FORD 50-WAY POWER DISTRIBUTION BOX (PDB) HYBRID CONNECTOR SYSTEM

1.0 SCOPE:

This procedure is applicable to Ford 50-WAY Power Distribution Box (PDB)
Series Numbers: 160044

Summary:
This application specification is meant to be a general overview and guideline for the assembly, operation and troubleshooting of the Ford 50-WAY PDB connector system.

2.0 PRODUCT DESCRIPTION:

Design Criteria:
- Connector Type:
    - Unsealed
    - Mate Assisted
    - Temperature Class II
    - Vibration Class V1
- General Requirements:
    - 4 keying options
    - One handed operation
    - Connectors must be able to mate without the need of being sequenced

3.0 REFERENCE DOCUMENTS:

Receptacle Assembly Drawing:
- HU5T-14489-DX   Water ingress version
- KU5T-14489-AX   Short version
- KU5T-14489-DX   Grommet version

Wire Dress Cover (WDC) Drawing:
- HU5T-14N003-GX   Water ingress version
- HU5T-14N003-CX   Short version
- KU5T-14N003-CX   Grommet Version

Terminal Drawings:
- XL3T-14474-BA (6.35mm Delphi-Apex terminals)
- EUST-14474-EA (2.80mm Sumitomo terminals)

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4.0 PROCEDURE

4.1 GENERAL REQUIREMENTS:

Taping Requirement:
- No Tape should occur within 20mm of the wire dress cover so as not to interfere with the fit between the wire dress cover and the module cover.

Terminal Type:
- 8X 6.35mm Delphi-Apex terminals
  - $0.75mm^2 - 6.00mm^2$ wire size capable
- 42X 2.8mm Sumitomo terminals:
  - $(0.35 - 4.00)$ mm² wire size capable

Crimped Terminal Straightness:
- Within ±3º

Terminal extraction tools:
- #638133501 for 2.8mm Sumitomo terminals / 6.35mm Delphi-Apex terminals

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4.2 ASSEMBLY INSTRUCTIONS:

4.2.1 COMPONENTS AS SHIPPED: Connecter is shipped with the lever in the final lock position and the TPA in the pre-lock position. The wire dress cover is shipped as a separate component.
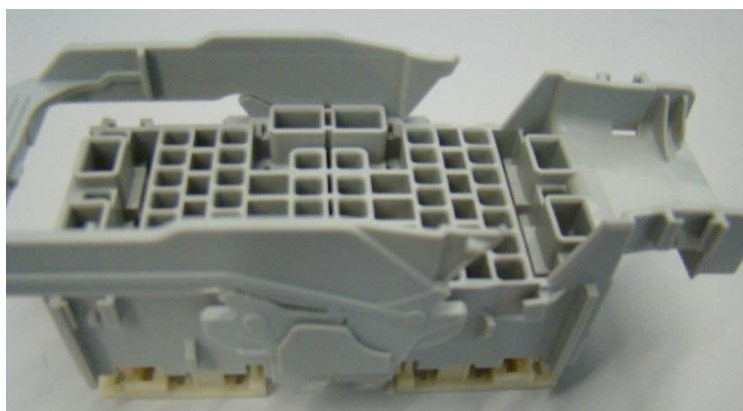
Connector with short wire shelf
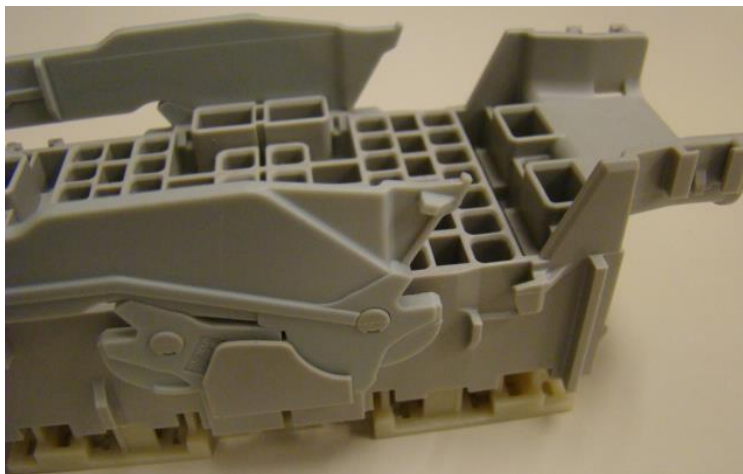
Connector with long wire shelf
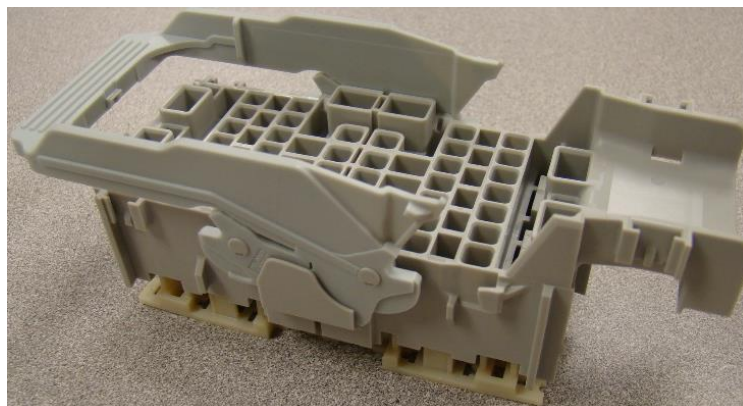
Connector with grommet wire shelf

Connectors shown "as shipped"

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Water Ingress Version

Short Version

Grommet Version

Wire dress covers shown as shipped

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4.2.2 BRINGING TPA TO "AS SHIPPED" POSITION

If TPA gets seated during shipping, make sure to lift it up and bring it to the pre-lock position prior to terminal installation. A small (2.4 – 3.5 mm blade width) screw driver can be used to do this operation. Insert flat-head screw driver in the areas between TPA and shroud wall on either side of the connector to lift the TPA
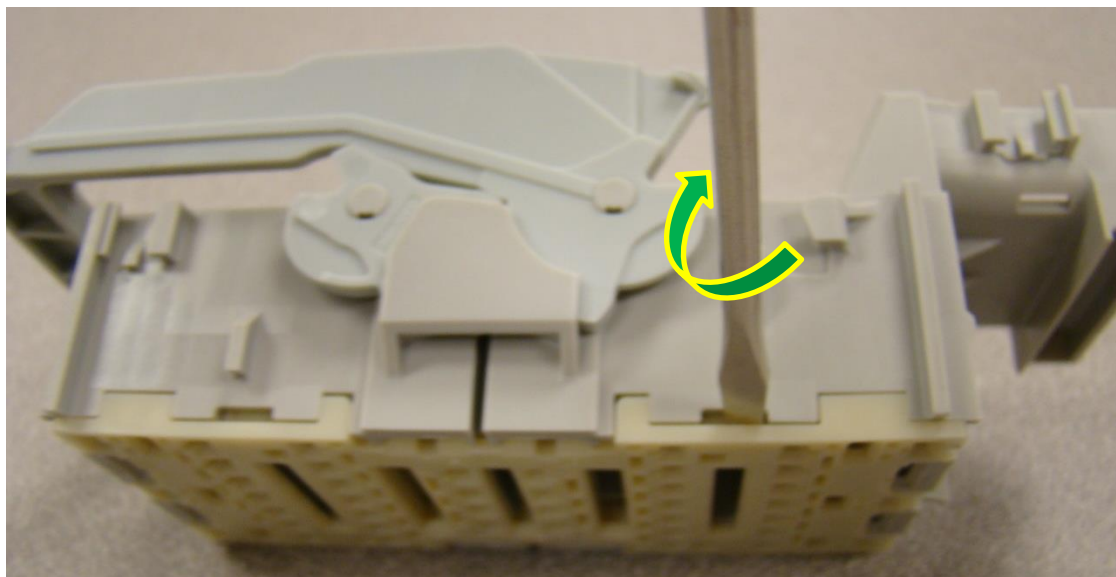
Rotate the screw driver to move the TPA from final lock to pre-lock position repeating on all four sides of the connector until it is lifted up evenly and is shifted to the pre-lock position.
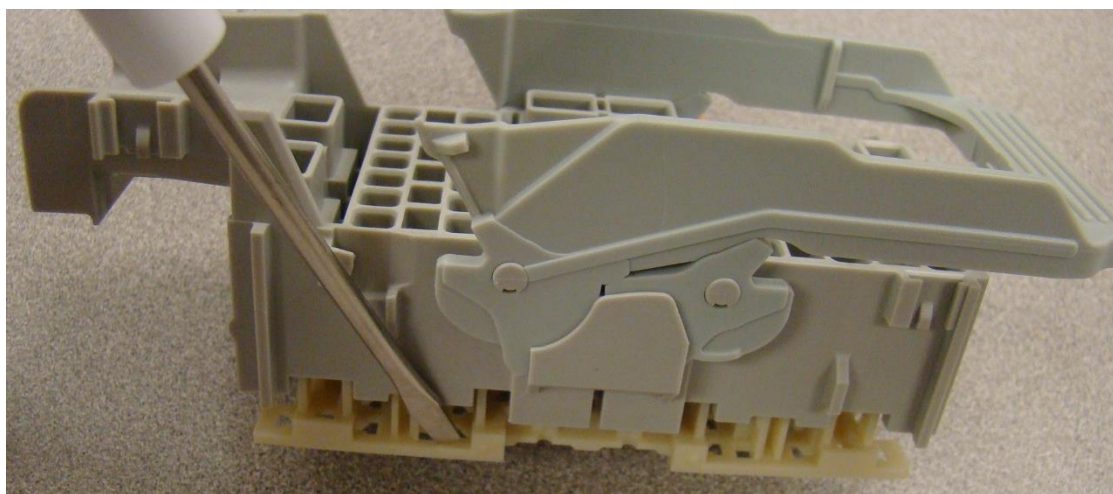
TPA is now in the pre-lock "AS SHIPPED" position

Note: TPA should never be removed during connector assembly operations

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4.2.3 **LEVER REPOSITIONING:** Connector lever has a possibility of moving during shipping and handling. If this occurs, the lever may get locked in its pre-lock position. Press lever arm tips inboard along the pivot location of the lever while pushing it down till it is released from its pre-lock position, as shown in illustrations below:
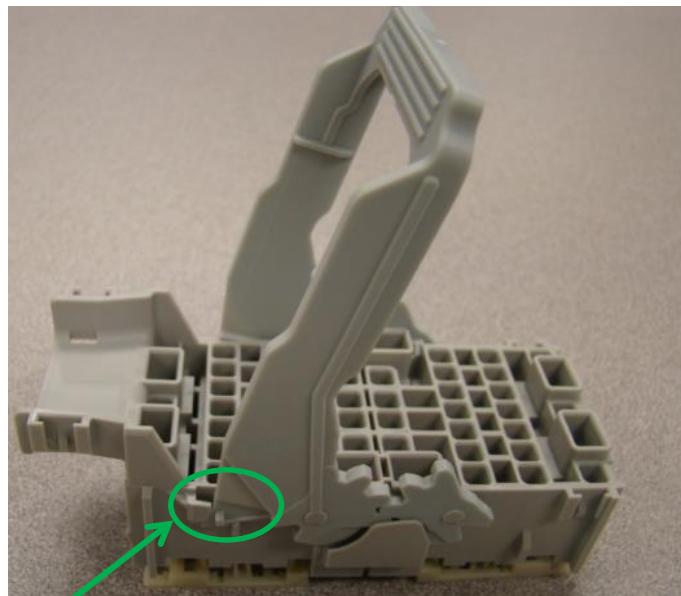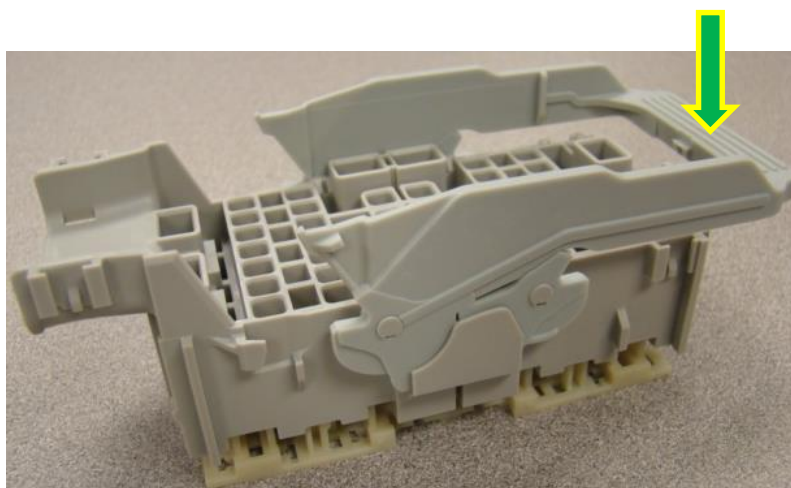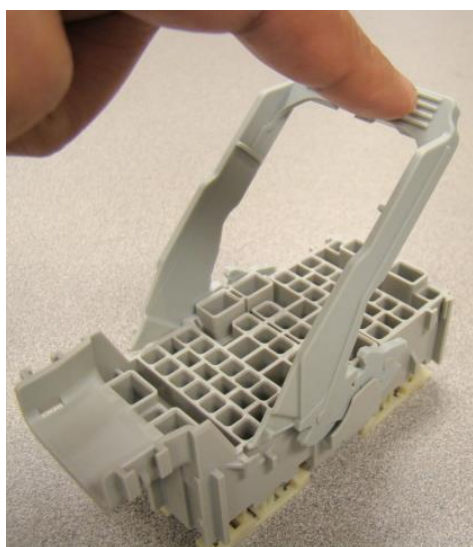

Lever Arm Tip
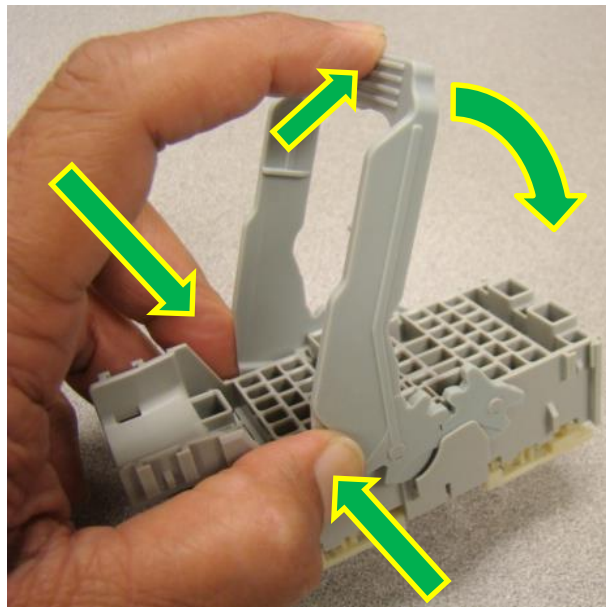
Once the lever is released from its pre-lock position, push the lever to throw it to the final lock position.

Push the lever down till it rests in its final lock position

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4.2.4 **TERMINAL INSTALATION:** Make sure TPA is in its pre-lock as shipped position, if not use a small screw driver to bring TPA in pre-lock position. Start populating the terminals, starting with the row closest to the wire shelf (cavities 1-5).

Cavity 1

Cavities 1-5

Cavities 6-12

Cavities 12-19
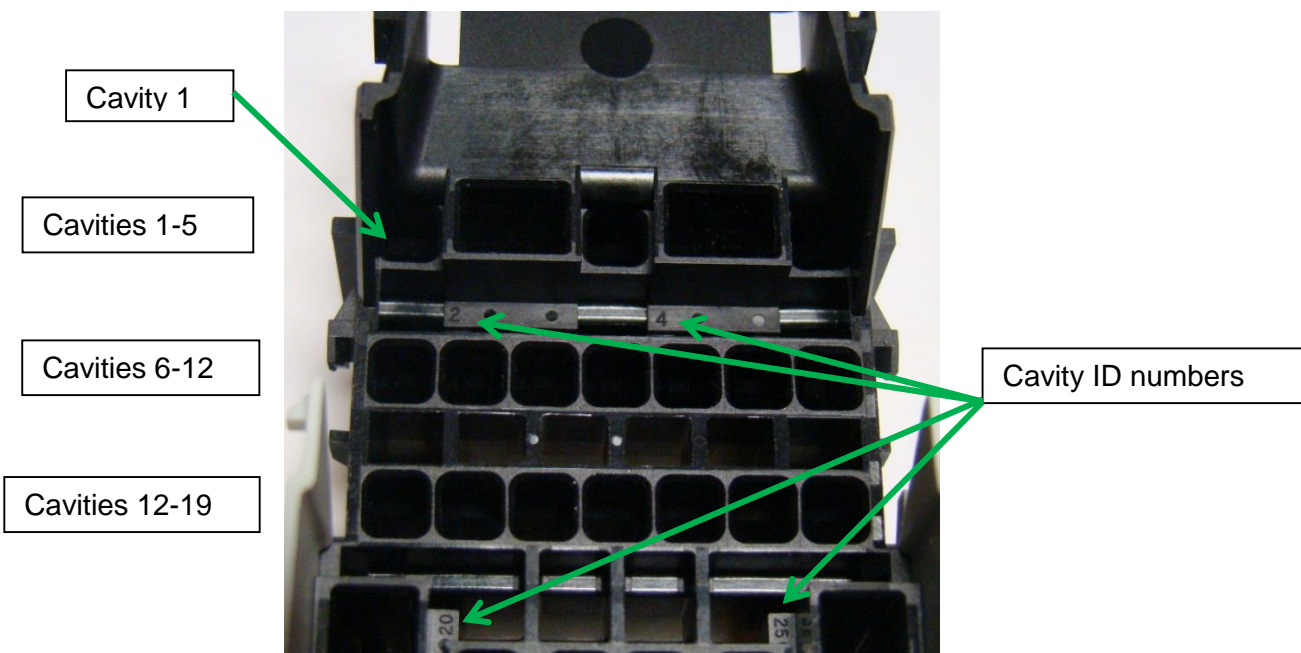
Cavity ID numbers

Cavity ID numbers are located on the top of the connector

Delphi-Apex terminals have a slanted face. Use this feature for correct orientation in the cavity

With TPA still in pre-lock position, orient terminal to the rear of connector as shown below. Grip the wire no less than 30 mm or 1.25 inches from the terminal insulations crimp and insert through appropriate circuit opening. If resistance is encountered, retract the terminal and adjust the angle of insertion. Continue inserting the terminal until it stops and locks up on the lock finger with tactile feedback. Once terminal clicks pull on the wire to confirm that terminal is properly seated. *(PUSH-CLICK-PULL)*
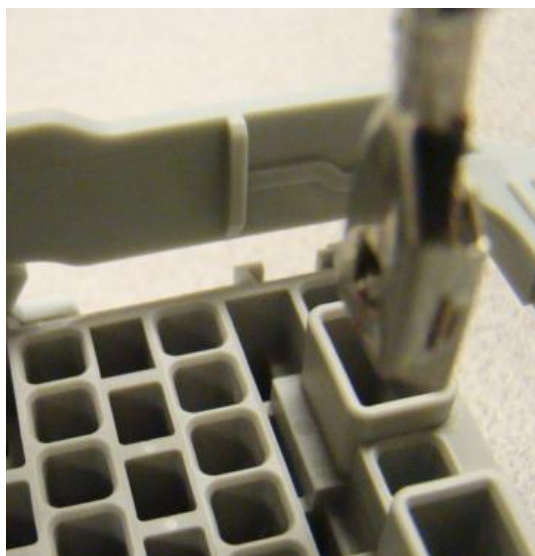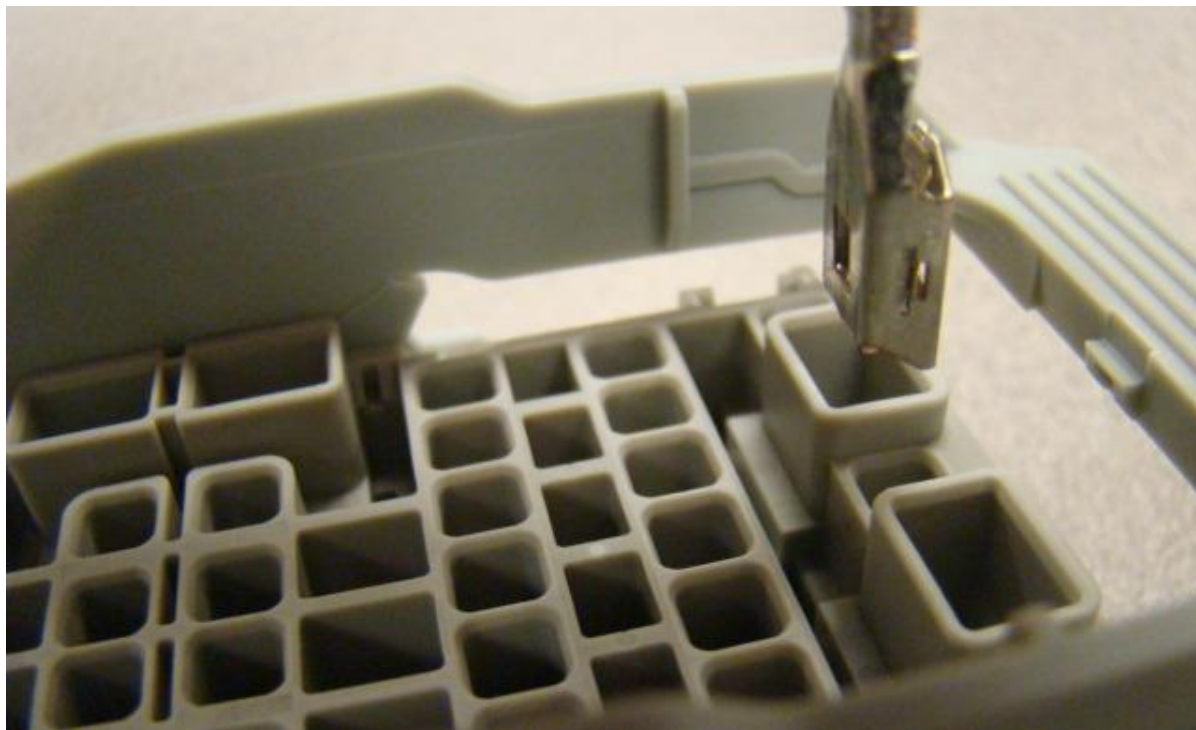
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The Delphi-Apex 6.35 mm terminals having no orientation feature and can be inserted 180 degrees around. Molex recommends that all the terminals should be oriented in the same direction to reduce the variability in the connector operation. Refer to the images below for the recommended terminal orientation relative to the connector.
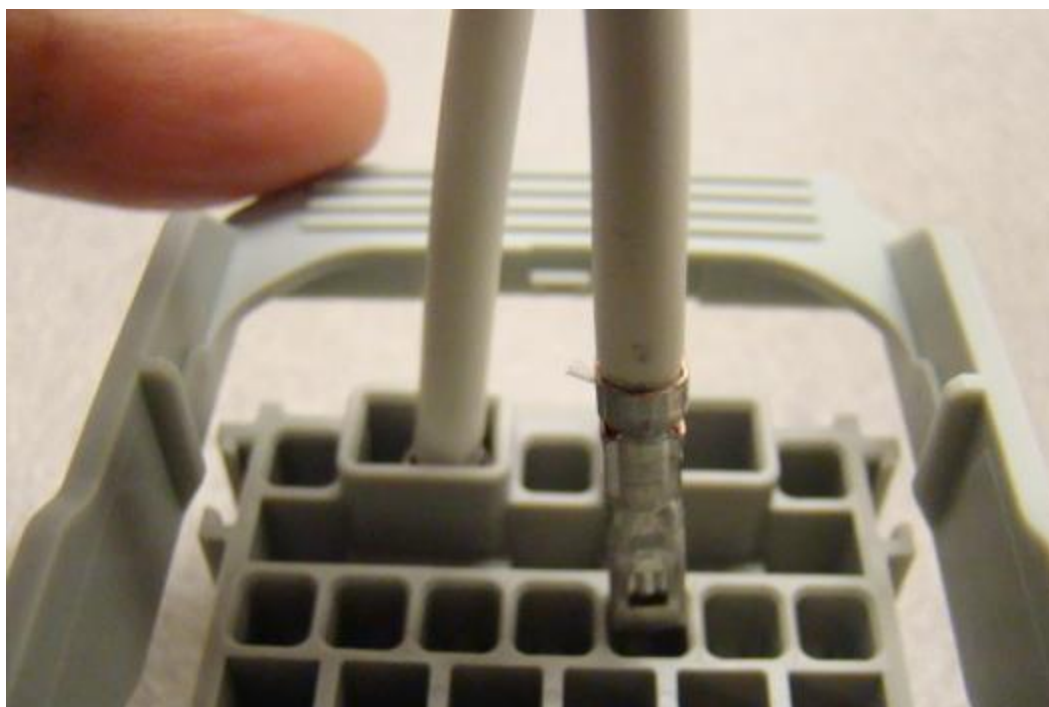

6.35mm terminal installation orientation
(Delphi-Apex Terminal)

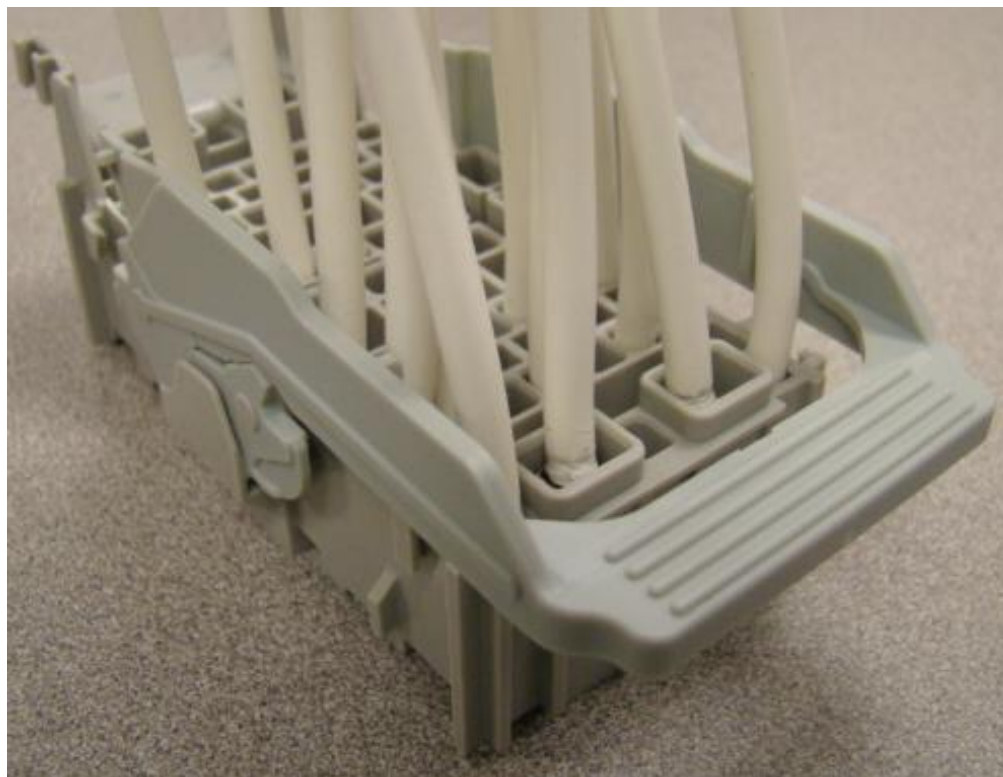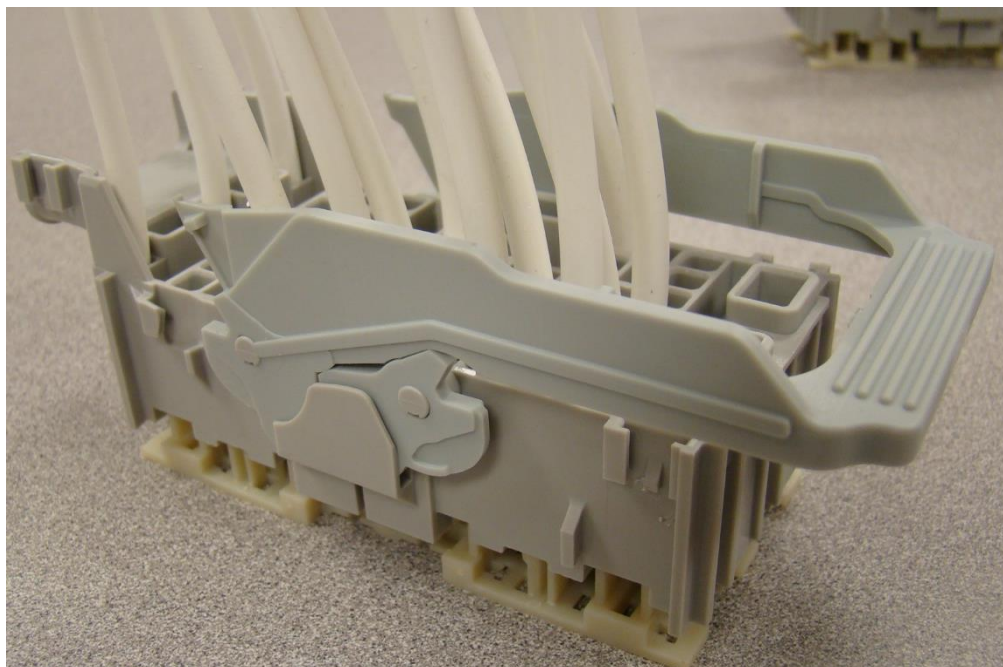| REVISION:	ECR/ECN INFORMATION:	TITLE:		SHEET No.
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2.80mm terminal installation orientation
with crimp side towards the wire-shelf
(Sumitomo Terminal)

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Populate cavities until all desired cavities are filled.

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4.2.5 **TPA SEATING:** The TPA can now be seated into the final lock position. To do so, hold the populated connector assembly by hands as shown in illustrations below. Hold the connector by the sides as shown and apply even pressure downward to seat the TPA. Grip the connector with both hands and push down evenly
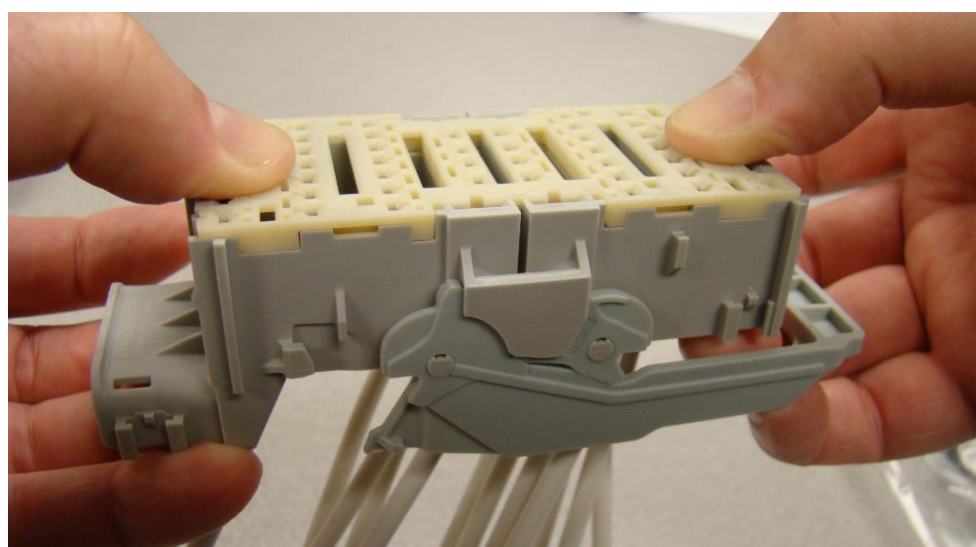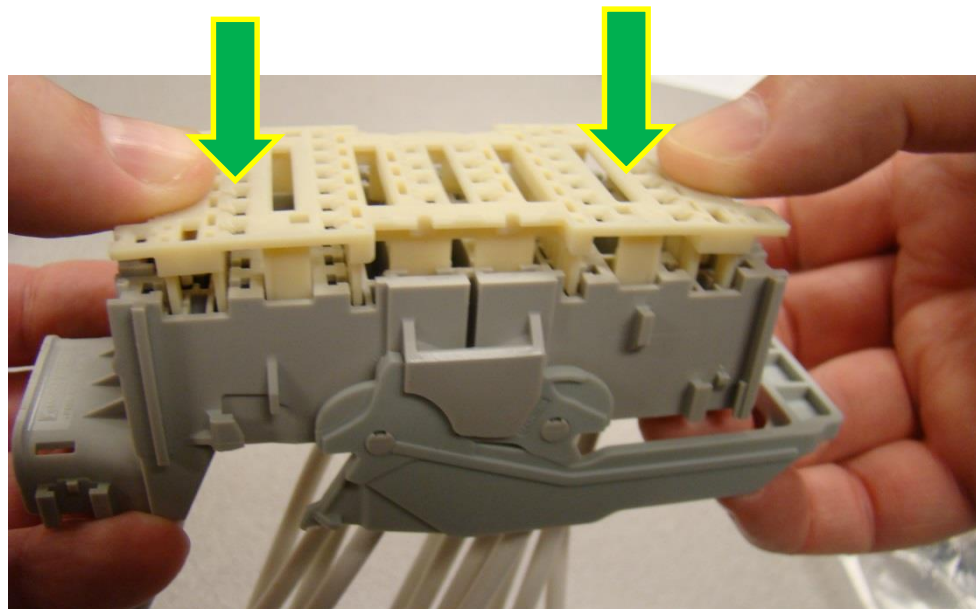
Fully seated TPA

Do not form the wires until the TPA has been seated due to the possibility of the <u>larger wire sizes biasing the terminals inside of the cavity and preventing the TPA from being properly seated</u>.

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4.2.6 **WIRE FORMING:** Due to the size of the wires being used it is recommended that each row of wires be folded seperately, starting with the row closest to the wire shelf. When folding the wires, do not pull them tight. Fold them down so that they lay as flat as possible inside the wire shelf.
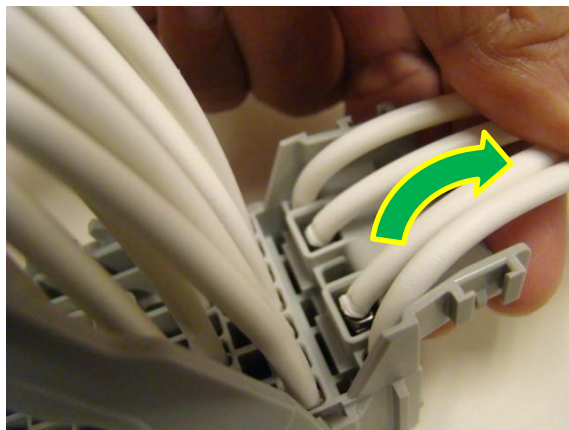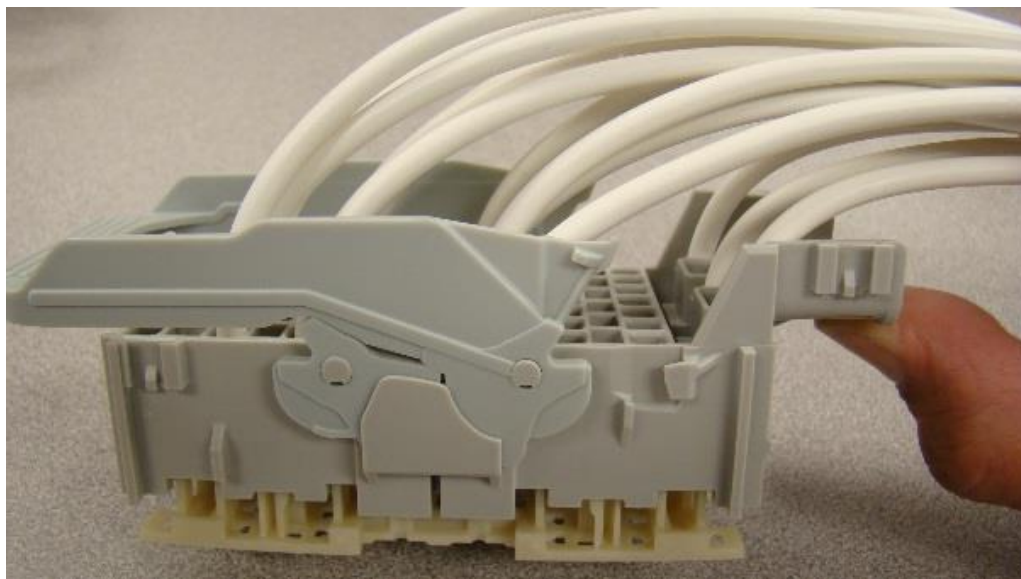

First row of wires being folded
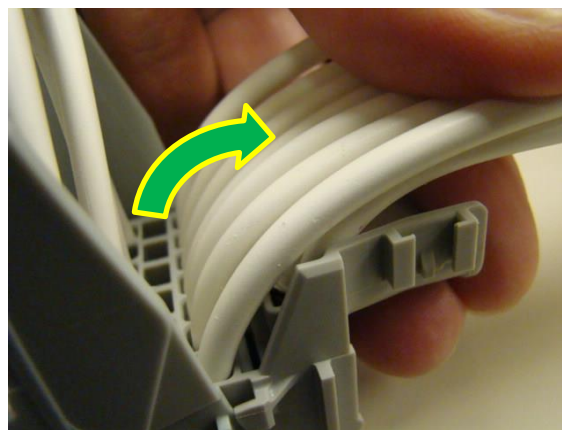
Second row of wires being folded

Note: Try to keep the wires from crossing each other. This helps reduce the size of the wire bundle inside the wire shelf.

Continue to fold the wires row by row until all the wires are folded down.

Note: It will become more difficult to hold the wire bundle down as more wires are added. Improper wire forming will create heavy resistance to install dress cover. Make sure not to pull the wires tight in the connector while trying to form them.

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(Wire forming continued)

Wire Bundle Height and Width Specifications:

Ford PN	Description	Height
HU5T-14489-DX HU5T-14489-EX HU5T-14489-KX	Water Ingress Version	31.55 mm
KU5T-14489-AX KU5T-14489-BX KU5T-14489-CX	Short Version	31.55 mm
KU5T-14489-DX KU5T-14489-EX KU5T-14489-FX	Grommet Version	31.55 mm

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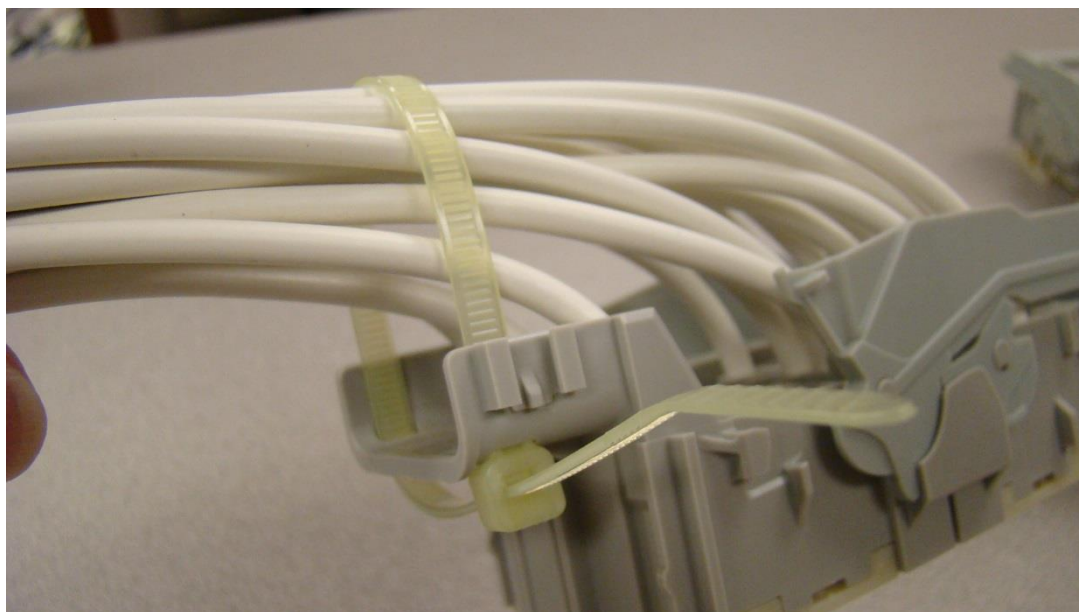*TEMPLATE FILENAME: APPLICATION_SPEC[SIZE_A](V.1).DOC*

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4.2.7 **WIRE TYING:** The wire bundle now needs to be secured to the wire shelf with a zip-tie. Insert he zip tie through the wire shelf slot to be secured and oriented as shown such that it would not cause interference with the module that the connector will be mated into.
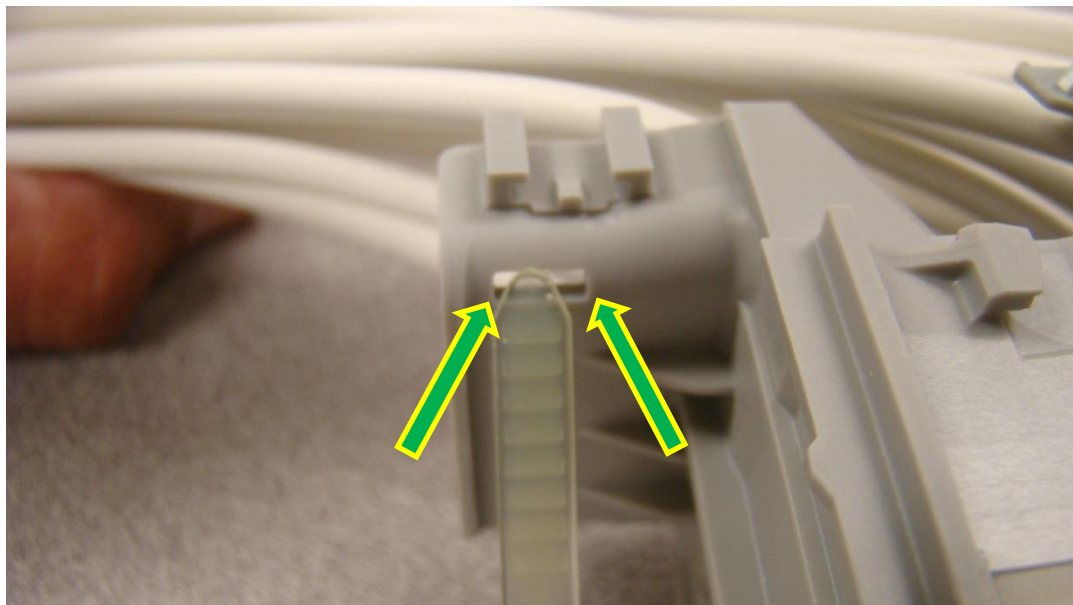
Insert the zip-tie into the bottom slot of the wire shelf

Wrap the zip-tie around the top of the wire bundle and feed it down through the 2nd slot on other side of the wire shelf such that the end of the zip-tie is locked and secured.
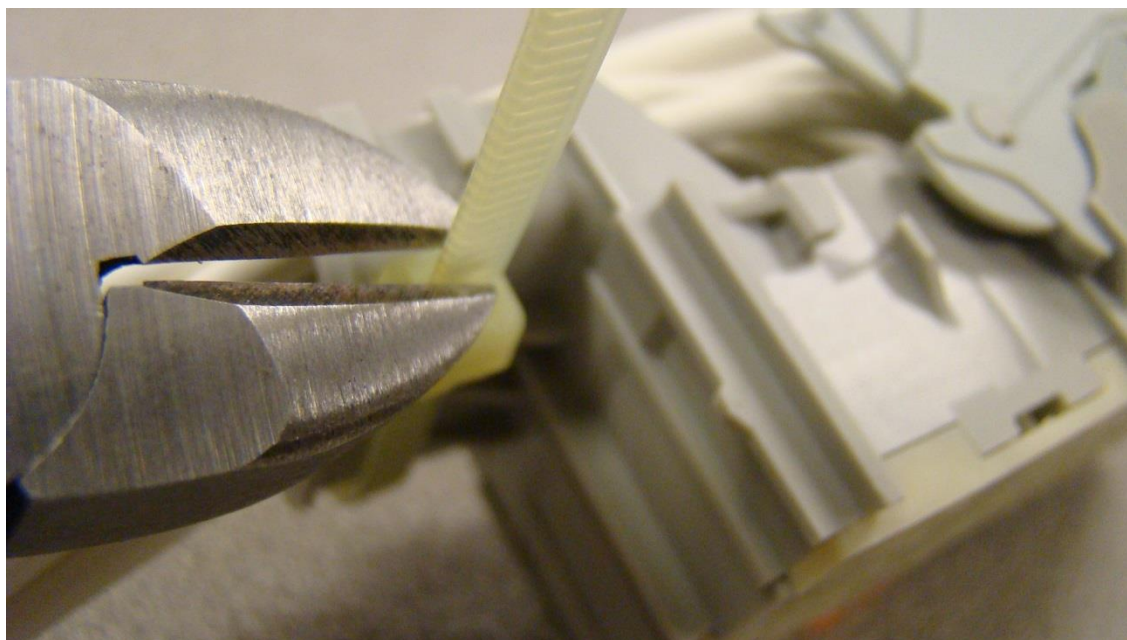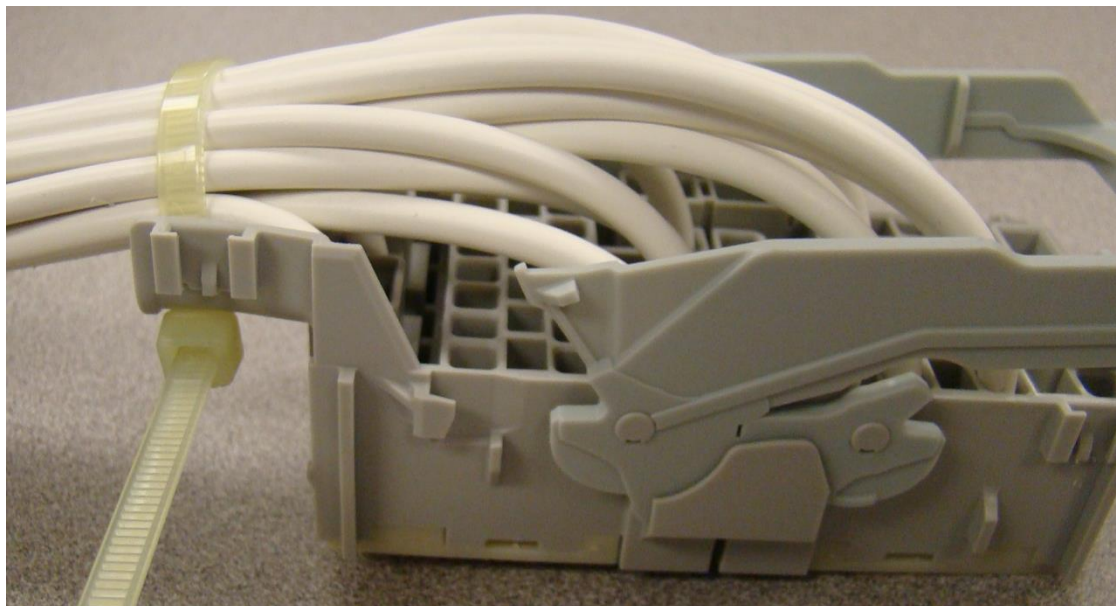

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The trailing length of the zip-tie needs to be trimmed off so it does not interfere with the mating of the connector.
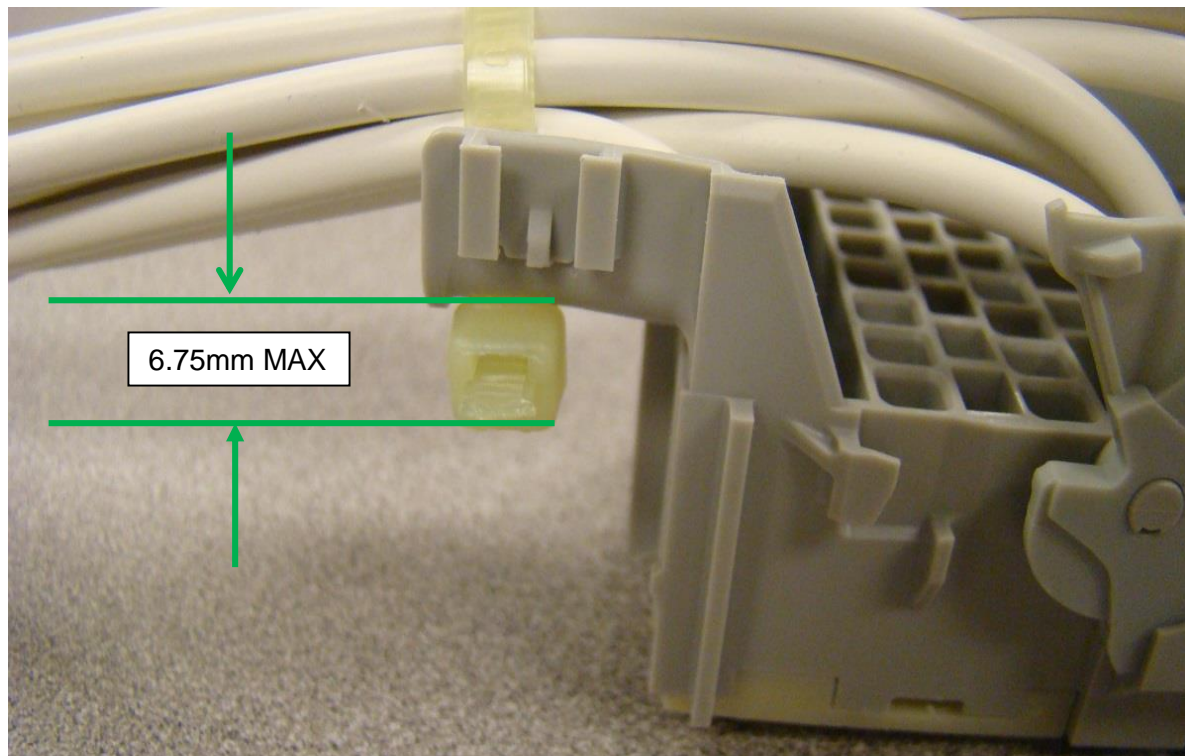

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The zip-tie **CANNOT** exceed a distance of 6.75mm from the bottom of the wire shelf, otherwise zip tie will resist connector mating with the module not allowing to sit completely


6.75mm MAX

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4.2.8 **THROWING LEVER IN PRE-LOCK POSITION:**
Holding the connector with one hand, lift the lever up using the other hand as shown in the figures below.
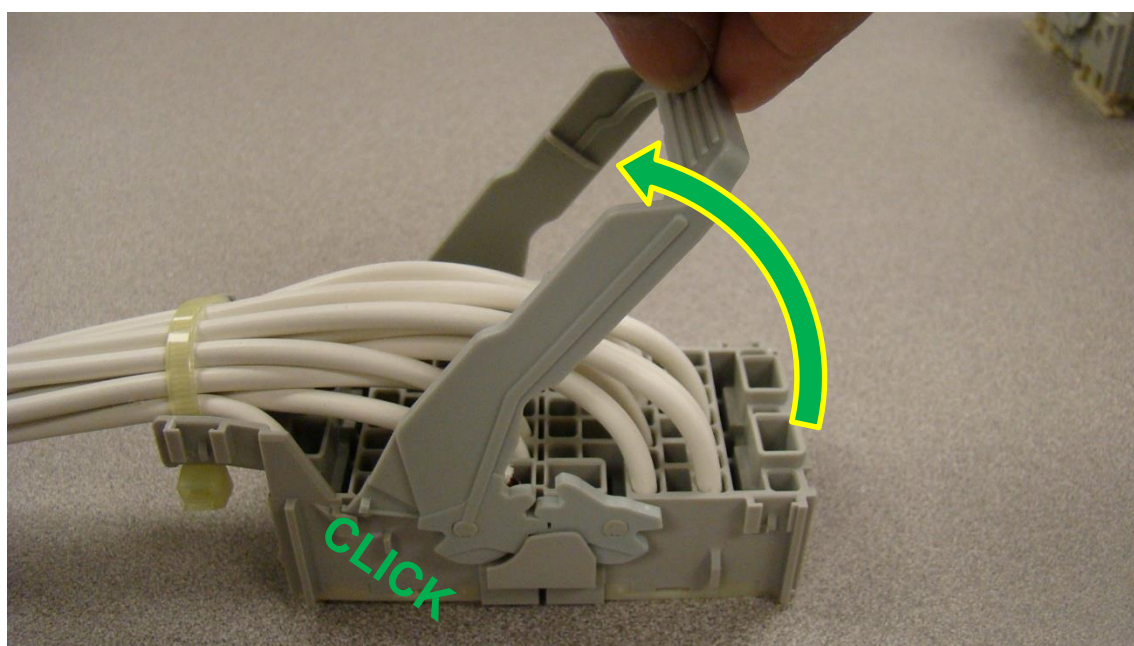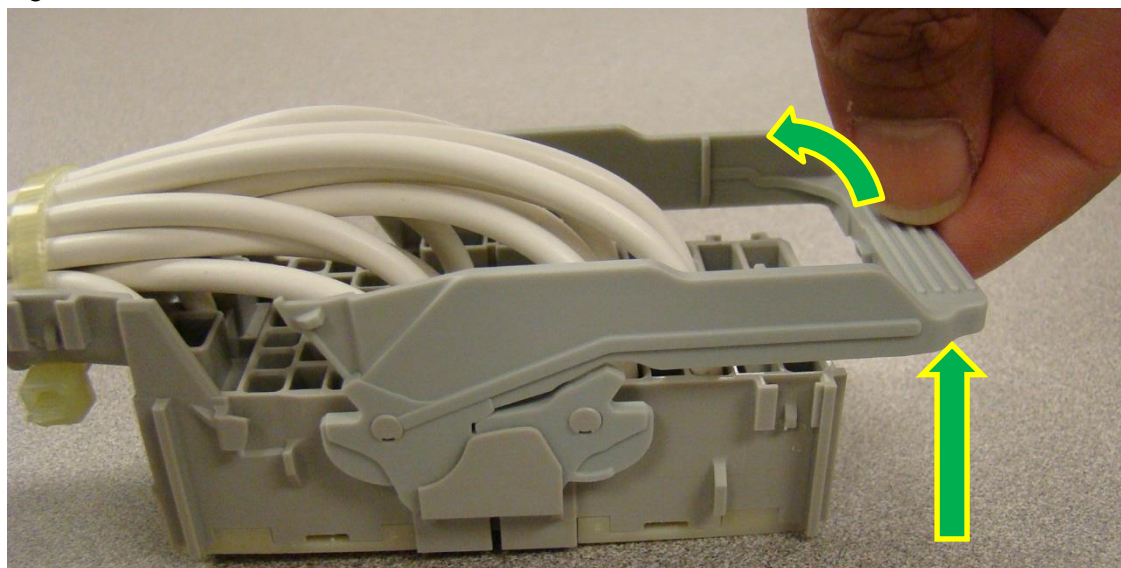
Keep rotating the lever while bringing it the in upright position until it clicks and locks itself in the pre-lock position.
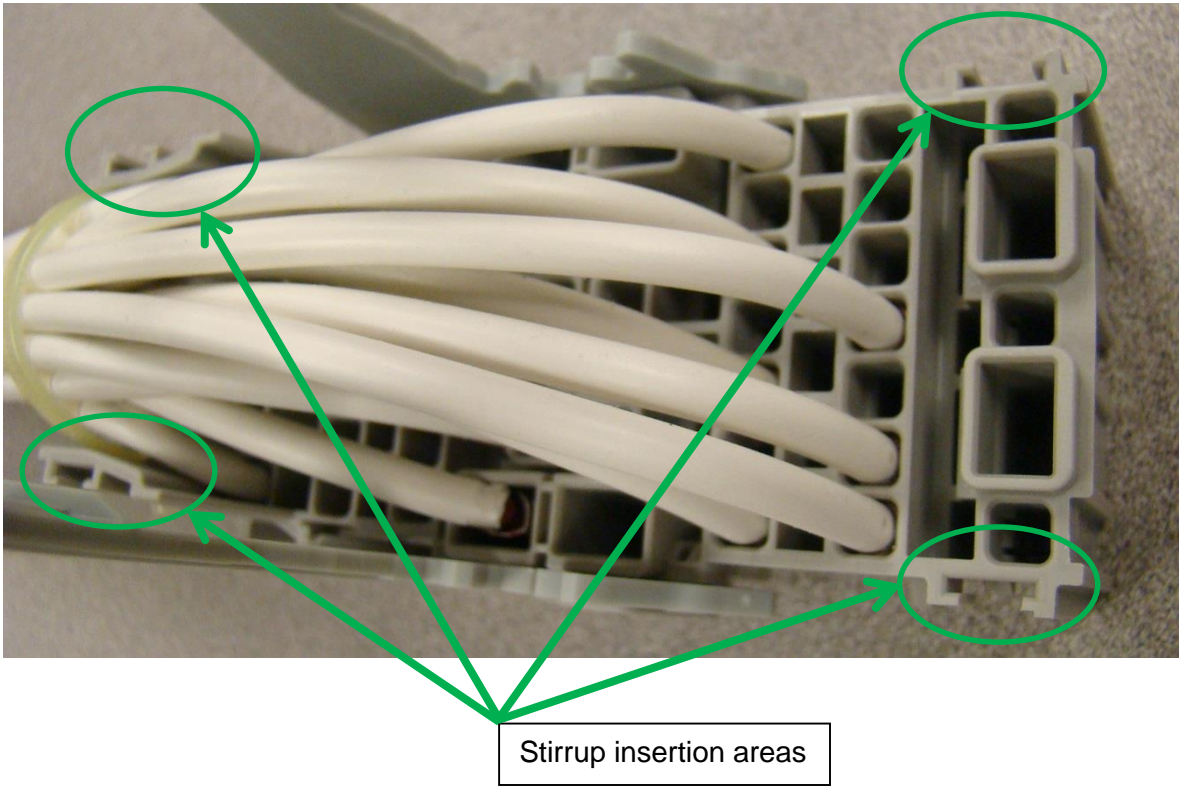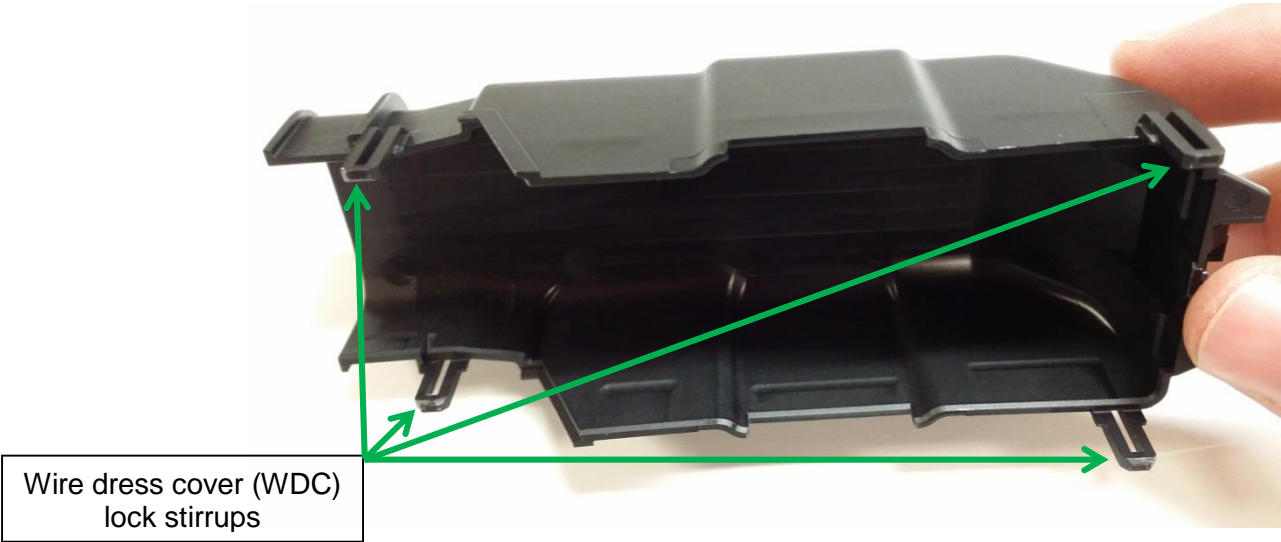
> The lever should click as it is shifted into the pre-lock position

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4.2.9 **WIRE DRESS COVER INSTALATION:** The wire dress cover can now be attached to the fully populated connector. The wire dress cover has four separate lock stirrups that match up with the four lock areas on the outside of the connector. The lever needs to be in the final lock position in order to mate the wire dress cover to the connector successfully.

Wire dress cover (WDC) lock stirrups

Stirrup insertion areas

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Slide the wire dress cover on top of the wire bundle over the connector through the lever so that all four WDC stirrups line up with their respective stirrup insertion areas on the connector
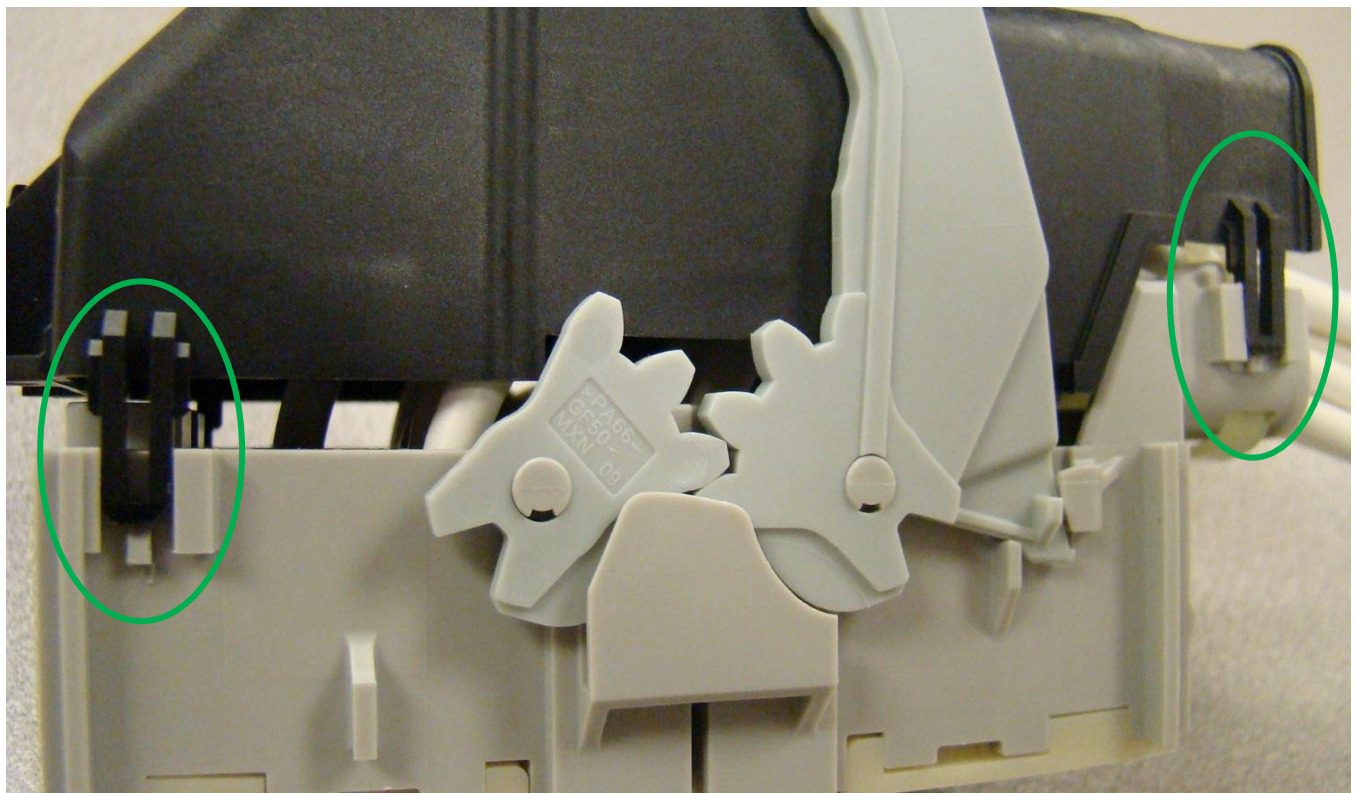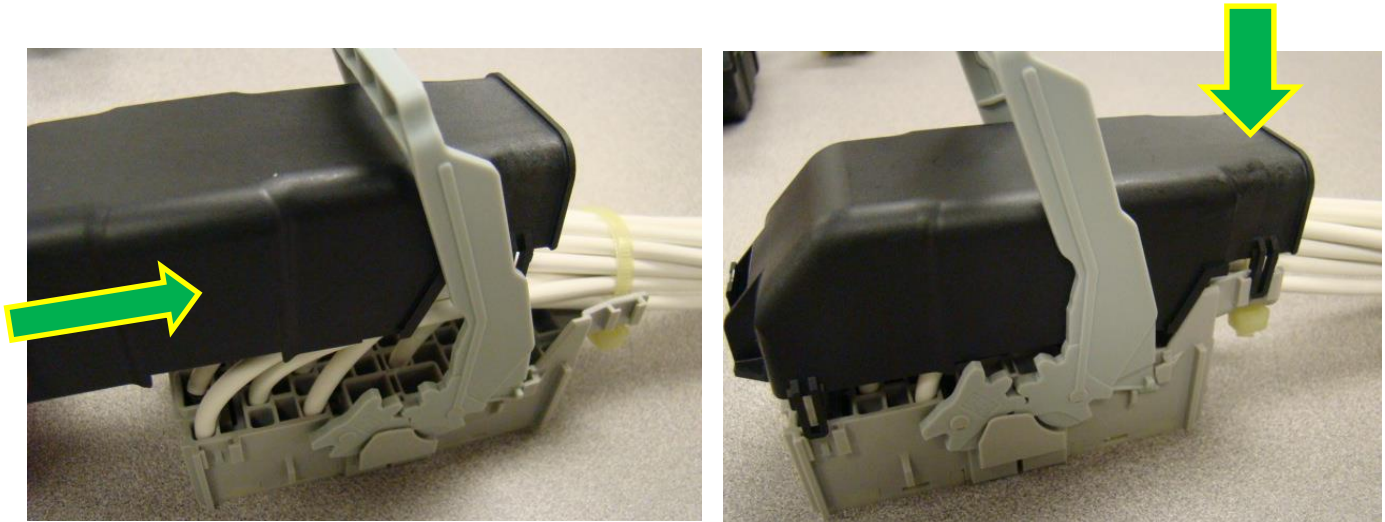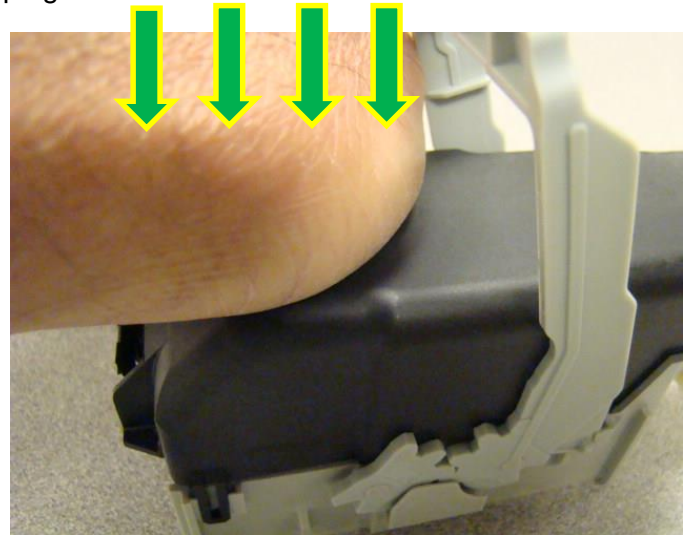

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Use hand palm to press the top of the wire dress cover on the wires takeout side of the connector to lock two stirrups on this side. Repeat same operation on the other side of the connector to lock remaining two stirrups get WDC locked as shown below:
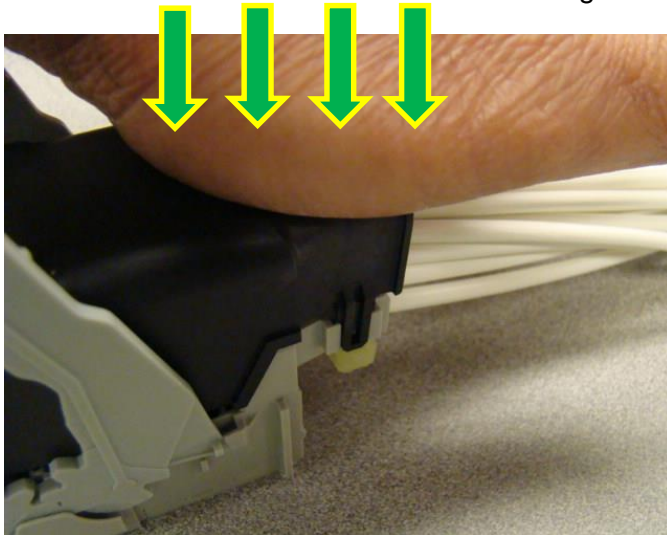
The lever is in the pre-lock position ready to be shipped to OEM plant from the harness manufacturing location

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4.2.10 CONNECTOR ASSEMBLY WITH THE MODULE

Hold the connector with lever in the pre-lock position and bring it closer to the module in proper orientation to ensure aligning the polarization key features on the connector shroud housing with the key-channels on the module to facilitate mating operation.
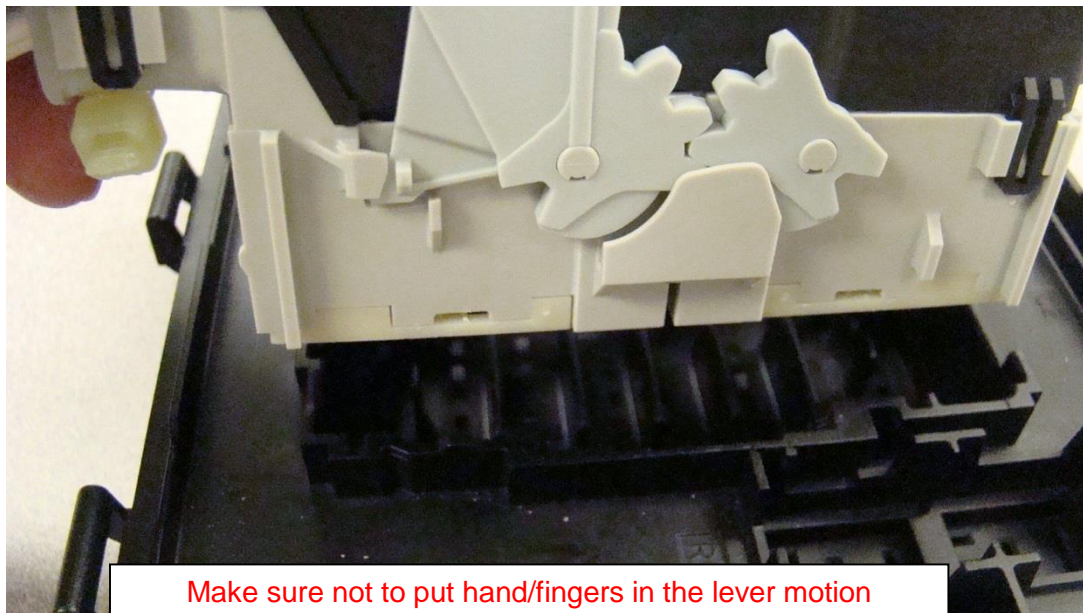
Make sure not to put hand/fingers in the lever motion direction when pushing on top flat surface of the connector dress cover while trying to engage with the module.
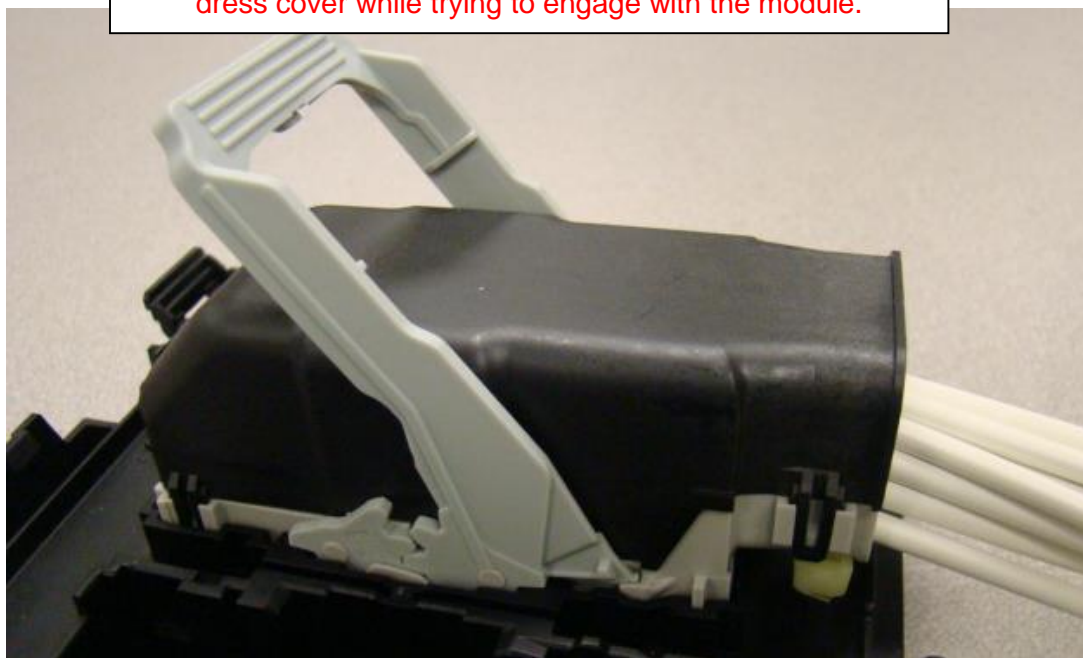
Once the connector is placed in the correct orientation over the module, the lever is released and gets free to be thrown to the final lock position.

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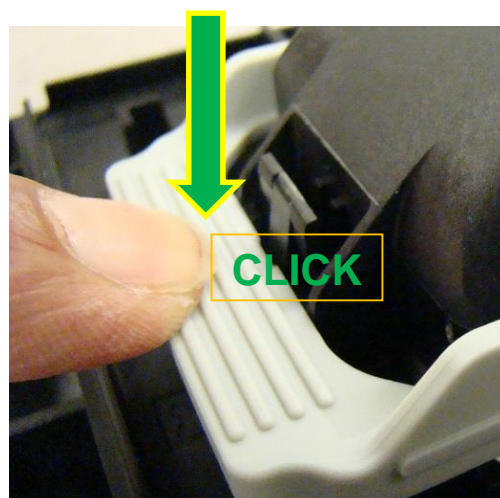| DOCUMENT NUMBER:	CREATED / REVISED BY:	CHECKED BY:	APPROVED BY:
RAS-160044-001	**Matt Young / Mahmood H.**	**Tim Skiver**	**Ron Bauman**

TEMPLATE FILENAME: APPLICATION_SPEC[SIZE_A](V.1).DOC

4.2.10 SHIFTING LEVER INTO LOCKED POSITION:

At this stage, lever is free to rotate and applying more push force will lock the lever throwing it in the final-lock position.

Apply vertically downwards force using thumb by pushing lever down to lock it in the final-lock position with an audible click

CLICK

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4.3 PDB CONNECTOR SERVICING INSTRUCTIONS

4.3.1 Connector Un-mating:

Using thumb depress hard the release button on the dress cover to release the lever and pull the leaver upwards using other hand to move it out of locked position
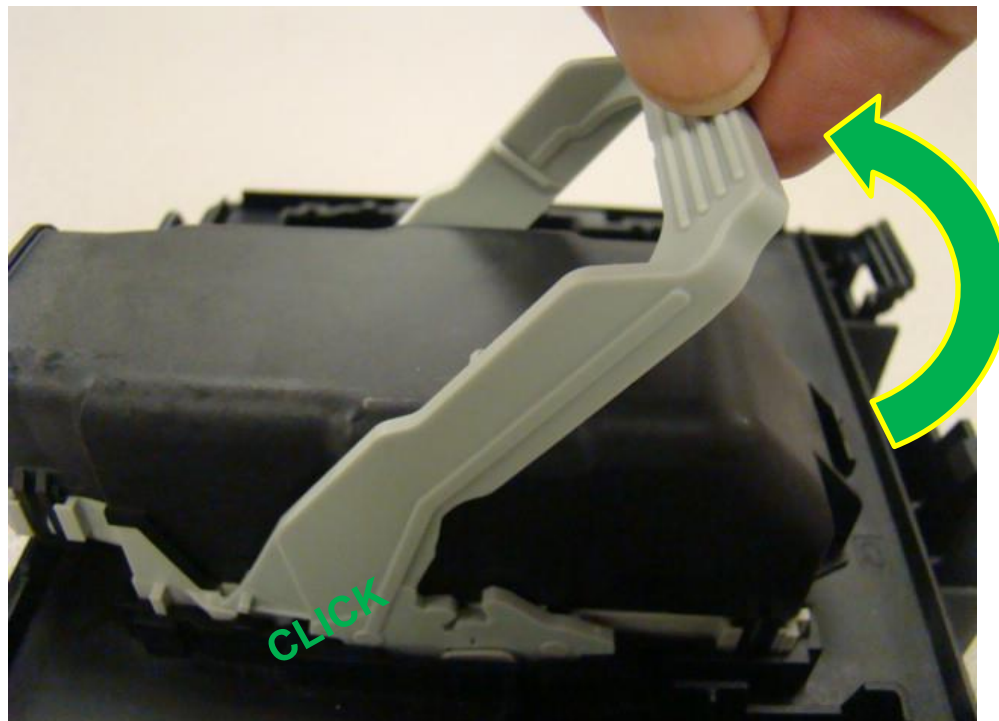

Lever Release button

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Now lever is released and free to rotate. Continue pulling lever rotating upwards until an audible click is heard when leaver is shifted in to pre-lock position. This operation would also release the connector allowing it to get disengaged from module to be pulled out.

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While pulling the connector out of the module, make sure not to pull it holding the lever. Use the connector body and wire dress cover to hold connector when pulling it upwards and out of the module to separate them apart.
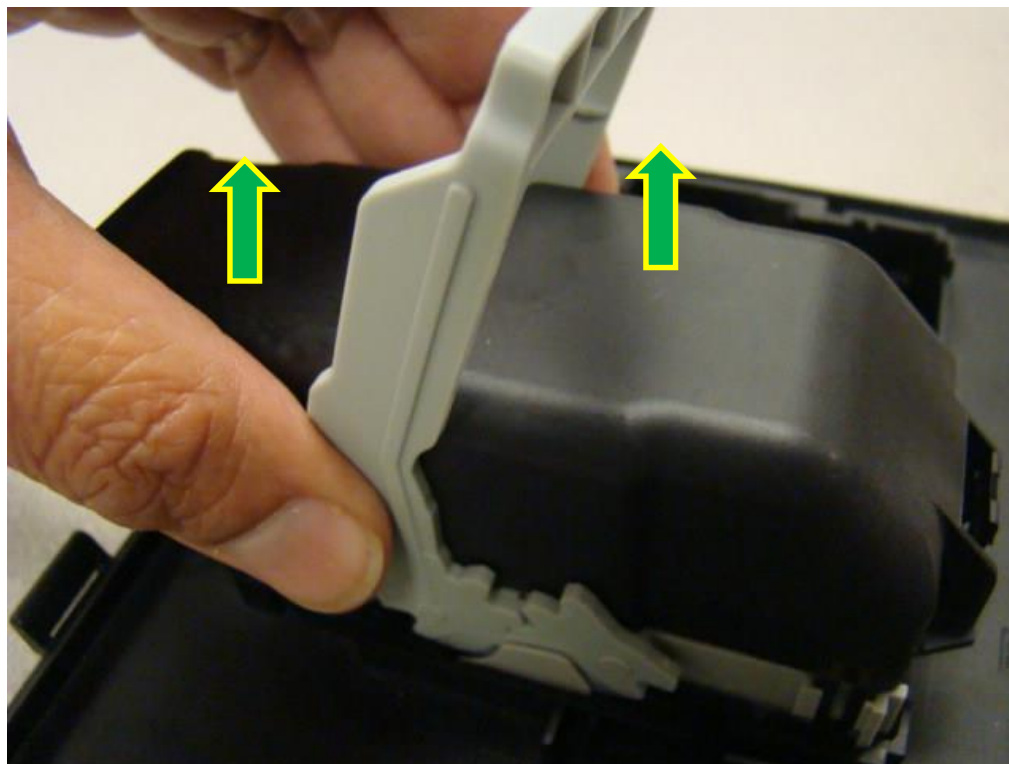
Note: Never use lever to pull through the connector out of the Module

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4.3.2 WIRE DRESS COVER REMOVAL:

To remove the wire dress cover, lift the four stirrups so that they pass over the shark fins on the receptacle housing. Use a small flat head screw driver (blade width 2.4 – 3.5 mm). Start by placing the screw driver at the bottom to gently pry the stirrup away from the connector to disengage dress cover. Repeat for all four stirrups while making sure they don't re-engage themselves.
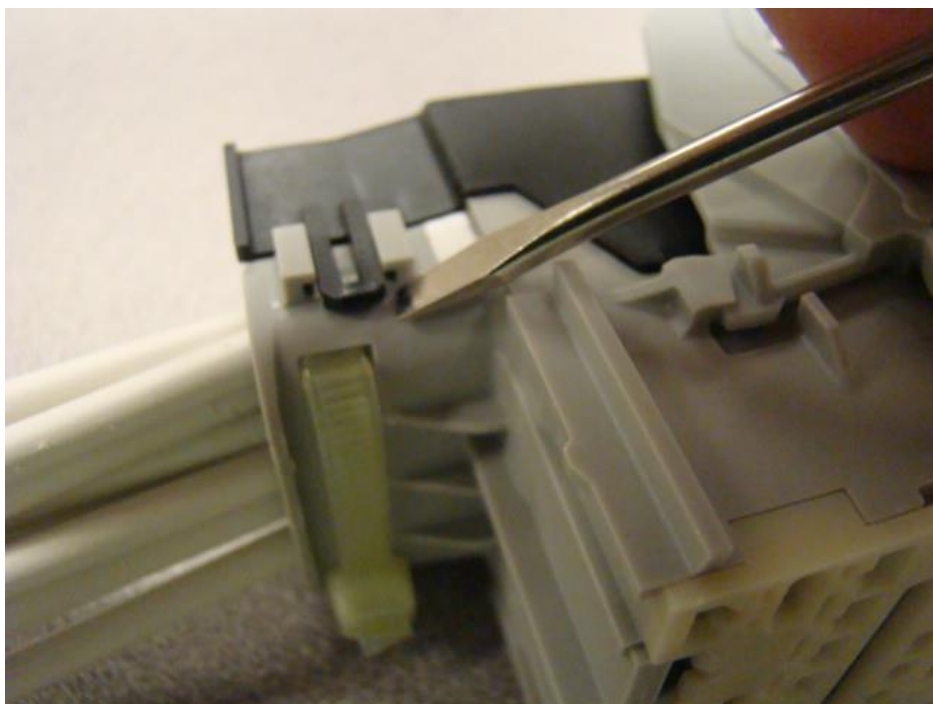
Place the screw driver underneath the wire dress cover stirrup. Pry upwards on with the screw driver so that the stirrup clears the shark fin on the receptacle housing.
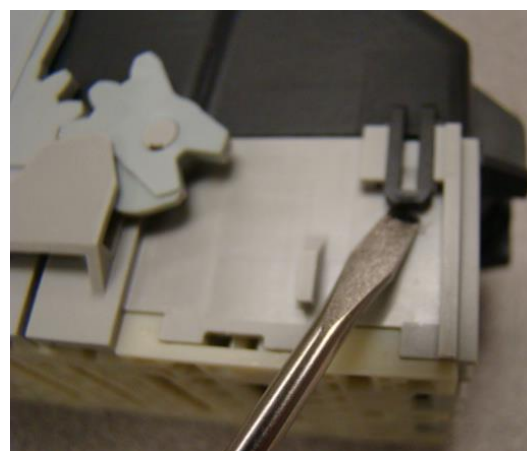
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Once all the stirrups have been disengaged, pull up on the wire dress cover to remove it.
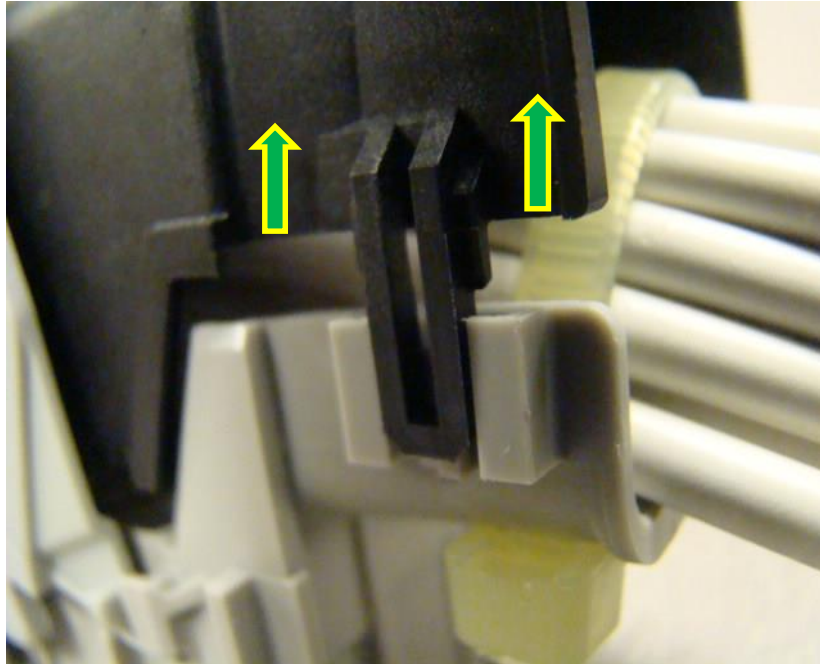
Once all stirrups are disengaged, lift up dress cover and start removing it from the receptacle housing while lifting up and pulling backwards in direction opposite to the wire bundle.

Note: If the wire dress cover becomes damaged during removal, it needs to be replaced
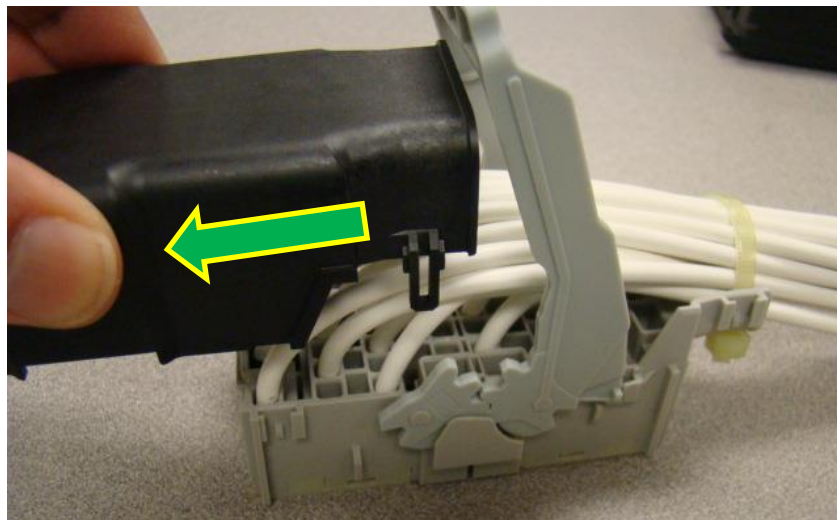
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4.3.3 TPA UNSEATING:

In order to service the terminals, the TPA must be unseated from the final lock position to the pre-lock position. A small (2.4 – 3.5 mm blade width) screw driver can be used to do this operation. Insert flat-head screw driver in the slot between TPA and shroud wall on either sides of the connector to lift the TPA
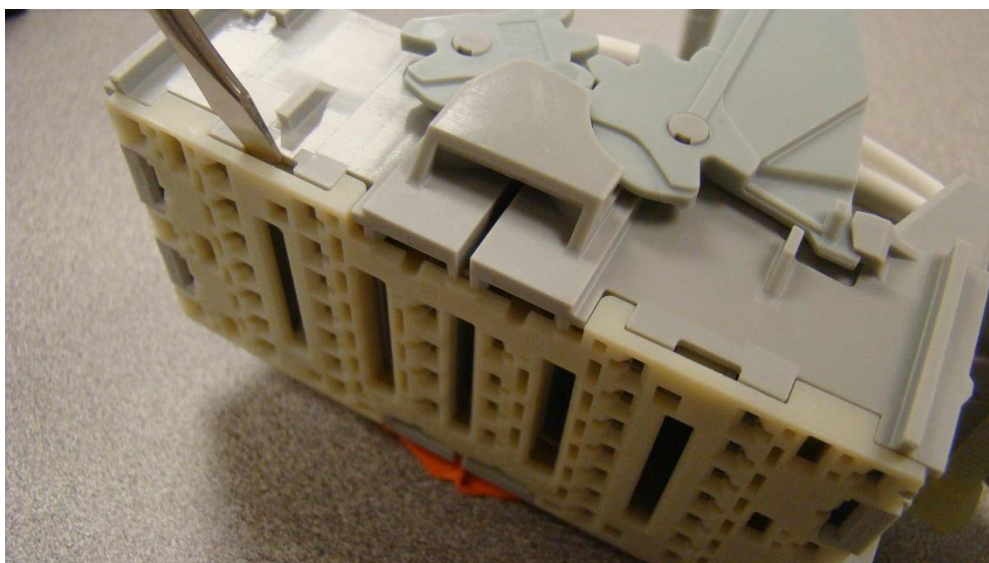
Rotate the screw driver to dislodge the TPA from final lock to pre-lock position repeating on all four sides of the connector until it is lifted up evenly and is shifted to the pre-lock position.
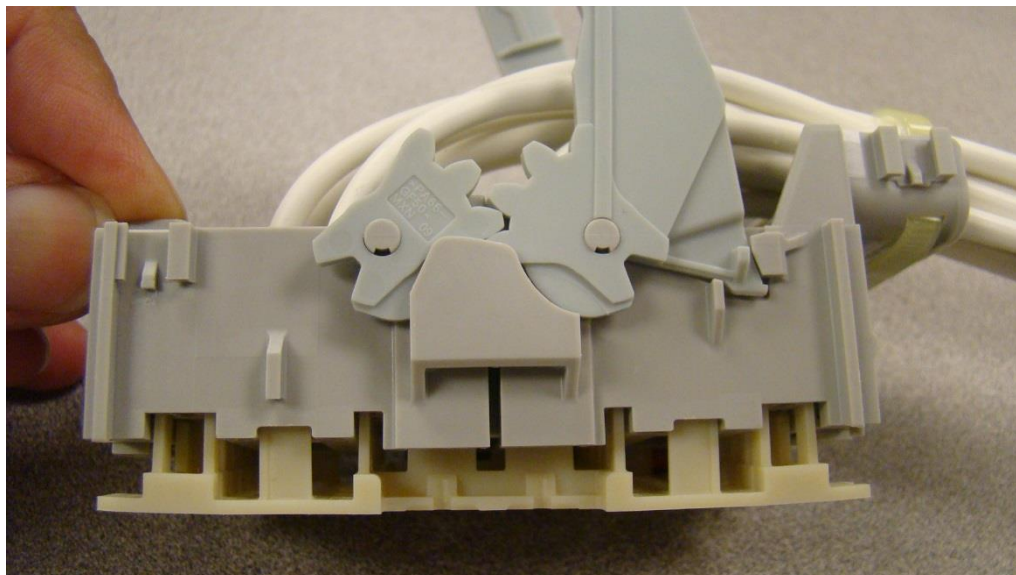
TPA is now in the pre-lock position

Note: TPA should never be removed during connector assembly operations and/or during terminal servicing processes.

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4.3.4 Cutting off Zip-Tie:

Use a cutter to cut the zip-tie underneath the wire self.
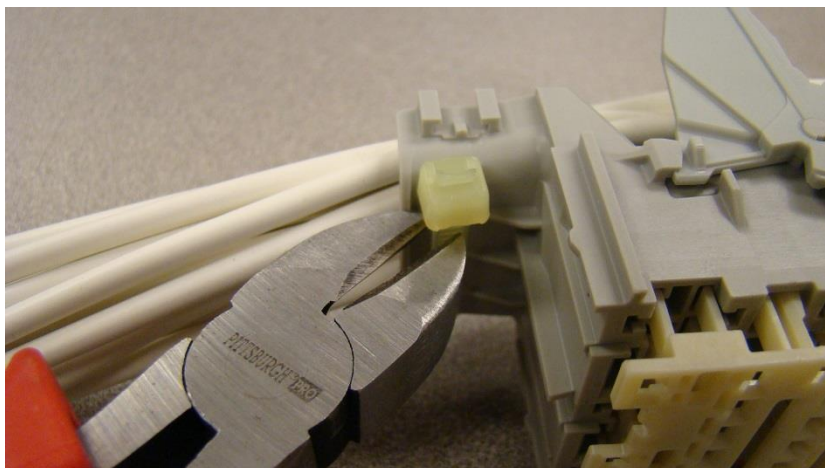
4.3.5   TERMINAL EXTRACTION:

4.3.5.1 Service Tool Slots (Access Opening):
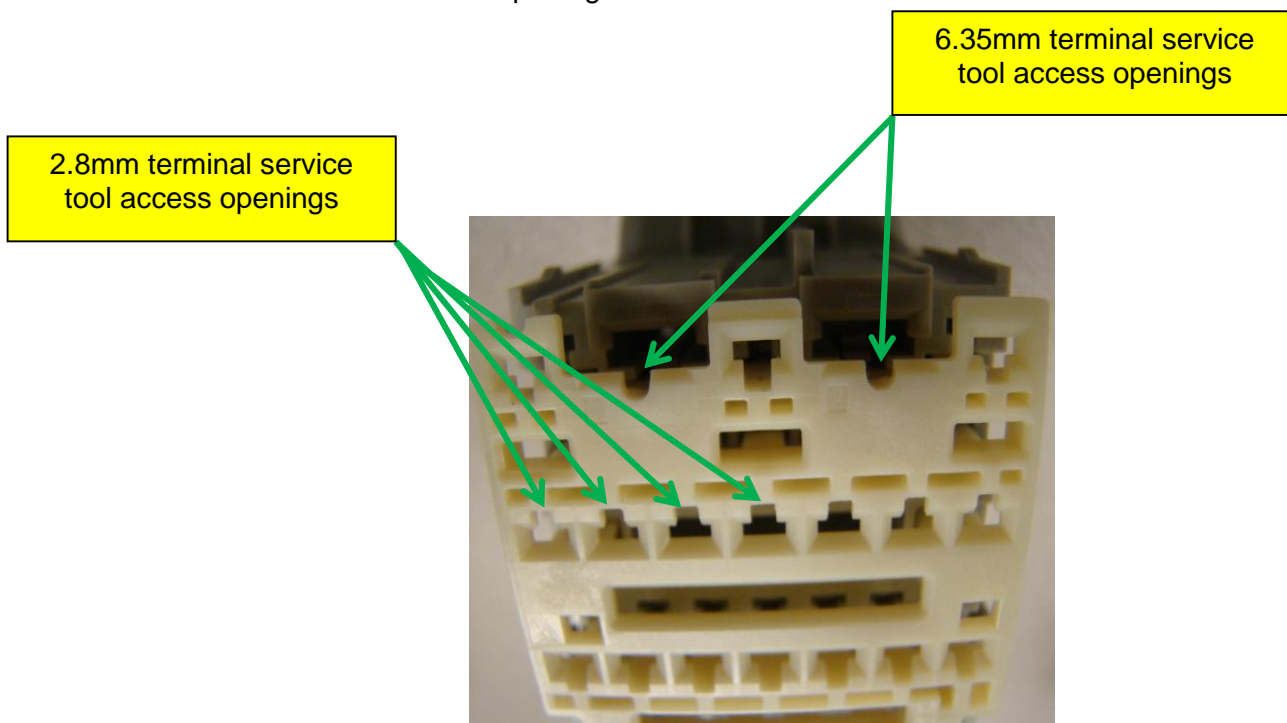6.3 Delphi-Apex terminals are located along the 4 walls as shown in the illustration below and rest are the openings for 2.8 Sumitomo terminals.

6.35mm terminal service tool access openings

2.8mm terminal service tool access openings

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4.3.5.2 Specific Service Tool:

Molex extraction **tool # 638133501** can be used for both 6.35mm and 2.8mm terminals as defined in the section 4.3.6 on following pages. The extraction tool is a square shaped tool with lead-in chisel tip. This shape helps tool to slide between the terminal box and the locking finger to release the terminal.
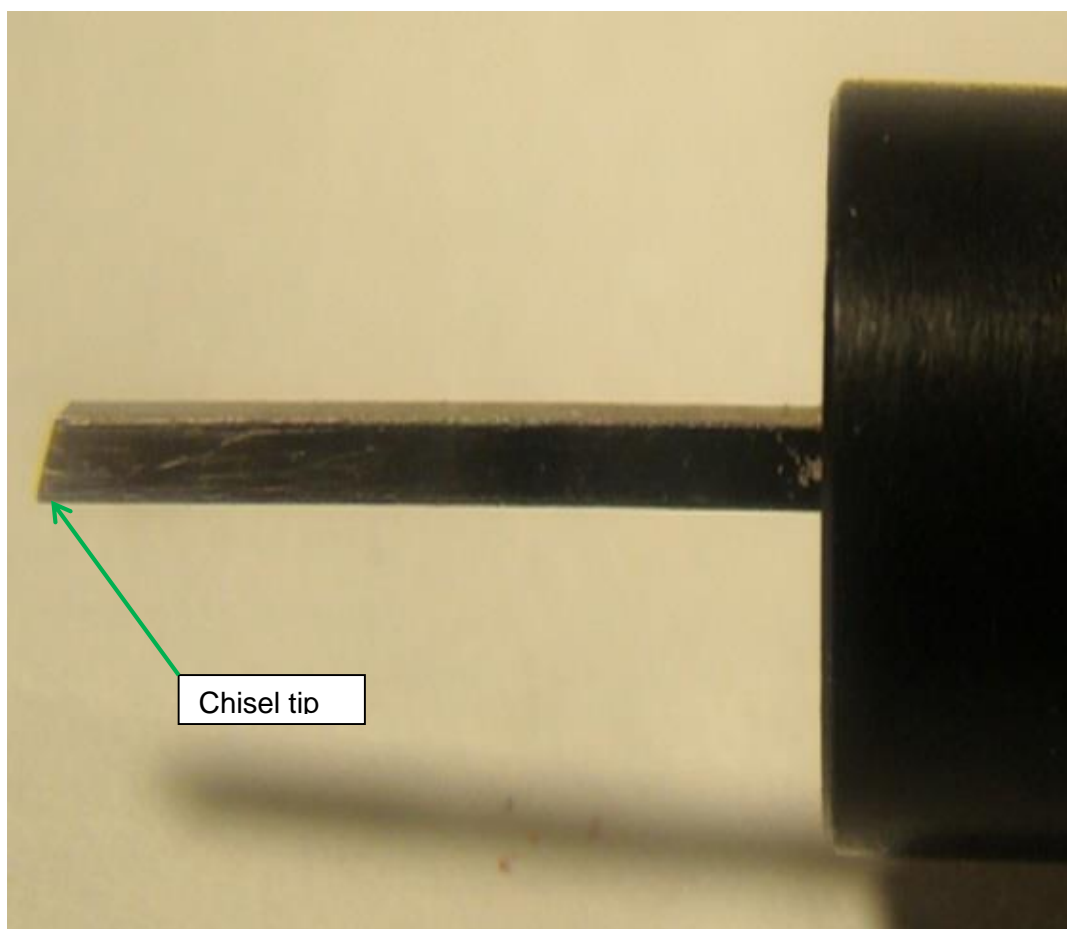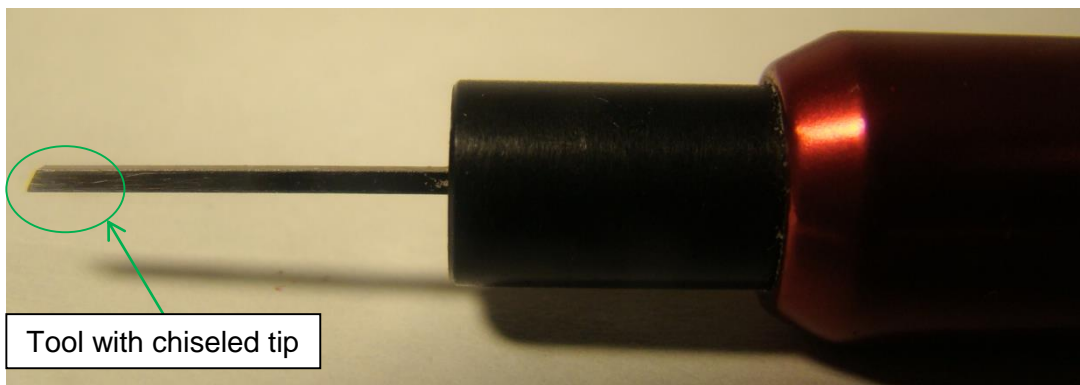
Tool with chiseled tip

Chisel tip

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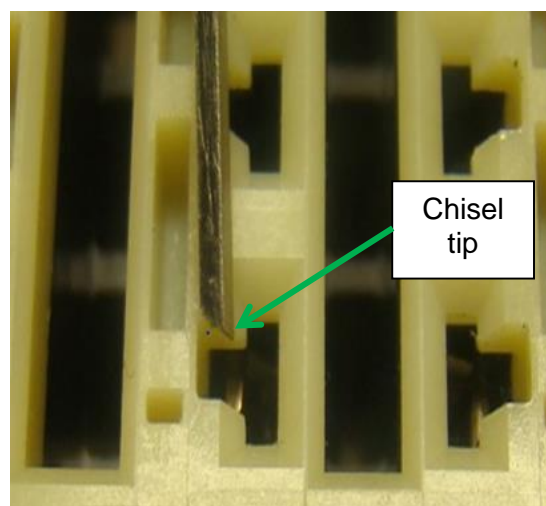| DOCUMENT NUMBER:	CREATED / REVISED BY:	CHECKED BY:	APPROVED BY:
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4.3.5.3 Terminal Extraction

Insert the terminal extraction tool in one of the tool slots to release the terminal locking finger. Keep pushing until extraction tool gets inserted between the locking finger and the terminal box.
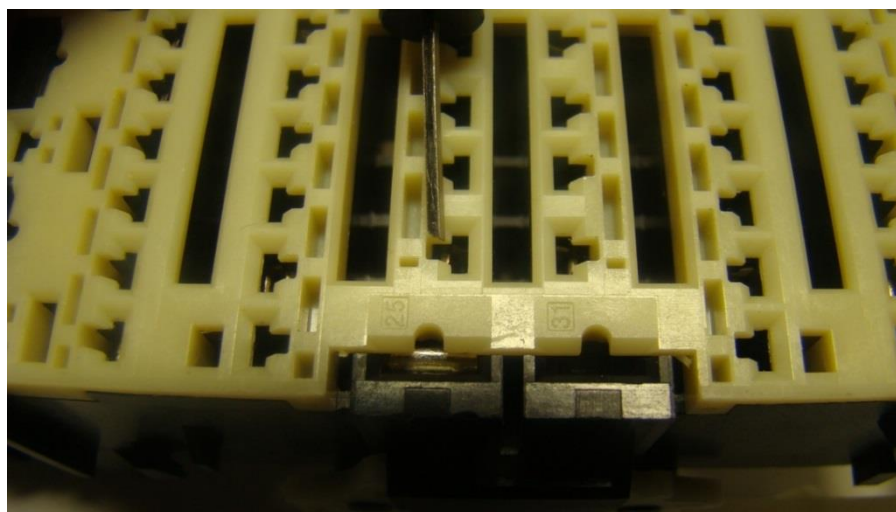
With the TPA in the pre-lock position, insert the terminal extraction tool # "638133501" into the designated slot cavity. Push the terminal to be removed forward in its cavity. Make sure the tool is oriented in the right direction such that the chisel tip slides against outside wall surface of the terminal box. Press the tool down the slot until you feel a click, releasing terminal. The lock finger should now be disengaged and terminal be free to be removed from the cavity. Pull the wire to remove the terminal. If the terminal does not remove easily, readjust the terminal extraction tool so that the terminal completely clears the cavity lock finger.
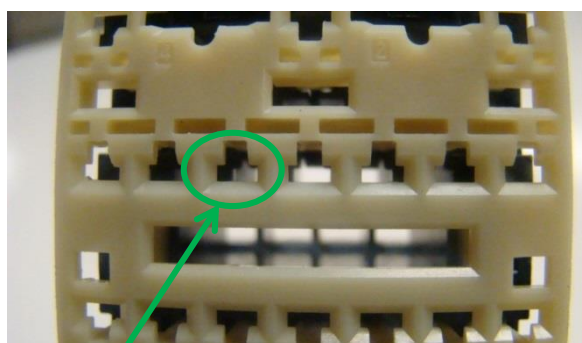
Insert tool with chiseled tip in appropriate orientation

Chisel tip

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When the terminal extraction tool is inserted correctly and the locking finger is disengaged, the terminal should be removed easily without exerting too much pull force. With the extraction tool inserted all the way, pull the wire in opposite direction to extract terminal out of the cavity.

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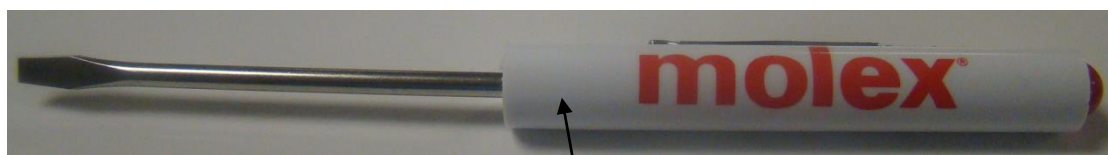*TEMPLATE FILENAME: APPLICATION_SPEC[SIZE_A](V.1).DOC*

4.3.6 SERVICE TOOLS

If any of the terminal needs to be replaced, use Molex part no. 63813-3501 – Service Tool to extract the terminal to be replaced.

Molex part no. 63813-3501 – Service Tool

For Service Tool ordering information, please visit www.molex.com

Standard Flat Tip Screw Driver (2.4 – 3.5) mm
Tip width – Service Tool

5.0 PDB CONNECTOR PROBING

5.1 Electrical continuity check

5.1.0 Electrical continuity check list

5.1.1 Probe pin recommendations:

1. When testing the parts for continuity, it is imperative that operators do not damage the pins.
2. Pogo pins should be checked for damage or sticking, several times during a shift. This should assure containment if an issue is found.
3. First a visual inspection of all the pins for damage should be performed.
4. Next a testing block should be used to depress all the pogo pins up into the barrel. If there is a bent or sticking pin, it will remain stuck in the barrel of the pogo pin and needs to be replaced immediately.

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5.1.2 Probing damage can occur:

1. If a sharp ended probe is used to contact the end terminal, the pin tip may damage the surface plating resulting in increased contact resistance and mate force.
2. If a probe is inserted at an angle or off centered, it may damage the pins, and or the connector.

Note: A damaged or stuck pin and/or sharp ended probe pin must always be replaced before any additional testing is performed.

5.1.3 Probe pin details
Check electrical continuity on the receptacle connector terminals and header pins using recommended probe pins as described below:

Probe pin details (for Header)
Manufacturer: Lone Star Industrial
Preferred probe number: LS054R-418
Pin diameter: 0.060" (1.52 mm)
Pin tip shape: Flat

! Must use above defined spring loaded pogo as pin or damage will occur !

Ordering Example: LSO54R-442-G-4.6
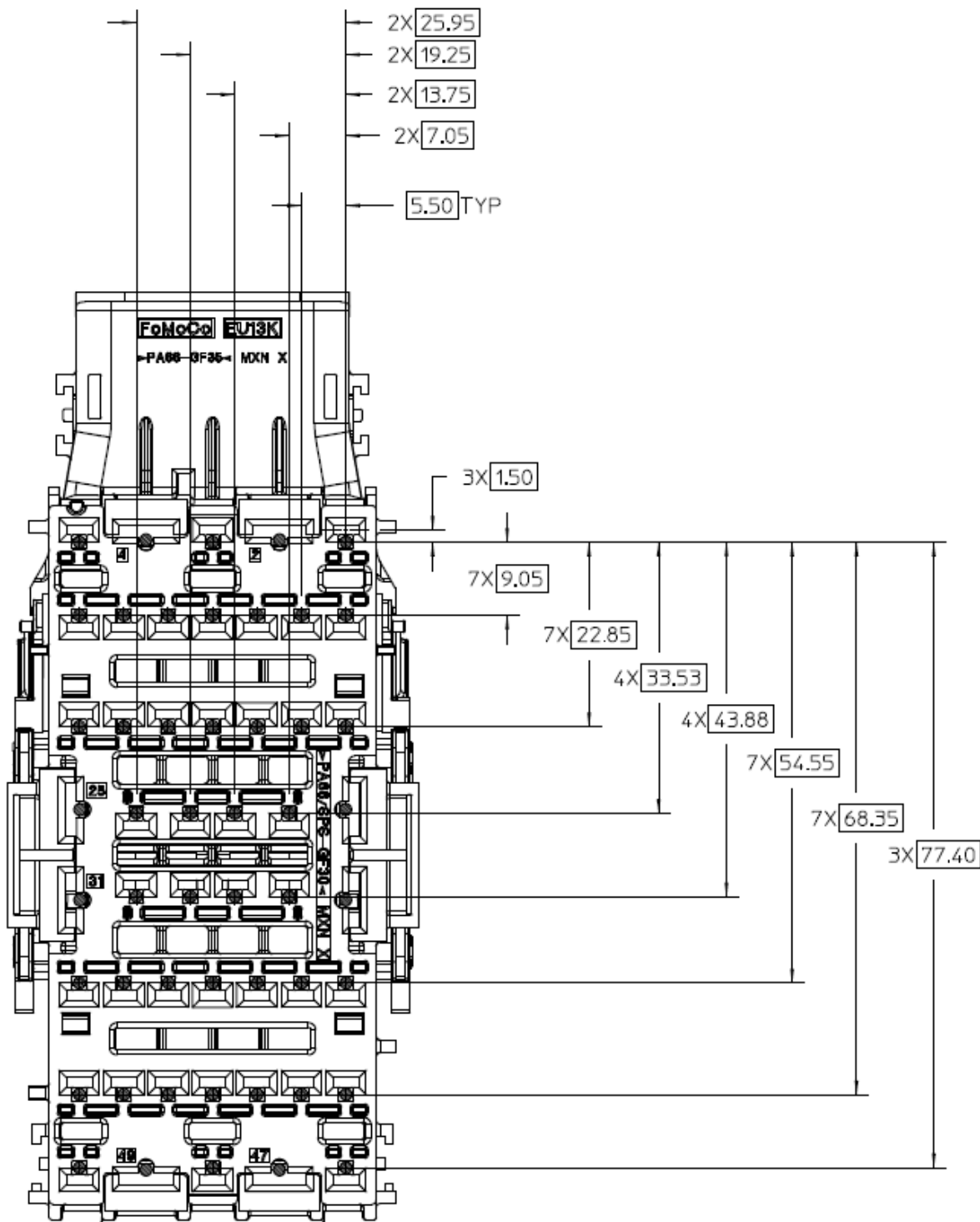
Plunger Plating - Spring Force

TECHNICAL DATA

Minimum Centers:	.100 (2.54) Except 460 and 463
Working Travel:	.170 (4.32)
Current Rating:	4 Amps

MATERIALS G N

Plunger:	Heat Treated BeCu, Gold or Nickel Plated.
Barrel:	Brass, Gold Plated.
Spring:	Stainless Steel or Music Wire.
Seal Ball:	Chrome Steel.
Receptacle:	Nickel Silver, Gold Plated.

SPRING FORCE

	OZ. (GRM) at .170 (4.32) Travel	PRELOAD
Standard	4.6 (131)	1.7 (48)
Optional	3.5 (99)	1.0 (28)
Optional	7.0 (199)	2.0 (57)

Dimensions in inches (millimeters)

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5.1.4 Pogo Pin Location for 2.8mm cavities

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5.1.5 Pogo Pin Location for 6.35mm cavities
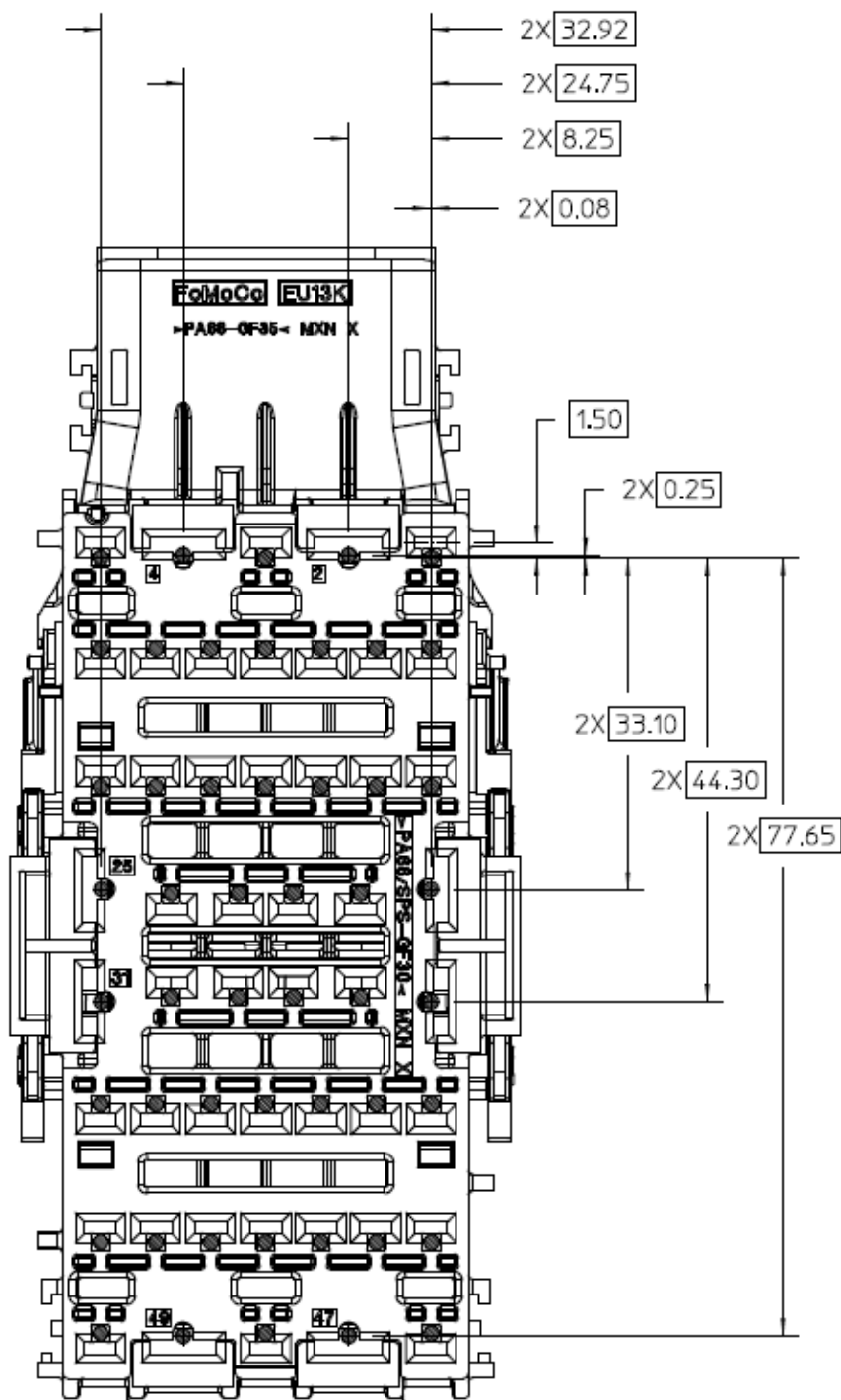
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