CHANGE

NO. 1

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DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 21 April 1989

CALIBRATION PROCEDURE
FOR ENVIRONMENT CONTROL TEST SET,
NSN 4920-00-111-5372
GRUMMAN MODEL A/E24T-102

TB 55-4920-346-34, 8 June 1987, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove Pages	Insert Pages
7 through 12	7 through 12

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

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WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR ENVIRONMENT CONTROL TEST SET, NSN 4920-00-111-5372 GRUMMAN MODEL A/E 24T-102

Headquarters, Department of the Army, Washington, D.C.
8 JUNE 1987

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REPORTING ERRORS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Aviation Systems Command, ATTN: AMSAV- MPSD, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished to you.

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*This bulletin supersedes TB 55-4920-346-34, 22 August 1972, including all changes.

SECTION I

IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of environment control test set, Grumman, Model A/E 24T-102. The manufacturer's manual was used as the prime data source in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. None.

b. Time and Technique. The time required for this calibration is approximately 6 hours, using the DC technique.

2. DA Form 2416 (Calibration Data Card).

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25. DA Form 2416 must be annotated in accordance with TB 750-25 for each calibration performed.

b. Adjustments to be reported on DA Form 2416 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
Input voltages	115 vac± 10 v. 400 Hz± 20 HZ
Inductors	12.25 vac ± 0.25 v
Meter phase voltage	110 vac ± 2.0 v
Milliamps	0-360 ma ac± 5.0 FS 0-500 ma dc± 5.0 FS
Temperature simulator Sensor simulator	0-99 K ohms± 0.5% 0-99 K ohms± 0.5%

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-287. Alternate items may be used by the calibrating activity when the equipment listed in table 2 is not available. 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.

5. Accessories Required. The accessories listed in table 3 are issued as indicated in paragraph 4 above and are used in this calibration procedure. When necessary, these items may be substituted by equivalent items, unless specifically prohibited.

Table 2. Minimum Specifications of Equipment Required

Item	Common Name	Minimum Use Specifications	Manufacturer and Model (Part Number)
A1	Signal Generator	Range: 0-115 vac 0-400 Hz	Krohn Hite, Model 4100R W/7500 Amplifier
A2	Voltmeter	Range: 0-115 vac Accuracy: ± 0.2% Range: 0-90 Kohms Accuracy: ± 0.5%	Hewlett-Packard, Model 3490A
A3	Electronic Counter	Range: 0-1 KHz Accuracy: 0.25%	Hewlett-Packard, Model 5345A
A4	Meter Calibrator	Range: 0-600 ma ac/dc Accuracy: 0.5%	John Fluke, Model 760

Table 3. Accessories Required

Item	Common Name (Official Nomenclature)	Description (Part Number)
B1	Cable Assembly	36-in. RG-5810 BNC to double banana plugs
B2	Test lead ✓1	24-in. No. 18 lead single banana plugs terminations (red)
B3	Test lead ✓1	24-in. No. 18 lead single banana plugs terminations (black)
B4	Adapter ✓1	Banana Jack to pin tip (1432 = 0)
B5	Adapter ✓2	Banana Jack to alligator clip (2240-0)
B6	Adapter	Test Prod #6 Banana Jack to miniature hook (4724-B)
B7	Adapter connector ✓2	Banana plug to cannon plug pin (3560 black)
B8	Adapter connector	Banana plug to cannon jack 3561-0 (red)
B9	Adapter box	SK-D-4850-3

✓1 Three required
✓2 Four required

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 and item identification number as listed in tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, refer to table 2, and for prefix B, refer to table 3.

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.

NOTE

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 manufacturer's manual for this TI.

NOTE

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

7. Equipment Setup

a. Remove the test instrument from case by loosening the fourteen (14) panel mounting screws.

b. Set the test instrument on a workbench in the upright position.

c. Set all toggle switches on the test instrument to their normal OFF position.

CAUTION

Test equipment power will be switched off before making or removing jumper and/or test equipment connections.

8. Inductors

a. Performance Check.

(1) Connect equipment as shown in figure 1.

(2) Adjust signal generator (Al) for 400 Hz ± 1 Hz on counter (A3) and output control for 18 vac as indicated on voltmeter (A2).

(3) Disconnect voltmeter test lead (B2) only from signal generator and connect to test instrument terminal E36 on terminal board, using adapter (B6).

(4) Voltmeter will indicate between 12 and 12.5 vac. If not, perform b(1).

(5) Disconnect signal generator test lead from L1 pin 1 and connect to L2 pin 1. Remove voltmeter test lead from terminal E36 and connect to E35.

(6) Voltmeter will indicate between 12 and 12.5 vac. If not, perform b(2).

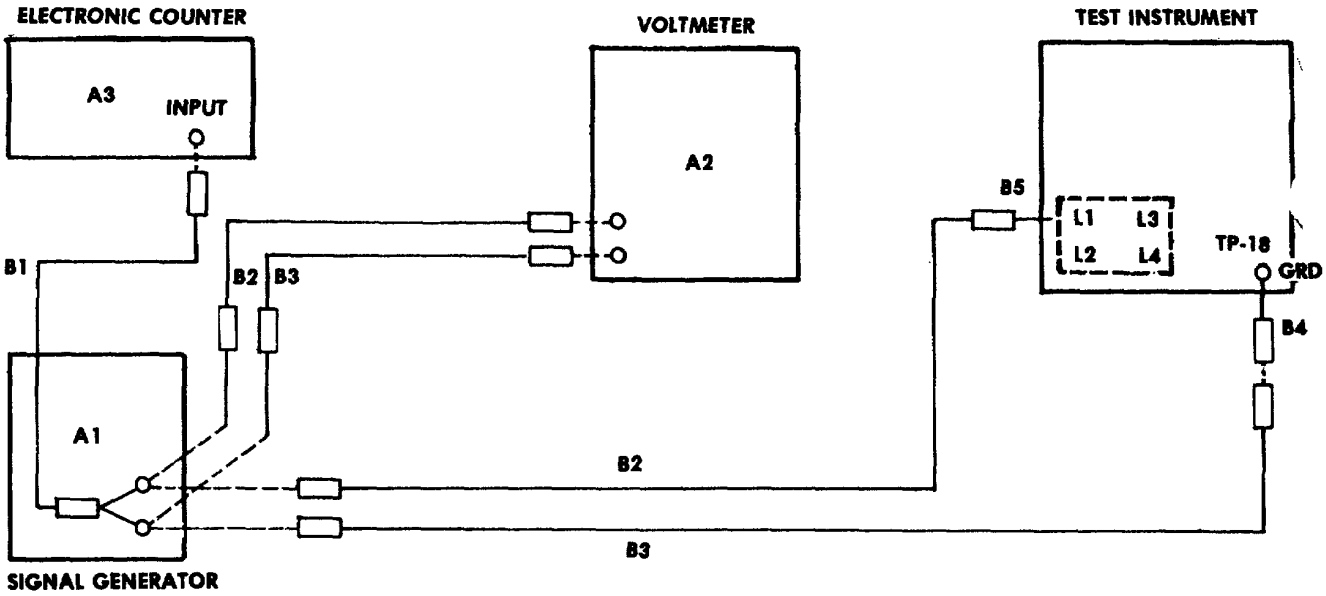

Figure 1. Inductor Equipment Setup (Front View)

(7) Disconnect signal generator test lead from L2 pin 1 and connect to L3 pin 2. Remove voltmeter test lead from terminal E35 and connect to E32.

(8) Voltmeter will indicate between 12 and 12.5 vac. If not, perform b(3) below.

(9) Disconnect signal generator test lead from L3 pin 2 and connect to L4 pin 2. Remove voltmeter test lead from terminal E32 and connect to E31.

(10) Voltmeter will indicate between 12 and 12.5 vac. If not perform b(4) below.

(11) Disconnect test equipment.

b. Adjustments

(1) Adjust inductor L1 for 12.25 vac.

(2) Adjust inductor L2 for 12.25 vac.

(3) Adjust inductor L3 for 12.25 vac.

(4) Adjust inductor L4 for 12.25 vac.

9. Meter Phase

a. Performance Check.

(1) Connect a test lead (B2) between potentiometer R7 and terminal E15 as shown in figure 2, using two adapters (B5).

(2) Connect equipment as shown in figure 3.

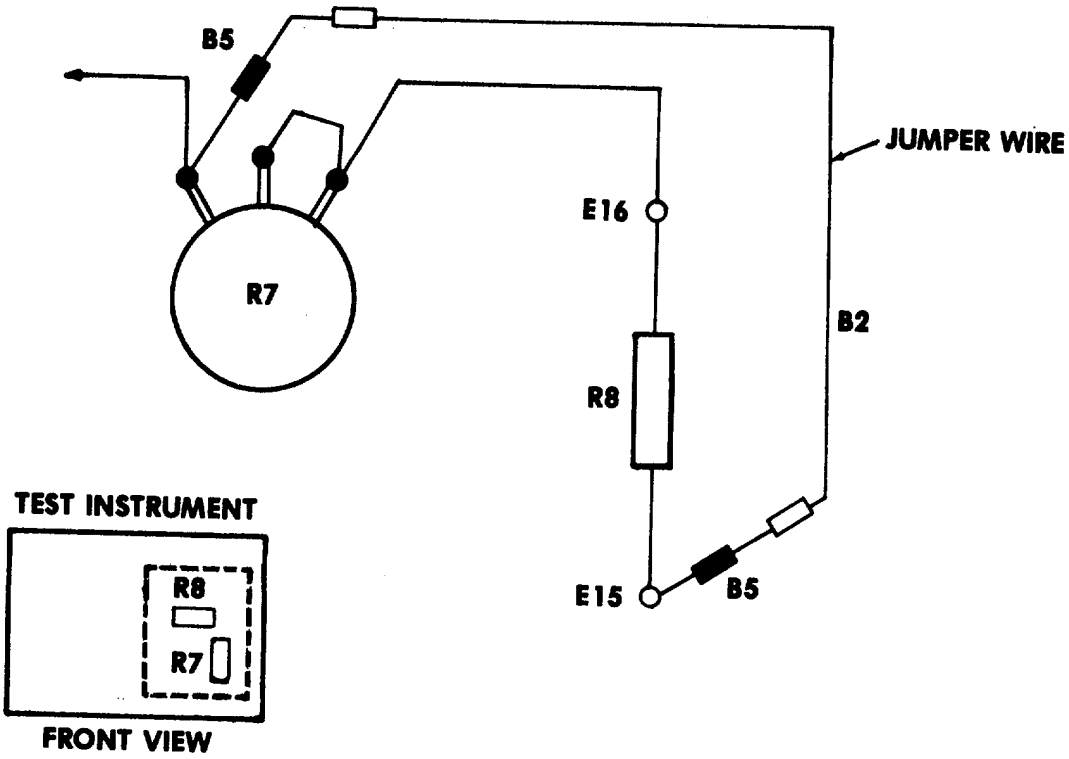

Figure 2. Meter Phase Circuit Jumper Setup

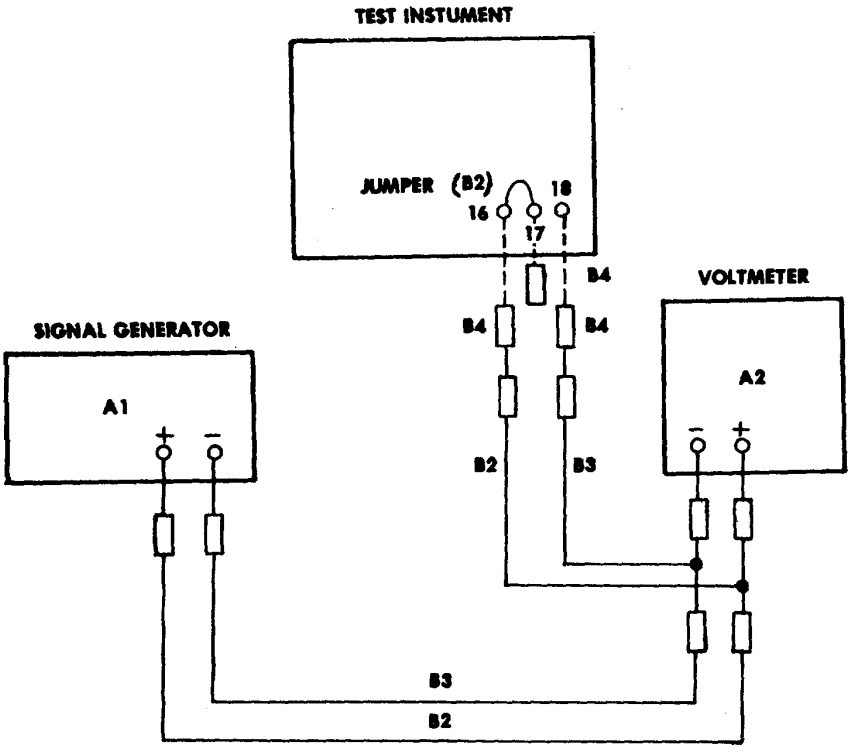

Figure 3. Meter Phase Circuit Equipment Setup

(3) Position the test instrument controls as follows:

(a) METER switch to INTERNAL.

(b) METER MODE to AC VOLTS-VAR 0

(4) Turn on signal generator (Al) power, allow proper warm-up. Adjust FREQ control for 400 Hz and OUTPUT control for 110 vac ± 0.2 volts as indicated on voltmeter (A2).

5) Depress and hold the CALIBRATE pushbutton on the test instrument.

(6) Test instrument meter must indicate LEAD 180. If not, perform b(1) below.

(7) Decrease OUTPUT of signal generator to zero and disconnect jumper wire from R7 and terminal E15.

(8) Adjust signal generator OUTPUT to 110 vac ± 0.2 volts as indicated on voltmeter.

(9) Depress and hold the CALIBRATE pushbutton on the test instrument. The test instrument meter will indicate in the center of the RED area on the scale. If not, perform b(2) below.

(10) Release CALIBRATE pushbutton. Test instrument will indicate 110 ± 2.0 volts. Set METER MODE selector to AC VOLTS-REF 0 and observe that the test instrument meter reads the same voltage. If not, perform b(3) below.

(11) Disconnect equipment from the test instrument.

(12) Connect 115 vac, 400 Hz input power to TI, as shown in figure 4, using signal generator (A1).

(13) Connect a 2-phase power source as shown in figure 4.

(14) Set METER MODE selector on the test instrument to PHASE ANGLE.

(15) Set 115 vac POWER switch to ON.

(16) Test instrument meter pointer deflects to LAG side of zero. (Note location of meter pointer.)

(17) Set all power to OFF and reverse the connections to test points 16 and 17.

(18) Set all power to ON. Test instrument meter pointer deflects to LEAD side of zero. (Note location of meter pointer.)

(19) The reading in steps (16) and (18) above will be equal in Phase Angle, one leading and one lagging. If not, perform b(4).

(20) Set all power to OFF and remove all test and power connections.

b. Adjustments.

(1) Adjust potentiometer R6 for an indication of 180.

(2) Adjust potentiometer R7 for red center area on the scale.

(3) Adjust potentiometer R4 for an average reading between the two METER MODE SELECTOR settings AC VOLTS-REF 0 and AC VOLTS-VAR 0.

(4) Adjust potentiometer R13 for equal deflection on both sides of center zero. Reversing test leads from test points 16 and 17 as necessary. Adjust R13 when phase A is in TP-16.

10. AC Milliamp

a. Performance Check.

(1) Connect equipment as shown in Figure 5.

(2) Set the METER MODE selector to AC MILLIAMPS and METER to the INTERNAL position on the test instrument.

(3) Set meter calibrator (A4) output controls to amps, 400 Hz position.

(4) Adjust the current controls on the meter calibrator for an indication of 100 MA on the test instrument. Meter calibrator will indicate between 82 and 118 MA.

(5) Adjust the current controls on the meter calibrator for each test instrument indication as listed in table 4. Meter calibration will indicate within the limits specified.

(6) Set all power to OFF.

b. Adjustment. No adjustments can be made.

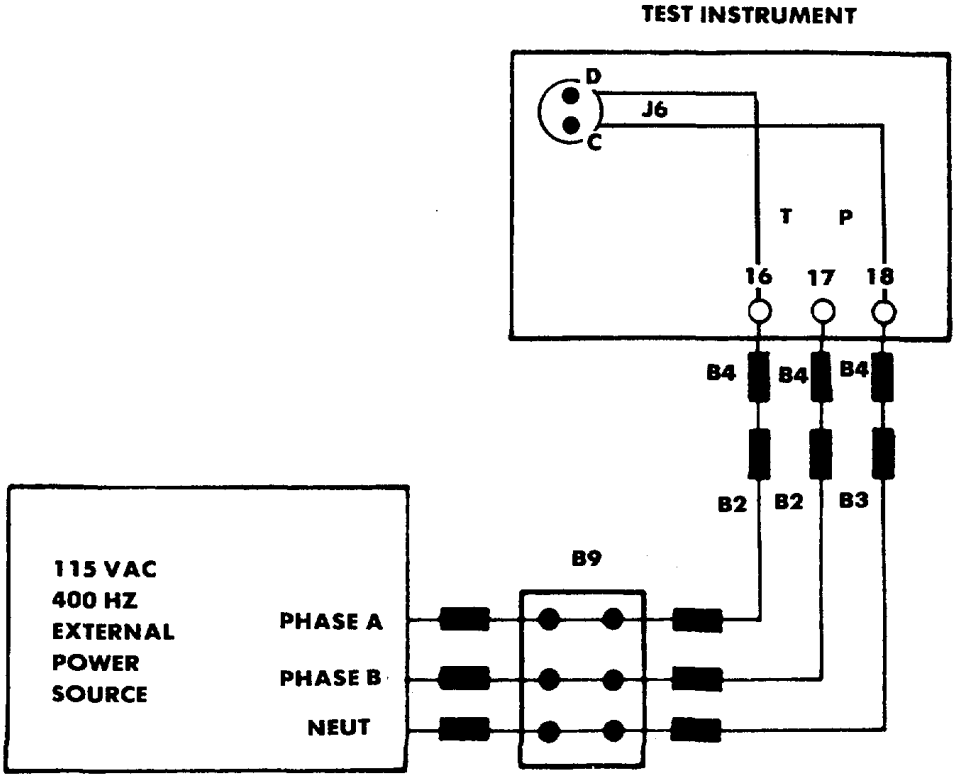

Table 4. AC Milliamp

Test Instrument Indication (MA)	Meter Calibrator Indication (MA)	
	Min	Max
200	182	218
300	282	318
360	342	378

11. DC Milliamp

a. Performance Check

(1) Connect equipment as shown in Figure 6.

(2) Set the METER MODE selector to DC MILLIAMPS and METER to the INTERNAL position on the test instrument.

(3) Set the meter calibrator (A4) output controls to amps DC position.

(4) Adjust the current controls on the meter calibrator for an indication of 100 MA on the test instrument. Meter calibrator will indicate between 75 and 125 MA.

(5) Adjust the current controls on the meter calibrator for each test instrument indication as listed in table 5.. Meter calibrator will indicate within the limits specified.

(6) Set all power to OFF and disconnect test equipment.

b. Adjustments. No adjustments can be made.

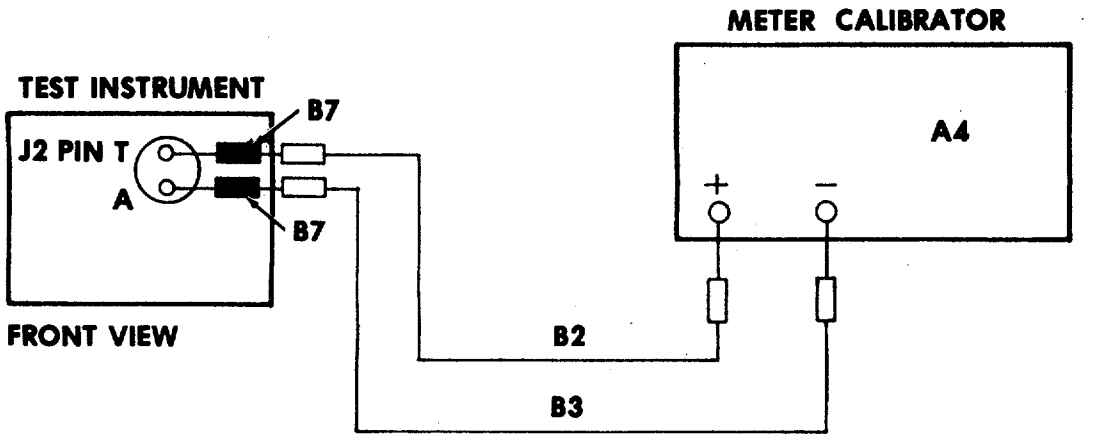

Figure 5. AC Milliamp Equipment Setup

Table 5. D.C. Milliamp

Test Instrument Indication (MA)	Meter Calibrator Indication (MA)	
	Min	Max
200	175	225
300	275	325
400	375	425
500	475	525

12. Simulators (Temp and Sensor).

a. Performance Check. (Figure 6 and Figure 7)

(1) Connect equipment as shown in figure 6. Check test leads resistance and record.

(2) Set the TEMPERATURE CONTROL SIMULATOR to 00100.0 on the test instrument.

(3) The voltmeter (A2) shall indicate within the limits specified in table 6, after substracting the lead resistance recorded in (1) above.

(4) Repeat the above check for each of the test instrument TEMPERATURE CONTROL settings listed in table 6.

(5) Disconnect test leads from TP-31 and 32 and connect to TP-39 and 40.

(6) Set the SENSOR SIMULATOR to 00100.0 on the test instrument.

(7) Repeat steps (3) through 4 above, using SENSOR CONTROL settings in table 6.

b. Adjustments. No adjustments can be made.

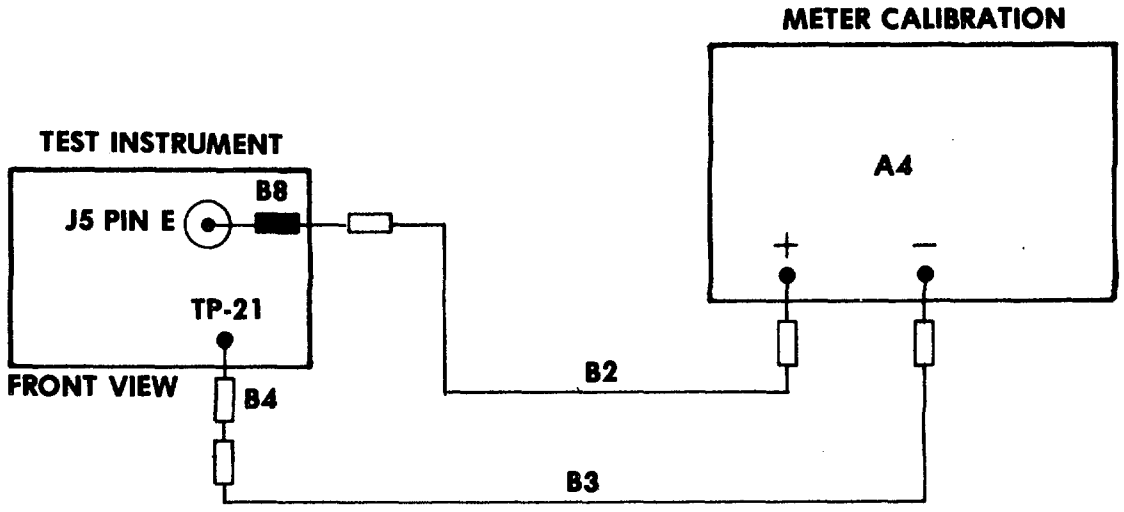

Figure 6. DC Milliamp Equipment Setup

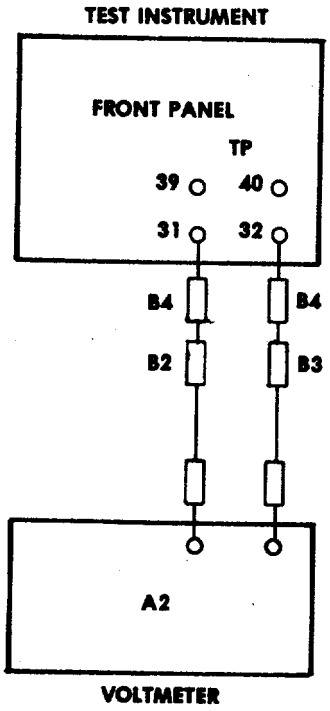

Figure 7. Simulator Equipment Setup

Table 6. Temp Control and Sensor Simulators Check

Test Instrument Temp and Sensor Simulator Settings	Resistance Voltmeter Indication (Ohms)	
	Min	Max
00100.0	99.50	100.50
00250.0	248.75	251.25
00500.0	447.50	502.50
01000.0	995.00	1005.00
05000.0	4975.00	5025.00
10000.0	9950.00	10050.00
50000.0	49750.00	50250.00
90000.0	89550.00	90450.00

13. Final Procedure.

a. Deenergize and disconnect all equipment and install TI into case and reinstall the protective cover.

PIN: 0093291001

*U.S. Government Printing Office; 1989-654-031/55043

b. When all parameters are within tolerance, annotate and affix DA Label 80 (US Army Calibrated Instrument). When the TI receives limited or special calibration, annotate and affix DA Label 163 (US Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, repair the TI in accordance with the maintenance manual. When repair is delayed for any reason or the TI cannot be repaired with local resources, annotate and affix DA Form 2417 (US Army Calibration System Rejected Instrument)and inform the owner/user accordingly in accordance with TB 750-25.

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

Distribution:

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

° F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	° C

PIN: 009329-000