



INSTRUCTION - PREHEAT INSTALLATION

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TSHAW109-3134 SERIES HELI-PREHEAT KITS

ON



**AGUSTA
A109E - A109S - AW109SP**

**PRATT AND WHITNEY
206C AND 207C**

PROPRIETARY DATA

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RECORD OF REVISIONS

When updated, this document is changed in its entirety.

REV	DATE	DESCRIPTION	BY	RELEASE
D	NOV-07-2023	Update for 1000 series documents	GDO	
C	MAY-24-2017	Revise MRGB and oil cooler elements	DNE	DNE
B	FEB-09-2017	Revise as installed add alt door kit TD03187 § 5.5, alt round mounting plate TU03189 dwg 03189, and MRGB element TEP2866- § 5.4. Tables and Figures updated accordingly.	DNE	DNE
A	APR-28-2016	Initial Release	DNE	DNE

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1. PURPOSE

The purpose of this instruction is to provide guidance for the installation of Tanis Aircraft Products (TAP) preheat/preconditioning kit listed on the cover page of this document.

2. REQUIREMENTS

Installation, Maintenance, Operating, documents and drawings, listed in Table 1, Section (§) 6.

- Accomplished by qualified technician or maintenance/repair facility.
- Performed in a clean environment under standard temperature conditions of 18°C / 65°F to 27°C / 80°F.
- Installation requires clear access to engine, review narratives and Figures in § 6.
- Installation times vary due to a wide range of variables.
- For global standardization and safety of operations shore power inlet is a non-locking blade type NEMA plug (Figure 2).
- Corresponding receptacle (outlet) connector is required on power extension cord (supplied for field installation with 230-volt kits). Approved outlets - TP02872-115, TP02829-230.
- Specific operational requirements or existing equipment may require modifications and/or additional elements, reference section (§) 3.1 for listing of approved options.

2.1 Materials

All components used in association with this kit shall be of aeronautical quality: AN, MS, MIL, NAS, NSN, etc.

- Installation requires additional hardware, consumables, finish-materials, brackets, lacing, and various cushion clamps, reference § 6, Table 2.
- Pad element bonding sealant is sourced at time of installation for approved sealants reference instruction TNDC730.

2.2 Tools

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

Note: Installation may require composite and/or sheet metal, fabrication, and finishing.

Required:

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

2.3 Power

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

- Ground based AC (alternating current) power source capable of supplying or producing required voltage and load for duration of operation is required.
- Parallel circuit, power at end of extension cord to be within +/- 10% of voltage requirement.
- Voltage and load requirements listed § 6, Table 3.

3. Standards

All components are to be installed in a manner that allows for proper inspection and maintenance. Record changes as required.

- (1) In Accordance With (IAW) current regulatory requirements 14 CFR Part 27, Part 29, and AC 43.13-1 (as amended) Chapter 11: Routing, securing, tying, and clamping §§ 9 through 12, Grounding and bonding § 15, Wire marking § 16, and feed-through penetrations § 17.
- (2) IAW approved procedures set in place by the installing authority, TAP installation documents, and applicable manufactures maintenance and repair manuals.
- (3) To compensate for routing leads may be: service looped, race-tracked, shortened, lengthened, or cut, and re-terminated with appropriate contact, splice or connector.
- (4) Leads may be repositioned in parallel in junctions/terminal blocks.
- (5) Installation is not to interfere with other systems such as engine or flight controls.
- (6) Wires and cables are to be supported by suitable cable ties, clamps, grommets, or other devices at intervals of not more than 6-inches / 15.25-centimeters, except when contained in ducts or conduits.
- (7) Properly secure wires and cables so movement is restricted to the span between the points of support and not on the connectors.
- (8) Supporting devices should be of a size and type capable of supporting wires and cables securely without damage to insulation.
- (9) Adequately support and secure wire and connectors to prevent excessive movement in areas of high vibration.
- (10) Route wiring and cabling with enough slack to compensate for movement of shock mounts.
- (11) Route cable/wire in a manner that ensures system components are not near high heat sources and use fire sleeve to protect wiring and connectors in questionable areas.
- (12) 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.
- (13) Check for proper installation of engine to airframe ground strap bonding.
- (14) Modifications and alterations:
 - a. Sheet metal alterations (plug door and bracket installations), AC 43.13-1 (as amended) Chapter 4, Section 4 as needed. Rivet using appropriate rivets. For structural installations, rivet layout shall be patterned after a small patch, similar to Figure 4.16 of AC 43.13-1 (as amended). Assemble wet and seal A/R with PS 870 (PR 1422B-2) or equivalent OEM approved corrosive inhibitor sealant.
 - b. Composites alterations (plug door and bracket installations), follow approved airframe manufacturer procedures and reference AC 43.13-1 (as amended) Chapter 3. Rivet using appropriate size blind rivets (Blind Cherry MS, CR and NAS series aluminum or Monel), assemble wet and seal A/R with PS 870 or equivalent (MIL-PRF-81733).

- c. Option - AV heater installation, AC 43.13-2 (as amended) Chapters 1 and 2 for structural consideration and examples equipment mounting options (mounting is to be consistent with installation methods, techniques and practices for avionic components).

3.1 Options

Standard list of approved substitution, modifications, and add-ons (Reference TNG1000):

- AV/Cabin Heater THP3094-500 - Preconditioning avionics allows for proper glass panel activation, reduces condensation, cold weather induced gyroscopic errors, increases safety of operations clearing windows of frost, snow and ice.
- Battery Kit TSB2800 - Preconditioning battery reduces battery freeze point depression and allows for higher amperage outputs, proper charge, and increased battery life.
- Cable kits - AV/Cabin Heater and AC Outlet: TC03071, TC03159.
- Circuit Protection Devices (CPD):
Dual fuse kit - TU03141 or TU03141-B used for 115 and 230-volt.
Breaker - 115-volt MS26574-10, MS3320-10, Klixon 2TC49-10, 230-volt W23-X1A1G-10.
- Connector - Disconnect kits: TU02968, TU03047, TU03127 (non-pressurized Class W 5015 crimp type disconnect).
- Door kits: TD02840 Single place, TD03097 2-place, TD03152 2-place, TD02935 3-Place, TD03187 3-place.
- Firewall Connector disconnect kits: TU03030 14 pin, TU03125 6 pin (non-pressurized Class KT crimp type).
- Firewall Grommet: TG01056 firewall and bulkheads feed through (non-pressurized).
- Plug – Circular (inlet): TP02770-115, TP02980-230.
- Plug – Circular receptacle (outlet): TP02872-115, TP02829-230.
- Plug - Flush mount (inlet) w/cap: TP02533-T-115, TP02822-T-230.
- Power interruption - Sealed two circuit switch (off / on): MS35059-22 (8822K20).

4. DESCRIPTION

Preconditioning, commonly referred to as preheating, is performed while on the ground prior to flight while in standby status. This kit preconditions engines and engine oil tanks, main and tailrotor gearboxes, hydraulic tanks, engine and main rotor gearbox oil coolers, and battery, avionics and cabin heated with forced air PTC heater.

- Increases engine life, reliability, and safety of operations.
- Reduces maintenance, torque oscillations, thermal stress, warm up, and launch times.
- System is self-regulating, does not operate in flight, and is not connected to or dependent on aircraft systems
- Heated components reach average state of thermal equilibrium in approximately six hours


4.1 Physical Attributes

Heat applied through electrical resistance elements, power routed through dedicated shore power plug and wire assembly with power indication and Circuit Protection Device (CPD).

AV/Cabin Heater preconditions avionics and cabin with forced air PTC heater.

Battery heater preconditions battery(s) with ambient temperature controlled external element.

4.2 Operation

 **Caution:** Before connecting system to power after installation or maintenance perform Functional System Check in Section 7 and review Operating Guide TPG1000.

4.3 Maintenance

Instructions for Continued Airworthiness (TCA1000), lists inspection and cleaning procedures. All processes are IAW aircraft/engine manufacturer's recommendations, and 43.13-1 (as amended) Chapter 11, Sections 1, 3, 4, 8, and 9.

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.

5. INSTALLATION

Referenced documents, Figures, and Tables located in § 6.

Note: Cable routing is suggested and may vary due to installed equipment, and/or operating requirements, installation may vary.

- Record and retain, information and documents, as indicated in Operating Guide and ICA

5.1 Overview

Review § 3. Standards, cable kit wire diagram, and documents listed in Table 1.

- (1) Weigh kit contents and intended installation hardware.
- (2) Locate power plug(s), junctions, and elements.
- (3) Route and terminate cabling, reference cable kit wire diagram.
- (4) Record and retain documents as indicated in Operating Guide and ICA.
- (5) Complete Functional System Check and Sign Off (§§ 7 and 8).

5.2 Technical Specifications

System and individual element values are listed in Table 3.

Circuit is parallel AC (alternating current), all leads supply the same voltage.

5.3 Weight and Balance


Weight kit and all installation hardware before installing.

- Record installed weight and arm calculation in Table 4 § 6
- New empty weight and corresponding C.G. location shall be calculated and entered into aircraft records

Approximate installed weights:

1. Preheat system weight: 9.0 pounds (lbs) / 4.08 Kilograms (Kg), use center line of forward engine firewall for C.G.
2. AV/heater weight: 1.3 lb. / 0.6 kg, use location as installed for C.G.

5.4 Elements

 **Caution:** Do Not - Connect elements to power before completing Functional System Check § 7.

Note: Element positioning, location, and/or lead orientation, may vary from narratives and Figures. Optional element configurations available for specialized avionics or other requirements (Figure 7B).

For any reason, should supplied element(s) not fit reference Substitutions list below and/or contact Tanis Aircraft (§ 1).

- Verify individual element resistance before installing (Table 3).
- Only locate elements using approved sealant DC 730, refer to Bonding Instruction TNDC730 (Table 1).
- Elements must be in full contact through bonding sealant.

Abbreviations: Main rotor gearbox (MRGB), Tailrotor gearbox (TRGB), Engine Accessory Gearbox (AGB) Fuel Control/metering unit (FCU).

Note: Configure oil coolers element accordingly.

* **A109E and A109S** (Figure 8A) - configured with three (3) oil coolers; individual MRGB, left and right engine oil coolers (Refer to Table 3A for Functional System Check).

** **AW109SP** (Figure 8B) - and subsequent (Oct. 14, 2010) configured with two (2) oil coolers; incorporating MRGB oil cooling with left and right engine oil coolers (Refer to Table 3B for Functional System Check).

Qty	P/N	Pad heat element location. Reference Figures 5 through 13, § 6.
1	THP3094-500	AV/Cabin Heater (Figure 6) – Locate in pax compartment on lower aft side of forward floor beam aft of left front seat.

Note: Installation of AV/Cabin heater optional, may be configured with or without AC outlet, reference cable kit wire diagram 03135 for circuit configuration.

1	TBP3086-31	Battery (Figure 7A) - element fitted with TB02645 panel and cable ties as required. Installation does not use sealant. Configure battery element with adapter panel if required. Wrap around battery perimeter, gently lace in place.
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Cut adapter panel to fit around contacts/connectors as required.

Do Not cut battery element.

Note: Optional avionics pad element TEP3188- or similar available, configured per application element. Optional 2nd battery heat element TBP3086-31- or as required, available elements listed on drawing 02800.

Oil cooler elements

* A109E and A109S:

2	TEP3179-	Eng Oil Coolers (Figure 8A) - Locate one element on outboard side of each engine oil cooler leads aft.
1	TEP3179-	MRGB Oil Cooler (Figure 8A) - Locate on outboard tank end near vernatherm valve lead aft.

** AW109SP:

- 2 TEP3179- LH and RH Oil Coolers (Figure 8B) – Locate on inboard tank end of each cooler. Note: MRGB element and lead not used (lead removed from junction and junction sealed with plug reference § 5.5 Cable Routing and dwg 03135)
- 2 TEN2656-42- Eng RH AGB (Figure 9) – Locate on front right square cover plate of each engine terminate lead in firewall connector.
- 2 TEN2703-42- Eng LH AGB (Figure 9) – Locate on front left round casting below of each engine, remove PW emblem if installed, terminate lead in firewall connector.
- 2 TEN2743-42- Eng FCU (Figure 9) – Locate on forward surface of each engine FCU lead down terminate in firewall connector.
- 1 TEP2710- Hyd Tank Aft large (Figure 10) – Locate on tank below nominal oil level on inboard side or tank end position lead for routing.
- 1 TEP2896- Hyd Tank Fwd small (Figure 10) – Locate on tank below nominal oil level on tank end or inboard side position lead for routing.
- 2 TEP2656- MRGB LH and RH FRT (Figure 11) – Locate horizontally above case split near left and right forward hydraulic distribution blocks leads to follow existing wiring.
- 1 TEP2656- MRGB RH LWR FRT (Figure 11) – Locate on lower right front lead left.
- 1 TEP2866- MRGB LH AFT (Figure 11) – Locate just forward of oil level sight glass lead down.
- 2 TEP2704- C-Box (Figure 12) – Locate one each side low near input drives leads inboard.
- 1 TEP2897-24- TRGB (Figure 13) – Locate on circular cover right side, lead down to follow existing wiring, lead is to terminate in tailboom forward of rear bulkhead.

5.5 Cable Routing

Routing is suggested - To compensate for routing leads may be: service looped, race-tracked, shortened, lengthened, or cut, and re-terminated with appropriate contact, splice or connector.

Reference cable kit wire diagram drawing 03135, Figures 14 through 19.

1. Shore power plug (power inlet) options (Figures 14A and 14B):

- (a) Door Kit TD02935 (supplied) – Locate in right side approx. STA 4960 WL 570, hold per drawing 02935 and 03139. Individual component instructions listed in Table 1. (Plug TN02070, Indicator Light TN03039, Door Switch TN02991).

Left aft plug position number 1 - main preheat system, position 2 - AV Heater and AC outlet, position 3 - open use as required or locate blanking plate when not used.

Note: Mounting Box 02935-5 and Blanking Plate 02935-9 may require modification to accommodate light and breakers in position 2, and or blanking plate (reference drawing 03139).

Note: When Tanis supplied AV Heater and/or AC outlet are not installed configuring or blanking of plug positions 2 and 3 are responsibility of installer.

- (b) Door Kit TD03187 (supplied separately or field fabricated) – Locate in right side approx. STA 5210 WL 1006, per drawing 03187. Individual component instructions listed in Table 1. (Plug TN02070, Indicator Light TN03039, Door Switch TN02991).

Left aft plug position number 1 - main preheat system, position 2 - AV Heater and AC outlet, position 3 - open use as required (install blanking plate when not used).

Note: When Tanis supplied AV Heater and/or AC outlet are not installed configuring or blanking of plug positions 2 and 3 are responsibility of installer.

- (c) Substitute door kits TD02935 or TD03187 and locate alternate in same location. Approved alternate door kit listed in § 3.1 Options.

- (d) Plug may be located/collocated with alternate approved shore power connection/plug(s).

2. AC plug (power outlet) and AV/Cabin Heater (Figure 14C):

Suggested location is in passenger compartment in lower outboard bulkhead non-structural inspection plate. Location varies due to seating configuration, operational, and available space.

Reference instruction TN02533 and cable kit wire diagram 03135 for circuit configuration.

Note: Installation of AC outlet and AV/Cabin heater circuit optional.

3. AV/Cabin Heater THP3094-500 (Figure 6):

Suggested location is in pax cabin on aft side of lower forward beam behind and below copilot seat (left side). Locate with four Click Bond standoff studs (supplied separately) CB4000E3CR20-750 (1-1/8 inch 10-32 stainless stud fiberglass base) or equivalent.

Location varies due to seating configuration.

Reference instruction TN03094 and cable kit wire diagram 03135 for circuit configuration.

Note: Installation of AC outlet and AV/Cabin heater circuit optional.

4. Firewall connectors:

Locate one Firewall Connector Kit TU03125 (supplied) in the forward firewall of each engine compartment in area near outboard edge (Figures 3 and 19).

Note: Due to firewall variations, space limitations, or existing equipment configurations, location may deviate from depictions. Use supplied mounting plate 03125-1, due to space limitation 03125-1 may be reconfigured as circular 2.75 in / 69.58 mm mounting plate (reference drawing 03189) or substituted with TU03189 mounting plate (supplied separately).

5. Tailboom disconnect connector options:

- (a) Locate Connector Kit TU02933 (supplied) at tailboom disconnect station (Figures 17 and 18) per drawing 02933 or space permitting connector may be installed in existing bracket (Figure 17).
- (b) TCS2598 and TCP2598 sealed connectors may be used as alternate in place of Connector Kit TU02933.

6. Ground:

Locate/bond ground wires on existing ground lug(s) or airframe adjacent to plug.

7. Junctions:

J-A - Locate in aft baggage hold right side forward of door on vertical stringer approx. STA 4960, suggest AS or MS21919WCH--16 clamp, MS35207-265 screw, and AN960JD10L washers, and nylon lock nut or equivalent (Figures 4 and 14).

J-B1, J-B2, J-B3, and J-B4 – Locate on left upper deck channel (above handhold) forward of oil coolers. Butter fly 2 sets opposing each other using single standoff anchor, suggested hardware: 1 ea. CB4004ECR 18 (A388ABE 18C), 1 ea. MS35207-264 screw, 2 ea. AN960JD10L flat washers, 2 ea. AS or MS21919WCH-16, and 1 ea. AS or MS21919WCH-19 or equivalent (Figure 15).

J-C – Locate forward of left engine firewall on outboard deck channel, suggest CB4004ECR (A388ABE __C) series standoff anchor (nut) and AS or MS21919WCH-16 clamp and appropriate hardware, or locate with clamp on existing bracket or on forward side of firewall near firewall connector.

J-D – Locate forward of right engine firewall on outboard deck channel, suggest CB4004ECR (A388ABE __C) series standoff anchor (nut) and AS or MS21919WCH-16 clamp and appropriate hardware

8. Leads:

01 - Power lead - Route between shore power plug and junction J-A through breakers.

02 - Indicator lead – Route from J-A to light.

03 - Route from J-B1 to J-A by entering left forward electrical conduit, route aft in conduit to exit in left upper corner of baggage hold, then across ceiling and down to Junction J-A mounted on vertical stringer above power plug/inlet (Figures 14A, 14B, 15, and 16).

05 through 17 – Route to corresponding elements as depicted in Wire Diagram.

Note: Lead 17 - When MRGB oil cooler not used seal corresponding pinouts in junction J-B4 with supplied locking sealing plugs (0413-217-1605 per dwg 03135).

18 - Battery lead, route from battery station up center windscreen post and aft in ceiling and down to junction J-A (Figure 16).

19 - Route from left engine junction J-C left to junction B1.

20, 21, and 23 - Terminate in left engine Firewall connector.

23 - Route from right engine junction J-D right to junction B1.

24, 25, and 26 - Terminate in right engine Firewall connector.

27 - TRGB lead, route aft with existing wiring to tailboom disconnect station through disconnect connector and aft to TRGB element. Note: Secure element connector forward of aft tailboom bulkhead, terminate accordingly (Figures 17 and 18).

28 - Power lead route through CPD breakers to back side of AC outlet and terminate with AV heater lead 29.

29 - Route from AV/Cabin Heater to back of Plug 2 and terminate with lead 28.

9. Battery thermal control cable (optional Avionics element):

Locate thermal control 6 to 18 inches (15 to 46 cm) from battery(s) using Click Bond cable mount or equivalent, or with cable tie with existing wiring. Once the cable is routed and secured, connect with battery element (Figure 7A).

Power lead for battery heater is routed forward through cabin in ceiling with existing cabling and down windscreen post or routed forward to battery with battery cables to battery compartment.

Battery element installation does not use bonding sealant. Wrap element and adaptor panel around perimeter of vertical surface with flat side toward battery. When required modify adaptor panel by cutting from center and fitting around battery connectors and/or contact block. Use cable-ties or appropriate lacing and gently lace element in place alternating tension between ties (Figure 7A).

Avionics pad element located between bracket and unit, secured to bracket with dollops of bonding sealant or as required (Figure 7B).

- (a) Note: Thermal Control Cable Assembly configured with two output leads for battery heater(s) and optional avionics series heat element (supplied separately configured per application, TEP3188- or similar). Cap second lead when not in use.

10. Placards:

Affix supplied placards near plug(s), or on door (Figures 2, and 14A and 14B). Placard left (fwd) plug with preheat system placard, and right (aft) plug with AV/Cabin Heater placard.

Optional field fabricated placard stating at a minimum; "Tanis", and voltage, is acceptable.

Placard AC outlet (not shown) with field fabricated placard as called out on wire diagram drawing 03135.

11. Inspect:

Verify all connectors are connected and leads are secure.

12. Complete:

Functional System Check and Sign Off, §§ 7 and 8.

6. TABLES AND FIGURES

Table 1 - Installation, Maintenance, and Operating, Documents

(Record documents as indicated in Operating Guide and ICA).

03134	Drawing - Preheat Kit / Item List (-115 or -230)
03135	Drawing - Cable Kit / Wire Diagram
02933	Drawing - Tailboom Bracket Kit (disconnect connector)
02935	Drawing - Shore Power Kit
03125	Drawing - Firewall Connector Kit
03139	Drawing - Plug Mounting Box Modification
TN02070	Instruction - Flush Mount Plug
TN02533	Instruction - Flush Mount Plug w/Cap (AC outlets 2989/2988).
TN02782	Instruction - Click Bond Kit
TN02793	Instruction - Connector (Termination and Assembly)
TN02800	Instruction - Battery Heat Installation
TN02829	Instruction - Receptacle (supplied with 230-volt kits)
TN02991	Instruction - Door Switch
TN03039	Instruction - Indicator 8mm
TN03094	Instruction - AV/Cabin Heater Installation
TNDC730	Instruction - Bonding (Element Installation and Sealant)
TNG1000	Instruction - Installation Guide - Standards Reference
TNH3134	Instruction - Preheat Installation (This instruction)
TCA1000	Instruction for Continued Airworthiness - ICA
TPG1000	Operating Guide

Table 2 - Clamp Reference.

AS or MS 21919 WDG, WCH, or WCE, size for secure fit.

Examples of base line sizing:

Size	AS/MS number	Application
1/8"	21919WDG-2	1 - 2 wire
1/4"	21919WDG-4	2 - 3 wire
5/16"	21919WDG-5	8mm Indicator light
5/8"	21919WDG-10	2 contact connector
7/8"	21919WDG-14	3 contact connector
1"	21919WDG-16	4 lead junction
1 3/16"	21919WDG-19	6 lead junction (WCH-18)
1 1/2"	21919WDG-24	Circular shore power plug

Table 3A - Technical Specifications – A109E and A109S

Use for systems configured with 3 oil cooler heat elements installed.

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

* AV heater Not included in totals - Ohm reading varies due to PTC element design.

115 Volt kit - A109E and S - with Battery **8.7 Amps** **999 Watts** **13.2 Ohms**
- without battery 8.0 Amps 924 Watts 14.3 Ohms

Qty	Element Part Number	Location	Wattage	Ohms
*1	THP3094-500	AV/Cabin Heater – PAX compartment	500	* (PTC)
1	TBP3086-31-115/75	Battery Element	75	176.3
2	TEN2656-42-115/80	RH AGB (each engine)	80	165.3
2	TEN2703-42-115/65	LH AGB (each engine)	65	203.5
2	TEN2743-42-115/23	FCU (each engine)	23	575.0
2	TEP3179-115/40	ENG Oil cooler (left and right)	40	330.6
1	TEP3179-115/40	MRGB Oil Cooler	40	330.6
2	TEP2656-115/80	LH and RH FRT MRGB	80	165.3
1	TEP2656-115/80	RH LWR FRT MRGB	80	165.3
1	TEP2866-115/70	LH AFT MRGB	70	188.9
2	TEP2704-115/40	C-Box (left and right inputs)	40	330.6
1	TEP2710-115/25	Hyd Tank AFT (large)	25	529.0
1	TEP2896-115/18	Hyd Tank FWD (small)	18	734.7
1	TEP2897-24-115/35	TRGB right side	35	377.9

230 Volt kit - A109E and S - with Battery **4.3 Amps** **999 Watts** **53.0 Ohms**
- without battery 4.0 Amps 964 Watts 57.3 Ohms

Qty	Element Part Number	Location	Wattage	Ohms
*1	THP3094-500	AV/Cabin Heater – PAX compartment	500	* (PTC)
1	TBP3086-31-230/75	Battery Element	75	705.3
2	TEN2656-42-230/80	RH AGB (each engine)	80	661.3
2	TEN2703-42-230/65	LH AGB (each engine)	65	813.8
2	TEN2743-42-230/23	FCU (each engine)	23	2300.0
2	TEP3179-230/40	ENG Oil cooler (left and right)	40	1322.5
1	TEP3179-230/40	MRGB Oil Cooler	40	1322.5
2	TEP2656-230/80	LH and RH FRT MRGB	80	661.3
1	TEP2656-230/80	RH LWR FRT MRGB	80	661.3
1	TEP2866-230/70	LH AFT MRGB	70	755.7
2	TEP2704-230/40	C-Box (left and right inputs)	40	1322.5
1	TEP2710-230/25	Hyd Tank AFT (large)	25	2116.0
1	TEP2896-230/18	Hyd Tank FWD (small)	18	2928.9
1	TEP2897-24-230/35	TRGB right side	35	1511.4

Table 3B - Technical Specifications – AW109SP

Use for systems configured with 2 oil cooler heat elements installed.

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

* AV heater Not included in totals - Ohm reading varies due to PTC element design.

115 Volt kit - AW109SP - with Battery	8.3 Amps	959 Watts	13.8 Ohms
- without battery	7.7 Amps	884 Watts	15.0 Ohms

Qty	Element Part Number	Location	Wattage	Ohms
*1	THP3094-500	AV/Cabin Heater – PAX compartment	500	* (PTC)
1	TBP3086-31-115/75	Battery Element	75	176.3
2	TEN2656-42-115/80	RH AGB (each engine)	80	165.3
2	TEN2703-42-115/65	LH AGB (each engine)	65	203.5
2	TEN2743-42-115/23	FCU (each engine)	23	575.0
2	TEP3179-115/40	ENG Oil cooler (left and right)	40	330.6
2	TEP2656-115/80	LH and RH FRT MRGB	80	165.3
1	TEP2656-115/80	RH LWR FRT MRGB	80	165.3
1	TEP2866-115/70	LH AFT MRGB	70	188.9
2	TEP2704-115/40	C-Box (left and right inputs)	40	330.6
1	TEP2710-115/25	Hyd Tank AFT (large)	25	529.0
1	TEP2896-115/18	Hyd Tank FWD (small)	18	734.7
1	TEP2897-24-115/35	TRGB	35	377.9

230 Volt kit - AW109SP - with Battery	4.2 Amps	959 Watts	55.0 Ohms
- without battery	3.8 Amps	884 Watts	59.8 Ohms

Qty	Element Part Number	Location	Wattage	Ohms
*1	THP3094-500	AV/Cabin Heater – PAX compartment	500	* (PTC)
1	TBP3086-31-230/75	Battery Element	75	705.3
2	TEN2656-42-230/80	RH AGB (each engine)	80	661.3
2	TEN2703-42-230/65	LH AGB (each engine)	65	813.8
2	TEN2743-42-230/23	FCU (each engine)	23	2300.0
2	TEP3179-230/40	ENG Oil cooler (left and right)	40	1322.5
2	TEP2656-230/80	LH and RH FRT MRGB	80	661.3
1	TEP2656-230/80	RH LWR FRT MRGB	80	661.3
1	TEP2866-230/70	LH AFT MRGB	70	755.7
2	TEP2704-230/40	C-Box (left and right inputs)	40	1322.5
1	TEP2710-230/25	Hyd Tank AFT (large)	25	2116.0
1	TEP2896-230/18	Hyd Tank FWD (small)	18	2928.9
1	TEP2897-24-230/35	TRGB	35	1511.4

Table 4 - Weight and Balance

Record installed weight, arm, and moment calculations and update aircraft records accordingly (refer to § 6.).

Preheat system arm use center line of forward engine firewall.

AV/Heater use arm location as installed.

	WEIGHT LB (KG)	ARM IN (CM)	MOMENT IN (CM)	MOMENT WT x ARM/100 IN (CM)
Preheat System	+			
AV/Cabin Heater	+			

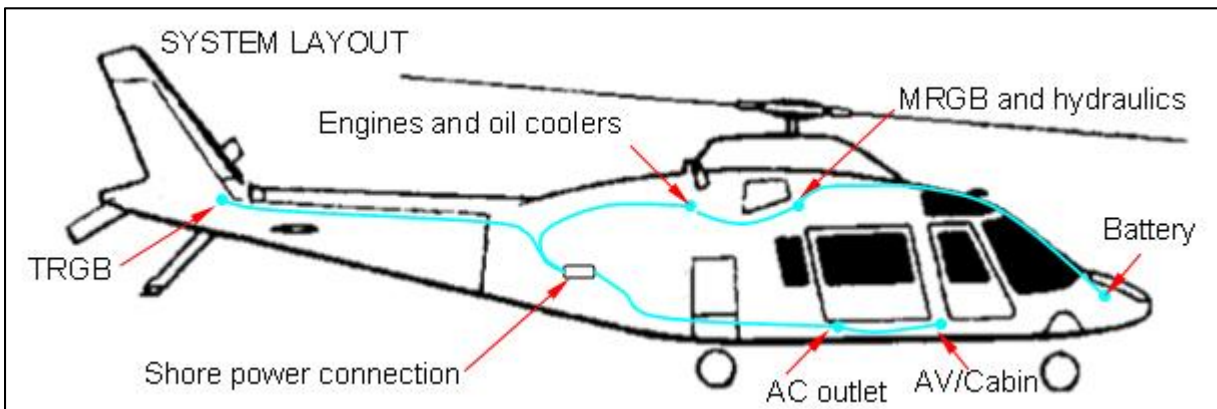


Figure 1 - Overview of AW109 series helicopter system.

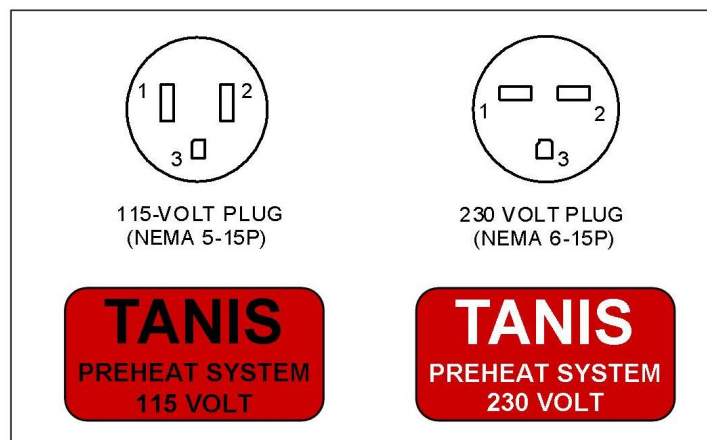


Figure 2 - Shore power plugs and placards. Alternate - Placard that states at a minimum, *Tanis* and the system voltage requirement (115 Volt or 230 Volt) is acceptable. Placard is to be affixed adjacent to plug or plug door, or on inside or outside of door.

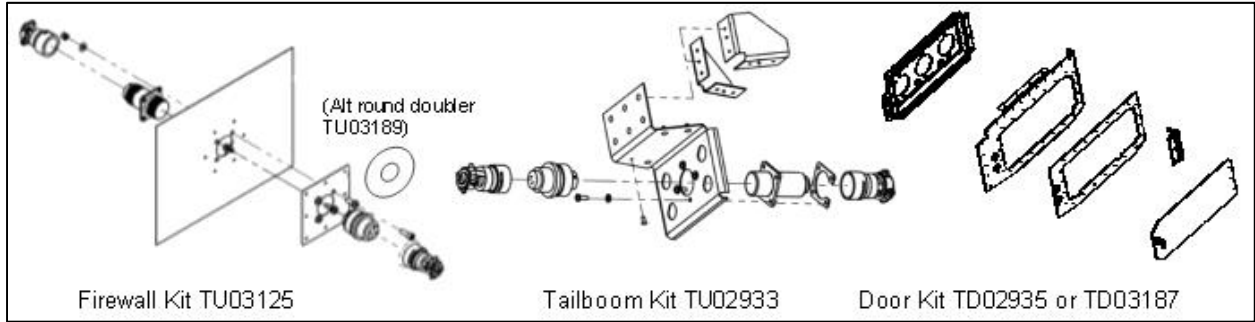


Figure 3 - Above kits requires sheet metal work; hardware and consumables supplied by installer. Refer to § 3.1 and 5.5 for alternate connector and door kits.

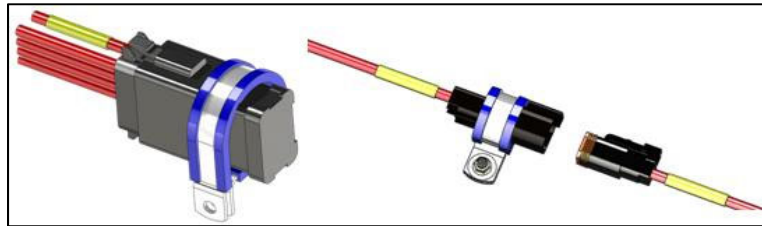


Figure 4 - Examples of clamp positioning on junction and connector, clamp sizing chart Table 2. Locate junction and connectors with appropriate lacing, cable ties, and/or clamp. Cable and lead routing descriptions § 5.5.



Figure 5 - Generic element with 6-inch lead, connector and yellow label with part number.

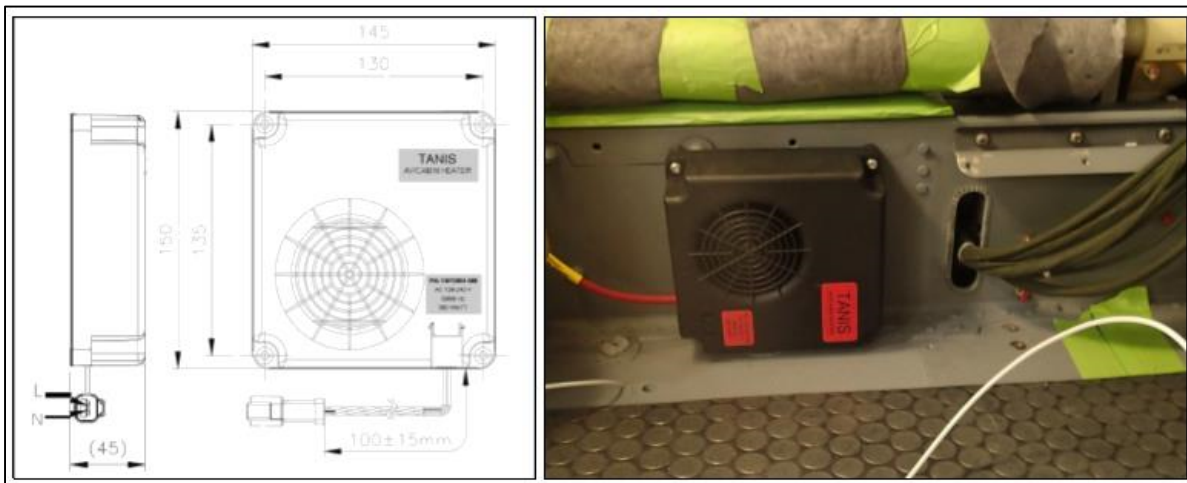


Figure 6 - Example of AV heater located in pax cabin on back of lower forward beam, aft of copilot seat (left side). Suggest locating with four Click Bond standoff studs CB4000ECR20-750 reference heater installation instruction TN03094.

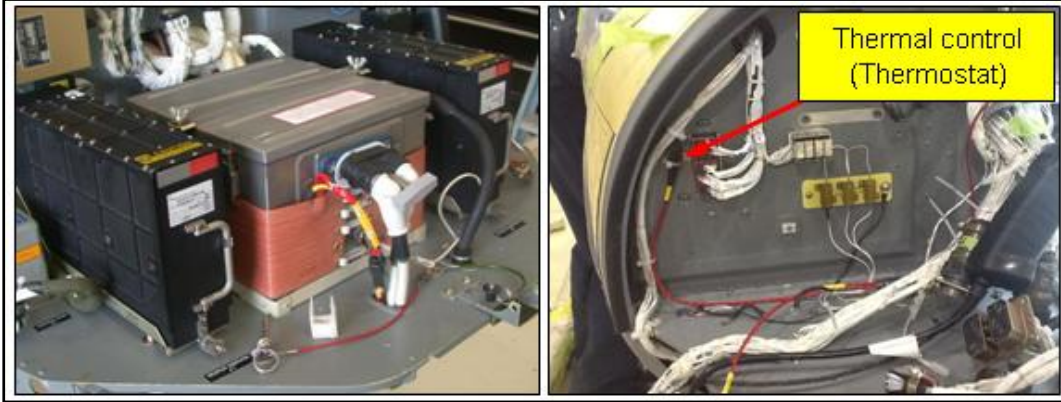


Figure 7A - Batter heat element and control cable assembly:

Battery heater – Locate TBP3086- and TB02645-07 non-heated adapter (use as required). Installation does not use sealant, gently lace in place around perimeter of battery con dr and/or use adapter panel as needed. Adapter panel may be cut as needed. Do Not cut battery element.

Thermal control cable assembly - Reference cable kit wire diagram 03135. Locate Thermal Control, 6 to 18 inch / 15 to 38 cm, from battery with Click Bond cable mount TU02782 (CB9120) supplied. Control cable assembly connects to battery lead, secure cable assembly with existing wiring.

Note: Installation may vary depending on battery and/or modifications. Cable assembly supplied with two output leads, second lead available for 2nd battery or individual avionics element(s) (supplied separately), cap when not in use.

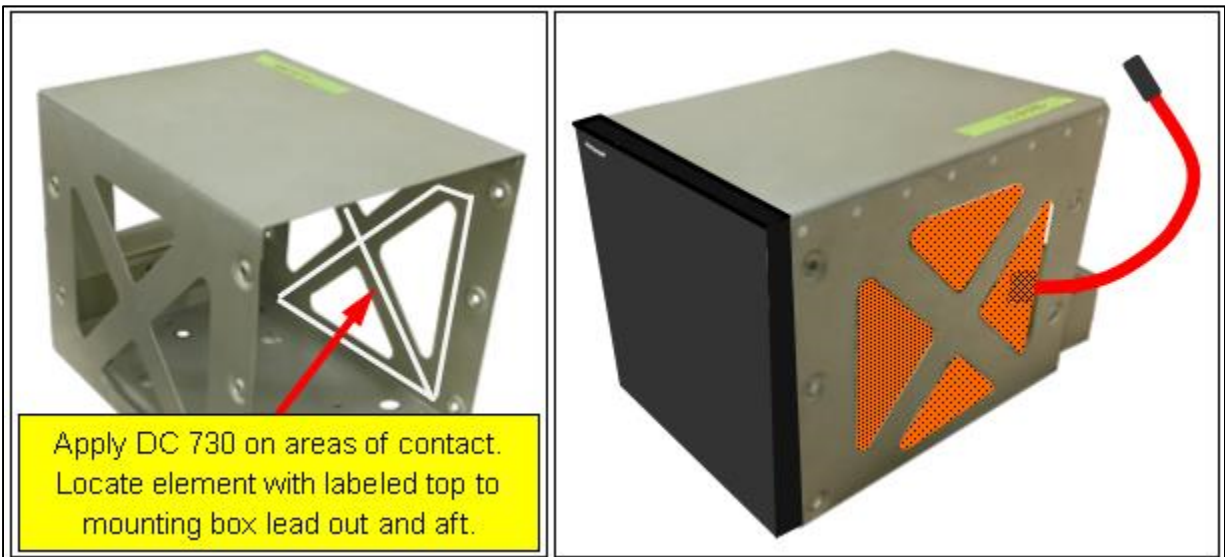


Figure 7B – Option – Example of ISAT unit with TEP3188- element (supplied separately). Example shown with element located on inside of mounting box, secured with bonding sealant. Equipment varies, element(s) supplied separately by application (contact Tanis Aircraft). Element powered through control cable assembly. Reference cable kit wire diagram 03135.

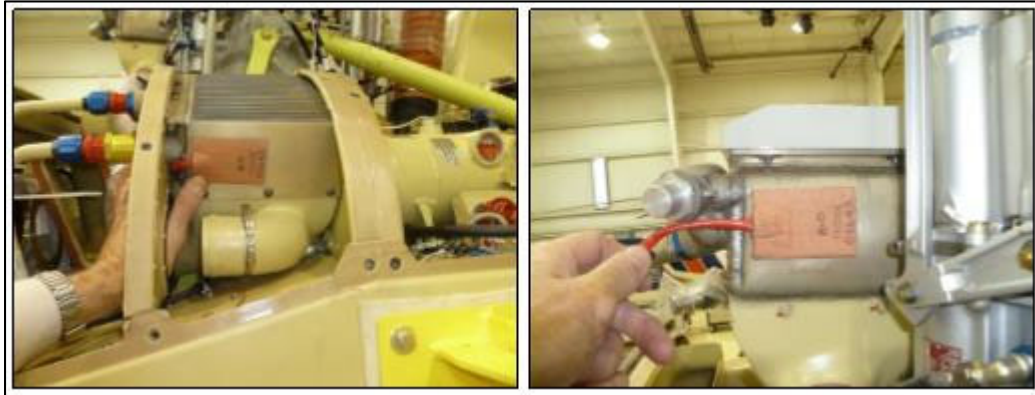


Figure 8A – A109E and A109S with three oil coolers (MRGB oil cooler separate from engine oil coolers):

Engine coolers - TEP3179- Locate one each on outboard side of engine oil coolers position leads to follow lines.

MRGB cooler - TEP3179- Locate on oil cooler tank end near vernatherm valve lead to follow lines.



Figure 8B - AW109SP and subsequent with two oil coolers (MRGB oil cooler incorporated with engine oil coolers):

TEP3179- Locate one each on left and right engine oil coolers on inboard tank end position leads to follow lines.

Note: Third TEP3179- element and MRGB Oil Cooler is not used remove lead from junction and seal with locking sealing plugs (0413-217-1605 per dwg 03135).

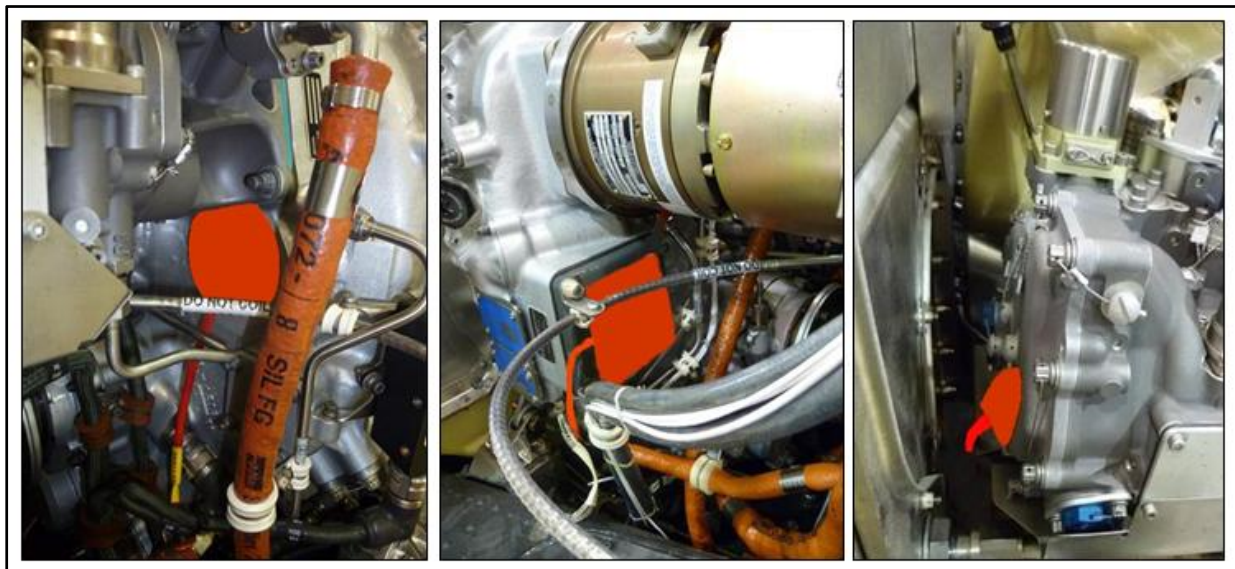


Figure 9 - Left and right engine elements:

TEN2703- Engine LH AGB element (round) - Locate on left front of each engine below FCU.

TEN2656- Engine RH AGB element (square) - Locate on right front accessory cover of each engine below starter/generator.

TEN2743- FCU element – Locate on forward vertical surface lead down.

Note: Element leads terminate in corresponding firewall connectors.



Figure 10 - Hyd Tank elements:

TEP2710- Locate on aft tank (large) below nominal oil level on midsection section or tank end. Forward or small tank.

TEP2896- Locate on forward tank (small) below nominal oil level on midsection or forward tank end.

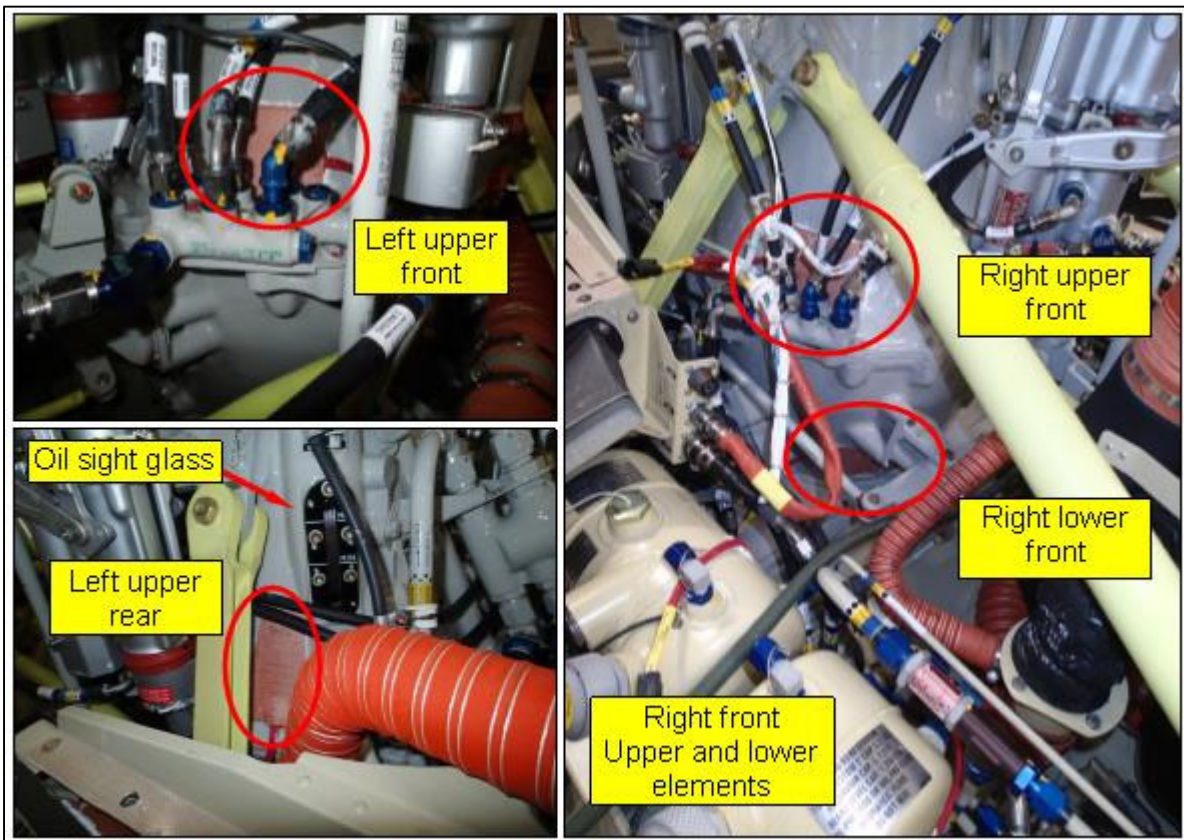


Figure 11 – MRGB elements:

TEP2656- Locate one each on left and right upper front behind hydraulic blocks.

TEP2866- Locate on left upper rear just forward of oil level sight glass.

TEP2656- Locate on right lower front.

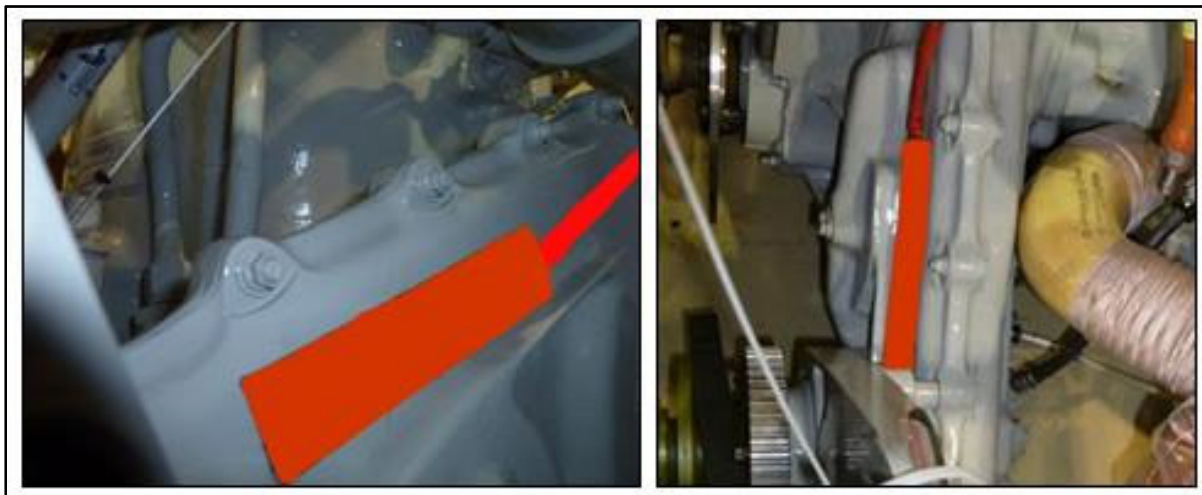


Figure 12 - Combiner box elements:

TEP2704- Locate one each on aft upper vertical surface near left and right input drives leads inboard.

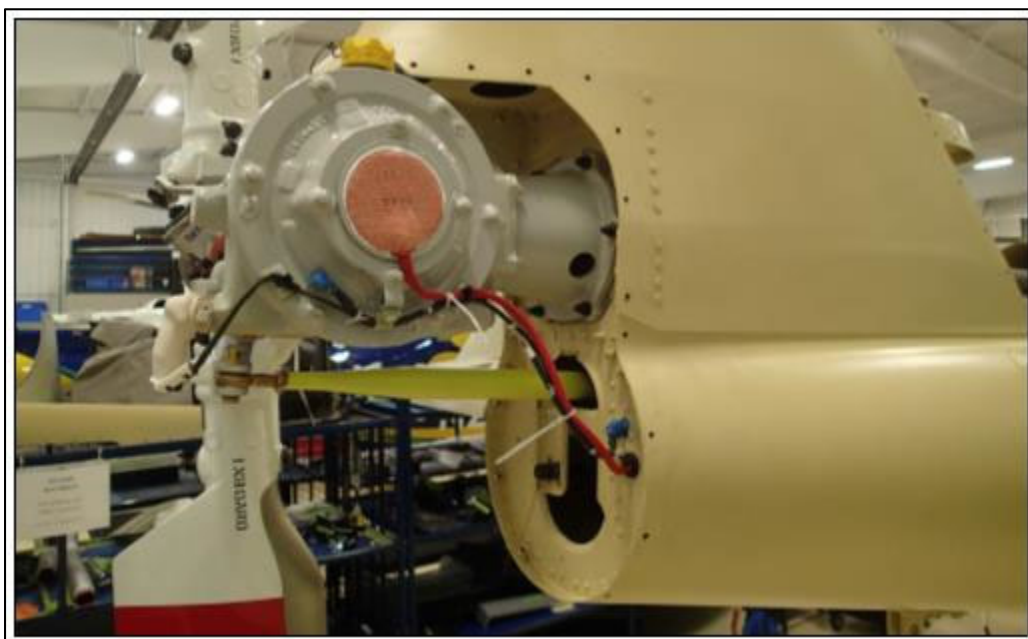


Figure 13 - TRGB element:

TEP2897-24- Locate on right side cover plate lead to follow existing wiring through rear tailboom bulkhead, terminate lead in tailboom secured connector with clamp or lace with existing wiring.

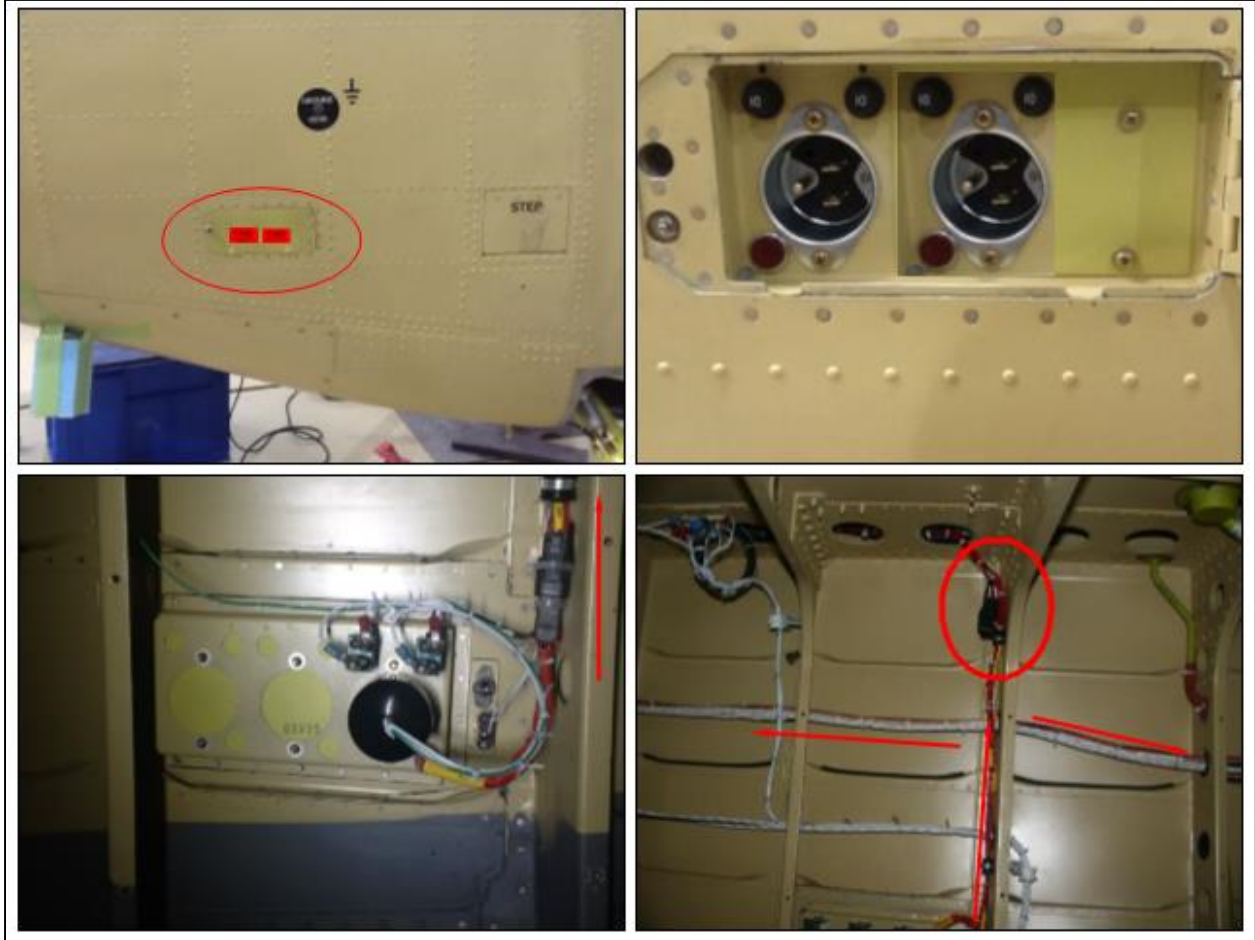


Figure 14A - Door kit option TD02935 (supplied):

Locate on lower right side just above aft baggage hold floor (STA 4960 WL 570) per drawing 02935 shown with blanking plate installed over accessory plug 3. Mounting Box (02935-5) and blanking plate (02935-9) may require modification and additional holes cut to support indicator light and breakers for the number 2 and 3 plug positions (reference drawing 03139). Locate supplied placards or field fabricated placards adjacent to plugs, or on inside or outside of door (Figure 2).



Figure 14B - Door kit option TD03187 (not supplied):

Locate on lower right side just below aft baggage hold ceiling (STA 5210 WL 1006) per drawing 03187.

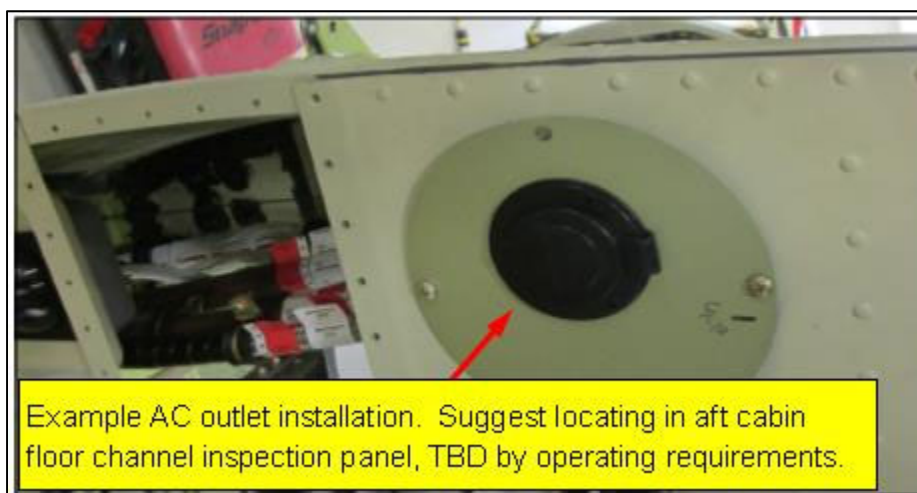


Figure 14C - AC outlet (TP02988-115 or TP02988-230 as supplied). Location to be determined by operator based on operational requirements and space availability.

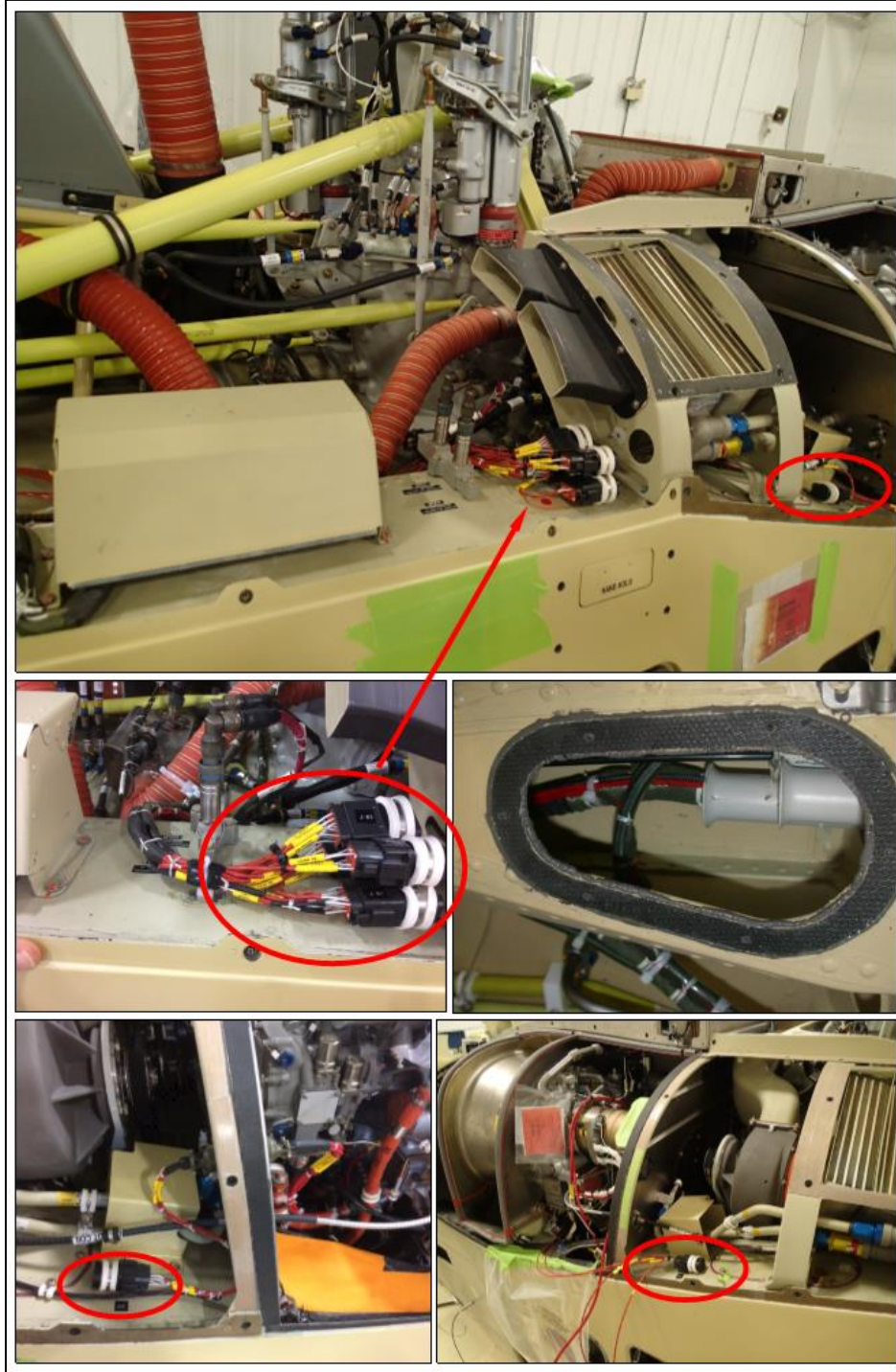


Figure 15 - Locate junctions J-B1, J-B2, J-B3, and J-B4 forward of left engine oil cooler, with Click Bond nut plate or stud, appropriate hardware, and clamps. Lead 03 routed forward to wire conduit and aft through conduit to baggage hold. Left and right engine junctions located forward of corresponding engine firewall, use clamp and secure with Click Bond stud or existing hardware when available.



Figure 16 - Left: Conduit access to upper deck for Lead 03. Right: Routing option for battery lead 18 shown down windscreen post, or route lead may be routed with existing wire or battery cables under floor deck.

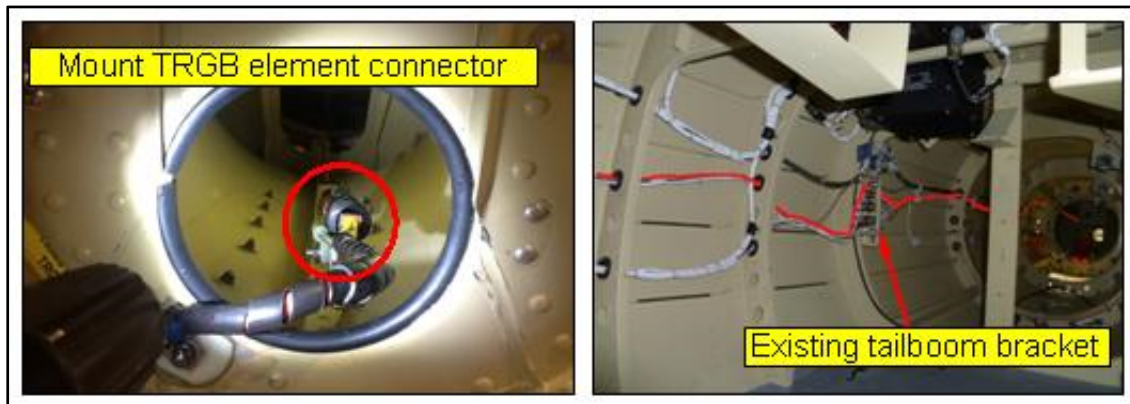


Figure 17 - Right: TRGB connector secured forward of aft tailboom bulkhead. Left: Tailboom connector may be installed in existing bracket or bracket supplied with connector kit TU02933 shown in Figure 18, alternate connectors listed in Wire Diagram.

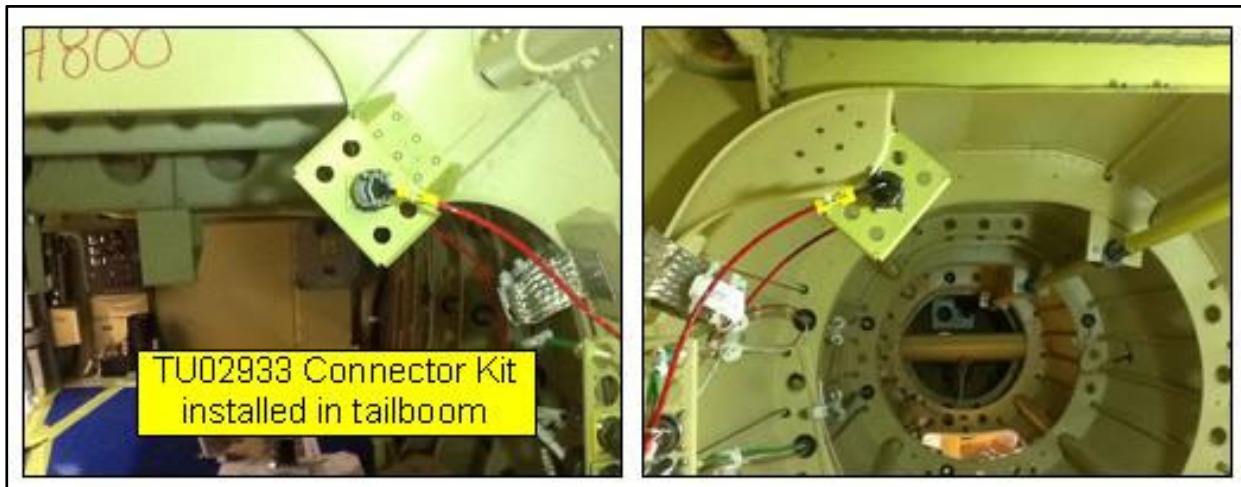


Figure 18 - Tailboom disconnect, Connector Kit TU02933 installed per drawing 02933, alternate connectors listed in Wire Diagram.

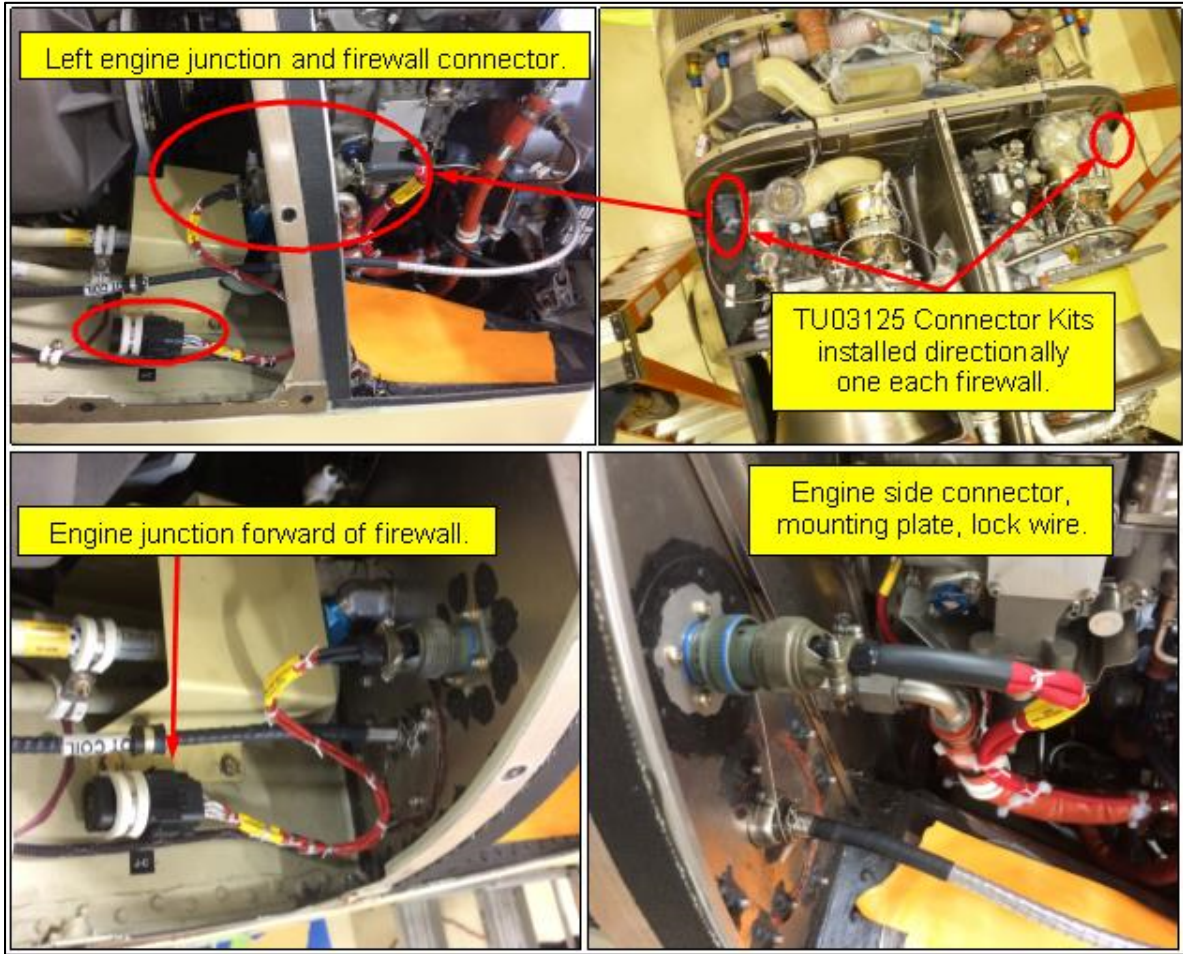


Figure 19 - Example of engine firewall connector kit TU03125, locate in forward firewalls of each engine. Location may vary due to firewall configuration. Locate engine junction forward of corresponding engine. Connector example shown located with round mounting plate per drawing TU03189.

7. FUNCTIONAL SYSTEM CHECK



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

Refer to Installation Guide TNG1000 and below.

1. Inspect: Visually inspect and verify kit is installed IAW this instruction.
2. Check: Perform Functional System Check, refer to Installation Guide TNG1000.
3. Record: IAW 14 CFR part 43.9, and/or other procedures set in place record installation.
 - a) Wt & BI and equipment list, amend as required under aircraft certificate.
 - b) Record and Retain Data as indicated in ICA: TCA1000 and Operating Guide: TPG1000.
 - c) Complete Warranty card Registration:
<https://www.tanisaircraft.com/warranty-card-registration/>

8. 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 *****