TANIS
AIRCRAFT PRODUCTS

INSTRUCTION – PREHEAT INSTALLATION

Document No.: TNH2765 REV. D

Dated: MAR-18-2015

TSHEC135-2765 SERIES HELI-PREHEAT KIT
ON

AIRBUS HELICOPTERS

EC135 - Arrius T1 2B/2B1/2B1A/2B1A1, T2/T2+ 2B2

RECORD OF REVISIONS

When updated, this document is changed in its entirety.

REV	DATE	DESCRIPTION	BY	RELEASE
D	MAR-18-2015	Add engine and tailboom disconnect connectors	DNE	Digitally signed by dirk@tanisaircraft.com DN: cn=dirk@tanisaircraft.com Date: 2015.03.18 12:05:00 -05'00'
C	DEC-12-2012	Correct typo on page 1, change instruction 186 to TN02788 and 192 to TN02793	GDO	DNE
B	NOV-01-2012	Update from install	GDO	DNE
A	JUN-10-2012	Initial Release	DNE	RCK

CONTENTS

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 narratives. Example: TU02615- (115 or 230).*

2. REQUIREMENTS

Required documents, and referenced figures and tables located in Section 5.

Retrofitting of this aircraft with the Tanis preheat kit is to be accomplished by appropriately qualified technician or maintenance/repair facility.

- Work is to be performed in a clean environment under standard temperature conditions of 18°C / 65°F to 27°C / 80°F.
- Installation requires clear access to various stations throughout the aircraft. This may include interior panels, sidewalls, ceiling, engine, gearboxes, tailboom, and battery.
- Installation times vary due to a wide range of variables. Bonding sealant cure time is in the range of 8 hours, refer to Instruction - Bonding (Table 1).
- System information is to be recorded as indicated in Operating Guide and ICA (Table 1).
- Installation is to be in accordance with (IAW) current regulatory requirements, airframe/engine manufacturer's recommendations, approved procedures set in place by the installing authority. Reference AC 43.13-1B Chapter 11, Sections 9 through 12 for securing, tying, and clamping, Section 15 for Grounding and bonding, and Section 17 for feed-through penetrations.
- For global standardization and safety of operations, power connection point (shore power plug), is a non-locking blade type NEMA connector (Figure 1). A corresponding receptacle connector (supplied for field installation with 230-volt kits) is required on power connection/extension cord. Additional approved receptacles are available though Tanis (TP02872-115, TP02829-230).

2.1 Materials

Installation hardware, consumables, finish-materials, brackets, lacing, various MS21919 cushion clamps (Table 2).

- Pad element bonding sealant is sourced at time of installation. Approved adhesive sealants and element installation procedures called out in Instruction - Bonding (Table 1).
- Sheet metal work and sealants are required review Sections 4.4, and 5. Tables and Figures.
- When penetrating composites refer to and follow manufactures procedures.
- Power supply and shore power connection (extension cord) is supplied by operator.

2.2 Tools

Various standard aviation hand tools are required and are not supplied.
Required:

- Ohmmeter certified to traceable standards
- Deutsch contact remover tool: DT-RT1 or equivalent
- Tanis 4 way indent crimp tool: TU02793
  - Alternate crimp tool, DMC: AF8-TH163

3. DESCRIPTIONS

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

System does not operate in flight, is not connected to or dependent on aircraft systems, and is self-regulating. Heated components reach an average state of thermal equilibrium in approximately six hours.

3.1 Physical Attributes

Preheat is applied through electrical resistance heat in the form of thin pads sized and shaped to fit various parts. This includes engine reduction gearboxes, attached accessories, main and tail rotor gearboxes, oil/hydraulic coolers and tanks, with accommodation for battery heat kit. Power is routed to elements through dedicated wiring assembly with circuit overload protection and shore power indication.

3.2 Technical Specifications

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

3.3 Weight and Balance

Record modification, update equipment list, and/or flight manual. Include adjustment to weight and balance. Approximate installed weight is 7.5 pounds (lb). Use center engine CG at aircraft center line for moment arm.

3.4 Power Requirements

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

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

Voltage and load requirements are listed Section 5, Table 3.

3.5 Operation

Caution: Only operate system after completing Functional System Check in Section 6. Before attaching power review Operating Guide listed in Table 1.

3.6 Maintenance

Instructions for Continued Airworthiness (Table 1), lists inspection and cleaning procedures. All processes are IAW 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 by 14 CFR Part 43.16 and 91.403, of the Federal Aviation Regulations unless an alternative program has been approved.

3.7 Options

Specific operational requirements may require modifications and/or additional elements.

- Heating of avionics allows for proper glass panel activation, reduces condensation and cold weather induced gyroscopic errors.
- Battery heating reduces freeze point depression, allows for higher amperage outputs and proper charge (cabling configured with power supply lead for battery heat kit).
- Modification and/or additional kits are available for installation with base kit.
- Interior power outlet kit TC03071.
- Alternate circuit protection: 03013 series Tanis Dual Fused Link, HTB-42I mountable fuse holder, MS26574-10 and MS3320-10 breakers.
- Approved bulkhead and firewall penetration, and dismount connector kits: Fireproof Grommet - TG01056, Firewall Connector Kit - TU03030, Connector Kits - TU3047 and 02968.

4. INSTALLATION

Referenced documents, figures, and tables, located in Section 5.

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.

- Record system information as indicated in Operating Guide and ICA.
- Preheat system and individual element values are listed in Table 3.

4.1 Overview

(1) Review all instructions and documents included with kit.

(2) Weigh kit contents and intended installation hardware.

(3) Access engine and identify installation sites for power plug, elements, and cable routing.

(4) Install components per instructions.

(5) Complete, Functional System Check and Sign Off (Sections 6 and 7).

4.2 Standards

Installation is to be IAW current regulatory requirements, AC 43.13-1B., and airframe/engine manufacturer's procedures.

(1) Wires and cables are to be supported by suitable cable ties, clamps, grommets, or other devices at intervals of not more that 6 inches apart except when contained in ducts or conduits.

(2) 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.

(3) Supporting devices should be of a size and type, with the wires and cables held securely in place without damage to the insulation.

(4) Adequately support and secure wire and connectors to prevent excessive movement in areas of high vibration.

(5) Route wiring and cabling with enough slack to compensate for movement of shock mounts.

(6) Route cable/wire 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.
(7) 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.
(8) 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.
(9) Use existing feed-through and fire barrier penetrations whenever possible. Feed-through penetrations are to be IAW with AC 43.13-1B Chapter 11, section 17. If routing requires a new fire barrier penetration reference Section 3.7 Options.
(10) Check for proper installation of engine to airframe ground strap bonding.

4.3 Elements

⚠ **Caution:** Do not connect elements to power until installed and Functional System Check has been completed.

- Verify individual element resistance before installing (Table 3).
- Select locations that are relatively flat and clear of oil drip points.
- Lead and pad orientations may deviate from depictions.
- Only install using approved sealants, refer to Instruction - Bonding (Table 1).

When sealing around parameter/edge of element use only enough sealant to create smooth transition along edge of element to mounting surface. Transition is not to extend beyond 3/8 of an inch (0.375") from the element, and not more than 3/16 of an inch (0.188") onto the element's upper surface.

Optional edge sealant: Parameter/edge of elements may be sealed with P/S 700 after primary element bonding sealant is cured. For proper adhesion, area adjacent to element and perimeter surface of pad must be free of primary element bonding sealant.

Abbreviations: Main rotor gearbox (MRGB), Tail rotor gearbox (TRGB), Engine accessory reduction gearbox (ENG AGB).

Qty	P/N	Pad element location. Reference Figures in Section 5.
2	TEP2650-	MRGB FWD LH/RH, one per side forward lower vertical surface, leads left.
2	TEP2675-	MRGB AFT LH/RH, horizontal on lower aft vertical surface, leads outboard.
2	TEN2675-42-	ENG OIL TANK- one each engine, below nominal oil level, leads down.
1	TEP2921-	TRGB bottom, lead left.
2	TEN2923-48-	ENG AGB TOP – one each engine, aft of the S/G, lead outboard.
*1	TBP2646	Battery heat element (supplied per order).

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. Use cable-ties or appropriate lacing, and gently lace element in place. Alternate tension between ties; avoid power lugs and sensor connectors. Adaptor panel (TB02645) may be used for fitting around terminal and sensor contacts. While lacing element in

place, do not pull too hard, this could result in pulling grommets out. Refer to battery ICA listed in Table 1, for installation and maintenance information.

4.4 Cable Routing

Cable routing is suggested and may deviate from narratives and depictions. Before starting installation review Sections 4.2 and 5, Cable Kit - Wire Diagram, and all supporting documents listed in Table 1.

- Use existing penetrations whenever possible.
- Should penetration in composites panel be required, refer to airframe manufacturer's procedures, and AC 43.13-1B Chapter 3.

1. Shore power connection - door and plug: Identify location for installing door and plug, and install. Use supplied door kit or mount plug with other approved ground power configuration. Suggested location is on the right rear of the aircraft just forward of the clamshell door frame near step.
2. Indicator light: Install in visible location adjacent to plug.
3. Ground: Connect to airframe adjacent to plug, use an existing ground lug when available.
4. Circuit protection: Mount supplied fuse holders, or alternates listed in Section 3.7. Options, in field fabricated bracket or in accessible location with or near existing breaker panel.
5. Engine compartment firewall connectors: Install Firewall Connector Kits TU03030 directionally in each engine compartment near outboard edge of engine deck as depicted in Section 5. Refer to wire diagram for wire pin-out and routing options.
6. Junctions: Mount using cushioned clamps in locations that allow for cable routing and connection as depicted in wire diagram.

   Junction A: Mount on load side of circuit protection.

   Junction B: Mount below left engine compartment near penetration, route Lead 04 to junction A, and terminate element leads in firewall connector TU03030.

   Junction C: Mount below right engine compartment near penetration route Lead 05 to junction A, and terminate element leads in firewall connector TU03030.

   Junction D: Mount forward of left engine firewall and left of main transmission, route Lead 03 aft through engine compartment to Junction A, transitioning through firewalls using Fireproof Grommet TG01056 for forward penetration, and Firewall Connector Kit installed for left engine element leads, or use route Lead 03, through transmission deck into passenger compartment and aft along ceiling to junction A. Route though deck with existing wiring or install TG01056 or approved fitting for penetration.
7. Tailboom connector kit and cable: Route Lead 08 from left engine Junction B, aft to tailboom disconnect station, install Connector Kit TU03047 directionally in existing disconnect plate - location for connector in panel determined by installer – continue routing aft to tailrotor element.
8. Battery heat cabling: Route Lead 11 from right engine Junction A to ceiling below battery compartment and connect to battery heat kit - supplied separately (cap if not used) - refer to Battery ICA, epoxy Click Bond cable mount on vertical inner panel below compartment and

cable tie thermal control to mount, route battery element lead up into battery compartment thought existing grommet and connect to battery element.

9. Placard: Affix placard (Figure 1), or placard with equivalent stating at a minimum; “Tanis”, and the system voltage near systems shore power plug.
10. Complete Functional System Check and Sign Off, Sections 6 and 7.

5. TABLES AND FIGURES

TABLE 1 - Supporting Installation Documents

* Note: Record and retain documents as indicated in Operating Guide and ICA.

02765	Heli-Preheat Kit - Item List (-115 or -230)
02764	Cable Kit - Wire Diagram
03030	Drawing – Firewall Connector Kit
03047	Drawing – Connector Kit (Tailboom)
TN02070	Instruction – Flush Mount Plug
TN02782	Instruction – Click Bond Cable Mount
TN02788	Instruction - Bonding (Element Installation and Sealant)
TN02793	Instruction - Connector (Termination and Assembly)
TN02829	Instruction - Receptacle (Supplied with 230-volt kits)
TN02840	Instruction – Flush Plug Door Installation
TN03039	Instruction - Indicator 8mm
TNH2765	Instruction - Heli-Preheat Installation
TCA0003	ICA - Rotorcraft Preheat System
TPG0003	Operating Guide - Rotorcraft Preheat System
TICA2800	ICA - Battery Heat Kit

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

(Clamp sizes vary by manufacturer, properly size for secure fit)

Size	MS number	Application
1/8"	MS21919WDG-2	1 - 2 wire
1/4"	MS21919WDG-4	2 - 3 wire
5/16"	MS21919WDG-5	8mm 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

TABLE 3 - Technical Specifications.

Total preheat system and individual element values +/- 10%.

* Battery information listed for reference.

115 Volt kit	**6.9 Amps**	**795 Watts**	**16.6 Ohms**
* With Battery	7.4 Amps	855 Watts	15.5 Ohms

Qty	Element Part Number	Location	Wattage	Ohms
2	TEP2650-115/120	MRGB FWD LH/RH	120	110.2
2	TEP2675-115/95	MRGB AFT LH/RH	95	139.2
2	TEN2675-42-115/95	LH/RH ENG OIL TANK	95	139.2
1	TEP2921-115/45	TRGB	45	293.9
2	TEN2923-48-115/65	LH/RH ENG AGB TOP	65	203.5
*1	TBP2646-115/60	Battery	60	220.4

230 Volt kit	**3.5 Amps**	**795 Watts**	**66.5 Ohms**
* With Battery	3.7 Amps	855 Watts	61.9 Ohms

Qty	Element Part Number	Location	Wattage	Ohms
2	TEP2650-230/120	MRGB FWD LH/RH	120	440.8
2	TEP2675-230/95	MRGB AFT LH/RH	95	556.8
2	TEN2675-42-230/95	LH/RH ENG OIL TANK	95	556.8
1	TEP2921-230/45	TRGB	45	1175.6
2	TEN2923-48-230/65	LH/RH ENG AGB TOP	65	813.8
*1	TBP2646-230/60	Battery	60	881.7

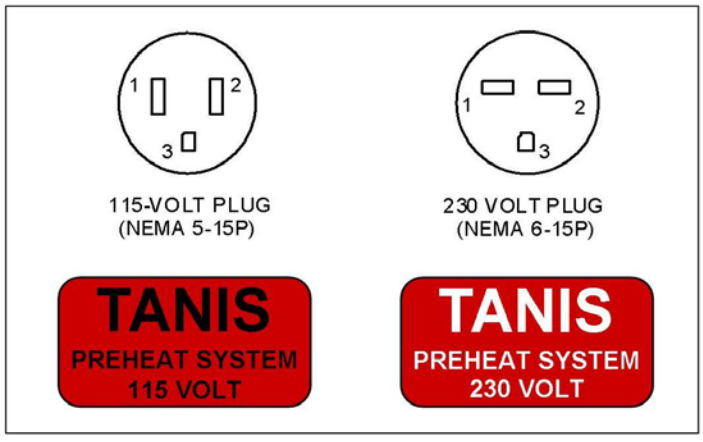

Figure 1 - Shore power plugs and placards. Placard that states at a minimum, *Tanis* and the system voltage requirement (*115 Volt* or *230 Volt)* is acceptable.

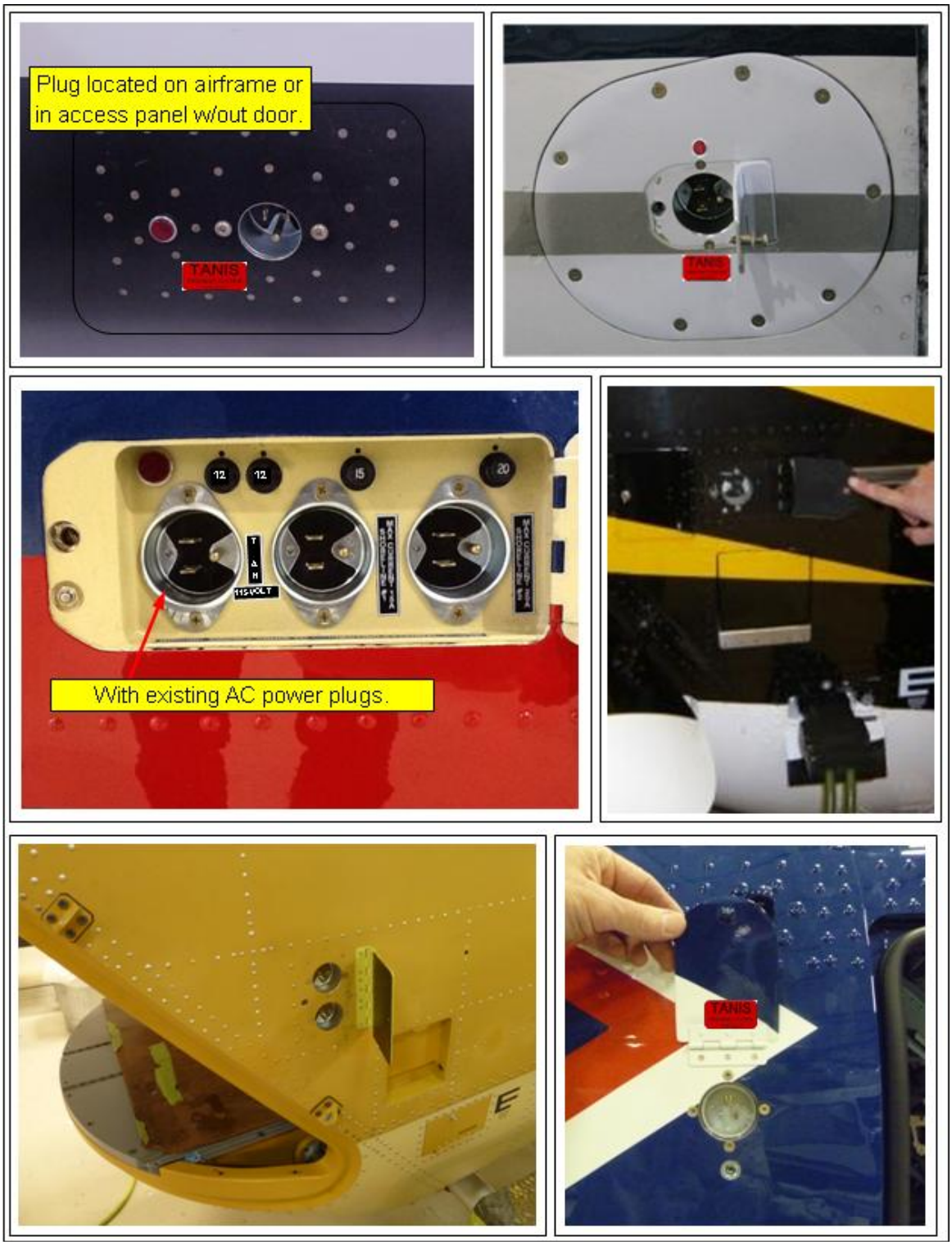

Figure 2 - Examples of shore power plugs mounting. Supplied door shown in three right images.

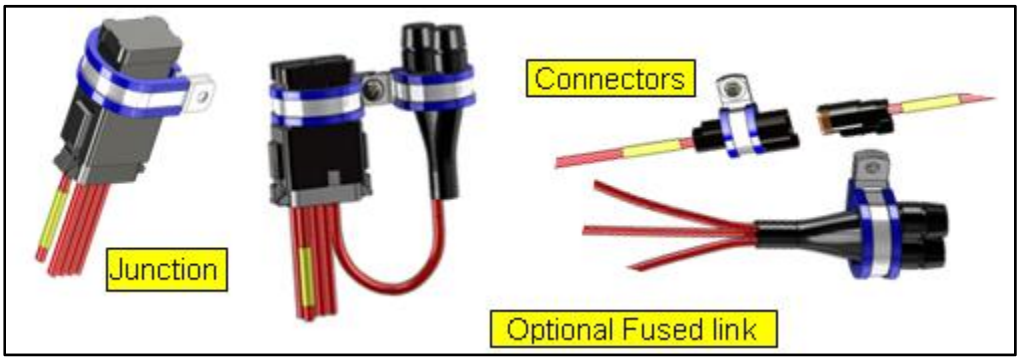

Figure 3 – Examples of clamp positions on junctions, connectors, and optional fused link.

Figure 4 - Generic example of pad heat element.

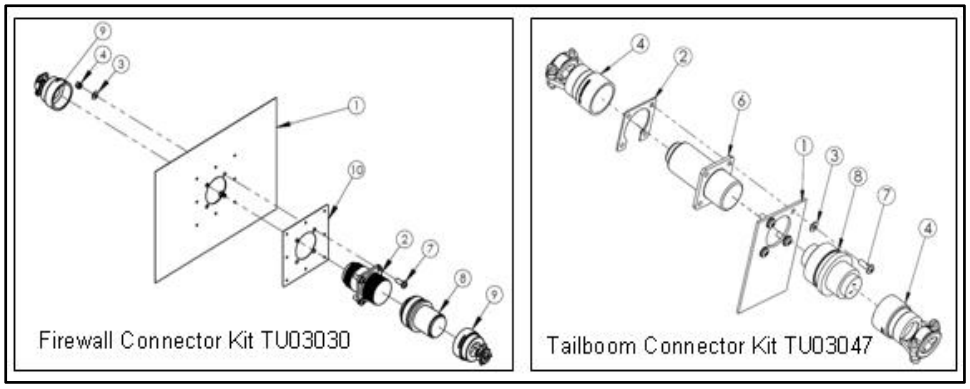

Figure 5 - Layouts for supplied disconnect connector kits.

Figure 6 – TEP2650- MRGB front lower sump left and right of center, leads outboard.

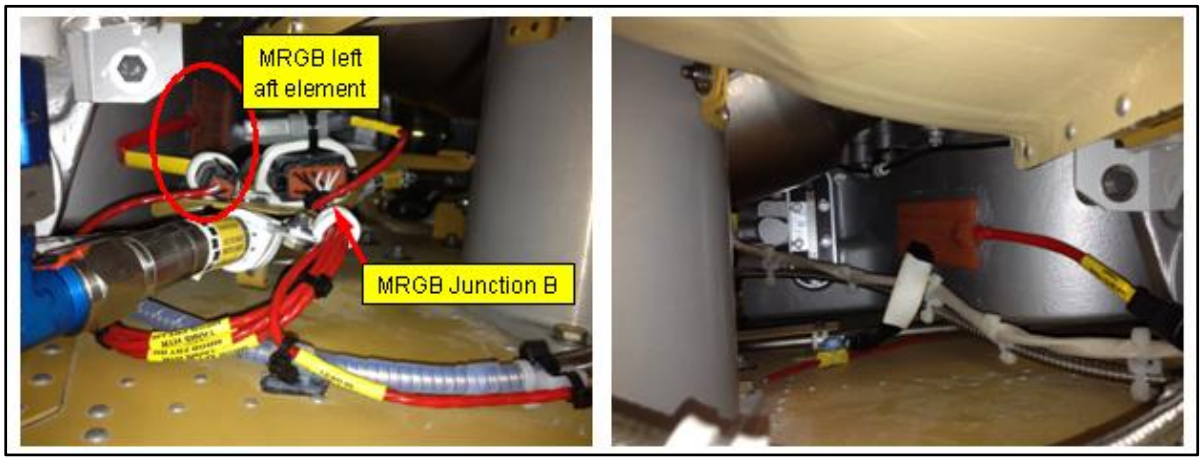

Figure 7 – TEP2675- and MRGB Junction D forward of left firewall or elements aft lower sump below inputs left and right sides, leads outboard routed to connect with Junction.

Figure 8 – TEN2675- Each engine oil sump bottom or on right side of sump.

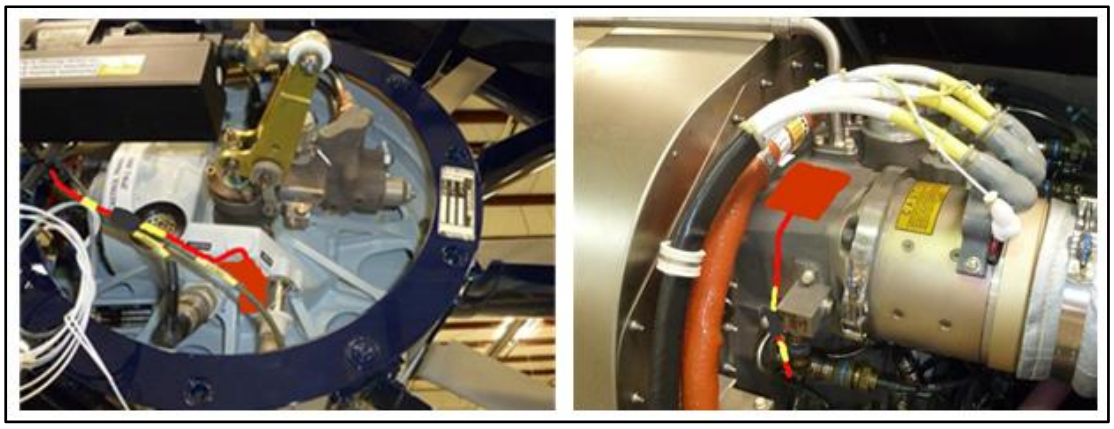

Figure 9 – TEP2921- TRGB element bottom. TEN2923- each engine.
AGB elements mount low on case clear of drip points left and right sides.

Figure 10 – Battery heat kit supplied separately. Installing cabling and thermal control below battery compartment and route element lead up through deck.

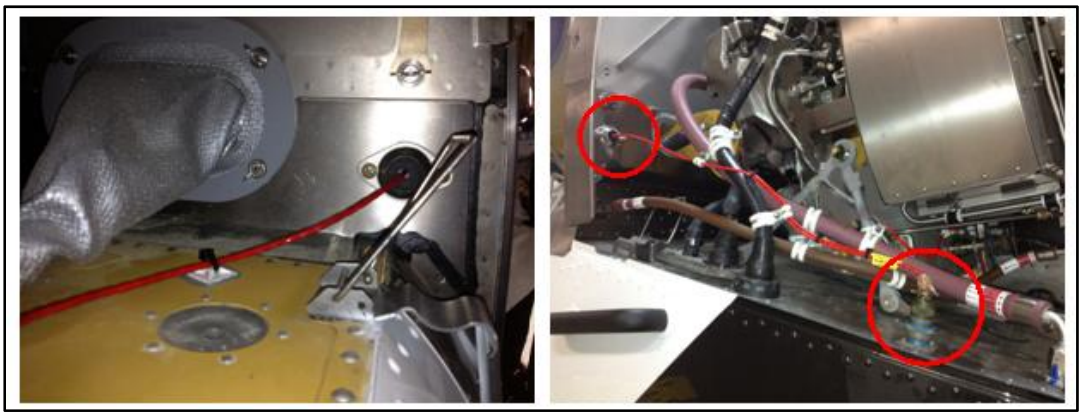

Figure 11 – Route of MRGB lead from Junction D (Figure 7) to left forward firewall though TG01056 Grommet through engine compartment to deck firewall connector, to Junction B mounted below engine deck, and sump element.

Figure 12 – Left - Routing for TRGB transitions through boom disconnect connector TU03047 installed in boom plate, location varies determined by installer. Right - Option for routing lead between MRGB and Left Engine Junction is along ceiling transitioning through cabin bulkhead, penetrating the main transmission deck with existing wiring or installing Tanis Grommet TG01056 or equivalent. When penetrating composites follow manufactures procedures for potting and edge sealing.

6. FUNCTIONAL SYSTEM CHECK

Caution: Contact with hot element can cause 2nd degree burns.

Before proceeding, verify that 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 when not installed.

[√] Check the system as follows:

1) [ ] Verify system components are installed in accordance with kit installation instructions.
2) [ ] Verify effected component fluid levels are at operational levels.
3) [ ] Verify engine to airframe/engine bonding (ground strap) is as per OEM requirements.
4) [ ] Verify preheat system ground by checking for continuity between shore power plug ground, pin 3 (Figure 1), engine, and airframe.
5) [ ] Verify there is no continuity between shore power plug pins 1 and 2, and the ground pin 3.
6) [ ] Using an ohmmeter, measure resistance between the power pins 1 and 2, and record total system resistance: _____. Compare with Table 3.
7) [ ] * Freeze (0°C) battery thermal control and repeat step 5, record: _____.
8) [ ] Connect the system to appropriate power.
9) [ ] Verify power indicator light is on (illuminated).
10) [ ] Within 30-minutes, area adjacent to the elements will start to feel warm. Check each element individually.
11) [ ] * While system is warming up, freeze (0°C) battery thermal control, then test battery heat element for heat. Element can be touched, as wattage density is low.
12) [ ] When testing is completed, disconnect (unplug) from power, latch any access doors that were open, and stow extension cord in appropriate location.
13) [ ] Update/modify weight and balance, and installed equipment lists (Section 3.5).
14) [ ] Complete/fill-in blanks as indicated on first and last pages of Operating Guide listed in Table 1, and file with POH/RFM.
15) [ ] Complete/fill-in blanks as indicated in Instructions for Continued Airworthiness (ICA), and file with aircraft manuals and logs.
16) [ ] Make a log entry to comply with 14 CFR Part 43.9 or other procedures set in place.
17) [ ] Complete and return Registration/Warranty Card.
18) [ ] Complete Sign Off in Section 7.

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)