



INSTRUCTION – PREHEAT INSTALLATION

Document No.: TNP2925, REV. D

Dated: SEP-10-2014

FOR

**TSP4CYL-2925 SERIES
ENGINE PREHEAT KITS**

ON

**CONTINENTAL - LYCOMING
FOUR CYLINDER PISTON ENGINES**

PROPRIETARY DATA

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RECORD OF REVISIONS

When updated, this document is changed in its entirety.

REV	DATE	DESCRIPTION	BY	APPROVAL
D	SEP-10-2014	Update with 3039 8mm indicator	DNE	
C	MAR-06-2014	Replace AFMS with TPG0001 Operating Guide	DNE	DNE
B	JUN-12-2013	Add narrative to Figures 4-1 and 4-2	DNE	DNE
A	APR-26-2013	Initial Release	DNE	DNE

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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 read this instruction, become familiar with all processes, 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. The last numbers in a part number sequence (after the dash), represent the voltage requirement 115 or 230, and may be omitted in narrative. Example: TU02615- (115 or 230).*

All Referenced Tables and Figures are found in Section 5 - Tables and Figures.

2. REQUIREMENTS

Retrofitting of this aircraft with the Tanis preheat kit is to be accomplished by certified technician or maintenance/repair facility.

Installation is to be in accordance with (IAW) AC43.13-1b, industry standards, acceptable methods, techniques and practices, airframe/engine manufacturer's recommendations, and approved procedures set in place by the installing authority. Securing, tying, and clamping of wire/cable is to be IAW AC43.13-1b Chapter 11, Section 9 through 12. Grounding and bonding IAW AC43.13-1b Chapter 11, Section 15. Feed-through penetration IAW AC43.13-1b Chapter 11, Section 17.

For global standardization of power connection point (shore power plug), a non-locking blade type NEMA connector is used (Figure 1). A corresponding receptacle connector (supplied for field installation with 230-volt kits), is required on power supply (extension cord). Approved receptacles are available through Tanis (TP02872-115, TP02829-230).

Installation requires clear access to the engine. Work is to be performed in a clean environment under standard temperature conditions of 18°C / 65°F to 27°C / 80°F.

Installation time is in the range of 2-5 hours. Bonding sealant cure time is in the range of 8 hours, refer to Bonding Instructions for more information (Table 1).

Required supporting documents listed in Section 5, Table 1.

Record system information as indicated in Operating Guide and ICA.

2.1 Sourced Separately

Due to shelf life limitations, pad heat element bonding sealant is sourced at time of installation. Refer to element Bonding Instructions for approved sealant (Table 1).

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

Tools, consumables, finish materials, installation hardware, brackets, lacing, and various MS21919 cushion clamps are sourced separately. Cushion Clamp and their suggested application are listed in Table 2.

2.2 Tools

Required:

Ohmmeter and 1/4 inch drive torque wench certified to traceable standards, and
TU02905-05 1/2-inch Slotted Socket, or equivalent.

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

3. DESCRIPTION

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

Preheat is applied through electrical resistance heat elements located on engine crankcase oil sump and in each cylinder assembly. Power is routed to elements through dedicated wiring assembly with circuit overload protection. System is self-regulating. Heated components reach an average state of thermal equilibrium in approximately six hours.

3.1 Power Requirements

System does not operate in flight and is not connected to or dependent on aircraft systems.

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 Section 5, Table 3.

3.2 Operation



Caution: Only operate the system after completing Completion Check List in Section 6, and verifying fluids are at operating levels.

Connection to ground power controls operation, reference Operating Guide (Table 1), for connection procedures and extension cord requirements.

3.3 Options

Specific operational requirements may require modifications or additional elements.

In addition, avionics and battery preheat is suggested. Heating of avionics allows for proper glass panel activation, reducing condensation build up and cold weather induced gyroscopic errors. Battery heating reduces freeze point depression, allowing higher amperage outputs and proper charge.

Modification and/or additional kits are available for installation with base kit.

Total operational load not to exceed 12-Amps.

3.4 Inspection and Cleaning

Instructions for Continued Airworthiness (Table 1), lists inspection and cleaning procedures. All processes are in accordance (IAW) with 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.

3.5 Weight and Balance

Record modification by updating equipment list and/or flight manual. If required include adjustment to weight and balance. Approximate installed weight is 1.0 pounds (lb). Use engine CG for moment arm.

3.6 Electrical Values

Preheat system and individual element values listed in Table 3.

4. INSTALLATION



Caution: For personal safety and system integrity, only operate the system after completing Completion Check List in Section 6, and verifying fluids are at operating levels.

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.

Note: Record information as indicated in Operating Guide and ICA.

Section 5 contains referenced documents, figures, and installations by engine make.

4.1 Overview

- a. Review all instructions and documents included with this kit.
- b. Weigh kit contents and intended installation hardware.
- c. Access engine and identify installation sites for elements, junction, shore power plug, fused link, indicator, and cable routing.
- d. Install components per instructions.
- e. Complete Check List, Section 6, and Sign Off, Section 7.

4.2 Standards

Installation is to follow 43.13-1b acceptable methods, techniques and practices, industry standards, and airframe/engine manufacturer's procedures.

- a. 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.
- b. 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.
- c. Supporting devices should be of a size and type, with the wires and cables held securely in place without damage to the insulation.
- d. Adequately support and secure wire and connectors to prevent excessive movement in areas of high vibration.
- e. Route, wiring and cabling with enough slack to compensate for movement of shock mounts.
- f. 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.

- g. 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.
- h. Check for proper installation of engine to airframe ground strap bonding.
- i. 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 extension cable.
- j. Use existing feed-through and fire barrier penetrations whenever possible. Feed-through penetrations are to be IAW with 43.13-1b Chapter 11, section 17. If routing requires a new fire barrier penetration use Tanis Fireproof Grommet TG01056, Firewall connector kit TU03030, or approved fitting.

4.3 Elements



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

Verify element resistance before installing (Table 3).

Fastener elements. Install one per cylinder assembly reference Figures, Section 5. Only install using Tanis 1/4 drive - 1/2 inch slotted socket TU02905-05 or equivalent. Refer to Tanis Instruction - Threaded Element and applicable Aircraft Maintenance Manual, for proper torque values for location of installation.

TTP2771- Fastener (Standard) element (1/4-20 50-watt). Install as intake or rocker cover fastener replacement. Install using 1/2 inch slotted socket. Torque is not exceed 110-inch pounds. Install for maximum thread engagement, not to bottom out or expose more than 2-3 threads. When required, use only flat steel or aluminum washers and/or spacers. Do not use stainless steel washers or lock washers of any type.

Intake fastener replacement: Note: On Lycoming engines Do Not use washers or spacers. Install with slotted socket and torque to manufacturer's specification.

Rocker cover fastener replacement: Install in a location with the greatest area of mass and maximum thread engagement.

Pad heat element. Only install using approved bonding sealant. Location should be relatively flat and clear of oil drip points. For approved sealant and installation procedures refer to Instructions - Bonding, listed in Table 1.

TEP2653- Pad element (2" x 3" 40-watt). Install on bottom or side of engine oil sump/tank, below nominal oil level.

Options

Due to operational demands and/or procedures, alternate element configuration may be desirable. Contact Tanis engineering for recommendations and approvals.

Avionics and Battery Preheat - Reference section 3.3.

4.4 Suggested Cable/Wire Routing

Review: 4.2 Standards, Tables and Figures in Section 5, and Cable Kit - Wire Diagram.

- a. Shore power plug. Power connection point. Plug is field terminated. Install with cushioned clamps or bracket in accessible location on engine, oil filler-tube, or engine mount. Optional shore power plugs configurations available. **Do not** allow plug to free-hang. Install power indicator light near plug as depicted, with clamp, and/or cable ties (Figures 2 and 3). 230 Volt kits supplied with plug receptacle adapter (TP02829-230), field installed on extension cord supplied by operator.
- b. Ground. Connect to engine/airframe. Inspect engine to airframe ground strap/bonding for proper installation.
- c. Cable kit. Route wiring/cabling between elements, junction and shore power plug. Adjust cable lengths as required by cutting and re-terminating or race-tracking. Avoid transitioning from engine to airframe. Power lead 01, may transition from engine when routing option allows for movement of shock mounts. Cabling has five leads for elements. Lead off the circuit protection is for power indicator light or accessory, cap if not used (DT04-2P-C017).

Suggested junction locations:

- a) On ignition leads near magnetos, with cable ties, cabling routed with ignition leads.
- b) On engine baffle with clamp, cabling routed with ignition leads.
- c) Below baffling mounted on engine with clamp and sump fasteners.
- d. Placard. Affix adjacent to shore power plug. Use supplied Tanis placard, or placard that states, at a minimum, *Tanis*, and the system voltage requirement, *115 Volt* or *230 Volt*.
- e. Perform functional test by completing checklist in Section 6, and sign off in Section 7.

5. TABLES AND FIGURES

TABLE 1 - Supporting Installation Documents

02925	Preheat Kit - Item List
02859	Cable Kit - Wire Diagram
TICA2925	Instructions for Continued Airworthiness - ICA
TN03039	Instruction - Indicator Light
TN02771	Instruction - Threaded Element
TN02788	Instruction - Bonding
TN02829	Instruction - Receptacle (Supplied with 230-volt kits)
TPG0001	Operating Guide - Preheat System

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

(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%.

115 Volt kit	2.1 Amps	240 Watts	55.1 Ohms
Element P/N:		Wattage	Ohms
TTP2771-115/50		50	264.5
TEP2653-115/40		40	330.6

230 Volt kit	1.0 Amp	240 Watts	220.4 Ohms
Element P/N:		Wattage	Ohms
TTP2771-230/50		50	1058.0
TEP2653-230/40		40	1322.5

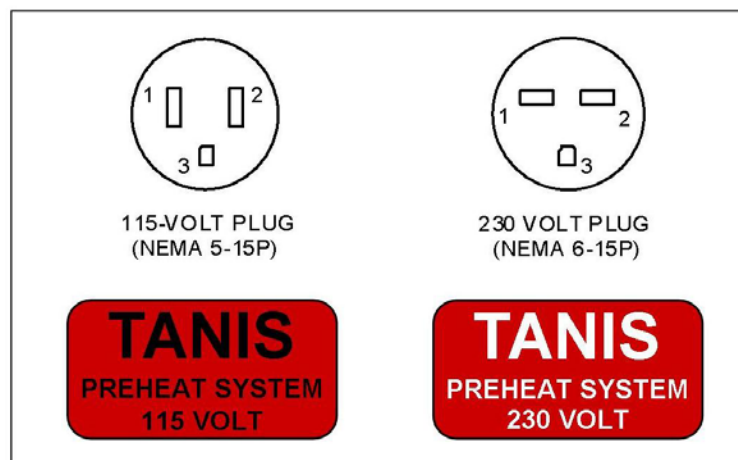


Figure 1 - Shore power plugs and placards.

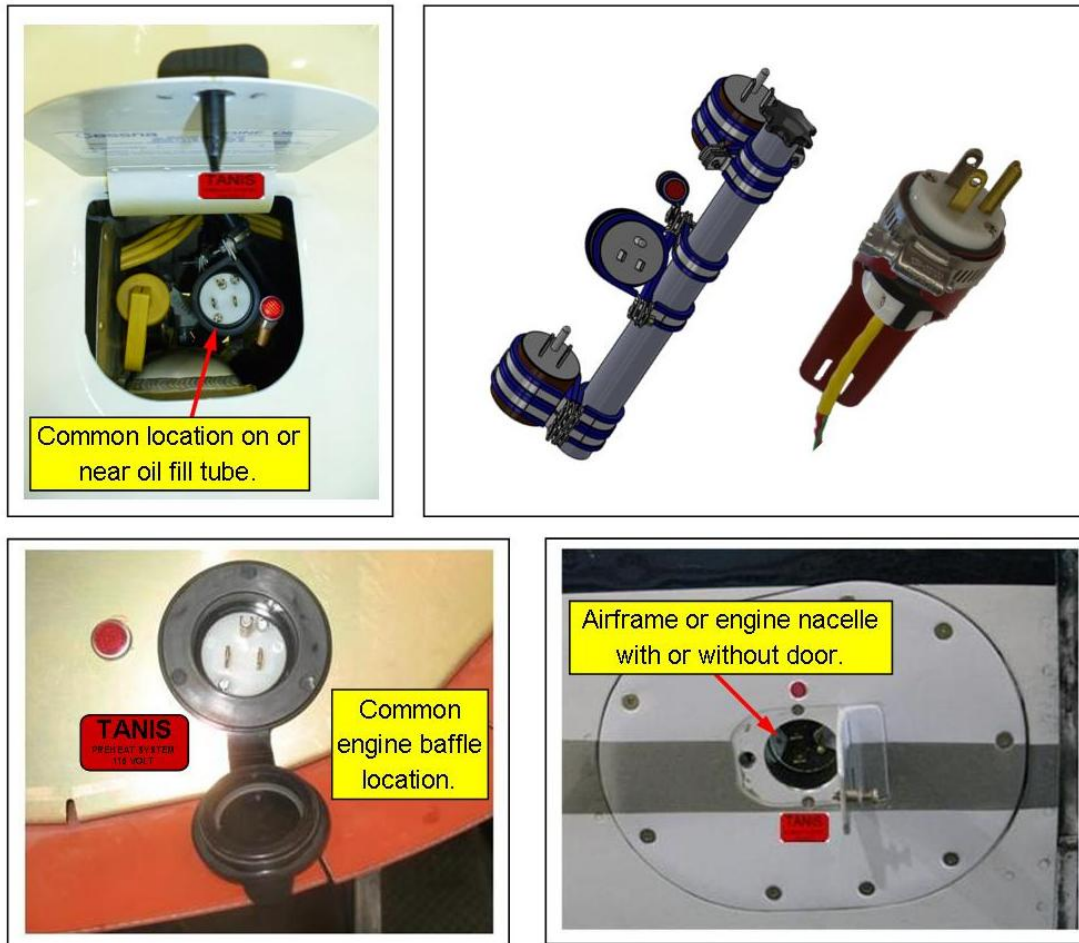


Figure 2 - Examples of plug mounting. Top two pictures depict shore plug supplied with kit, bottom two pictures optional flush plugs configurations.

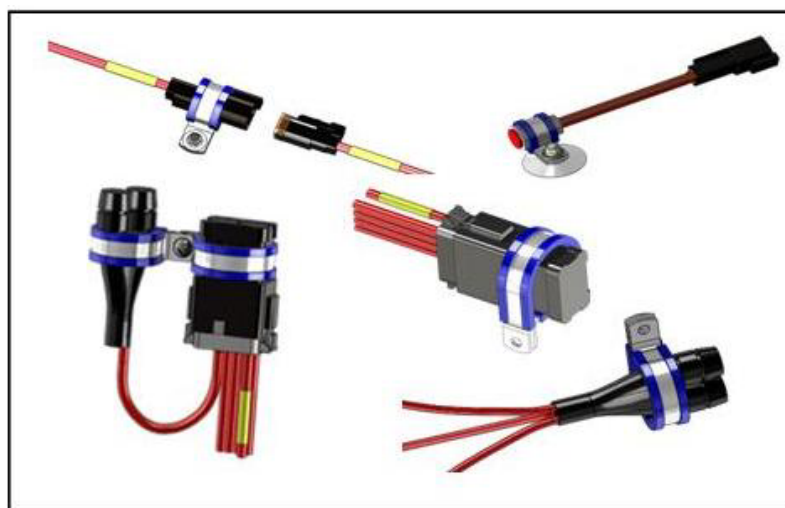


Figure 3 - Clamp positions: connectors, indicator light, junction, and fused link.



Figure 4 - Examples of fastener and pad elements.



Figure 5 Fastener elements are installed in rocker cover or intake locations. Note when installing as Lycoming intake fastener do not use washers or spacers. Install using split socket and torque to factory specification (Do Not to exceed 110-inch pounds).

5.1 Continental

Review Section 4 Installation, and preceding Tables and Figures.

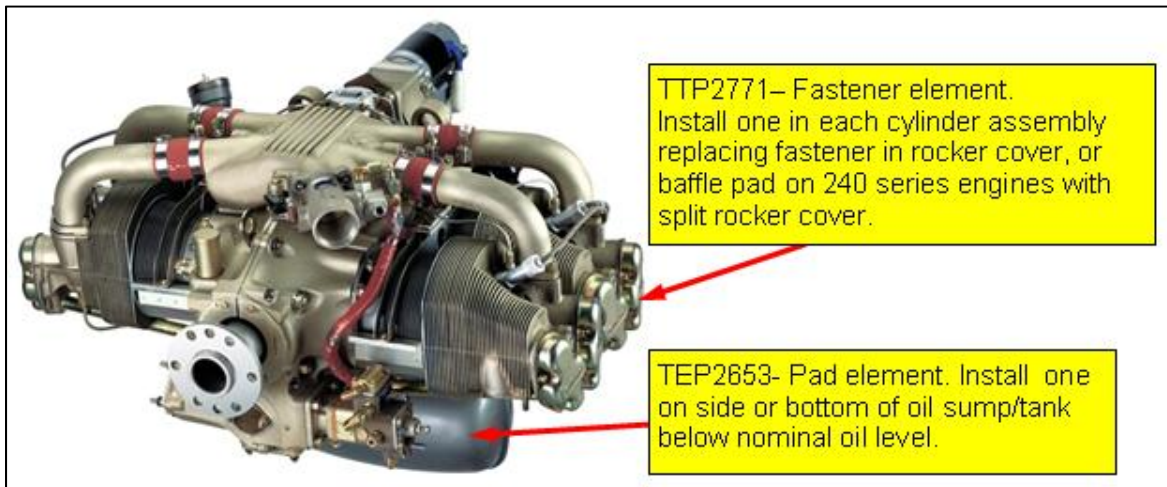


Figure 6 General element locations shown on generic 4 cylinder Continental (240 series).

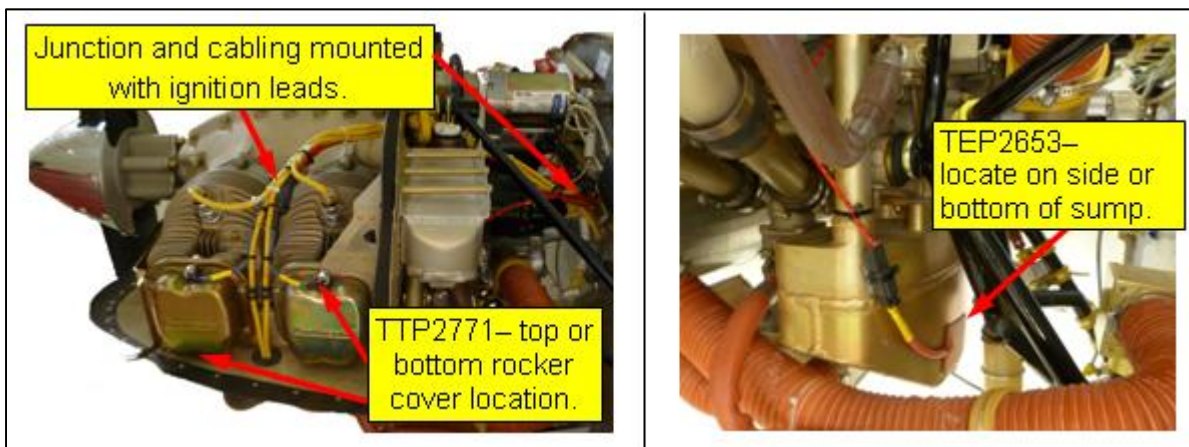


Figure 7 Left, suggested wire routing shown with ignition leads. Right, tank element location with wire routed from junction mounted on ignition leads near engine magnitos. Shore power plug is to be secured to on engine mount with clamps, or oil filler tube with optional bracket (TU01062).

1. Four fastener elements are installed by replacing one rocker cover or baffle pad fastener (between rocker covers on 240 series) in each cylinder assembly. Elements are not to bottom out or extend beyond a maximum of 2 to 3 threads. Use spacers and/or flat washers, and/or all steel self-locking nuts (AN363-420) as required. Use proper torque values for location of installation.
2. Pad heat element is located on the oil tank below nominal oil level.
Note: System may be used with oil-tank cover kits, Van Dusen 340685 and 340693.
3. Shore power plug is to be securely mounted using clamps or other acceptable means.
Note: Do not mount on aluminum oil filler tubes over 12 inches long.
4. Cabling is routed between elements, junction, fused link, and shore power plug, adjusting lengths as required. Ground is connected to the engine or airframe.

5.2 Lycoming

Review Section 4 Installation, and preceding Tables and Figures.

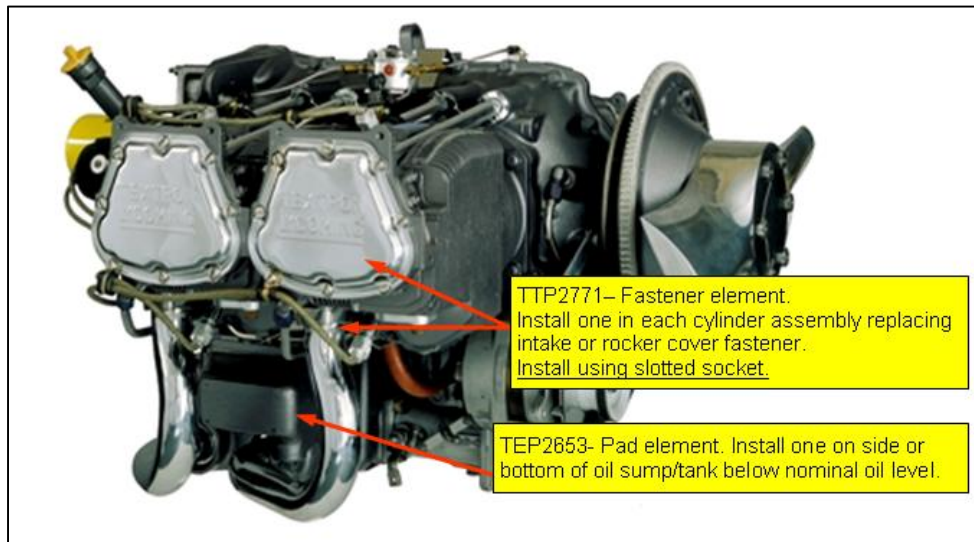


Figure 8 General element locations shown on generic Lycoming engine.

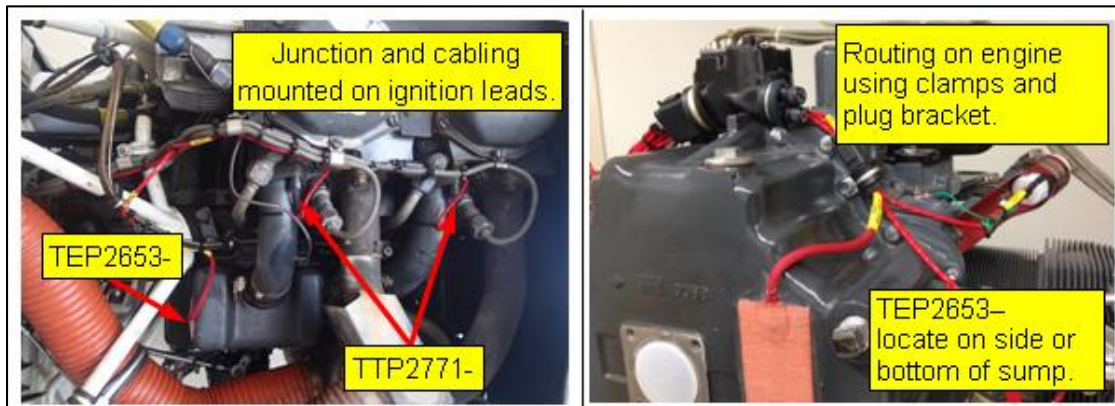


Figure 9 Examples of wire routing options, and pad locations.

1. Four fastener elements are installed by replacing one intake tube or rocker cover fastener in each cylinder assembly. Elements are not to bottom out or extend beyond a maximum of 2 to 3 threads. Use spacers and/or flat washers as required. Note: to allow for maximum thread engagement when replacing intake tube fasteners do not use washers or spacers. Use proper torque values for location of installation, not to exceed 110-inch pounds.
2. Pad heat element is installed on flat surface of plenum/sump below nominal oil level near oil drain or sump screen bolt if possible. When installing pad element it is acceptable to locate the element on the side or bottom surface of the crankcase oil plenum/sump. Suggest positioning element to allow for securing of the element connector to engine using sump bolt and cushioned clamp.
3. Shore power plug is to be securely mounted using clamps or other acceptable means.
4. Cabling is routed between elements, junction, fused link, and shore power plug, adjusting lengths as required. Ground is connected to engine or airframe.

6. 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 if not installed.

[☒] Check the system as follows:

- 1) [☐] Verify system components are installed in accordance with kit installation instructions.
- 2) [☐] Verify engine to airframe/engine bonding (ground strap) is as per OEM requirements.
- 3) [☐] Verify preheat system ground by checking for continuity between shore power plug ground, pin 3 (Figure 1), engine, and airframe.
- 4) [☐] Using an ohmmeter, verify there is no continuity between shore power plug 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: _____. Compare with Table 3.
- 6) [☐] Connect the system to appropriate power.
- 7) [☐] * Verify power indicator light is on (illuminated).
- 8) [☐] Within 30-minutes, area adjacent to the elements will start to feel warm. Check each element individually.
- 9) [☐] Update/modify weight and balance, and installed equipment lists (Section 3.5).
- 10) [☐] Complete/fill-in blanks as indicated on first and last pages of Operating Guide listed in Table 1, and file with POH/AFM..
- 11) [☐] Complete/fill-in blanks as indicated in Instructions for Continued Airworthiness (ICA), and file with aircraft manuals and logs.
- 12) [☐] Make a log entry to comply with 14 CFR Part 43.9 or other procedures set in place.
- 13) [☐] Complete and return Registration/Warranty Card.
- 14) [☐] Complete Sign Off in Section 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 *****