Kidde Technologies Inc.
UTC Aerospace Systems

TROUBLESHOOTING PROCEDURE FOR TERMINAL LUG SENSING ELEMENT DETECTOR

181844 Rev A

Troubleshooting

The document contains the information necessary to isolate an issue with a Thermal Lug Sensing Element (TLSE) Detector. The TLSE detector consists of two parts the TLSE module and the element (Figure 1).

Figure 1 - Detection Module and Element

Step 1: TLSE Module Inspection

- Verify the status lamp on the face of the TLSE Module is illuminated solid green. If the lamp is not illuminated the TLSE module is not getting power.

Figure 2 – Status Lamp

- Verify the electrical connections at the TLSE module are not damaged and all connections are secure.

Step 2: Confirm System Issue is with TLSE Detector

- Isolate the TLSE Detector from the rest of the fire system and confirm that removing the TLSE detector eliminates the system fault.

    - Remove the TLSE detector by disconnecting the connections plugged into the TLSE module's two black connectors and plug them together. These connections may be a harness and an End of Line or a harness and a harness.

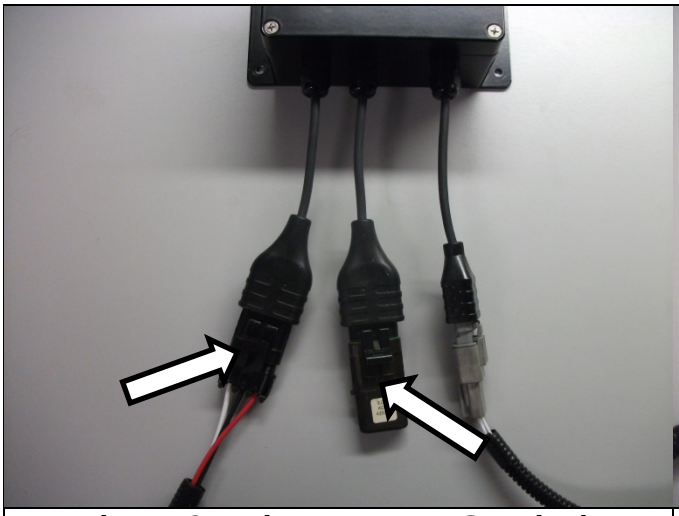

Figure 3 – Disconnect TLSE Black Connections

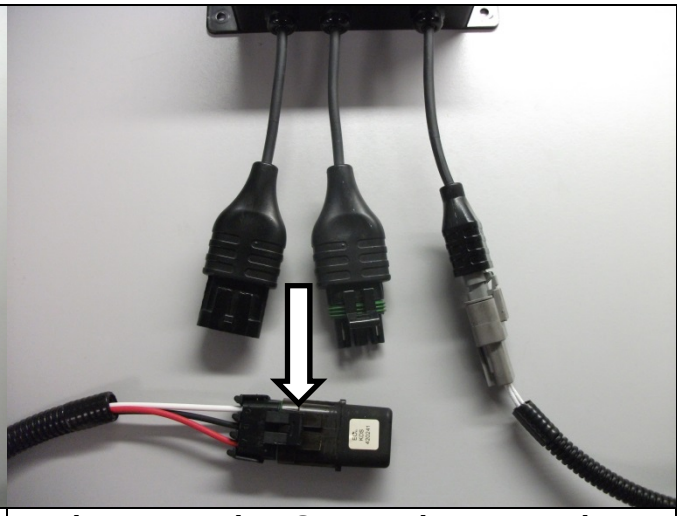

Figure 4 – Plug Connections Together

    - If the fault clears that indicates the issue lies with the TLSE detector.
    - If the fault does not clear there is a fault with the system somewhere other than the TLSE detector.

Step 3: Determining if the Issue is with the Module or the Element

If Step 2 indicates that an issue lies with the TLSE detector:

- Reconnect the connections to the TLSE module's two black connectors.
- Disconnect the TLSE module's gray connector.

Figure 5 – Disconnect the Gray Connection

- Connect a test cable, 476722, to the module's gray connector.

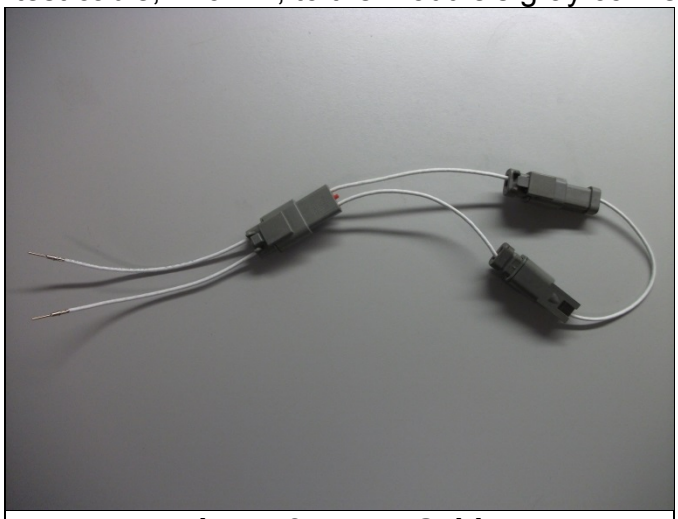

Figure 6 – Test Cable

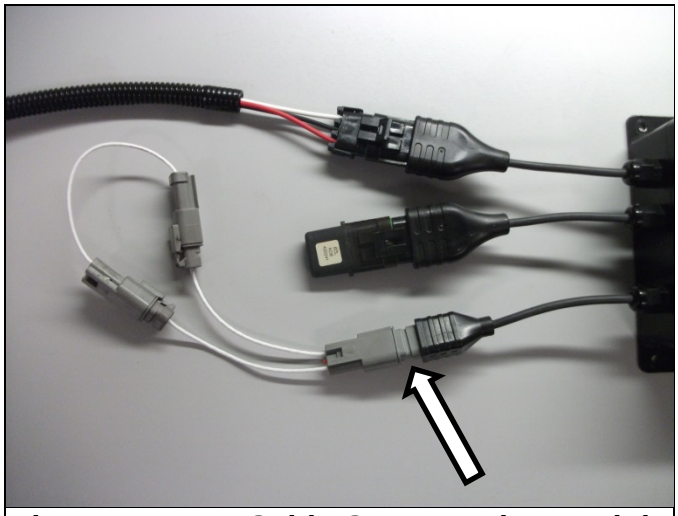

Figure 7 – Test Cable Connected to Module

- Observe whether the fault clears.
  - If the fault clears the issue is with the element or the wiring going from the module to the element.
  - If the fault does not clear, the issue is with the module.

Module Issues

If the issue is determined to be with the module:

- Check the fuse in the module.

NOTE: The status lamp on the face of the TLSE Module is not affected by the fuse in the TLSE module. Thus the status lamp being illuminated is not an indication that the fuse is good.

NOTE: The fuse can be removed using a small flat tipped screwdriver to quarter turn the top of the fuse holder. The replacement fuse is a ceramic 5MMX20MM, 2A slow blow fuse (Littlelfuse PN 0215002)

Figure 8 – Fuse Removal

- Test the fuse for continuity using a multimeter.
  - If the meter indicates that the fuse is open, replace the fuse.
  - If the fuse tests good, replace the TLSE module.

Element Issues

If the issue is determined to be with the element or the wiring going from the module to the element the following tests can further identify the problem.

Testing the Element

Isolating the element

The element must be disconnected from the system before performing the following tests. To disconnect the sensing element from the system, disconnect the gray Deutsch connection at the TLSE module.

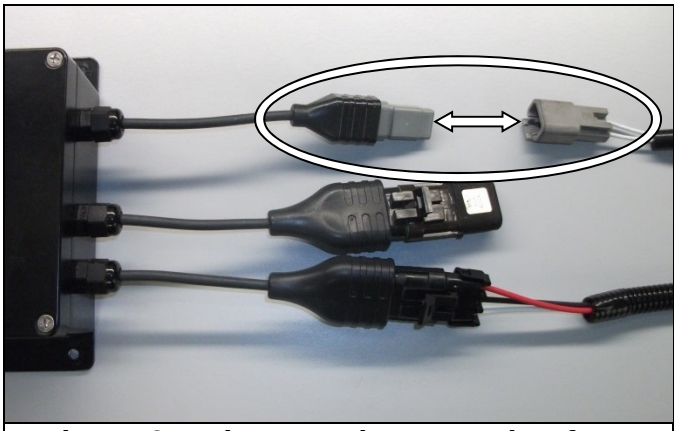

Figure 9 – Element Disconnection from System

Continuity Test (Digital Multimeter Required)

Verify the resistance between each terminal lug of the element is **less than or equal to** the maximum permitted resistance. The maximum permitted resistance of an element is equal to the length of the element in feet.

Example: An element with Kidde Part # 476153-96 is 96 inches long which is equal to 8ft. Therefore the resistance between the two ends of the element must be less than or equal to 8Ω.

NOTE: Let the temperature of the sensing element become stable at ambient temperature before performing this test.

a. Connect the multimeter test leads to the terminal lug at each end of the sensing element.

NOTE: The easiest method of taking this measurement is by measuring the resistance between the two pins in the harness which plugs into the 3 pin gray Deutsch connection on the TLSE module. The flying lead portion of the TLSE test cable can be used to make taking this measurement easier.

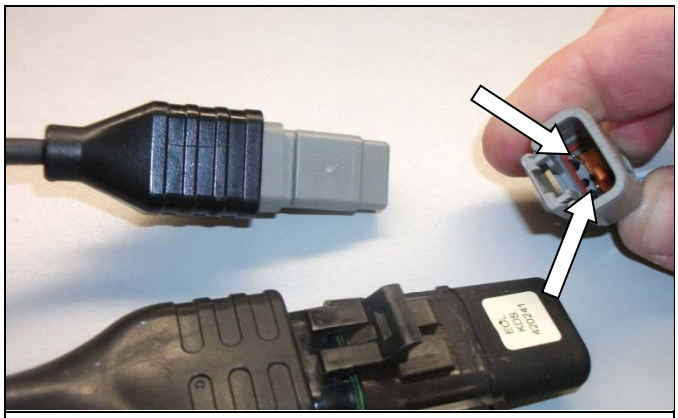

Figure 10 – Pins from which to take Measurement

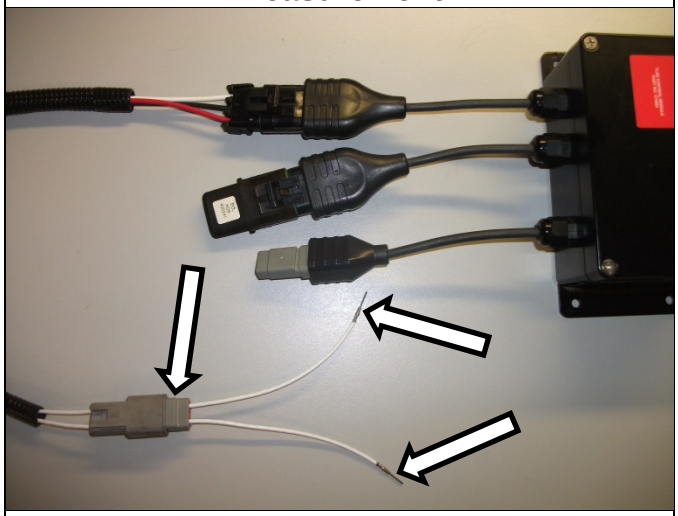

Figure 11 – Connection of Flying Lead Portion of Test Cable

b. Measure the continuity resistance of the sensing element. The measured resistance **must be less than or equal** to the maximum permitted resistance.

c. If the measured resistance is more than the maximum permitted resistance, check the resistance of the element directly between the lug end connections.

(In other words, take the wiring going from the TLSE Module to each end of the element out of the equation).

- If the resistance between the lug end connections is less than the maximum permitted resistance, there is an issue with the wiring.

- If the resistance between the lug end connections is not within the maximum permitted resistance, there is an issue with the element and it must be replaced.

NOTE: The resistance of the wiring should be less than 0.2Ω.

Insulation Resistance Test (10VDC Megohmmeter Required)

The insulation resistance test finds if the resistance between the conductor that is not grounded and the grounded conductor of the sensing element is more than the minimum permitted resistance.

NOTE: Before performing this test, let the temperature of the sensing element become stable at ambient temperature and record the ambient temperature.

Step 1: Calculate the minimum insulation resistance

a. Refer to the Minimum Insulation Resistance Chart (Table 1). Find the applicable ambient temperature and document the corresponding insulation resistance number.

b. Divide the insulation resistance number by the sensing element length, in inches to get the minimum insulation resistance in megohms.

Example: A sensing element is at the ambient temperature of 70°F (21°C). The corresponding insulation resistant number from Table 1 is 3.91. The Dash number at the end of the part number is -192 indicating the element is 192 inches long. Therefore the minimum insulation resistance is 0.02036 MΩ.

Minimum Insulation Resistance Chart (In Meg Inches) For 476153 Series Elements			
TEMP °F/°C	Insulation Resistance Factor @10VDC	TEMP °F/°C	Insulation Resistance Factor @10VDC
65/18	4.46	82/28	2.84
66/19	4.35	83/28	2.77
67/19	4.23	84/29	2.70
68/20	4.12	85/29	2.62
69/21	4.01	86/30	2.56
		87/31	2.49
70/21	3.91	88/31	2.42
71/22	3.81	89/32	2.36
72/22	3.71		
73/23	3.61	90/32	2.30
74/23	3.51	91/33	2.24
75/24	3.42	92/33	2.18
76/24	3.33	93/34	2.12
77/25	3.25	94/34	2.07
78/26	3.16	95/35	2.01
79/26	3.08	96/36	1.96
		97/36	1.91
80/27	3.00	98/37	1.86
81/27	2.92	99/37	1.81

Table 1 - Minimum Insulation Resistance Chart

Step 2: Perform the minimum insulation resistance test

a. Connect the negative megohmmeter lead to the sensing element shell. See Figure 12.

b. Connect the positive megohmmeter lead to one of the two terminal lugs via the signal pigtail connection using the TLSE test cable, 476722, as shown.

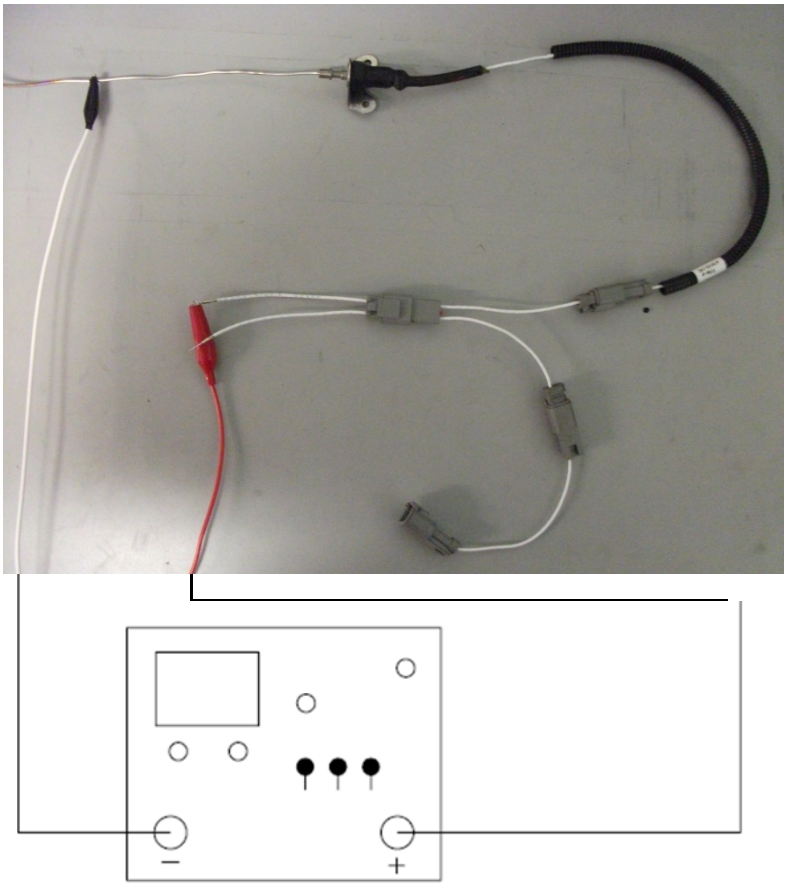

Figure 12 – Megohmmeter Connection

c. Set the megohmmeter test voltage to 10VDC.

d. Read the megohmmeter. The resistance value **must be greater than or equal to** than the value calculated in step 1.

e. If the sensing element has a lower insulation resistance than the value calculated, replace it.

REVISION HISTORY

Revision	Date	Preparer	Comments
A	May 22, 2016	Chad Rouse	Initial Release