TB 9-4920-364-35

CHANGE 4

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR EXHAUST GAS TEMPERATURE TESTER HOWELL INSTRUMENT, INC., MODEL BH112JA36

Headquarters, Department of the Army, Washington, DC
6 July 2001

TB 9-4920-364-35, 13 July 1983, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page.

Remove pages	Insert pages
1 and 2	1 and 2
9 and 10	9 and 10

2. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

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JOEL B. HUDSON
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05959

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Change 3

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CALIBRATION PROCEDURE FOR EXHAUST GAS TEMPERATURE TESTER HOWELL INSTRUMENT, INC., MODEL BH112JA36

Headquarters, Department of the Army, Washington, DC
19 November 1986

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CALIBRATION PROCEDURE FOR EXHAUST GAS TEMPERATURE TESTER HOWELL INSTRUMENT, INC., MODEL BH112JA36

Headquarters, Department of the Army, Washington, DC
18 September 1985

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Change 1

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CALIBRATION PROCEDURE FOR EXHAUST GAS TEMPERATURE TESTER HOWELL INSTRUMENT, INC., MODEL BH112JA36

Headquarters, Department of the Army, Washington, DC
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1 through 4	1 through 4
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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR EXHAUST GAS TEMPERATURE TESTER HOWELL INSTRUMENT, INC., MODEL BH112JA36

Headquarters, Department of the Army, Washington, DC
13 July 1983

REPORTING OF ERRORS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedure, please let us know. Mail your letter or DA Form 2028 to: Commander, U. S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5230. A reply will be furnished to you. You may also send in your comments electronically to our e-mail address 2028@redstone.army.mil or FAX 256-842-6546/DSN 788-6546.

*This bulletin supersedes TB 55-4920-244-50, 30 July 1973, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Exhaust Gas Temperature Tester, Howell Instrument Inc., Model BH112JA36. The manufacturer's manual and TM 55-4920-244-14 were 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 4 hours, using the dc and low frequency 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
Potentiometer	Range: 0 to 1100°C Accuracy: ±1°C at engine operating temperature
Thermocouple	Range: 0 to 135 V ac Accuracy: ±5 V ac
EGT indicator	Range: 700°C Accuracy: ±10°C
Resistance	Range: 4.21, 8.0, and 22.0 Accuracy: ±0.25 on each position
Rpm	Range: 0 to 10,000 rpm Accuracy: ±0.1%
Insulation resistance	Range: 0 to 100,000 Accuracy: ±10%

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. 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	AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	General Radio, Model W10MT3AS3 (7910809)
A2	DC VOLTAGE STANDARD	Range: 0.84 to 48.0 mV Accuracy: ±0.33%	John Fluke, Model 332B/AF (332B/AF)
A3	DIFFERENTIAL VOLTMETER	Range: 125 to 135 V ac; 29 mV dc Accuracy: ±1%	John Fluke, Model 887AB/AN (887AB/AN)
A4	FREQUENCY COUNTER	Range: 14.20 to 14.30 ms Accuracy: ±0.025%	Hewlett-Packard, Model 5345A (MIS-28754/1 Type 1)
A5	RESISTANCE STANDARD	Range: 0 to 110,000Ω Accuracy: ±0.03%	Biddle-Gray, Model 601147-1 (7910328)
A6	TEST OSCILLATOR	Range: 60 to 75 Hz Frequency response: ±0.25%	Hewlett-Packard, Model 652A (MIS-10224)
A7	THERMOMETER	Range: 70 to 85°F Accuracy: ±1%	Instrulab, Inc., Model 4100 (7915890)

Table 3. Accessories Required

Item	Common name (official nomenclature)	Description (part number)
B1	ADAPTER	BNC T-type, 2 jacks, 1 plug (MS35173-274C)
B2	ADAPTER	BNC jack to double banana plug terminations (7907592)
B3	CABLE (TEST LEAD)	36-in., RG-58/U; BNC plug to double banana plug terminations (7907471)
B4	LEAD	36-in., BNC plug to 2 test hooks (7915942-1)
B5	LEAD	18-in., spade lug terminations (red) (7911292-14)
B6	LEAD	18-in., spade lug terminations (black) (7911292-13)
B7	LEVEL	Bench type (7902565)
B8	PIN[1]	1-in., number 14 or 16 gauge wire (fabricate locally)

[1]Two 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, see table 2, and for prefix B, see 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 and TM 55-4920-244-14 for this TI.

NOTE

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

7. Equipment Setup

NOTE

If TI requires adjustment, remove deck assembly from protective case and place right side up on an insulated bench. It will be necessary to remove TEMP. REGULATOR knob and power supply BH1766 board.

a. Level and support TI deck assembly, using level (B7).

b. Position controls as listed in (1) through (4) below:

(1) **TEMP. REGULATOR** control fully ccw.

(2) **SELECTOR SWITCH SW-1** to **OFF**.

(3) **SW-7** switch to **OFF**

(4) **SW-6** switch to **MECH ZERO**.

c. Connect TI power line connector P1 to autotransformer (A1), using cable (BH499, p/o TI). Connect autotransformer to a 115-V ac source and adjust for 110 V output. Allow 1 hour for TI to warm-up.

8. Potentiometer Accuracy

a. Performance Check

(1) Connect equipment as shown in figure 1, connection A.

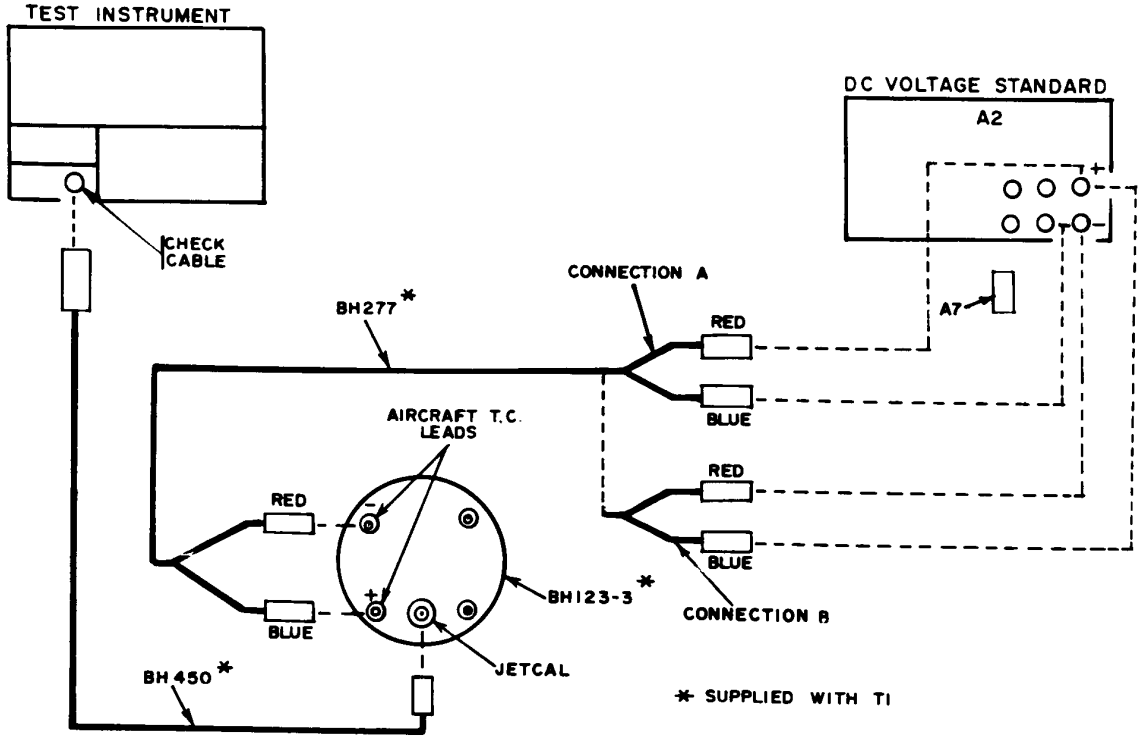

Figure 1. Potentiometer - equipment setup.

(2) Set dc voltage standard (A2) **STANDBY/RESET** switch to **STANDBY**. Place thermometer (A7) near the output of dc voltage standard. Wait 10 minutes and record temperature.

(3) Position controls as listed in (a) through (c) below:

(a) **SELECTOR SWITCH SW-1** to **T/C**.

(b) **SW-5** switch (located on BH 123-3) to **JETCAL**

(c) **THERMOCOUPLE CHECK SW-2** switch to **S-2**.

(4) Adjust **GALVO-1 MECH. ZERO** control until **GALVO-1** indicates 0. Repeat as necessary throughout procedure.

(5) Adjust °**C** control for a 0 dial indication.

NOTE

Throughout this procedure it will be necessary to constantly check the ambient temperature to assure that millivolt values in table 4 are applicable.

(6) Refer to table 4 and adjust dc voltage standard to millivolt value corresponding to temperature recorded in (2) above.

Table 4. Ambient Temperatures Versus Millivolt Values

Degrees Fahrenheit	Degrees Centigrade	Millivolt values[1]
70	21.1	0.843
71	21.7	0.865
72	22.2	0.888
73	22.8	0.910
74	23.3	0.933
75	23.9	0.955
76	24.4	0.978
77	25.0	1.000
78	25.6	1.023
79	26.1	1.045
80	26.7	1.068
81	27.2	1.090
82	27.8	1.113
83	28.3	1.135
84	28.9	1.158
85	29.5	1.181

[1]From NBS standard monograpg 125.

(7) Set **SW-6** switch to **RANGE**.

(8) Adjust °**C** control for 0 indication on **GALVO-1**. If TI °**C** dial does not indicate 0° ±1°, perform **b**(1) through (13) below.

(9) Set **SW-6** switch to **MECH. ZERO**.

(10) Connect equipment as shown in figure 1, connection B.

(11) Adjust dc voltage standard output to 48.462 mV less value recorded in (6) above.

(12) Adjust °C control until dial indicates 1190.

(13) Set **SW-6** switch to **RANGE**.

(14) Adjust °**C** control until **GALVO-1** indicates 0. If °**C** dial does not indicate between 1189 and 1191, perform **b**(1) through (13) below.

(15) Set **SW-6** switch to **MECH. ZERO**.

(16) Repeat technique of (11) through (14) above, using values listed in table 5. TI °**C** dial will indicate within limits specified.

Table 5. Potentiometer Range

Dc voltage standard output (mV)[1]	Test instrument °C dial indication		
	Min	Initial	Max
45.108	1099	1100	1101
41.269	999	1000	1001
37.325	899	900	901
33.277	799	800	801
31.214	749	750	751
29.128	699	700	701
27.022	649	650	651
24.902	599	600	601
20.640	499	500	501
16.395	399	400	401
12.207	299	300	301
8.137	199	200	201
4.095	99	100	101

[1]Subtract millivolt value recorded in 8a(6) above.

b. Adjustments

(1) Set **SW-6** switch to **MECH. ZERO**.

(2) Connect equipment as shown in figure 1, connection A,

(3) Adjust °**C** control for a 0-degree indication.

(4) Repeat **a**(6) above.

(5) Set **SW-6** switch to **RANGE**.

(6) Adjust TRIMPOT B (fig. 2) until **GALVO-1** indicates 0.

(7) Repeat (1) above.

(8) Connect equipment as shows in figure 1, connection B.

(9) Adjust °**C** control to 1000 dial indication

(10) Adjust output of dc voltage standard to 41.269 mV, less millivolt value used in **a**(6) above.

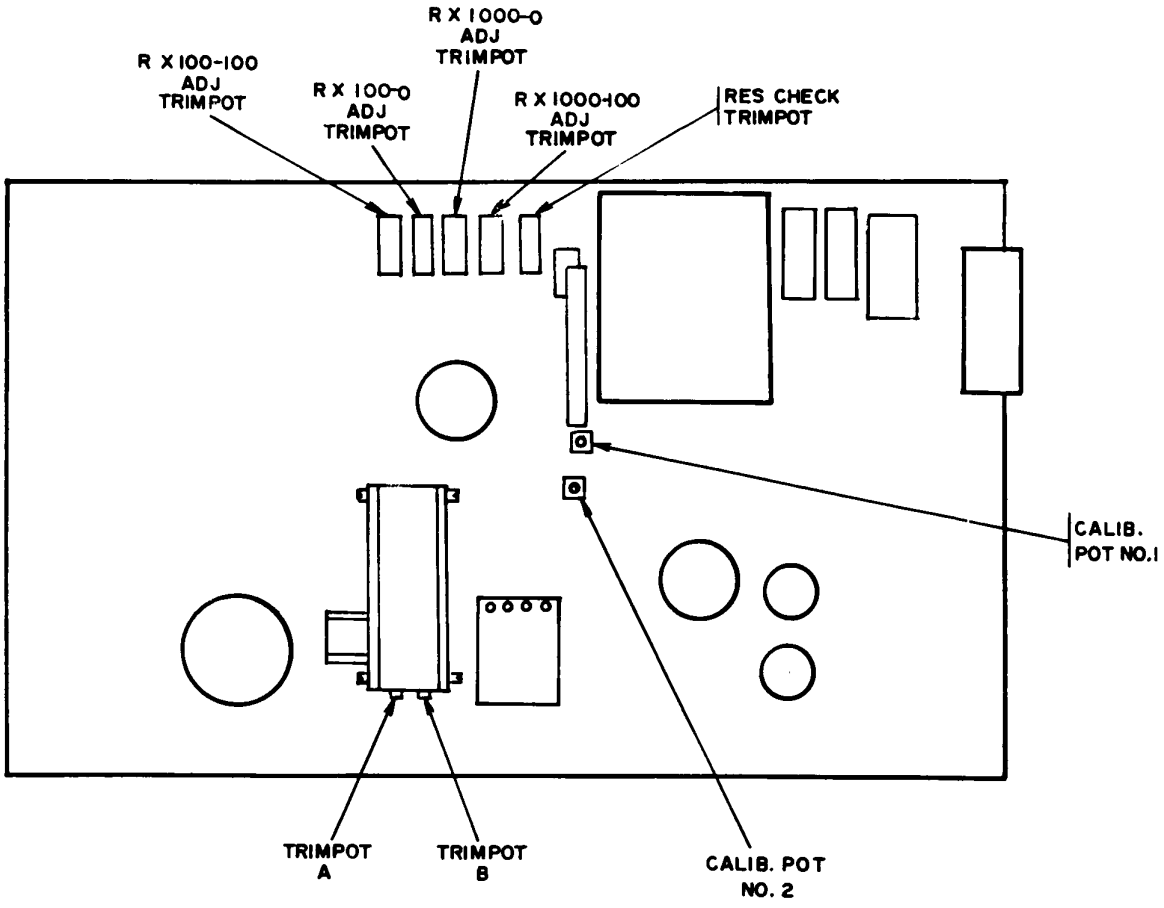

Figure 2. Adjustment locations -bottom view.

(11) Repeat (5) above.

(12) Adjust TRIMPOT A (fig. 2) until **GALVO-1** indicates 0

(13) Repeat (1) through (12) above until no further adjustments are required.

9. Resistance Check

a. Performance Check

(1) Connect TI **INPUT RES. INSUL. P-2** to **HIGH** and **LOW** terminals of resistance standard (A5), using cable, resistance check adapter (BH-485 and BH823, P/o TI) and leads (B5 and B6).

(2) Set **SELECTOR SWITCH SW-1** to **RES**

(3) Set **SW-6** switch to **MECH. ZERO**.

(4) Adjust **GALVO-1 MECH. ZERO** for a 0 indication on **GALVO-1**.

(5) Adjust resistance standard for 4.21

(6) Set **RESISTANCE CHECK SW-3** switch to 4.21

(7) Set **SW-6** switch to **RANGE**. If **GALVO-1** does not indicate 0 ±5 divisions, perform **b** below.

(8) Set **SW-6** switch to **MECH. ZERO**.

(9) Repeat technique of (4) through (7) above for each setting of **RESISTANCE CHECK SW-3** switch and set resistance standard to the value indicated on **SW-3**. TI **GALVO-1** will indicate within ±5 divisions at all **SW-3** settings.

b. Adjustments. Adjust RES CHECK TRIMPOT (fig. 2) for 0 indication on GALVO-1 (R).

10. Insulation Resistance Check

a. Performance Check

(1) Adjust resistance standard (A5) for 0 ohms.

(2) Connect TI **INPUT RES. INSUL. P-2** to **HIGH** and **LOW** terminals of resistance standard, using cable and insulation check adapter (BH485 and BH821, p/o TI).

(3) Set **SELECTOR SWITCH SW-1** to **INSUL**. and **SW-8** switch to **RX100**. If **INSULATION CHECK** meter does not indicate 0, perform **b**(1) below.

(4) Adjust resistance standard for indication of 10,000 ohms on **INSULATION CHECK** meter. If resistance standard does ,not indicate between 9000 and 11,000 ohms, perform **b**(2) below.

(5) Repeat (1) above.

(6) Set **SW-8** switch to **RX1000**. If **INSULATION CHECK** meter does not indicate zero, perform **b**(3) below.

(7) Adjust resistance standard for an indication of 100,000 ohms on **INSULATION CHECK** meter. If resistance standard does not indicate between 90,000 and 110,000 ohms, perform **b**(4) below.

b. Adjustments (fig. 2)

(1) Adjust RX100 0 ADJ TRIMPOT for zero indication on INSULATION CHECK meter (R).

(2) Adjust decade resistor for 10,000 ohms and adjust RX100 100 ADJ TRIMPOT for INSULATION CHECK meter indication of 10,000 ohms (R).

(3) Adjust RX1000 0 ADJ TRIMPOT .for zero indication on INSULATION CHECK meter (R).

(4) Adjust RX1000 100 ADJ TRIMPOT for INSULATION CHECK meter indication of 100,000 ohms (R).

11. Rpm Check

a. Performance check

(1) Set **SW-7** switch to **MECH. ZERO**.

(2) Adjust **GALVO-2 MECH. ZERO 4** control for 0 indication.

(3) Adjust **R.P.M**. control for 0 indication on **%** dial.

(4) Set **SW-7** switch to **RANGE**. If **GALVO-2** does not indicate 0, perform **b**(1) below.

(5) Set **SW-7** switch to **MECH. ZERO**.

(6) Connect equipment as shown in figure 3.

(7) Adjust test oscillator (A6) frequency for an indication of 14.285 ms on frequency counter (A4).

(8) Adjust **R.P.M.** control to 100.0 as indicated on **%** dial

(9) Set **SW-7** switch to **RANGE**.

(10) Adjust test oscillator frequency dial for 0 indication on **GALVO-2**. If frequency counter does not indicate between 14.271 and 14.300 ms, perform **b**(2) below.

(11) Set **SW-7** switch to **OFF**.

b. Adjustments (fig. 2)

(1) Adjust CALIB. POT No. 1 for zero indication on **GALVO-2** (R).

(2) Adjust test oscillator for indication of 14.285 ms on frequency counter and adjust CALIB. POT No. 2 for zero indication on **GALVO-2** (R).

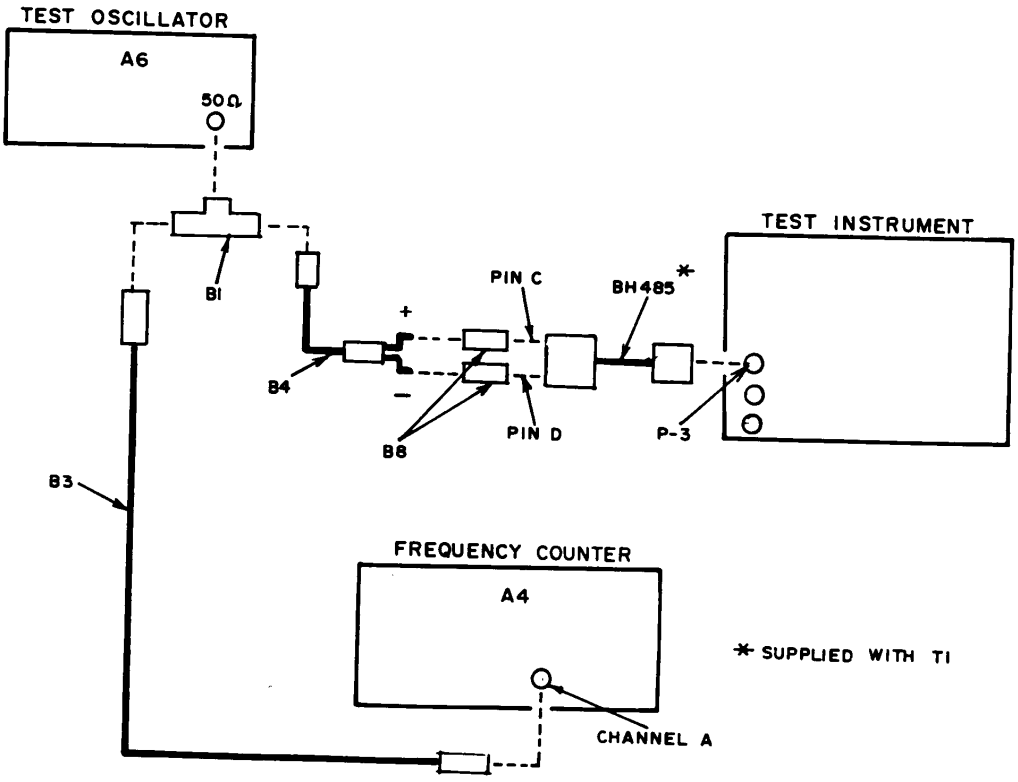

Figure 3. Rpm - equipment setup.

12. (DELETED)

13. EGT Indicator Check

a. Performance Check

(1) Place thermometer (A7) near differential voltmeter (A3) input terminals for 10 minutes and record temperature. (Refer to table 4. Record millivolt equivalent to the ambient temperature recorded above.)

(2) Connect **INPUT R.P.M. E.G.T. P-3** to differential voltmeter, using adapter and cable (BH822 and BH485, p/o TI).

(3) Set **E.G.T. IND. CHECK SW-4** switch to **8**W.

(4) Set **SELECTOR SWITCH SW-1** to **E.G.T**.

(5) Set **SW-6** switch to **MECH. ZERO**.

(6) Adjust **GALVO-1 MECH. ZERO** for 0 indication.

(7) Set °**C** control to 700°C on the dial.

(8) Adjust R-1 ADJ RHEO control until differential voltmeter indicates 29.128 mV dc, minus value recorded in (1) above.

(9) Set **SW-6** switch to **RANGE**.

(10) Adjust °**C** control for 0 indication on **GALVO-1**. TI °C dial will indicate between 690 and 710°C.

(11) Set **E.G.T. IND. CHECK SW-4** switch to **22**W. TI °**C** dial will be within limits specified in (10) above.

b. Adjustments. No adjustments can be made.

14. Final Procedure

a. Deenergize and disconnect all equipment and reinstall protective cover on TI.

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 Limited or Special Calibration). When the TI cannot be adjusted within tolerance repair the TI in accordance maintenance manual. When repair is delayed for any reason or the TI 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.

TB 9-4920-364-35

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