

TANIS
AIRCRAFT PRODUCTS
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INSTRUCTION - PREHEAT INSTALLATION

**TNP1045
REV A, APR-30-2013**

**FOR
ENGINE PREHEAT KITS**

**TSP8CYL-1045-115 AND TSP8CYL-1045-230
(115VAC AND 230VAC)**

**ON
720 SERIES 8 CYLINDER**



LYCOMING

ENGINES

PROPRIETARY DATA

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Record of Revisions

When updated, this document is changed in its entirety.

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1. Introduction

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

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

2. Installation Requirements

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

Installation is to be performed following industry standards, acceptable methods, techniques and practices, airframe manufacturer's procedures, and approved procedures set in place by the installing authority. Securing, tying, and clamping of wiring to be in accordance with (IAW) AC43.13-1b Chapter 11, Section 9 through 12, grounding and bonding IAW with 43.13-1b Chapter 11, Section 15, and feed-through penetration, if required, are to be IAW with 43.13-1b section 17.

The installation requires clear access to the engine, and engine oil drained. For proper installation, work is to be performed in a clean environment under standard temperature conditions of 18°C (65°F) to 27°C (80°F). Installation times vary depending on shop procedures, installation options, and other modifications. For reference, required supporting documents are listed below (Table 2-0).

TABLE 2-0 Supporting Installation Documents

1045	Preheat Kit - Item List
02813	Cable Kit - Wire Diagram
TN02771	Instruction - Threaded Element
TN02788	Instruction - Bonding

2.1. Sourced Separately

- 2.1.1. Pad heat element bonding sealant is to be sourced at time of installation due to compound shelf life limitations. Refer to bonding instruction (TN02788), for approved bonding sealants and installation procedures.
- 2.1.2. Tools, consumables, finish materials, installation hardware, brackets, lacing, various MS21919 cushion clamps. Table 2-1 lists commonly sized clamps and their application.
- 2.1.3. Power supply and shore power connection (extension cord).

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

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

3. General System Information

3.1. Description

The Tanis preheat kit described is for a single engine preheat system. Through separate approval, optional Tanis components may be installed in conjunction with the engine kit (3.4. Options).

Preheating is a cold weather aviation procedure that increases reliability and safety of operations, reduces thermal stress, and launch times. Engine preheating is accomplished through electrical resistance heat located in each cylinder assembly, and on the sump. Power is routed to the heat elements through a dedicated wiring assembly with circuit overload protection. The system is self-regulating through design. Heated components reach an average state of thermal equilibrium in six hours.

3.2. Power Requirements

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

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

3.3. Operation

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

For cold weather aircraft operations and engine starting procedures, refer to the Original Equipment Manufacturer (OEM) operating procedures, Flight Manual Supplements (FMS), and FAA Advisory Circulars (AC).

For detailed operating instructions of the preheat system, refer to the Tanis FMS.

3.4. Options

- 3.4.1. When incorporating any options such as, a battery heat kit, second engine kit, or fuselage mounted plug, etc., it is to be installed through separate approval. Only use approved Tanis components, and or kits, total amperage with additions is not exceed 12 Amps. Refer to 43.13-1b Chapter 11, Sections 6 and 7, for proper wire selections, and contact Tanis engineering for approval.
- 3.4.2. The addition of Tanis indicator light, avionics and battery heaters is suggested. An indicator light provides the ground crew with power indication. Heating of avionics allows for proper glass panel activation, reduces condensation build up, and cold weather induced gyroscopic errors. Battery heating reduces freeze point depression, allows for higher amperage outputs, and proper charge.

3.5. Inspection and Cleaning

Processes are in accordance with Tanis instruction for continued airworthiness (ICA), aircraft manufacturer's recommendations, and 43.13-1b Chapter 11, Sections 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.

3.6. 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.

3.7. Electrical Values

Engine system and individual element values are listed below (Table 3-1).

TABLE 3-1 System Values +/- 10%

115 Volt System	810 Watts	7.0 Amps	13.0-16.0 Ohms
<u>Quantity</u>	<u>Element P/N:</u>	<u>Wattage</u>	<u>Ohms</u>
8	TTP2771-115/50	50	264.5
1	TTP2634-115/50	50	264.5
3	TEP2650-115/120	120	110.2

230 Volt System	810 Watts	3.5 Amps	52.3-64.0 Ohms
<u>Quantity</u>	<u>Element P/N:</u>	<u>Wattage</u>	<u>Ohms</u>
8	TTP2771-230/50	50	1058.0
1	TTP2634-230/50	50	1058.0
3	TEP2650-230/120	120	440.8

4. Installation

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

4.1. Installation Overview

- 4.1.1. Review all kit contents and documents.
- 4.1.2. Weigh the kit and installation hardware before installing.
- 4.1.3. Determine heat element locations.
- 4.1.4. Prepare the element installation sites and install elements.
- 4.1.5. Identify mounting location for junctions, fused link and ground, and install.

- 4.1.6. Identify mounting location for shore power plug, and indicator light if used.
- 4.1.7. Appropriately route cabling and connect.
- 4.1.8. Mount shore power plug and indicator light.
- 4.1.9. Secure cabling and connectors.
- 4.1.10. Affix system placard adjacent to the shore power plug.
- 4.1.11. Perform "Systems Check" and "Sign Off."
- 4.1.12. Update the aircraft equipment list and (as required) weight & balance record.
- 4.1.13. Complete paper work filing (ICA and FMS etc.).

4.2. Element Installation and Location



Caution: Do not connect elements to power until properly installed.

Threaded elements: install and torque per OEM specifications for location of installation.

Using an ohmmeter verify elements resistance before installing (Table 3-1). *For deviations outside of expected range, contact Tanis Aircraft.*

P/N	Element, location and orientation (Figures 4-1 thru 4-4)
TTP2771- TTP2634-	Threaded heat element, one per cylinder assembly (Figures 4-1, 4-3, & 4-4). Sump screen heat element, replaces OEM screen bolt. Drain oil and install with new AN900-16 crush washer, torque, safety-wire (Figure 4-2 & 4-6), and renew oil as per OEM procedures.
TEP2650-	Pad heat element, install on lower forward area of case above starter, lead aft. Secure cabling to upper surface of induction tubes (Figure 4-2). The installation of this element is best preformed with the starter removed.
TEP2650-	Pad heat element, install one each on the bottom of left and right sumps (Figure 4-2), leads aft to meet with sump screen cabling.
TB02800-	Optional battery heat kit is installed through separate approval. Example of battery heat element installed on circumference of battery (Figure 4-5).

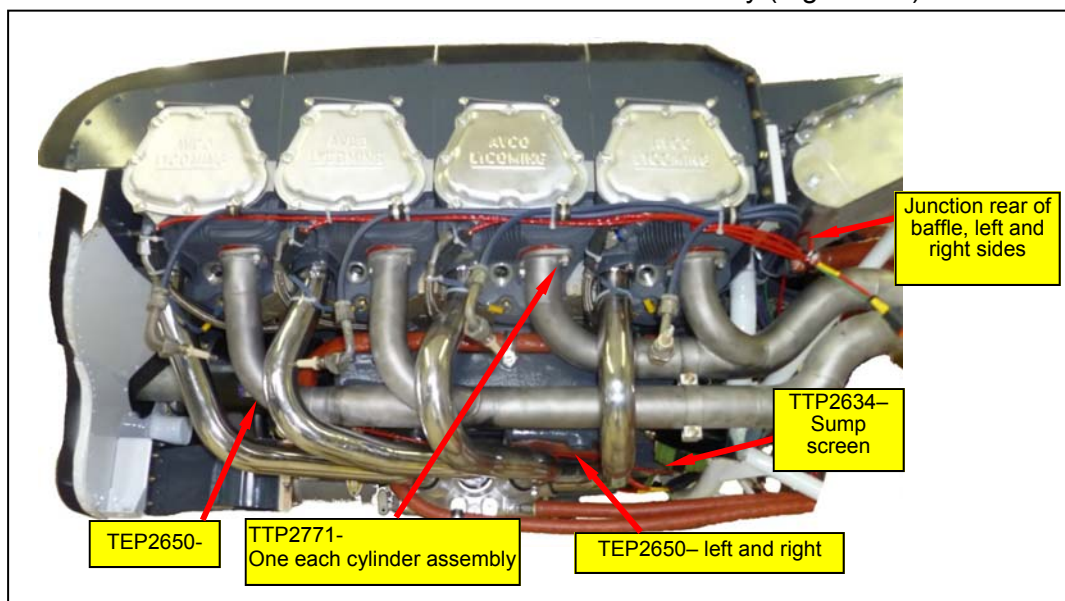


Figure 4-1 Engine left side view.

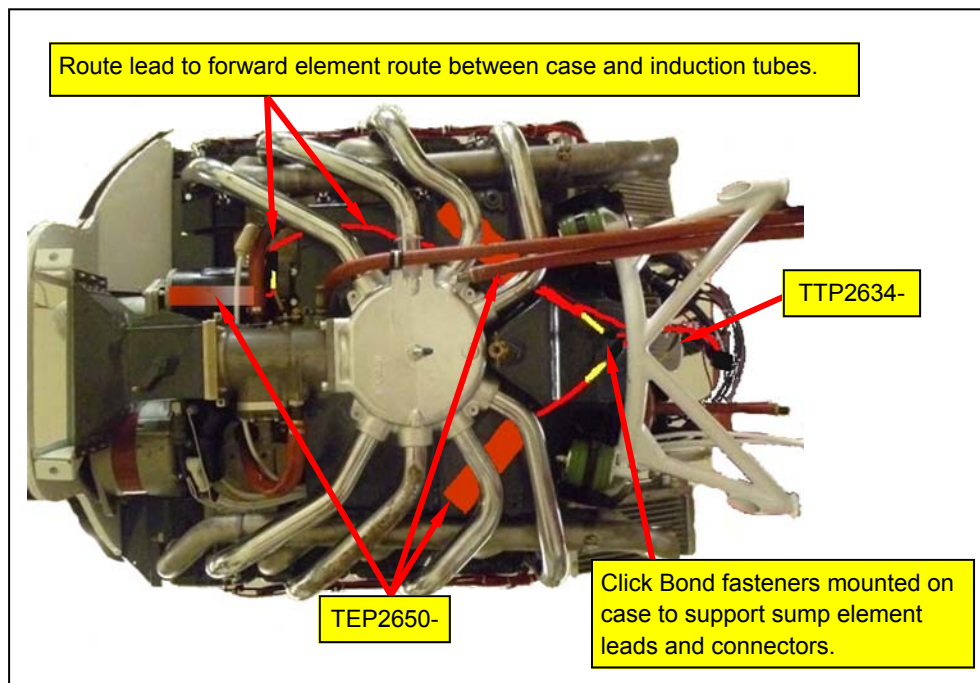


Figure 4-2 Engine bottom view.

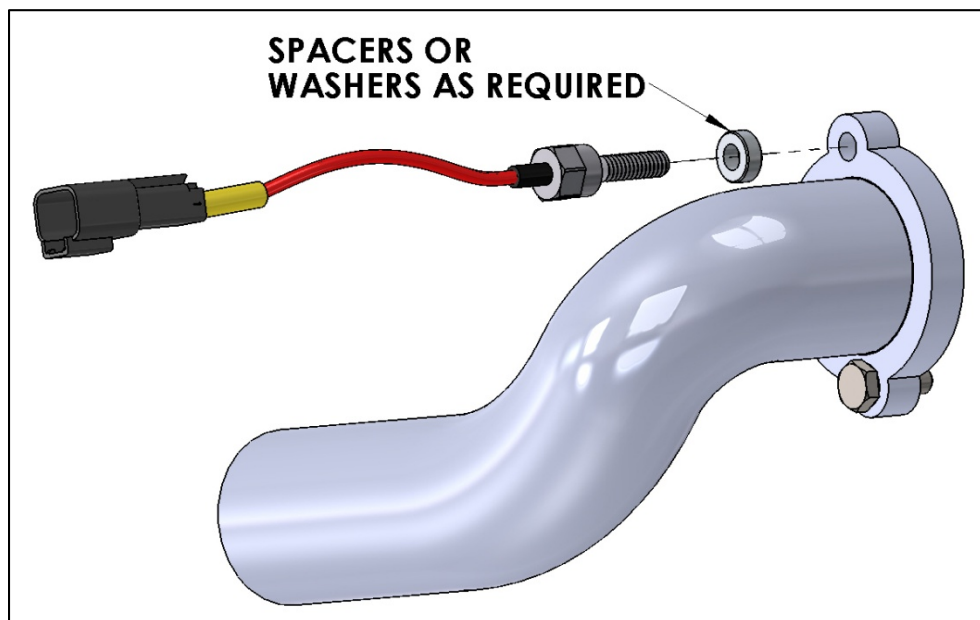


Figure 4-3 TTP2771- threaded element replaces intake tube flange bolt.



Figure 4-4 TTP2771- threaded element, and generic pad heat element.



Figure 4-5 Example of optional battery heat element installed.

4.3. Cabling



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

To compensate for routing options, it is acceptable to service loop, racetrack, or shorten cables by cutting and re-terminating with appropriate connector, or lengthen with jumper cable. Use existing feed-through, and fire barrier penetrations, whenever possible. If routing requires a new feed-through, or fire barrier penetration use Tanis Fireproof Grommet (TG01056), MIL-C-38999, MIL-DTL-5015 series crimp type disconnects, or approved fitting conforming to 14 CFR Part 23-1191/AC20-135. Feed-through penetrations are to be IAW with 43.13-1b Chapter 11, Section 17.

4.4. Suggested Cable Routing

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

Note: A spare lead (with sealing cap) is supplied off the load side of the circuit protection for powering optional indicator light and/or accessories (Section 3.4. Options).

- 4.4.1. Lay out the cable kit and required installation documents, reference figures in this document.

4.4.2. Determine location and method for mounting the a) shore power plug, b) system ground, c) fused link, and d) optional indicator light (TLP1026-).

- a) Shore power plug: secure using cushioned clamps or circular plug bracket (TU01062). Typical location for the plug is on or near the oil filler tube, or in a location accessible through an oil door or cowl opening (Figure 4-8).

Options: Plug brackets, flush mount plugs, and shore power plug door kits are available (Figure 4-10), and are installed through separate approval.

- b) Ground wire: connect to the engine block or airframe in accordance with 43.13 1b Chapter 11, Section 15. Do not ground to a cylinder assembly or rocker cover.

Note: Check engine ground bonding strap for proper installation.

- c) Fuse link with spare lead: secure with existing wiring or cushioned clamp, cap spare lead when not used.

Options: Indicator Light, located in viewable location, and secure in place with cushioned clamps, cable ties, or other acceptable means (Figure 4-9).

4.4.3. Identify mounting location for the cable junctions which allow junction cable leads to reach elements and corresponding items as called out. A suggested location is on or near the rear of the engine in a manner that allows cabling to reach and/or follow ignition leads to each of the cylinder elements (Figures 4-1, 4-2, and 4-6).

- a. Locate left bank junction A, forward of the left oil cooler. Secure to ignition leads using cable ties or mount using cushioned clamp(s) (Figures 4-1 and 4-6). Attach ground to engine case. Junction A is the main power junction with ground wire. This junction connects to the left cylinder elements and Junction B.
- b. Locate sump junction B on the aft of the engine. Secure to ignition leads, below oil filter, using cable ties. This junction connects to the sump elements, forward case element and junction C.
- c. Locate right bank junction C forward of the right oil cooler, secure to ignition leads using cable ties or mount on rear of baffling using cushioned clamp(s) (Table 2-1). This junction connects to the right cylinder elements (Figure 4-6).

4.4.4. Once locations for above items are verified; install and mount as indicated.

4.4.5. Using the wire diagram and depictions for reference, identify labeled leads from each junction and route accordingly.

4.4.6. Numbered leads from left bank junction A:

- 02, 04, 05, and 06 - Route forward with ignition leads to each of the cylinder heating elements as labeled.
- 03 - Route starboard with ignition leads to the just below the oil filter and connect to lead 03 of the sump junction B.

4.4.7. Numbered leads from sump junction B:

- 07, 08, and 09 - Route forward to the two lower sump elements left, right, and threaded sump screen element.
 - * Install Click Bond fasteners (cable mount) on lower case/sump in appropriate location for securing sump element leads and connectors (Figures 4-2 and 4-6).
- 10 - Route forward to element located on case above starter.
- 11 - Route starboard with ignition leads. Connect to lead 11 on the right bank junction C.

4.4.8. Numbered leads for right bank junction C:

- 12 thru 15 - Route forward with ignition leads to each of the cylinder heating elements as labeled.

4.4.9. Once locations for above items are verified, install and mount as indicated.

4.4.10. Secure cabling, element leads, and connectors to reduce wire fatigue at wire connector and element interfaces.

4.4.11. Affix placard near the system's shoreline power plug.

4.4.12. Follow and complete Completion Check List and Sign Off (Sections 5 and 6).

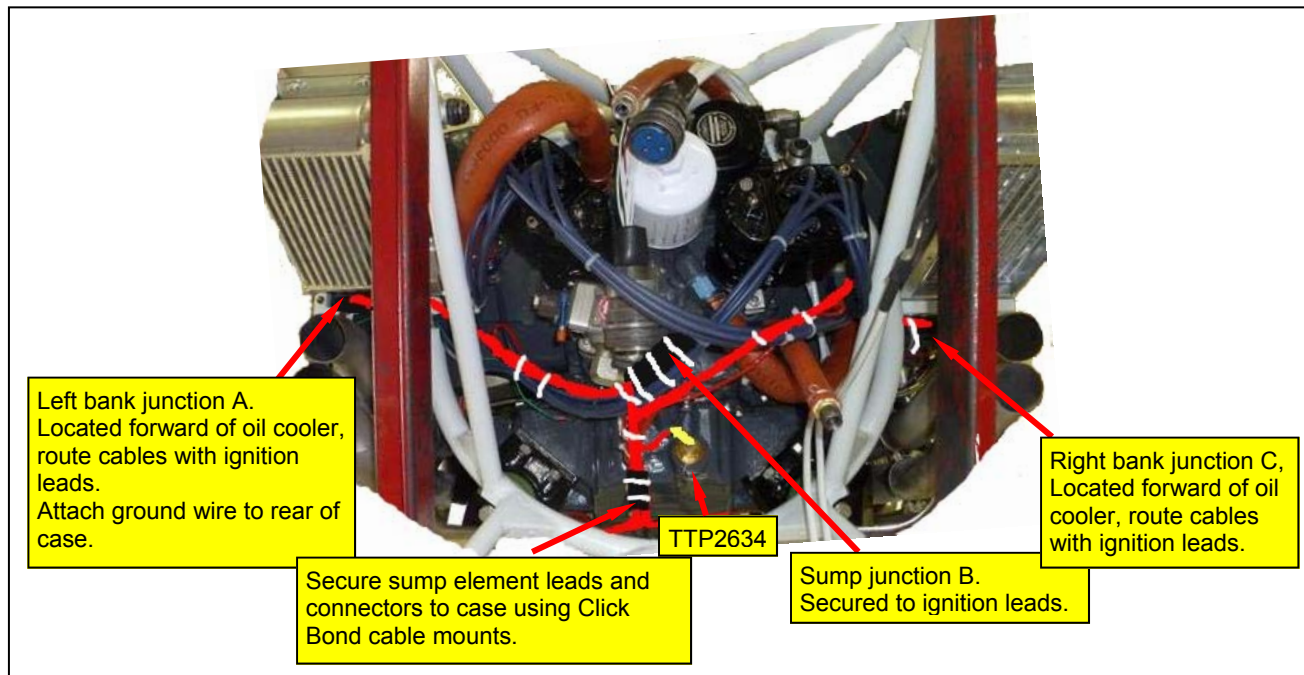


Figure 4-6 Harness routing

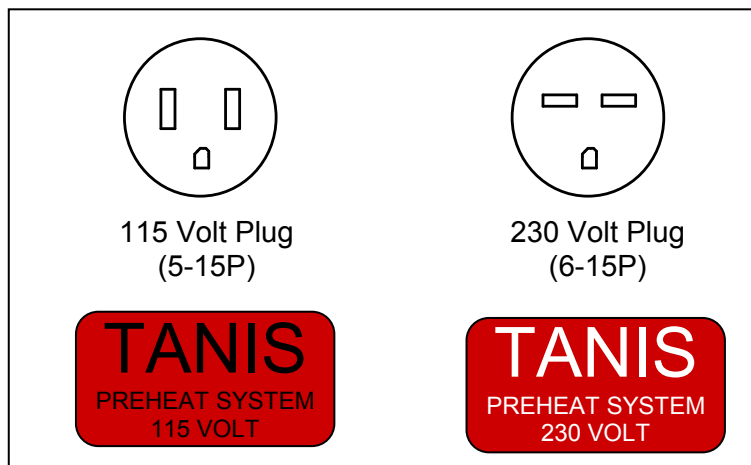


Figure 4-7 Shore power plug types and placards.

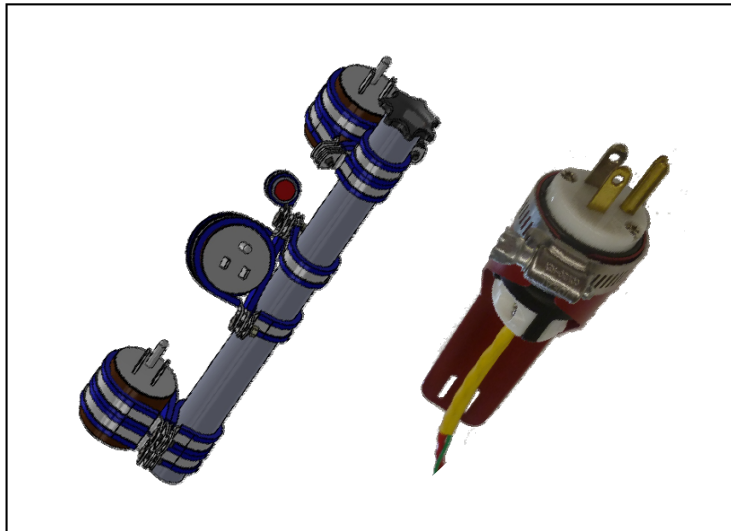


Figure 4-8 Mounting options for circular shore power plug and indicator light using cushioned clamps or Tanis circular bracket (TU01062).

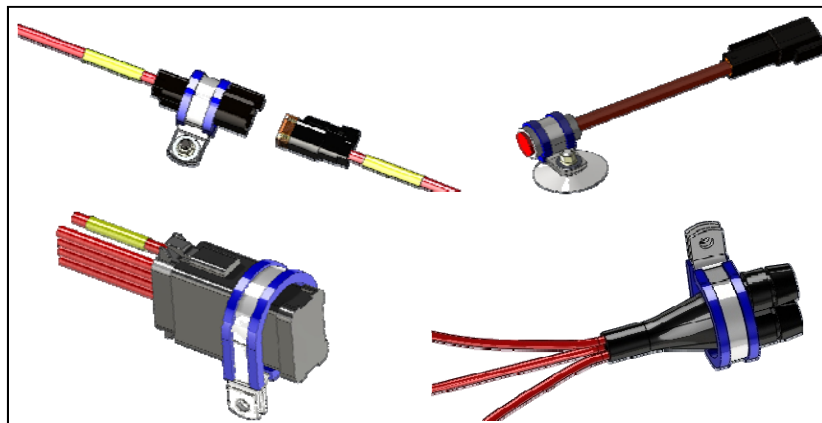


Figure 4-9 Mounting options for connectors, junction, fused link, and optional indicator light.



Figure 4-10 Optional shore power plug configurations using flush mount plug, engine baffle, and access panel with Tanis door kit.

5. Completion Check List



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

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

[√] Check the system as follows:

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

6. 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: _____

System test performed by: _____
(Signature)

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

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