

## **TT1200 Turbine Temperature Test Set**

### USER INSTRUCTION MANUAL BARFIELD M/N TT1200

*56-101-00920*

*September 15, 2008*

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### **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.

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### **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.

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**REVISION RECORD**

REV.	ECO #	REV. DATE	DESCRIPTION OF CHANGE
A	N/A	Jan. 24, 1995	Initial Release
B	---	Oct. 20, 2000	Added Addendum A (Option A). Revised Table of Contents accordingly.
C	260-00729	Sep. 15, 2008	Updated Company Logo and Format



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### **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.

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## **CHAPTER 1: GENERAL INFORMATION**

### **1. PURPOSE OF MANUAL**

- A. This publication contains the description and the operating procedures for the:

TT1200 DIGITAL TURBINE TEMPERATURE TEST SET, P/N 101-00920 Fig. 1.

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- B. This manual is developed to address the above Test Set especially designed to test and calibrate Chromel-Alumel (CH-AL) temperature indicating systems. It contains complete instructions for maintenance inspection, testing, troubleshooting, and calibration of systems installed on aircraft engines.

### **2. GENERAL DESCRIPTION OF THE TEST SET**

The TT1200 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-function versatility.

- A. TT1200 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 (°C).
- (2) Thermocouple and lead resistance measurements to 0.001 ohm and insulation measurements up to 200 megohms.
- (3) Simulates thermocouple outputs and system lead resistances from 2 to 25 ohms.
- (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.

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- (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, 9mm (0.35") high characters, 4 1/2 digit Liquid Crystal Display (LCD) with pre-programmed legends.
- (7) Carrying Case features;
  - (a) Fabricated from high impact plastic.
  - (b) Provides a pouch on the rear for test lead storage.
  - (c) The lid contains a placard of abridged operating instructions for the experienced technician.

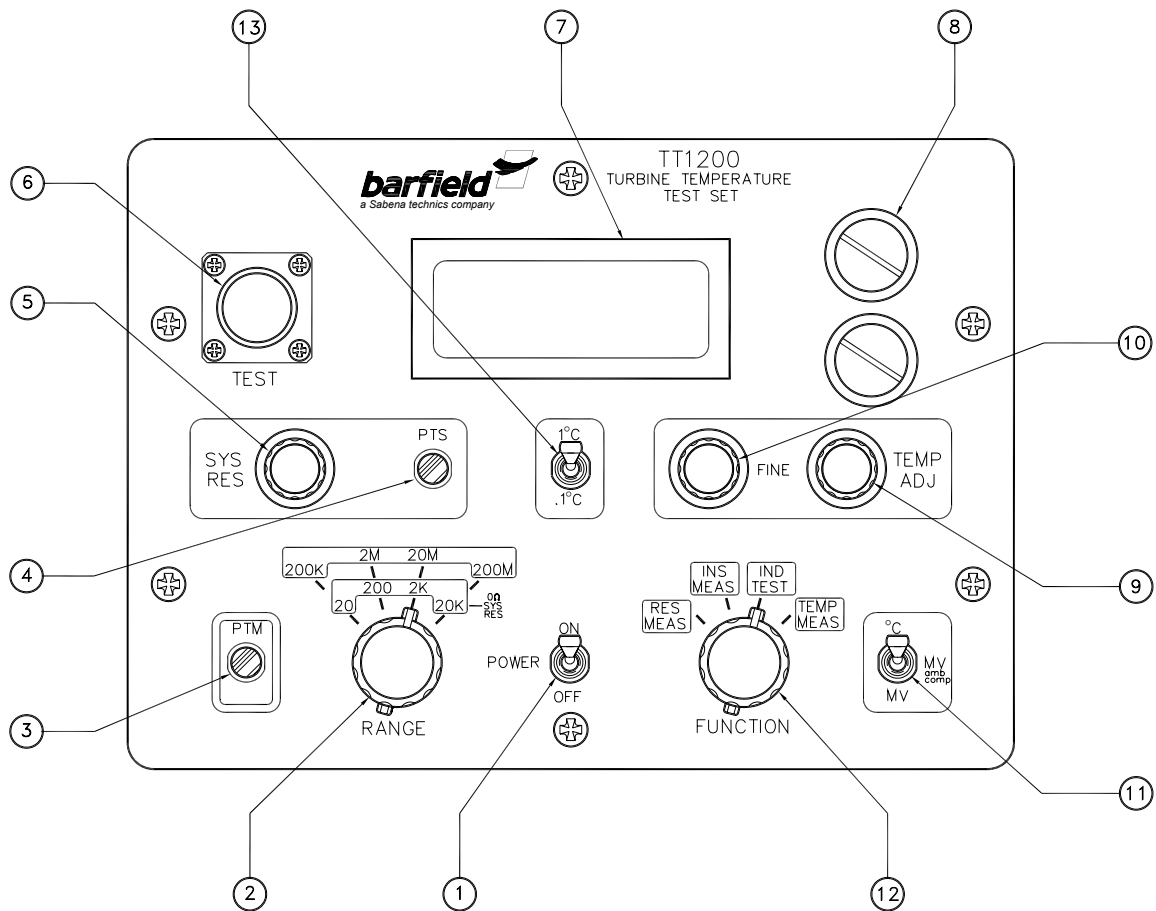
**NOTE:** For nonexperienced personnel it is advisable to become familiar with this publication, the TT1200, and the aircraft system before performing any test or checks.

### 3. **SWITCHING FUNCTIONS** (Ref. Fig. 1)

- A. The ON/OFF toggle switch (1) applies power for all functions.
- B. The RANGE switch (2), a 4 position rotary switch, permits selection of the resistance and insulation ranges,  $20\Omega$ ,  $200\Omega$ ,  $2K\Omega$  and  $20K\Omega$  for RES MEAS or  $200K\Omega$ ,  $2M\Omega$ ,  $20M\Omega$  and  $200M\Omega$  for INS MEAS. The fourth position is also used for 0 ohm system resistance for the IND TEST function.
- C. The PTM (Press To Measure) pushbutton (3), when depressed activates the TT1200 excitation and measuring circuitry when the FUNCTION switch is set to the RES MEAS or INS MEAS positions.
- D. The PTS (Press To Set) pushbutton (4), when depressed with test leads shorted and the FUNCTION switch in the RES MEAS position connects the SYS RES potentiometer for system resistance adjustment.
- E. The SYStem RESistance control knob (5), a 10 turn potentiometer used to adjust system lead resistance, 2 to 25 ohms, when test leads are shorted and the PTS pushbutton is depressed.
- F. The TEST connector (6) provides the means for connecting the TT1200's standard leads or specifically designed interface cabling.



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**TT1200 FRONT PANEL LAYOUT**

**Figure 1**

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- G. The display (7) is a 4 1/2 digit LCD which provides all the readings with associated units and legends for low battery warning (BAT) and an open thermocouple circuit (OPEN).
- H. Two battery holders (8) house 4 each AA alkaline cells which provide power for all test set functions.
- I. The TEMP ADJ control knob (9), a 10 turn potentiometer permits coarse adjustment of the temperature or millivoltage while the FINE control (10), provides exact adjustment of the readings which are displayed on the LCD when the FUNCTION switch is in the IND TEST position.
- J. The °C/MV toggle switch (11) allows the user to configure the test set to display either °C or millivoltage when the FUNCTION switch is set to IND TEST or TEMP MEAS positions. The center position, MV (amb\_ient comp\_ensated), provides the operator with a millivoltage display that is based on a reference junction at 0°C. The lower position, MV, may be thought of as a DVM function and provides the user with a display equivalent to having a DVM connected in parallel at the test set's Red and Black clips.
- K. The FUNCTION switch (12), a 4 position rotary switch that permits selection of the four principal test functions, RESistance MEASure, INSulation MEASure, INDicator TEST and TEMPerature MEASure.
- L. The 1°C/.1°C toggle switch (13) allows the user to set the test set's display resolution when the FUNCTION switch is set to IND TEST or TEMP MEAS and °C is selected.

#### **4. RECERTIFICATION**

The Test Set P/N 101-00920 has a one-year recertification requirement. Maintenance required by this unit must be performed by qualified technicians in a shop equipped with the necessary tooling and facilities.

## **CHAPTER 2: OPERATION**

### **1. GENERAL OPERATING INSTRUCTIONS**

Consult temperature indicator system and/or engine manufacturer's instructions for procedures and specifications. Read complete TT1200 Operation procedures before attempting to use the TT1200.

#### **A. Protective Circuits;**

- (1) Although the TT1200 has input protection the test set should never be connected to an energized circuit.

#### **B. Preparation For Use:**

##### **(1) Battery Installation / Replacement;**

- (a) Using a coin or screwdriver remove the covers from the battery holders located in the upper right corner of the panel. Invert the TT1200 so that batteries slide out. With the TT1200 upright insert two AA alkaline batteries into each holder with the negative terminals down for all.
- (b) To check the 4 AA batteries set the FUNCTION switch to RES MEAS, the RANGE switch to 20 ohm position and short test lead clips together.
- (c) Depress the PTM pushbutton switch. If BAT is displayed replace the batteries as detailed above.

#### **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 TT1200 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.

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- (5) To conserve battery power, place ON/OFF switch to OFF when the test set is not in use.
- (6) BAT warning displayed indicates about 10% battery life of the batteries remain and they should be replaced.

### D. Hot Engine Testing

A hot engine will cause thermocouples to generate a small potential which will produce errors in measured resistance values. This effect is inherent in any type 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 thermocouples are too hot, the readings will be too far from nominal to provide sufficient accuracy. In such a case, wait for the engine to cool further.

## 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. Set the FUNCTION switch to RES MEAS.
- D. Set the RANGE switch to 200 ohm.
- E. Setting of 1°C/.1°C switch is immaterial.
- F. Setting of °C/MV switch is immaterial.
- G. Place ON/OFF switch to ON and depress the PTM pushbutton switch.
- H. Display will indicate resistance in ohms to within  $\pm 0.01$  ohm.

If a 1\_\_\_\_ is displayed, resistance is greater than 199.99 ohms or there is an open circuit.

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- I. Interchange RED and BLACK test clip connections and the display should repeat when the PTM pushbutton is depressed. If the reading does not repeat, the engine thermocouples may be hot. (Ref. Para. 1. D. above.)

**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.

- J. Place ON/OFF switch to OFF, disconnect the TT1200 and return aircraft to original configuration.

### 3. **THERMOCOUPLE 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. Set the FUNCTION switch to RES MEAS.
- D. Set the RANGE switch to 200 ohm.
- E. Setting of 1°C/.1°C switch is immaterial.
- F. Setting of °C/MV switch is immaterial.
- G. Place ON/OFF switch to ON and depress the PTM pushbutton switch.
- H. Display will indicate resistance in ohms to within  $\pm 0.01$  ohm.

If a 1\_\_\_\_ is displayed, resistance is greater than 199.99 ohms or there is an open circuit.

- I. Interchange RED and BLACK test clip connections and the display should repeat when the PTM pushbutton is depressed. If the reading does not repeat, the engine thermocouples may be hot. (Ref. Para. 1. D. above.)

**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.

- J. Place ON/OFF switch to OFF, disconnect the TT1200 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. (Ref. engine manufacturers' Maintenance Manual for specific hookup.)
- B. Set the FUNCTION switch to INS MEAS.
- C. Set the RANGE switch to 2M ohm or as desired.
- D. Setting of 1°C/.1°C switch is immaterial.
- E. Setting of °C/MV switch is immaterial.
- F. Place ON/OFF switch to ON and depress the PTM pushbutton switch.
- G. Display will indicate insulation resistance in 1,000,000's of ohms (megohms).

If a 1. \_\_\_\_ is displayed, resistance is greater than 1.999 megohms or there is an open circuit.

**NOTE:** Resistance to ground must not be less than manufacturer's specifications.

- H. Place ON/OFF switch to OFF, disconnect the TT1200 and return aircraft to original configuration.

#### **5. INDICATOR TEST PROCEDURE (With Specified Lead Resistance)**

- A. Set the FUNCTION switch to RES MEAS.
- B. Set the RANGE switch to 200 ohm.
- C. Place ON/OFF switch to ON.
- D. Short test lead clips together and depress the PTS pushbutton while adjusting SYS RES control knob for displayed system resistance to be simulated.
- E. Set the FUNCTION switch to IND TEST.
- F. Set 1°C/.1°C switch as desired.
- G. Set °C/MV switch to °C or as desired.
- H. Disconnect aircraft thermocouple leads from temperature indicator.

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- I. Connect test lead clips to indicator terminals, OBSERVING POLARITY. Alumel is negative (-) and connects to the TT1200 BLACK clip; Chromel is positive (+) and connects to the TT1200 RED clip.
- J. Set TEMP ADJ control for the desired test temperature as displayed on the digital indicator. It may be necessary to use the FINE control to achieve the exact settings.
- K. Compare readings of indicator under test with TT1200 indications.

NOTE: Indicator must agree with TT1200 reading to within manufacturers' specifications.

- L. Place ON/OFF switch to OFF, disconnect the TT1200 and return aircraft to original configuration.

### **6. POTENTIOMETRIC OR SERVOED TYPE INDICATOR TEST PROCEDURE (Without Lead Resistance)**

#### A. General

- (1) The Potentiometric or Servoed indicator, as it is generally referred to 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. (Ref. Maintenance Manual)
- (2) Disconnect electrical connector at rear of indicator.
- (3) Connect TT1200 leads to probe pins sized to fit chromel and alumel pin sockets of aircraft plug removed from indicator.
- (4) Follow Para. 2. System Lead Resistance Test Procedure, steps C. through H above.

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

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### C. Thermocouple Resistance Measurement:

- (1) Disconnect aircraft power to indicator. (Ref. Maintenance Manual)
- (2) Follow Para. 3. Thermocouple Resistance Test Procedure above.

### D. Insulation Testing:

- (1) Disconnect aircraft power to indicator. (Ref. Maintenance Manual)
- (2) Disconnect electrical connector at rear of indicator
- (3) Follow Para. 4. Insulation Testing Procedure, steps B. thru F. above, using probe pins at aircraft plug or make connection at engine thermocouple terminal blocks.

### E. Indicator Test:

- (1) Disconnect aircraft power to indicator. (Ref. Maintenance Manual)
- (2) Disconnect leads from indicator at engine thermocouple terminal block.
- (3) Set the FUNCTION switch to IND TEST.
- (4) Set the RANGE switch to 20 K ohm - 0  $\Omega$  SYS RES.
- (5) Set 1°C/.1°C switch as desired.
- (6) Set °C/MV switch to °C or as desired.
- (7) Connect test lead clips to indicator leads OBSERVING POLARITY. Alumel is negative (-) and connects to the TT1200 BLACK clip: Chromel is positive (+) and connects to the TT1200 RED clip.
- (8) Place aircraft temperature indicating system power to ON.
- (9) Place ON/OFF switch to ON.
- (10) Rotate the TEMP ADJ control for desired test points as read on the TT1200 digital display. It may be necessary to use the FINE control to achieve the exact settings.
- (11) Compare readings of indicator under test with TT1200 indications.

**NOTE:** Indicator must agree with TT1200 reading to within manufacturer's specifications.



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- (12) Place aircraft temperature indicating system power to OFF.
- (13) Place ON/OFF switch to OFF, disconnect the TT1200 and return aircraft to original configuration.

### 7. TEMPERATURE MEASUREMENT TEST PROCEDURE

- A. Set the FUNCTION switch to TEMP MEAS.
- B. Set the RANGE switch to 20 K ohm - 0  $\Omega$  SYS RES.
- C. Set 1°C/.1°C switch as desired.
- D. Set °C/MV switch to °C or as desired.

**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.

- E. Connect test lead clips to thermocouple leads OBSERVING POLARITY. Alumel is negative (-) and connects to the TT1200 BLACK clip: Chromel is positive (+) and connects to the TT1200 RED clip.
- F. 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.



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## **CHAPTER 3: SPECIFICATIONS AND CAPABILITIES**

### **1. PHYSICAL DATA**

- A. Height: 6.5 in (16.5 cm)
- B. Width: 9.3 in (23.6 cm)
- C. Depth : 7.0 in (17.8 cm)
- D. Weight: 5.4 lbs (2.4 kg)

### **2. SPECIFICATIONS**

- A. Temperature Measurement:
  - (1) Type: K (CH-AL Thermocouple).
  - (2) Range: 0 to 1200°C certified, -50 to +1250°C extended.
  - (3) Accuracy: Typical measurement error at 25°C ambient: less than  $\pm 0.3^{\circ}\text{C}$ .
- B. Lead Resistance:
  - (1) Range; 0 -19.999 ohms in 0.001 ohm increments.  
Range; 0 -199.99 ohms in 0.01 ohm increments.  
Range; 0 -1.9999 K ohms in 0.1 ohm increments.  
Range; 0 -19.999 K ohms in 1 ohm increments.
  - (2) Accuracy;  $\pm 0.05\%$  of reading  $\pm 2$  counts
- C. Insulation:
  - (1) Range; 0 -199.9 k $\Omega$  in 0.1K ohm increments.  
Range; 0 -1.999 M $\Omega$  in 1K ohm increments.  
Range; 0 -19.99 M $\Omega$  in 10K ohm increments.  
Range; 0 -199.9 M $\Omega$  in 100K ohm increments.
  - (2) Accuracy;  $\pm 5\%$  of reading  $\pm 2$  counts.
  - (3) Excitation; 45V DC nominal.

D. Simulated System Resistance:

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

**3. CAPABILITIES**

- A. Measures and displays resistance of thermocouples, thermocouple rings and system lead circuits.
- B. Measures and displays insulation resistance of system wiring and other components.
- C. Simulates CH-AL thermocouples with or without simulated system lead resistance.
- D. Measures and displays values of CH-AL thermocouples in terms of degrees Celsius (°C) temperature.
- E. Automatically compensates for ambient temperature at test lead connection junction point or indicates this cold junction temperature.

## **CHAPTER 4: RECEIVING, SHIPPING, AND STORAGE**

### **1. RECEIVING**

No special unpacking procedures are necessary. It is recommended that factory shipping container and packing materials be retained should it become necessary, for any reason, to reship the Test Set.

It is also recommended that the Test Set be carefully inspected for damage. If damaged, immediately notify both the carrier and manufacturer.

### **2. SHIPPING**

Use standard delicate electronic equipment packaging procedures when packing the Test Set for reshipment.

### **3. STORAGE**

Store in a cool dry place.