



INSTRUCTION – PREHEAT KIT INSTALLATION

Subject: P/N: TSHB407-3083-115, Heli-Preheat Kits - 115 Volt
TSHB407-3083-230, Heli-Preheat Kits - 230 Volt
Bell Helicopter 407 Series (FAA STC SR03474CH)

Document No: TNH3083
Revision: J
Date: OCT-17-2019

RECORD OF REVISIONS

When revised document changed in its entirety.

REV	DATE	DESCRIPTION	BY	CKD
J	OCT-17-2019	Update battery adapter, CPD, add door switch option.	DNE	GDO
H	FEB-20-2019	Move deck penetration from tail boom deck to eng pan.	DNE	GDO
G	JUN-08-2018	Correct typo page 9.	GDO	DNE

Current revision approval: _____

1. PURPOSE

This instruction provides guidance for installation of subject kits listed above.

2. REQUIREMENTS

Subject kit top-level drawing, 03083-115 or 03083-230, parts and documents as listed.

- Tools, hardware, consumables, power supply, and extension cords, not supplied.
- Pad element bonding sealant supplied separately, refer to TN02788.
- Plug door and firewall passthroughs require hardware and sheet metal work, refer to this instruction and related documents listed on top level drawing.

3. INSTALLATION

⚠ Caution: Energized elements can cause 2nd and 3rd degree burns. **Do Not** connect power to elements or system before completing Functional System Check, TNG1000.

Abbreviations: Alternating current (AC), Center of gravity (CG), Circuit protection device (CPD), Engine accessory gearbox (AGB), Fuel control unit (FCU), Flight manual (FM), Main rotor gearbox (MRGB), Maintenance manual (MM), Original equipment manufacturer (OEM), Remove and replace (R&R), Section (§), Tail rotor gearbox (TRGB), To be determined (TBD), Top-level drawings (TLD).

- Technicians and users of this instruction should be familiar with all related documents on TLD, Installation Guide TNG1000, Bell BHT-407-MM-2, BHT-ALL-SRM, and BHT-ELEC-SPM.
- When installing kit on 407 equipped with Eagle Copters HTS900 engine conversion TCCA STC SH14-47 or FAA STC SR03496NY, engine element substitutions required refer to subject kit top-level drawings and Appendix A.

3.1 Inventory

Start with parts inventory and document review, refer to subject kit top-level drawing (TLD).

PROPRIETARY DATA

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3.2 Weight and Balance

Weigh kit before installation and intended installation hardware. Approximate total installed weight 7.5 lb. / 3.4 kg.

Use engine arm for CG calculations or reweigh aircraft (FL STA 156, 82 WL Reference Bell RFM BHT-407-FM-1 or BHT-407-MM-2). Refer to TNG1000 for change requirements.

Optional AV/Cabin Heater approximate installed weight 1.5 lb. / 0.70 kg. Use location as installed for CG calculations.

3.3 Elements

Locate elements with reference to narratives and examples in § 4.

- a) Measure resistance of each element before installing.
- b) Equipped with Allison/RR250 engine refer to § 4. Tables 4.1. or 4.2.
- c) Equipped with HTS900 engine refer to Appendix B. § 5. Tables 5.1 and 5.2.
- d) Battery heat element and adapter panel secured around parameter of battery.
- e) Pad heat elements bonded to gearboxes and tanks with sealant refer to TN02788.
- f) Should alternate or additional elements be required contact Tanis engineering.
- g) Option: AV/Cabin Heater supplied separately refer to Appendix B.

3.4 Electrical

Typical system installation below for additional descriptions refer Figures § 4.

- a) Refer to cable kit wire diagram drawings, 02774 and 03082.
 - b) Routing suggested final routing TBD by installing authority.
 - c) Wire termination and tooling refer to instructions TN02793 and TN03012.
 - d) 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. Refer to TNG1000 and AC 43.13-1 (as amended) Chapter 11.
 - e) Only connect power after completing Functional System Check with ohmmeter, § 3.5.
1. External shore power connection: TD03095 2-place door kit. Locate in right side of aft lower tail boom fairing refer to Figures 4.1., 4.8., and 4.9. For optional door sites and kits refer to Appendix B.
 2. Door switch: TU03273 door annunciator switch located in modified area of plug door and wired into Crew Alerting System (CAS) circuit, refer to Figure 4.9.
 3. Shore plug (inlet) and indicator light: Locate plug and light in door kit.
(by voltage Plug: TP02070-M-115 or TP02839-S-230, Light: TLP3039-115 or TLP3039-230).
 4. Cable kit TCH3082 with CPD: Locate junctions, and CPD (fused link) in serviceable areas that allow leads to reach corresponding components and route accordingly refer to Figures 4.1. through 4.16.

5. Ground wire: Verify OEM engine/airframe bonding strap is installed. Attach ring crimp end of green 22759-181 wire to applicable ground on airframe and terminate in shore plug. Connection not to exceed .003 ohms, refer to TNG1000 and Figure 4.10.
6. Engine firewall passthroughs:
TU03030 firewall connector kit, left forward firewall refer to Figures 4.6, and 4.13.
TU03125 firewall connector kit, engine pan refer to Figures 4.10, and 4.12.
Firewall grommet, aft firewall refer to Figures 4.11. and 4.12.
Note: Due to existing equipment and/or space limitations final location of passthrough TBD installing authority.
Rear firewall warning placard (Bell Part No: 230523363) may be relocated and/or replaced as required for passthrough positioning.
Previous revision of preheat kit used TU03125 or TU03030 firewall connector kit on rear firewall and engine pan. These connector kits may be used when required, additional connector kits supplied separately.
7. Battery heater control cabling: Locate thermal control cable assembly and controller in battery compartment refer to Figures 4.2. and 4.16.
8. Placard: Affix applicable placard by voltage near shore power plug, on inside or outside of door. Alternate field fabricated placard with *Tanis Preheat* and voltage requirement (*115 Volt* or *230 Volt*) may be used refer to Figure 4.9.
9. Option THP3094 AV/Cabin Heater: Supplied separately refer to Appendix B.

3.5 Completion

1. Inspect: Visually inspect and verify components are connected and secure.
2. Check: Perform Functional System Check, refer to Installation Guide TNG1000.
3. Record: Record and retain data as indicated in Instructions for Continued Airworthiness TCA1000 and Operating Guide TPG1000.

4. TABLES AND FIGURES

This section contains technical information and examples of typical installation actual installation may vary due to existing equipment or operating requirements.

Note: Eagle Copters HTS900 engine conversion refer to § 5. Appendix, Tables 5.1. and 5.2.

Table 4.1. 115-Volt Electrical Values (equipped with **250-C47** series engine).

System and individual element value tolerances +/- 10%.

* Battery heater circuit normally open, closed below +5°C / 41°F refer to TN03046 and Functional System Check located in Installation Guide TNG1000.

** Option supplied separately: AV/Cabin heater ohms and inrush amperage vary due to heater design, refer to instructions TN03094 and TN03235.

115 Volt Kit:

Total power requirement 14.3 Amps.

Recommend 20 Amp 115 VAC continuous power source: 10-amps per plug.

Plug 1. Engines, gearboxes, battery			Total: 4.6 Amps	527.5 Watts	25.1 Ohms
* Without battery heater:			4.1 Amps	467.5 Watts	28.3 Ohms
Qty	Element Part Number	Element Location		Watts	Ohms
* 1	TBP2646-31-115/60	Battery	each:	60	220.4
1	TEN2661-78-115/10	Eng FPP or FCU	each:	10	1322.5
1	TEN2675-24-115/95	Eng LH AGB	each:	95	139.2
1	TEN2714-78-115/60	Eng RH AGB	each:	60	220.4
1	TEP2658-115/7.5	HYD TANK	each:	7.5	1763.3
1	TEP2675-115/95	MRGB Bottom	each:	95	139.2
1	TEP3179-115/40	Eng OIL TANK	each:	40	330.6
1	TEP3179-24-115/40	TRGB	each:	40	330.6
1	TEP3190-115/120	MRGB RH	each:	120	110.2

** Plug 2. AV/Cabin Heater			6.0 Amps	500 Watts	26.5 Ohms
Qty	Part Number	Location		Watts	Ohms
1	THP3094-500	Crew cab	each:	500	26.5

Table 4.2. 230-Volt Electrical Values (equipped with **250-C47** series engine).

System and individual element value tolerances +/- 10%.

* Battery heater circuit normally open, closed below +5°C / 41°F refer to TN03046 and Functional System Check located in Installation Guide TNG1000.

** Option supplied separately: AV/Cabin heater ohms and inrush amperage vary due to heater design, refer to instructions TN03094 and TN03235.

230 Volt Kit:

Total power requirement 7.1 Amps.

Recommend 10 Amp 230 VAC continuous power source: 5-amps per plug.

Plug 1. Engines, gearboxes, battery			Total:	2.3 Amps	527.5 Watts	100.3 Ohms
* Without battery heater:				2.0 Amps	467.5 Watts	113.2 Ohms
Qty	Element Part Number	Element Location		Watts	Ohms	
* 1	TBP2646-31-230/60	Battery	each:	60	881.7	
1	TEN2661-78-230/10	Eng FPP or FCU	each:	10	5290.0	
1	TEN2675-24-230/95	Eng LH AGB	each:	95	556.8	
1	TEN2714-78-230/60	Eng RH AGB	each:	60	881.7	
1	TEP2658-230/7.5	HYD TANK	each:	7.5	7053.3	
1	TEP2675-230/95	MRGB Bottom	each:	95	556.8	
1	TEP3179-230/40	Eng OIL TANK	each:	40	1322.5	
1	TEP3179-24-230/40	TRGB	each:	40	1322.5	
1	TEP3190-230/120	MRGB RH	each:	120	440.8	

** Plug 2. AV/Cabin Heater			Total:	3.0 Amps	500 Watts	26.5 Ohms
Qty	Part Number	Location		Watts	Ohms	
1	THP3094-500	Crew cab	each:	500	26.5	

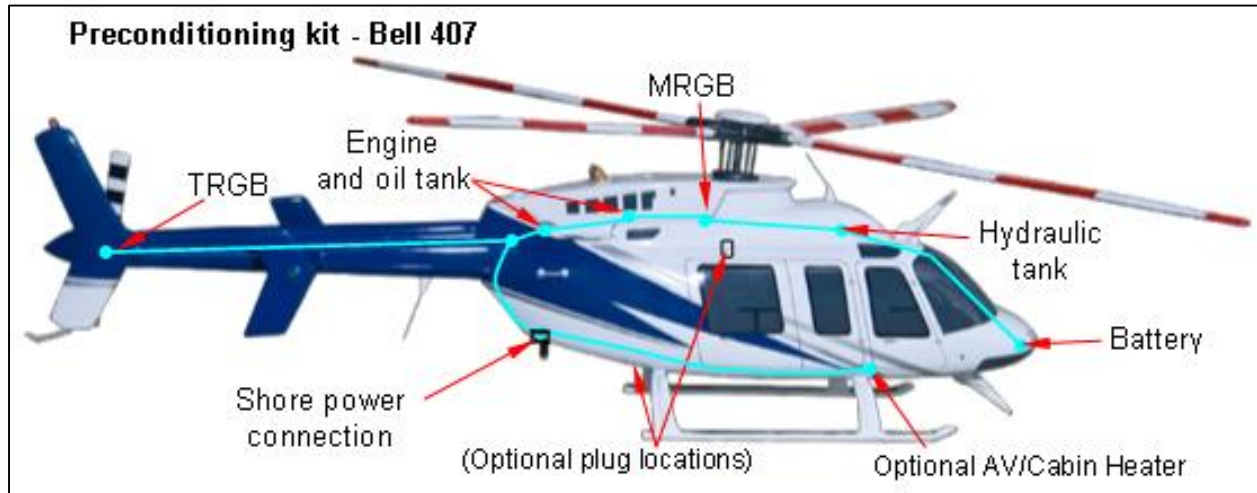


Figure 4.1. Overview of preconditioning kit.

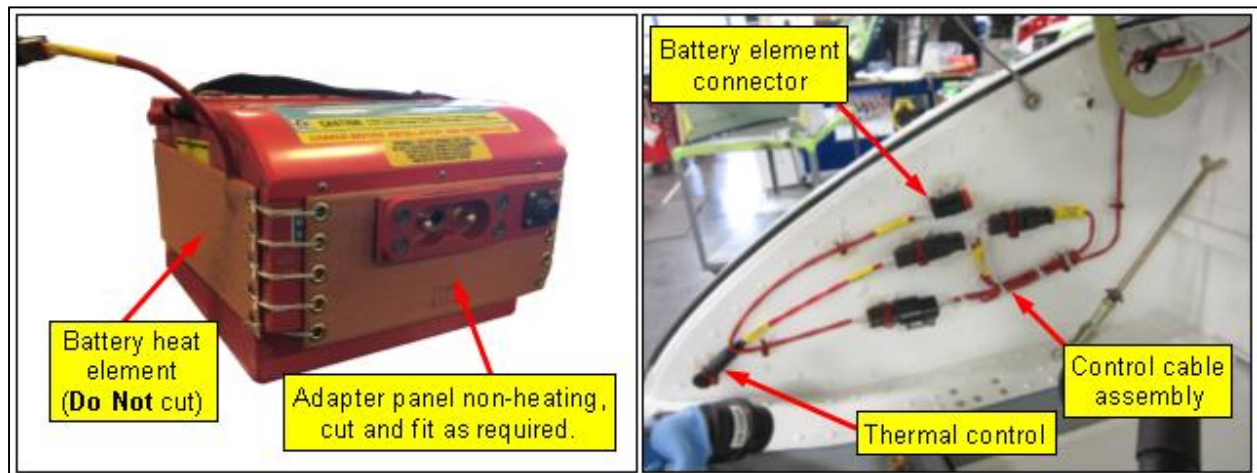


Figure 4.2. Battery heater:

Left: Battery element TBP2646-31- with adaptor panel TB03268-09 fitted around battery. Non-heating adapter panel is cut to fit around contact block. **Do Not** cut element. Using cable-ties and/or appropriate lacing gently lace in place around perimeter of battery. Alternate tension between lacing and grommets. Be careful not to pull too hard. This could result in grommets pulling out. Installation does not use bonding sealant.

Right: Example of thermal control TLP3046-05 and control cable assemble TL03217-C located in right side of battery station alongside battery secured with cable-ties and anchors TU02782, refer to instruction TN03046 and TN02782.

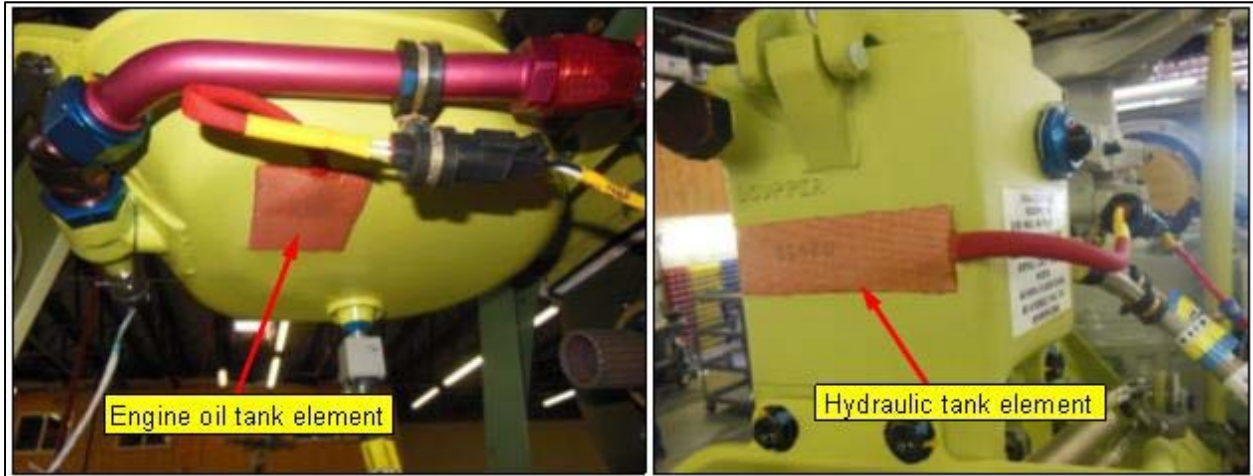


Figure 4.3. Engine Oil tank and MRGB elements:

Left: TEP3179- locate on bottom of engine oil tank position for lead routing through aft firewall and engine pan to junction J-A.

Right: TEP2658- HYD Tank element locate on front or side below nominal oil level position to allow lead to follow lines aft to junction J-B.

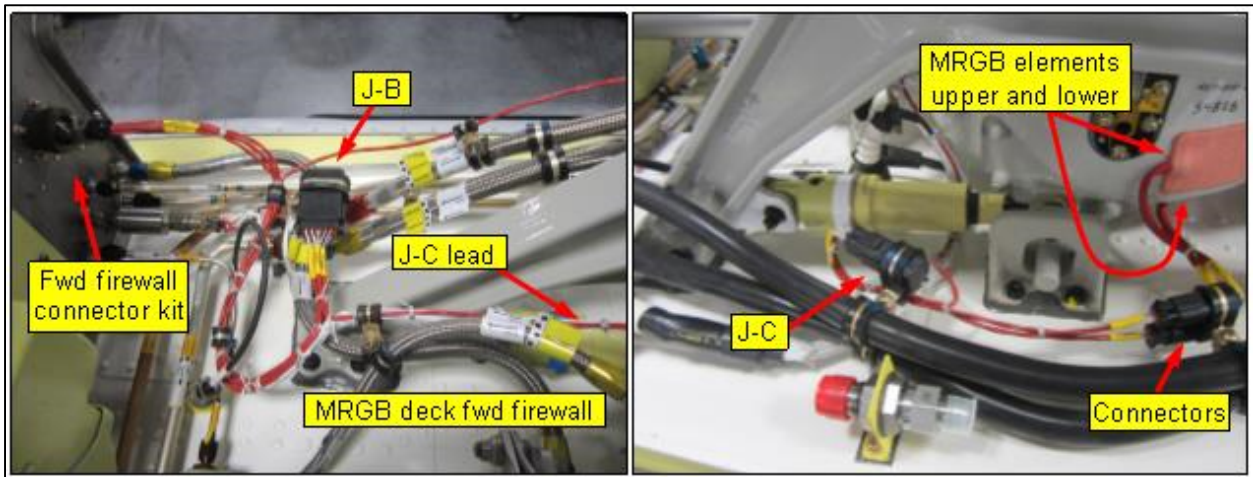


Figure 4.4. Main rotor gearbox (MRGB) routing and elements:

Left: Forward engine firewall connector kit TU03030 and routing from junction J-B.

Right: MRGB elements and junction J-C.

TEP3190- locate on side of MRGB forward of oil sight glass lead aft.

TEP2675- locate on bottom of MRGB lead aft.

Note: Gearbox configuration may require deviation, relocate as required below nominal oil level.

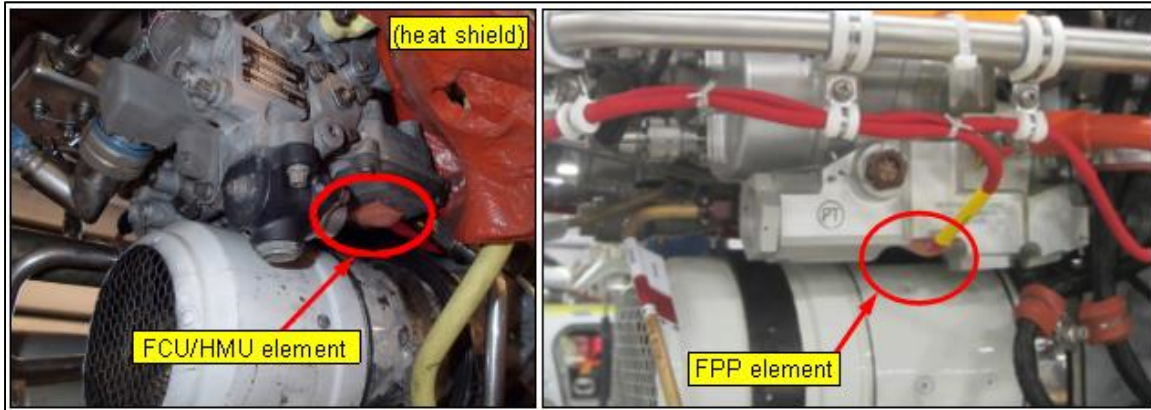


Figure 4.5. Fuel control heat element:

TEN2661- locate on bottom of FCU/FPP position for lead routing.

Left: FCU element located on bottom of unit by loosening or R&R of heat shield. Early model 407 S/N: 53001 to 54299 (Rolls Royce 250-C47B). Model 407 S/N: 54300 to 54565 with commercial designation of 407GX (Rolls Royce 250-C47B plus Garmin G1000H). Model 407 S/N: 54566 and 54568 to 54800 with commercial designation of 407GXP (Rolls Royce 250-C47B/8 plus Garmin G1000H).

Right: FPP element located on bottom of unit. Late model 407 S/N: 54567 and 54805 and subsequent with commercial designation of 407GX_i (Rolls Royce 250-C47E/4 plus Garmin G1000H NX_i).

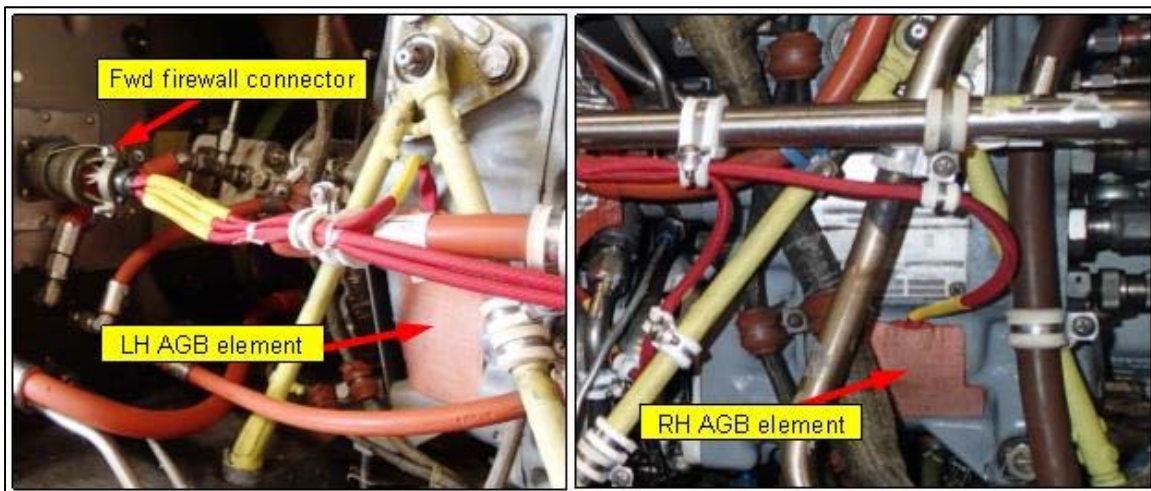


Figure 4.6. Forward firewall connector and engine accessory gearbox (AGB) elements:

Left: Firewall connector kit TU03030 located on left side of forward firewall, safety with lock wire. Location approximate, may vary due to equipment and/or operational requirements.
TEN2675- LH AGB element, locate on left side of tank section below engine mount pad. Lead terminated in firewall connector.

Right: TEN2714- RH AGB element, locate on right side of tank section below engine placard. Lead terminated in firewall connector.

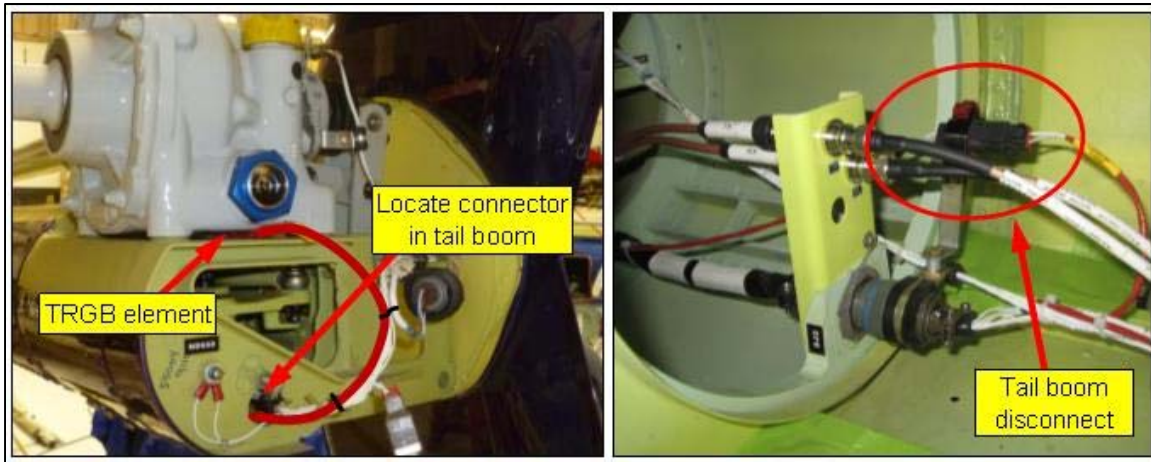


Figure 4.7. TRGB element:

Left: TEP3179-24- (long lead) locate on bottom of TRGB lead aft, route lead with existing wiring through aft tail boom bulkhead and secure connector in tail boom with existing wiring (forward of aft tail boom bulkhead).

Right: Tail boom disconnect, locate connectors at tail boom disconnect station, TCS2598 and TCP2598, and secure with cushioned clamps or cable-tie/lace with existing wiring.

Alternate Mil spec. connector kits (supplied separately): 2 contact TU03047 or 5 pin TU03127.

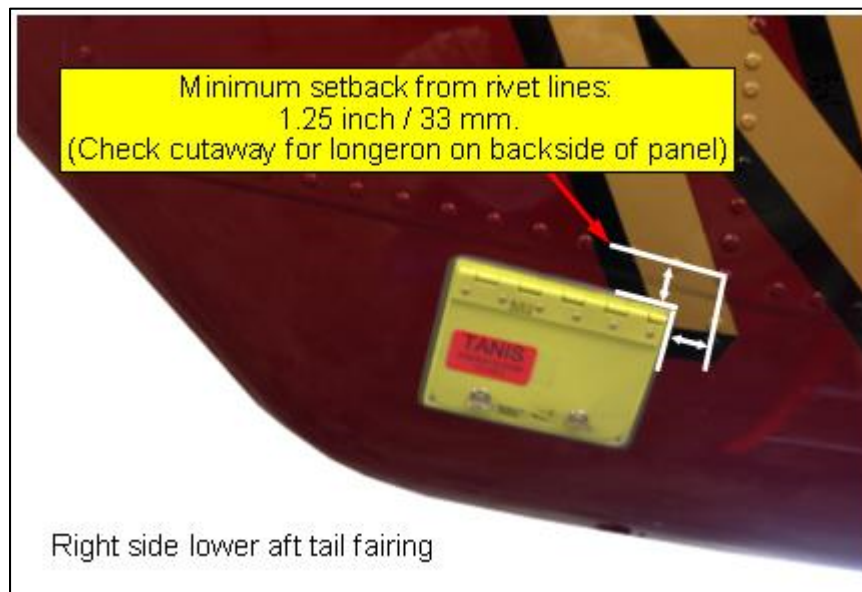


Figure 4.8. 2-place door kit TD03095: Locate on right side of lower aft tail fairing (approximate STA 209, WL 37) minimum 1.25 inches (33 mm) below and aft of rivet lines. Setback suggested for edge clearance of composite core cutback for inner longerons. Refer to drawing 03095 and instruction TN03095 for installation instruction.

Note: Door may be located parallel/level with ground. Before cutting verify inner core edge clearance can be maintained and door kit can properly conform to fairing shape.



Figure 4.9. External power connection:

Note: Winged latch studs may be replaced with appropriate slotted or cross recess pan head studs (V26S or 26S) sized accordingly. Required when float equipped.

Left: Door kit on right side of aft lower tail boom fairing.

Right: Plug door open:

Plug 1 (left): System power plug and indicator light, door annunciator switch, and alternate placard location.

Plug 2 (right): Blanking plate located when not used or use for optional AV/Cabin Heater circuit or other (supplied separately) refer to cable kit drawings 02774 and 03082.

- a. Door annunciator switch TU03273: Modify door kit to accept switch, wire switch into existing Crew Alerting System circuit (CAS), refer to switch instruction TN03273, drawing 03095, and BHT-407-MM-12.
- b. Shore power plug(s) and light(s): Locate plug and light in door kit; plug by voltage TP02070-M-115 or TP02839-S-230, light by voltage TLP3039-115 or TLP3039-230.
- c. Refer to instructions TN02070 and TN03039.
- d. Placard: Affix placard to outside or inside of door, by voltage TU02615-115 or TU02615-230.
- e. CPD (fused link) part of cable kit, locate in serviceable area near rear of plug, location TBD by installing authority. Secure with existing wiring, stud mount kit TU03262 and clamp (supplied separately), cable anchor TU02782 (supplied) or equivalent.

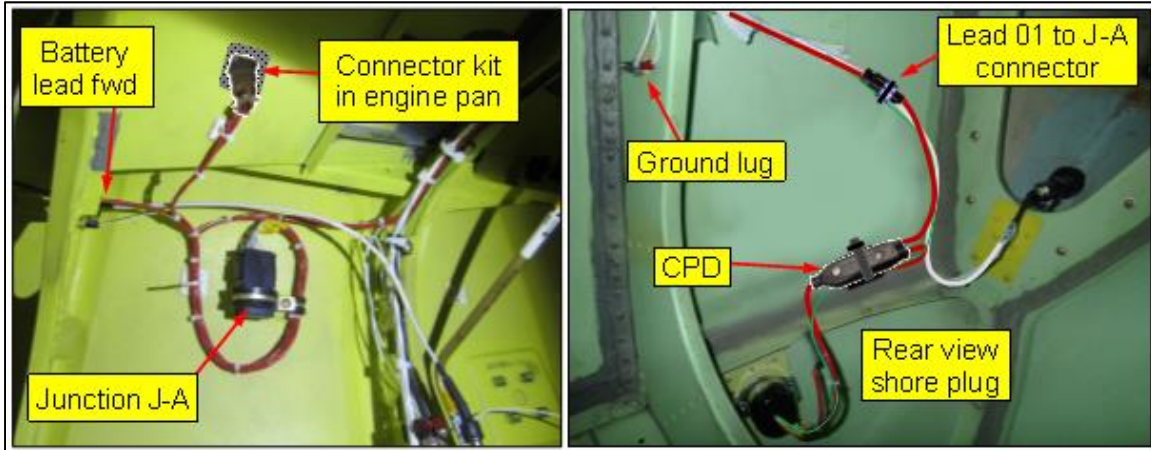


Figure 4.10. Examples of cable routing inside aft tail section:

Left: TU03125, Connector kit (six pin). Example of connector located on sloped section of engine pan, right of center, forward of engine firewall, approximate: STA 183, WL 70.5, LBL or RBL 6.5, or use existing passthrough, route accordingly.

Junction J-A. Example of junction on right side of compartment panel approximate location: STA 190, WL 67, RBL 16. Secure with existing wiring or with MS21919 series clamp and stud mount CB4001 or stud kit TU03262 (supplied separately). CPD shown located on panel near plug with TU02782 cable-tie anchor (supplied). Additional anchors and stud kits available separately.

Right: 'View from inside of tail section, backside of plug door. When locating plug and light verify black protective cap is installed on rear of plug and yellow wire support shrink is on indicator light. Refer to plug and light instructions TN02070 and TN03039.

Ground wire: Locate green ground wire on existing ground lug or on airframe, connection not to exceed 0.003 ohms, refer to TNG1000.

Note: Location of junction and CPD may vary from examples. Stud mount kits and anchors located with CB92 Adhesive Kit (supplied), CB200 structural adhesive, or equivalent.

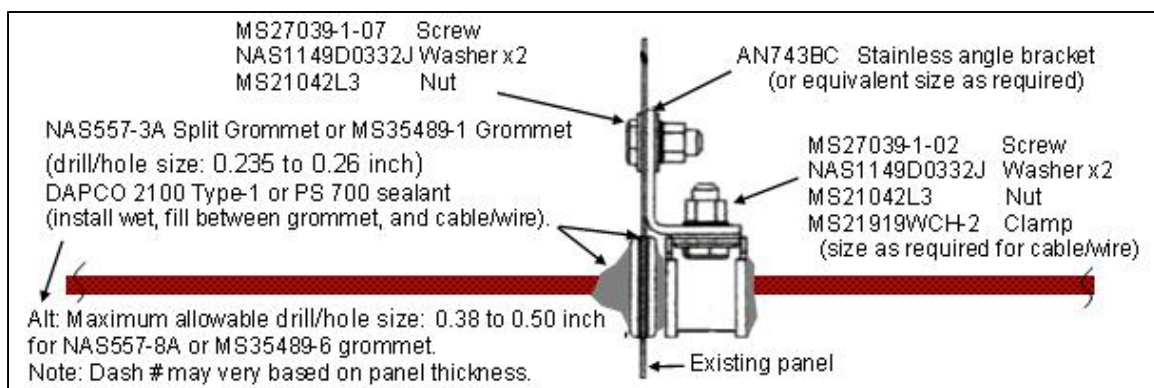


Figure 4.11. Rear firewall passthrough layup. Grommet may also be used for engine pan passthrough. Grommet, hardware, and sealant supplied separately. Note Alt: Maximum allowable hole size for alternate grommet 0.50 inch. Refer to drawings 02774 and 03082, and Figure 4.12.

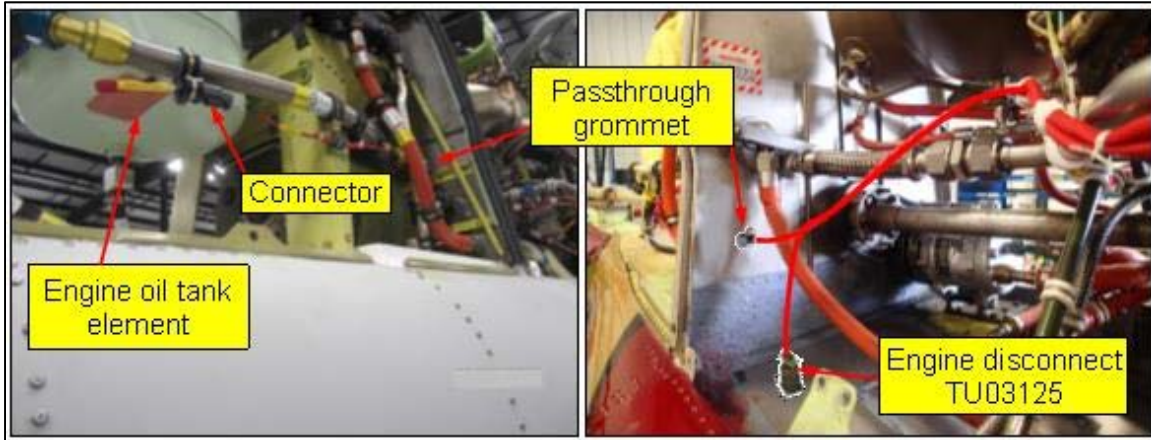


Figure 4.12. Rear firewall and engine pan passthrough:

Left: Oil tank lead from junction J-A routed through rear firewall with NAS557 or MS35489 series grommet.

Right: Engine pan fitted with firewall connector kit TU03125.

Locations for passthroughs TBD due to existing equipment and/or aircraft model variations refer to drawings 03082, 03125, and Figure 4.11.

Firewall warning placard (Bell Part No: 230523363) may be relocate and/or replaced as required. Note: Previous preheat kit used TU03030 connector kit on aft firewall.

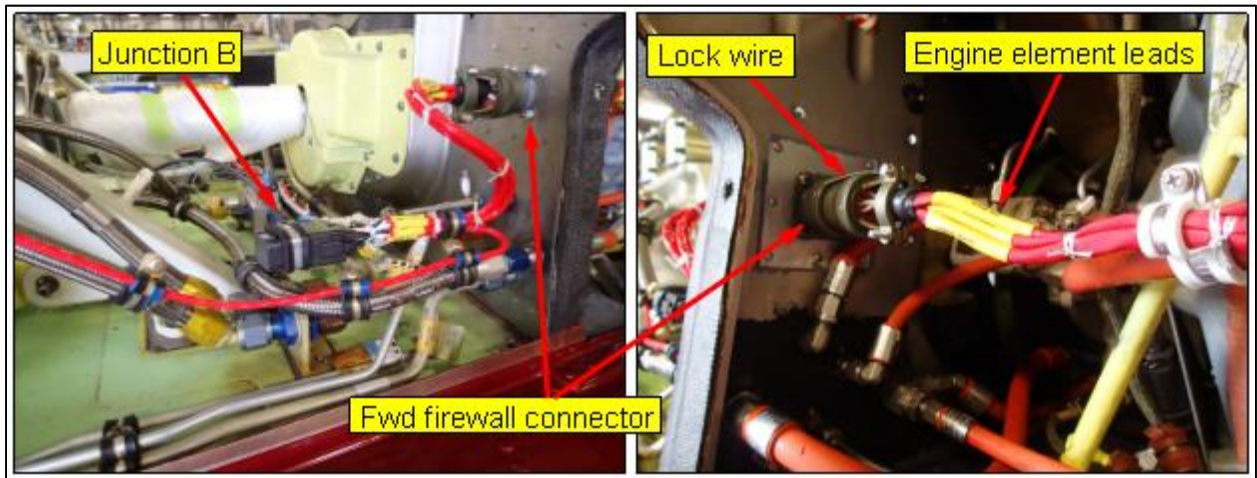


Figure 4.13. Junction J-B and forward engine firewall connector kit:

Left: Example of location for junction J-B in MRGB compartment and forward firewall connector kit TU03030 on left side of firewall.

Right: Firewall connector, disconnect with element leads secured with lock wire.

Location for may vary due to variations in firewall configurations and/or equipment options.



Figure 4.14. Example of MRGB and hydraulic tank cable routing from forward firewall connector and junction J-B.

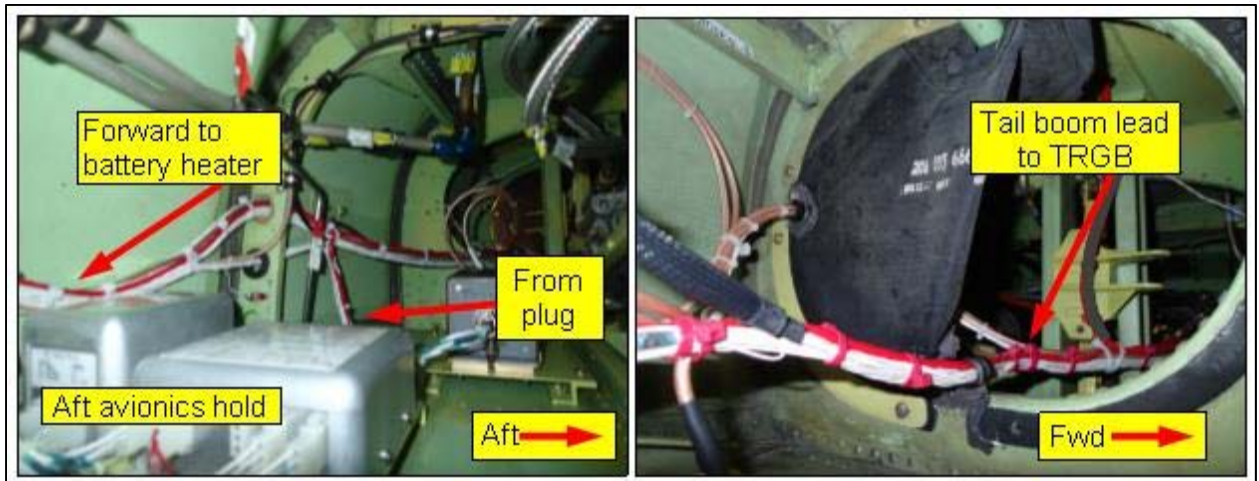


Figure 4.15. Example of routing through tail section and aft avionics hold. Battery lead routed between J-A and battery station, across cabin ceiling and down windscreen post. TRGB routed between J-A and tail rotor gearbox. Locate connector kits at tailboom disconnect refer Figure 4.7.

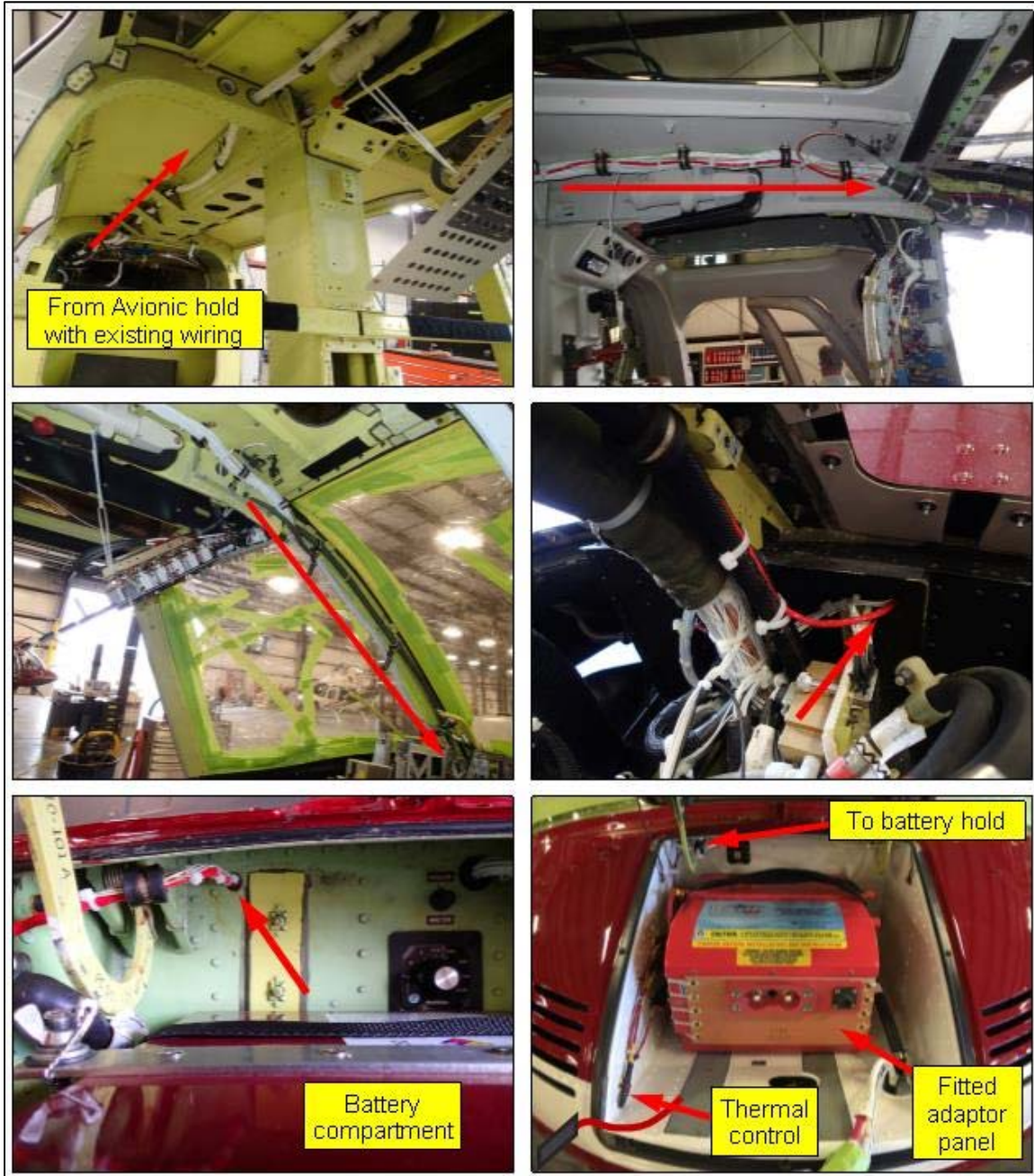


Figure 4.16. Examples of routing options for battery cable assembly. Route between battery station and junction J-A with existing wiring through cabin and down wind screen post as shown or route with battery cables under crew deck. On some older models the battery lead can be routed from upper transmission deck forward to existing penetration above cockpit to windscreen post. However, if this option is used insure penetration is properly sealed to avoid fluid infiltration into cabin area.

5. APPENDIX A

Section contains modification instructions and electrical values associated with Eagle Copters HTS900 engine conversion (STC SH14-47 or SR03496NY)

Requires engine element substitutions, remainder of installation remains the same, refer to subject kit top-level drawings and Figure 5.1.

Table 5.1. 115-Volt Electrical Values (equipped with **HTS900**).

System and individual element value tolerances +/- 10%.

* Battery heater circuit normally open, closed below +5°C / 41°F refer to TN03046 and Functional System Check located in Installation Guide TNG1000.

** Option supplied separately: AV/Cabin heater ohms and inrush amperage vary due to heater design, refer to instructions TN03094 and TN03235.

115 Volt Kit (HTS900):

Total power requirement 14.3 Amps.

Recommend 20 Amp 115 VAC continuous power source: 10-amps per plug.

Plug 1. Engines, gearboxes, battery			Total:	5.4 Amps	620.5 Watts	21.3 Ohms
* Without battery heater:				4.9 Amps	560.5 Watts	23.6 Ohms
Qty	Element Part Number	Element Location			Watts	Ohms
* 1	TBP2646-31-115/60	Battery		each:	60	220.4
1	TEN2715-60-115/18	Eng FCU/HMU		each:	18	734.7
2	TEN3181-60-115/120	Eng LH AGB		each:	120	110.2
1	TEP2658-115/7.5	HYD TANK		each:	7.5	1763.3
1	TEP2675-115/95	MRGB Bottom		each:	95	139.2
1	TEP3179-115/40	Eng OIL TANK		each:	40	330.6
1	TEP3179-24-115/40	TRGB		each:	40	330.6
1	TEP3190-115/120	MRGB RH		each:	120	110.2

** Plug 2. AV/Cabin Heater			6.0 Amps	500 Watts	26.5 Ohms
Qty	Part Number	Location		Watts	Ohms
1	THP3094-500	Crew cab		each: 500	26.5

Table 5.2. 230-Volt Electrical Values (equipped with **HTS900**).

System and individual element value tolerances +/- 10%.

* Battery heater circuit normally open, closed below +5°C / 41°F refer to TN03046 and Functional System Check located in Installation Guide TNG1000.

** Option supplied separately: AV/Cabin heater ohms and inrush amperage vary due to heater design, refer to instructions TN03094 and TN03235.

230 Volt Kit (HTS900): Plugs 1 and 2

Total power requirement 7.1 Amps.

Recommend 10 Amp 230 VAC continuous power source: 5-amps per plug.

Plug 1. Engines, gearboxes, battery			Total:	2.7 Amps	620.5 Watts	85.3 Ohms
* Without battery heater:				2.4 Amps	560.5 Watts	94.4 Ohms
Qty	Element Part Number	Element Location			Watts	Ohms
* 1	TBP2646-31-230/60	Battery		each:	60	881.7
1	TEN2715-60-230/18	Eng FCU/HMU		each:	18	2938.9
2	TEN3181-60-230/120	Eng LH AGB		each:	120	440.8
1	TEP2658-230/7.5	HYD TANK		each:	7.5	7053.3
1	TEP2675-230/95	MRGB Bottom		each:	95	556.8
1	TEP3179-230/40	Eng OIL TANK		each:	40	1322.5
1	TEP3179-24-230/40	TRGB		each:	40	1322.5
1	TEP3190-230/120	MRGB RH		each:	120	440.8

** Plug 2. AV/Cabin Heater			Total:	3.0 Amps	500 Watts	26.5 Ohms
Qty	Part Number	Location			Watts	Ohms
1	THP3094-500	Crew cab		each:	500	26.5

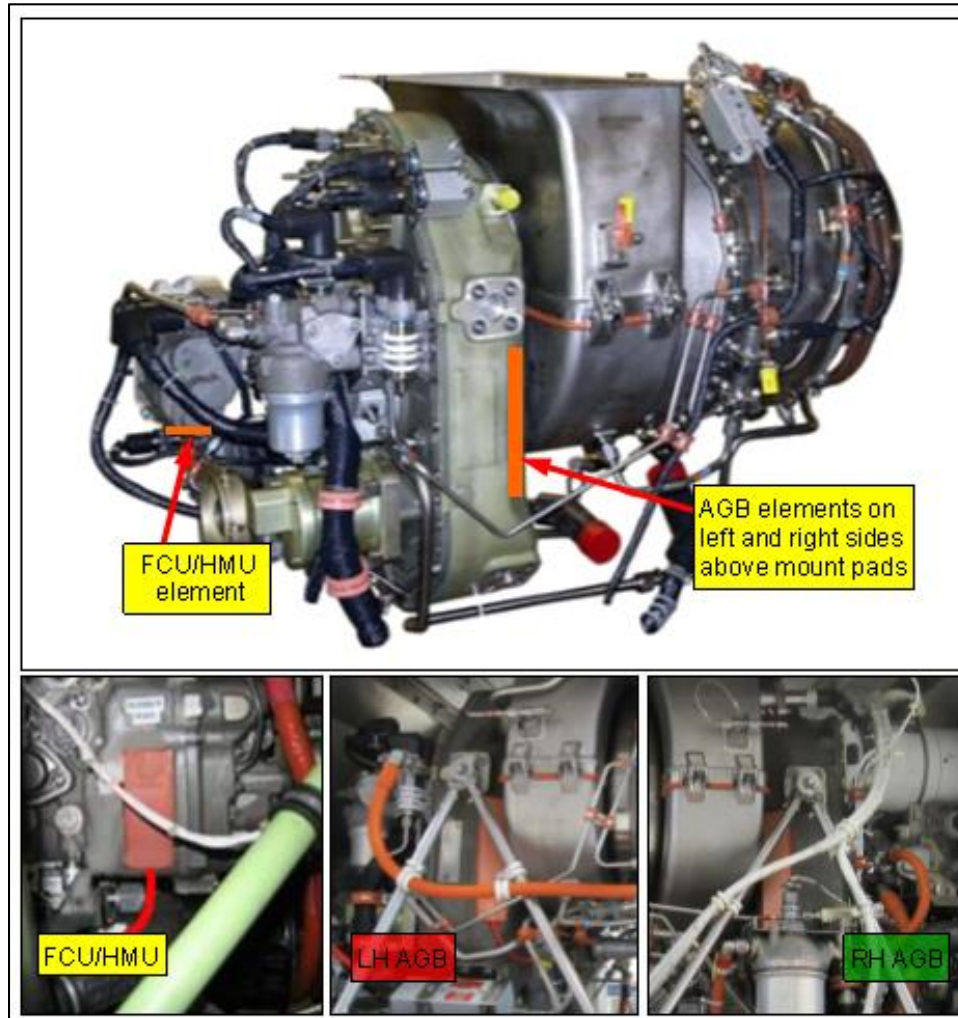


Figure 5.1. HTS900 engine conversion:

Substitute supplied engine elements TEN2661-78-, TEN2675-24-, and TEN2714-78-, with 1 each: TEN2715-60-, and 2 each: TEN3181-60-.

FCU/HMU element TEN2715-60- locate low on side of unit when possible, may require alternate element, route to and terminate in forward firewall connector kit (TU03030).

LH and RH AGB elements TEN3181-60- locate one each, low on side of tank section leads down, route to and terminate in forward firewall connector.

Note: Example of forward firewall connector shown in Figures 4.6. and 4.13.

6. APPENDIX B

Contains examples for optional AV/Cabin Heater, annunciator switch, and plug doors kits.



Figure 6.1. Option: Generic example of THP3094 series AV/Cabin Heater (supplied separately). Location TBD by installer, may vary due to seating configuration. Routed into crew cab with existing wiring. For installation and circuit requirements refer to wire diagram 03082, heater operating guide TPG3094 and instructions TN03094.



Figure 6.2. Option: Door kit TD02840 (supplied separately). Located in right side of main transmission (MRGB) cowl forward of engine firewall, STA 125, WL 76, approx.

Requires reconfiguring cable kit, wire diagram drawing 03082, and may require field fabrication of additional doubler refer instruction TN02840.

Locating door annunciator switch TU03273 optional with upper deck door installation.



Figure 6.3. Option: Door kit TD02840 (supplied separately) or supplied 2-place door kit. Located in belly panel aft of rear skid near aft edge of panel refer to door kit instruction TN02840 or TN03095 as applicable.

Requires reconfiguring cable kit, wire diagram drawing 03082, and may require field fabrication of additional doubler refer instruction TN02840 or TN03095 as applicable.

Door annunciator switch: TU03273 Locate in center area of door hinge. For Crew Alerting System circuit (CAS), applicable by S/N, refer to BHT-407-MM-12, door modification refer instruction TN03273.

******* NOTHING FOLLOWS *******