

TN 904-4

Subject: Retrofit of capacitor-PCB

Affected: E1 Antares, factory Nr. 01 to 69E52, 900, 901

Date: 20.03.2014

Urgency: Before next flight

Reason: The E-1 Antares is equipped with a DC/DC converter, which uses electric power from the drive battery to supply the 12 V bus for flight instruments and electric systems. This DC/DC converter is integrated in the power electronics of the motor.

In some cases this DC/DC converter has failed.
If the aircraft has been equipped with TN 904-2 level 3, then the 12V bus will be supplied by an alternate redundant DC/DC converter. If the aircraft has not been equipped with TN 904-2 level 3, then power to the complete electrical system including propulsion, instruments, radio etc. is lost.

The cause of failure is a dynamic capacitive effect between an electric wire going from the DC/DC converter to the keyswitch and all other objects in the vicinity of the cable that have an electrical potential that is related to systems GND. Depending on the exact build of the aircraft, this effect can lead to the exceeding of absolute maximum input ratings of this DC/DC converter.

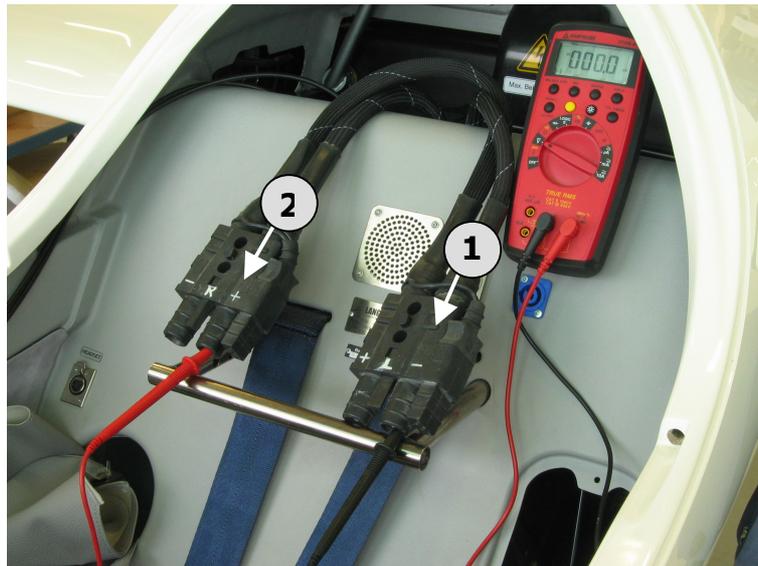
The problem is remedied by installing a PCB at a pre-existing disconnection point on the affected wire. The electronics on the PCB are designed to counteract the dynamic capacitive effect, and thus to prevent an the exceeding of absolute maximum input ratings of this DC/DC converter

Actions: Carefully read through the entire Technical Note prior to the implementation of the described actions.

TN 904-4 Retrofit of a „capacitor PCB“

The following procedural steps must be performed:

- a. Turn the key switch to the position off and remove the key. Wait until the system has fully shut down (display is off).
- b. Disconnect both drive battery connectors (located in the wing roots).
- c. Disconnect 230 /110V power-grid connector from its socket in the forward bulkhead.
- d. Disconnect the “Trailer charge” connector from its socket in the forward bulkhead
- e. Voltage measurement:



Use a Voltmeter to measure the voltage between the minus connector (1) of the left wing connector and the plus connector (2) of the right wing connector. Set the voltmeter to measure DC voltages at a 300V range. Take note not to measure against the bridging cable, which connects the right wing connector with the left wing connector. The measured voltage should not be above 2 V. Should a higher voltage be

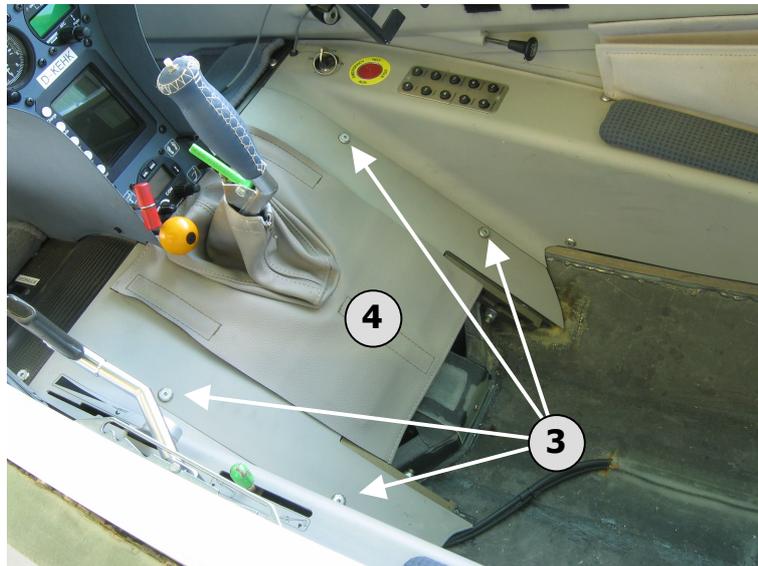
measured, then contact Lange Aviation GmbH.

The aircraft has now been separated from all power sources and is safe for electrical work.

2. Check the circuit breaker area:
In some aircraft an equivalent capacitor PCB has already been installed close to the key-switch. In these aircraft procedural steps 3 to 4 should not be performed. In order to avoid unnecessary work, and in order to avoid that two PCBs are installed, it must first be checked whether a PCB has already been installed close to the key-switch

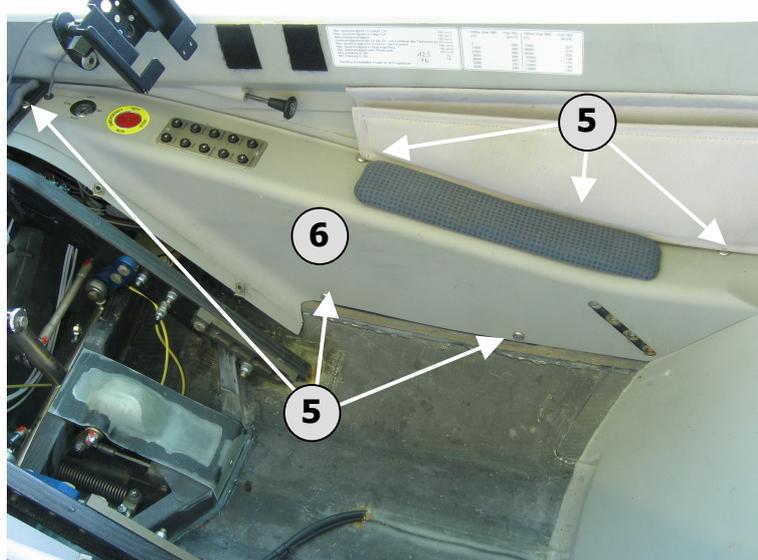
Attention: Operating the aircraft with two capacitor PCBs installed may lead to the DC/DC converter failure!

- a. Remove the seat cushion and the seat-pan including the backrest.
- b. Remove the upper leg-rest:



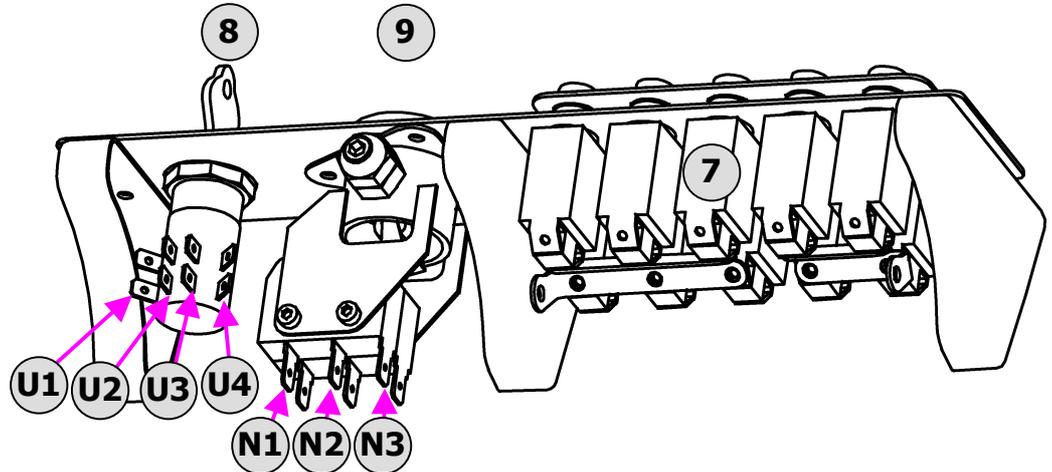
Use a 3 mm Allen wrench to remove the four M5 countersunk screws including collars (3) that are used to mount the upper leg-rest (4). Put the screws aside. Remove the upper leg-rest as well as the leather stick-cover.

c. Remove the side panel:



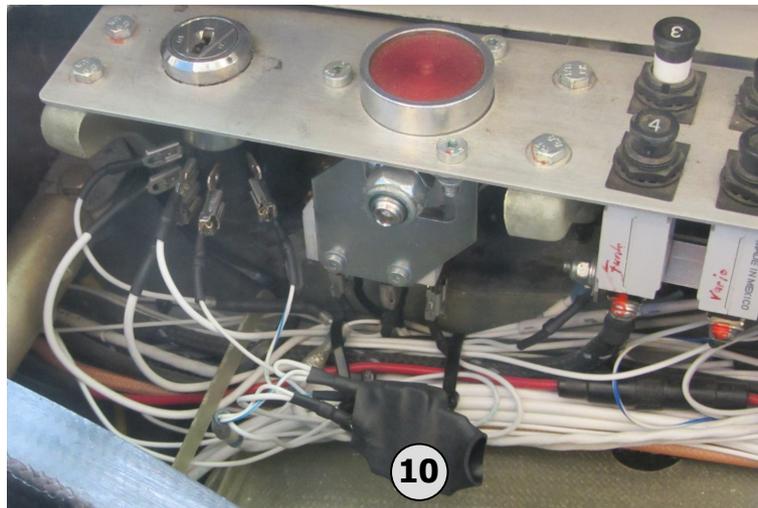
Use a 3 mm Allen wrench to remove the six M5 countersunk screws including collars (5) that are used to mount the side panel (6). Put the screws aside. Remove the side panel.

- d. Check the cables in the vicinity of the key-switch:



In addition to circuit breakers (7), the now uncovered circuit breaker panel contains the key-switch (8) and the emergency-off-switch (9).

- e. Start by identifying the key-switch plug positions (U3) and (U4). Trace the cables that are connected to these plug positions.



- f. If these cables lead directly to a PCB (10) that has been covered by heat-shrink tube, then the capacitor PCB has already been installed, and subsequently procedural steps 3, 4

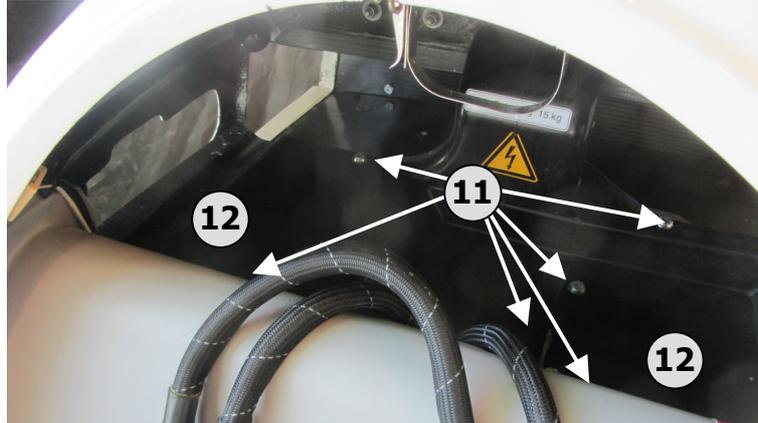
and 6 are skipped

Attention: The installation and installation location may, to some degree, vary from the picture above.



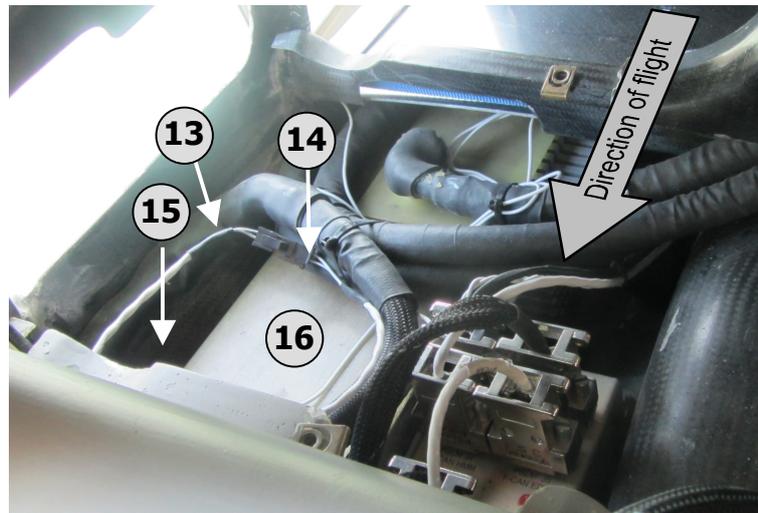
- g. If these cables do not lead directly to a PCB that has been covered by heat-shrink tube, but rather continue straight along the cable tray as depicted above, then continue with procedural step 3.
3. Install capacitor PCB
The capacitor PCB is installed at a pre-existing disconnection point on the affected wire. This disconnection point is located in the vicinity of the power electronics for the propulsive motor.

a. Removal of the baggage compartment floor:



Use a 3 mm Allen wrench to remove the six M5 countersunk screws including collars (11) that are used to mount the baggage compartment floor (12)

Identify the disconnection point:

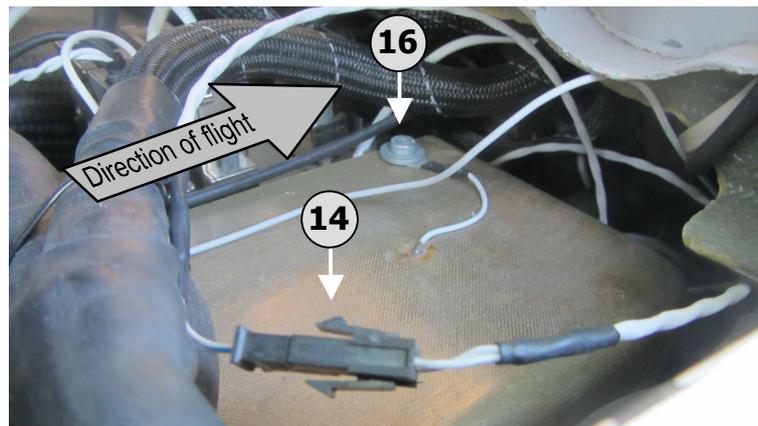


Use the picture above to identify the cable (13) and the disconnection point (14). If this wire can not be identified immediately, then it is possible that it is located in the space (15) between the power electronics (16) and the right-hand fuselage shell. The routing of the cables may differ from the picture, but there is only one disconnection point in this area. This eliminates the danger of incorrect identification.

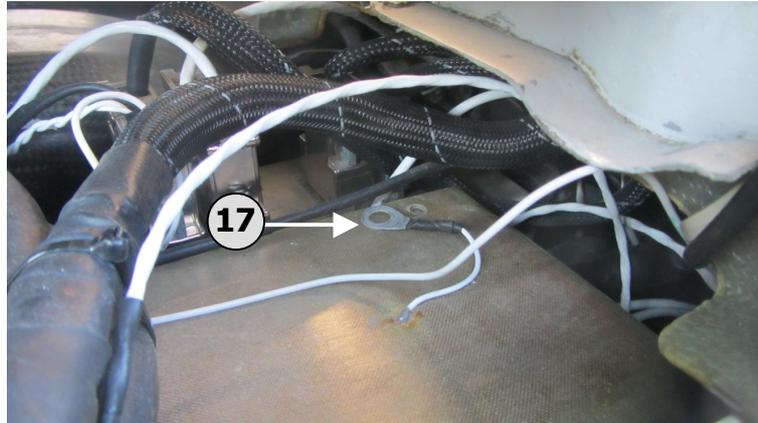
Note: The disconnection point may be covered in heatshrink-tube. In this case the heatshrink tube must be removed first. The removal of the heatshrink tube can be simplified by using a hot air gun to heat it up first, before cutting it open with the help of a pair of side cutting pliers. Take care not to damage cable or connector during this process.

Attention: If the cable and the disconnection point can not be located, then it is likely that the cable is positioned in the space in front of the power electronics, and can not be reached. In this case the capacitor PCB is installed in an alternative location. Skip directly to procedural step 4, and do not perform any of the in-between procedural steps.

- b. Remove a screw connection on the power electronics enclosure:

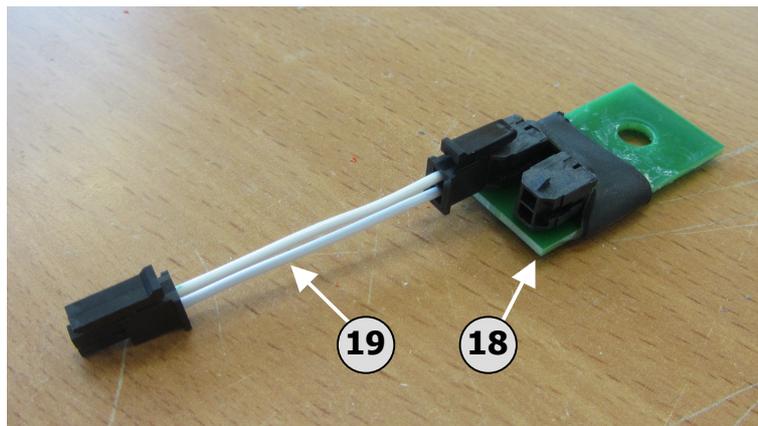


Use the picture above to identify the forward top screw connection (16) on the power electronics enclosure. Depending on the screw type, use a 3 or a 4mm Allen wrench to remove this M5 Screw including washer.



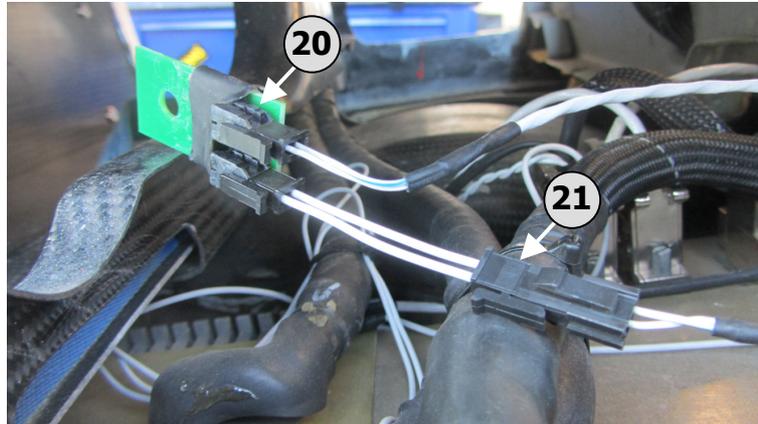
It is possible that removing this screw connection will release one or more shield connections (17).

- c. Equip the capacitor PCB (18) with adapter-cable 1 (19).



Note: The capacitor-PCB contains two female connectors. These are functionally- and pin-equivalent. There is no danger of incorrect installation.

d. Installation of the capacitor PCB

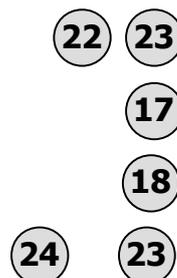


Open the disconnection point (14)

Note: In order to perform this procedural step, it may be required to remove one or more cable ties. Use a pair of side cutting pliers to do so.

Plug the male connector (20) into the fitting female connector directly on the capacitor PCB. Plug the male connector (21) on adapter-cable 1 into the fitting female connector.

e. Secure the capacitor PCB:





If the procedural Step 3b resulted in the release of no, or only one shield connection, then stack the parts that need to be secured in the following way:

- > Hexagon socket screw with low head - M5x12
(supplied as a part of the kit) (22)
- > Washer - M5 (supplied as a part of the kit) (23)
- > Shield connection (if released in procedural step 3b) (17)
- > Capacitor PCB (18)
- > Washer - M5 - DIN 9021 (23)

If the procedural Step 3b resulted in the release of more than one shield connection, then stack the parts that need to be secured in the following way:

- > Hexagon socket screw with low head - M5x16
(supplied as a part of the kit) (22)
- > Washer - M5 (supplied as a part of the kit) (23)
- > Shield connections (17)
- > Capacitor PCB (18)
- > Washer - M5 - DIN 9021 (23)

Apply a small amount of medium strength threadlocker (24), Loctite 243 blue, to the exposed thread. Take care not to apply so much threadlocker that it can creep up into the electrical connection.

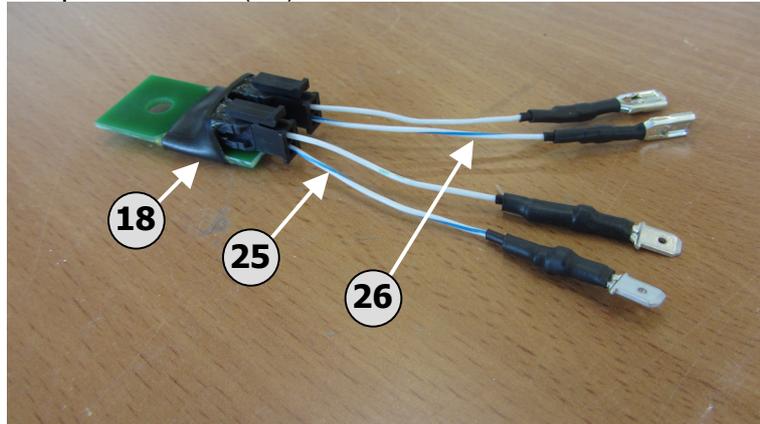
Depending on the screw type, use a 3 or a 4mm Allen wrench to secure this M5 Screw including the abovementioned components to the power electronics.



Attention: If the screw is too long, and the thread end collides with the heat-sink of the power electronics (the screw can not be screwed in any further, but the PCB can easily be rotated around the screw), then one more washer should be added underneath the screw head.

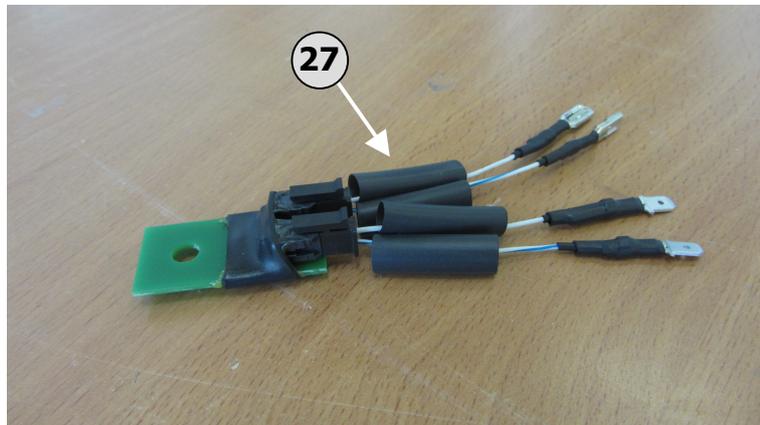
- f. Use the cable ties to re-route the wires tidily.
- g. Seeing that the capacitor PCB is now installed, procedural step 4 is skipped.

4. Install the capacitor PCB in the alternate position
 - a. Equip the capacitor PCB (18) with adapter-cable 2 (25) and adapter-cable 3 (26)

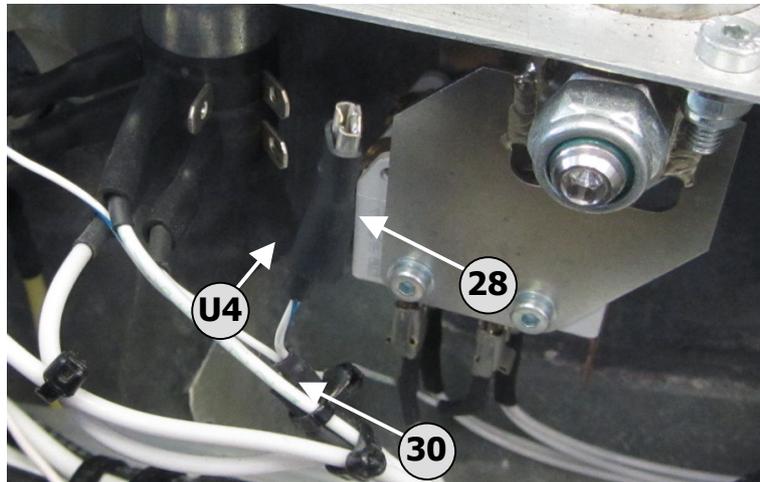


Note: The capacitor-PCB contains two female connectors. These are functionally- and pin-equivalent. There is no danger of incorrect installation

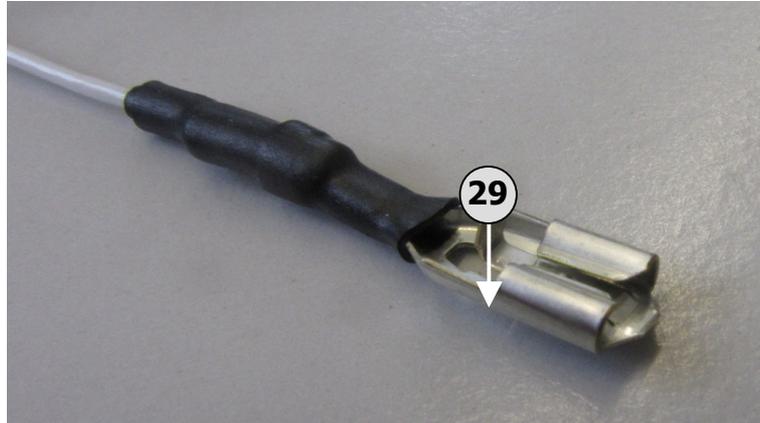
- b. Slide one length of heat-shrink-tube (27) over each cable end of the adapter-cables.



- c. Start by disconnecting the cable lug (28) located in plug position (U4) of the key-switch. Press down the release tab (29) in order to unlock the cable lug.

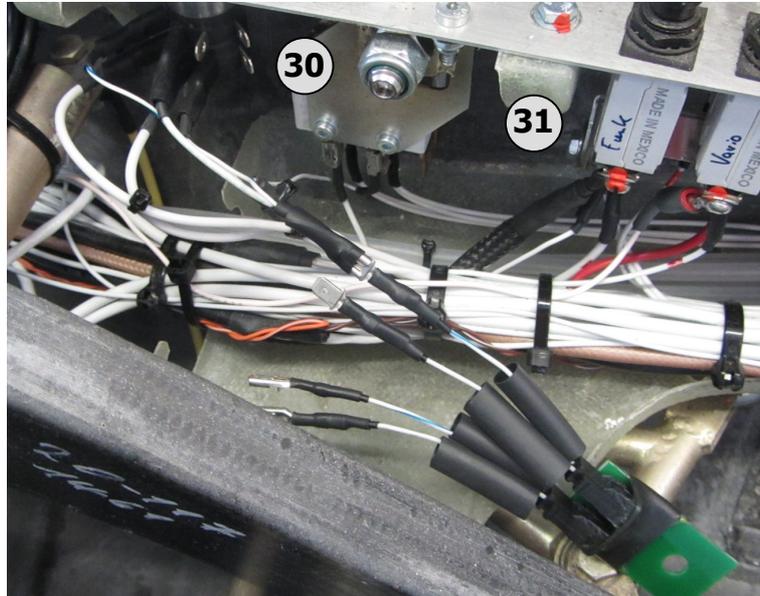


Note: In most aircraft the cable lug will be covered with heat-shrink-tube. The release tab can be pressed through the heat-shrink-tube.



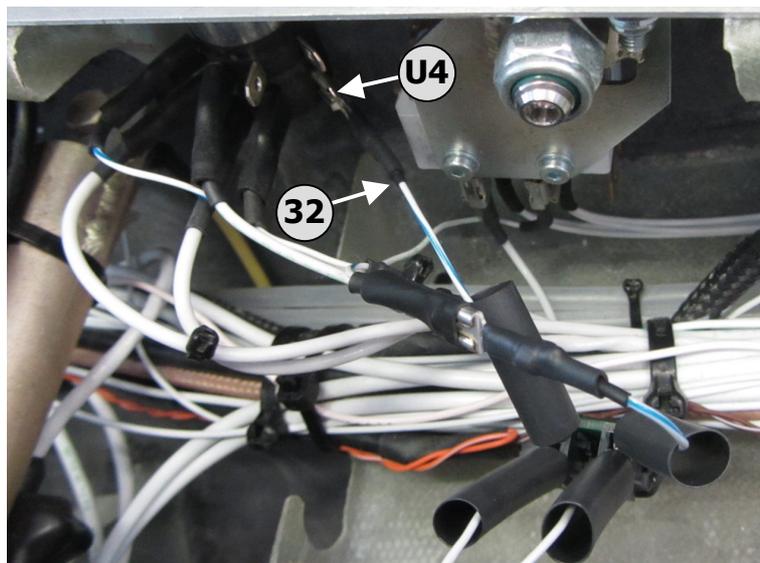
Note: In order to perform procedural steps 4c and f, it may be required to remove one or more cable ties. Use a pair of side cutting pliers to do so.

- d. Connect the now exposed white-blue wire (30) with the white blue wire of adapter-cable 2 (31).



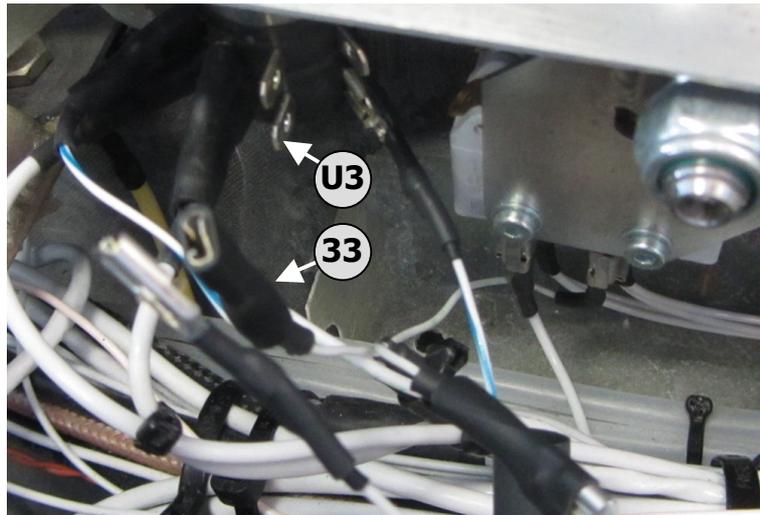
Ensure that the cable-lug and the tab form a locked connection by gently trying to pull the connection apart.

- e. Connect the white-blue striped cable of adapter-cable 3 (32) to plug position (U4) of the key-switch.

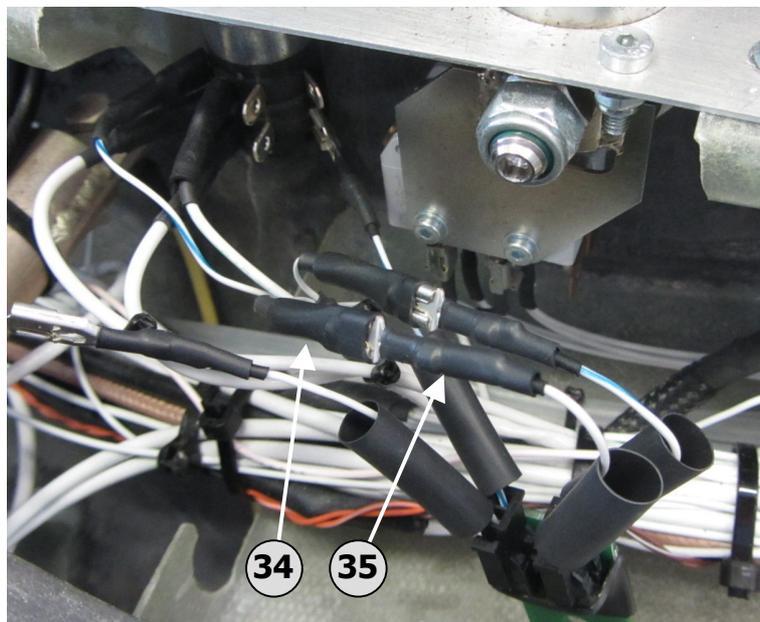


Ensure that the cable-lug is locked in position by gently trying to pull the connection apart.

- f. Disconnect the cable lug (33) located in plug position (U3) of the key-switch.

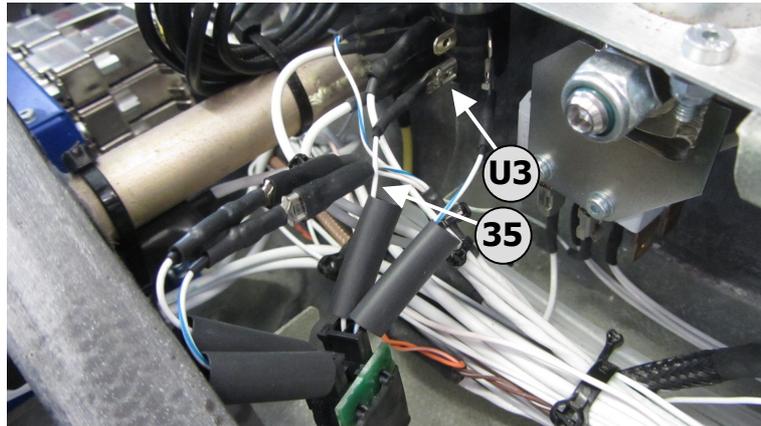


- g. Connect the now exposed white wire (34) with the white wire of adapter-cable 2 (35).

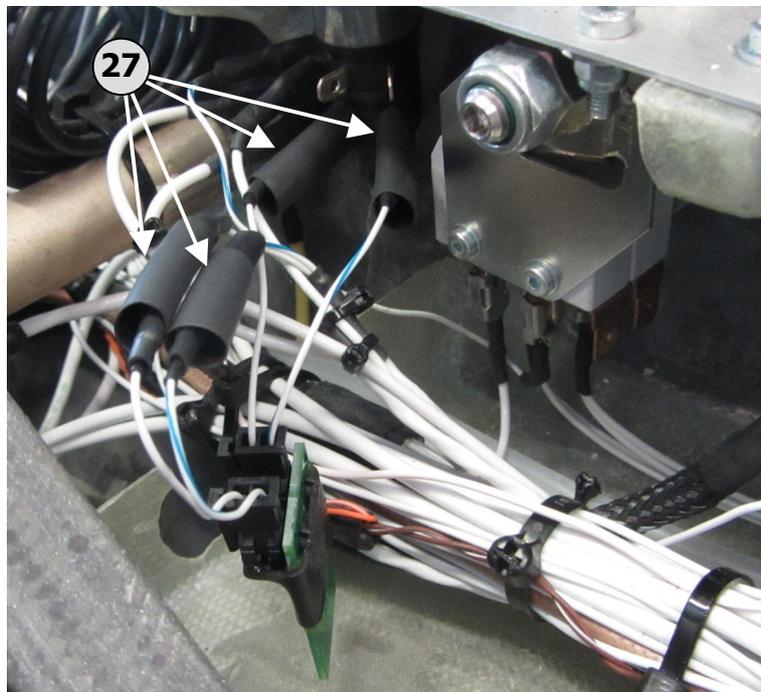


Ensure that the cable-lug and the tab form a locked connection by gently trying to pull the connection apart.

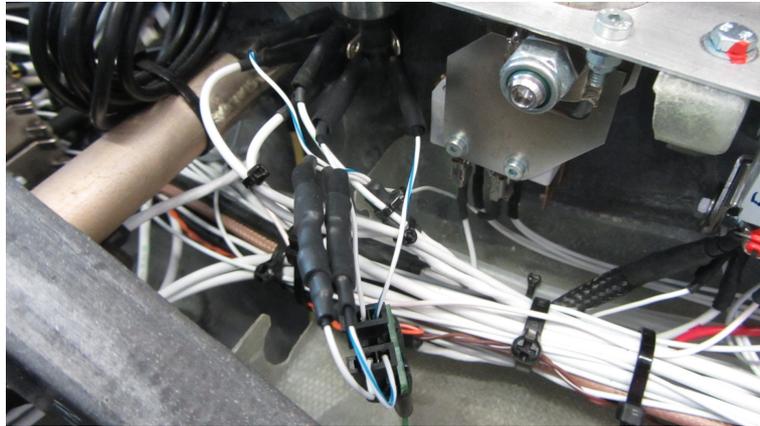
- h. Connect the white striped cable of adapter-cable 3 (35) to plug position (U3) of the key-switch.



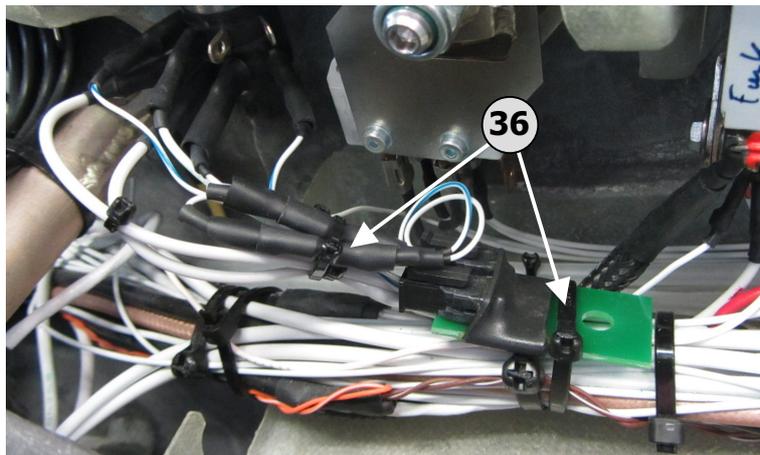
- i. Slide the four lengths of heat-shrink tube (27) that were introduced in procedural step 4a over the connections that were made in procedural steps 4d, e, g and h.



- j. Use a hot-air gun to shrink the four lengths of heat-shrink tube.



- k. Use the enclosed cable ties (36) to secure the capacitor PCB and to re-route the wires tidily



5. Perform procedural steps (2.c-2.a) in reverse to re-install the cockpit interior
6. Perform procedural steps (2.c-2.a) in reverse to re-install the baggage compartment floor

Final functional test:

- a. Turn the key-switch to position "OFF"
 - b. If installed; disconnect 120 / 230VAC grid power.
 - c. Connect the drive battery
 - In de-rigged condition: Attach all relevant trailer cables.
 - In rigged condition: Connect and lock the left and right main power connector
 - d. Press the „CHARGE“-key on the display unit. The system should not boot in this condition (display remains dark).
 - e. Turn the key-switch to position "ON", and wait until the system reaches the „system status“ screen. The „Systems“ field must indicate a value between 12.0 and 12.4 V
 - f. If no anomalies have been detected, then the retro-fit has been completed. If anomalies have been detected, please contact Lange Aviation GmbH.
7. Record TN 904-4 in the log book.

Personell:

The action may be performed as pilot/owner maintenance. However, it must then be inspected according to the current regulations for qualified inspection personnel according to Part 66 (maintenance).

Materials:

- 1 x „Capacitor PCB“
- 1 x Adapter-cable 1
- 1 x Adapter-cable 2 (on request)
- 1 x Adapter-cable 3 (on request)
- 1 x Screw M5x12 DIN 7984
- 1 x Screw M5x16 DIN 6912
- 2 x Washer M5 DIN 9021
- 2 x Cable tie - small
- 1 x Cable-tie - medium (on request)

Tools:

- Allen wrenches: 3 and 4 mm
- A Voltmeter (range: 0-300V DC)
- Medium strength threadlocker Loctite 243
- A pair of side cutting pliers
- A hot air gun

Mass The change of mass is negligible.

C.G. position The change of the C.G. position is negligible.

Approved by: European Aviation Safety Agency

Major Change Approval 10050056

Zweibrücken, 20.03.2014

Lange Aviation GmbH



MAJOR CHANGE APPROVAL
10050056

This Major Change Approval is issued by EASA, acting in accordance with Regulation (EC) No. 216/2008 on behalf of the European Community, its Member States and of the European third countries that participate in the activities of EASA under Article 66 of that Regulation and in accordance with Commission Regulation (EU) No. 748/2012 to

LANGE AVIATION GMBH

**BRUESSELER STRASSE 30
66482 ZWEIBRUECKEN
GERMANY**

and certifies that the change in the type design for the product listed below with the limitations and conditions specified meets the applicable Type Certification Basis and environmental protection requirements when operated within the conditions and limitations specified below:

Original Type Certificate Number : EASA.A.092
Type Certificate Holder : LANGE AVIATION GMBH
Type Design - Model : E1 ANTARES

Description of Design Change:

TN 904-4: Retrofit of capacitor-PCB
TN 904-5: Shaft-coupling in pump-unit

EASA Certification Basis:

The Certification Basis (CB) for the original product remains applicable to this certificate/ approval. The requirements for environmental protection and the associated certified noise and/ or emissions levels of the original product are unchanged and remain applicable to this certificate/ approval.

Associated Technical Documentation:

- Description of Retrofit of capacitor-PCB (TN 904-4)
- Description of Shaft-coupling in pump-unit (TN 904-5)
or later revisions of the above listed documents approved by EASA.

See Continuation Sheet(s)

For the European Aviation Safety Agency,

Date of issue: 29 July 2014

European Aviation Safety Agency
Manfred REICHEL
Project Certification Manager
General Aviation

Note:
The following numbers are listed on the certificate:
EASA current Project Number: 0010030504-001

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Limitations/Conditions:

-Retrofit of capacitor-PCB for S-No. 1 to 69E52, 900, 901
Shaft coupling in pump-unit for S-No. 1 to 60E49

- end -

Note:

The following numbers are listed on the certificate:
EASA current Project Number: 0010030504-001

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