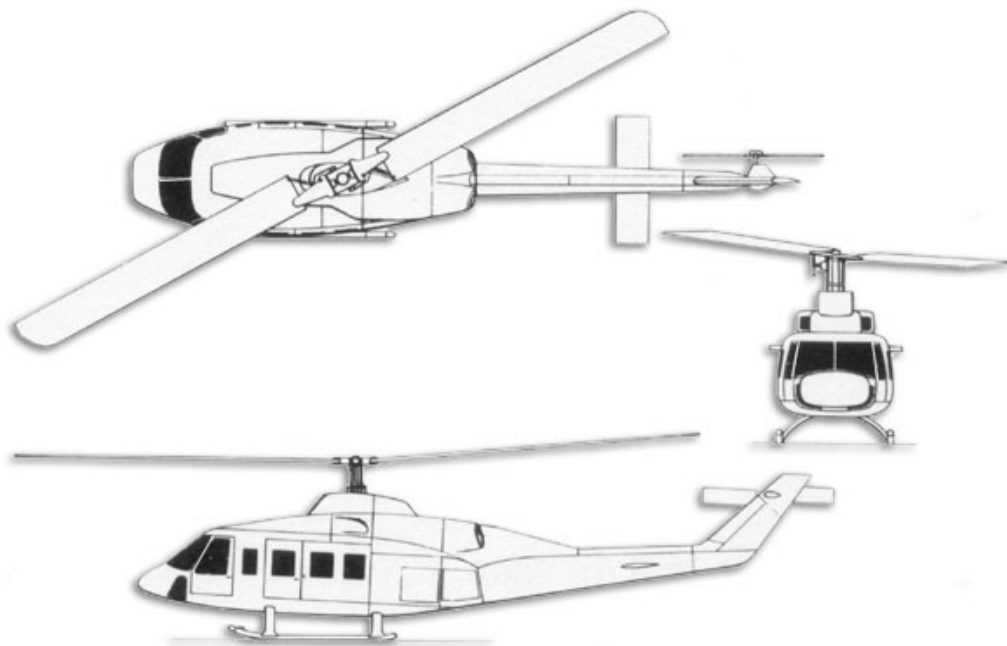




## **INSTRUCTION - PREHEAT INSTALLATION**

**Document No: TNH2602, REV. A**  
**Dated: MAR-14-2014**

**FOR**  
**HELI-PREHEAT KIT**  
**ON**  
**BELL HELICOPTER**  
**214ST - GE CT7-2A**



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## RECORD OF REVISIONS

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

| REV | DATE        | DESCRIPTION     | BY  | APPROVAL |
|-----|-------------|-----------------|-----|----------|
| A   | MAR-14-2014 | Initial Release | DNE |          |
|     |             |                 |     |          |
|     |             |                 |     |          |

## CONTENTS

|                                      |           |
|--------------------------------------|-----------|
| <b>RECORD OF REVISIONS.....</b>      | <b>2</b>  |
| <b>CONTENTS .....</b>                | <b>2</b>  |
| <b>1. PURPOSE.....</b>               | <b>3</b>  |
| <b>2. REQUIREMENTS .....</b>         | <b>3</b>  |
| 2.1 Sourced Separately .....         | 3         |
| 2.2 Tools .....                      | 4         |
| <b>3. DESCRIPTION.....</b>           | <b>4</b>  |
| 3.1 Power Requirements .....         | 4         |
| 3.2 Operation .....                  | 4         |
| 3.3 Options.....                     | 4         |
| 3.4 Inspection and Cleaning .....    | 4         |
| 3.5 Weight and Balance .....         | 5         |
| 3.6 Electrical Values .....          | 5         |
| <b>4. INSTALLATION.....</b>          | <b>5</b>  |
| 4.1 Overview .....                   | 5         |
| 4.2 Standards.....                   | 5         |
| 4.3 Elements .....                   | 6         |
| 4.4 Suggested Cable Routing .....    | 7         |
| <b>5. TABLES AND FIGURES.....</b>    | <b>8</b>  |
| <b>6. COMPLETION CHECK LIST.....</b> | <b>13</b> |
| <b>7. SIGN OFF .....</b>             | <b>14</b> |

## 1. PURPOSE

The purpose of this instruction is to provide guidance for the installation of the preheat kit listed on the cover page of this document. It is the responsibility of the technician and/or maintenance/repair facility performing the installation to read this instruction, become familiar with all processes, and resolve conflicting issues before proceeding. Final judgment regarding the proper installation and inspection details are the responsibility of the authority releasing the aircraft for service. Contact Tanis engineering for design change approvals as needed (952-224-4425).

**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 115 or 230, and may be omitted in narrative. Example: TU02615- (115 or 230).*

*Referenced Tables and Figures are listed in corresponding sections, see Contents page 2.*

## 2. REQUIREMENTS

The retrofitting of this aircraft with the Tanis preheat kit is complex and is to be accomplished by competent, appropriately rated and certified technician or maintenance/repair facility.

Installation is to be in accordance with (IAW) AC43.13-1b, industry standards, acceptable methods, techniques and practices, airframe/engine manufacturer's recommendations, and approved procedures set in place by the installing authority. Securing, tying, and clamping of wire/cable is to be IAW AC43.13-1b Chapter 11, Section 9 through 12, grounding and bonding Chapter 11, Section 15, and feed-through penetration Chapter 11, Section 17.

The installation requires clear access to the engines, gearboxes and various stations throughout the aircraft to allow for wire routing.

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 familiarity with installation.

Required supporting documents are listed in Table 1.

### 2.1 Sourced Separately

Due to shelf life limitations, pad heat element bonding sealant is to be sourced at time of installation. Approved bonding sealant called out in element installation instructions listed in Table 1.

Method and mounting of the power plug and circuit protection may require sheet metal work and/or field fabricated brackets.

Battery Heat Kit is ordered separately due to variations in battery location and requirements.

Tools, consumables, finish materials; installation hardware, brackets, lacing, and various MS21919 cushion clamps. Clamps and suggested application are listed in Table 2.

Note: Two fireproof grommet kits TG01056, are supplied for engine firewall penetration. Optional Tanis dismountable power plant kits (firewall bulkhead fitting) TU03030, are available as an alternate. Approved firewall fitting (MS5015, MS38999) are acceptable.

## **2.2 Tools**

Ohmmeter certified to traceable standard required for system check.

Suggested tools for system installation, modification, and repair:

- Deutsch contact remover tool: DT-RT1
- Tanis 4 way indent crimp tool: TU02793  
- Alternate crimp tool, DMC: AF8-TH163

## **3. DESCRIPTION**

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

Preheat is supplied through electrical resistance elements in the form of thin pads sized and shaped to fit engine, FCU, main and tail rotor gearboxes, oil and hydraulic tanks. Power is routed to the elements through a dedicated wiring assembly with circuit overload protection and power indicator light. System is self-regulating through design. Heated components reach an average state of thermal equilibrium in approximately six hours.

### **3.1 Power Requirements**

The system does not operate in flight, is not connected to or dependent on aircraft systems, and is only capable of operation when connected to a ground based power source.

System design is for operation at plus or minus 10% of system voltage requirement.

Ground based power source capable of supplying or producing required voltage and load for duration of operation is required, commonly AC (alternating current).

Refer to Table 3 for voltage and load requirements.

### **3.2 Operation**

Plugging and unplugging the system controls operation. Only operate the system once the installation is complete and affected component fluids are at operational levels.

For detailed information on system operation, refer to Operating Guide listed in Table 1.

### **3.3 Options**

Specific operational requirements may require modifications or additional elements. In addition, avionics and battery preheat is suggested. Heating of avionics allows for proper glass panel activation, reducing condensation build up and cold weather induced gyroscopic errors. Battery heating reduces freeze point depression, allowing higher amperage outputs and proper charge.

Modification and/or additional kits installed in conjunction with the base kit are acquired and installed separately. Total operational load is not to exceed 12-Amps.

### **3.4 Inspection and Cleaning**

Processes are in accordance with aircraft/engine manufacturer's recommendations, and 43.13-1b Chapter 11, Sections 1, 3, 4, 8, and 9. 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 approved.

For specific inspection and maintenance instructions, refer to ICA listed in Table 1.

### 3.5 Weight and Balance

Record the modification by updating the aircrafts equipment list and/or flight manual. As required, include an adjustment to the weight and center of gravity (CG) for the preheat kit. Approximate installed weight is 8.5 pounds (lbs). For moment arm, use engine divider firewall at engine arm.

### 3.6 Electrical Values

Preheat system and individual element values are listed in Table 3.

\* Note: Record system information as indicated in Operating Guide.

\*\*For battery heat kit information, refer to battery kit documentation supplied with battery kit.

## 4. INSTALLATION



Caution: For personal safety, and to avoid the possibility of fire, do not connect the system or any of its components to a power source until installation and Completion Check List in Section 6 has been completed.

All components are to be installed in a manner that allows for proper inspection and maintenance. Installation is not to interfere with other systems such as engine or flight controls.

Referenced documents are listed in Table 1

### 4.1 Overview

Begin installation by weighing kit contents and intended installation hardware. Access various stations as required. Identify installation sites and method for mounting plug, elements, and cabling, then install. Verify installation by completing checklist in Section 5.

### 4.2 Standards

Installation is to follow 43.13-1b acceptable methods, techniques and practices, industry standards, and airframe/engine manufacturer's procedures.

- a. Wires and cables are to be supported by suitable cable ties, clamps, grommets, or other devices at intervals of not more than 6 inches apart except when contained in ducts or conduits.
- b. Do not allow connectors to free hang. Properly secure wires and cables so movement is restricted to the span between the points of support and not on the connectors.
- c. Supporting devices should be of a size and type, with the wires and cables held securely in place without damage to the insulation.
- d. Adequately support and secure wire and connectors to prevent excessive movement in areas of high vibration.
- e. Route, wiring and cabling with enough slack to compensate for movement of shock mounts.
- f. Route, wiring and cabling in a manner that ensures system components are not in close proximity to high heat sources and use fire sleeve to protect wiring and connectors in questionable high heat areas.
- g. Where practical, route wires and cables above fluid lines, and provide separation from fuel lines. Such wiring should be closely clamped and rigidly supported and tied at

intervals such that contact between lines and related equipment would not occur in the case of a broken wire and/or a missing wire tie or clamp.

- h. Check for proper installation of engine to airframe ground strap bonding.
- i. 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 extension cable.
- j. Use existing feed-through and fire barrier penetrations whenever possible. Feed-through penetrations are to be IAW with 43.13-1b Chapter 11, section 17. If routing requires a new fire barrier penetration use Tanis Fireproof Grommet TG01056, dismountable power plant kit TU03030, or approved fitting.

### 4.3 Elements



**Caution.** Do not connect power to elements until installed and bonding sealant is cured.

Before installing elements check resistance values and compare with listing in Table 3.

*For deviations outside of excepted range, contact Tanis Aircraft Product.*

For element installation procedures reference, Instruction - Pad Bonding listed in Table 1.

Lead orientations may deviate from depictions, generic pad heat element shown in Figure 1.

Abbreviations: MRGB (main rotor gearbox), CBox (combiner gearbox), IGB (intermediary tail rotor gearbox), TRGB (tail rotor gearbox), AGB (engine accessory gearbox), HYD MOD (Hydraulic Module/Reservoir).

| Qty | P/N      | Pad heat element location and orientation                                      |
|-----|----------|--|
| 4   | TEP2649- | AGB 1 each engine tank (Figure 2), left and right side CBox (Figures 5 and 7). |
| 2   | TEP2650- | MRGB 1 each side of hyd. pump accessory pad, leads up (Figure 5).              |
| 2   | TEP2688- | HYD MOD lower side 1 each, position leads for best routing (Figure 6).         |
| 1   | TEP2706- | MRGB lower sump/ tank (Figure 5).  |
| 2   | TEP2730- | IGB side or bottom, TRGB aft surface, lead to follow chip light (Figure 4).    |
| 2   | TEP2733- | 1 ea. on FCU (Figure 3).   |
| **  | Varies   | Battery heat element ordered separately and varies by order (Figure 8).        |

Battery element installation does not use bonding sealant. Element is installed using cable ties. Wrap element around the perimeter of vertical surface with flat side toward battery. Element ends should not overlap. Using supplied or appropriate cable-ties, and lace element together. Pull cable ties gently and alternate tension between ties while avoiding power lugs and sensor connector. Adaptor panel (TB02645) may be supplied for fitting around terminal and sensor contacts. While lacing element in place, do not pull too hard, this could result in pulling grommets out. For further details, reference Battery ICA TICA2800.

#### 4.4 Suggested Cable Routing

When planning wire/cable routing refer to Cable Kit - Wire Diagram, listed in Table 1.

Mount junctions using cushioned clamp (Figure 7 and 11), route cabling with existing wiring when possible. Once routing has been verified, cut, label, and appropriately terminate.

Use existing penetrations when possible. Before penetrating composites, refer to airframe manufacturer's procedures, and AC43.13-1b Chapter 3, for proper penetration and potting methods.

Shore power plug: Identify location and method of installation for shore power plug, ground, fuse holders, and power indicator light, then install. Suggested location is on pilot side of airframe (Figure 10) with existing shore power plugs, or in avionics bay door. Depending on location and method of mounting, sheet metal modification and/or field fabrication may be required.

Junctions (terminal block):

- a) Power Junction A: Locate adjacent to shore power plug. As per Cable Kit - Wire Diagram, connect and install, fuse holders, ground wire, and shore power plug.
- b) MRGB Junction B: Locate on the transmission deck, or in an accessible location that allows leads to reach corresponding elements. Suggested location is left of CBox near fire bottles (Figure 7). Route lead 04 back to power distribution junction A, located near power plug. There may be a need to penetrate composite deck if routing from below CBox deck. If so, cut and pot around hole per Bell structures manual and install standard MS grommet.
- c) Engine Junction C: Locate forward of engine firewalls, may be collocated with MRGB Junction B. Route corresponding element leads to each engine, penetrating firewalls with existing wiring, using supplied TG01056 fireproof grommets, or optional power plant dismount kits TU03030. Route, lead 05 with lead 04 back to the power distribution junction A.

Lead 03 Tail boom, IGB and TRGB: Begin routing from IGB. Route longer unterminated Tail Boom lead forward with existing wiring to Power Junction A. Route shorter lead with socket connector labeled TRGB with chip light wiring up to TRGB element.

Lead 06 Battery: Route from battery with existing wiring to power distribution junction A. When not in use, or battery kit is not being installed, seal connector with supplied sealing cap.

Placard: Affix adjacent to shore power plug. Alternate placard stating *Tanis* and required voltage (115/230) is acceptable.

## 5. TABLES AND FIGURES

**TABLE 1** - Supporting Installation Documents

|               |  |
|---------------|--|
| 2599          | Cable Kit - Wire Diagram                     |
| 02602-115/230 | Heli-Preheat Kit - Item List                 |
| TN01026       | Instruction - Indicator                      |
| TN01056       | Instruction - Fireproof Grommet              |
| TN02070       | Instruction - Shore Power Plug               |
| TN02782       | Instruction – Click Bond Kit                 |
| TN02788       | Instruction - Bonding (Element Installation) |
| TN02793       | Instruction - Connector                      |
| TPG0003       | Operating Guide - Rotorcraft Preheat         |

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

| Size    | MS number     | Application                        |
|---------|---------------|------------------------------------|
| 1/8"    | MS21919WDG-2  | 1 - 2 wire                         |
| 1/4"    | MS21919WDG-4  | 2 - 3 wire                         |
| 5/16"   | MS21919WDG-6  | 8mm Indicator light                |
| 1/2"    | MS21919WDG-8  | 1/2 Indicator light                |
| 5/8"    | MS21919WDG-10 | 2 contact connector                |
| 7/8"    | 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          |

\*\* Note: Record system information as indicated in Operating Guide.



**TABLE 3 - System Values +/- 10%**

\*\* Note: Record system information as indicated in Operating Guide.

For battery heat kit information, refer to battery kit documentation supplied with battery kit.

| <b>115 Volt System</b> | <b>1220 Watts</b>   | <b>10.6 Amps</b> | <b>10.8 Ohms</b> |
|------------------------|---------------------|------------------|------------------|
| <u>Qty</u>             | <u>Element P/N:</u> | <u>Wattage</u>   | <u>Ohms</u>      |
| 4                      | TEP2649-115/120     | 120              | 110.2            |
| 2                      | TEP2650-115/120     | 120              | 110.2            |
| 2                      | TEP2688-115/20      | 20               | 661.3            |
| 1                      | TEP2706-115/224     | 224              | 59.0             |
| 2                      | TEP2730-115/65      | 65               | 203.5            |
| 2                      | TEP2733-115-53      | 53               | 249.5            |

| <b>230 Volt System</b> | <b>1220 Watts</b>   | <b>5.3 Amps</b> | <b>43.4 Ohms</b> |
|------------------------|---------------------|-----------------|------------------|
| <u>Qty</u>             | <u>Element P/N:</u> | <u>Wattage</u>  | <u>Ohms</u>      |
| 4                      | TEP2649-230/120     | 120             | 440.8            |
| 2                      | TEP2650-230/120     | 120             | 440.8            |
| 2                      | TEP2688-230/20      | 20              | 2645.0           |
| 1                      | TEP2706-230/224     | 224             | 236.0            |
| 2                      | TEP2730-230/65      | 65              | 813.8            |
| 2                      | TEP2733-230/53      | 53              | 998.1            |



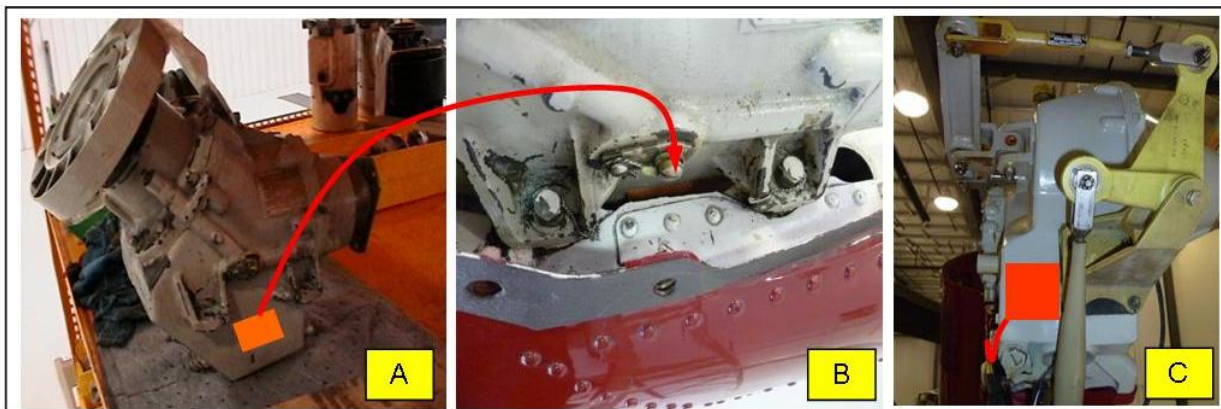
**Figure 1** Generic element shown with 6 inch lead, connector and yellow label with part number.



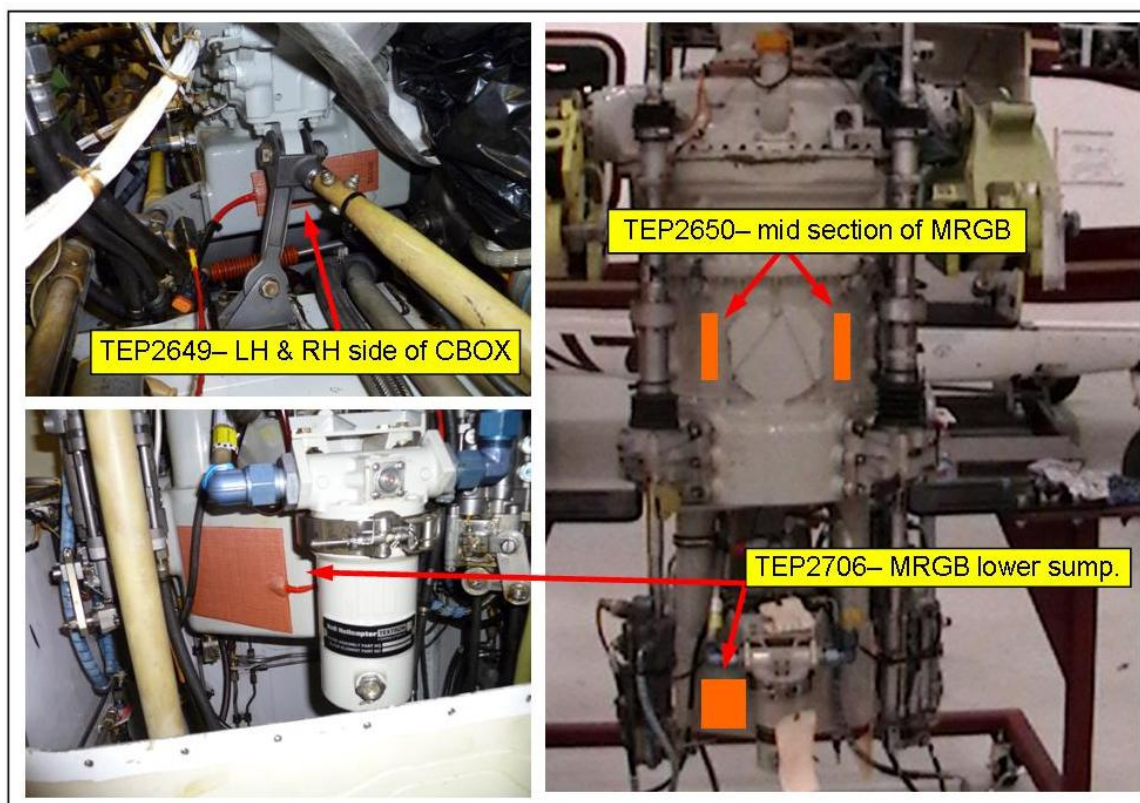
**Figure 2** | TEP2649- Engine AGB adjacent to sight glass below nominal oil level, lead down.



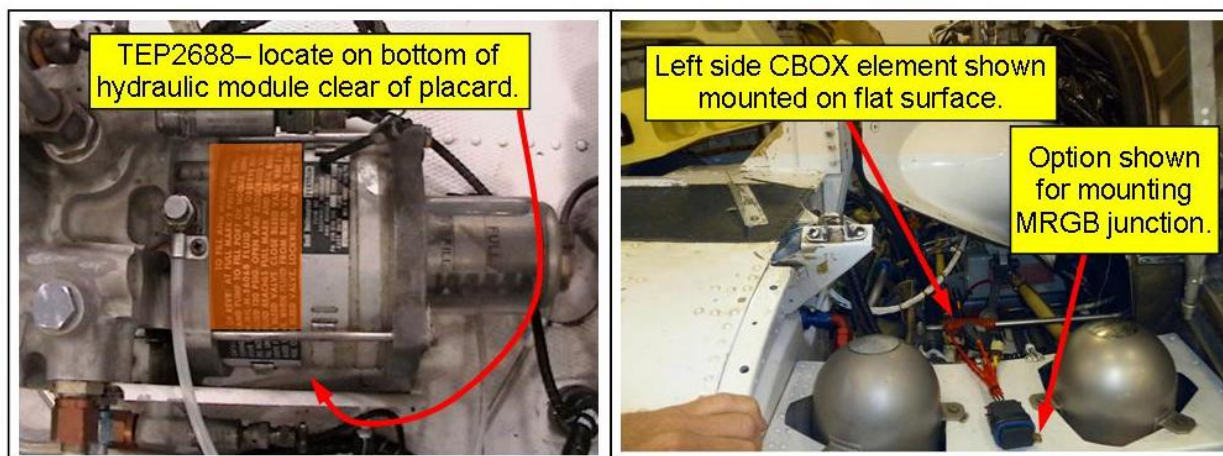
**Figure 3** TEP2733- Engine FCU installed convex cover plate, position lead for proper wire routing.



**Figure 4** TEP2730- one pad is located on a flat lower aft or side surface of IGB figures A and B, and one is located on the aft side of TRGB figure C. Route lead with chip light.



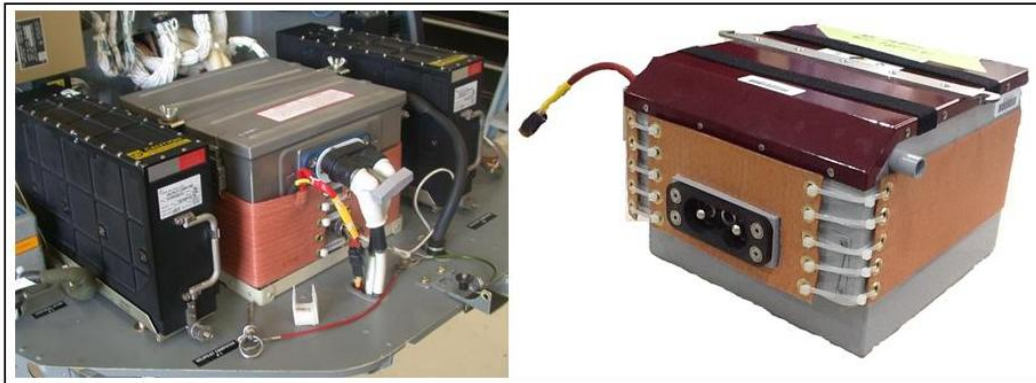
**Figure 5** Two TEP2649- elements are installed on the Combiner box, left and right sides. Two TEP2650- elements are installed on the mid section of the MRGB in vertical surfaces between ventral ridges adjacent to accessory pad. One TEP2706- is installed on the MRGB lower sump/tank.



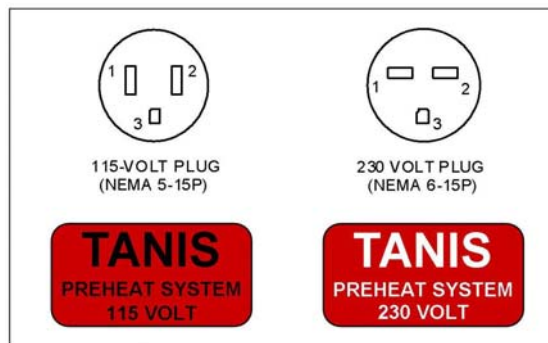
**Figure 6** TEP2688- One installed on each Hydraulic module. Install on lower surface avoid covering placard information.

**Figure 7** TEP2649- two installed on CBox, left and right side. MRGB junction can be mounted on airframe using cushioned clamp, example shown above near fire bottles.

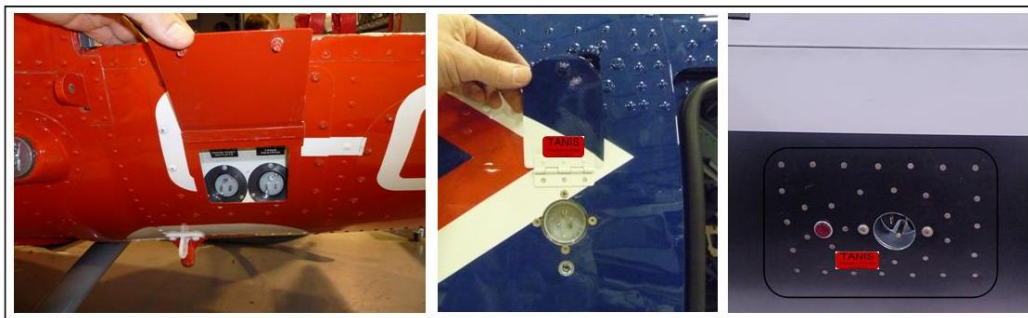




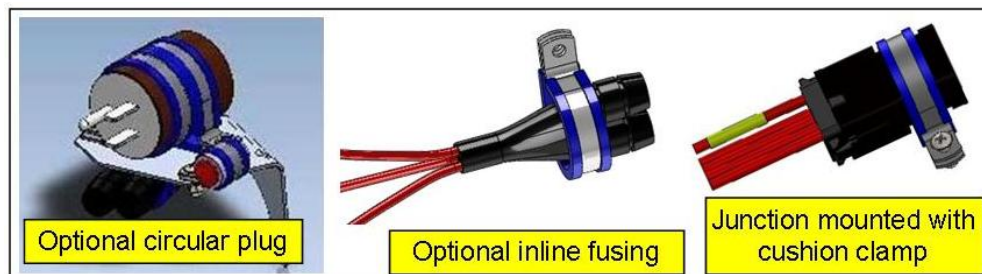
**Figure 8** Examples Battery kits. Note supplied separately from main kit.



**Figure 9** Shore power plug types and placards.



**Figure 10** Examples for plug mounting using custom door, supplied door, and in panel without door.



**Figure 11** Optional plug, fusing, and depiction of junction with cushioned clamp.

## 6. 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 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 when not installed.**

[ ☒ ] Check the system as follows:

1. [ ☐ ] Verify system components are installed in accordance with kit installation instructions.
2. [ ☐ ] Verify engine to airframe/engine bonding (ground strap) is as per OEM requirements.
3. [ ☐ ] Verify preheat system ground by checking for continuity between shore power plug ground, pin 3 (Figure 9), engine, and airframe.
4. [ ☐ ] Using an ohmmeter, verify there is no continuity between shore power plug 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: For circuit verification and reference as required.*
- 6) [ ☐ ] Connect the system to appropriate power.
- 7) [ ☐ ] Verify power indicator light is on (illuminated).
- 8) [ ☐ ] Within 30-minutes, area adjacent to the elements will start to feel warm. Check each element individually..
- 9) [ ☐ ] **\*\* While system is warming up, freeze (0°C) battery thermal control, then test battery heat element for heat. This element can be touched, as wattage density is low.**
- 10) [ ☐ ] Update/modify weight and balance, and installed equipment lists (Section 3.5).
- 11) [ ☐ ] Complete/fill-in blanks on first and last pages of Operating Guide TPG0003, and file with POH/AFM.
- 12) [ ☐ ] Appropriately file supplied Instructions for Continued Airworthiness (ICA), and installation documents with aircraft manuals and logs.
- 13) [ ☐ ] Make a log entry to comply with 14 CFR Part 43.9 or other procedures set in place.
- 14) [ ☐ ] Complete and return Registration/Warranty Card.

## 7. SIGN OFF

The undersigned found the system installed and operating correctly.

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

### **Preheat Kit**

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

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

### **Airframe**

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

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

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

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

### **Engine**

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

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

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

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

\_\_\_\_\_  
(Printed name, title and certificate number, if applicable)

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