



## **INSTRUCTION – PREHEAT INSTALLATION**

**Document No.: TNP2579 REV. F**

**Dated: OCT-31-2018**

**TSP4CYL-2579 Series Engine Preheat Kits**



**4 - CYLINDER  
912 / 914 SERIES ENGINES**

### **PROPRIETARY DATA**

Tanis Aircraft Products proprietary rights are included in the information disclosed herein. The recipient by accepting this document agrees that neither this document nor the information disclosed herein nor any part thereof shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by Tanis Aircraft Products - 952-224-4425.

## RECORD OF REVISIONS

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

REV	DATE	DESCRIPTION	BY	RELEASE
F	OCT-31-2018	Add info on TU02846 straps	GDO	Dirk N. Ellis <small>Copyright © 2018 Tanis Aircraft Products, Inc.  016-000-0000-0000  on@tanisaircraft.com  www.tanisaircraft.com  tanis@tanisaircraft.com  1400  1016-000-0000-0000</small>
E	JUN-29-2016	Add Table 4, standardize 2639 threaded elements (3112), and add metric references	GDO	DNE
D	APR-09-2015	Update install options for 2639 elements.	GDO	DNE
C	OCT-10-2014	6mm element tap procedure.	DNE	DNE

## CONTENTS

<b>RECORD OF REVISIONS</b> .....	<b>2</b>
<b>CONTENTS</b> .....	<b>2</b>
<b>1. PURPOSE</b> .....	<b>3</b>
<b>2. REQUIREMENTS</b> .....	<b>3</b>
2.1 Materials .....	3
2.2 Tools .....	4
2.3 Power.....	4
<b>3. DESCRIPTION</b> .....	<b>4</b>
3.1 Physical Attributes .....	4
3.2 Technical Specifications .....	4
3.3 Weight and Balance .....	4
3.4 Operation .....	5
3.5 Maintenance .....	5
3.6 Options.....	5
<b>4. INSTALLATION</b> .....	<b>5</b>
4.1 Overview .....	5
4.2 Standards.....	6
4.3 Elements .....	7
4.4 Cable Routing .....	8
<b>5. TABLES AND FIGURES</b> .....	<b>9</b>
<b>6. FUNCTIONAL SYSTEM CHECK</b> .....	<b>18</b>
<b>7. SIGN OFF</b> .....	<b>19</b>

## 1. PURPOSE

The purpose of this instruction is to provide guidance for the installation of the preheat kit listed on the cover page of this document. It is the responsibility of the technician and/or maintenance/repair facility performing the installation to review all document associated with the installation 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. Letters before and after the 4 digit drawing number are modifiers used for article configuration and maybe omitted in narratives. Example: TEP2653-115/40 = Tanis **E**lement with a **P**in connector (2653) 115-volts / 40-watts.

## 2. REQUIREMENTS

### Required documents, and referenced figures and tables located in § 5.

Retrofitting with the Tanis Engine Preheat Kit is to be accomplished by appropriately qualified technician or maintenance/repair facility.

- Installation requires clear access to the engine.
- Retain documents and make record as indicated in Operating Guide and ICA.
- 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 due to a wide range of variables.
- Element sealant cure time (approximately 8 hours)
- Installation is to be in accordance with (IAW) current regulatory requirements, airframe/engine manufacturer's procedures, and 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
- Power inlet (aircraft) - for global standardization and safety of operations - shore power plug - is a non-locking blade type NEMA connector (Figure 2) that is required to be securely located.
- Power outlet (shore power/GPU) - corresponding plug receptacle (supplied for field installation with 230-volt kits) - is required on extension cord. Approved outlets - TP02872-115, TP02829-230, reference instruction TN02829

### 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).
- 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.
- 1/4 inch drive torque wrench certified to traceable standards.
- TU03032 11mm Slotted Socket or equivalent.
- M6x1.00 Standard Hand Tap.

Suggested tools for wire repairs include:

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

## 2.3 Power

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

- 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 listed § 5, Table 3

## 3. DESCRIPTION

Preheat is a cold weather aviation procedure that increases reliability and safety of operations.

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

### 3.1 Physical Attributes

Preheat is applied through electrical resistance heat elements located on engine crankcase, oil tank, and in each cylinder assembly.

Power is routed to elements through dedicated wiring assembly with circuit overload protection.

### 3.2 Technical Specifications


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

### 3.3 Weight and Balance

Kit and all installation hardware are to be weighted before installing.

- Approximate installed weight: 1.0 pounds (lbs) / 0.45 Kilograms (Kg)
- Use engine arm for C.G. calculations
- Record installed weight and arm calculation in § 5 Table 4.
- New empty weight and corresponding C.G. location is to be calculated and entered in the aircraft permanent records

### 3.4 Operation

 **Caution:** Before connecting system to power complete Functional System Check in § 6 and review Operating Guide.

### 3.5 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.

### 3.6 Options

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

- Additional cabling, components and interconnect kits available
- Circuit protection: Fuse kit TU03141 w/2 HTB-42I holders and fuses. Breaker: MS26574-10, MS3320-10, or Klixon 2TC49-10 for 115V, and W23-X1A1G-10 for 230V
- Sealed power switch: MS35059-22 (8822K20)
- Firewall Connector Kit: TU03030 and TU03125 (non-pressurized firewall and bulkheads)
- Fireproof Grommet Kit: TG01056 (non-pressurized firewall and bulkheads)
- Disconnect connector kits: TU02968, TU03047, or TU03127 (5015/38999 crimp type disconnect)
- AV/Cabin Heater THP3094-500, allows for proper glass panel activation, reduces condensation, cold weather induced gyroscopic errors, and helps to clear windows of frost, snow and ice
- Battery Heat (TSB2800) reduces freeze point depression and allows for higher amperage outputs and proper charge
- Contact Tanis Aircraft Products for additional options

## 4. INSTALLATION

Referenced documents, documents, tables and figures, located in § 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 listed in Table 1.
- (2) Weigh kit contents and intended installation hardware.
- (3) Identify installation sites for elements, shore power plug, and cable routing.
- (4) Install components per instructions.
- (5) Record and retain documents as indicated in Operating Guide and ICA.
- (6) Complete, Functional System Check and Sign Off (§§ 6 and 7).

## 4.2 Standards

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

Listing below may supplement above procedures:

- (1) Wires and cables are to be supported by suitable cable ties, clamps, grommets, or other devices at intervals of not more than 6 inches apart except when contained in ducts or conduits.
- (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 capable of supporting wires and cables securely without damage to 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, shorten, or lengthen, wires/cables by cutting and re-terminating with appropriate contacts, splice or connector.
- (9) Check for proper installation of engine to airframe ground strap bonding.
- (10) When penetrating composites follow approved airframe manufacturer procedures and reference AC 43.13-1B Chapter 3 as needed. When riveting use appropriate size blind rivets (Blind Cherry MS, CR and NAS series aluminum or Monel as appropriate, assemble wet and seal A/R with PS 870 or equivalent (MIL-PRF-81733).
- (11) When working with sheet metal, reference AC 43.13-1B Chapter 4, Section 4. Use appropriate rivets per installation. For structural installations, rivet layout is to be patterned after a small patch, similar to Figure 4.16 of AC 43.13-1B. Assemble wet and seal A/R with PS 870 (PR 1422B-2).

### 4.3 Elements



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

1. Threaded elements - Locate and install with reference to instruction TN02905 and applicable Aircraft Maintenance Manual.
  - a) **Note:** Clear threads in installation site with a standard M6x1.00 hand tap before installing any fastener element - required whether fastener/bolt was removed or not.
  - b) Verify element resistance before installing (Table 3).
  - c) Torque using Tanis 1/4 drive TU03032, 11mm slotted socket or equivalent.
  - d) **Do Not** exceed maximum torque limitations of 115 lbs / 13-Nm
  - e) When located fastener elements are to be in full contact through element head bearing surface and threads. Elements are not to bottom out or overextend with more than 2-3 threads exposed at tip.
  - f) Use only flat steel or aluminum washers and/or spacer as required.
2. Pad element - Locate with reference to instruction TN02788.
  - a) Pad elements must be in full contact through bonding sealant.
  - b) Only install using approved sealants. Refer to Bonding Instructions.
  - c) When installing consider oil drip points, lead orientation, and cable routing.
  - d) Hold pad in place during cure with included TU02864 straps (Figure 10) or other suitable method. Remove straps after cure is completed and seal edge. Refer to Bonding Instructions.

Qty    P/N    Heater description and general location (reference § 5. for examples)

- |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | TTP2639- | Threaded elements – Locate using spacer and/or washers as required (Figures 5 through 9)<br><br>Locate 4 - one per cylinder, in baffle pad/ear torque 30 lbs / 3.4 Nm or per Rotax maintenance manual.<br><br>Alternate location: Replace cylinder head coolant flange bolt torque to factory specification.<br><br>Locate 1 – in back side of PRGB just above top of engine crankcase torque 30 lbs / 3.4 Nm or per Rotax maintenance manual.<br><br>Alternate location: Replace lower crankcase bolt aft of oil pump. |
| 1 | TEP2688- | Pad element - Locate on remote engine oil tank below nominal oil level (Figure 10).                                                                                                                                                                                                                                                                                                                                                                                                                                     |

Options:

- |             |                               |
|-------------|-------------------------------|
| THP3094-500 | AV/Cabin heater (Figure 15).  |
| TSB2800     | Battery Heat Kit (Figure 16). |

#### 4.4 Cable Routing

Referenced documents, figures, and tables are located in § 5.

Routing is suggested - variations in aircraft and engine configuration may require deviation

- Locate junction on engine in location that allows leads to reach corresponding components.
  - Review cable kit wire diagram 2578 and additional component instruction listed in Table 1.
  - Note: Avoid transitioning from engine to airframe. Power lead 01 may transition from engine when routing option allows for movement of shock mounts and shore plug is located off engine.
1. Shore power plug:  
Locate in area accessible through oil or coolant access door, cowl opening, on or near an engine mount. The plug is not to be allowed to free-hang. It must be securely located in a bracket or with cushioned clamps, optional configurations available (Figures 1 through 3).
  2. Spare Lead:  
Cabling as spare lead off fused link for optional power indicator light or accessory, cap when not used (DT04-2P-C017).
  3. \*Optional indicator light:  
When used, locate in viewable location with or near plug 3) or secure in place with cushioned clamp, cable ties or other acceptable means.
  4. Placard: locate adjacent to the shore power plug. Affix standard Tanis placard (Figure 2), or a placard that states at a minimum, *Tanis* and the system voltage requirement (*115 Volt* or *230 Volt*).
  5. Junction and lead routing:  
Locate junction on engine in location that allows leads to reach corresponding elements adjusting lengths as required (Figures 1, 11, 12 and 13).
  6. Ground-wire:  
Bond ground wire on existing ground lug or on engine adjacent to plug (Figure 14).
  7. Complete Functional System Check and Sign Off, §§ 6 and 7.



## 5. TABLES AND FIGURES

**TABLE 1 - Supporting Installation Documents**

2579	Drawing - Preheat Kit Item List
2578	Drawing - Cable Kit Wire Diagram
TN02793	Instruction - Connector
TN02788	Instruction - Bonding
TN02829	Instruction - Receptacle (Supplied with 230-volt kits)
TN02905	Instruction - Threaded Element
TCA0001	Instructions for Continued Airworthiness (ICA)
TPG0001	Operating Guide

**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 - Electrical Values.**

Preheat system and individual element values +/- 10%.

<b>115 Volt kit</b>		<b>1.9 Amps</b>	<b>220 Watts</b>	<b>60.1 Ohms</b>
<b>Qty</b>	<b>Part Number and Location</b>	<b>Wattage</b>		<b>Ohms</b>
5	TTP2639-115/40, Engine	40		330.6
1	TEP2688-115/20, Oil tank	20		661.3

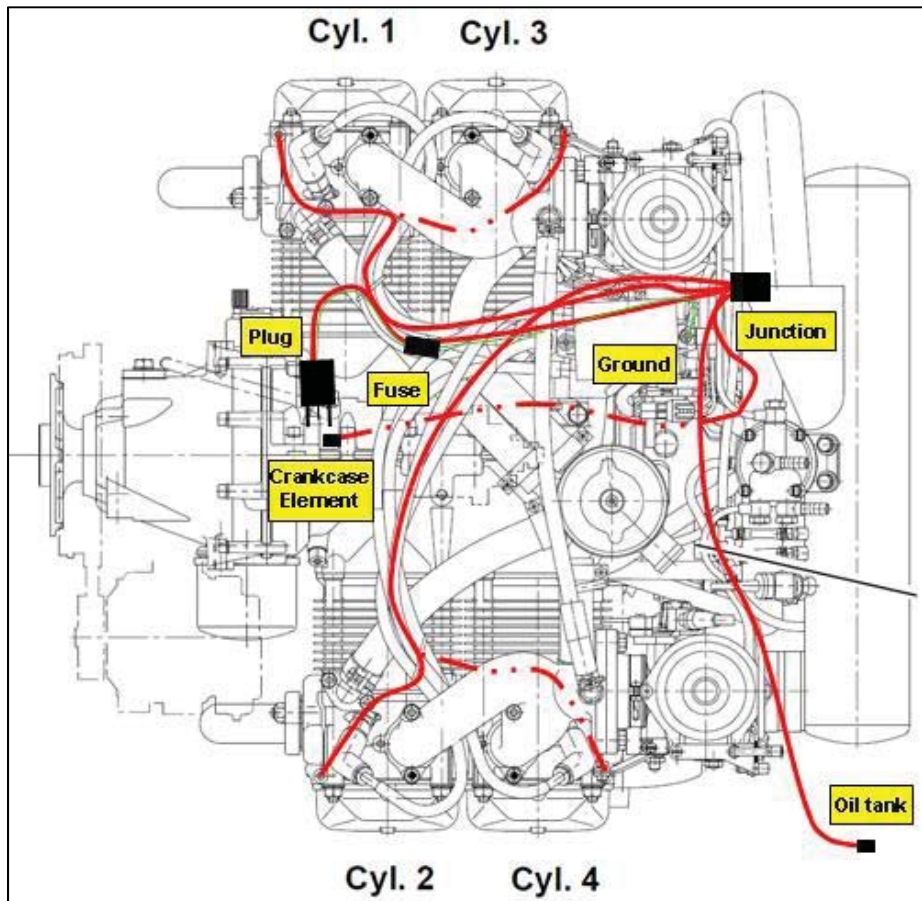
<b>230 Volt kit</b>		<b>1.0 Amp</b>	<b>220 Watts</b>	<b>240.5 Ohms</b>
<b>Qty</b>	<b>Part Number and Location</b>	<b>Wattage</b>		<b>Ohms</b>
5	TTP2639-230/40, Engine	40		1322.5
1	TEP2688-230/20, Oil tank	20		2645.0

**TABLE 4 - Weight and Balance**

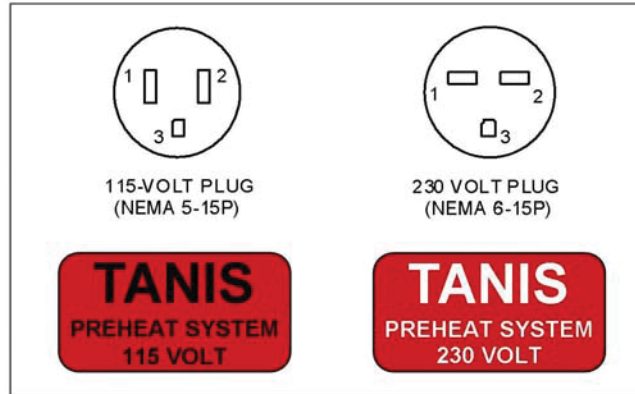
Record installed weight, arm, and moment calculations and update aircraft records accordingly (refer to § 6.).

For engine preheat system arm use engine arm. Optional AV/Heater and battery kits use arm location as installed.

	WEIGHT LB (KG)	ARM IN (CM)	MOMENT IN (CM)	MOMENT WT x ARM/100 IN (CM)
Engine Preheat System	+			
AV Heater (Option)	+			
Battery Kit (Option)	+			



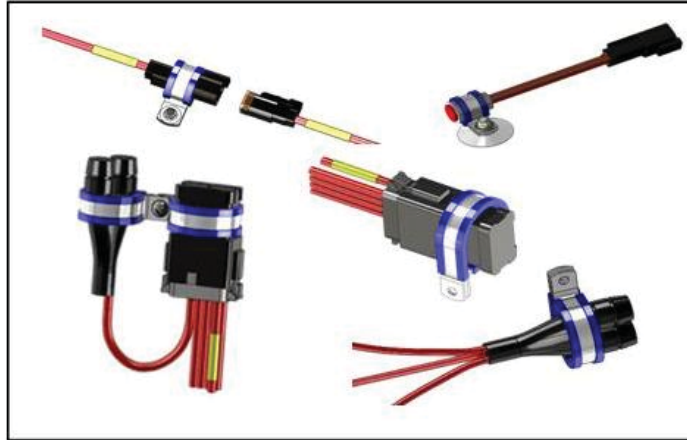
**Figure 1 - General preheat kit layout:** Installation varies by application. Route leads with existing wiring. Shore power plug - suggested location is in area accessible through oil or coolant filler door, or cowl opening.



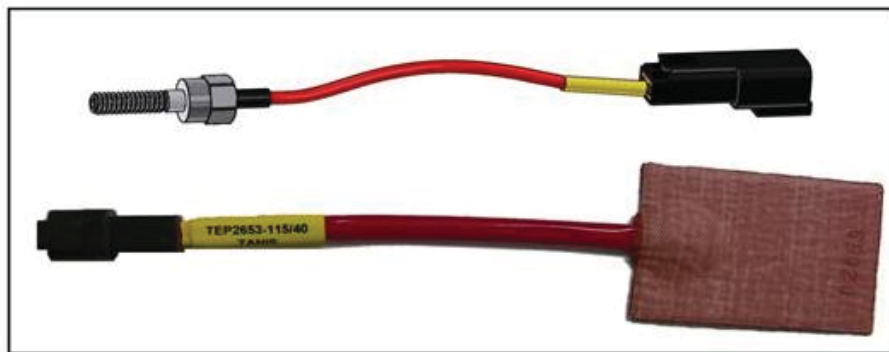
**Figure 2** - Plugs and placards. Locate placard near plug. Placard that states at a minimum, *Tanis* and the system voltage requirement (115 Volt or 230 Volt) is acceptable.



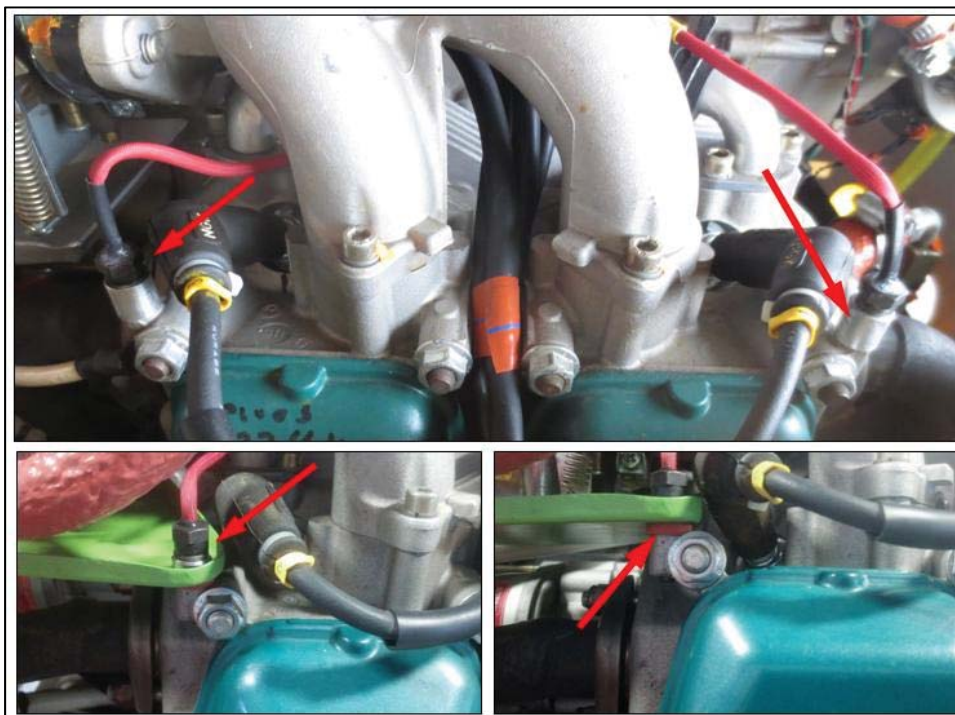
**Figure 3** - Examples for locating plug and optional indicator. Top two pictures depict shore plug supplied with kit secured with cushioned clamps and optional circular plug bracket, bottom pictures optional flush plug configurations.



**Figure 4** - Clamp positions, connectors, optional light, junctions, and fused link.



**Figure 5** - Element types: Threaded and pad heat elements.

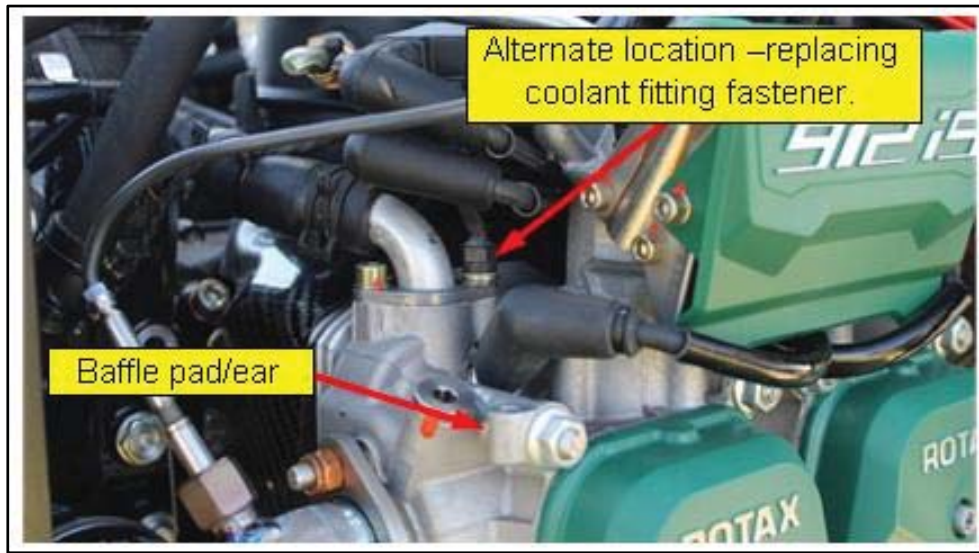


**Figure 6** - TTP2639- Locate in baffle pad/ear on carbureted and injected (iS) engines. Clear

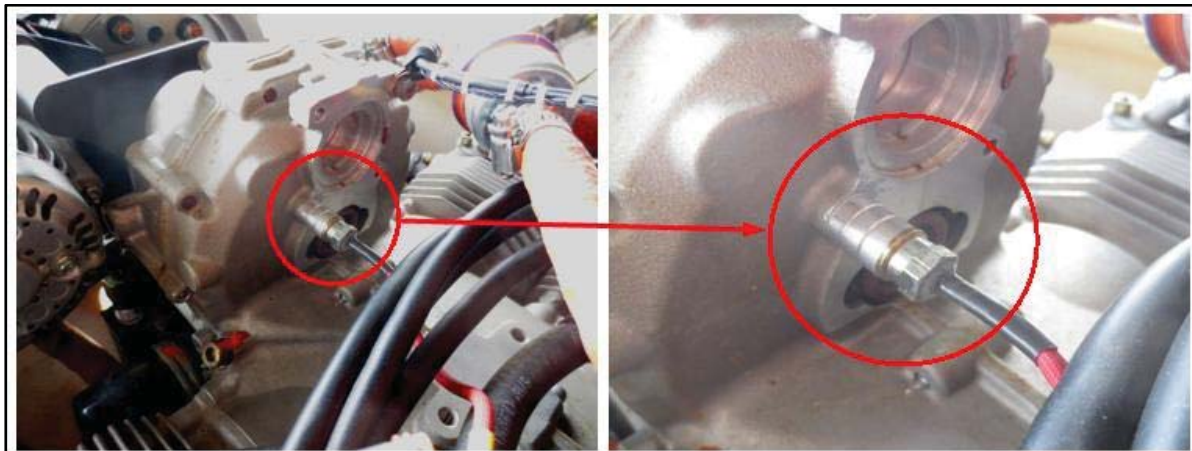


threads with hand tap, install element for maximum thread engagement - using spacers and/or flat washers as required - torque 30 lbs / 3.4 Nm. Note element bearing surface is to be in full contact with spacers and tip is not to extend from back side of baffle pad more than 2 or 3 threads.

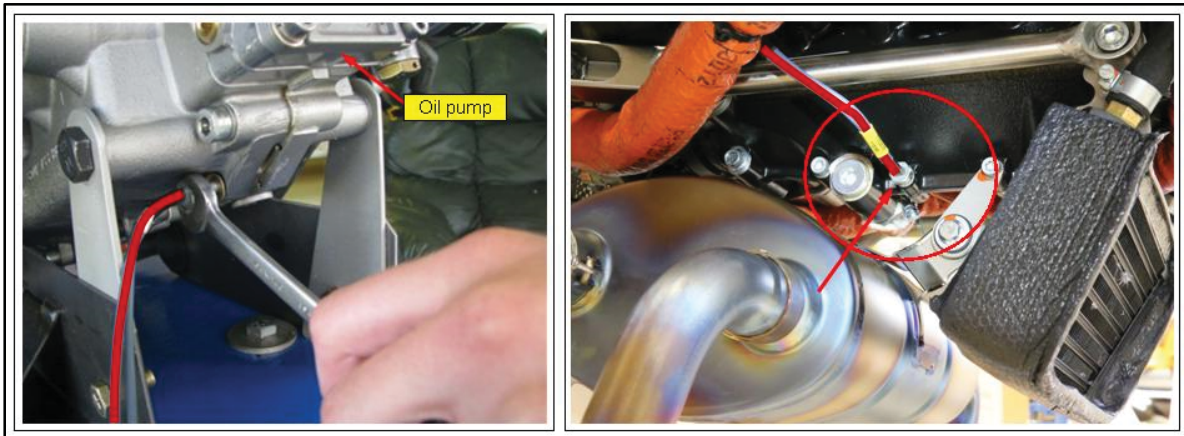
Lower images of engine with drip plate installed. Note Verify factory silicone spacers or equivalent are located between bracket and engine, with element spacers located on top of drip plate, torque to factory specification.



**Figure 7** - TTP2639- Alternate location - replace coolant fitting fastener - carbureted and injected (iS) engines. Remove fastener, clear threads with hand tap, install element for maximum thread engagement - use flat washers or spacer as required - torque to factory specification.



**Figure 8** - TTP2639- Locate one threaded element in one of two threaded holes (6-1.00mm) located in the back side of the PRGB just above top of engine crankcase. Clear threads with hand tap, install element for maximum thread engagement - use spacers as required - torque 30 lbs / 3.4 Nm.



**Figure 9** - TTP2639- Alternate location, replacing lower 6mm crankcase fastener. Remove fastener, clear threads with hand tap, locate element with one flat washer, torque to factory specification.

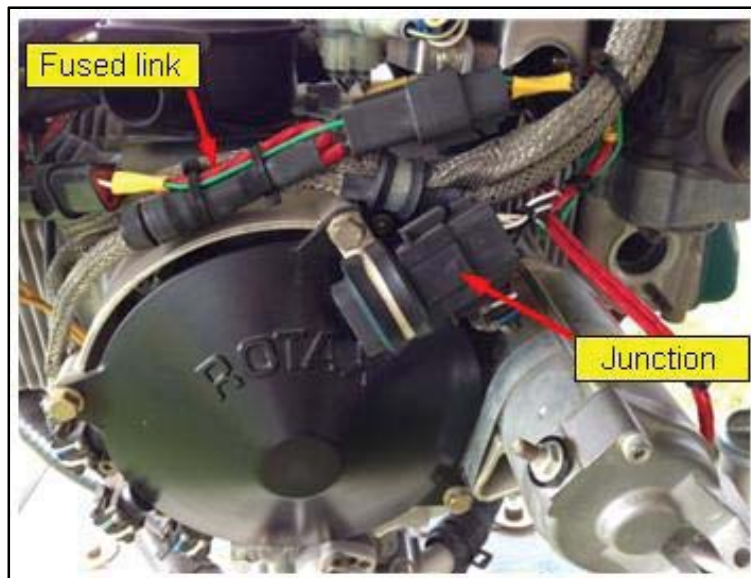


**Figure 10** - TEP2688- Pad Heat Element. Install below minimum/nominal operating level. Verify level by holding dipstick outside of tank at the same depth used to the check oil level (flat center portion is operating range, min to max). **Note:** Correct dipstick has straight top finger loop. Incorrect dipsticks are identified by oval finger loop at top and should be replaced.

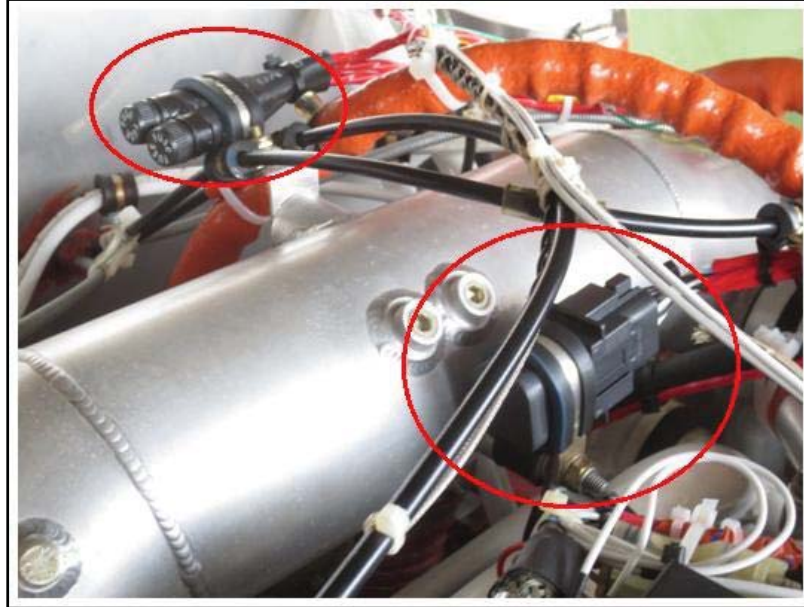




**Figure 11** - Routing option: Junction secured with cable ties on existing wiring.



**Figure 12** - Routing option: Junction located at back of engine secured with clamp and top ignition (stator) cover fastener. Area may be difficult to access.

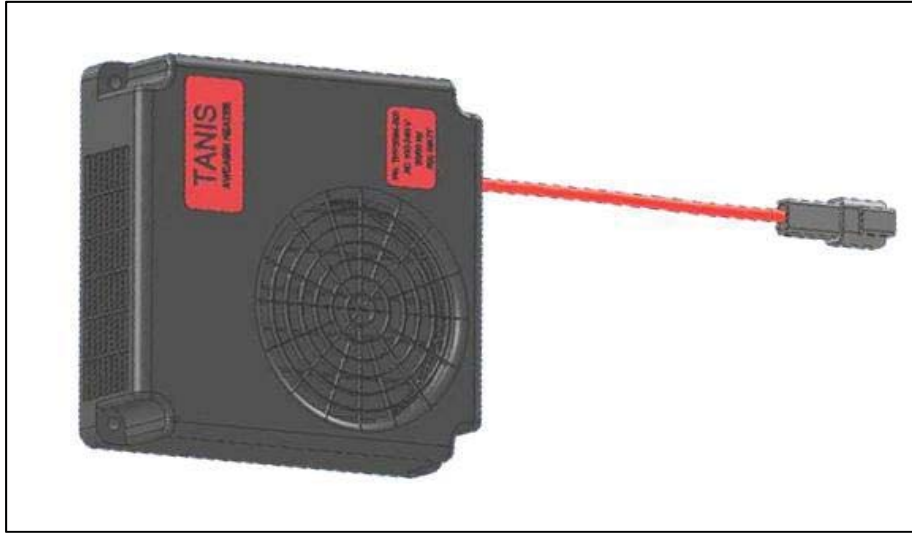


**Figure 13** - Routing option: Examples of locating options for fused link and cable junction using cushioned clamps.



**Figure 14** - Example of system ground location using existing ground lug on engine.





**Figure 15** - Option: AV/Cabin Heater THP3094-500.



**Figure 16** - Option: Battery Heat Kit (varies by application).

## 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, or test separately.

[  ] Check both power plugs as follows:

- 1) [  ] Verify installation is in accordance with kit installation instructions.
- 2) [  ] Verify any effected component fluid levels are at operational levels.
- 3) [  ] Verify visually and with ohm meter that airframe, engine, bonding (ground straps) are in place per OEM requirements.
- 4) [  ] Verify system ground by checking for continuity between shore power plug ground pin 3 (Figure 2), airframe and engine.
- 5) [  ] Verify there is no continuity between ground pin 3 and blades 1 or 2.
- 6) [  ] Using an ohmmeter measure resistance between blades 1 and 2 and record resistance: \_\_\_\_\_.
- 7) [  ] \* Freeze (0°C) battery thermal control and repeat step 6, record: \_\_\_\_\_.
- 8) [  ] Compare resistance figures recorded in steps 6 and 7 with values in Table 3.p
- 9) [  ] Review Operating Guide TPG0001 and connect power.
- 10) [  ] Verify power indicator light on (illuminated).
- 11) [  ] Within 30-minutes, area adjacent to the elements will start to feel warm. Check each element individually.
- 12) [  ] \* While system is warming up, freeze (0°C) battery thermal control, test battery heat element for heat. Element can be touched, as wattage density is low.
- 13) [  ] \* Verify AV heater operation by checking for audible fan and warm air circulation.
- 14) [  ] When testing is completed, disconnect (unplug) from power, latch any access doors that were open, and stow extension cord(s) in appropriate location.
- 15) [  ] Complete/fill-in blanks as indicated on first and last pages of Operating Guide listed in Table 1, and file with POH/FM.
- 16) [  ] Complete/fill-in blanks as indicated in Instructions for Continued Airworthiness (ICA) listed in Table 1, and file with aircraft manuals and logs.
- 17) [  ] Update aircraft Weight and Balance (recorded in Table 4) and Equipment List (§ 3.3).
- 18) [  ] Make a log entry to comply with 14 CFR Part 43.9 or other procedures set in place by the operator.
- 19) [  ] Complete and return Registration/Warranty Card.
- 20) [  ] Complete Sign Off in § 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)

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