Subject: DC/DC converter in Hydraulics module

Affected: E1 Antares
Factory No. 01 to 04, 06 to 12, 14, 17, 18, 19, 22, 23, 25, 26, 28, 32E30 to 40E38, 42E39, 44E40, 45E41, 47E42, 49E43, 51E44, 53E45, 55E46, 56E47, 58E48, 60E49, 900, 901

Date: 21.09.2010

Urgency: Level 1: Already performed
Level 2: To be performed before 31.03.2011
Level 3: Optional

Personell: The action may be performed as pilot/owner maintenance but must be performed by a qualified person. The action must be documented in the aircraft log book

Reason: A massive short circuit occurred during the operation of an E1 Antares. The short circuit was located in the DC-DC converter which supplies power to the hydraulic pump, and it lead to the DC-DC converter becoming inoperable. The heat generated during the failure of the DC-DC converter also lead to the adjacently positioned Hydraulic Management Module (HMM) being damaged to such an extent that micro-switch positions in the whole engine-bay could no longer be recorded. Consequentially, the position of the motor pylon (retracted, extended or in an in-between position) could no longer be determined, and the running motor was switched off as a safety precaution. The pilot could glide to the nearest airfield and landed safely.

An analysis of the incidence showed that current fluctuations occurring in the drive battery led to the failure of the DC-DC converter. The analysis also showed that the current design has an elevated risk for failure of the DC-DC converter.

The main risk resulting from the aforementioned failure scenario is not the loss of the DC-DC converter, but rather the damage to the Hydraulic Management Module, as this can lead to the complete loss of motor-power.

In order to avoid this risk, TN 902-2 Level 1 was performed at the highest level of urgency.

TN 904-2 Level 1: Installation of a fuse in front of the DC/DC converter

A fuse is installed in front of the DC/DC converter. This ensures that in the case of a short-circuit, no over-voltage / -current can take place. This again protects the adjacent Hydraulic Management Module from being damaged.

Level 1 was performed within the framework of TM 904-2-1, and new aircraft have also been equipped accordingly.

This technical Note describes how to perform Levels 2 and 3

TN 904-2 Level 2: The installation of a new DC/DC converter with input module and parallel implementation

In Level 2, the existing DC/DC-converter for the hydraulics is replaced by two DC/DC-converters working in parallel. In addition, each DC/DC-converter is equipped with an input module that both prevents voltage fluctuations and controls the rate of voltage change when the aircraft is switched on. Additionally, there is, on the output side, electronics which ensure that the hydraulic motor is started up without excess current peaks.

Through the implementation with two DC/DC-converters, the load on each DC/DC-converter is reduced by approximately 50%. Should one half of the circuit fail, then the aircraft can be operated for the rest of the flight using the remaining part of the circuit. If one half of the circuit fails, then the circuit recognizes this, and this is then announced through an acoustic warning signal. In order to fit the two parallel circuits, the old enclosure has to be replaced by a new and substantially larger enclosure. The implementation of Airworthiness Directive 2008-0182-E level 2 as described above not only fulfills, but also by far surpasses the certification requirements for gliders and motor-gliders with regards to safeguarding against system failure.

Important:
Should one of the two parallel implemented DC/DC converters fail, then this will trigger a loud buzzing noise.

Should this take place during flight, then this flight may be finished. However, the pilot must be aware that an elevated

risk for Hydraulic failure exists, and plan the flight accordingly.

Should this take place while the aircraft is on the ground, then the aircraft should be repaired before next flight.

Each of the two parallell implemented DC/DC converters is equipped with a replaceable fuse on the input-side. Usually, these fuses blow if there is a short-circuit in the DC/DC converter. The fuses are not there to safeguard the equipment (here the Hydraulic Management Module), but rather to protect the cables in the aircraft.

Should one of these fuses blow, then it is most likely that this DC/DC converter circuit has failed completely, and the manufacturer must be contacted.

TN 904-2 Level 3: The installation of a maintenance socket with a bridging function (optional).

In addition to the DC/DC-converter for the hydraulic power, the Antares 20E also contains a forward DC/DC-converter. This converter converts power from the drive battery (212-288V) into 12V power for all systems, instrumentation and avionics.

Should the forward DC/DC-converter fail, then this would, amongst others, result in the failure of the motor. Due to the low failure rates for the installed components, this “safe life” design completely fulfills the certification requirements for gliders and motor-gliders as well as and their underlying philosophy.

The manufacturer has developed an electric circuit that integrates the power supply for the hydraulic system into the systems power supply. This results in a triple redundant power supply for systems, instrumentation and avionics. Should the forward DC/DC-converter fail, then the systems power will be supplied by the two hydraulics DC/DC-converters. Should both the forward DC/DC-converter as well as one hydraulics DC/DC-converter fail, then the remaining hydraulics DC/DC-converter is still capable of delivering power for systems, instrumentation, avionics and hydraulics for the rest of the flight.

This system design approaches the fail-safe philosophy used by civil aviation

Important:
Should the forward DC/DC converter fail, then this can be recognized by observing the systems voltage indicated on the flight display. There are two indicators for a failed forward DC/Dc converter:

- **The systems voltage for an intact system normally lies somewhere between 11.9 and 12.4 V. If the forward DC/DC converter fails, then this value is reduced to a value between 11.0 and 11.5 V.**

- **If the forward DC/DC converter has failed, then the indicated systems voltage fluctuates when the hydraulic system is operated, and reaches values below 11V. The display shows a warning.**

Each of these indicators alone is evidence for a failed forward DC/DC converter.

Should such a failure take place during flight, then this flight may be finished.

Should such a failure take place while the aircraft is on the ground, then the aircraft should be repaired before next flight.

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

TN 904-2 Level 2: The installation of a new DC/DC converter with input module and parallel implementation

The following procedural steps must be performed:

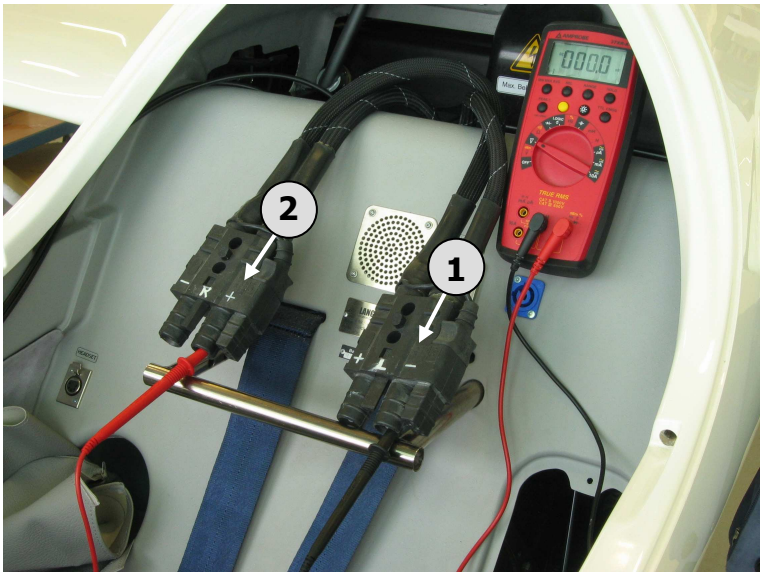
1. Extend the motor.

Extend the motor and leave it in maintenance position (motor extended, motor bay covers open) as described in the flight manual (3.9.2.1.5).

If the aircraft is not rigged, the motor extension can be performed using 12V power supplied through the maintenance sockets in the left leg-rest. In this case, keys ENTER and PLUS must be pressed in order to operate the pylon. Do not extend the motor using wing power from the “Trailer charge” socket.

Secure the motor in the “up” position prior to working in the engine bay…

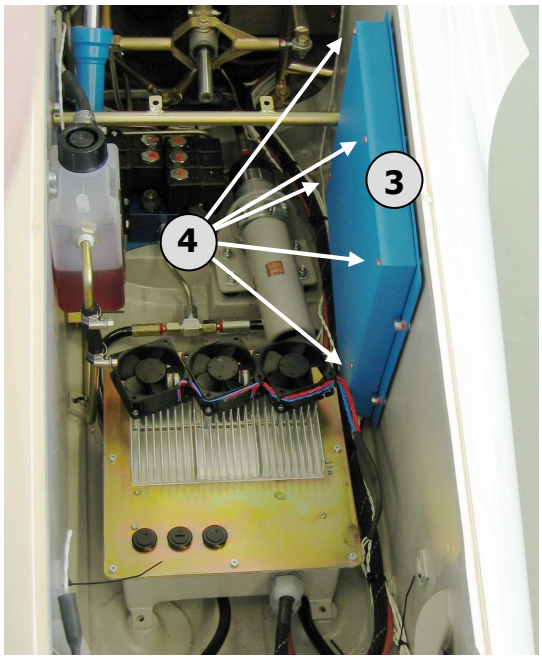
2. Disconnect the aircraft from all power sources
   a. Turn the key switch to the position off and remove the key. Wait until the system has fully shut down (display is off).
   b. Disconnect both drive battery connectors (located in the wing roots).
   c. Disconnect 230 /110V power-grid connector from 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.

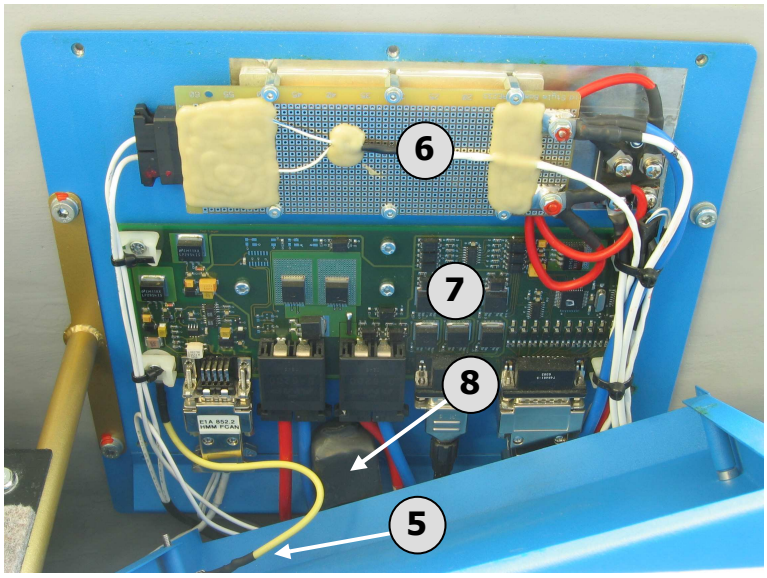
3. Remove of Hydraulic Management Module housing cover:



The DC-DC converter and the HMM share a common housing (3) located at the right engine bay wall. In this procedural step the cover is removed from the common housing.

a. Use a 2.5 mm Allen-wrench to remove the 5 screws (4) (M4 inbus) holding the cover in place, and carefully remove the cover. Store the screws.

b. Remove grounding cable:

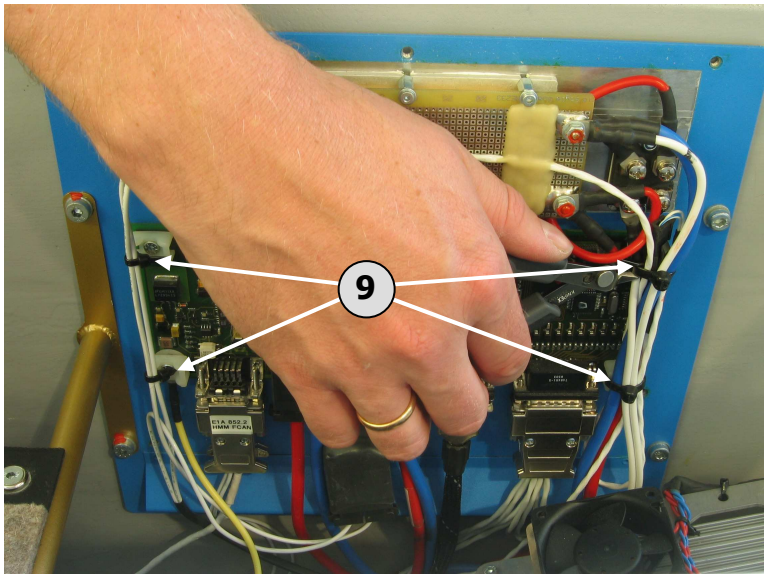


Disconnect the yellow grounding cable (5) from the cover and store the cover safely. The picture shows the DC/DC converter (6), and the HMM (7) after the removal of the cover. Depending on the build state of the aircraft, there may be small differences between the picture and the aircraft. Factory No. 01 to 03, 06 to 12, 18, 19, 22, 23, 25, 32E30 to 40E38, 42E39, 44E40, 45E41 and 901 have, within the framework of TN 904-2 level 1, been retrofitted with an inline fuse (8). Aircraft built or modified after the introduction of TN 904-2 level 1 will have the fuse installed directly on the DC/DC converter.

4. Remove the current DC/DC converter:

The DC/DC converter generates 12V current for the hydraulic pump and valves. In this procedural step, the DC/DC converter is removed from the system.

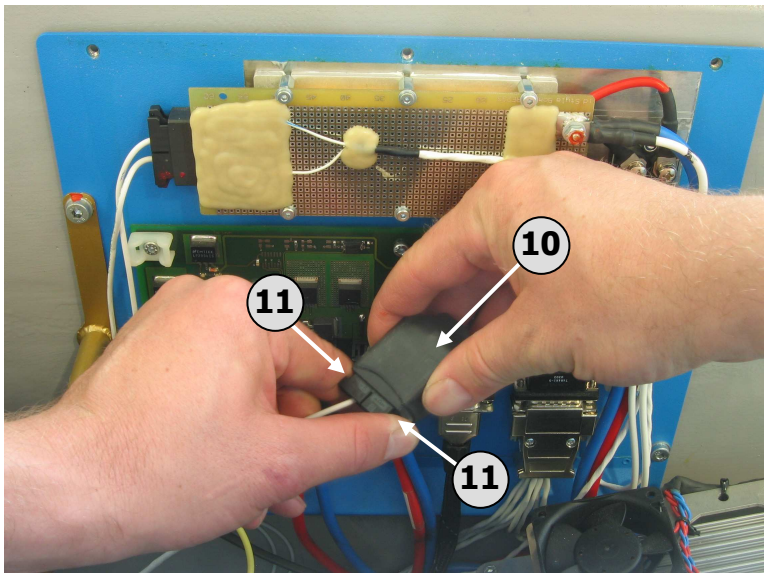
a. Remove cable ties:



Remove the 4 cable ties (9) a pair of side-cutting pliers.

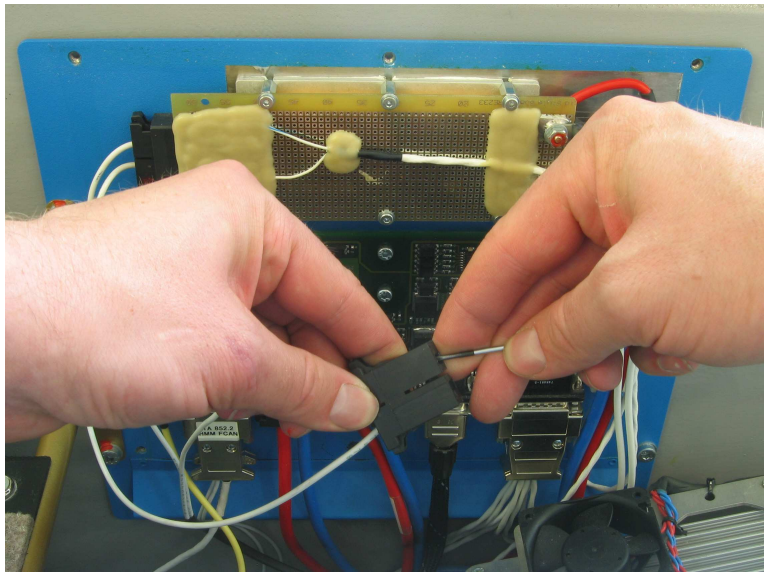
Attention: only aircraft that within the framework of TN 904-2 level 1 have been equipped with an inline fuse must perform procedural steps b, c, e and f (Factory No. 01 to 03, 06 to 12, 18, 19, 22, 23, 25, 32E30 to 40E38, 42E39, 44E40, 45E41, 901).

b. Remove inline fuse (only Factory No. 01 to 03, 06 to 12, 18, 19, 22, 23, 25, 32E30 to 40E38, 42E39, 44E40, 45E41, 901):

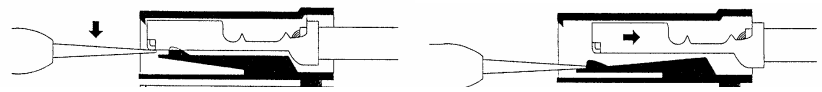


Remove the inline fuse (10) installed as a part of TN 904-2 level 1. To release the connector press both securing latches (11) together and keep them pressed while connector housing is pulled out of the socket.

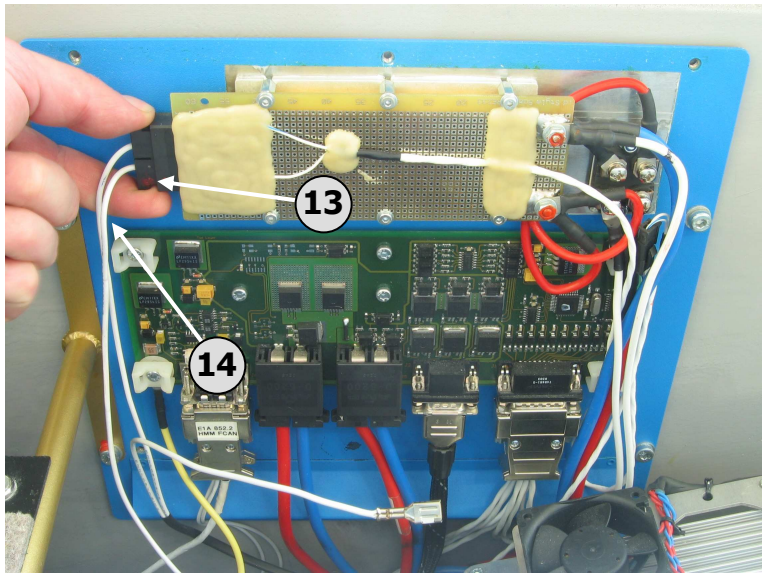
c. Disassemble connector „inline fuse“ (only Factory No. 01 to 03, 06 to 12, 18, 19, 22, 23, 25, 32E30 to 40E38, 42E39, 44E40, 45E41, 901):



Unplug both connectors from the connector housing that was disconnected in procedural step 4.b. To unplug the connector from the housing, insert a small slotted screwdriver into the connector housing and press the securing latch down and away from the connector (see sketch). While doing so, gently pull the connector out of the connector housing.

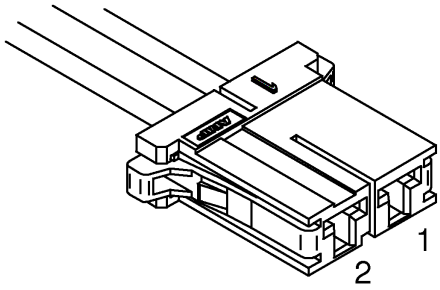


d. Disconnect 288V supply connector:



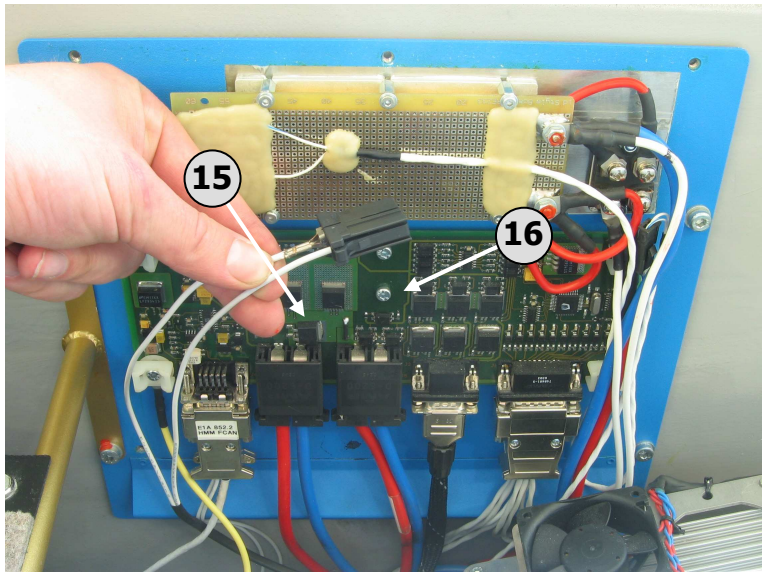
Disconnect the supply connector (13). To release the connector press both securing latches together and keep them pressed while connector housing is pulled out of the socket.

e. Removal of cable „inline fuse“ (only Factory No. 01 to 03, 06 to 12, 18, 19, 22, 23, 25, 32E30 to 40E38, 42E39, 44E40, 45E41, 901):



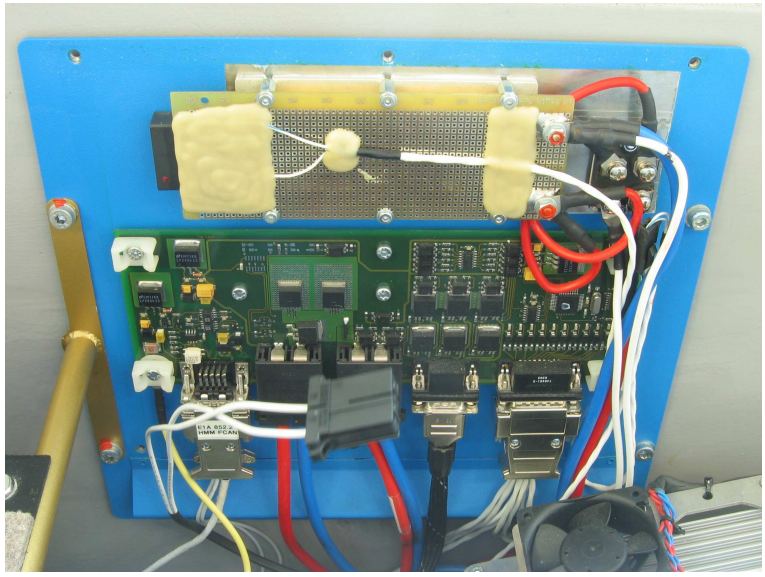
Remove the cable (14) from plug-in position 1: Insert a small slotted screwdriver into the connector housing and press the securing latch down and away from the connector. While doing so, gently pull the connector out of the connector housing. Remove the remaining connector housing and cable (these parts were installed as a part of TM 904-2 level 1).

f. Re-assembly of 288V supply cable (only Factory No. 01 to 03, 06 to 12, 18, 19, 22, 23, 25, 32E30 to 40E38, 42E39, 44E40, 45E41, 901):



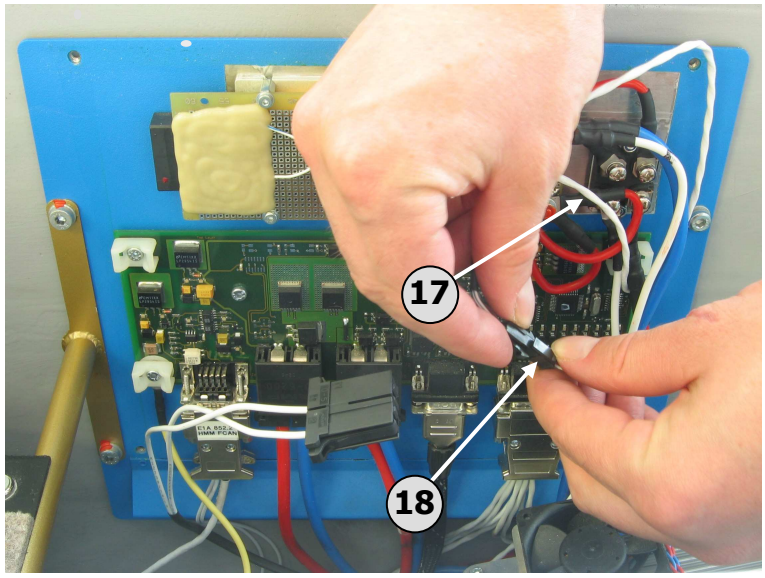
Insert this free connector (15) into the now free plug-in position 1 (16). Make sure that the securing latch of the connector engages so that it can no longer be pulled out of the connector housing. This completes removal of parts installed as a part of TM 904-2 level 1.

g. Intermediate state



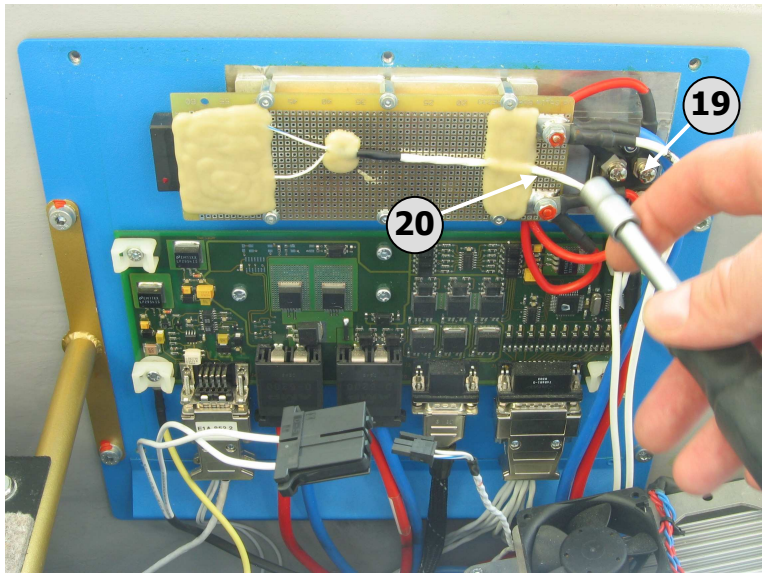
Starting at this procedural step, all aircraft are equal. Aircraft with TN 904-2 level 1 have been re-wired to a state prior to TN 904-2 level 1.

h. Disconnect switching cable:



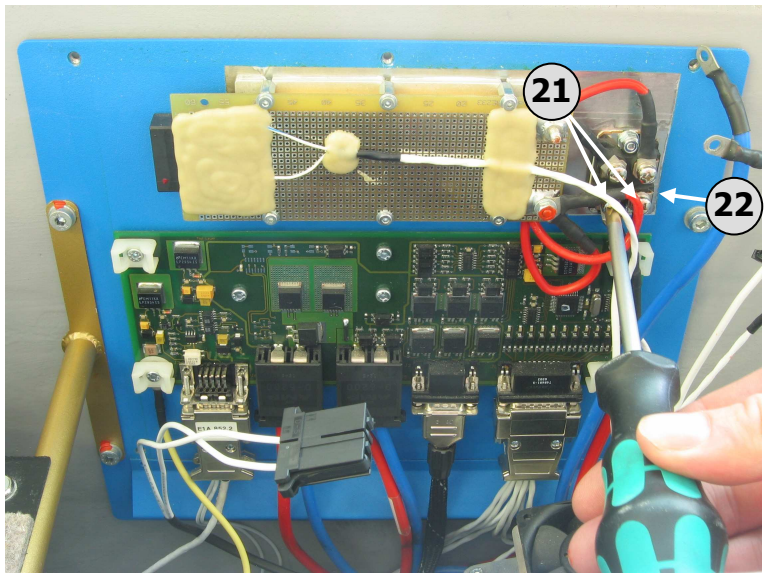
Follow the switching cable (17) to the inline connector (18), and disconnect said connector. If the connector is covered by heat shrink tube, then remove this tube before proceeding to disconnect. Some aircraft have the connector directly on the DC/DC converter PCB. If this is the case, then disconnect the cable here.

i. Disconnect the minus cables:



Use a 7mm wrench or socket to disconnect the minus cables (19) from the topmost terminal on the DC/DC converter PCB (20). If the white cable is unmarked or not clearly marked, mark the cable to indicate minus using a black or blue permanent marker.

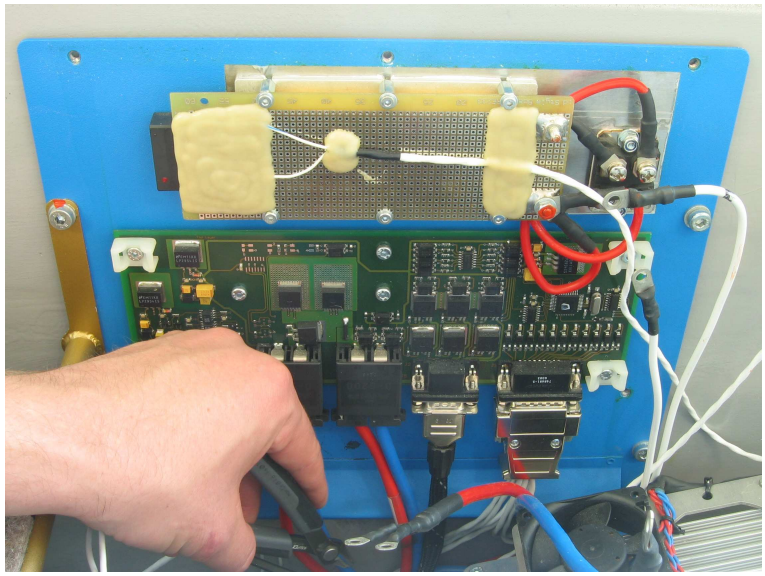
j. Disconnect 12 V cables



Use a Philips-head screwdriver to disconnect the 12V cables

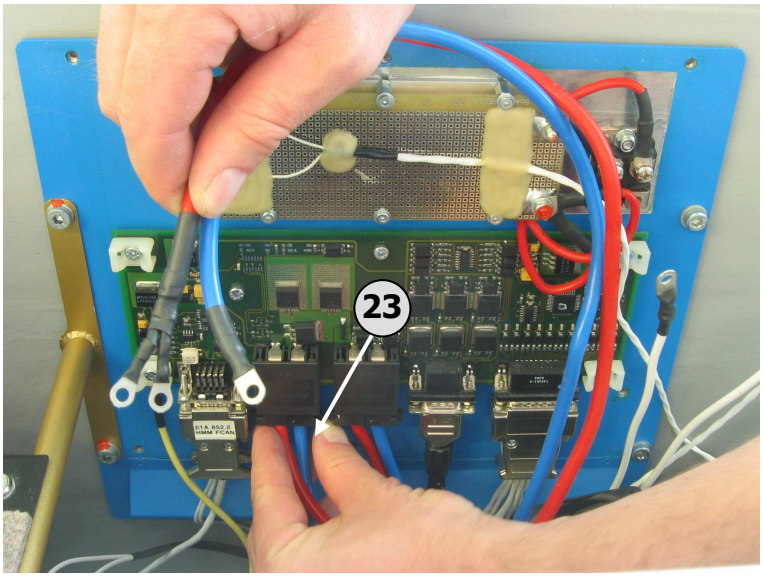
(21) from the two lower terminals (21) of the protective diode (22). If the white 12V cable is not marked, then mark this using a red permanent marker.

k. Untie the lower cable bundle:



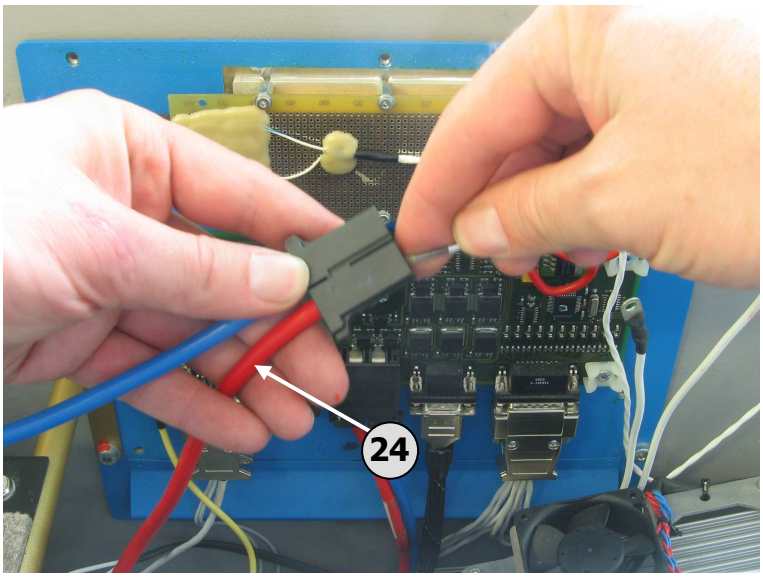
Use a pair of side cutting pliers to cut open and remove the cable-ties holding the cable bundle passing underneath the HMM together. The DC/DC converter is now electrically completely disconnected from the rest of the system.

l. Remove 12V supply connector:



Remove the 12V supply connector (23) from the socket on the HMM PCB (leftmost black socket in picture). To release the connector press both securing latches together and keep them pressed while connector housing is pulled out of the socket.

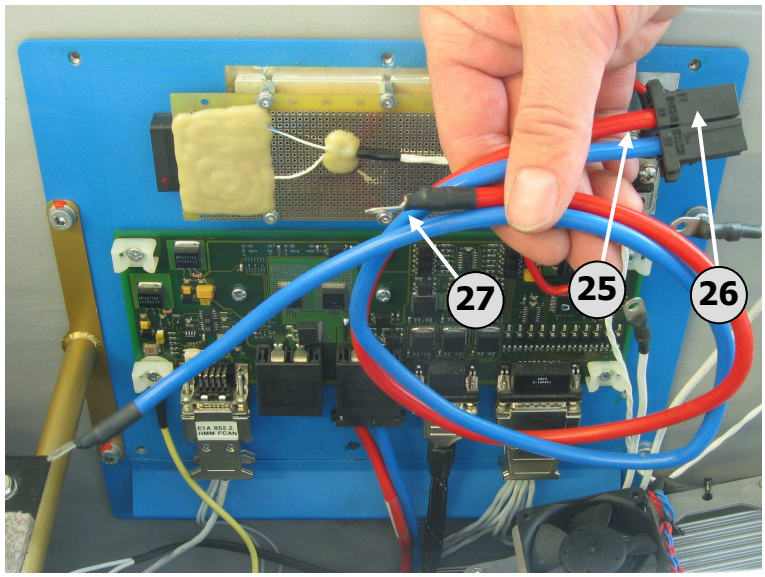
m. Disassemble the 12V supply cable:



Remove the red 12V cable form the 12V supply connector.

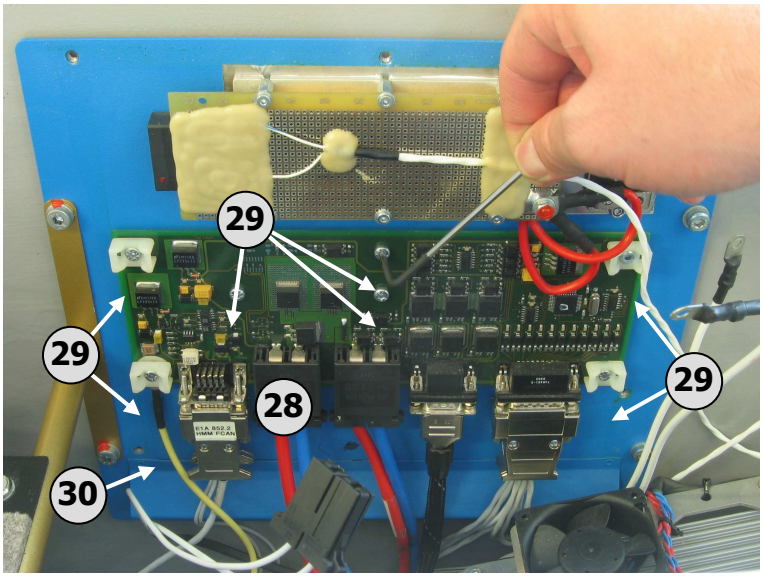
Insert a small slotted screwdriver into the connector housing and press the securing latch down and away from the connector. While doing so, gently pull the connector out of the connector housing.

n. Modify and reassemble the 12V supply cable:



Insert the new red cable found in the TN-kit (25) into the now free plug-in position 1 (26). Make sure that the securing latch engages the connector so that it can no longer be pulled out of the connector housing.

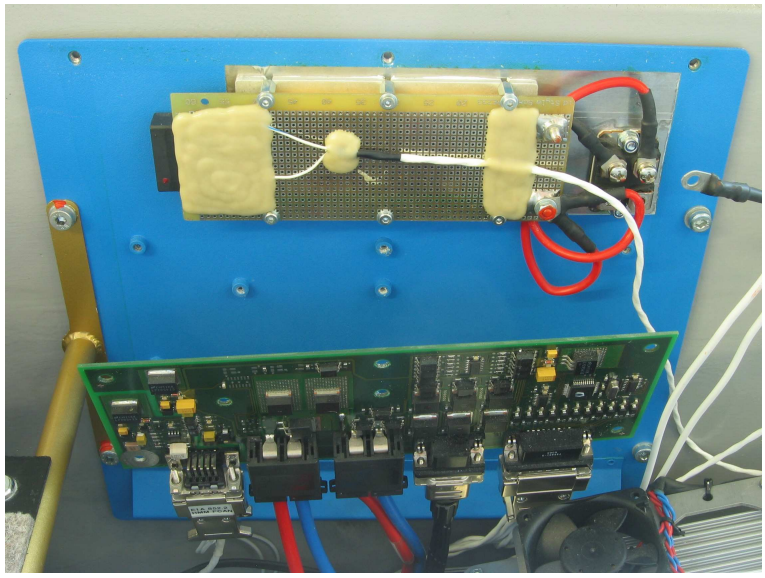
o. Reinstall the 12V supply cable:



Re-insert the 12V supply connector (28) into the socket on the HMM PCB. Make sure that the securing latches engage the socket so that the connector can no longer be pulled out of the socket.

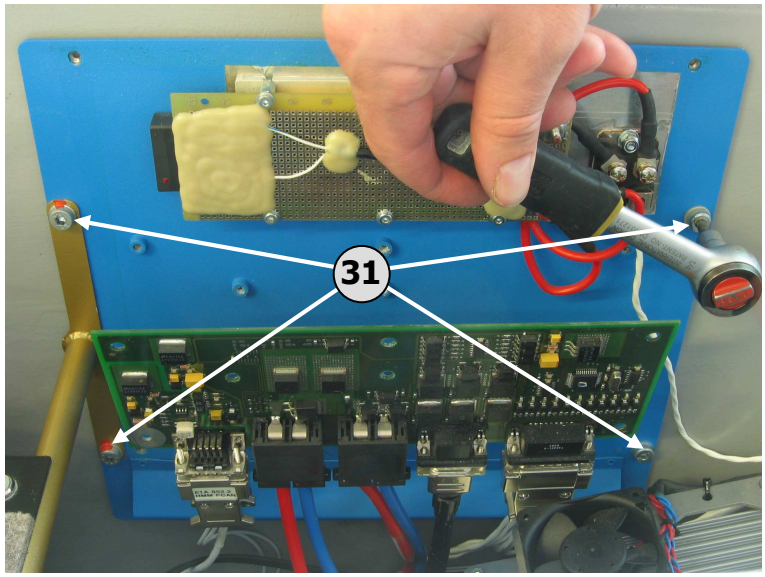
p. Disconnect the HMM PCB:
Use a 2.5 mm Allen wrench to remove the seven M4-Screws (29) that connect the HMM-PCB to the base plate. Store the screws and the yellow grounding cable (30).

q. Intermediate state:



The HMM PCB has now been completely separated from the base-plate and the DC/DC converter.

r. Disconnect base-plate:



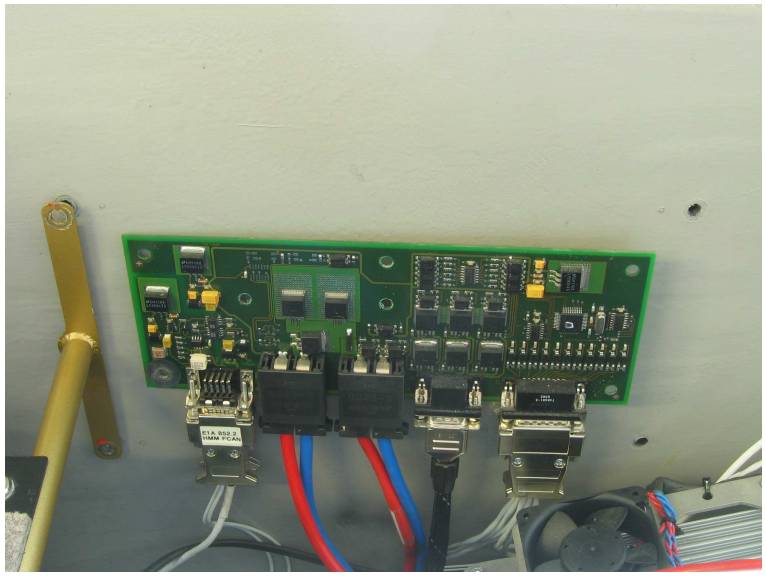
Use a 5 mm allen wrench to remove the four M6-Screws (31) that fix the base-plate to the motor-bay wall.

Note that two washers are installed between base-plate

and motor-bay wall at each screw. Do not lose these washers!

Store the screws and the washers.

s. Remove the base-plate:

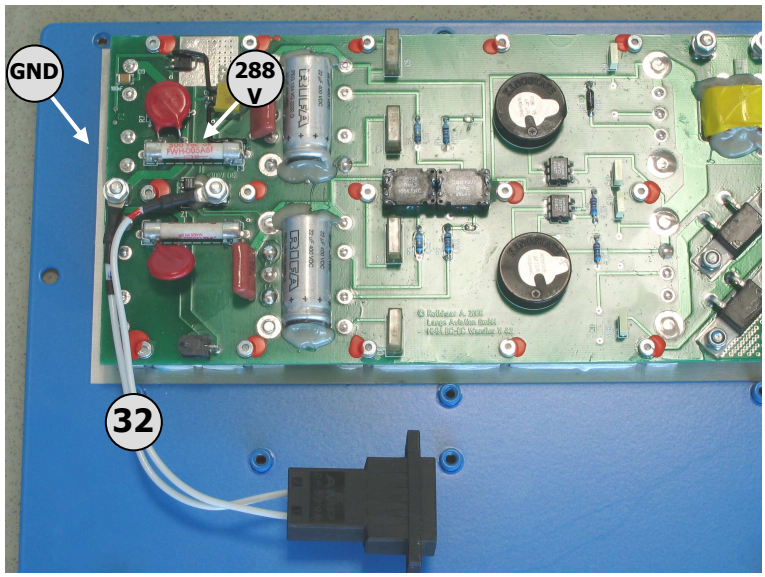


Remove the base-plate including the old DC/DC converter.

5. Installation of the new DC/DC converter:
When the new DC/DC converter is installed, two options are given: Either modify the 288V supply cables, or use an adapter cable. If the correct crimping tool is available, then it is advised to modify the cable. This corresponds to the build state of new aircraft.

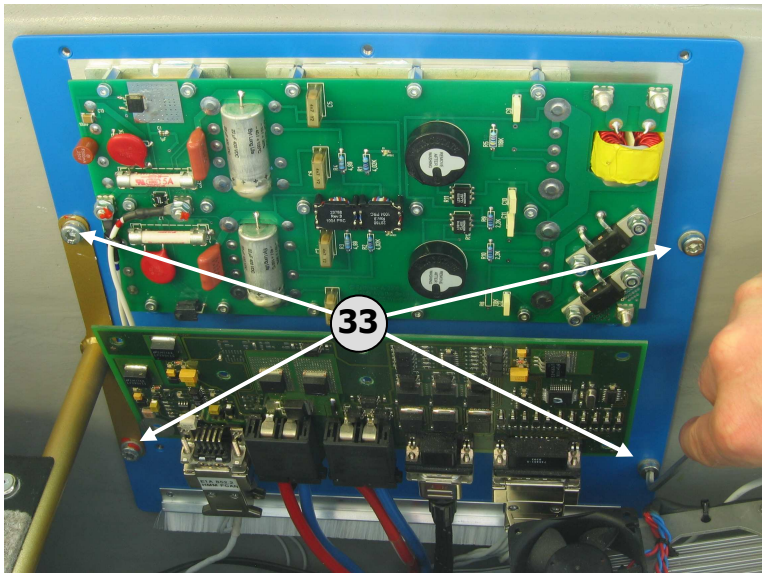
a. Record the Part No. Of the new DC/DC PCB on the "Protocol" form (at the end of this TN).

b. Install 288V adapter cable. (Skip if Crimping tool for ring lug 4 mm / AWG 14 - DIN 46225 Form A is available)



Now install the 288V adapter cable (32). position the cables on the terminals and route the cables as shown on the picture above. The cable with the red markings connects the plus terminal to the right with position 1 on the inline connector. The cable with the black markings connects the minus terminal to the left with position 2 on the inline connector. Apply Loctite 243 (blue) to the M4 nuts before installing them, and use a 7mm wrench or socket. Be careful not to apply too much torque to the nuts, as this can lead to the thread of the terminals to shear off. Apply inspection lacquer to the nuts.

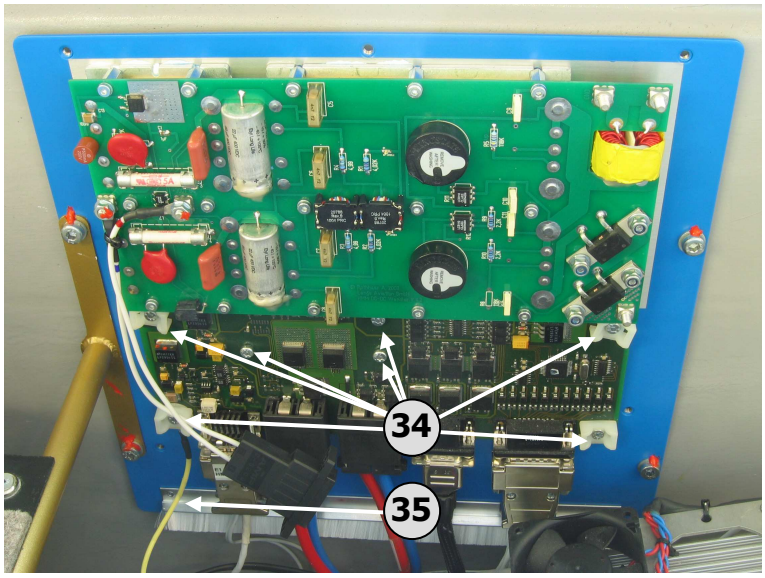
c. Install the new base-plate with DC/DC converter:



Slide the new base-plate with DC/DC converter into position between motor-bay wall and the transverse shaft of the propeller blade catcher.

Apply Loctite 243 to the four M6 screws that were removed in procedural step 4.r (33). Use these to mount the base-plate to the motor-bay wall, starting with the two screws on the right (aft of aircraft). Note that, at each screw, two washers must be installed between base-plate and motor-bay wall.
Apply inspection lacquer to the screws.

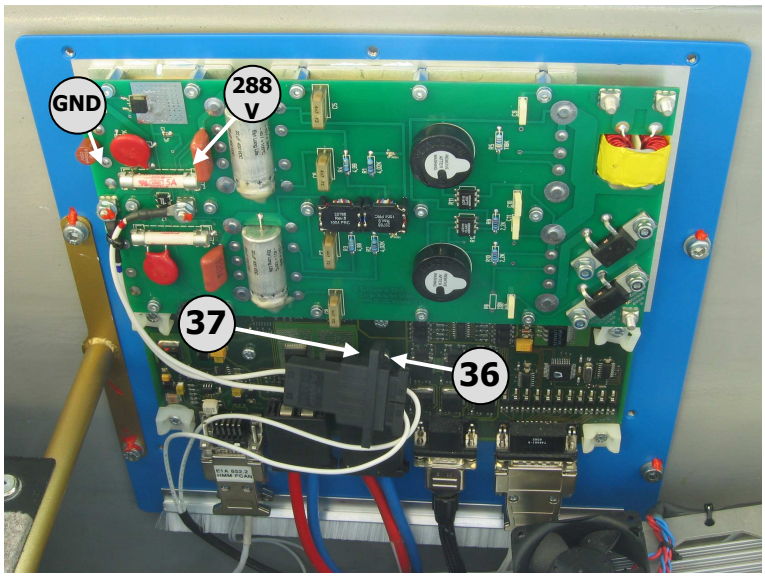
d. Install the HMM-PCB:



Apply Loctite 243 to the seven M4 screws that were removed in procedural step 4. p (34). Use these to mount the HMM-PCB to the base-plate.
Apply inspection lacquer to the screws.

Note that the four leftmost and rightmost screws must be equipped with cable-tie holders before being installed, and that the yellow grounding cable (35) must be installed between PCB and cable-tie holder in the bottom left corner.

e. Connect the 288V supply cable (Skip if Crimping tool for ring lug 4 mm / AWG 14 - DIN 46225 Form A is available):

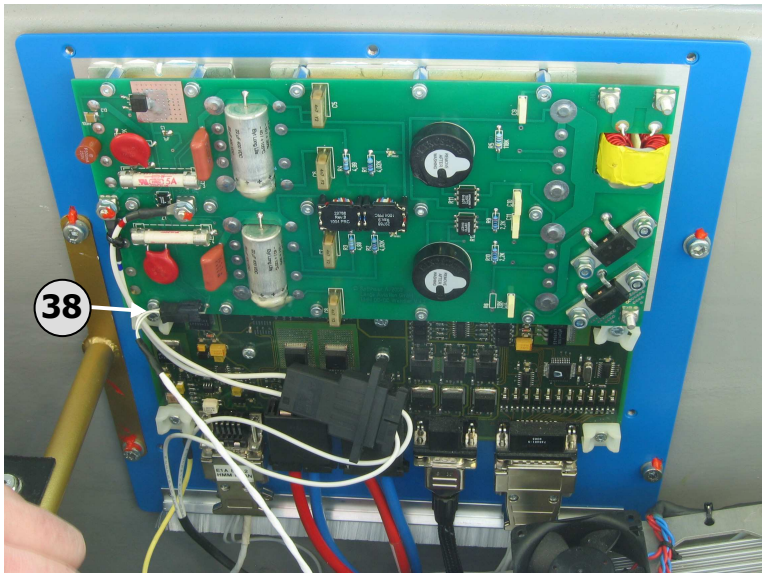


Insert the 288V connector that was disconnected in procedural step 4.d into the 288V adapter-socket (37), which hangs down from the DC/DC converter PCB. Make sure that the securing latches engage the socket so that the connector can no longer be pulled out of the socket.

f. Modify and connect 288V supply cable (Only if Crimping tool for ring lug 4 mm / AWG 14 - DIN 46225 Form A is available):

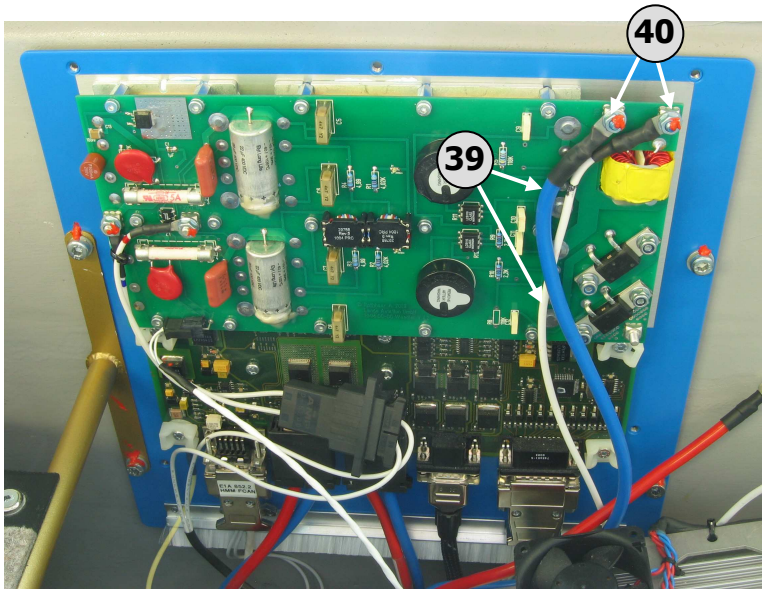
As an alternative to procedural steps 4.b and 5.e, it is possible to equip the 288V supply cable directly with 4 mm ring lugs. If this is done, then it is very important to ensure that the 288V cable (connector position 1) and the 0V cable (connector position 2) are unmistakably marked and correctly connected. This corresponds to the build state of new aircraft.

g. Connect the switching cable:



Connect the switching cable (38) that was disconnected in procedural step (4.h) to the fitting socket on the DC/DC converter PCB. Make sure that the securing latch engages the socket so that the connector can no longer be pulled out of the socket.

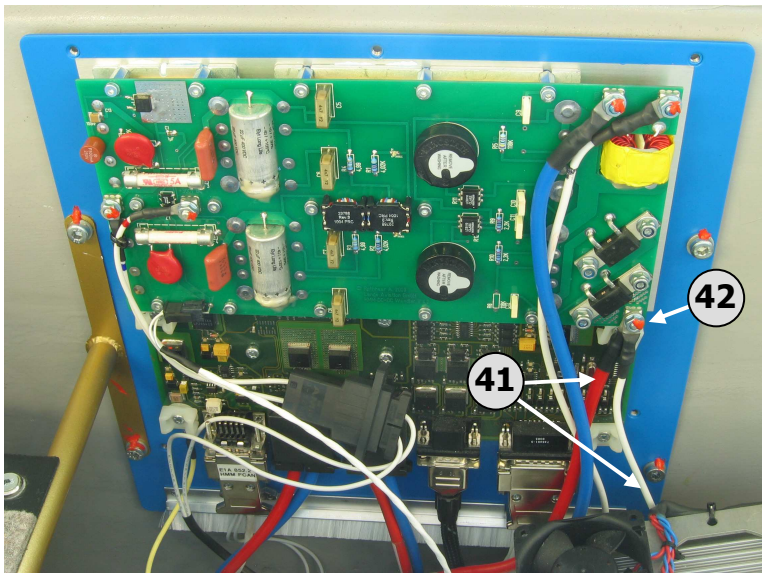
h. Connect the minus cables:



Connect the minus cables (39) that were disconnected in

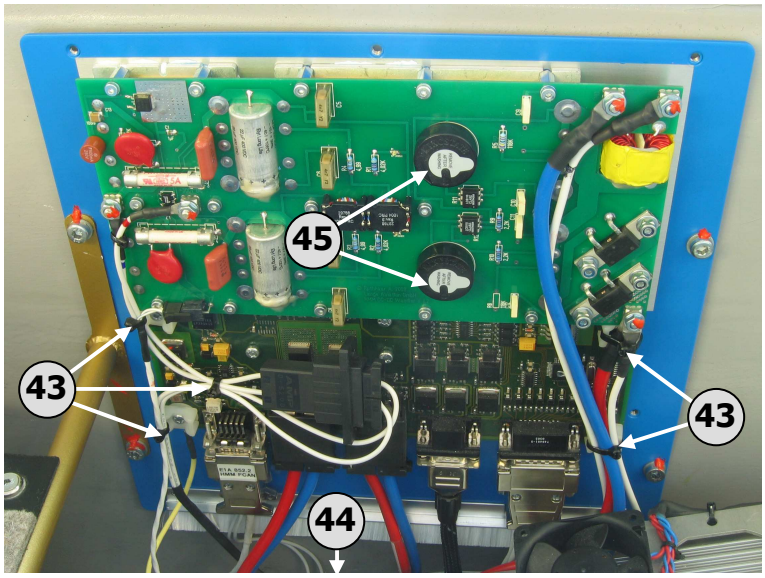
procedural step 4.i to the two top right terminals (40)on the DC/DC converter PCB as shown on the picture above. Apply Loctite 243 (blue) to the M4 nuts before installing them, and use a 7mm wrench or socket. Be careful not to apply too much torque or pressure, as this can lead to the thread of the terminals to shear off or damage to the PCB. Apply inspection lacquer to the nuts.

i. Connect the 12V cables:



Connect the minus cables (41) that were disconnected in procedural step 4. j to the two top right terminals (42) on the DC/DC converter PCB as shown on the picture above. Apply Loctite 243 (blue) to the M4 nuts before installing them, and use a 7mm wrench or socket. Be careful not to apply too much torque or pressure, as this can lead to the thread of the terminals to shear off or damage to the PCB. Apply inspection lacquer to the nuts.

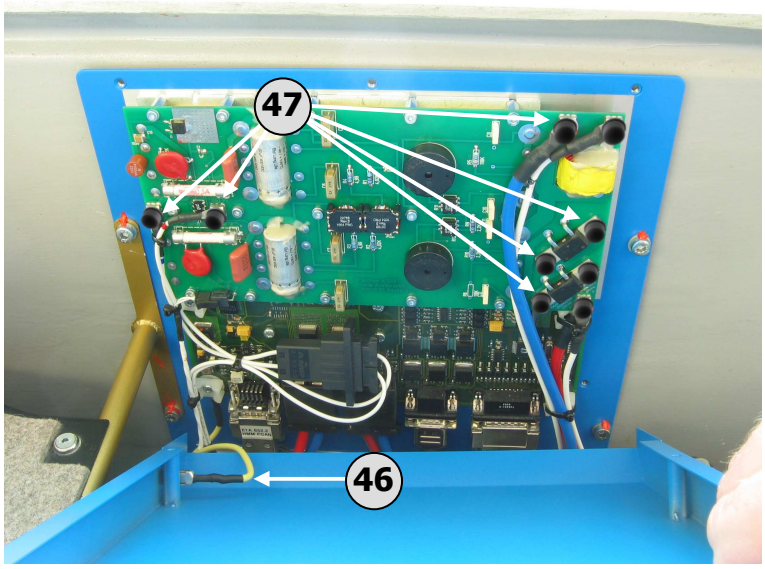
j. Define the cable routing:



Use the cable ties (43) from the TN kit to fix the cable routing as shown in the picture above. Also use cable ties to fix the cable bundle (44) that was loosened in procedural step 4.k.

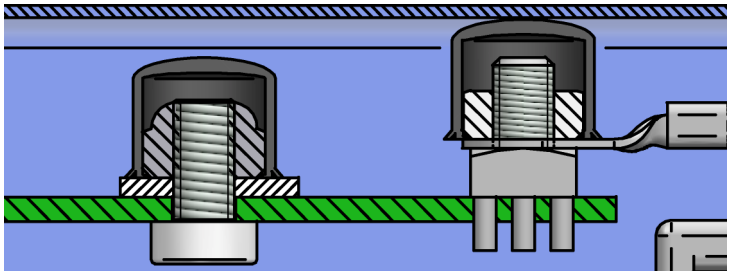
k. Remove the two stickers (45) that protect the buzzers against dirt.

l. Reconnect the grounding cable:



Reconnect the yellow grounding cable (46) to the cover.

m. Installing insulating nut-covers
Install the 9 black nut-covers supplied with the TN-kit on all M4 nuts (47) found on the top surface of the DC/DC converter PCB.



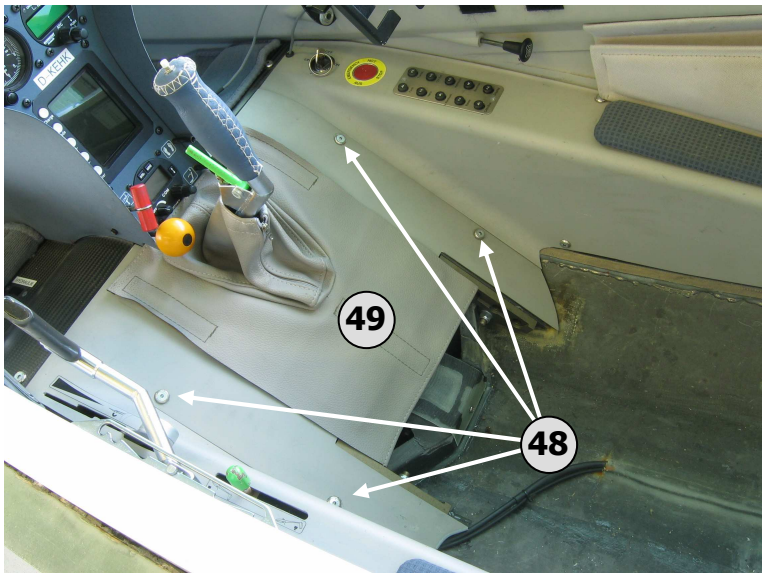
n. Apply Loctite 243 to the five M4 screws that were removed in procedural step 3. 0. Use these to mount the cover to the base-plate.
Apply inspection lacquer to the screws.

Attention: Care must be taken to ensure that no cables are squeezed during the assembly.

6. Modification of switching cables up front:
The switching cable has to be modified to work so that the new DC/DC converter can be switched over the key-switch or the emergency-off switch.

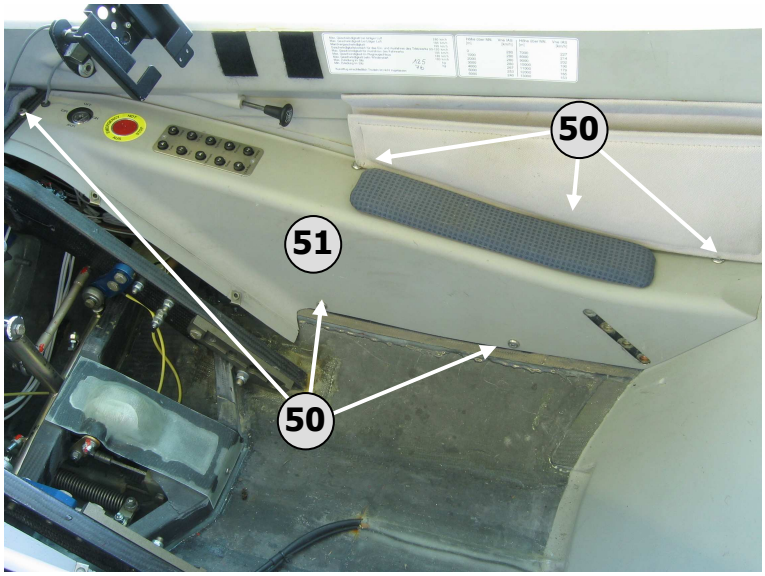
a. Remove the seat-pillow and the seat-pan including the back-rest.

b. Remove the upper leg-rest:



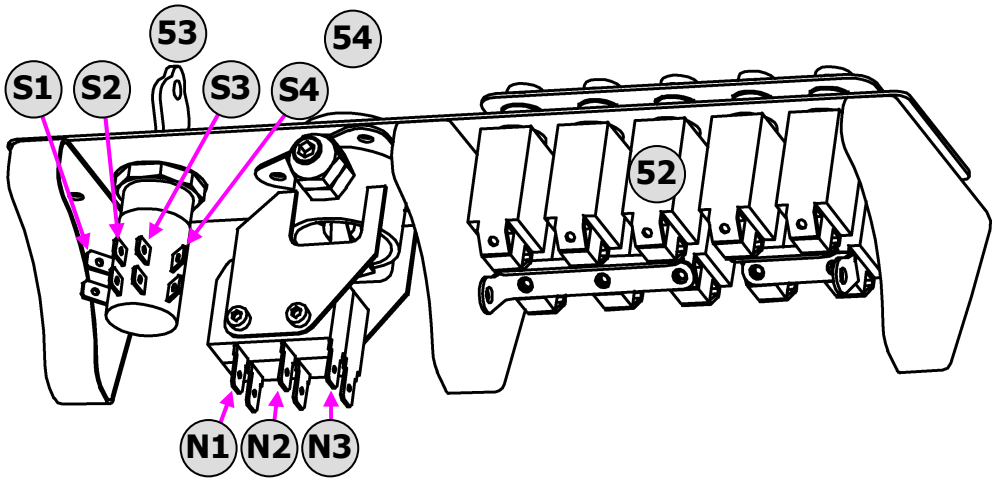
Use a 3 mm Allen wrench to remove the four M5 countersunk screws including collars (48) that are used to mount the upper leg-rest (49). Put the screws aside. Remove the upper leg-rest as well as the leather stick-cover.

c. Remove the side panel:



Use a 3 mm Allen wrench to remove the six M5 countersunk screws including collars (50) that are used to mount the side panel (51). Put the screws aside. Remove the side panel.

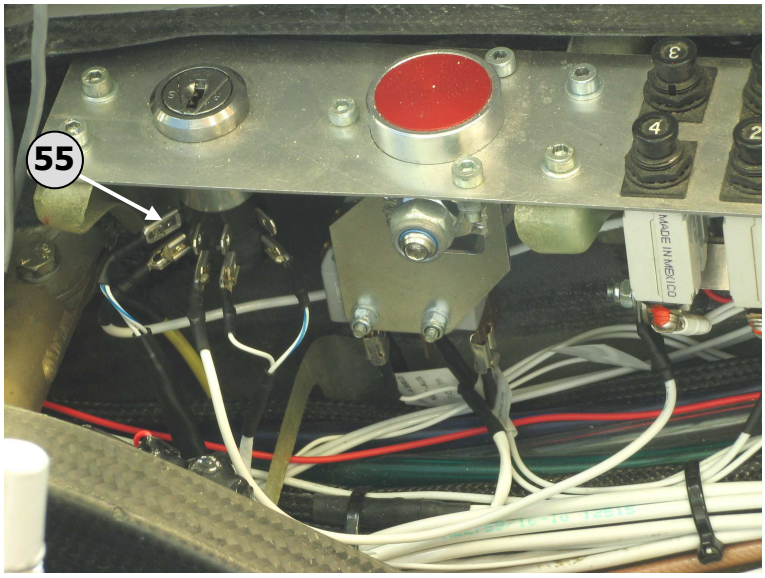
d. Remove the switching cable from the key-switch:



Next to the circuit breakers (52), the now accessible circuit breaker panel also contains the key-switch (53) and the emergency-off switch (54). Now remove the two cable lugs

from key-switch terminals (S3) and (S4). Squeeze the locking tab to release the cable lug from the terminal. In order to perform procedural steps d, e, f, g and h, it may be necessary to remove some cable-ties.

e. Modify and re-install the switching cable at the key-switch:

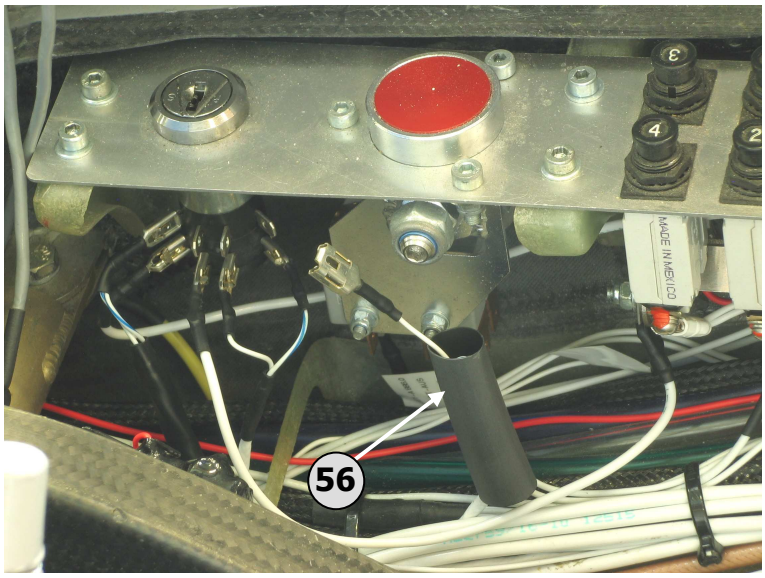


Fold the cable lug with the white wire back along the main cable and insulate it as follows: Slide one of the two 5 cm heat shrink tubes, (found in the TN kit) over the cable so that said cable lug is fully covered, and use a hot air gun to shrink the tube. Install the remaining cable lug with the blue striped wire (55) on key-switch terminal (S1).
Pull lightly on the cable lug to check for proper locking. It may be necessary to turn the lug so that it faces the opposite direction.

f. Remove the switching cable from the emergency-off switch:

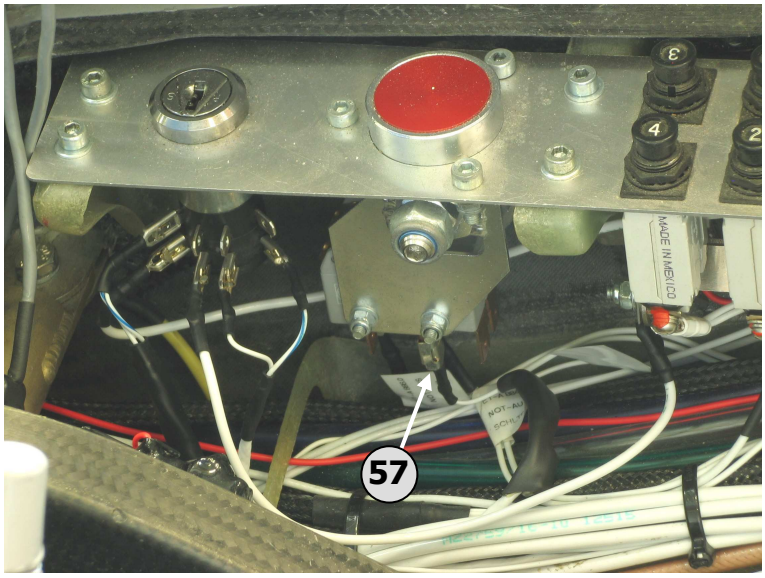
Disconnect the two cable lugs from emergency-off switch terminals N1 and N3. Squeeze the locking tab to release the cable lug from the terminal.

g. Modify the emergency-off switch switching cable:



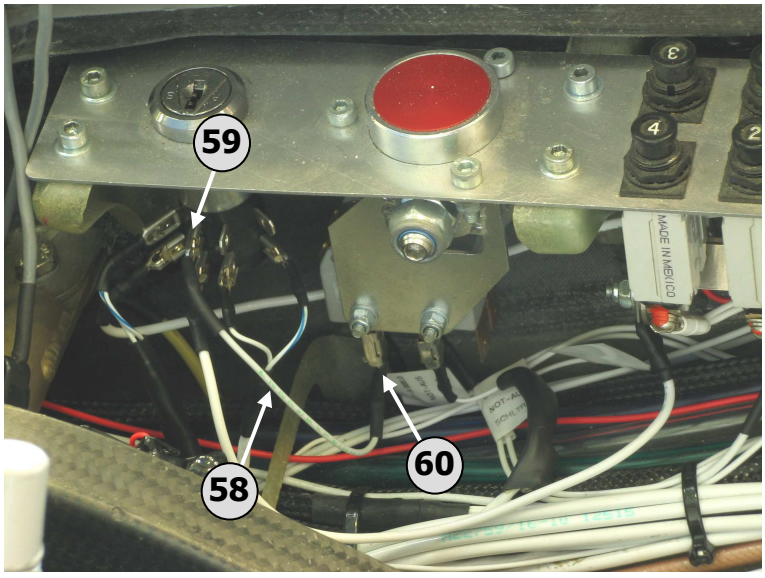
Fold the cable lug with the with the blue striped wire back along the main cable. Slide the second 5 cm heat shrink tube (56) over the cable so that said cable lug is fully covered, and use a hot air gun to shrink the tube.

h. Connect switching cable to the emergency-off switch:



Install the remaining cable lug (57) with the white wire on emergency-off switch terminal (N2).
Pull lightly on the cable lug to check for proper locking.

i. Install the switching cable bridge:



locate the white bridge-cable (58) in the TN kit, and use it to connect key-switch terminal (S2) with emergency-off switch

terminal (N1). Pull lightly on the cable lugs to check for proper locking. It may be necessary to turn a lug so that it faces the opposite direction.

j. Reverse procedural steps (6.c-a) to re-install the cockpit interior.

7. Final functional test:

a. Reconnect both drive battery connectors.
b. Insert and turn the keys-witch to the position “on”. Wait until the system has completed booting
c. Install a clamp ammeter around one of the two cables going to the hydraulic pump, and connect the meter to an oscilloscope with trigger function. Run the pump shortly (retract the landing gear or similar). The highest current peak occures within the first 150 ms of pump operation, and may not exceed 80A. If a peak current above 80A is observed, then the procedure must be stopped, and Lange Aviation GmbH must be contacted.
d. Record the peak current on the “Protocol” form (at the end of this TN).
Use the single lever control to fully extend and retract the motor three times. Observe the common housing of the DC-DC converter and the Hydraulic Management Module while these operations take place. If no abnormalities can be detected, the modification is concluded. Contact manufacturer if any abnormalities are detected.

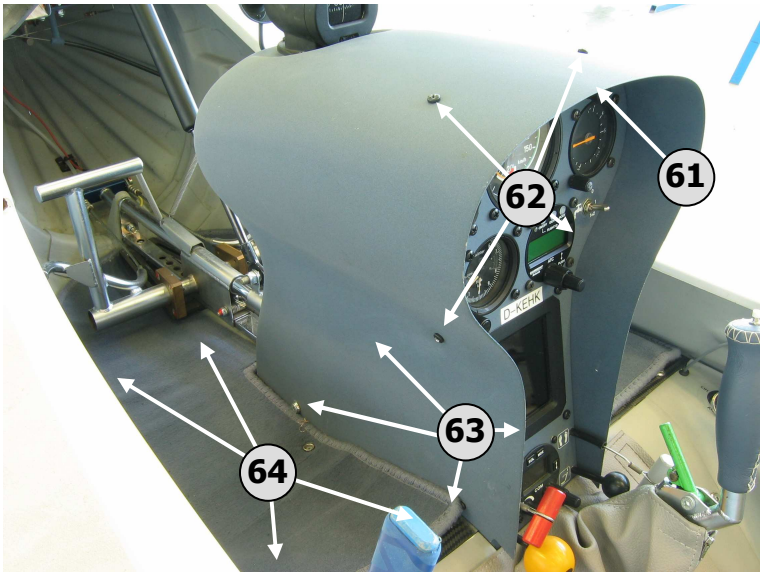
8. Instruction of pilots/exchange of flight manual pages:

The owner of the aircraft must ensure that all people flying the aircraft are made aware of this Technical Note prior to their next flight. The flight manual pages that were inserted as a part of TN 904-2-1 must be removed, and the new pages that belong to the TN kit must be installed.

TN 904-2 Level 3: The installation of a maintenance socket with a bridging function (optional).

1. Measure the forward system voltage, and then disconnect all power sources:
   a. Connect both drive battery connectors, either at the wing root or through the “trailer charge” connector.
   b. Disconnect the 230 /110V power-grid connector from its socket in the forward bulkhead.
   c. Switch the aircraft on using the key-switch. Wait until the system has finished booting.
   d. Select the flight screen.
   e. Read the systems voltage, and record it on on the “Protocol” form (at the end of this TN).
   f. Use the key-switch to switch the aircraft off. Remove the key. Wait until the aircraft has finished shutting down
   g. Disconnect both drive battery connectors.
   h. Disconnect the “trailer charge” connector.

2. Remove the instrument console cover:



   a. First remove the turn knob for the mirror control (61) as well as the nut below. Put these aside.
   b. Use a philips head screwdriver to remove the four raised head M4 screws in black anodized aluminum (62). Put the screws aside.

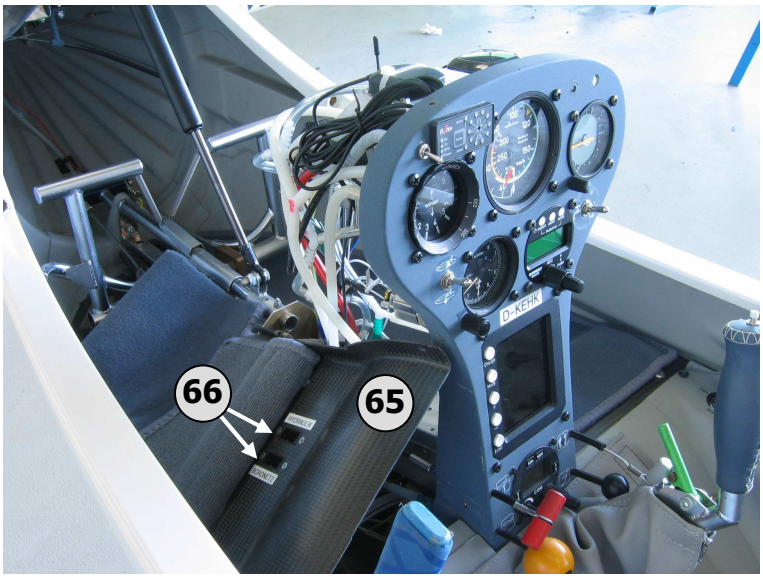
c. Use a 3 mm Allen wrench to remove the four M5 countersunk screws including collars (63). Put the screws aside.

d. Remove the instrument panel cover by first tilting it forward and then lifting it up

3. Remove the lower leg-rest containing the old maintenance sockets:

a. Unfasten the lower leg-rest:
Use a 3 mm Allen wrench to remove the four M5 countersunk screws including collars (64). Put the screws aside.

b. Make the maintenance cables accesible:



Tilt the lower leg-rest (65) so that it's underside becomes accessible for further work.

c. Make sure that the sockets are clearly marked before removing them from the floor panel. Using a 2 mm Allen wrench, remove the four M3 countersunk screws that connect the old maintenance sockets "Hydraulics" and "System" (66) to the lower leg-rest.

4: Modify lower leg-rest:

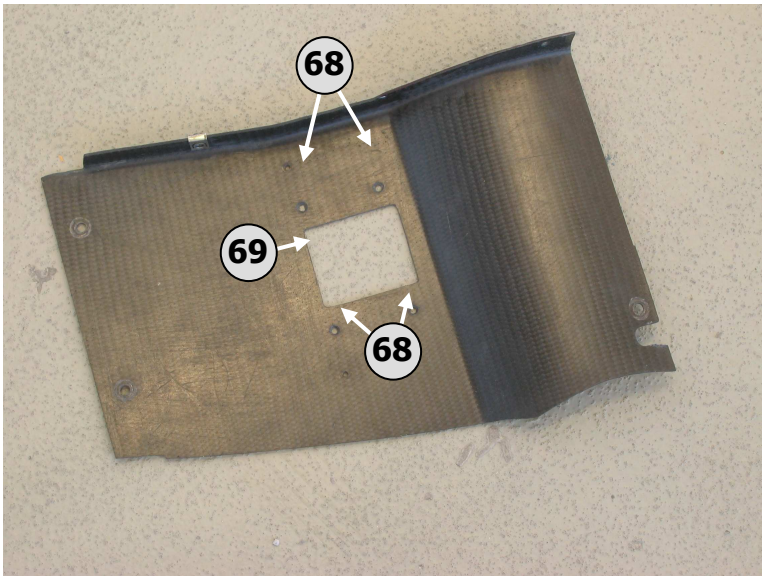
a. Apply the cutout mask:

Remove the lower leg-rest from the aircraft and use tape to position the attached cutout-mask (67) so that the following criteria are fulfilled:

1. The cutout for the maintenance socket covers both old maintenance socket cutouts including screw holes.
2. All four ∅ 4,3 mm countersunk holes are located on the flat surface of the lower leg-rest.
3. The contour of the maintenance hatch does not overlap the two screws or rivets that fix the carpet to the lower leg-rest.
4. The maintenance socket connectors face away from both trim and elevator/aileron controls.

b. Transfer the positions of the four countersunk holes and the cover cutout to lower leg-rest. This may be achieved by using a sharp knife.

c. Drill the countersunk holes:



Drill and countersink the four ∅ 4.3 mm holes (68). If required, then remove the carpet first..

d. Create the cutout:
Create the cutout for the maintenance hatch (69).

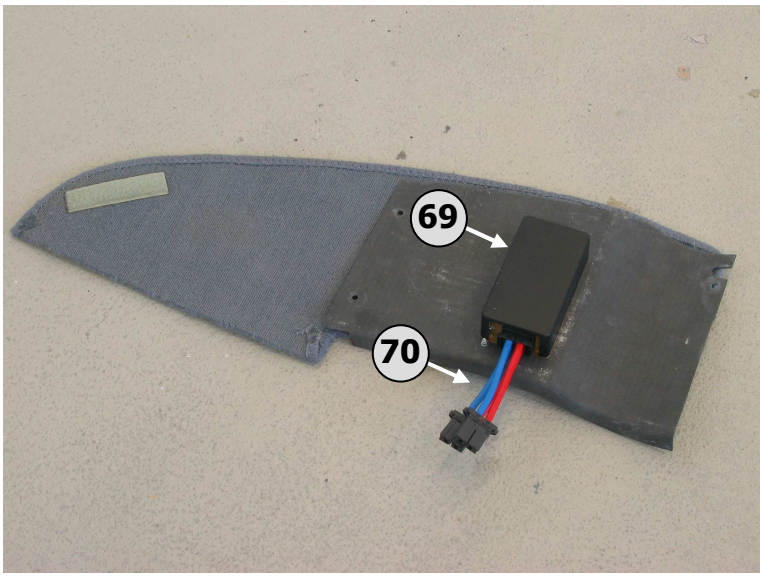
e. Reinstall the carpet:
If the carpet had to be removed, then reinstall it.

4: Install the maintenance socket:

When the maintenance socket is installed, two options are given: Either modify maintenance cables, or use an adapter cable. If the correct crimping tool is available, then it is advised to modify the cables. This corresponds to the build state of new aircraft.

a. Record the component number of the maintenance socket on on the “Protocol” form (at the end of this TN).

b. Install the maintenance socket onto the lower leg-rest:



Position the new maintenance socket (69) underneath the lower leg-rest. Make sure that the cover opens and closes easily. Apply Loctite 243 to the four M4 countersunk screws, and then use an Allen wrench to attach the maintenance socket to the lower leg-rest. Apply inspection lacquer to the screws.

c. Modify the maintenance cables (Only if Crimping tool for D5M / AWG 10-12 is available.):
Make sure that the single wires of the maintenance cables are clearly marked. Cut the cables just behind the old maintenance sockets. Equip each wire end with a connector of type D5M for AWG 10-12. Locate the 4 pole D5200 connector housing in the TN kit. Insert the connectors into the connector housing according to the table below.

Wire	Connector position
Hydraulik +12 V	A1
Hydraulik 0 V	A2
System +12 V	B1
System GND	B2

Make sure that the securing latches of the connector engage so that it can no longer be pulled out of the connector housing.

d. Install the adapter cable (Skip if Crimping tool for D5M / AWG 10-12 is available.):
Insert the adapter cable (70) into the socket on the side of the maintenance socket housing. Make sure that the securing latches engage the socket so that the connector can no longer be pulled out of the socket.

e. Position the lower leg-rest in the aircraft so that further work underneath the leg-rest is possible.

f. Connect the maintenance socket with system and hydraulic powersupplies (Only if Crimping tool for D5M / AWG 10-12 is available.):
Insert the 4-pole connector that was installed in procedural step (4. c) into the connector on the side of the maintenance socket housing. Make sure that the securing latches engage the socket so that the connector can no longer be pulled out of the socket.

g. Connect the maintenance socket with the system powersupply (Skip if Crimping tool for D5M / AWG 10-12 is available.):
Insert the upper pair of adapter-cables into the connector marked „System". Make sure that the securing latches engage the socket so that the connector can no longer be pulled out of the socket.

h. Connect the maintenance socket with the hydraulics powersupply (Skip if Crimping tool for D5M / AWG 10-12 is available.):
Insert the lower pair of adapter-cables into the connector marked „Hydraulics". Make sure that the securing latches

engage the socket so that the connector can no longer be pulled out of the socket.

i. Position the lower leg-rest correctly in the aircraft. Make sure that the maintenance cables cannot get into any controls. If necessary, use cable-ties to fix the cable routing.

j. Reverse Procedural steps 3 and 2 to reinstall all interior panels.

5. Final functional test:

a. Connect both drive battery connectors, either at the wing root or through the “trailer charge” connector.

b. Disconnect the 230 /110V power-grid connector from its (blue) socket in the forward bulkhead.

c. Switch the aircraft on using the key-switch. Wait until the system has finished booting.

d. Select the flight screen.

e. Record the displayed systems voltage on the “Protocol” form (at the end of this TN).
If the systems voltage is higher than measured in procedural step (1.e), then contact the manufacturer before proceeding with the TN

7. Instruction of pilots / Change of flight manual pages:

The owner of the aircraft must ensure that all pilots are informed about the TN before next start..

8. Send the protocol to the manufacturer.

Materials: The manufacturer provides a material-kit for this Technical Note, which consists of the following items:

Level 2

1. 1 x DC/DC converter on base-plate
2. 1 x HMM enclosure cover
3. 1 x red cable 12V supply
4. 1 x white switching cable bridge
5. 2 x heat shrink tube
6. 10 x cable ties
7. 1 x adapter cable 288V supply.
8. 9 x insulating nut covers (7mm black)
9. Optional:
    a. 2 x ring-lug 4 mm / AWG 14 - DIN 46225 Form A – brass, zink surface
    b. 2 x ring-lug 4 mm / AWG 14 - DIN 46225 Form A – brass, zink surface
    c. 3 x heat shrink tube
    d. Pos. 3 not required
    e. Pod. 7 not required

Level 3

1. 1 x maintenance socket
2. 1 x Adapter cable
3. Optional:
    a. 4 x Connector D5M für AWG 10-12 – AMP 316040-3
    b. 2 x Connector housing D5200 4-Positions – AMP 1-917807-2
    c. Pos. 2 not required

The material kit can be obtained from the following address:

Lange Aviation GmbH
Brüsseler Str. 30
66482 Zweibrücken
Deutschland

Tel.: ++49 63 32 96 27 0
Fax.: ++49 63 32 96 27 19
e-mail: info@lange-aviation.com

Furthermore the following materials are needed::

- Medium strength threadlocker Loctite 243
- Inspection lacquer (red)

Tools:

- Allen wrenches: 2, 2.5, 3, 4 and 5mm
- A 7 mm wrench
- A pair of side cutting pliers
- A slotted screwdriver (max. 2mm wide)
- A Philips head screwdriver (PH2x100 or similar)
- A drill with a 4.3mm drill bit and a fitting countersinking cutter
- A cutting tool for CFRE
- Permanent markers red and blue
- A Voltmeter (range: 0-300V DC)
- A hot air pistol
- An Oscilloscope with memory and trigger functions. (min. measuring frequency: 25 MHz)
- A Clamp ammeter (for measuring up to 100A) for Oscilloscope. (min. measuring frequency: 25 MHz)
- Optional:
  - A Crimping tool for ring lug 4 mm / AWG 14 - DIN 46225 Form A (for example WZ 25 with insert F6.3-1-2.5 / Knipex 975205 (€124 at RS components)
  - A Crimping tool for ring lug 4 mm / AWG 10 - DIN 46225 Form A
  - A Criming tool for D5M / AWG 10-12 – AMP 234171-1 (€800 at Digi-Key)

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

Minor Change Approval 10033054

Protocol

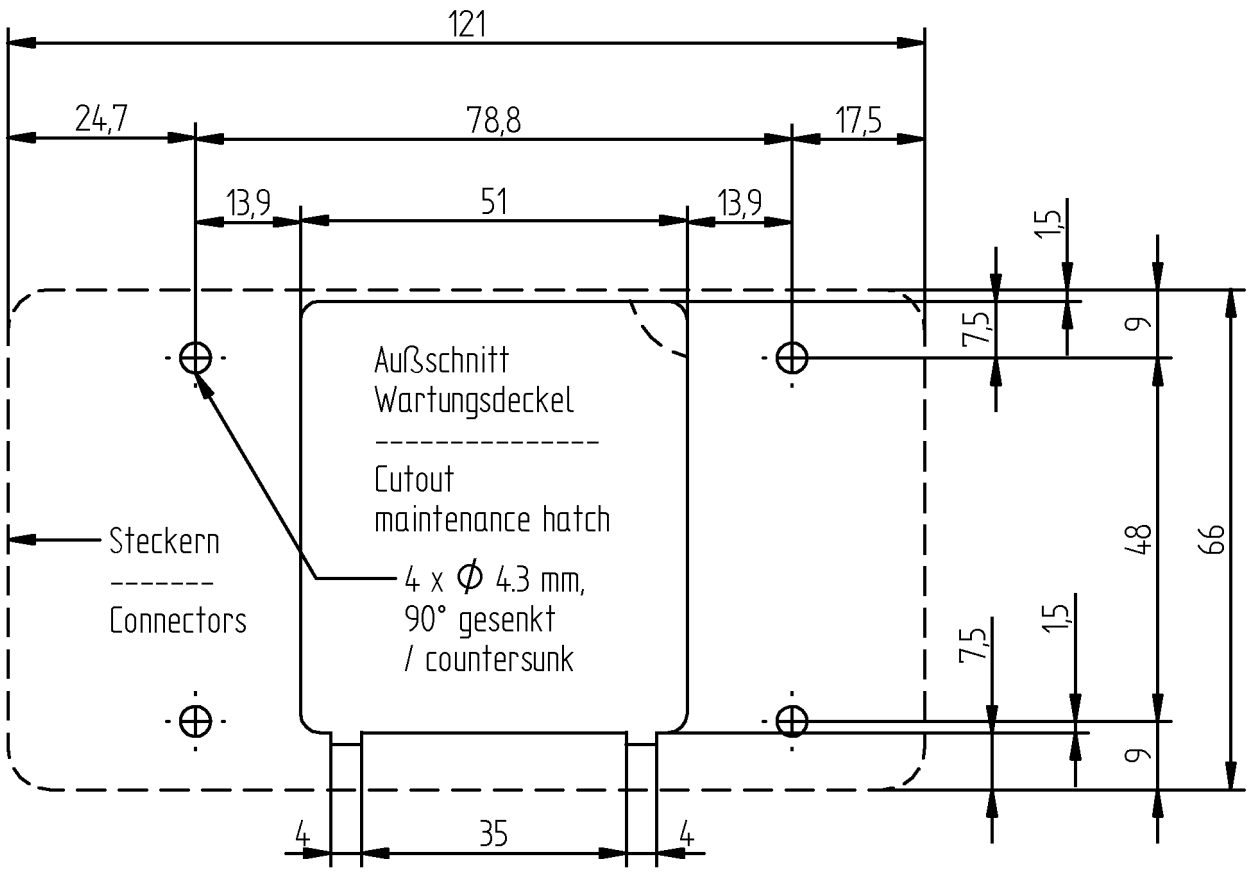
Fill in the form below and send / fax it to the following address:

Lange Aviation GmbH
Brüsseler Str. 30
66482 Zweibrücken
Deutschland

Tel.: ++49 63 32 96 27 0
Fax.: ++49 63 32 96 27 19
e-mail: info@lange-aviation.com

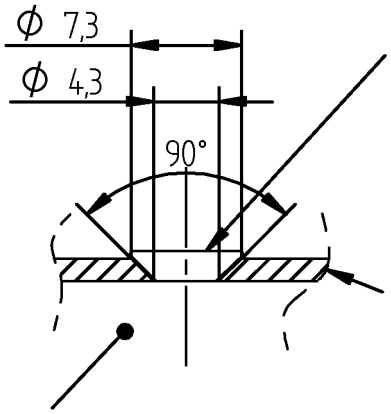
Factory No.:	.....
Reg. No.:	.....
TN 904-2 level 2 completed:	yes / no
Part No. DC/DC converter PCB:	.....
Measeured peak current Hydraulic pump:	.....
TN 904-2 level 3 completed:	yes / no
Part No. maintenance socket:	.....
Systems voltage before modification:	.....
Systems voltage after modification:	.....

....
Signature Date



Querschnitt Senkbohrung

Cross-section of countersunk hole



Achtung:
Drückertoleranzen kann
zum Maßänderungen führen.
Schablone Nachmessen!

Attention:
Printer tolerances can lead
to incorrect measurements.
Measure the printout before use!

European Aviation Safety Agency

MINOR CHANGE APPROVAL

10033054

This Minor 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 (EC) No. 1702/2003 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 Product TC Number : EASA.A.092
TC Holder : LANGE AVIATION GMBH
Model : E1 ANTARES

Description of Design Change:
Technical Note no. 904-2, Levels 2 and 3

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

Associated Technical Documentation:
Technical Note no. 904-2, Levels 2 and 3 or later revisions of the above listed documents approved by EASA.

Limitations:
Serial no: 01 up to 04, 06 up to 12, 14, 17, 18, 19, 22, 23, 25, 26, 28, 32E30 up to 40E38, 42E39, 44E40, 45E41, 47E42, 49E43, 51E44, 53E45, 55E46, 56E47, 58E48, 60E49, 900, 901

See Continuation Sheet(s)

For the European Aviation Safety Agency,

Date of issue: 16.12.2010

European Aviation Safety Agency
Roger HARDY
Certification Manager
General Aviation
Tel: +49 221 89990 4006
roger.hardy@easa.europa.eu

Note:
The following numbers are listed on the certificate:
EASA current Project Number: 0010008574-001