AIRCRAFT PRODUCTS
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TNP3002
REV A, FEB-28-2013

INSTRUCTION - PREHEAT INSTALLATION

FOR
PREHEAT KITS
TSP7CYL-3002-115
AND
TSP7CYL-3002-230
(115VAC AND 230VAC SYSTEMS)

ON

JACOBS AIRCRAFT ENGINE COMPANY
R-755
7 CYLINDER SERIES ENGINE
(L-4/5/6)

Record of Revisions

When updated, this document is changed in its entirety.

REV	DATE	DESCRIPTION	BY	APPROVAL
A	FEB-28-2013	Initial Release	DNE	Dirk Ellis Digitally signed by Dirk Ellis DN: CN = Dirk Ellis, C = US, O = Tanis Aircraft Products Date: 2013.03.04 06:41:45 -06'00'

Contents

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 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 all wiring to be in accordance with AC43.13 1b Section 10 through 12. Grounding and bonding to the airframe is to be in accordance with 43.13 1b Section 15.

The installation requires access to the engine, oil tank, and/or accessories. 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.

Depending on the voltage of the kit being installed, the Engine Preheat Kit top level drawing (03002-115 or 03002-230), lists parts and documents supplied. These supporting documents are also listed in Table 2-0 below.

TABLE 2-0 Supporting Installation Documents

02890, Drawing - Cable kit
03002, Preheat kit - item list
TN02788, Instruction - Element bonding
TN02793, Instruction - Connector
TN02905, Instruction - Threaded element

2.1. Supplied by Installer

Tools, consumables, finish materials, installation hardware, brackets, lacing, various MS21919 cushion cable clamps (MS21919WCE -2, -3, -4, -6, -10, -18, 19, etc.), are to be supplied by the installer. Table 2-1 list commonly sized clamps and their application.
Power supply and shore power connection (extension cord) are supplied by the operator.

Review the documents listed in Table 2-0 for additional required materials and parts.

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

Size	MS number	Application
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. System Description

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

Preheating is accomplished using electrical resistance heat in the form of threaded component heaters, installed in cylinder assemblies, and pad elements mounted on the engine case, sump, and oil tank. The heated components and their attached accessories reach an average state of thermal equilibrium in six hours. Power is routed to the heating elements through a dedicated shore power plug, circuit protection, and wiring assembly.

3.2. Power Requirements

Kits are available in two separate AC voltage configurations; 115 volt or 230 volt. The voltage requirement is identified by part number, power plug, and placard. Design is for operation at +/- 10% of the system the voltage requirement.

3.3. Operation and Options

Operation is controlled by plugging the system into an appropriate AC power.

The system is only to be operated with the installation completed, and effected aircraft system component fluids at operational levels. Design is for continual operation in all weather and temperature conditions while in stand-by status. For the system 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 kit, the use of insulated cowl plugs and covers is suggested.

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

For detailed operating instructions of the preheat kit, refer to the Tanis Aircraft pilot guide/flight manual supplement (FMS).

Options: The addition of Tanis avionics and battery heaters are also suggested. 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.

3.4 Inspection and Cleaning

Processes are in accordance with Tanis instruction for continued airworthiness (ICA) and aircraft manufacturer's recommendations. 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.

3.5 Weight and Balance

Record the modification by updating the aircrafts equipment list and/or flight manual. In the aircrafts, basic Weight and Balance amendment record include an adjustment to the weight and center of gravity (CG) for the Tanis kit.

3.6 Electrical Values

System and individual element values are listed below (Table 3-1), and in Cable Kit drawing.

Table 3-1 System Values +/- 7%

115 Volt System	**750 Watts**	**6.5 Amps**	**16.3-18.9 Ohms**
Quantity	Element P/N:	Wattage	Ohms
7	TTP2845-115/50	50	264.5
1	TEP2649-115/120	120	110.2
2	TEP2650-115/120	120	110.2
1	TEP2653-115/40	40	330.6

230 Volt System	**750 Watts**	**3.3 Amps**	**65.5-75.5 Ohms**
Quantity	Element P/N:	Wattage	Ohms
7	TTP2845-230/50	50	1058.0
1	TEP2649-230/120	120	440.8
2	TEP2650-230/120	120	440.8
1	TEP2653-230/40	40	1322.5

4. Installation

The following is a general overview of the installation. Table 2-0 contains a list of required documents. Figures 4-1 through 4-14 depict component installations.

4.1. Installation Overview.

4.1.1. Review all kit contents and documents.
4.1.2. Weight the kit 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 and indicator light.
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 weight & balance records.
4.1.13. Complete paper work filing (ICA and FMS etc.).

4.2 Element Locations

Caution: Do not connect elements to power until properly installed.
Threaded elements, install and torque per OEM specifications for location of installation.

P/N	Element, location and details (Figures 4-1 thru 4-7)
TTP2845-	5/16-UNF threaded heat element, one each cylinder assemble replacing intake tube bolt or stud (Figures 4-1 and 4-2).
TEP2649-	Pad heat element, install on starter pad (Figure 4-4).
TEP2650-	Pad heat element, install two on oil tank below the nominal oil level as far apart as reasonable (Figure 4-5).
TEP2653-	Pad heat element, install on top of sump (Figure 4-3 and 4-6).
Optional	Battery heat element, mounts on battery circumference. (Figure 4-7).

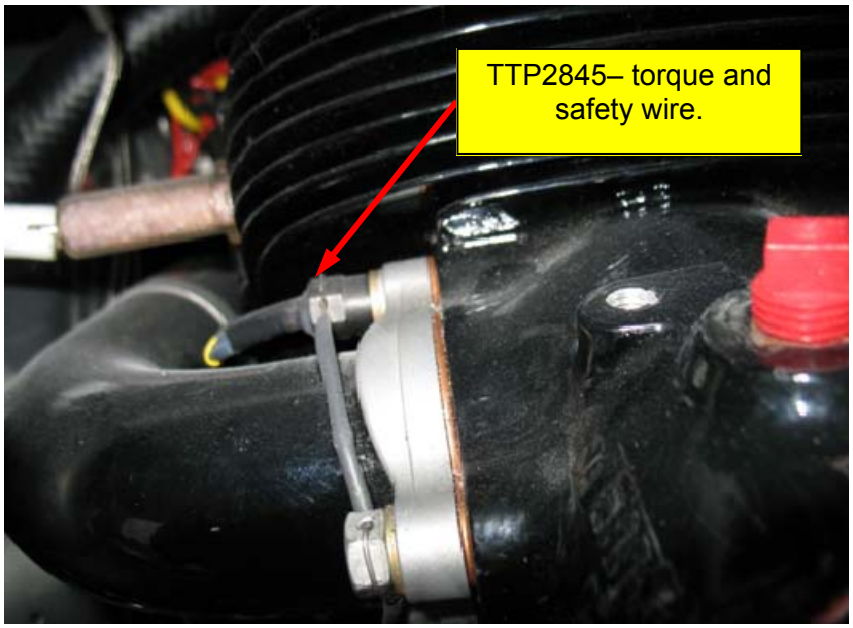

Figure 4-1 Each cylinder assembly, install one TTP2845- in place of intake bolt.

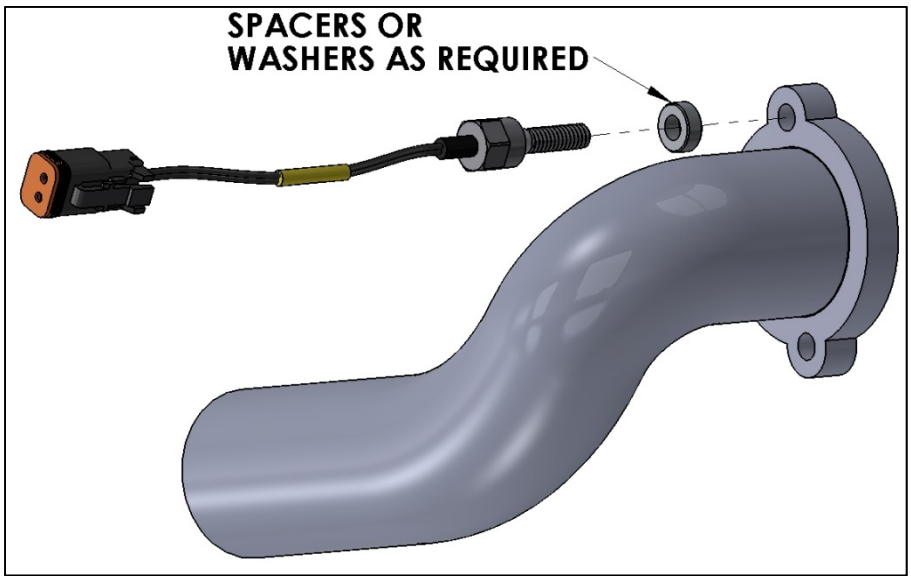

Figure 4-2 Generic threaded element installation replacing intake-tube flange bolt.

Figure 4.3 Example of element and part number label (TEP2653-115/40)

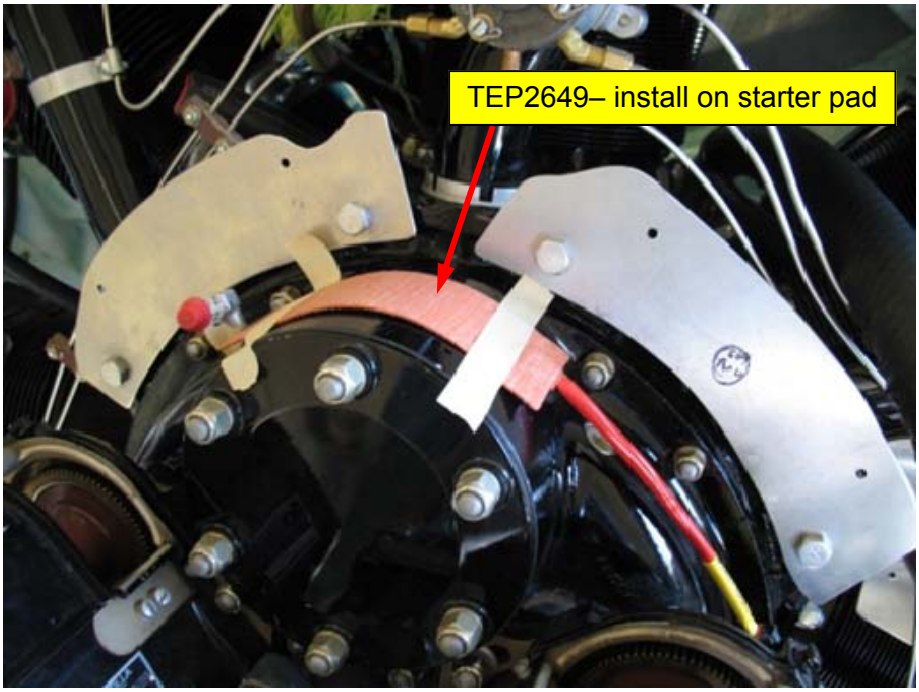

Figure 4-4 TES2649 located on starter pad.

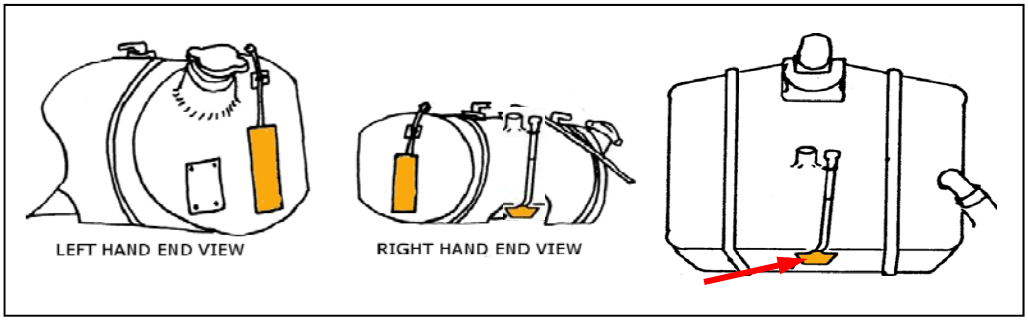

Figure 4-5 Examples of pad elements mounted on oil tank below nominal levels

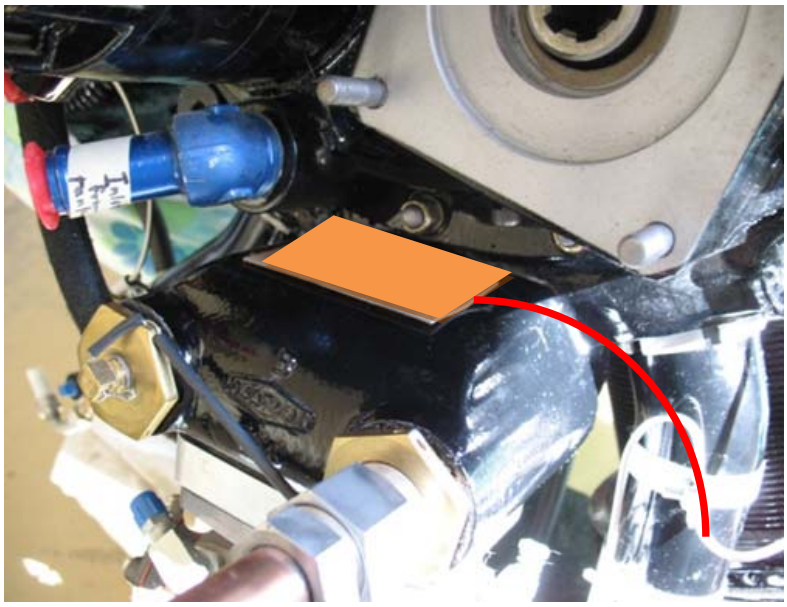

Figure 4-6 TEP2653- located on top of sump

Figure 4-7 Example of optional battery heat element installed.

4.3 Cabling

⚠ Caution: Do not allow junction or 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; pay particular attention to connectors and junction blocks. Apply fire sleeve to components located in questionable areas. Appropriately identify cables and connections, as required (AC43.13-1b Chapter 11). Check for proper engine to airframe ground bonding.

For cable routing options, it is acceptable to shorten cables by cutting and terminating with appropriate connector (Instruction TN02793), lengthen with additional cable or racetrack to compensate for routing options. Use existing firewall and barrier penetrations whenever possible. If routing requires a new penetration of a fire barrier use Tanis Fireproof Grommet (TG01056), MIL-C-38999, MIL-DTL-5015 series crimp type disconnect, or appropriately approved fitting conforming to 14 CFR Part 23-1191/AC20-135.

Before penetrating composites, reference airframe manufacturer's procedure for proper penetration and potting procedures.

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 (Table 2-1, Figures 4-8 through 4-15).

1. Lay out the cabling, reference the cable kit wire diagram.
2. Determine location and method for mounting of shoreline power plug, system grounding on engine, circuit protection, and indicator light (Figures 4-9, 4-11 and 4-12) and install.

Optional shore power kits are available separately (Figure 4-7).

3. Identify mounting location for the cable junctions (Figures 4-13 through 4-15) and install.
4. Using the wire diagram identify leads and route as follows:
   01 - From the power plug, route lead 01 to junction A.

Junction A leads:

   02 and 03 - Connect to elements mounted on the oil tank.
   04 - Connect to the engine junction B
   05 - Connect to element on engine sump.
   06 - Connect to element located on engine starter pad.

Junction B leads:

   07 through 10 - Connect to threaded elements as labeled.
   11 - Interconnect lead between junctions B and C.

Junction C leads:

   12 through 15 - Connect to threaded elements as labeled.
   16 - Route back to shore power plug and connect to indicator light (Figure 4-9 and 4-12)

5. Secure cabling and element leads to reduce wire fatigue at wire connector and element interface.

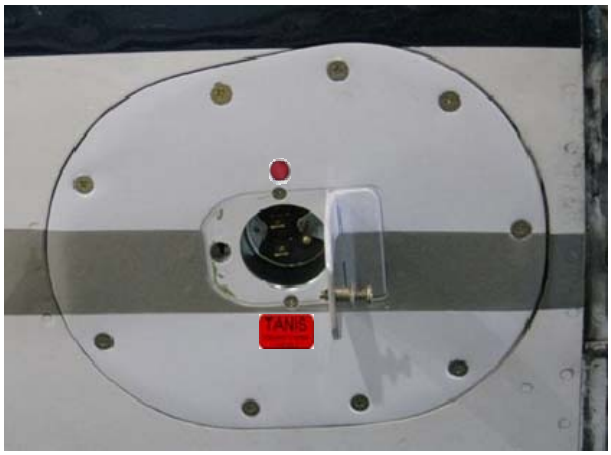

Figure 4-8 Option, power plug mounted in access panel (Tanis P/N: TD02837)

Figure 4-9 Shore power plug and indicator mounted on bracket in lower cowl opening

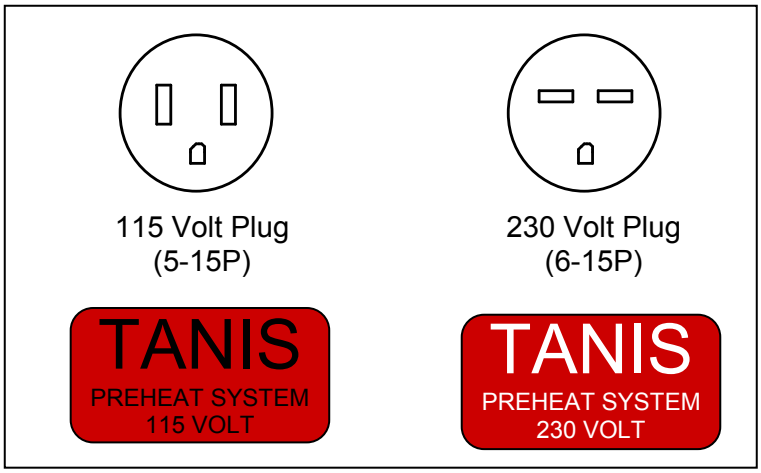

Figure 4-10 Shore power plug types and placards

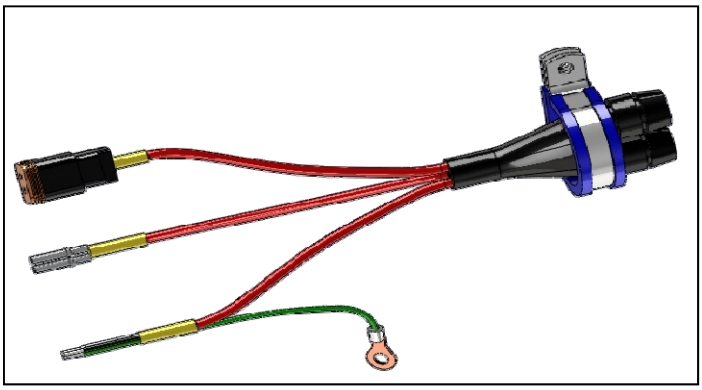

Figure 4-11 Example of fused link mounted with cushion clamp (Adel)

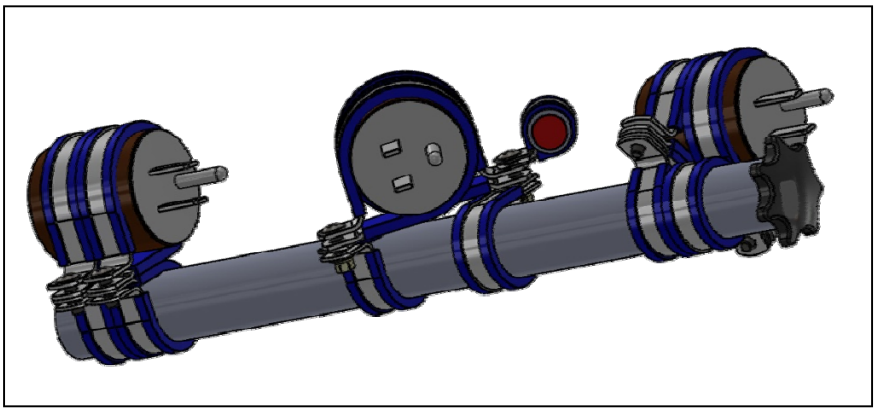

Figure 4-12 Examples of shore power plug and indicator light mounted using clamps.

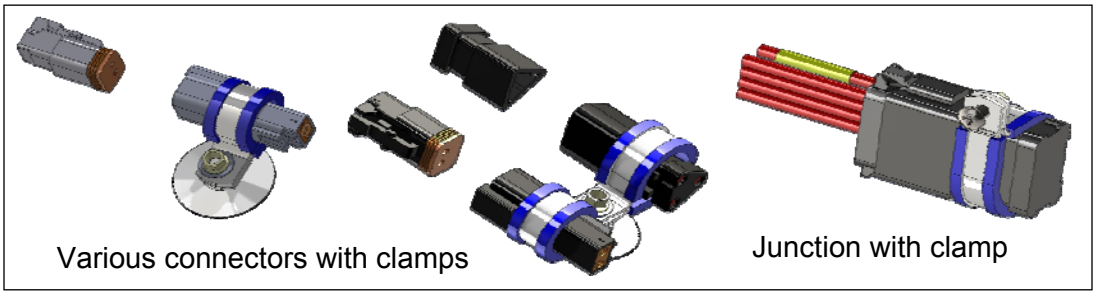

Figure 4-13 Connector and junction mounting

Figure 4-14 Suggested mounting location for junction using cushioned clamp

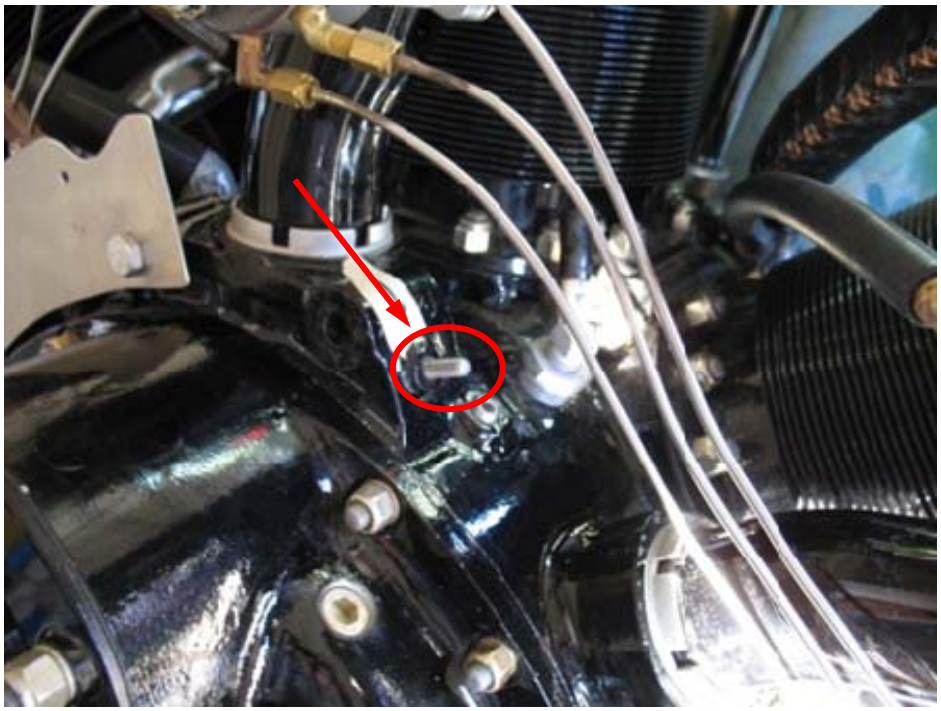

Figure 4-15 Second mounting location for junction using cushioned clamp

5. Completion Check List

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

Before proceeding verify 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.
Verify system components are installed in accordance with instruction these instructions.

[√] Check the system as follows:

1) [ ] Verify engine to airframe bonding is as per OEM requirements.
2) [ ] Verify Tanis system ground by checking for continuity between shore power plug ground pin, engine, and airframe.
3) [ ] Verify there is no continuity between shore power plug power pins and the ground.
4) [ ] Using an ohmmeter, measure resistance between the power pins and record.

   Total system: _____ resistance.
   Note: This is done for circuit verification and future reference if required.

5) [ ] Connect the system to appropriate power.
6) [ ] Verify the indicator light is illuminated. In about 30 minutes, the area next to the elements should feel warm. Check each element individually.
7) [ ] Update/modify weight and balance calculations and installed equipment lists (Section 3-5).
8) [ ] Appropriately file supplied Flight Manual Supplement (FMS), Instructions for Continued Airworthiness (ICA) and installation documents into existing aircraft manuals and logs.
9) [ ] Make a log entry to comply with 14 CFR Part 43.9 or other procedures set in place.
10) [ ] 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)

***** END *****