



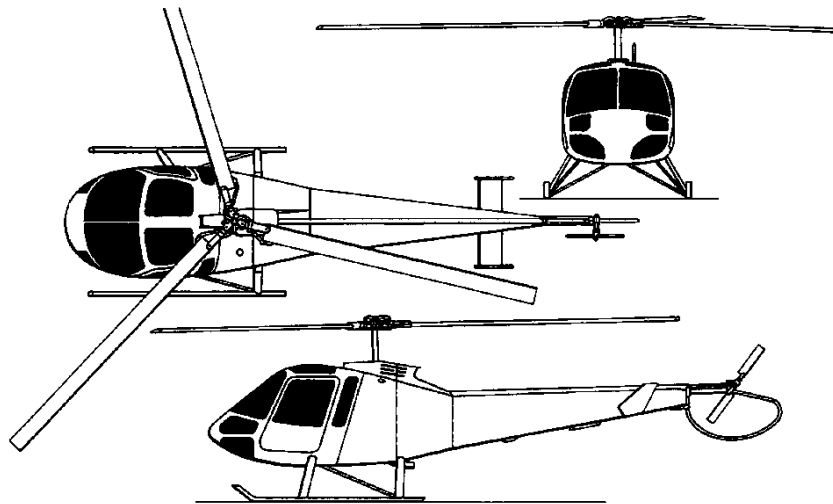
## **INSTRUCTION - PREHEAT INSTALLATION**

**TNH2504  
REV A, APR-22-2013**

**FOR  
HELI-PREHEAT KITS**

**TSHEN480-2504-115 AND TSHEN480-2504-230  
(115VAC AND 230VAC)**

**ON**



**ENSTROM 480 Series - 250-C20W**

### **PROPRIETARY DATA**

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## **Record of Revisions**

*When updated, this document is changed in its entirety.*

REV	DATE	DESCRIPTION	BY	APPROVAL
A	APR-22-2013	Initial Release	DNE	

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## **1. Introduction**

These instructions are provided as guidance only. Final judgment regarding the proper installation and inspection details are the responsibility of the installing mechanic and inspection authority releasing the aircraft for service. Should other aircraft modifications require departure from these installation procedures, it becomes the installing agency's responsibility to obtain separate approval for the deviation. Contact Tanis engineering for design change approvals as needed (952-224-4425). The installer must read this installation manual, become familiar with all processes, and resolve any conflicting issues before proceeding with the installation.

**Note:** *This instruction is for the installation of both 115 Volt and 230 Volt kits. The last numbers in a part number sequence (after the dash) represent the voltage requirement. These numbers are 115 or 230 and they may be omitted in narratives contained in this instruction. Example: TEP2653- (115 or 230).*

## **2. Installation Requirements**

The retrofitting of this aircraft with the Tanis preheat kit is complex and is to be accomplished by competent, appropriately rated and certified mechanics with airframe and power plant experience in the type of aircraft for intended installation.

Installation is to be performed following industry standards, acceptable methods, techniques and practices, airframe manufacturer's procedures, and approved procedures set in place by the installing authority. Securing, tying, and clamping of all wiring to be in accordance with AC43.13 1b Section 10 through 12. Grounding and bonding is to be in accordance with 43.13 1b Section 15.

The installation requires access to the engine, oil tank, and/or accessories. For proper installation, work is to be performed in a clean environment under standard temperature conditions of 18°C (65°F) to 27°C (80°F). Installation times vary depending on shop procedures, installation options, and other modifications.

The preheat kit item list (-115 or -230) lists parts and documents supplied. These supporting documents are also listed in Table 2-0.

**TABLE 2-0** Supporting Installation Documents

2503, Cable Kit - Wire Diagram
2504, Heli-Preheat Kit - Item List
TN02788, Instruction - Bonding
TN01026, Instruction - Indicator Light
TN02070, Instruction - Flush Mount Plug

### **2.1. Sourced Separately**

2.1.1. Tools, consumables, finish materials, installation hardware, brackets, lacing, various MS21919 cushion clamps are sourced separately. Table 2-1 list commonly sized clamps and their application.

2.1.2. Pad heat element bonding sealant is to be sourced at time of installation due to compound shelf life limitations. Refer to bonding instruction (TN02788), Instruction - Bonding, for approved bonding sealants and installation procedures.

2.1.3. Power supply and shore power connection (extension cord) are supplied by the operator.

**TABLE 2-1** Cushioned Clamp Reference. (Alternate: MS21919WCH-)

<u>Size</u>	<u>MS number</u>	<u>Application</u>
1/8"	MS21919WDG-2	1 - 2 wire
1/4"	MS21919WDG-4	2 - 3 wire
1/2"	MS21919WDG-8	Indicator light
5/8"	MS21919WDG-10	2 contact connector
3/4"	MS21919WDG-14	3 contact connector and fused link
1"	MS21919WDG-16	4 lead junction
1 3/16"	MS21919WDG-19	6 lead junction (WCH-18)
1 1/2"	MS21919WDG-24	Circular shore power plug

### **3. General System Information**

#### **3.1. System Description**

The Tanis Preheat Kit to be installed on this aircraft is for the engine and main rotor transmission. Optional Tanis systems may be installed in conjunction with the kit.

Preheating is a cold weather aviation procedure that increases reliability and safety of operations, reduces torque oscillations, thermal stress, spool-up, and launch times.

Preheating is accomplished using electrical resistance heat in the form of thin surface mounted pads sized and shaped to fit various parts. Power is routed to the heat elements through a dedicated wiring assembly with circuit overload protection. The system is self-regulating through design. Heated components reach an average state of thermal equilibrium in six hours.

#### **3.2. Power Requirements**

Kits are available in two separate AC voltage configurations: 115 volt or 230 volt. Voltage requirement is identified by part number, power plug, and placard. Circuit protection is 12 amps. Design is for operation at plus or minus 10% of system voltage requirement.

Power requirements for power plug, indicator light and heating elements, are identified through part number, and use the same installation procedures, locations, and cable kit.

#### **3.3. Operation**

The system is operated by plugging it into an appropriate AC power.

It is only to be operated with the installation completed, and affected component fluids at operational levels. Design is for continual operation in all weather and temperature conditions while in stand-by status. For preheat to be of maximum benefit when temperatures are at or below 0°C (32°F), it should be in continual use for a minimum of 6 hours before engine start. To increase the efficiency of the preheat system, the use of insulated cowl plugs and covers is suggested.

For cold weather aircraft operations and engine starting procedures, refer to the Original Equipment Manufacturer (OEM) operating procedures, Flight Manual Supplements (FMS), and FAA Advisory Circulars (AC). For detailed operating instructions of the preheat system, refer to the Tanis Aircraft pilot guide/flight manual supplement (FMS).

#### **3.4. Options**

The addition of Tanis avionics and battery heaters are also suggested. Heating of avionics allows for proper glass panel activation, reduces condensation build up, and cold weather induced gyroscopic errors. Battery heating reduces freeze point depression, allows for higher amperage outputs, and proper charge.

### 3.5. Inspection and Cleaning

Processes are in accordance with Tanis ICA (TCA0003) and aircraft manufacturer's recommendations. The Airworthiness Limitations section of the FAA specifies inspections and other maintenance required under §§ 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

### 3.6. Weight and Balance

Record the modification by updating the aircraft's equipment list and/or flight manual. As required, include an adjustment to the weight and center of gravity (CG) for the preheat kit.

Approximate kit weight = 2.25 Lbs.

### 3.7. Electrical Values

System and element electrical values are listed below (Table 3-1), and in the Cable Kit drawing.

**TABLE 3-1** System Values +/- 7%

<b>115 Volt System</b>		<b>292 Watts</b>	<b>2.5 Amps</b>	<b>42.1 – 48.5 Ohms</b>
<u>Qty</u>	<u>Element P/N:</u>	<u>Wattage</u>	<u>Ohms</u>	
1	TEP2653-115/40	40		330.6
3	TEP2664-115/50	50		265.0
1	TEP2672-115/37	37		357.4
1	TEP2730-115/65	65		203.5

<b>230 Volt System</b>		<b>292 Watts</b>	<b>1.3 Amps</b>	<b>168.4 – 193.9 Ohms</b>
<u>Qty</u>	<u>Element P/N:</u>	<u>Wattage</u>	<u>Ohms</u>	
1	TEP2653-230/40	40		1322.5
3	TEP2664-230/50	50		1058.0
1	TEP2672-230/37	37		1429.7
1	TEP2730-230/65	65		813.8

## 4. Installation

The following is a general overview. Table 2-0 contains a list of required documents and element installation instructions. The following narratives and figures depict installation options.

### 4.1. Installation Overview

- 4.1.1. Review all kit contents and documents.
- 4.1.2. Weigh the kit and installation hardware before installing.
- 4.1.3. Determine heat element locations.
- 4.1.4. Prepare the element installation sites and install elements.
- 4.1.5. Identify mounting location for junctions, fused link and ground, and install.
- 4.1.6. Identify mounting location for shore power plug, and indicator light.
- 4.1.7. Appropriately route cabling and connect.

- 4.1.8. Terminate and mount shore power plug, and indicator light.
- 4.1.9. Secure cabling and connectors.
- 4.1.10. Affix system placard adjacent to the shore power plug.
- 4.1.11. Perform "Systems Check" and "Sign Off."
- 4.1.12. Update the aircraft equipment list and (as required) weight & balance record.
- 4.1.13. Complete paper work filing (ICA and FMS etc.).

## 4.2. Element Installation and Location



Caution: Do not connect power to elements until properly installed and sealant is cured.

Using an ohmmeter verify elements resistance before installing (Table 3-1). *For deviations outside of expected range, contact Tanis Aircraft.* Element and lead orientations may deviate from depictions as required.

Abbreviations: Main rotor gearbox (MRGB), Accessory gearbox (AGB), Engine (ENG), Left hand (LH), Right hand (RH).

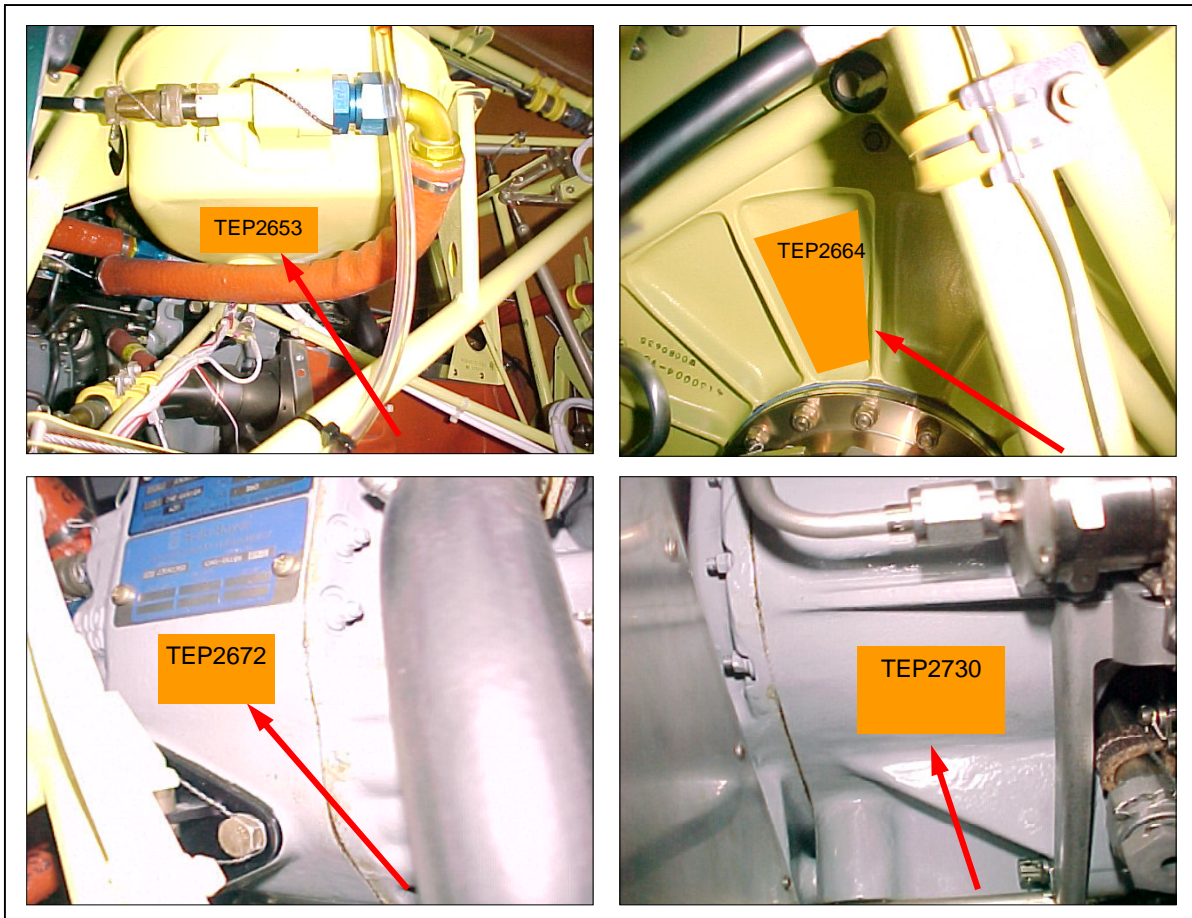
QTY	P/N	Element Installation (accessory location and orientation)
1	TEP2653-	OIL TANK, below nominal oil level (Figure 4-4 and 4-5).
3	TEP2664-	MRGB, between ventral fins (Figure 4-6).
1	TEP2672-	ENG AGB RH, below data plate (Figure 4-7).
1	TEP2730-	ENG AGB LH, (Figure 4-8).



**Figure 4-1** Example of element and part number label (TEP2653-115/40).



**Figure 4-2** Example of optional battery heat element installed.



**Figure 4-3** Element locations, bottom of oil tank, 3 pad heat elements on bottom of MRGB between ventral fins, and sides of engine AGB tank right and left sides.

### 4.3. Cabling



**Caution:** Do not allow junctions and connectors to free hang. Properly secure and support to avoid wire fatigue. Route cabling in a manner that ensures system components are not in close proximity to high heat sources. Apply fire sleeve to components located in questionable areas. Check for proper engine to airframe ground bonding.

To compensate for routing options, it is acceptable to service loop, racetrack, or shorten cables by cutting and re-terminating with appropriate connector, or lengthen with jumper cable. Use existing firewall and barrier penetrations whenever possible. If routing requires a new penetration through a fire barrier, use Tanis Fireproof Grommet (TG01056), MIL-C-38999, MIL-DTL-5015 series crimp type disconnect, or approved fitting conforming to 14 CFR Part 23-1191/AC20-135.

### 4.4. Suggested Cable Routing

Route the cabling between the shore power plug and elements. Follow and use existing wiring and penetrations when possible. Use cushioned clamps and cable ties for securing kit components.

4.4.1. Lay out the cable kit and required installation documents, and reference narratives and figures (4-3 through 4-9).

4.4.2. Determine location and method for mounting the a) shore power plug, b) system ground, c) fused link, and d) indicator light.

- a) Shore power plug: secure using cushioned clamps or circular plug bracket (Figure 4-7). Typical location for the plug is on or near the oil filler tube, or in a location accessible through an oil door or other cowl opening (Figure 4-5).

*Option: Plug brackets, flush mount plugs, and shore power plug door kits are available.*

- b) Ground wire: connect to the engine or airframe in accordance with 43.13 1b Section 15.

*Note: Check engine and transmission ground bonding straps for proper installation.*

- c) Fuse link with indicator lead: secure with existing wiring or cushioned clamp.

- d) Indicator Light, locate in viewable location, and secure in place with cushioned clamps, cable ties, or other acceptable means and connect to labeled indicator lead.

4.4.3. Identify mounting locations for the two (2) junctions (A and B) once verified, install as indicated using cushioned clamp or other acceptable means.

- A. Power junction, mount in a location that allows for cable leads (01 through 05) to be routed as follows:

- 01 - Shore power plug and indicator light.
- 02 - Right engine AGB element.
- 03 - Oil tank element located on bottom of tank.
- 04 - Left engine AGB element.
- 05 - Junction B.

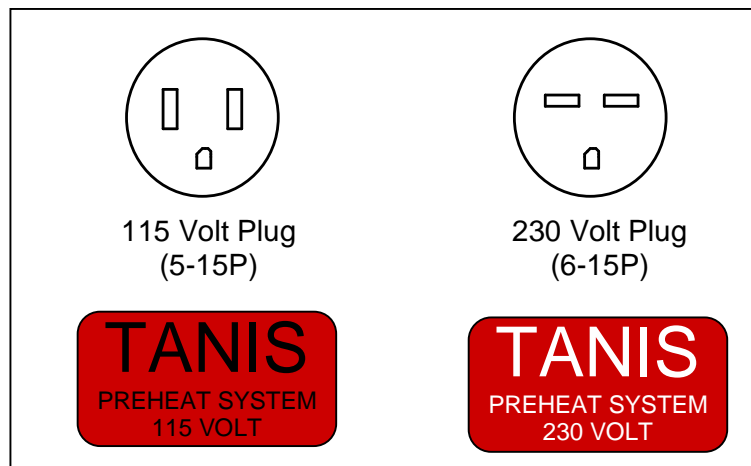
- B. MRGB junction, mount in the vicinity of the MRGB, on a support or in a location that allows leads to be routed as follows:

- 06, 07, and 08 - route to each of the elements located on the bottom of the MRGB between ventral fins.

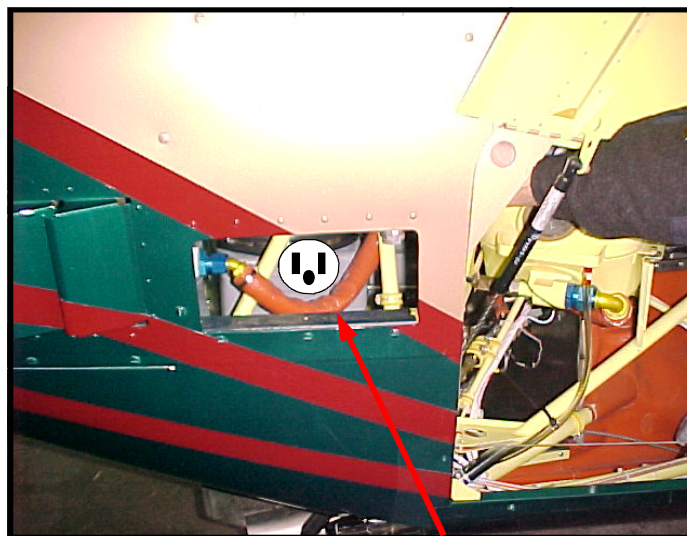
4.4.4. Once locations for above items are verified, install and mount as indicated, and connect elements.



- 4.4.5. Secure cabling, element leads, and connectors to reduce wire fatigue at wire connector and element interface.
- 4.4.6. Affix placard near the system's shoreline power plug.
- 4.4.7. Follow and complete Completion Check List and Sign Off (Sections 5 and 6).



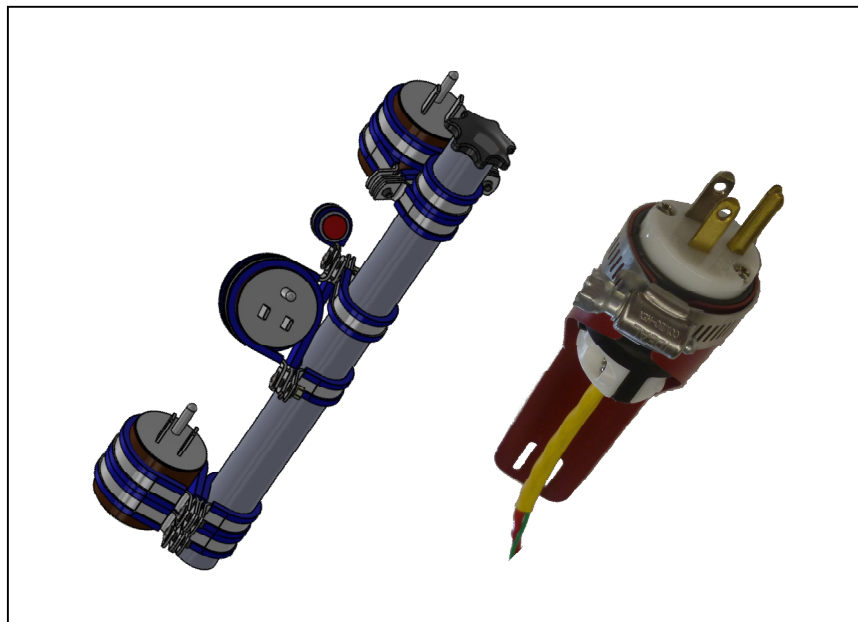
**Figure 4-4** Shore power plug types and placards.



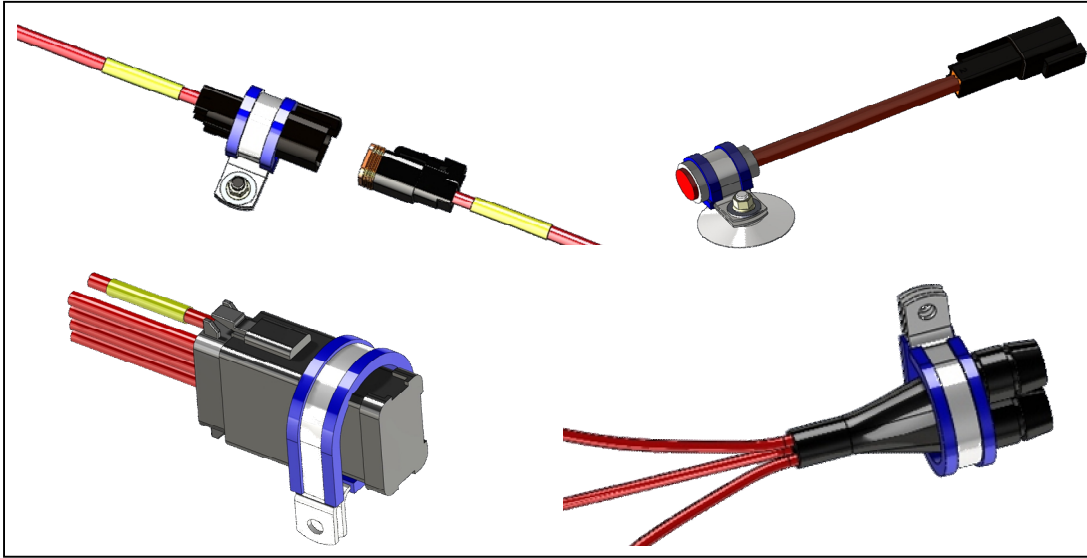
**Figure 4-5** Suggested shore power plug location.



**Figure 4-6** Wire routing option from engine to MRGB junction following airframe.



**Figure 4-7** Mounting options for circular shore power plug and indicator light using cushioned clamps or Tanis circular bracket (TU01062).



**Figure 4-8** Mounting options for connectors, indicator light, junction, and fused link.

## **5. Completion Check List**



**Caution:** Do not touch hot elements they can burn bare skin.

Before proceeding, verify system is not powered or connected to a power source.

Verify that all elements are properly connected and bonding sealant is cured.

Follow in sequence, record as indicated, and check off when completed.

If a discrepancy is found, correct before proceeding to the next step.

**\*\* Skip this procedure if optional battery heat kit is not connected to or installed with this kit.**

[ ☒ ] Check the system as follows:

- 1) [ ☐ ] Verify system components are installed in accordance with instructions.
  - 2) [ ☐ ] Verify engine to airframe bonding is as per OEM requirements.
  - 3) [ ☐ ] Verify Tanis system ground by checking for continuity between shore power plug ground pin, engine, and airframe.
  - 4) [ ☐ ] Using an ohmmeter, verify there is no continuity between shore power plug power pins (1 and 2), and the ground pin (3).
  - 5) [ ☐ ] Using an ohmmeter, measure resistance between the power pins (1 and 2), and record.  
Total system: \_\_\_\_\_ resistance.  
*Note: This is done for circuit verification and future reference if required.*
  - 6) [ ☐ ] Connect the system to appropriate power.
  - 7) [ ☐ ] In about 30-minutes the area next to the elements should feel warm. Check each element individually. If optional indicator light is used the light will be on.
  - 8) [ ☐ ] **\*\*While system is warming up, freeze (0°C) battery thermostat, and test battery heat element for heat (This element can be touched, wattage density is low).**
  - 9) [ ☐ ] Update/modify weight and balance calculations and installed equipment lists (Section 3-5).
  - 10) [ ☐ ] Appropriately file supplied Flight Manual Supplement (FMS), Instructions for Continued Airworthiness (ICA), and installation documents into existing aircraft manuals and logs.
  - 11) [ ☐ ] Make a log entry to comply with 14 CFR Part 43.9 or other procedures set in place.
- [ ☐ ] Complete and return Registration/Warranty Card.

## **6. Sign Off**

The undersigned found the system installed and operating correctly.

Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

### **Preheat System**

Part Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

### **Airframe**

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Registration: \_\_\_\_\_

### **Engine**

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

System test performed by: \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Printed Name, Title and Certificate number, if applicable)

\*\*\*\*\* NOTHING FOLLOWS \*\*\*\*\*