

To buy, sell, rent or trade-in this product please click on the link below:

<http://www.avionteq.com/Barfield-TT1000A-Turbine-Temperature-Test-Set-PN-101-00901.aspx>

AvionTEq

Test with full trust

www.avionteq.com

TT-1000A

TURBINE TEMPERATURE TEST SET

USER INSTRUCTION MANUAL

M/N: TT-1000A

P/N:101-00901

Doc. P/N: 56-101-00901

Revision D

April 24, 2013

BARFIELD, INC.



Corporate Headquarters

4101 Northwest 29th Street

Miami, Florida 33142

www.barfieldinc.com

Email: gsesales@barfieldinc.com



CONTACT INFORMATION

Users are requested to notify the manufacturer of any discrepancy, omission, or error found in this manual. Inquiries should include specific questions and reference the publication title, number, chapter, page, figure, paragraph, and effective date.

Please send comments to:

**TECHNICAL CUSTOMER SUPPORT - GSTE
BARFIELD, INC.
4101 NW 27th Street
MIAMI, FL 33142
USA**

Telephone **(305) 894-5400**
 (800) 321-1039

Fax **(305) 894-5401**

Email gsesales@barfieldinc.com

DISCLAIMER

BARFIELD INC., neither a vendor nor supplier of Turbine Temperature Systems or an airframe manufacturer, has no control over calibration figures or procedures. A variant between actual and those recommended may exist, however, information presented is correct to the best of our knowledge at the time of publication and is presented for reference only.



ATTENTION

Although every effort has been made to provide the end user of this equipment with the most current and accurate information, it may be necessary to revise this manual in the future. Please be sure to complete and return the enclosed **OWNER WARRANTY REGISTRATION CARD** to Barfield in order to validate the warranty and to ensure that you will receive updated information when published. You MUST have your name and address on file at Barfield as a registered user of this equipment, to be able to obtain the service covered by the warranty.

Visit the company website, <http://barfieldinc.com/>, for publication updates.

Please send the Registration Card to:

Barfield, Inc.
4101 NW 27th Street
Miami, FL 33142
USA



LIMITED ONE YEAR WARRANTY

BARFIELD INC. ("BARFIELD") warrants only to the original Purchaser of this product from BARFIELD or an authorized distributor that this product will be free from defects in material and workmanship under normal use and service for one year after date of purchase. BARFIELD reserves the right, before having any obligation under this limited warranty, to inspect the damaged BARFIELD product, and all costs of shipping the BARFIELD product to BARFIELD for inspection shall be borne solely by the Purchaser. In order to recover under this limited warranty, Purchaser must make claim to BARFIELD within 60 days of occurrence, and must present acceptable proof of original ownership (such as a purchase order, invoice, warranty card registration, or other documentation BARFIELD deems acceptable) for the product. BARFIELD, at its option, shall repair or replace the defective unit covered by this warranty. Please retain the dated sales receipt as evidence of the original purchaser's date of purchase. You will need it for any warranty service. In order to keep this limited warranty in effect, the product must have been handled and used as prescribed in the instructions accompanying this product. This limited warranty does not cover any damage due to accident, misuse, abuse or negligence. This limited warranty is non-transferable and does not apply to any purchaser who bought the product from a reseller or distributor not authorized by BARFIELD, including but not limited to purchases from internet sites. This warranty does not affect any other legal rights you may have by operation of law. Contact BARFIELD at www.Barfieldinc.com or customer service at (305) 894-5506 for warranty service procedures.

DISCLAIMER OF WARRANTY

EXCEPT FOR THE LIMITED WARRANTY PROVIDED HEREIN, TO THE EXTENT PERMITTED BY LAW, BARFIELD DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ALL WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT THAT ANY IMPLIED WARRANTIES MAY NONETHELESS EXIST BY OPERATION OF LAW, ANY SUCH WARRANTIES ARE LIMITED TO THE DURATION OF THIS WARRANTY. SOME STATES/PROVINCES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

LIMITATION OF LIABILITY

REPAIR OR REPLACEMENT OF THIS PRODUCT, AS PROVIDED HEREIN, IS YOUR EXCLUSIVE REMEDY. BARFIELD SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOST REVENUES, LOST PROFITS, LOSS OF USE OF SOFTWARE, LOSS OR RECOVERY OF DATA, RENTAL OF REPLACEMENT EQUIPMENT, DOWNTIME, DAMAGE TO PROPERTY, AND THIRD-PARTY CLAIMS, ARISING OUT OF ANY THEORY OF RECOVERY, INCLUDING WARRANTY, CONTRACT, STATUTORY OR TORT. NOTWITHSTANDING THE TERM OF ANY LIMITED WARRANTY OR ANY WARRANTY IMPLIED BY LAW, OR IN THE EVENT THAT ANY LIMITED WARRANTY FAILS OF ITS ESSENTIAL PURPOSE, IN NO EVENT WILL BARFIELD'S ENTIRE LIABILITY EXCEED THE PURCHASE PRICE OF THIS PRODUCT. SOME STATES/PROVINCES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAYNOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS THAT VARY FROM STATE TO STATE AND PROVINCE TO PROVINCE.

BARFIELD INC.

4101 NW 29th Street

Miami, Florida 33142, USA

Form 7.5.3-13

Dated 02/01/2011, Rev. 0

REVISION RECORD

REV.	ECO #	REV. DATE	DESCRIPTION OF CHANGE
A	N/A	May 5, 1995	Initial Release
B	N/A	February 16, 2002	Updated to latest format. Added List of Figures/Tables page.
C	260-00890	January 27, 2012	Updated to latest format; specifications section changes.
D	260-00970	April 24, 2013	Added instructions for using 45vdc voltage converter.



MAINTENANCE AND REPAIR INFORMATION

The manufacturer of this equipment does not recommend the user to attempt any maintenance or repair. In case of malfunction, contact the manufacturer, to obtain the list of approved repair facilities worldwide, ensuring that this equipment will be serviced using proper procedures and certified instruments. A Return Maintenance Authorization (RMA) number will be assigned during this call, to keep track of the shipment and the service.

BARFIELD PRODUCT SUPPORT DIVISION

Telephone (305) 894-5400
(800) 321-1039

Fax (305) 894-5401

Mailing / Shipping Address:

Barfield, Inc.
4101 NW 29th Street
Miami, Florida 33142
USA

TABLE OF CONTENTS

Contact Information
Attention
Warranty Information
Revision Record
Maintenance and Repair Information
Table of Contents

	Page
DESCRIPTION	
Purpose of Manual.....	1
General Description.....	1
Switching Functions.....	2
OPERATION	
General Operating Instructions	4
System Lead Resistance Test Procedure	7
Thermocouple Resistance Test Procedure	8
Insulation Testing Procedure.....	9
Indicator Test Procedure	10
Potentiometer or Servo type Indicator Test Procedure	12
Temperature Measurement Test Procedure	14
SPECIFICATIONS AND CAPABILITIES	
Physical Data	15
Specification	15
Capabilities	16
Recertification	18
SHIPPING	
Receiving	19
Shipping	19
STORAGE	
Procedure	19

LIST OF FIGURES AND TABLES

<u>SECTION</u>	<u>FIGURE / TABLE</u>	<u>TITLE</u>	<u>PAGE</u>
1-1	1	TT-1000A FRONT PANEL LAYOUT	3
1-1	2	VOLTAGE CONVERSION	5
1-2	1	16 Ω INDICATOR TEST CONVERSION TABLE	11
1-3	2	THERMOCOUPLE LINEARIZATION TABLE	17
1-3	3	REFERENCE JUNCTION COMPENSATION TABLE	18
1-3	4	ERROR TABLE	18

DESCRIPTION

1. PURPOSE OF MANUAL

A. This publication contains the description, operating procedures for the:

TT-1000A DIGITAL TURBINE TEMPERATURE TEST SET, P/N 101-00901
(Refer to Figure 1.)

Manufactured by:
Barfield Inc.

B. This manual is released to address the TT-1000A which is designed to test and calibrate Chromel-Alumel (CH-AL) temperature indicating systems.

2. GENERAL DESCRIPTION

The TT-1000A provides the means for quickly troubleshooting aircraft temperature indicating systems. It has sufficient sensitivity and accuracy to test thermocouple and system resistance, insulation, and indicator calibration. It features portability, simplicity of operation, direct reading, and multi-functional versatility.

A. TT-1000A Features;

- (1) Specifically designed to meet all requirements for testing aircraft Chromel-Alumel (CH-AL) temperature measuring systems and provides an accurate display of thermocouple outputs in degrees Celsius ($^{\circ}\text{C}$).
- (2) Thermocouple and lead resistance measurements to 0.01Ω and insulation measurements up to $2 \text{ M}\Omega$.
- (3) Simulates thermocouple outputs and system lead resistances from 0 to 25Ω .
- (4) Completely self-contained, self-monitoring, easily portable temperature and resistance measuring and simulating device for all CH-AL systems with the capability to bench test indicators.
- (5) Human engineered for maximum ease of operation and maintenance with state of the art low battery drain circuitry with automatic ambient test point temperature correction.
- (6) A large, 0.35 in. (9mm) high characters, 3 1/2 digit Liquid Crystal Display (LCD) with preprogrammed legends.

(7) Carrying Case features;

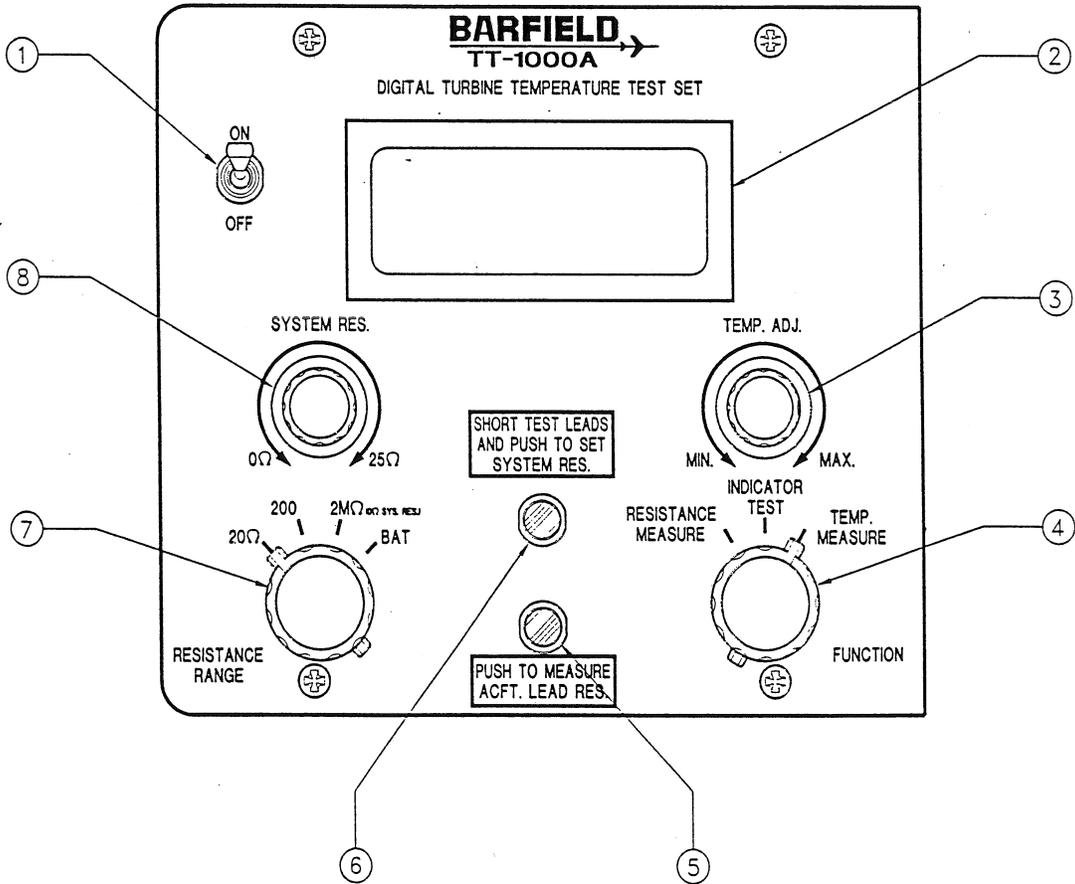
- (a) Fabricated from drawn aluminum for maximum strength.
- (b) The lid has been fitted with a bracket which, when the lid is closed, contacts the "ON/OFF" switch, in the "ON" position and moves it to the "OFF" position.
- (c) Provides, on the right hand side, space for test lead storage.
- (d) The lid also contains a placard presenting abridged operating instructions for the experienced technician.

NOTE: For personnel without experience, it is advisable to become familiar with this publication, the TT-1000A, and the equipment with which it is to be used BEFORE performing any test or checks.

3. SWITCHING FUNCTIONS (Refer to Figure. 1)

- A. The "ON/OFF" switch (1) applies power for all functions.
- B. The "TEMP. ADJ." control knob (3), a ten turn potentiometer permits exact adjustment of the millivoltage generator for temperatures which are displayed on the LCD (2) as °C when the "FUNCTION" switch (4) is in the "INDICATOR TEST" position.
- C. The "FUNCTION" switch, a three position rotary switch that permits selection of the three principal test functions, "RESISTANCE MEASURE", "INDICATOR TEST" and "TEMP. MEASURE".
- D. The "PUSH TO MEASURE ACFT. LEAD RES." **BLACK** pushbutton (5), when depressed with test leads connected to aircraft system and "FUNCTION" switch in "RESISTANCE MEASURE" position produces a display of the resistance in the system.
- E. The "SHORT TEST LEADS AND PUSH TO SET SYSTEM RES." **RED** pushbutton (6), when depressed with test leads shorted and the "FUNCTION" switch in the "RESISTANCE MEASURE" position connects the "SYSTEM RES." potentiometer for system resistance adjustment.
- F. The "RESISTANCE RANGE" switch (7), a four position rotary switch, permits selection of the resistance range, 20 Ω, 200 Ω or 2 MΩ - (0 Ω system resistance) and "BAT" position for monitoring the 45-volt battery.

G. The "SYSTEM RES." control knob (8), a ten turn potentiometer used to adjust system lead resistance 2 to 25 Ω , when test leads are shorted and the **RED** pushbutton is depressed.



TT-1000A FRONT PANEL LAYOUT
Figure 1

OPERATION

1. GENERAL OPERATING INSTRUCTIONS

Consult temperature indicator system and/or engine manufacturer's instructions for procedures and specifications. Read complete TT-1000A operation procedures before attempting to use the TT-1000A.

A. Protective Circuits;

- (1) PCB1 F1 (AGC 1/2A) protects the TT-1000A from overloads through the test leads.
- (2) PCB1 D1 across the 9 volt supply prevents accidental application of reverse polarity at battery replacement.

B. Preparation for Use:

(1) Battery Installation / Replacement;

- (a) Place the TT-1000A on a clean area. (A clean cloth or paper pad placed next to the TT-1000A to receive the panel is desirable.) Remove the four corner panel screws. Lift the panel high enough (approx. 2 in.) to disconnect the 45 volt battery connector located under "ON/OFF" switch (if required). Withdraw the panel and bulkhead assembly.
- (b) Insert six (6) 1.5 volt size AA (NEDA 15A) batteries by grasping the ends and pushing straight down. **Observe polarity**. The plus (+) terminal is positive.
- (c) Connect the 45 volt No. 415 (NEDA 213) battery. to the battery connector terminals, place battery into lower holder clips and rotate upward until it is seated. **Observe polarity**.

NOTE: To remove batteries reverse steps (b) and (c) above.

- 1 Connect a new 9 Volt alkaline battery to the 9V Input terminals of the Voltage Converter observing polarity (see Figure 3).

WARNING: POWERING THE 137-08001 FROM ANY SOURCE OTHER THAN AN ALKALINE 9 VOLT BATTERY MAY CAUSE DAMAGE TO THE CONVERTER.

NOTE: The converter output can be checked by connecting a DVM (10M Ω input impedance or less and set for 200 VDC) to the 45V Output terminals of the converter observing polarity. The output voltage with a fresh battery should measure approximately 47 VDC.

- 2 Connect the 45V battery leads to the 45V Output terminals of the Converter observing polarity as depicted in Figure 3.



VOLTAGE CONVERSION

Figure 2

- (d) The "coin" battery has a minimum life expectancy of five years and is installed at time of manufacture. To remove the "coin" battery, do the following;

- 1 Insert screwdriver between face of cell and holder spring clip through one of the slots.
- 2 Pry up and remove with fingers or insulated tweezers.

CAUTION: IF A SCREWDRIVER OR OTHER METAL TOOL IS USED TO PRY OUT CELLS, TAKE CARE NOT TO SHORT CIRCUIT OR DAMAGE CELL INSULATION.

- (e) Carefully place bulkhead of panel assembly between vertical guides in the carrying case, and slide assembly downward until 45V battery connector can be connected and connect, then slide panel assembly downward into place.

(2) Perform the TT-1000A Battery check prior to testing as follows:

- (a) To check the 45 volt battery used for insulation testing, rotate the "FUNCTION" selector switch to "RESISTANCE MEASURE" position and the "RESISTANCE RANGE" selector to "BAT".
- (b) If voltage is below 45 volts, replace the 45-volt battery as outlined in paragraph (1) a, **Battery Installation/Replacement**.
- (c) To check the six 1.5 volt batteries used for all functions rotate the "RESISTANCE RANGE" selector switch to 20 ohm position and short test lead clips together.

- (d) Depress the **BLACK** pushbutton switch. If "**BAT**" is displayed replace the six 1.5 volt batteries as outlined above.

NOTE:After removal, test each cell individually (under load) as one or more defective cells mixed with good ones may produce a low battery warning.

C. Precautions

- (1) Do **NOT** press either pushbutton with test clips connected to the aircraft indicator. The current applied may damage the indicator.
- (2) Do **NOT** connect test clips to an energized circuit. Although the TT- 1000A is provided with protective devices, not all damaging potentials can be made completely safe.
- (3) Allow sufficient time for test clips to stabilize to the temperature of the terminals to which they are connected for temperature tests.
- (4) Measure system and thermocouple resistance with a cold engine for greatest accuracy.
- (5) To conserve battery power, place "ON/OFF" switch to "OFF" when the test set is not in use.
- (6) "**BAT**" warning displayed indicates that about 10% battery life of the six 1.5V batteries remains and the batteries should be replaced.
- (7) Perform insulation battery check, (Refer to. paragraph (2) (a) & (b) in this section before taking measurements. Voltage should be 45 volts or greater.

D. Hot Engine Testing

A hot engine will cause thermocouple to generate a small potential which will produce errors in measured resistance values. This effect is inherent in any type of resistance measuring instrument.

The effect can be circumvented by taking two measurements; the first with test leads connected in one polarity, and then reversing the lead connections for the second measurement. The true value is equal to the average of the two readings (i.e., add the two readings and divide by two). The two readings must be taken in quick succession so that the thermocouple temperature will be the same for both readings. If the thermocouple are too hot, the readings will be too far from nominal to provide sufficient accuracy. In this case, wait for the engine to further cool.

2. SYSTEM LEAD RESISTANCE TEST PROCEDURE

- A. Disconnect thermocouple leads from system temperature indicator.
- B. Carefully connect test lead clips to each of the lead wires insuring a good electrical connection.
- C. Rotate the "FUNCTION" selector to "RESISTANCE MEASURE".
- D. Rotate the "RESISTANCE RANGE" selector to 20 Ω .
- E. Place "ON/OFF" switch to "ON" and depress the **BLACK** pushbutton switch.
- F. Display will indicate resistance in ohms to within $\pm 0.01 \Omega$. If a "1 ." is displayed, select 200 Ω on the "RESISTANCE RANGE" switch.

If a "1 ." is displayed, resistance is greater than 199.9 Ω or there is an open circuit.

- G. Swap the **RED** and **BLACK** test clip connections and the display should repeat when the **BLACK** pushbutton is depressed. If the reading does not repeat, the engine thermocouple may be hot. (Refer to paragraph. 1. D, **Hot Engine Testing** this section.)

NOTE: Resistance must be within manufacturer's specifications. If results are slightly outside limits, repeat entire procedure to insure test failure is not due to human error.

- H. Place "ON/OFF" switch to "OFF", disconnect the TT-1000A and return aircraft to original configuration.

3. THERMOCOUPLE RESISTANCE TEST PROCEDURE

- A. Disconnect lead wires from the engine thermocouple terminals.
- B. Carefully connect test lead clips to each of the terminals insuring a good electrical connection.
- C. Rotate the "FUNCTION" selector to "RESISTANCE MEASURE".
- D. Rotate the "RESISTANCE RANGE" selector to 20 Ω .
- E. Place "ON/OFF" switch to "ON" and depress the **BLACK** pushbutton switch.
- F. Display will indicate resistance in ohms to within $\pm 0.01 \Omega$. If a "1 ." is displayed, select 200 Ω on the "RESISTANCE RANGE" switch.

If a "1 ." is displayed, resistance is greater than 199.9 Ω or there is an open circuit.

- G. Swap the **RED** and **BLACK** test clip connections and the display should repeat when the **BLACK** pushbutton is depressed. If the reading does not repeat, the engine thermocouple may be hot. (Refer to. paragraph 1. D, **Hot Engine Testing** this section.)

NOTE: Resistance must be within manufacturer's specifications. If results are slightly outside limits, repeat entire procedure to insure test failure is not due to human error.

- H. Place "ON/OFF" switch to "OFF", disconnect the TT-1000A and return aircraft to original configuration.

4. INSULATION TESTING PROCEDURE

- A. Disconnect one or both leads at system temperature indicator. Then connect the **BLACK** lead clip to ground and the **RED** lead clip to one or both thermocouple system lead wires. (Refer to engine manufacturers' Maintenance Manual for specific connections.)
- B. Rotate the "FUNCTION" selector to "RESISTANCE MEASURE".
- C. Rotate the "RESISTANCE RANGE" selector to 2 M Ω (0 Ω SYS. RES.).
- D. Place "ON/OFF" switch to "ON" and depress the **BLACK** pushbutton switch.
- E. Display will indicate insulation resistance in 1,000,000's of ohms (M Ω). If a "1. " is displayed, insulation resistance is above 2 M Ω . (Refer to the Aircraft Maintenance Manual for low limit.)

NOTE: Resistance to ground must not be less than manufacturer's specifications.
- F. Place "ON/OFF" switch to "OFF", disconnect the TT-1000A and return aircraft to original configuration.

5. INDICATOR TEST PROCEDURE (With Specified Lead Resistance)

- A. Rotate the "FUNCTION" selector to "RESISTANCE MEASURE".
- B. Rotate the "RESISTANCE RANGE" selector to 20 Ω for a resistance under 20 Ω , or to 200 Ω for 0 to 200 Ω .
- C. Place "ON/OFF" switch to "ON".
- D. Short test lead clips together and depress the **RED** pushbutton while adjusting "SYSTEM RES." control knob for displayed system resistance to be simulated.
- E. Rotate the "FUNCTION" selector to "INDICATOR TEST".
- F. Disconnect aircraft thermocouple leads from temperature indicator.
- G. Connect test lead clips to indicator terminals. **OBSERVE POLARITY**. Alumel is negative (-) and connects to the TT-1000A **BLACK** clip: Chromel is positive (+) and connects to the TT-1000A **RED** clip.
- H. Set "TEMP. ADJ." control for the desired test temperature as displayed on the digital indicator.
- I. Compare readings of indicator under test with TT-1000A indications. Units with **Mod "B"** incorporated must use the conversion table (Table 1).

NOTE: Indicator must agree with TT-1000A reading to within manufacturers' specifications.

J. Place "ON/OFF" switch to "OFF", disconnect the TT-1000A and return aircraft to original configuration.

TT-1000A	INDICATOR
000	0
99	50
201	100
302	150
396	200
492	250
588	300
687	350
789	400
892	450
1000	500
1109	550
1217	600
1325	650
1432	700
1538	750
1642	800
1746	850
1848	900
1949	950

16 Ω INDICATOR TEST CONVERSION TABLE (Mod "B" ONLY)
Table 1

6. "POTENTIOMETRIC" OR "SERVO" TYPE INDICATOR TEST PROCEDURE (Without Lead Resistance)

A. General

- (1) The "**Potentiometric**" or "**Servo**" indicator, as it is generally referred, may be recognized by its multiple pin electrical connector and the requirement of aircraft electrical power to operate.
- (2) Thermocouple lead resistance is not critical with this type of indicator, and usually need not be measured.

B. System Lead Resistance Measurement:

- (1) Disconnect aircraft power to indicator. (Refer to the Aircraft Maintenance Manual.)
- (2) Disconnect electrical connector at rear of indicator.
- (3) Connect TT-1000A leads to probe pins sized to fit chromel and alumel pin sockets of aircraft plug removed from indicator.
- (4) Follow paragraph 2, **System Lead Resistance Test Procedure**, steps C. through H this section..

NOTE: Lead resistance is not critical, generally in the order of 5 to 100 ohms. (Refer to the Aircraft Maintenance Manual for specific values.)

C. Thermocouple Resistance Measurement:

- (1) Disconnect aircraft power to indicator. (Refer to the Aircraft Maintenance Manual)
- (2) Follow steps listed in paragraph 3, **Thermocouple Resistance Test Procedure** this section.

D. Insulation Testing:

- (1) Disconnect aircraft power to indicator. (Refer to the Aircraft Maintenance Manual)
- (2) Disconnect electrical connector at rear of indicator.

- (3) Follow paragraph 4. **Insulation Testing Procedure**, steps B. thru F, using probe pins at aircraft plug or make connection at engine thermocouple terminal blocks.

E. Indicator Test:

- (1) Disconnect aircraft power to indicator. (Refer to the Aircraft Maintenance Manual.)
- (2) Disconnect leads from indicator at engine thermocouple terminal block.
- (3) Rotate the "FUNCTION" selector to "INDICATOR TEST".
- (4) Rotate the "RESISTANCE RANGE" selector to 2 M Ω (0 Ω SYS. RES.)
- (5) Connect test lead clips to indicator leads **OBSERVING POLARITY**. Alumel is negative (-) and connects to the TT-1000A **BLACK** clip: Chromel is positive (+) and connects to the TT-1000A **RED** clip.
- (6) Place aircraft temperature indicating system power to "ON".
- (7) Place "ON/OFF" switch to "ON".
- (8) Rotate the "TEMP. ADJ." control for desired test points as read on the TT-1000A digital display.
- (9) Compare readings of indicator under test with TT-1000A indications.

NOTE: Indicator must agree with TT-1000A reading to within manufacturer's specifications.

- (10) Place aircraft temperature indicating system power to "OFF".
- (11) Place "ON/OFF" switch to "OFF", disconnect the TT-1000A and return aircraft to original configuration.

7. TEMPERATURE MEASUREMENT TEST PROCEDURE

A. Rotate the "FUNCTION" selector to "TEMP. MEASURE".

CAUTION: AIRCRAFT INDICATORS OF THE D'ARSONVAL TYPE MUST **NOT** BE CONNECTED DURING THIS TEST. D'ARSONVAL INDICATORS MAY GENERALLY BE RECOGNIZED BY THE ABSENCE OF A MULTI-PIN CONNECTOR AND WILL USUALLY HAVE TWO TERMINAL POSTS OR TERMINAL SCREWS.

B. Connect test lead clips to thermocouple leads **OBSERVING POLARITY**. Alumel is negative (-) and connects to the TT-1000A **BLACK** clip; Chromel is positive (+) and connects to the TT-1000A **RED** clip. Units with Mod "B" incorporated must connect to only one thermocouple lead pair at a time.

C. Display will indicate thermocouple temperature directly in C.

NOTE: If the word "OPEN" is displayed, there is an open circuit in the thermocouple or lead wires.

SPECIFICATIONS AND CAPABILITIES

1. PHYSICAL DATA

- A. Length - 8.0 in (20.3 cm)
- B. Width - 5.5 in (14.0 cm)
- C. Height - 5.0 in (12.7 cm)
- D. Weight - 4.0 lbs (1.8 kg)

2. SPECIFICATIONS

A. Temperature Measurement:

- (1) Type: K (CH-AL Thermocouple).
- (2) Range: 0 to 1000°C certified, -25 to +1100°C extended.
0 to 1200°C certified, -25 to +1225°C extended with option D.
- (3) Accuracy: Typical measurement error at 25°C ambient: less than $\pm 1^\circ\text{C}$.
- (4) National Institute of Standards & Technology (NIST) Conformity: Refer to **Table 2**.
- (5) Reference Junction Compensation: Refer to **Table 3**.
- (6) Error: Refer to **Table 4**.

B. Lead Resistance:

- (1) 20 Ω Range; 0-19.99 Ω in 0.01 Ω increments.
- (2) 200 Ω Range; 0-199.9 Ω in 0.1 Ω increments.
- (3) Accuracy; $\pm 0.1\%$ of reading $\pm 0.01 \Omega$ (20 Ω Range).
 $\pm 0.1\%$ of reading $\pm 0.1 \Omega$ (200 Ω Range).

C. Insulation:

- (1) Range; 0-1.999 M Ω in 1 k Ω increments.
- (2) Accuracy; $\pm 3\%$ of reading $\pm 0.003\text{M}\Omega$.
- (3) Excitation; 45V DC nominal.

D. Simulated System Resistance:

- (1) Adjustment Range; Less than 2.0 Ω to greater than 25 Ω .
- (2) Fixed Setting; Less than 0.1 Ω .

3. CAPABILITIES

- A. Measures and displays resistance of thermocouple, thermocouple rings and system lead circuits.
- B. Measures and displays insulation resistance of system wiring and other components.
- C. Simulates CH-AL thermocouple with or without simulated system lead resistance.
- D. Measures and displays values of CH-AL thermocouple in terms of degrees Celsius temperature.
- E. Automatically compensates for ambient temperature at test lead connection junction point or indicates this "cold junction" temperature.
- F. Also refer to section 1-1, 2.A. and 3. A. through G.

NIST CONFORMITY: (TEST CLIP LINEARIZATION)	
RANGE °C	ERROR ± °C
* -25 TO -21	LESS THAN 2.0
* -20 TO 0	LESS THAN 1.0
0 TO 90	LESS THAN 0.6
91 TO 169	LESS THAN 1.0
170 TO 1000	LESS THAN 0.6
* 1001 TO 1025	LESS THAN 1.0
* 1026 TO 1050	LESS THAN 2.0
* 1051 TO 1100	LESS THAN 5.0

* EXTENDED RANGE

THERMOCOUPLE LINEARIZATION
Table 2

* REFERENCE JUNCTION COMPENSATION	
TEMPERATURE °C	ERROR ± °C
0 TO 30	LESS THAN 0.1
31 TO 40	LESS THAN 0.3
41 TO 50	LESS THAN 0.6

* AT TEST CLIPS

REFERENCE JUNCTION COMPENSATION
Table 3

0 TO 1000°C AT 25°C AMBIENT	
ERROR SOURCE	ERROR ± °C
CALIBRATION ERROR	LESS THAN 0.5
RESOLUTION & REPEATABILITY	1.0
TOTAL (INCLUDING REF. JCT.)	1.5 (+ NIST CONFORMITY)
TEMPERATURE COEFFICIENT	0.005% OF READING PER °C

ERROR TABLE
Table 4

4. RECERTIFICATION

The Test Set P/N 101-00901 has a one-year recertification requirement.

SHIPPING

1. RECEIVING

Special unpacking procedures are unnecessary. It is recommended that the factory-shipping container and packing materials be retained should it become necessary, for any reason, to reship the TT-1000A.

It is also recommended that the TT-1000A and its carrying case be carefully inspected for damage. If damaged, immediately notify the carrier and the manufacturer.

2. SHIPPING

Use standard delicate electronic equipment packaging procedures when packing the TT-1000A for reshipment.

STORAGE

1. PROCEDURE

- A. Remove the batteries and store separately.
- B. Place a four-ounce bag of desiccant inside the case.
- C. Close and latch the cover.
- D. Store in a cool dry place.