground Terminal:

This binding post allows connection of the standard to earth ground.

RATIO Multiplier Dial:

Four-position rotary dial allows selection of 1, 10, 100, and 200 ratio multiplier values.

1.0 Step RATIO Dial:

Eleven-position rotary dial allows selection of ratio values of .8, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. The .8 dial step is used for setting ratio values between 0.8 and 1.0.

0.1 Step RATIO Dial:

Eleven-position rotary dial allows selection of ratio values of 0, .1, .2, .3, .4, .5, .6, .7, .8, .9, 1.0.

0.01 Step RATIO Dial:

Eleven-position rotary dial allows selection of ratio values of 0, .01, .02, .03, .04, .05, .06, .07, .08, .09, .10.

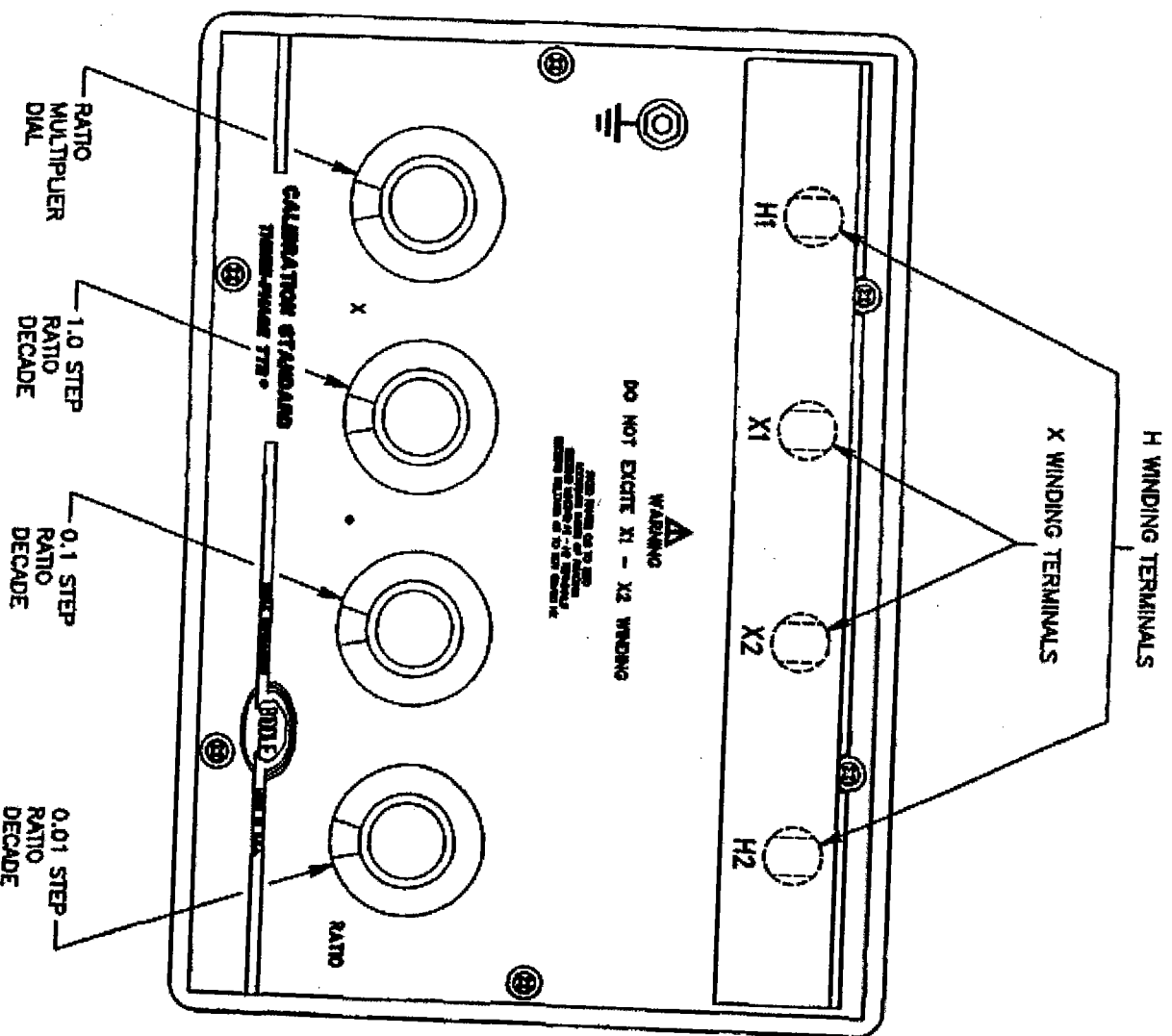


Figure 1: Control Panel

CONTROLS AND TERMINALS

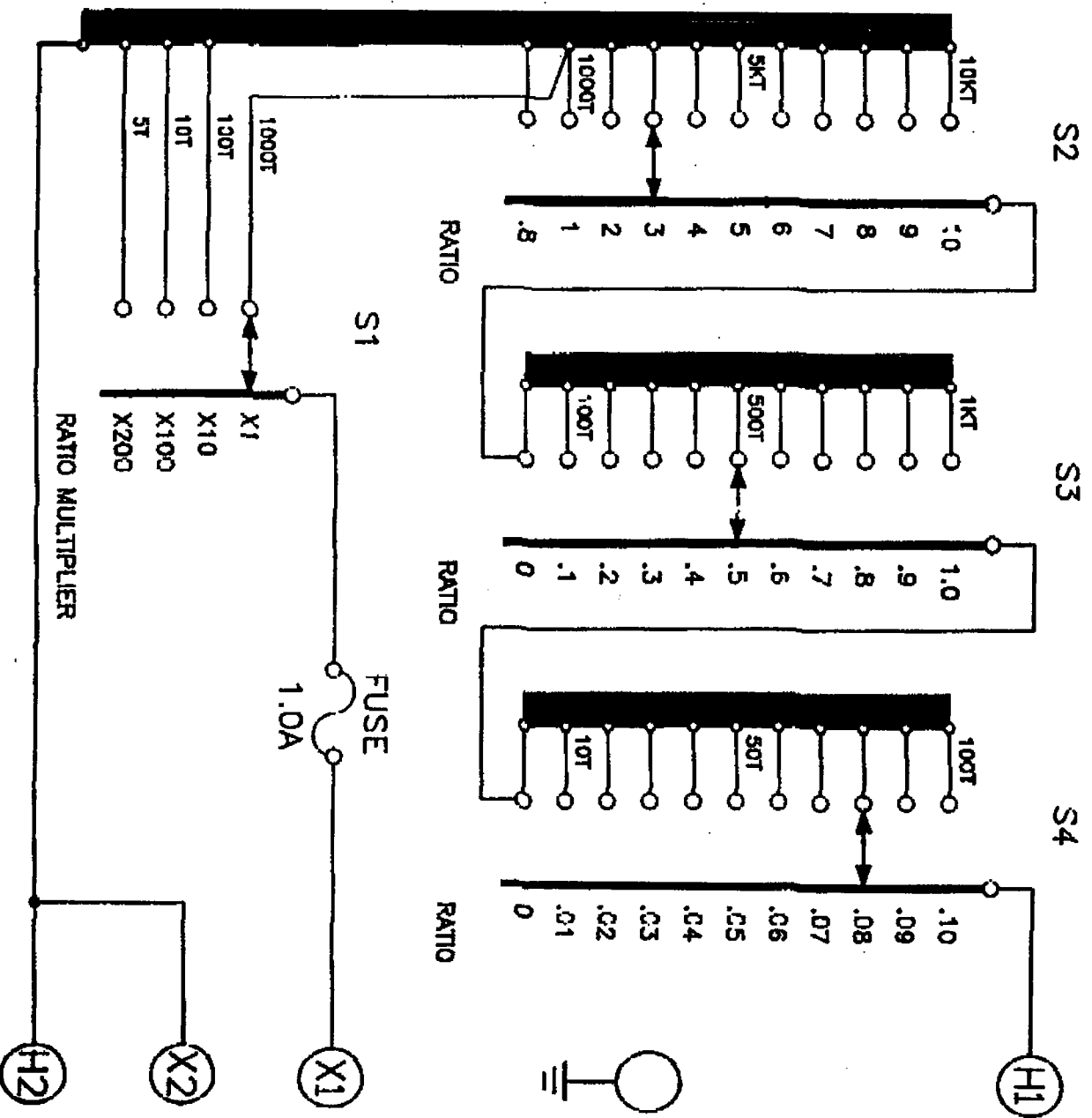


Figure 2: Calibration Standard, Simplified Schematic

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OPERATION

General

The operating procedure is based on using the Calibration Standard to check the overall operation and accuracy of Megger's Three-Phase TTR and Single-Phase TTR (TTR100) Test Sets.

A complete preliminary operation and calibration check should always be performed on a TTR test set before making any calibration checks with the standard. This will ensure that the test set is functioning properly.

Setup

Follow all safety precautions. Refer to Section 2, Safety. Figure 3 shows the setup arrangement.

1. Place the TTR test set and the Calibration Standard on a level bench or other suitable support.
2. Position the TTR test set at least 2 ft (60 cm) away from the Calibration Standard.
3. Use suitable protective barriers, barricades, for the setup.
4. Connect the wing nut ground terminal of the TTR test set to a low-impedance earth ground using the 15-ft ground lead supplied with the TTR test set.
5. Connect the ground terminal of the Calibration Standard to the ground terminal of the TTR test set using #18 AWG or heavier conductor.
6. Connect printer accessory to the TTR test set if desired. Refer to the TTR instruction manuals.
7. Using the H and X test leads supplied with the TTR test set, connect to the respective H and X winding receptacles of the TTR test set. Make sure that its connectors lock to the receptacles.

8. Connect the heavy-duty clips marked H1 and H2 of the test leads to the corresponding terminals on the Calibration Standard.

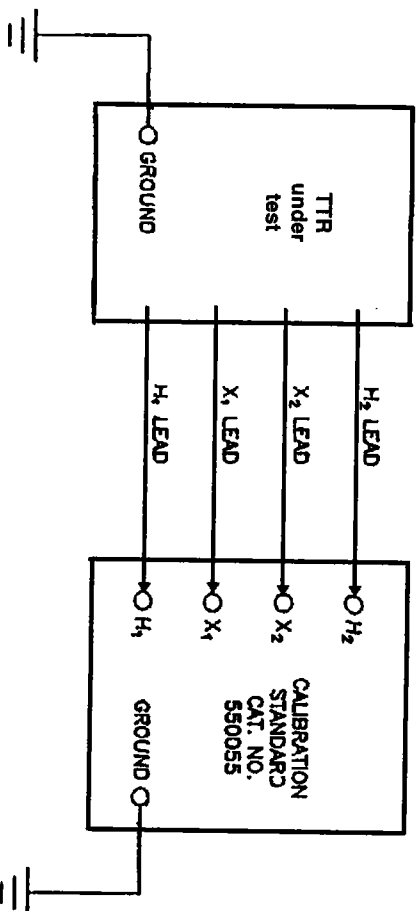


Figure 3: Test Setup for Calibration Check

9. Connect the heavy-duty clips marked X1 and X2 of the test leads to the corresponding terminals on the Calibration Standard.
10. With the TTR POWER switched off, plug input power cord into TTR panel receptacle and into three-wire grounded power outlet (for the Three-Phase TTR).

WARNING



Never interchange connections between the high (H) and low (X) voltage terminals of the Calibration Standard. Failure to observe proper connections will result in a safety hazard and may result in damage to the TTR test set or Calibration Standard.

Operation with Cat. No. 550100 TTR

Proceed only after fully understanding Section 2, Safety, and setting up the test set as described.

1. Switch TTR POWER breaker on. Ensure that the TTR test set performs a successful self-check of the test set display, calibration, and operation before proceeding to the next step. Refer to Section 5 of the TTR instruction manual.
2. Switch printer on, if used.

OPERATION

3. Set TRANSFORMER TYPE switch to 1 ϕ .
4. Set STANDARD/REVERSE switch to STANDARD.
5. Set PHASE switch to 1 ϕ .
6. If printer is used, push OFF/CLEAR/PRINT push button three times; heading will print out.
7. Set TEST VOLTAGE switch and Calibration Standard initially to the Test No. 1 settings shown in Table 1.

WARNING



High voltage will be present. Treat all terminals of the Calibration Standard as live.

8. Push START TEST push button. When test is complete, the ratio and milliampere readings will be displayed.
9. Record readings on a Calibration Check Sheet if printer accessory is not used. If printer is used, push OFF/CLEAR/PRINT push button. Readings will be printed out.
10. Repeat steps 7 through 9 for the remaining combinations of TEST VOLTAGE and Calibration Standard dial settings as shown in Table 1. A total of 30 readings should be obtained.
11. Examine the recorded or printed out readings. The readings for a new test set should be within the tolerances indicated in Table 1. Retain copy of recorded or printed out readings as permanent record. Record the test set and Calibration Standard serial numbers, date, and operator's name on record.
12. Switch POWER breaker off, then disconnect all test cables.

CAUTION



The Calibration Standard must not be used with ac excitation voltages greater than 130 V rms applied across the H1-H2 terminals.

Any use on dc circuits, except for troubleshooting resistance checks with a digital multimeter will void the calibration certification.

Table 1: Cat. NO. 550100 Three-Phase TRR Calibration Check

Test No.	Test Voltage	Cal Std Setting	Ratio		Milliamp Hi Tol
			Lo Tol	Hi Tol	
1	40	.90	0.8991	0.9009	012
2	40	1.00	0.9990	1.0010	008
3	40	2.00	1.9980	2.0020	004
4	40	4.00	3.9960	4.0040	004
5	40	7.00	6.9930	7.0070	004
6	40	10.0	09.990	10.010	008
7	40	20.0	19.980	20.020	004
8	40	40.0	39.960	40.040	004
9	40	70.0	69.930	70.070	004
10	40	100	099.90	100.10	008
11	40	200	199.80	200.20	004
12	40	400	399.60	400.40	004
13	40	700	699.30	700.70	004
14	40	1000	0997.0	1003.0	002
15	40	2000	1994.0	2006.0	002
16	120	.90	0.8991	0.9009	020
17	120	1.00	0.9990	1.0010	016
18	120	2.00	1.9980	2.0020	006
19	120	4.00	3.9960	4.0040	004

OPERATION

Test No.	Test Voltage	Cal Std Setting	Ratio		Milliamp Hi Tol
			Lo Tol	Hi Tol	
20	120	7.00	6.9930	7.0070	004
21	120	10.0	09.990	10.010	016
22	120	20.0	19.980	20.020	006
23	120	40.0	39.960	40.040	004
24	120	70.0	69.930	70.070	004
25	120	100	099.90	100.10	016
26	120	200	199.80	200.20	006
27	120	400	399.60	400.40	004
28	120	700	699.30	700.70	004
29	120	1000	0999.0	1001.0	004
30	120	2000	1994.0	2006.0	004

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SERVICE

Troubleshooting

Service to the Calibration Standard should only be performed by qualified personnel who are familiar with the hazards involved in checking electrical circuitry. Circuit repairs should not be attempted in the field. Refer to Section 7 for a list of replaceable parts. The following are the recommended tests to be made on a Calibration Standard for verifying trouble. The only equipment required is a 120 V, 50/60 Hz voltage source, whose output can be current limited to 50 mA, and a digital multimeter having an ohms range up to 10 k Ω and a low ac milliamperere range of 20 mA full scale.

If unable to obtain an output voltage between the X1 and X2 terminals when the H1-H2 winding is excited, check internally for a blown-out fuse. The fuse is used to help protect the reference transformer winding in the event of an incorrect connection between the high (H) and low (X) voltage windings.

X Winding Resistance Measurement

The X winding resistance can be checked by connecting the digital multimeter between the X1 and X2 terminals. The approximate resistance values for each ratio multiplier setting are shown in Table 2. Check for a blown-out fuse if all four dial settings indicate an open circuit.

Table 2: Resistance Values for Multiplier Dial Settings

Ratio Multiplier Dial Setting	Approximate Resistance (Ω)
X 1	60
X 10	6
X 100	1
X 200	0.5

H Winding Resistance Measurement

The H winding resistance can be checked by connecting the digital multimeter between the H1 and H2 terminals. The approximate resistance values for each ratio setting are shown in Table 3.

Table 3: Resistance Values for Ratio Dial Settings

Ratio Dial Setting	First* Ratio Dial Resistance (Ω)	Second* Ratio Dial Resistance (Ω)	Third* Ratio Dial Resistance (Ω)
.8	48	-	-
1	60	68	60.5
2	215	76	61.0
3	375	84	61.5
4	535	92	62.0
5	700	100	62.5
6	880	108	63.0
7	1050	116	63.5
8	1250	124	64.0
9	1450	132	64.5
10	1600	140	65.0

*When checking first dial, set second and third dials to 0. When checking second or third dial, set first dial to 1 and other dial to 0.

Magnetizing Current Measurement

Magnetizing current can be measured to indicate the condition of the reference transformer core. At 120 V, 50/60 Hz, and a ratio setting of 1.00, it is normally about 5 mA.

Mechanical or electrical abuse of the reference transformer will reduce its quality so that the magnetizing current will increase. If the magnetizing current is found to be in excess of 20 mA, it is advisable to send the Calibration Standard back to the factory for inspection.

To measure the magnetizing current, connect the current limited 120 V, 50/60 Hz voltage source to the H1 and H2 terminals of the Calibration Standard with the digital multimeter in series between one of the terminals of the voltage source and standard. The digital multimeter should be set to the 20 mA range.

Routine Maintenance

The Calibration Standard is sturdily constructed and requires no periodic maintenance. It is to be used as a standard and should be treated as a standard. An occasional visual inspection and cleaning of the case and control panel is sufficient. The control panel and case can be cleaned with detergent and water. Water must not be allowed to penetrate panel holes because it may adversely effect internal components. An all-purpose spray cleaner may also be used. Polish with a soft, dry cloth.

Calibration

A calibration check of the Calibration Standard should be made normally once every two years. It is recommended that the Calibration Standard be returned to Megger for this check.

Repair

Megger offers a complete repair service and recommends that its customers take advantage of this service in the event of equipment malfunction. Equipment returned for repair should be shipped prepaid and insured and marked for the attention of the Repair Department. Please indicate all pertinent information including problem symptoms and attempted repairs. The catalog number and serial number of the standard should be specified. Pack the instrument in a carton (original shipping carton if available) with adequate dunnage in accordance with best commercial practice. Seal the carton with waterproof tape.

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REPLACEABLE PARTS LIST

Description	Vendor P/N	Megger P/N
Casandlid (complete)	-	18845-1
Handle, case (Bruce)	0861-0014	23103
Latch, case, black (Southco Inc)	07-10-205-12	18976
Feet, case, black (3MCo)	SJ-5023	5599-1
Screw, panel, beige hd	-	23303-3
Binding post (Superior Elect)	BP-30-GP10	11166-4
Dial knob (1, 10, 100, 200)	-	26767-2
Dial knob (.8, 1, 2,...8, 9, 10)	-	26767-1
Dial knob (0 to 10)	-	26767
Fuse, 1ASlo-Blo	BussmanMDL, Littlefuse313	2567-19
Fuse holder (Littlefuse)	155120U	29619
Instruction Manual	-	AVTM55-5J

GLOSSARY

Use only in accordance with Instruction Manual.

Grounding procedures must be followed.

TTR Transformer turn ratio; a registered trademark of Megger

turn ratio The ratio of the number of turns in a higher voltage winding to that in a lower voltage winding.

WARRANTY

Products supplied by Megger are warranted against defects in material and workmanship for a period of one year following shipment. Our liability is specifically limited to replacing or repairing, at our option, defective equipment. Equipment returned to the factory for repair must be shipped prepaid and insured. This warranty does not include batteries, lamps, or similar items, where the original manufacturer's warranty shall apply. We make no other warranty. The warranty is void in the event of abuse (failure to follow recommended operating procedures) or failure by the customer to perform specific maintenance as indicated in this manual.