

# \*TB 9-6625-2408-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

## CALIBRATION PROCEDURE FOR CLAMP METERS FLUKE MODELS 333, 334, 335, 336 AND 337

Headquarters, Department of the Army, Washington, DC

5 May 2010

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### REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

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\*This bulletin supersedes TB 9-6625-2408-24, dated 16 February 2010, including all changes.

**SECTION I  
IDENTIFICATION AND DESCRIPTION**

**1. Test Instrument Identification.** This bulletin provides instructions for the calibration of Clamp Meters, Fluke Models 333, 334, 335, 336 and 337. The manufacturers' manuals were used as the prime data sources in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

**a. Model Variations.** Variations among models are described in text.

**b. Time and Technique.** The time required for this calibration is approximately 1 hour, using the dc and low frequency technique.

**2. Forms, Records, and Reports**

**a.** Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

**b.** Adjustments to be reported are designated (R) at the end of the sentence in which they appear. When adjustments are in tables, the (R) follows the designated adjustment. Report only those adjustments made and designated with (R).

**3. Calibration Description.** TI parameters and performance specifications which pertain to this calibration are listed in table 1.

Table 1. Calibration Description

Test instrument parameters		Performance specifications
DC voltage:	All models	Range: 0 to 600 V DC Accuracy: $\pm(1.0\%$ of rdg + 5 dgts)
AC voltage:	Models 333, 334, 335	Range: 0 to 600 V AC 50/60 Hz Accuracy: $\pm(1.0\%$ of rdg + 5 dgts)
	Models 336, 337	Range: 0 to 600 V AC 20 Hz to 100 Hz Accuracy: $\pm(1.0\%$ of rdg + 5 dgts) 100 Hz to 400 Hz Accuracy: $\pm(6.0\%$ of rdg + 5 dgts)
DC Current:	Models 336, 337 Only	Range: 0 to 600 A DC (Model 336) 0 to 1000 A DC (Model 337) Accuracy: $\pm(2.0\%$ of rdg + 5 dgts)
AC Current:	Models 333, 334, 335	Range: 0 to 400 A AC (Model 333) 0 to 600 A AC (Model 334, 335) 50/60 Hz Accuracy: $\pm(2.0\%$ of rdg + 5 dgts)
	Models 336, 337	Range: 0 to 600 A AC (Model 336) 0 to 1000 A AC (Model 337) 10 Hz to 100 Hz Accuracy: $\pm(2.0\%$ of rdg + 5 dgts) 100 Hz to 400 Hz Accuracy: $\pm(6.0\%$ of rdg + 5 dgts)
Resistance:	All models	Range: 0 to 6000 $\Omega$ 0 to 600 $\Omega$ (Model 333) Accuracy: $\pm(1.5\%$ of rdg + 5 dgts)
Frequency:	Model 337 Only	Range: 0 to 400 Hz Current Only Accuracy: $\pm(0.5\%$ of rdg + 5 dgts) Sensitivity: 10Hz to 100 Hz $\geq 5$ A AC 5 Hz to 10 Hz and 100 Hz to 400 Hz $>10$ A AC

**SECTION II  
EQUIPMENT REQUIREMENTS**

**4. Equipment Required.** Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards Set AN/GSM-286; AN/GSM-287; or AN/GSM-705. Alternate items may be used by the calibrating activity. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, the actual accuracy of the equipment selected is shown in parenthesis.

**5. Accessories Required.** The accessories required for this calibration are common usage accessories issued as indicated in 4 above, and are not listed in this calibration procedure. The following peculiar accessories are also required for this calibration: Fluke, Model 5500A/Coil.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
CALIBRATOR	Dc voltage: Range: 0 to 600 V Accuracy: $\pm 0.25\%$ Ac voltage Range: 0 to 600 V Frequency: 10 Hz to 400 Hz Accuracy: $\pm 0.25\%$ Dc Current Range: 0-11 A Accuracy: Dc A $\pm 0.5\%$ Ac Current Range: 0-11 A Frequency: 50Hz to 400 Hz Accuracy: Ac A $\pm 0.5\%$ Resistance Range: 0-6k $\Omega$ Accuracy: $\pm 0.375\%$	Fluke, Model 5720A (5720A) (p/o MIS-35947); w amplifier, Fluke 5725A/AR (5725A/AR)

**SECTION III  
CALIBRATION PROCESS**

**6. Preliminary Instructions**

**a.** The instructions outlined in paragraphs 6 and 7 are preparatory to the calibration process. Personnel should become familiar with the entire bulletin before beginning the calibration.

**b.** Items of equipment used in this procedure are referenced within the text by common name as listed in table 2.

c. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration. Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturers' manuals for this TI.

d. Unless otherwise specified, all control and control settings refer to the TI.

**7. Equipment Setup:** Set TI function switch to **V $\Omega$** .

**WARNING**

HIGH VOLTAGE is used or exposed during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

**8. Dc Voltage**

**a. Performance Check**

(1) Connect calibrator to TI **V $\Omega$**  and **COM** inputs.

(2) Set calibrator output for 19 V. TI will indicate within limits specified in first row of table 3.

(3) Repeat technique of (2) above, using settings and indications listed in table 3. TI will indicate within limits specified in table 3.

Table 3. Dc Voltage Accuracy

Calibrator		Test instrument			
Output (Dc)		Min		Max	
19	V	18.3	V	19.7	V
-19	V	-18.3	V	-19.7	V
190	V	187.6	V	192.4	V
-190	V	-187.6	V	-192.4	V
420	V	415.3	V	424.7	V
-420	V	-415.3	V	-424.7	V
540	V	534.1	V	545.9	V
-540	V	-534.1	V	-545.9	V

(4) Set calibrator output to minimum.

**b. Adjustments.** No adjustments can be made.

**9. Ac Voltage**

**a. Performance Check**

(1) Connect calibrator to TI **V $\Omega$**  and **COM** inputs.

(2) Set TI function switch to **V $\sim$** .

(3) Set calibrator for an output of 19 V at a frequency of 50 Hz. If TI does not indicate within limits specified in first row of table 4, perform **b** below.

(4) Repeat technique of (3) above for settings and indications listed in table 4. If TI does not indicate within limits specified in table 4, perform **b** below.

Table 4. Ac Voltage Accuracy

TI Model #	Calibrator output				Test instrument indications					
	Amplitude		Frequency		Range		Min		Max	
All Models	19	V	50	Hz	600	V	18.3	V	19.7	V
333, 334, 335	540	V	50	Hz	600	V	534.1	V	545.9	V
All Models	540	V	60	Hz	600	V	534.1	V	545.9	V
336, 337	540	V	400	Hz	600	V	507.1	V	572.9	V

**b. Adjustments**

- (1) Remove the two screws on the bottom of TI and lift off top case.
- (2) Set TI function switch to V~.
- (3) Set calibrator for an output of 600.0 V at a frequency of 50 Hz.
- (4) Adjust **R12** as indicated in figure 1 below until TI reads  $600.0 \pm 1.0$  V (R).

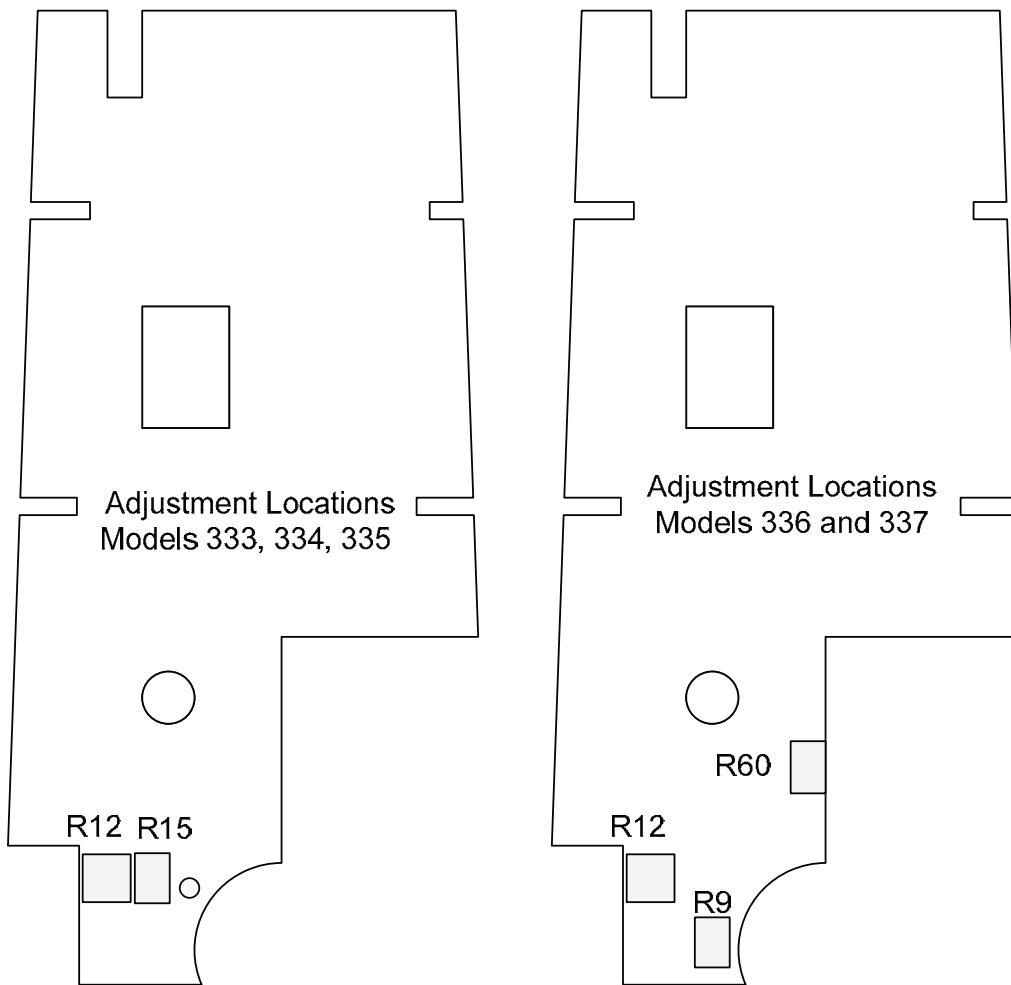


Figure 1. TI adjustment locations.

- (5) Set calibrator output to minimum.

**10. Dc Current**

**a. Performance Check (Models 336 and 337 only)**

- (1) Connect calibrator to current coil.
- (2) Set function switch to **A $\text{---}$** .
- (3) Position TI clamp so it is centered on current coil.
- (4) Set calibrator output for 0.4 A. If TI does not indicate within limits specified in first row of table 5, perform **b** below.
- (5) Repeat technique of (4) above, using settings and indications listed in table 5. If TI does not indicate within limits specified in table 5, perform **b** below.

Table 5. Dc Current Accuracy (A)

Calibrator Output	Test instrument					
	Range <sup>1</sup>		Min		Max	
0.4 A	600	A	19.1	A	20.9	A
-0.4 A	600	A	-19.1	A	-20.9	A
10.8 A <sup>2</sup>	600	A	528.7	A	551.3	A
-10.8 A	600	A	-528.7	A	-551.3	A

<sup>1</sup>1000 Amp range for model 337.

<sup>2</sup>Disconnect calibrator and connect amplifier to current coil.

**b. Adjustments**

- (1) Remove the two screws on the bottom of TI and lift off top case.
- (2) Set TI function switch to **A $\text{---}$** .
- (3) Adjust **R60** as indicated in figure 1 above until TI reads 0.0A  $\pm$  2.0 A (R).

**11. Ac Current**

**a. Performance Check**

- (1) Connect calibrator to current coil.
- (2) Set TI function switch to **A $\sim$** .
- (3) Position TI clamp so it is centered on current coil.
- (4) Set calibrator output for 0.4 A at 60 Hz (50 Hz for models 333, 334, and 335). If TI does not indicate within limits specified in appropriate row of table 6, perform **b** below.
- (5) Repeat technique of (4) above, using settings and indications listed in table 6. If TI does not indicate within limits specified in table 6, perform **b** below.

Table 6. Ac Current Accuracy (A)

TI Model #	Calibrator		Test instrument			
	Output	Frequency	Range <sup>1</sup>	Min	Max	
333, 334, 335	0.4 A	50 Hz	400/600 A	19.1 A	20.9 A	
All Models		60 Hz	600/1000 A	19.1 A	20.9 A	
336, 337		400 Hz	600/1000 A	18.3 A	21.7 A	
333, 334, 335	7.2 A <sup>2</sup>	50 Hz	400/600 A	352.3 A	367.7 A	
333, 334, 335		60 Hz	400/600 A	352.3 A	367.7 A	
336, 337	10.8 A <sup>2</sup>	60 Hz	600/1000 A	528.7 A	551.3 A	
336, 337		400 Hz	600/1000 A	507.1 A	572.9 A	

<sup>1</sup>400/600/1000 Amp ranges are for models 333/334,335,336/337 respectively.

<sup>2</sup>Disconnect calibrator and connect amplifier to current coil.

**b. Adjustments**

- (1) Remove the two screws on the bottom of TI and lift off top case.
- (2) Set TI function switch to **A~**.
- (3) Connect calibrator/amplifier to current coil.
- (4) For models 336 and 337, set calibrator for an output of 2.0A at a frequency of 50 Hz. Proceed to step **b** (7).
- (5) For models 333, 334 and 335, set calibrator for an output of 4.0A at a frequency of 50 Hz.
- (6) Adjust **R15** as indicated in figure 1 above until TI reads  $200 \text{ A} \pm 0.5 \text{ A}$ . Proceed to step **b** (9) (R).
- (7) Note measurement with coil wire at top and bottom of TI jaw opening.
- (8) Adjust **R9** as indicated in figure 1 above until difference noted in **b** (7) above is less than 1.0 A (R).
- (9) Set calibrator output to minimum.

**12. Resistance****a. Performance Check**

- (1) Connect calibrator to TI **V  $\Omega$**  and **COM** inputs.
- (2) Set TI function switch to  **$\Omega$** .
- (3) Set calibrator for a 190  $\Omega$  nominal output and set 2 wire comp to on.
- (4) Rotate calibrator knob below EDIT FIELD pushbutton to adjust calibrator display indication to equal TI indication. Calibrator Err display will indicate within limits specified in table 7.
- (5) Repeat technique of (3) and (4) above, using calibrator outputs and TI indications listed in table 7. Calibrator Err display will indicate within limits specified in table 7.

Table 7. Resistance Accuracy

Test instrument	Calibrator	
	Nominal output	Err indication $\pm$ (%)
600 $\Omega$ <sup>1</sup>	190 $\Omega$	1.7632
6 k $\Omega$	1.9 k $\Omega$	1.7632

<sup>1</sup>For Model 333, perform only this range.

- (6) Set calibrator output to minimum.

**b. Adjustments.** No adjustments can be made.

**13. Frequency****a. Performance Check (Model 337 Only)**

- (1) Connect calibrator to current coil.
- (2) Set TI function switch to **Hz**.
- (3) Position TI clamp so it is centered on current coil.

(4) Set calibrator output for 0.1 A at 10 Hz. TI will indicate within limits specified in first row of table 8.

(5) Repeat technique of (4) above, using settings and indications listed in table 8. TI will indicate within limits specified in table 8.

Table 8. Frequency Accuracy

Calibrator output		Test instrument indication (Hz)			
Output <sup>1</sup>		Frequency		Min	Max
0.1	A	10	Hz	9.4 Hz	10.6 Hz
0.5	A	90	Hz	89.0 Hz	91.0 Hz
1.0	A	390	Hz	387.5 Hz	392.5 Hz

<sup>1</sup>Increase applied current as required to obtain a stable display on TI.

(6) Set calibrator output to minimum and disconnect equipment setup.

**b. Adjustments.** No adjustments can be made.

**14. Final Procedure**

**a.** Deenergize and disconnect all equipment.

**b.** Annotate and affix DA label/form in accordance with TB 750-25.



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Secretary of the Army*

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To: <2028@redstone.army.mil

Subject: DA Form 2028

1. **From:** Joe Smith
2. **Unit:** home
3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-2840-229-23
9. **Pub Title:** TM
10. **Publication Date:** 04-JUL-85
11. **Change Number:** 7
12. **Submitter Rank:** MSG
13. **Submitter FName:** Joe
14. **Submitter MName:** T
15. **Submitter LName:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 2
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
26. **Total:** 123
27. **Text**

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