



PRODUCTION SYSTEMS

CTU System

MAINTENANCE MANUAL

BINAR

Binar Production Systems – CTU Maintenance

2019-04-11 ver 1.02 eng

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1. Introduction and system overview

1.1 Introduction

The CTU system is used to perform component connection tests to preassembled car parts. The test objective is to find assembly errors before the parts are assembled in the car. In order to manufacture at low cost, it is very important to keep high quality throughout the whole process and not only assure quality at the EOL, but also at every workstation where assembly is done.

In a modern car, there are a lot of electrical consumers like LEDs, speakers, sensors, switches, outlets and so on. Those components are assembled onto parts like seats, interior door panels, interior roofs, bumpers and cockpits. If one of those sensors, switches etc. is not functioning when the car is checked at the EOL, there is often a major cost to correct it.

The LP335 CTU, Connection Test Unit, is a module that has a standardized electrical interface that may be used to quality assure assembly of electrical harness. The most common method is to power up the components that has been connected to the harness and measure the current consumption. The system can also measure the impedance. For the more intelligent modules connected to the harness, there are three communication channels; CAN, LIN and Serial (RS232), that can be used. Those channels require a specific driver to be developed for each case.

To be able to connect to each harness, a specific cable adaptor must be manufactured. LP335 CTU includes in- and outputs to control LEDs and read a switch in the adaptor. The LEDs can be lit up in the colors green, yellow and red. They will show status to the operator during the test sequence. A switch inside the adaptor is used to verify that the adaptor has been connected to the test harness.

1.1.1 Prepared for the future

The CTU is based on a PCB that is developed together with Volvo Car Tooling. The board contains several features that is used in other equipment sold to Volvo Car. The latest is a new M12 Ethernet port included for future internal service, WEB page for status monitoring and more.

1.2 Components

The components in a CTU system is.

- CTU
- HAU
- Standard cables
- Special cables

1.2.1 CTU

The main part of the CTU System is the CTU. The CTU is connected to the factory network and is acting like an intelligent I/O-node. The interface is either CAN or ProfiNet.



Picture: LP335 – CTU (Connection test unit)

The CTU has 8 connectors at the bottom intended for connection of test objects. In the current version of the CTU only connector 1 to 4 is implemented, Connector 5 to 8 is intended for future usage to communicate with test objects.

In addition, there is one power connector and two bus connectors to connect to the factory network.

In most installations it is not enough with one CTU. When several CTUs is needed or when special cross connections are required a HAU is used.

1.2.2 HAU

One HAU (Harness Adapter Unit) can be connected to four CTUs. Inside the HAU is one printed circuit board (PCB) for every CTU. On this PCB another PCB is fitted. This PCB is called X-CONN-card (Cross Connection), and it is designed for each unique test case.



Picture: LP339 – HAU (Harness Adapter Unit)

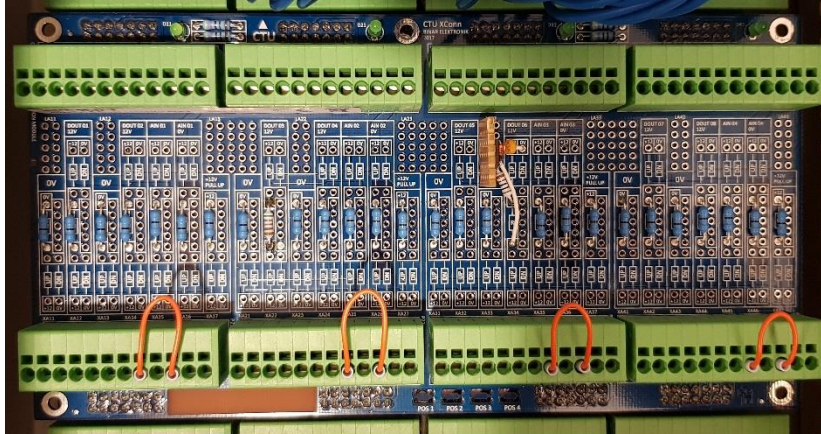


Picture: LP339 interior with one X-CONN-card.

At the bottom of the HAU connectors for the specific cables are mounted. The gland plate is not a standard part, it is made unique for every test case.

1.2.2.1 X-CONN-Card

The HAU contains one X-CONN-card for each CTU connected. The cards may be customized to fit every unique test case, some tests are carried out without modifications to the X-CONN-card.



Picture: X-CONN-card with some modifications

1.2.3 Standard cables

Between each CTU and the HAU four standard cables are used. These cables can be ordered in different lengths; 2m, 5m, 10m or 15m.

The standard cables all have a 12 pin Harting connector in each end.

1.2.4 Specific cables

To be able to connect to the car harness a specific connection adapter has to be manufactured for each specific harness. These adaptors come with a short cable of 1,5 meters. It may be extended by extension cables. We try also to keep the specific cables to follow some standard, thus also these cables are fitted with either a 12 pinned or a 24 pin Harting connector depending on the amount of pins (cables) needed.

Inside the special adaptors a small LED unit is fitted. The LEDs may be used to indicate which connector to use if the test system can handle several variants of test objects. The LEDs are controlled by CTU outputs.



Picture: Specific cable with special adapter.

It is basically up to the factory's programmer to decide how to use the LEDs, but our suggestion is to blink yellow when a connector is supposed to be used. When a connector is correctly connected turn on the green LED and if a connector is connected but not supposed to be, the red LED can be turned on. There are only two outputs from the CTU, red and green. The yellow light is done by turning on both red and green simultaneously.

Another suggestion is to use red and green light to indicate test results.



Picture: Specific cable with 12-pinned Harting.

The picture showing an example of a specific test cable with a 12 pinned Harting (to the left) and a special adaptor to connect to the car harness (to the right).

1.3 Overview



CTU

Standard cables
CTU to HAU
2m, 5m, 10 or 15m

Standard cables
HAU to Adaptor



Optional BiDisp3 for information

CTU

Standard cables CTU to HAU 2m, 5m, 10 or 15m

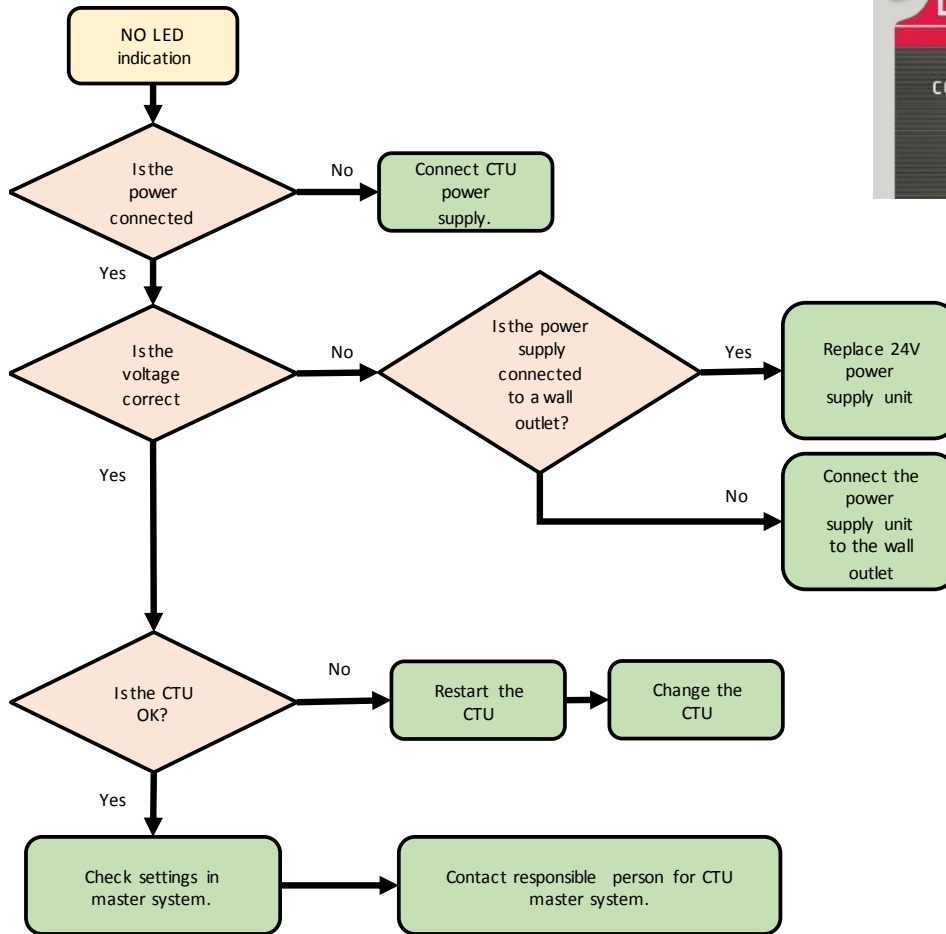
HAU Harness Adapter Unit

2. Fault processing

<i>Fault processing list</i>	
Problem	Action
No LED indication on CTU	Check power supply to CTU, see chapter 3.1
No communication with CTU	Check power supply and bus connection to CTU, see chapter 3.2
No indication in test adaptor	Check cable and perform lamp test from factory system, see chapter 3.3
Bus Error indication on CTU	Check communication cables and factory master system, see chapter 3.2
Test failed	Check limits, special adaptor and specific cables, see chapter 3.4
Test failed, short circuit in test cable	Check test cables, see chapter 3.4
Test failed, Harting cable not connected	Check cables, see chapter 3.4
Test failed, test part (EUT) material	Check if EUT changed, connectors, part numbers, manufacturer

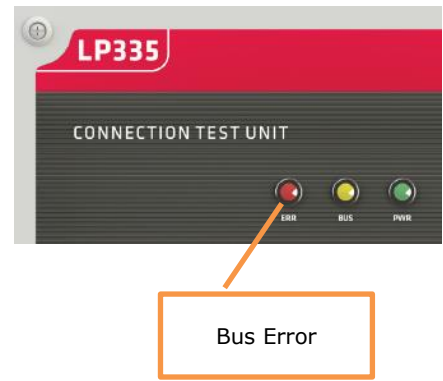
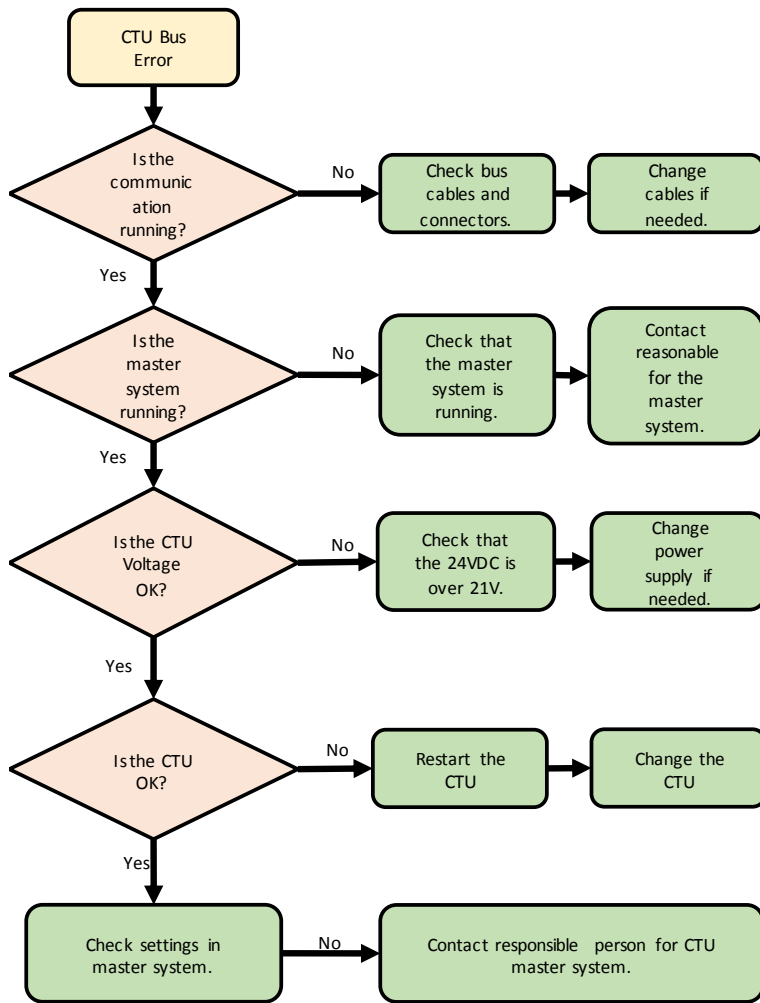
3. Trouble shooting tree

3.1 NO LED indication on CTU

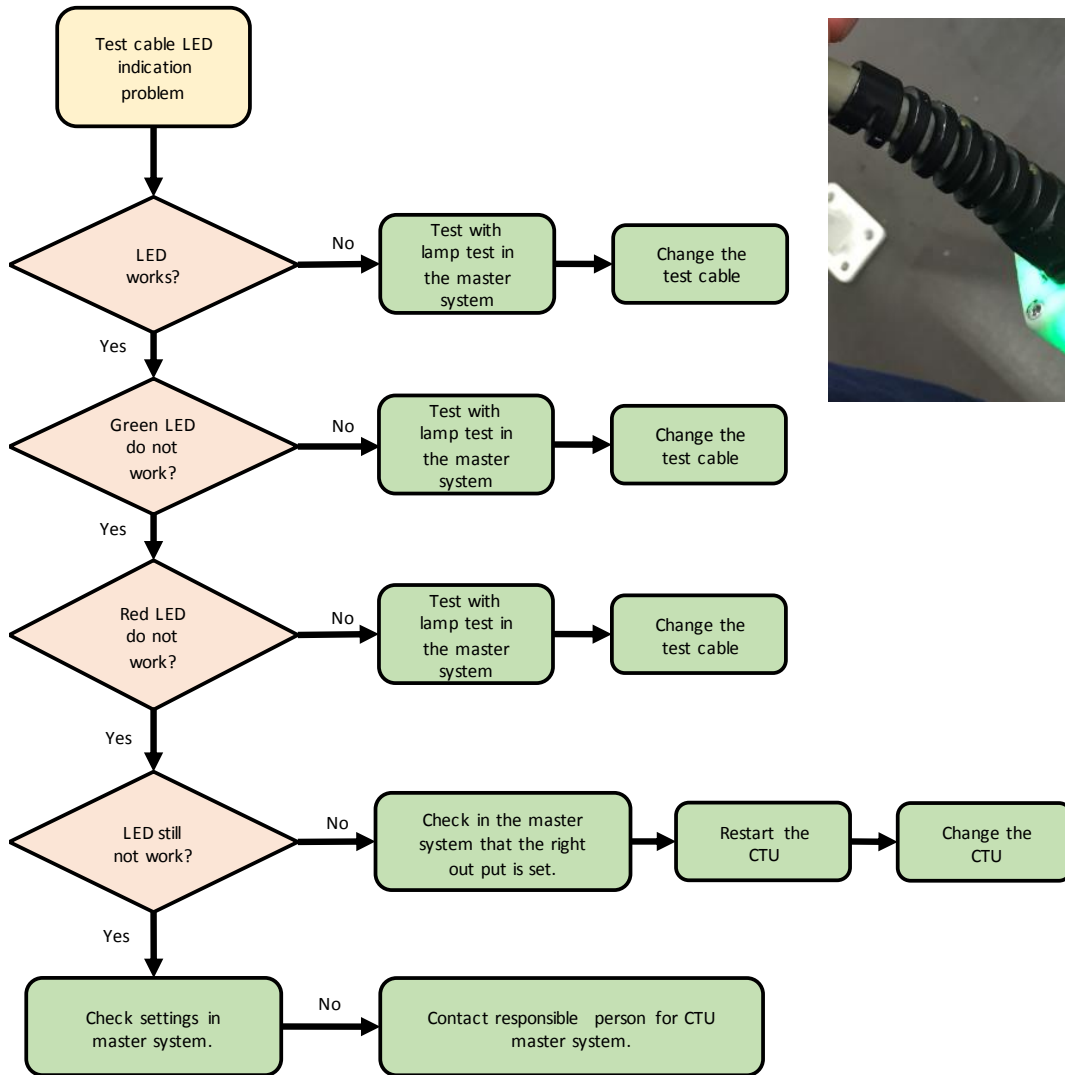


Power

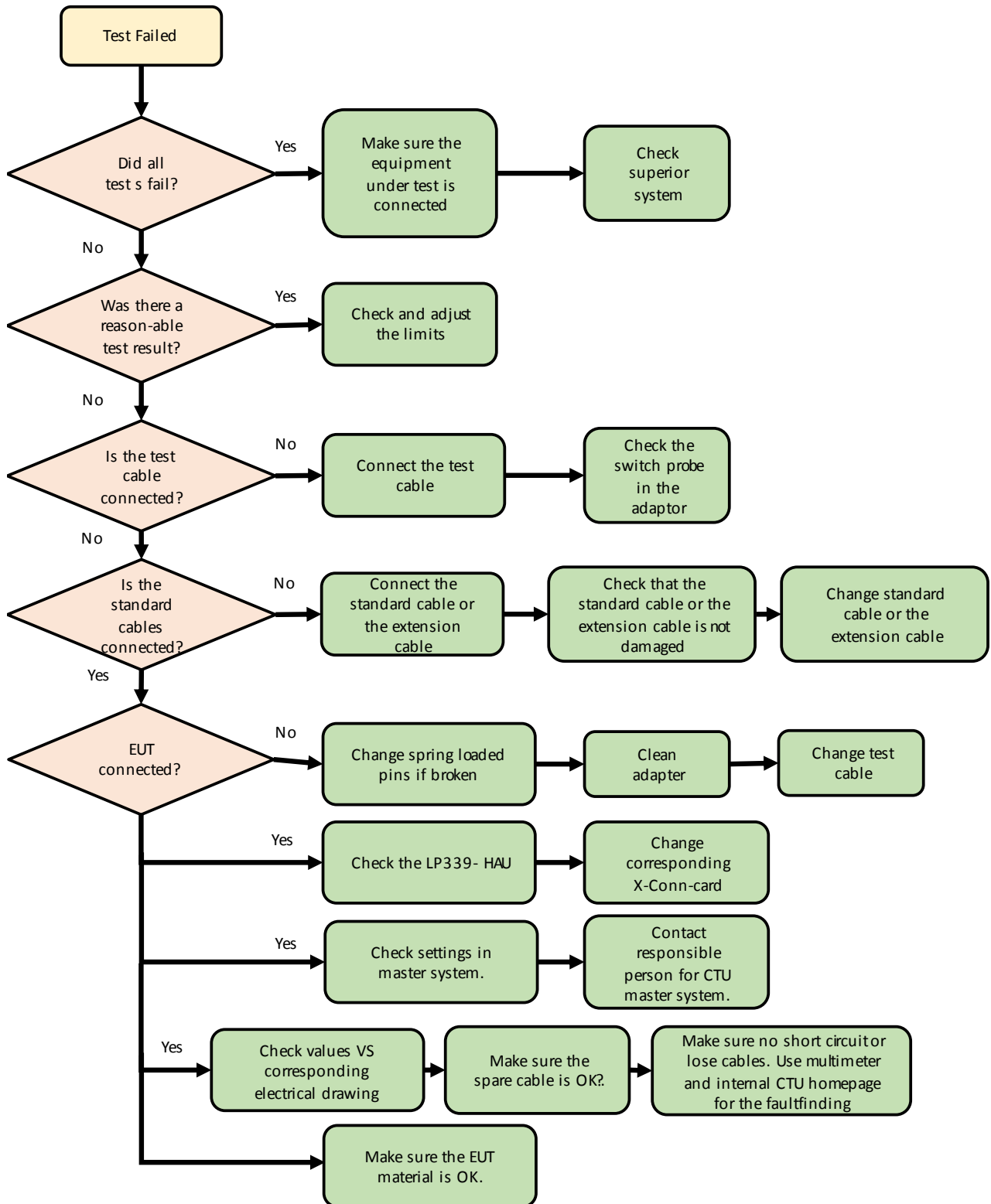
3.2 CTU Bus error



3.3 Test cable indication problem



3.4 Test Failed



4. Preventive maintenance

4.1 CTU

Make sure all connectors are firmly connected and that the box is clean and closed. Also check for damages. If the box is damaged it should be replaced or at least verified to have its full function before further usage.

4.2 HAU

Make sure all connectors are firmly connected and that the box is clean and closed. Also check for damages. If the box is damaged it should be replaced or at least verified to have its full function before further usage.

If the HAU has been in transport or moved in any way, make sure to open it and verify that all X-CONN-cards are correctly fitted.

4.3 Standard cables

Make sure all connectors are firmly connected that no cables are damaged. Moving cables should be checked more regular to avoid problem. Depending on how often the system is used the moving cables should be changed minimum once per year.

4.4 Test cables

Make sure all connectors are firmly connected that no cables are damaged. Moving cables should be checked more regular to avoid problem (weekly). Depending on how often the system is used the moving cables should be changed minimum once per year and 6 months at 68 jph.

Make sure the special adaptor is not damaged in any way. The adaptors are a sensitive part in the CTU concept and need special attention.

Pins can be broken if something is penetrating the connector when it's not used, be aware about how its handled, how it is hanging, how its removed and dropped by the operator when they use it.

The test cables included adaptors, switch probe, hocking, gland, LED, spring probes (pins) should be checked weekly.

Clean all the parts with a vacuum cleaner and a fine soft brush, use no oil or cleaning chemicals!

4.4.1 Switch probe

Check the function of the switch probe by pressing it with a small tool, it should be moving in and out without any hiccups.

4.4.2 Hocking system

Make sure the hocking system is clean and that its working correctly.

4.4.3 Cable gland

Check the cable gland so its tightened and not damaged and make sure the cable attached properly.

4.4.4 Spring probe

Check the spring probe (pins) as soon as needed but minimum once a week.

The spring probes is recommended to change every month if used daily at 68 jph.

If an adaptor is broken, send it to the supplier for repair.

There are 2 types of spring probes (probe with pin head and probe with a bowl head) and the approach to remove and to assemble the probes differs.

4.4.4.1 Probes removal (pin type)

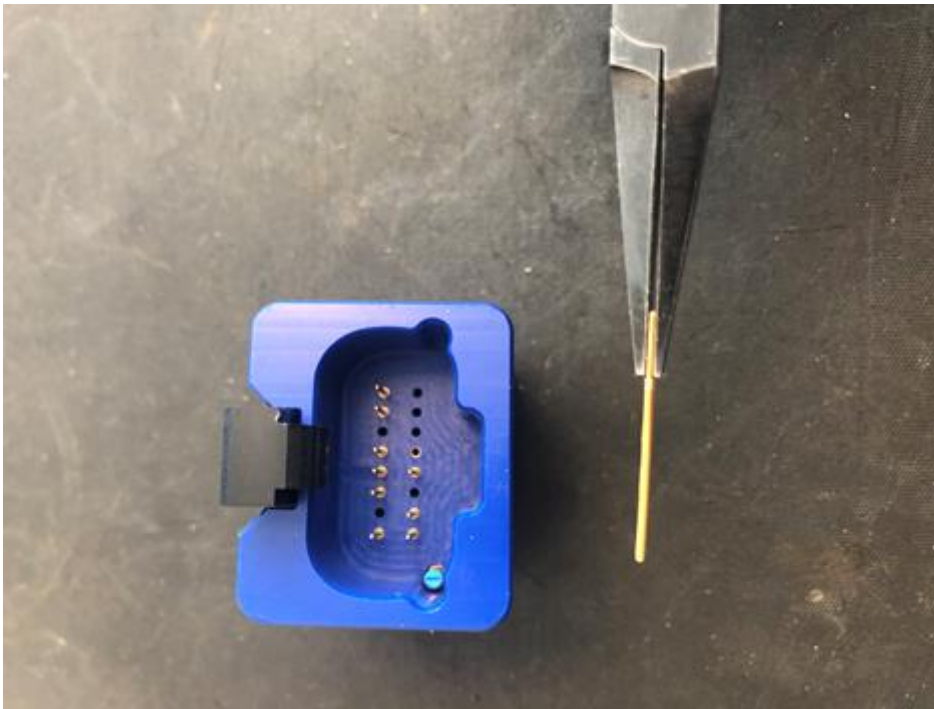
Ensure you have a plier that is not too big and fits between the probes.



Grab the probe with pliers with firm pressure



Pull out the probe straight up, the socket will remain in the connector

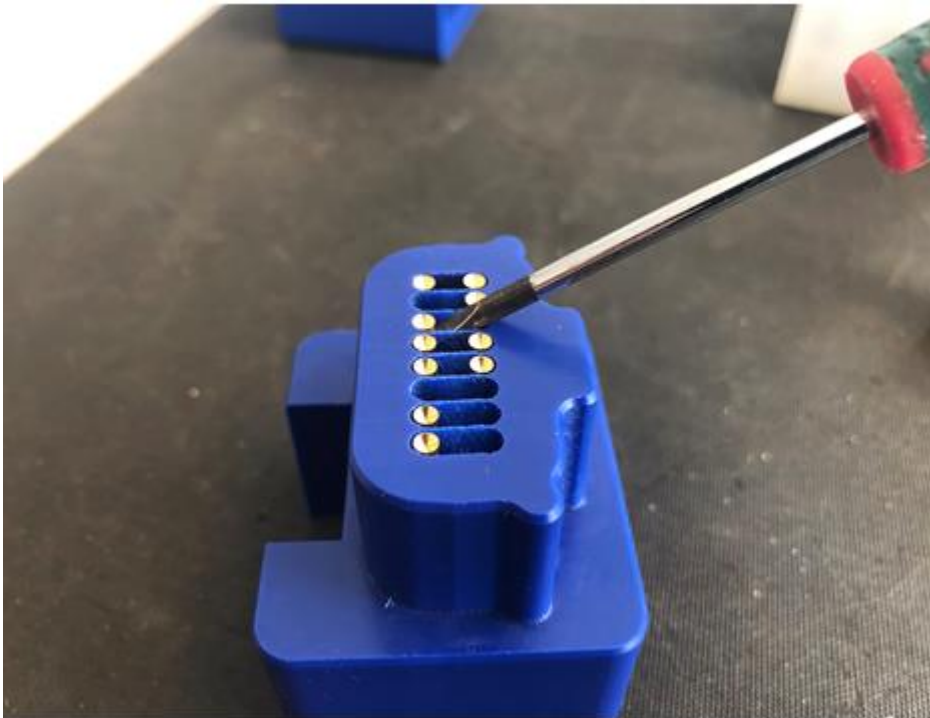


4.4.4.2 Probes removal (bowl type)

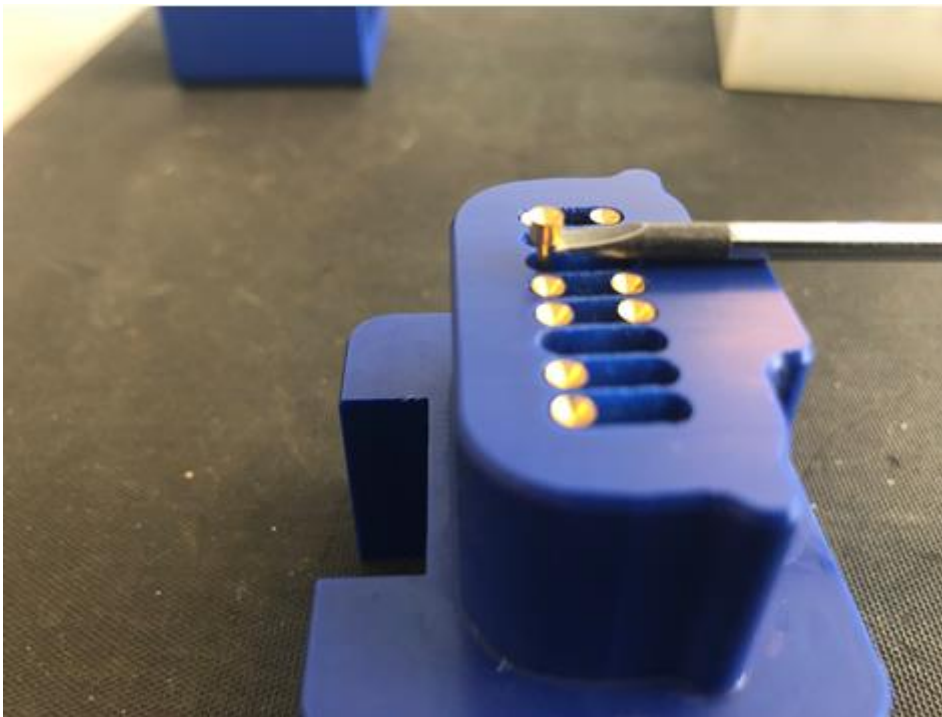
Ensure you have screwdriver that will fit the cavity



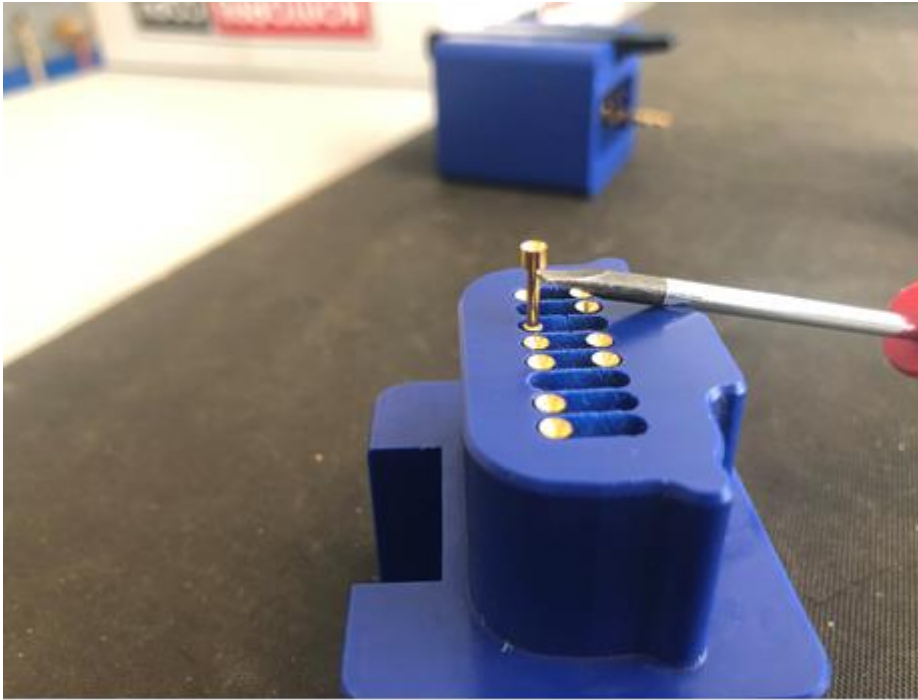
Insert the screwdriver in the cavity below the probe and support the screwdriver on the plastic to achieve lever



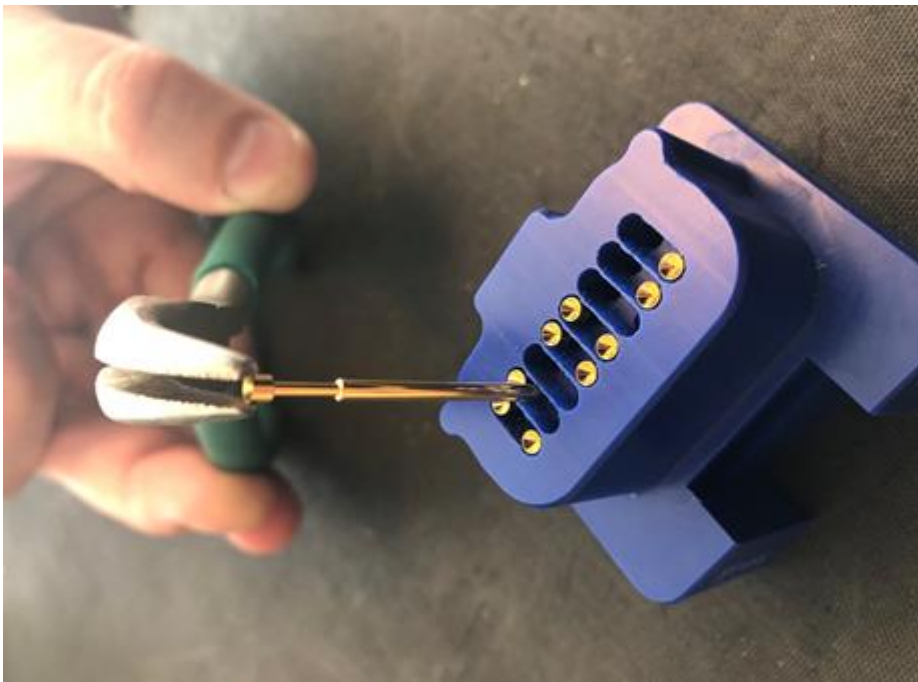
Now gently push down the screwdriver



The probe will come loose from socket



Use a plier to remove it completely

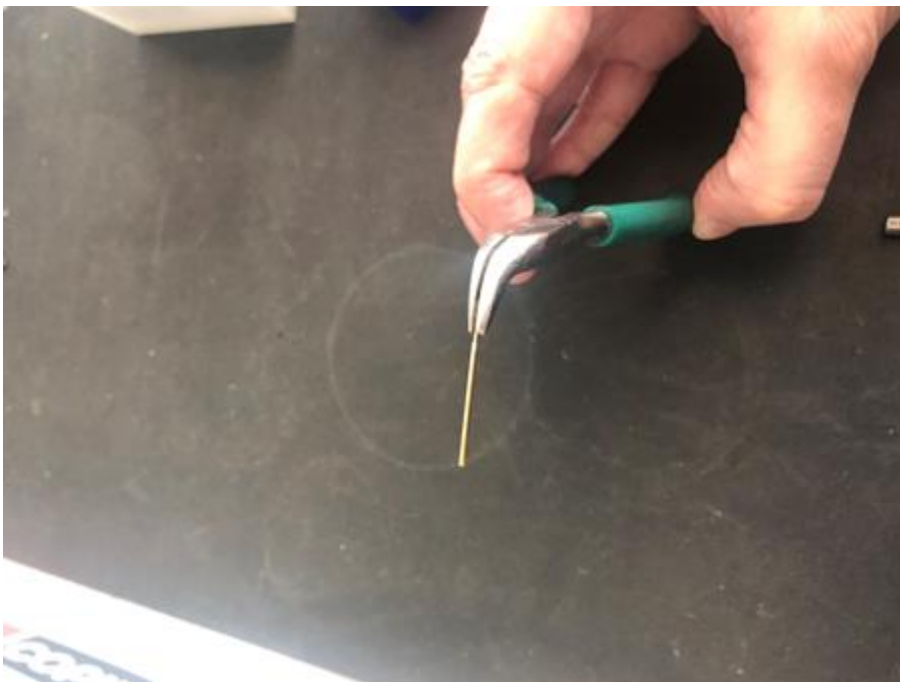


4.4.4.3 Probes assembly (pin type)

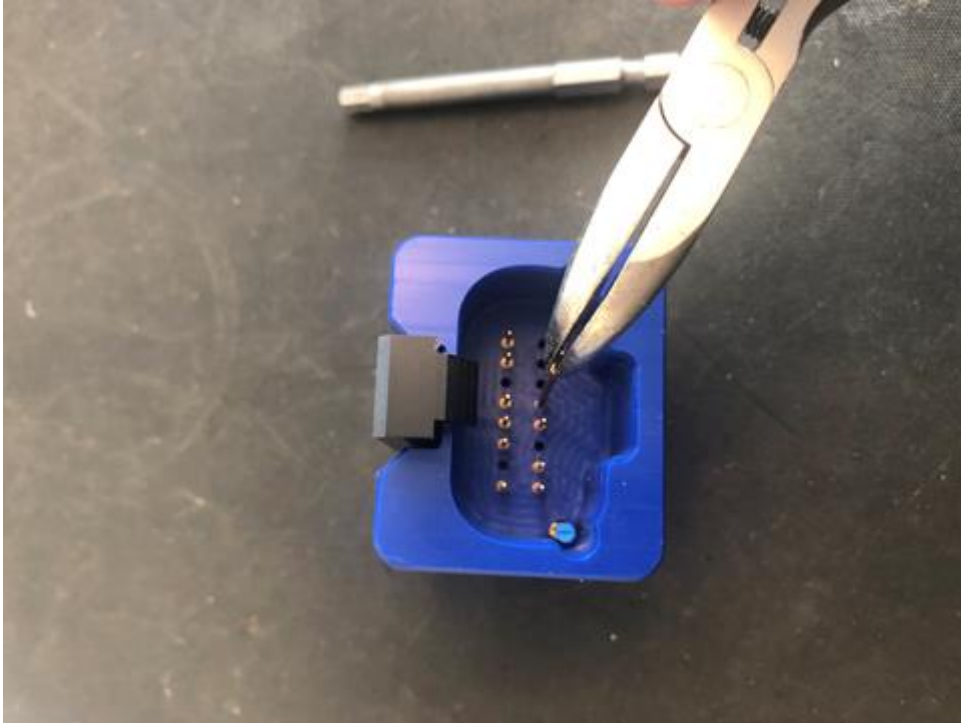
Ensure you have the correct probe and a tool that has a flat head and that fits in between the probes (in the example below we have a bit holder but you can also use a screwdriver intended for Torx)



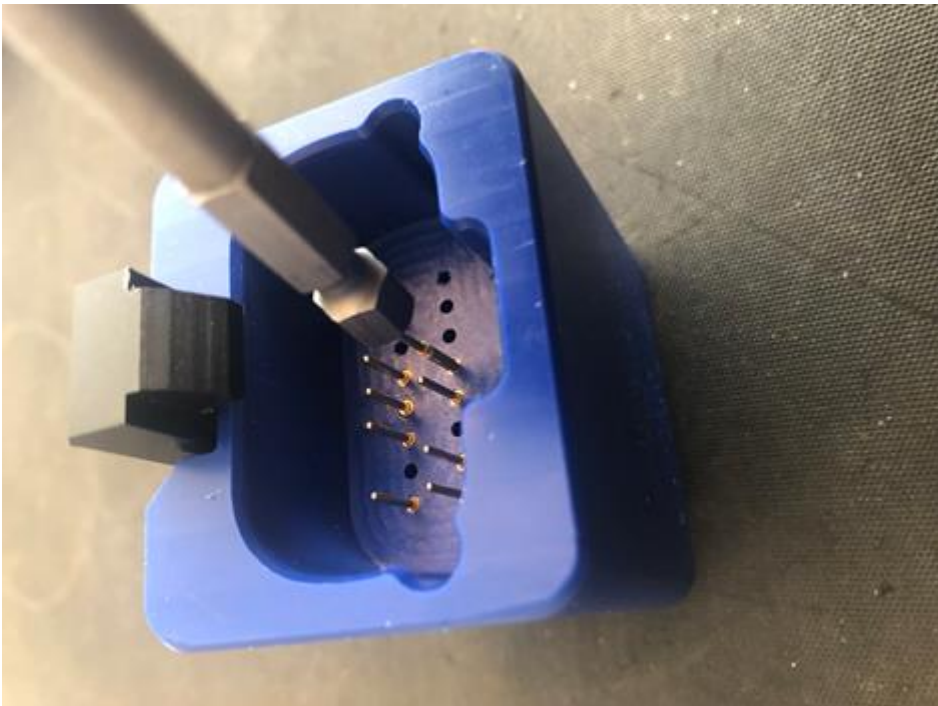
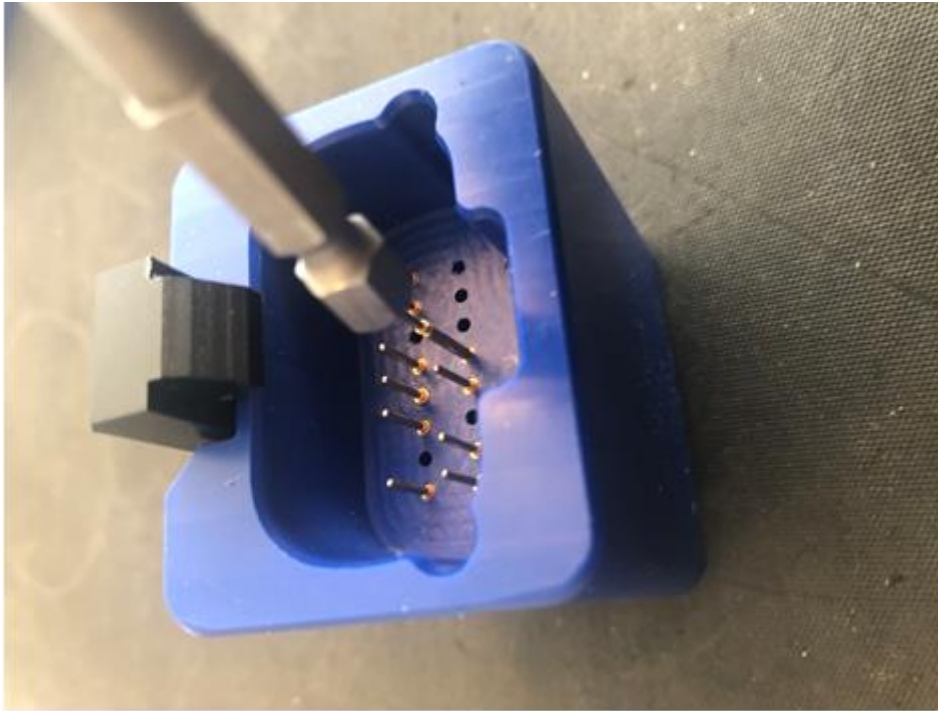
Grab the probe gently



Insert the probe in the socket



Now use the flatheaded tool and start to push the probe straight down



Push the probe to the bottom of the connector, you will feel some more resistance at the end right before the probe fits in to the socket.

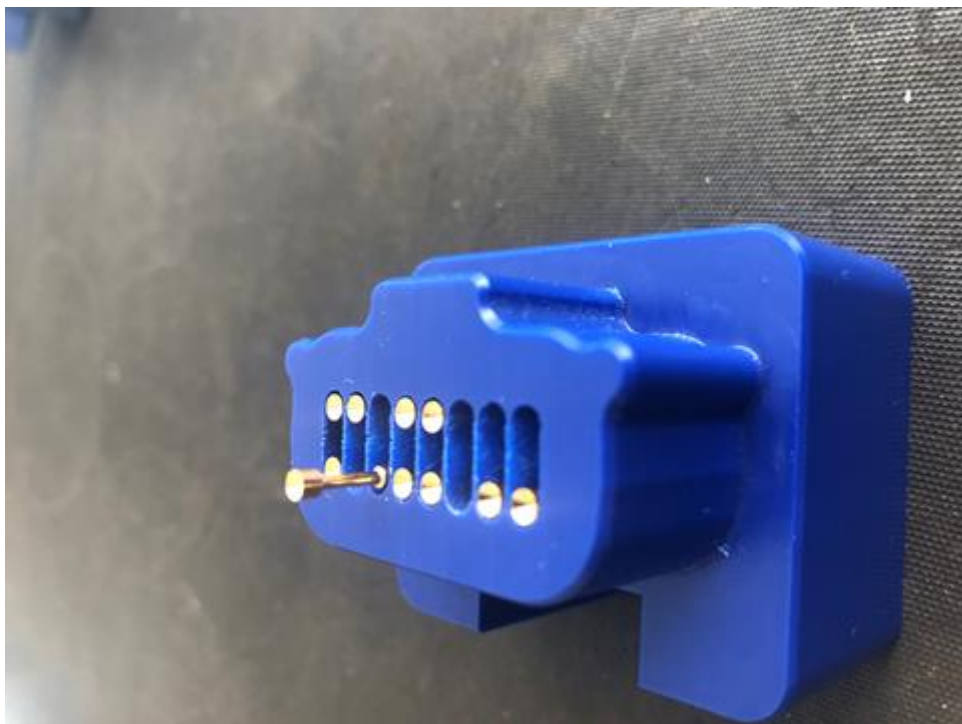
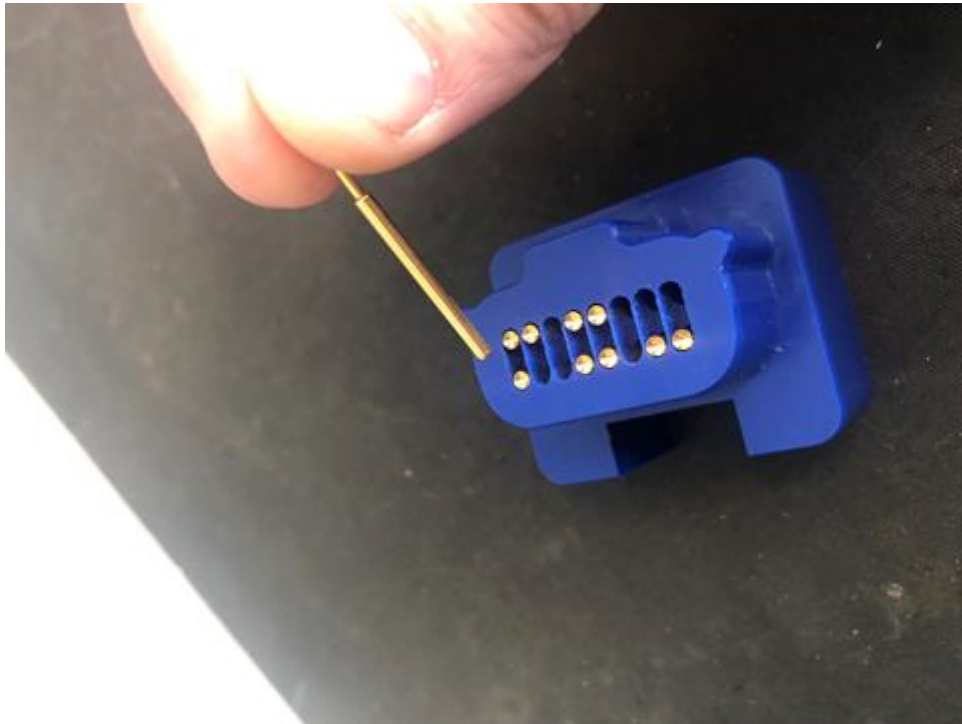


4.4.4.4 Probes assembly (bowl type)

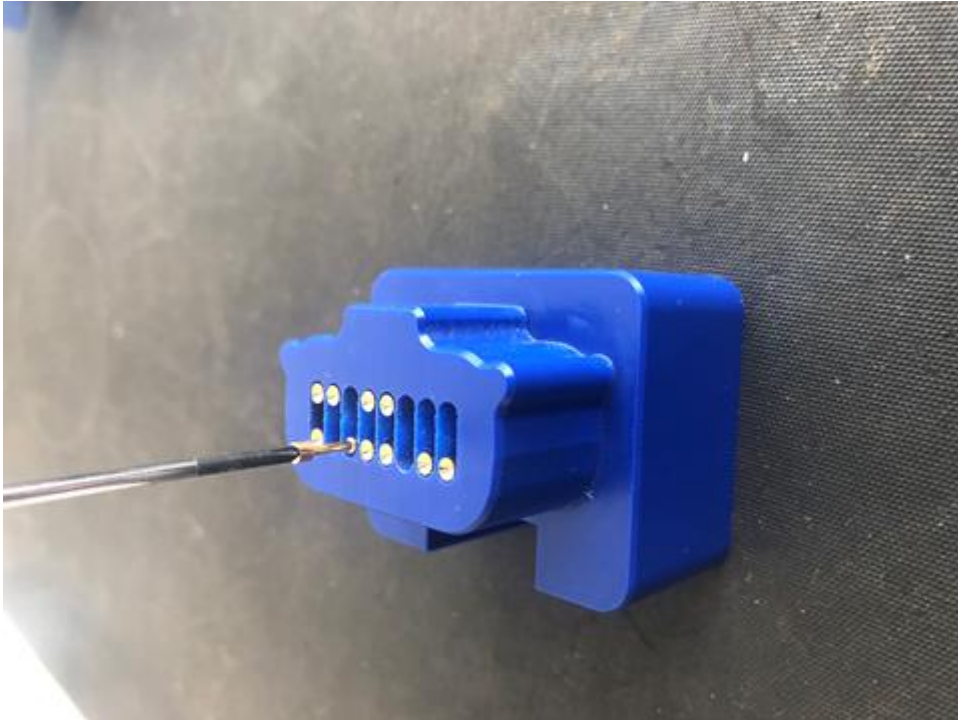
Ensure you have the correct probe and screwdriver that fits in the diameter of the "bowl"



Insert the probe in the socket



Now insert the screwdrivers tip into the cavity of the "bowl"



Push down the probe until you feel a complete stop, you will feel some more resistance at the end right before the probe fits in to the socket.



4.4.5 LED

Check that the LED is working properly.

5. Repairing

5.1 Changing test cable

Make sure the new cable has the same part number as the old one. Disconnect the old cable and connect the new one the same way.

5.1.1 Disassembling and repair

Repairs should only be done by educated and skilled maintenance personal, to soldering inside the adaptors should only be done by personal with soldering education and diploma. If the adapter is disassembled the guarantee ends for the test cable. We recommend that the cables is sent to the supplier for repair.

5.1.2 Root cause analyze

1. Was the cable removed before going to next station?
2. Do the process stop the line is operator forget to remove the test cable?
3. How does the process look like, do the operator remove the cable by releasing the hock properly?
4. No risk that the cable will hook in to something on the line?
5. Have someone disassembled the connector and not tightened the gland?
6. Was the cable gland loose when the problem was found?
7. How do the cables been mounted, can they hit something or each other when operator release them?

Take photos of the problem and send the broken cable to supplier.

5.2 Changing CTU

The CTUs come in two different versions depending on communication interface.

CAN variant part number 51335 LP335/CTU/C and have A-coded M12 connectors.

Profinet variant part number 52335 LP335/CTU/P and have D-coded M12 connectors.

5.2.1 CAN

To replace a CAN-version, change the MAC-address of the CTU in the superior communication system and replace the CTU.

Make sure to disconnect the power supply before disconnecting other cables and connect the power supply to the new CTU after connecting all the other cables. While the CAN-cables are disconnected the CAN-nodes located after this CTU on the CAN-bus will not communicate with the master.

5.2.2 Profinet

When replacing a ProfiNet version of a CTU, make sure it has the same "Device Name" as the old one and replace it. To change the CTU's "Device Name" use for example Siemens tool "PRONETA".

Make sure to disconnect the power supply before disconnecting other cables and connect the power supply to the new CTU after connecting all the other cables. While the power supply to the CTU is disconnected the ProfiNet communication will not go through the CTU.

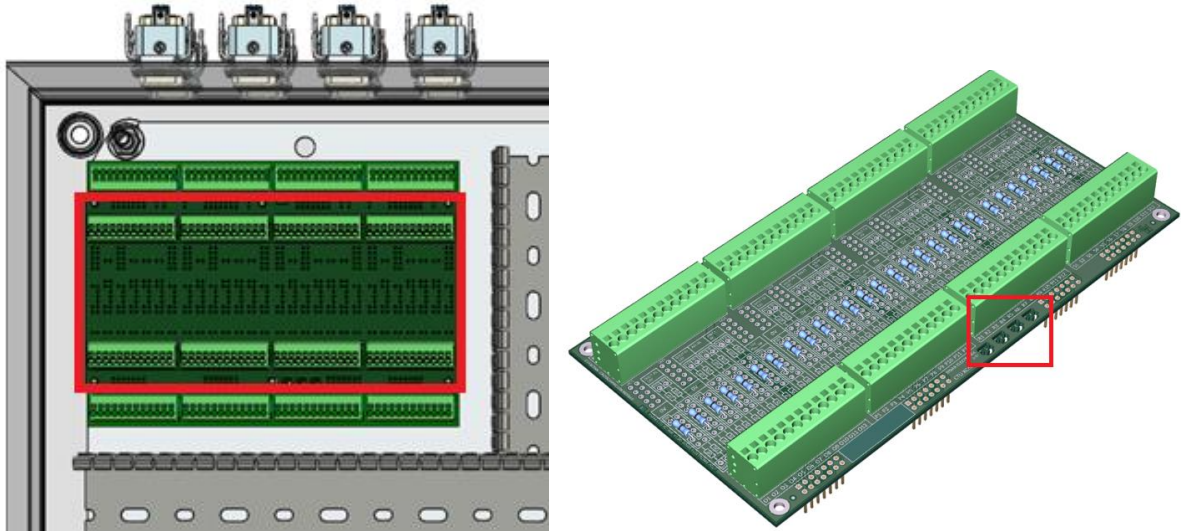
5.3 Changing HAU

The HAU has no intelligence and no communication with any other device. To change a HAU simply replace it with an identical one.

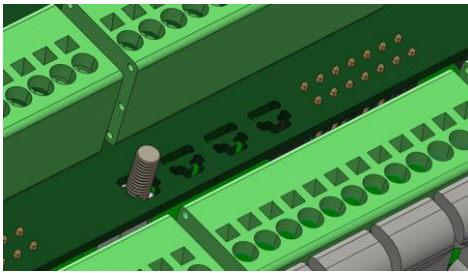
If the spare HAU is missing the gland plate, all wires from the bottom Harting connectors must be removed from the base card in the HAU and the plate must be removed and installed in the new HAU. Also, the X-CONN-cards must be moved to the new HAU, see next chapter.

5.4 Changing X-CONN-card

If an X-CONN-card needs to be replaced, make sure to get an exact identical card.



To remove an X-CONN-card get a good grip of the sides and pull it gently straight up. It might help to jiggle it a little. When installing the new card, first make sure the code hole is correct.



Then be **very accurate when lowering the card towards the base card and be absolutely 100% sure that the card is correctly aligned before pushing it down into the base card.**

6. Data and spare parts

6.1 Technical data

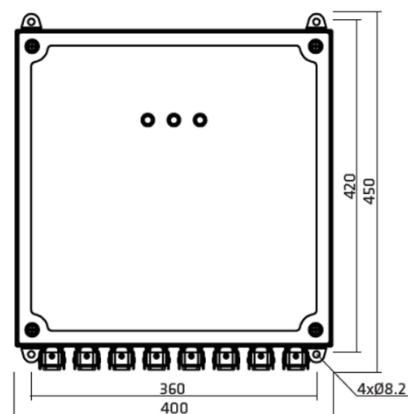
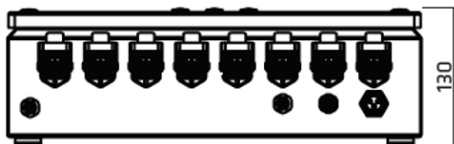
Technical data CTU	
Part No CTU.	51335 CAN / 52335 ProfiNet
Power Supply	20 - 30VDC
Current Consumption	max 4A
Communication	51335: CAN, 125kbit/s 52335: Profinet
Connectors	1x M12, 5 pin, Male, A code 1x M12, 5 pin, Female, A code 1x M12, 4 pin, Female, D code 1x 7/8' 16UNF, 5 pin, (51335 Male 1x 7/8' 16UNF, 3 pin, Male) 8x Harting, 12 pin + PE
CE	EN 61000-6-3 & EN 61000-6-2
IP	IP41
Temperature Range	0 - 50 °C
Humidity	0 - 95 % non-condensing
Dimensions	w 400 x h 450 x d 130mm
Weight	14kg
Mounting	Wall mount

Technical data HAU	
Part No HAU.	Standard without gland plate and X-CONN cards 52231. For exact copy see HAU label on your box.
Connectors	8 x 12pol Harting, Female
CE	EN 61000-6-3 & EN 61000-6-2
IP	IP65
Temperature Range	0 - 50 °C
Humidity	0 - 95 % non-condensing
Dimensions	w 500 x h 500 x d250mm
Weight	13 - 15kg
Mounting	Wall mount

6.2 Dimensions

6.2.1 CTU Dimensions

w 400 x h 450 x d130mm



6.2.2 HAU Dimensions

w 500 x h 500 x d250mm

6.3 Certifications

6.3.1 CTU

EG-FÖRSÄKRAN OM ÖVERENSSTÄMMELSE. EC/EEA DECLARATION OF CONFORMITY

Undertecknad representerar följande tillverkare
The undersigned, representing the following manufacturer:

Namn *Name:* Binar Elektronik AB
Adress *Address:* Hedekullevägen 24
S-461 11 TROLLHÄTTAN
Telefon *Telephone no:* +46 520 473200
Telefax *Telefax no:* +46 520 473210

Härmed försäkras att produkt *herewith declares the the product:*
Type/modell/projekt. *Type/model/project.:* **CTU LP335 CAN & PN**
överensstämmer med följande EG-direktiv *is in conformity with the provisions of the following*
EC directive(s):

Referens nr <i>reference no</i>	Titel <i>title</i>
2014/30/EU	EMC-direktivet <i>electromagnetic compatibility (EMC-directive)</i>
2011/65/EU	RoHS Directive

och att följande harmoniserande standarder är tillämplade *and the following harmonized standards have been applied:*

Standard <i>standard</i>	Titel <i>subject</i>
SS-EN 61000-6-3	Emission, Conducted and Radiated emission
SS-EN 61000-6-2	Immunity, RF-fields, conducted common mode HF, Fast transient (burst), Surges
EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Samtliga produkter måste installeras i enlighet med de installationsanvisningar som ingår i produktdokumentationen.

All products must be installed in accordance with the installation instructions contained in the product documentation.

Behörig att sammanställa teknisk dokumentation
Authorized to compile technical documentation:
Nils Johansson

Binar Elektronik AB
Trollhättan 2018-01-08

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fax +46 (0)520 47 32 10

website: www.binar.se
e-mail: info@binar.se
VAT No: SE556716467701

6.3.2 HAU

EG-FÖRSÄKRAN OM ÖVERENSSTÄMMELSE.
EC/EEA DECLARATION OF CONFORMITY

Undertecknad representerar följande tillverkare
The undersigned, representing the following manufacturer:

Namn Name: Binar Elektronik AB
Adress Address: Hedekullevägen 24
 S-461 11 TROLLHÄTTAN
Telefon Telephone no: +46 520 473200
Telefax Telefax no: +46 520 473210

Härmed försäkras att produkt *herewith declares the the product:*
 Type/modell/projekt. *Type/model/project.:* HAU LP339
 överensstämmer med följande EG-direktiv *is in conformity with the provisions of the following*
EC directive(s):

Referens nr <i>reference no</i>	Titel <i>title</i>
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och att följande harmoniserande standarder är tillämpade *and the following harmonized standards have been applied:*

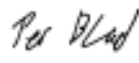
Standard <i>standard</i>	Titel <i>subject</i>
SS-EN_61000-6-3	Emission, Conducted and Radiated emission
SS-EN_61000-6-2	Immunity, RF-fields, conducted common mode HF, Fast transient (burst), Surges
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 Nils Johansson

Binar Elektronik AB
 Trollhättan 2018-01-08

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